8.3.16 Salmon (*Salmo salar*) in Subdivisions 22–31 (Baltic Sea, excluding Gulf of Finland)

ICES stock advice

ICES advises that when the MSY approach is applied, total commercial sea catch in 2016 should not exceed 116 000 salmon. Applying the same catch proportions estimated to have occurred in 2014, this catch would be split as follows: 10% unwanted catch (previously referred to as discards) and 90% wanted catch (77% reported, 7% unreported, and 6% misreported). Setting a TAC under a discard ban needs to take account of wanted and unwanted catch. In setting the TAC, consideration should also be given to expected unreporting and misreporting levels in 2016.

ICES advises that management of salmon fisheries should be based on the status of individual river stocks. Fisheries on mixed stocks that cannot target only river stocks with a healthy status, present particular threats to stocks that do not have a healthy status. Fisheries in open sea areas or coastal waters are more likely to pose a threat to depleted stocks than fisheries in estuaries and rivers. Effort in these mixed-stock fisheries has been reduced to low levels and should not increase.

Salmon stocks in the rivers Rickleån, Kågeälven, and Öreälven in the Gulf of Bothnia, Emån in southern Sweden, and in several rivers in the southeastern Main Basin are especially weak. These stocks need longer-term stock-specific rebuilding measures, including fisheries restrictions in estuaries and rivers, habitat restoration, and removal of physical barriers. In order to maximize the potential recovery of these stocks, exploitation should not increase along their feeding and spawning migration routes at sea. The offshore fishery in the Main Basin catches all weak salmon stocks on their feeding migration. The coastal fishery catches weak stocks from northern rivers when the salmon pass the Åland Sea and the Gulf of Bothnia on their spawning migration.

Stock development over time

To evaluate the current status of the wild stocks, ICES uses the smolt production relative to the potential smolt production capacity (PSPC) on a river-by-river basis. Of the 29 assessed rivers in Subdivisions 22–31, the probability that the smolt production has reached 50% of the PSPC in 2014 is above 70% for 12 rivers, between 30% and 70% for 10 rivers, and below 30% for 7 rivers (Table 8.3.16.9). The probability that the smolt production has reached 75% of PSPC in 2014 is above 70% for four of the 29 rivers. With a few exceptions, the rivers in the northern Baltic Sea area present a better status than the southern ones.

The total wild smolt production has increased tenfold in Assessment Units (AU) 1–2 since the Salmon Action Plan was adopted in 1997 (Figure 8.3.16.1). The smolt production in AUs 3 and 4 has remained at around the same level. The strong spawning runs in 2012, 2013, and 2014, will likely result in increased smolt production in the near future. Despite the overall increase in wild smolt production, the decline in post-smolt survival from the late 1980s until the mid-2000s (Figure 8.3.16.2) has impacted fishing possibilities. Some indications of improvement in post-smolt survival have been noticed in recent years.

Smolt production in AU 5, assessed by expert judgement, has been low (Figure 8.3.16.1). However, based on recent parr density data some increase may be expected in the near future. A range of problems in the freshwater environment play a significant role in explaining the poor status of stocks in the southern Baltic rivers.

The harvest rate of salmon has decreased considerably since the beginning of the 1990s (Figure 8.3.16.1).

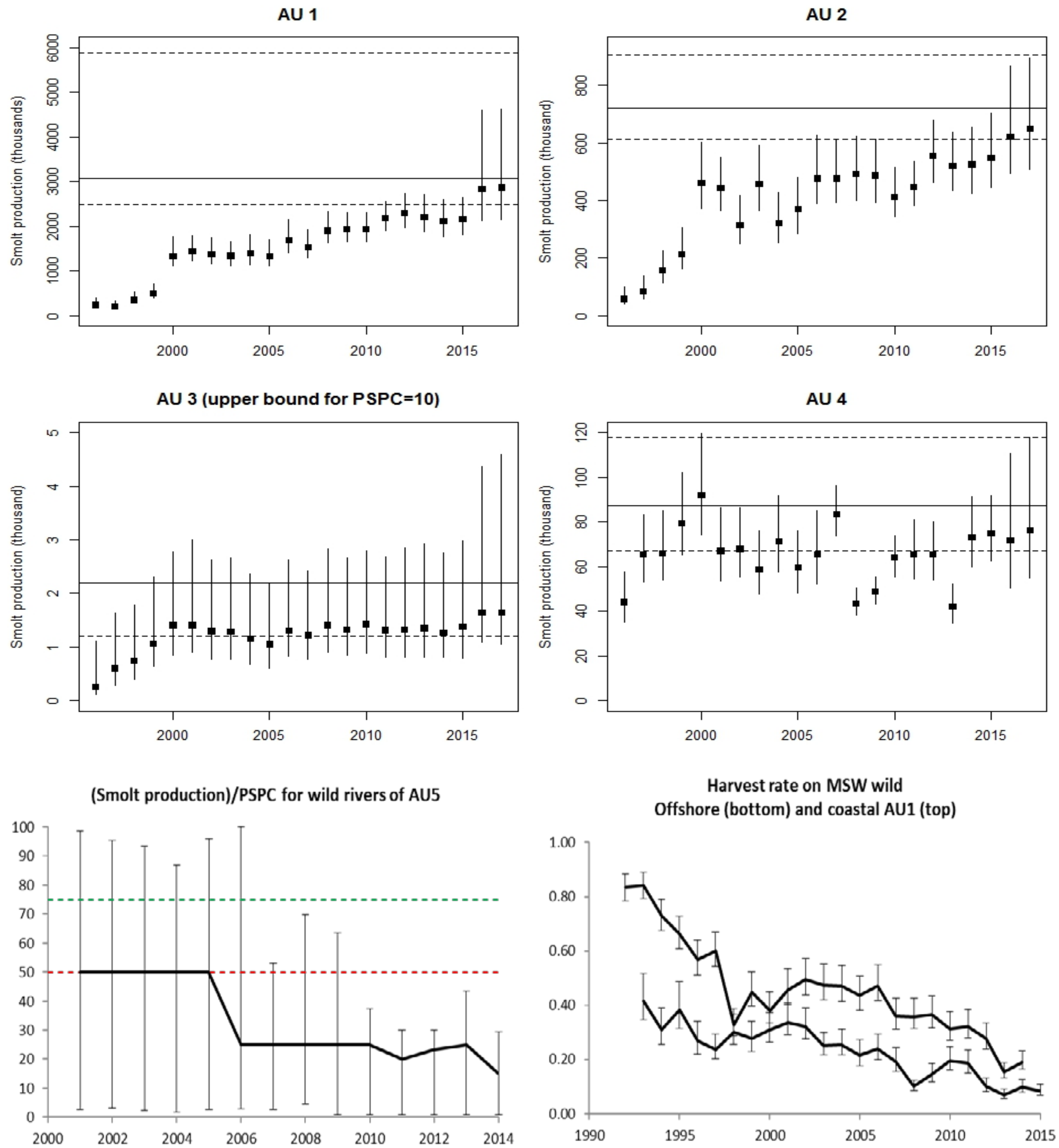

Figure 8.3.16.1 Salmon in Subdivisions 22–31. Top and middle rows: Smolt production (time-series) and PSPC (horizontal solid line) for AUs 1–4 (median estimate for the entire unit and 90% probability intervals). Bottom left: Smolt production relative to PSPC for AU 5 (median estimate across the wild rivers and 90% probability interval); values on the vertical axis denote percentages. Bottom right: harvest rates in offshore (by fishing season) and coastal (by calendar year) fisheries.

Catch options

The fishing scenarios in Table 8.3.16.1 were considered for 2016. Scenario 1 corresponds to the same total commercial catch at sea as the total advised by ICES for 2015 (116 000 salmon). Scenarios 2 and 3 represent a 20% increase and a 20% decrease in catch, respectively, compared with Scenario 1. Scenario 4 follows the EU Commission's proposal for a multiannual plan for Baltic salmon (EU, 2011). Two options are presented under Scenario 4: (a) F = 0.1 that covers the commercial catch at sea; (b) F = 0.1 that covers total (commercial and recreational) catch at sea. Scenario 5 illustrates stock development under no fishing, neither at sea nor in rivers. Projection assumptions are described in Table 8.3.16.10.

The Outlook table for 2016 (Table 8.3.16.1) splits the total commercial catch at sea into similar components as in previous years, using the proportions estimated to have occurred in 2014: wanted catch reported (77%), wanted catch unreported (7%), wanted catch misreported (6%), and unwanted catch (10%; this is the catch that would be discarded if discarding was allowed). The 10% unwanted catch is the sum of 3% (undersized salmon) and 7% (seal-damaged salmon). Seal-damaged salmon is always dead, whereas a proportion of the undersized salmon would survive if it was discarded. All scenarios assume additional recreational catches at sea that constitute 14% of the total (commercial + recreational) sea catch, based on the available data for 2014, and a constant harvest rate on returning salmon in rivers.

Table 8.3.16.1 Salmon in Subdivisions 22–31. The catch options.

Scenario	Commercial catch (thousands of fish) at sea in Subdvisions 22–31 in 2016					
	Total commercial catch at sea	Wanted catch Reported	Unwanted catch (dead+alive)		Wanted catch Unreported	Wanted catch Misreported
			Undersized	Seal damaged		
1	116	89.3	3.5	8.1	8.1	7.0
2	139	107.0	4.2	9.7	9.7	8.3
3	93	71.6	2.8	6.5	6.5	5.6
4(a)	96.495	74.301	2.895	6.755	6.755	5.790
4(b)	82.600	63.602	2.478	5.782	5.782	4.956
5	0	0	0.0	0	0	0
Scenario	Recreational catch at sea 2016	Total sea catch (comm. + recr.) 2016	River catch 2016		Spawners 2016	
1	19	135	39		136	
2	23	162	36		125	
3	15	108	43		148	
4(a)	15.708	112.203	42		146	
4(b)	13.446	96.046	44		153	
5	0	0	0		245	

*All values in the table are in thousands of fish.

MSY approach

Figure 8.3.16.4a–b presents the river-specific annual probabilities of meeting 75% of the PSPC under each scenario, for the 15 wild rivers of AUs 1–4 included in the stock projections. Table 8.3.16.11 shows these probabilities for year 2021 (for stocks in AUs 1–3) or 2020 (for stocks in AU 4), which is approximately one full generation ahead from now. The results indicate relatively small differences between scenarios 1–4, and only scenario 5 (zero fishing) is clearly different. There are, however, differences between rivers, with some of them having a much lower probability of reaching 75% of the PSPC. Rivers Emån (southern Sweden) and Simojoki, Rickleån, and Öreälven (Gulf of Bothnia) have the lowest probabilities. However, Rickleån and Öreälven are showing positive trends under most scenarios.

Figure 8.3.16.5a–b displays estimated smolt production in the past and projected future smolt production under Scenario 1. For all rivers except Emån and Mörrumsån, smolt production in 2020–2021 is expected to remain around current levels or to increase.

Given that the perception about current stock status has not changed markedly from last year's assessment, Scenario 1, corresponding to the commercial catch at sea advised last year, is still considered to provide the upper limit for exploitation under the MSY approach. This corresponds to a total commercial sea catch not exceeding 116 000 salmon in 2016.

Stock projections are not conducted for Kågeälven (AU 2), Testeboån (AU 3), and stocks in AU 5. The majority of these stocks are regarded as weak and several have shown decreasing trends during the last decade. Mixed-stock fisheries pose a special problem in managing these stocks. Effort in these fisheries has been reduced to low levels and should not increase. The reasons for the low productivity of southern stocks may, at least partly, be tracked down to special problems in the freshwater environment. Special actions (not only fishery-related) for these stocks are required in addition to the TAC.

Management Plan

According to the management plan proposed by the EC, fishing mortality in 2016 should not exceed F = 0.1. The plan does not specify exactly how to interpret F = 0.1, or whether this value covers the total catch at sea or only the commercial part of this catch. Different fisheries occur at different points in time and space, and many fisheries catch only maturing salmon. Hence, any catch calculation based on F = 0.1 is only approximate. ICES has calculated the catch option by calculating the abundance at sea on September 1st for 1 sea-winter fish and on July 1st for multi sea-winter fish applying only natural mortality from the start of the year, and then multiplying that abundance by 1−exp(−F).

Assuming that F = 0.1 covers only the commercial catch at sea (Scenario 4(a) in Table 8.3.16.1), this corresponds to total commercial catch at sea not exceeding 96 495 salmon.

Assuming that F = 0.1 covers the total catch at sea (Scenario 4(b) in Table 8.3.16.1), this corresponds to total commercial catch at sea not exceeding 82 600 salmon.

ICES has not evaluated this management plan for consistency with the precautionary approach and MSY.

Basis of the advice

Table 8.3.16.2 Salmon in Subdivisions 22–31. The basis of the advice.

Advice basis	MSY approach
Management plan	EC proposal (COM/2011/0470 final), not formally adopted

Quality of the assessment

The overall quality of the assessment for AU 1–4 stocks is considered to be good.

There are doubts concerning the quality of the yearly smolt production estimates for rivers Emån and Mörrumsån. The assessment this year estimated a considerably better status for Mörrumsån than previous assessments. This is expected to be a consequence of revised information on the PSPC for this river. However, the assessment of stock status for Mörrumsån and Emån should be regarded as tentative. A revised smolt production model is under development for these rivers. In addition, the PSPC for Ume/Vindelälven is considered likely to be underestimated, and stock status overestimated, which may be explained by an ongoing recolonization of salmon in the river, where local density-dependent effects may temporally affect the PSPC estimate. Similar effects may also be occurring in other rivers.

The limited data for AU 5 stocks preclude an analytical assessment of their status. The assessment results for these rivers should be interpreted with caution. More data from AU 5 are needed to improve the quality of the assessment. Establishing an index river in AU 5, where parr density, smolt trapping, and spawner abundance data are collected would facilitate the assessment of these stocks.

A considerable amount of the total catch consists of unreported catches (Table 8.3.16.8). Additionally, catch per unit effort in the Polish offshore fishery and deviations in the reported species composition between Polish and other countries' longline fisheries indicate substantial misreporting of salmon as sea trout in the Polish fishery. Even though the magnitude of the misreporting has likely decreased, it still constitutes a significant catch. Internationally coordinated attempts at resolving the issue have occurred in recent years, but further progress is still needed. Adjustments are made in the assessment to account for misreporting and unreporting of salmon landings. This uncertainty in the data introduces additional uncertainty in the results.

The assessment uses current available estimates of recreational catches at sea and in rivers, but there is substantial uncertainty around these values.

Issues relevant for the advice

There is considerable uncertainty about the amount of salmon discarded, and even greater uncertainty about the proportion that survives when discarded. Seal-damaged salmon is all dead, but there is also uncertainty on the amount of seal-damaged salmon. The values used in this advice represent the current available knowledge and are based on data from a variety of sources (such as logbooks, interviews with fishers, agreed sampling schemes with skippers, or DCF sampling data), but these data are generally sparse. Expert judgement has been applied to supplement these data or when no data are available. Because of this uncertainty, current estimates of discards should be considered only as an order of magnitude and not as precise estimates. Table 8.3.16.12 presents the current understanding of the amount of undersized fish that would survive if discarded, and provides additional detail by fishery.

Recent efforts to re-establish self-sustaining salmon stocks in 'potential' rivers, where salmon stocks have been extirpated in the past, present exceptional challenges to management. The numbers of spawners in the 'potential' rivers are likely to be particularly low following initial re-introductions, and productivity is likely to be lower than average. The considerations presented in this advice for the existing weak salmon stocks (e.g. habitat restorations, fishery restrictions, etc.) also apply to re-established stocks.

Harvest rates on salmon are presently rather low compared to the history. This implies that natural processes, mainly post-smolt and adult natural mortalities, will have a high relative impact on the resulting chances of reaching the management objective. The prevalence of the M74 syndrome has been decreasing since the mid-1990s and is currently at a low level. The present advice has taken into account this pattern of incidence of M74.

Exploitation in the Main Basin offshore fisheries affects possibilities for recovery of the Gulf of Finland salmon stocks as Gulf of Finland salmon is partly caught in the Main Basin. The future development in the longline fishery in the Main Basin is, thus, also important for the recovery rate of salmon stocks in the Gulf of Finland.

Reference points

To evaluate the current state of the stock, ICES uses the smolt production in 2014 relative to 50% and 75% of the natural production capacity (potential smolt production capacity; PSPC) on a river-by-river basis. The 75% of PSPC reference is based on the MSY approach (ICES, 2008a, 2008b), whereas 50% of PSPC has no formal status as a reference point in ICES but is widely considered an interim objective for weak stocks; hence, it is also included as part of the stock status evaluation.

Basis of the assessment

ICES uses five assessment units for salmon in the Baltic Main Basin and Gulf of Bothnia (Figure 8.3.16.6). 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. It can therefore be assumed that they are subject to the same fisheries, experience the same exploitation rates, and could be managed in the same way (e.g. using coastal management measures might improve the status of all stocks in a specific assessment unit). Even though stocks of AUs 1–3 have the highest current smolt productions and, therefore, have an important role in sustaining economically viable fisheries, the stocks in AUs 4 and 5 contain a relatively high proportion of the overall genetic variability of Baltic salmon stocks.

Table 8.3.16.3 Salmon in Subdivisions 22–31. Assessment areas.

Assessment unit	Name	Salmon rivers included
1	Northeastern Bothnian Bay stocks	On the Finnish–Swedish coast from Perhonjoki northward to the river Råneälven, including River Tornionjoki.
2	Western Bothnian Bay stocks	On the Swedish coast between Lögdeälven and Luleälven.
3	Bothnian Sea stocks	On the Swedish coast from Dalälven northward to Gideälven and on the Finnish coast from Paimionjoki northwards to Kyrönjoki.
4	Western Main Basin stocks	Rivers on the Swedish coast in ICES Subdivisions 25–29.
5	Eastern Main Basin stocks	Estonian, Latvian, Lithuanian, and Polish rivers.

Table 8.3.16.4 Salmon in Subdivisions 22–31. The basis of the assessment.

ICES stock data category	1 (ICES, 2015b)
Assessment type	Bayesian state–space model for a majority of rivers in AUs 1–4; assessment by expert judgement for AU 5 and a new wild river in AU 3. Uncertainties about estimated quantities from the Bayesian model are expressed as probability distributions.
Input data	Commercial removals (international landings and effort by fishery, wild and reared proportions, tag returns); recreational catch; estimated unreported and misreported catch; spawner counts in some rivers, parr densities from all rivers, smolt counts in some rivers.
Discards and bycatch	Included in the assessment (estimates based partly on data and partly on expert evaluation).
Indicators	None.
Other information	Latest benchmark was in 2012 (IBP Salmon; ICES, 2012).
Working group	Assessment Working Group on Baltic Salmon and Trout (WGBAST)

The PSPC is estimated based on a combination of expert knowledge and spawner/smolt estimates (based on river-specific stock–recruit relationships) which are derived by fitting the assessment model to the data. The assessment model incorporates new information annually and updates the estimates of smolt production historically and the PSPC for each river.

Information from stakeholders

There is no information available.

History of the advice, catch, and management

Table 8.3.16.5 Salmon in Subdivisions 22–31 (Main Basin and Gulf of Bothnia). ICES advice for salmon, landings, total catches, and agreed TACs; all numbers in thousands of fish. Landings and total catch figures for 2014 are preliminary.

Year	ICES advice	ICES advice	Landings[1] at sea	Catch[2] at sea	TAC	River catch
1987	No increase in effort	-	729	957		11
1988	Reduce effort		543	716		13
1989	TAC	850	755	1001		18
1990	TAC		861	1179		28
1991	Lower TAC	-	630	857		27
1992	TAC	688	619	845		26
1993	TAC	500	549	753	650	25
1994	TAC	500	454	630	600	21
1995	Catch as low as possible in offshore and coastal fisheries	-	501	758	500	27
1996	Catch as low as possible in offshore and coastal fisheries	-	486	753	450	44
1997	Catch as low as possible in offshore and coastal fisheries	-	370	629	410	56
1998	Offshore and coastal fisheries should be closed	-	369	575	410	37
1999	Same TAC and other management measures as in 1998	410	313	588	410	37
2000	Same TAC and other management measures as in 1999	410	363	689	450	35
2001	Same TAC and other management measures as in 2000	410	388	632	450	39
2002	Same TAC and other management measures as in 2001	410	362	589	450	36
2003	Same TAC and other management measures as in 2002	410	350	613	460	29
2004	Same TAC and other management measures as in 2003	410	410	827	460	32
2005	Current exploitation pressure will not impair the possibilities of reaching the management objective for the stronger stocks.	-	293	504	460	39
2006	Current exploitation pressure will not impair the possibilities of reaching the management objective for the larger stocks. Long-term benefits for the smaller stocks are expected from a reduction of the fishing pressure, although it is uncertain whether this is sufficient to rebuild these stocks to the level indicated in the Salmon Action Plan.	-	196	303	460	24
2007	ICES recommends that catches should not increase.	324	182	294	429	30
2008	ICES recommends that catches should be decreased in all fisheries.	-	136	171	364	58
2009	ICES recommends no increase in catches of any fisheries above the 2008 level for SDs 22–31.	-	172	295	310	41
2010	TAC for SDs 22–31	133	141	258	294	23
2011	TAC for SDs 22–31	120	144	221	250	25
2012	TAC for SDs 22–31	54	128	170	123	63
2013	TAC for SDs 22–31	54	106	145	109	51
2014	TAC for SDs 22–31, corresponding to reported commercial sea landings assuming discards, unreporting, and misreporting as in 2012 (corresponding total commercial sea removals are given in brackets)	78 (116*)	104	129	107	55
2015	Total commercial sea catch for SDs 22–31 (estimates of the split of the catch in 2013 into: unwanted, wanted and reported, wanted and unreported, wanted and misreported, are given in brackets).	116 (11%, 68%, 10%, 11%)			96	
2016	Total commercial sea catch for SDs 22–31 (estimates of the split of the catch in 2014 into: unwanted, wanted and reported, wanted and unreported, wanted and misreported, are given in brackets).	116 (10%, 77%, 7%, 6%)				

[1]Total reported catches including recreational catches. [2]Estimated total catches including discards, mis- and unreporting. *Value corresponds to total commercial sea removals, including reported landings, unreporting, misreporting, and dead discards.

History of catch and landings

The salmon fishery has changed considerably since the beginning of the 1990s (Table 8.3.16.7, Figure 8.3.16.7). The very high exploitation rate in the offshore and coastal fisheries has decreased successively due to, e.g. (1) regulatory measures such as closed areas and changes in the opening time of fishery; additionally, reduced national quotas since 2012 have restricted salmon catch in some countries, (2) marketing restrictions on large salmon in certain countries due to high dioxin levels, and (3) increased seal damage to catches and gears. The driftnet ban in 2008 decreased offshore catches in 2008 to the lowest value recorded since 1972. However, changes in the application of dioxin regulations in 2009, increases in market price for salmon, and reduced opportunities for income in other fisheries resulted in an increase in offshore longline fishing from 2008 to 2010. Offshore exploitation has thereafter decreased and is now even lower than in 2008. Despite less restrictive dioxin regulations since 2009, these regulations are still suppressing some of the fisheries.

Table 8.3.16.6 Salmon in Subdivisions 22–31. Catch distribution in 2014.

Catch distribution	Total removal (dead catch) (2014) was 1076 t (including also non-commercial and river catches), where 86% were nominal landings (commercial and non-commercial in sea and in rivers), 5% estimated dead discards, and 8% estimated unreported and misreported landings.

Table 8.3.16.7 Salmon in Subdivisions 22–31 (Main Basin and Gulf of Bothnia). Nominal landings of Baltic salmon in round fresh weight and in numbers: landings from rivers, coast, and offshore; total; commercial (in numbers) from coast and offshore combined; agreed TAC for Subdivisions 22–31.

Year	Rivers		Coast		Offshore		Total		Coast and offshore*	TAC
	thousand tonnes	thousand fish	thousand tonnes	thousand fish	thousand tonnes	thousand fish	thousand tonnes	thousand fish	thousand fish	thousand fish
1993	0.11		0.83		2.57		3.52		676	650
1994	0.10		0.58		2.25		2.93		584	600
1995	0.12		0.67		1.98		2.77		553	500
1996	0.21	35	0.77	168	1.73	366	2.71	570	456	450
1997	0.28	45	0.80	149	1.50	282	2.58	476	396	410
1998	0.19	30	0.59	104	1.52	314	2.30	449	334	410
1999	0.17	30	0.59	104	1.23	256	1.99	391	286	410
2000	0.18	30	0.52	100	1.45	313	2.15	442	312	450
2001	0.16	30	0.57	121	1.19	262	1.92	413	355	450
2002	0.14	28	0.59	126	1.03	234	1.75	388	336	450
2003	0.12	28	0.43	113	1.00	235	1.56	376	327	460
2004	0.13	25	0.77	161	1.11	247	2.01	433	365	460
2005	0.17	31	0.61	118	0.86	175	1.64	323	254	460
2006	0.10	19	0.40	71	0.63	124	1.12	213	172	460
2007	0.14	23	0.35	69	0.55	111	1.04	204	159	429
2008	0.26	45	0.46	92	0.21	43	0.93	180	109	364
2009	0.18	32	0.55	113	0.27	56	1.00	201	138	310
2010	0.11	18	0.37	66	0.35	71	0.84	155	118	294
2011	0.17	20	0.37	66	0.33	73	0.87	159	122	250
2012	0.33	50	0.45	72	0.29	53	1.06	175	108	123
2013	0.26	39	0.45	68	0.21	38	0.92	146	87	109
2014**	0.32	43	0.42	69	0.19	32	0.93	144	85	107

*For comparison with TAC (includes only commercial catches, except for years 1993–2000 when also recreational catches at sea are included).

**Preliminary.

Table 8.3.16.8 Salmon in Subdivisions 22–31 (Main Basin and Gulf of Bothnia). The table gives total catches (from sea, coast, and river) of salmon, in numbers, in the whole Baltic (Subdivisions 22–32), split into: nominal catches by country, discards (including seal-damaged salmon), and unreported catches (95% PI = probability interval). Discards and unreported catches for the years 2001–2014 are estimated by a different method and different expert-elicited coefficient factors than for the years 1993–2000. Catch figures for 2014 are preliminary.

Year	Country									reported	Discard		Estimated	Total unreported catches***		Total catches	
	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden	total	median	95% PI	misreported catch**	median	95% PI	median	95% PI
1993*	111840	5400	248790	6240	47410	2320	42530	9195	202390	676115	95162	57550–146900	4100	136604	44110–307000	930761	810200–1088100
1994	139350	1200	208000	1890	27581	895	40817	5800	158871	584404	74979	45150–116300	16572	126716	51191–267771	805001	706471–936071
1995	114906	1494	206856	4418	27080	468	29458	7209	161224	553113	76541	46060–118500	64046	173150	98095–310945	821265	723545–948445
1996	105934	1187	266521	2400	29977	2544	27701	6980	206577	649821	97938	58360–152200	62679	196649	103608–368478	967938	846478–1128678
1997	87746	2047	245945	6840	32128	879	24501	5121	147910	553117	81897	46910–130500	85861	202355	121361–353661	858277	752661–999961
1998	92687	1629	154676	8379	21703	1069	26122	7237	166174	479676	67571	41080–103800	60378	157603	92777–275177	720768	636677–830077
1999	75956	2817	129276	5805	33368	1298	27130	5340	139558	420548	61785	36980–95760	122836	209558	150425–317635	706612	629835–807135
2000	84938	4485	144260	8810	33841	1460	28925	5562	165016	477297	71015	39450–115200	159251	261698	190230–397350	828764	735850–955850
2001	90388	3285	115756	7717	29002	1205	35606	7392	149391	439742	48970	43580–56610	126100	228000	197400–305100	695100	663700–773500
2002	76122	3247	104641	5762	21808	3351	39374	13230	138255	405790	45980	40860–53380	115000	211900	182800–283300	636500	606700–709600
2003	108845	2055	99174	5766	11339	1040	40870	4413	115347	388849	51420	44980–60670	143200	237000	205700–321100	642800	610500–728200
2004	81425	1452	132105	7087	7700	704	17650	5480	192856	446459	54500	47140–66210	254300	392900	343300–519600	858800	808400–988600
2005	42491	1618	115068	4799	5629	698	22896	3069	144584	340852	36020	32230–41770	110800	196300	169400–260200	548500	521100–613700
2006	33723	1516	64501	3551	3195	488	22207	1002	97285	227468	25290	22970–28530	46900	97810	82500–131900	334800	319200–369500
2007	16145	1378	75092	3086	5318	537	18988	1408	95241	217193	21270	19330–24170	54310	106800	91070–142600	331400	315300–367700
2008	7363	1890	80735	4151	2016	539	8650	1382	90584	198103	11120	10360–12240	3295	43840	32810–65250	246600	235500–268300
2009	16072	2209	77897	2799	2741	519	10085	584	104918	216883	17280	15120–20690	62910	122900	104200–162600	347200	328200–387400
2010	29637	1756	44673	1520	1534	427	5774	491	77787	162685	15280	13000–18840	65510	111900	97060–146300	281500	266200–316500
2011	21064	1845	49717	1850	1271	546	6204	470	86305	167792	13450	11990–15550	33500	74000	62320–97620	248500	236600–272700
2012	23175	1093	70234	1362	1056	568	5684	412	84332	186826	10950	9866–12590	12200	50640	40310–68630	244800	234300–263000
2013	24657	2291	56393	1430	2083	1210	5412	387	67082	160946	13250	11070–15530	14000	41260	33160–55510	206200	198000–220600
2014	24482	2065	64886	1264	1878	610	3118	418	62680	161401	10980	9357–12590	6799	28560	22880–37530	191500	185800–200500

All data from 1993–1994 include Subdivisions 24–32, while it is more uncertain in which years Subdivisions 22–23 are included.

The catches in Subdivisions 22–23 are normally less than one tonnes.

From 1995 data includes Subdivisions 22–32.

Catches from the recreational fishery are included in reported catches as follows: Finland from 1980, Sweden from 1988, Denmark from 1998.

Other countries have no, or very low recreational catches.

* In 1993 the Faroe Islands caught 3200 individuals, which is included in the total Danish catches.

** Corresponds only to Polish catch.

*** Including also the estimated misreported catch.

Summary of the assessment

Table 8.3.16.9 Salmon in Subdivisions 22–31. Overview of the status of the Gulf of Bothnia and Main Basin stocks in terms of their probability of having reached 50% and 75% of the potential smolt production capacity in 2014. The probability values are classified in four groups: Above 90%, between 70% and 90%, between 30% and 70%, and below 30%. For stocks in AUs 1–4 (except Testeboån) the results are based on the assessment model. Results for Testeboån and AU 5 stocks are based on expert judgement and no precise probabilities can be presented for these stocks.

		Probability of reaching 50% of PSPC					Probability of reaching 75% of PSPC				
		Probability	Above 90%	Between 70% and 90%	Between 30% and 70%	Below 30%	Probability	Above 90%	Between 70% and 90%	Between 30% and 70%	Below 30%
Unit 1	Tornionjoki	0.69			X		0.16				X
	Simojoki	0.78		X			0.23				X
	Kalixälven	1.00	X				0.82		X		
	Råneälven	0.73		X			0.34			X	
Unit 2	Piteälven	1.00	X				0.96	X			
	Åbyälven	0.90		X			0.61			X	
	Byskeälven	0.97	X				0.72		X		
	Kågeälven	0.31			X		0.17				X
	Rickleån	0.00				X	0.00				X
	Sävarån	0.83		X			0.51			X	
	Ume/Vindelälven	0.98	X				0.57			X	
	Öreälven	0.37			X		0.15				X
	Lögdeälven	0.76		X			0.44			X	
Unit 3	Ljungan	0.74		X			0.46			X	
	Testeboån	n.a.			X		n.a.				X
Unit 4	Emån	0.00				X	0.00				X
	Mörrumsån	1.00	X				0.96	X			
Unit 5	Pärnu	n.a.				X	n.a.				X
	Salaca	n.a.		X			n.a.			X	
	Vitrupe	n.a.			X		n.a.				X
	Peterupe	n.a.			X		n.a.				X
	Gauja	n.a.			X		n.a.				X
	Daugava	n.a.			X		n.a.				X
	Irbe	n.a.			X		n.a.				X
	Venta	n.a.			X		n.a.				X
	Saka	n.a.				X	n.a.				X
	Uzava	n.a.				X	n.a.				X
	Barta	n.a.				X	n.a.				X
	Nemunas	n.a.				X	n.a.				X

Table 8.3.16.10 Salmon in Subdivisions 22–31. Key assumptions underlying the stock projections. The same post-smolt survival scenario and M74 scenario are assumed for all effort scenarios. Post-smolt and M74 survival are autocorrelated in time, starting from the most recent reliable estimated values. Survival values in the table represent the medians to which post-smolt and M74 survival are expected to converge in the long run.

Fishing effort in 2015 is assumed to be equal to that observed in 2014	
Scenario for 2016	
1	Commercial catch at sea in 2016 equal to that advised by ICES for 2015
2	20% increase with respect to scenario 1
3	20% decrease with respect to scenario 1
4(a)	F = 0.1 approach applied to commercial catch at sea
4(b)	F = 0.1 approach applied to total (commercial + recreational) catch at sea
5	zero fishing
Post-smolt survival of wild salmon: Average survival in the period 2010–2013 (14%)	
Post-smolt survival of reared salmon: Same relative difference to wild salmon as on average in history	
M74 survival: Historical median (96%)	
Releases: Same number of annual releases in the future as in 2014	
Maturation: Age group-specific maturation rates in 2015 are predicted using January–March SST data. For other years, average maturation rates over the time-series are used, separately for wild and reared salmon.	

Table 8.3.16.11 Salmon in Subdivisions 22–31. River-specific probabilities of achieving 75% of the PSPC in 2021 or 2020 (depending on the assessment unit) under the projection scenarios (Table 8.3.16.1). Probabilities greater than 0.70 are shaded green.

River	Year of comparison	Probability to meet 75% of PSPC					
		Scenario					
		1	2	3	4(a)	4(b)	5
Tornionjoki	2021	0.55	0.51	0.59	0.58	0.60	0.81
Simojoki	2021	0.16	0.13	0.21	0.22	0.23	0.52
Kalixälven	2021	0.88	0.85	0.88	0.88	0.89	0.92
Råneälven	2021	0.61	0.55	0.66	0.65	0.66	0.84
Piteälven	2021	0.88	0.86	0.90	0.87	0.90	0.93
Åbyälven	2021	0.74	0.72	0.78	0.76	0.78	0.87
Byskeälven	2021	0.80	0.80	0.86	0.85	0.85	0.90
Rickleån	2021	0.02	0.02	0.04	0.03	0.04	0.12
Sävarån	2021	0.65	0.65	0.70	0.69	0.70	0.81
Ume/Vindelälven	2021	0.89	0.88	0.90	0.90	0.91	0.91
Öreälven	2021	0.38	0.34	0.40	0.40	0.44	0.59
Lögdeälven	2021	0.68	0.64	0.68	0.68	0.72	0.81
Ljungan	2021	0.57	0.52	0.59	0.59	0.60	0.71
Mörrumsån	2020	0.70	0.69	0.73	0.73	0.75	0.88
Emån	2020	0.00	0.00	0.00	0.00	0.00	0.00

Table 8.3.16.12 Salmon in Subdivisions 22–31. Detail of unwanted catch (previously discarded) by fishery in 2016 under each of the projection scenarios in the Outlook table (Table 8.3.16.1). This table splits the "Unwanted catch, undersized" column of the Outlook table into five columns (by fishery, and assuming a surviving fraction of 23% for longline, 61% for trapnet, and 0% for unwanted catch due to other reasons, if these fish were discarded instead of retained). Similarly, the "Unwanted catch, seal damaged" column of the Outlook table is split into three columns here (by fishery; all these salmon are dead). The splits are based on what is estimated to have occurred in 2014. It should be noted that there is considerable uncertainty in all these estimates, particularly in the survival rates.

Scenario	Unwanted catch (previously discarded; thousands of fish)							
	Undersized catch					Seal damaged		
	Survive if it was discarded		Dead if it was discarded					
	longline	trapnet	longline	trapnet	other	longline	trapnet	other
1	0.2	1.4	0.8	0.9	0.2	4.9	2.6	0.6
2	0.3	1.7	0.9	1.1	0.3	5.9	3.2	0.7
3	0.2	1.1	0.6	0.7	0.2	3.9	2.1	0.5
4(a)	0.174	1.166	0.626	0.752	0.176	4.066	2.195	0.493
4(b)	0.149	0.998	0.536	0.644	0.150	3.481	1.879	0.422
5	0	0	0	0	0	0	0	0

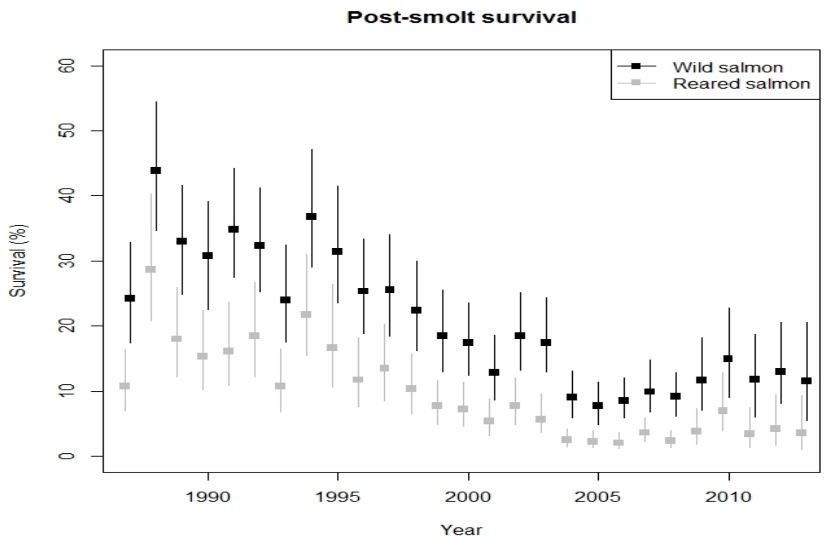

Figure 8.3.16.2 Salmon in Subdivisions 22–31 (Main Basin and Gulf of Bothnia). Post-smolt survival for wild and hatchery-reared salmon. Posterior probability distribution (median and 90% PI).

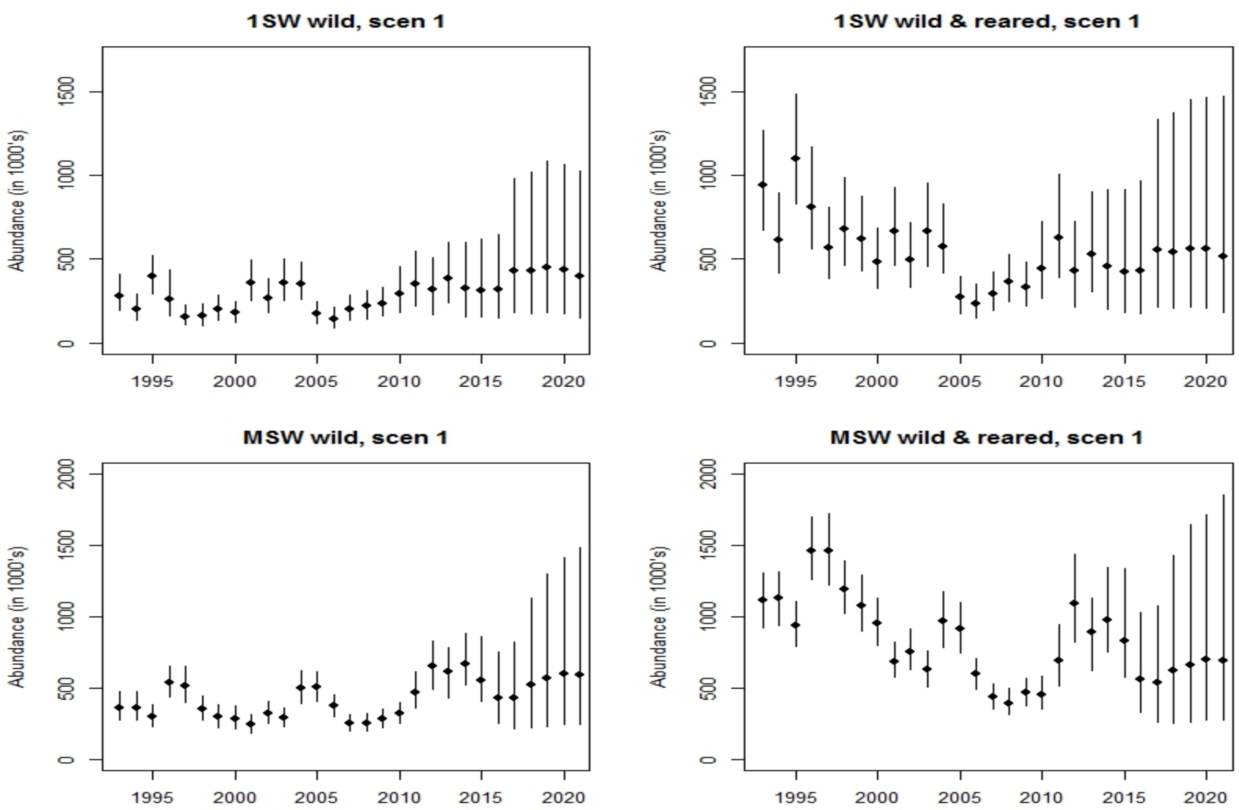

Figure 8.3.16.3 Salmon in Subdivisions 22–31. Top panels: Annual abundances of 1 sea-winter salmon (1SW) available to the fisheries. Four months of adult natural mortality are taken into account (from 1 May until 1 September) to cover natural mortality during the fishing season after the post-smolt mortality phase. Bottom panels: Annual abundances of multi sea-winter salmon (MSW) available to the fisheries. Six months of adult natural mortality are taken into account (from 1 January until 1 July) to cover natural mortality during the fishing season. The left panels are for wild salmon and the right panels for wild and reared salmon together. The predicted development in abundance following projection Scenario 1 is also indicated.

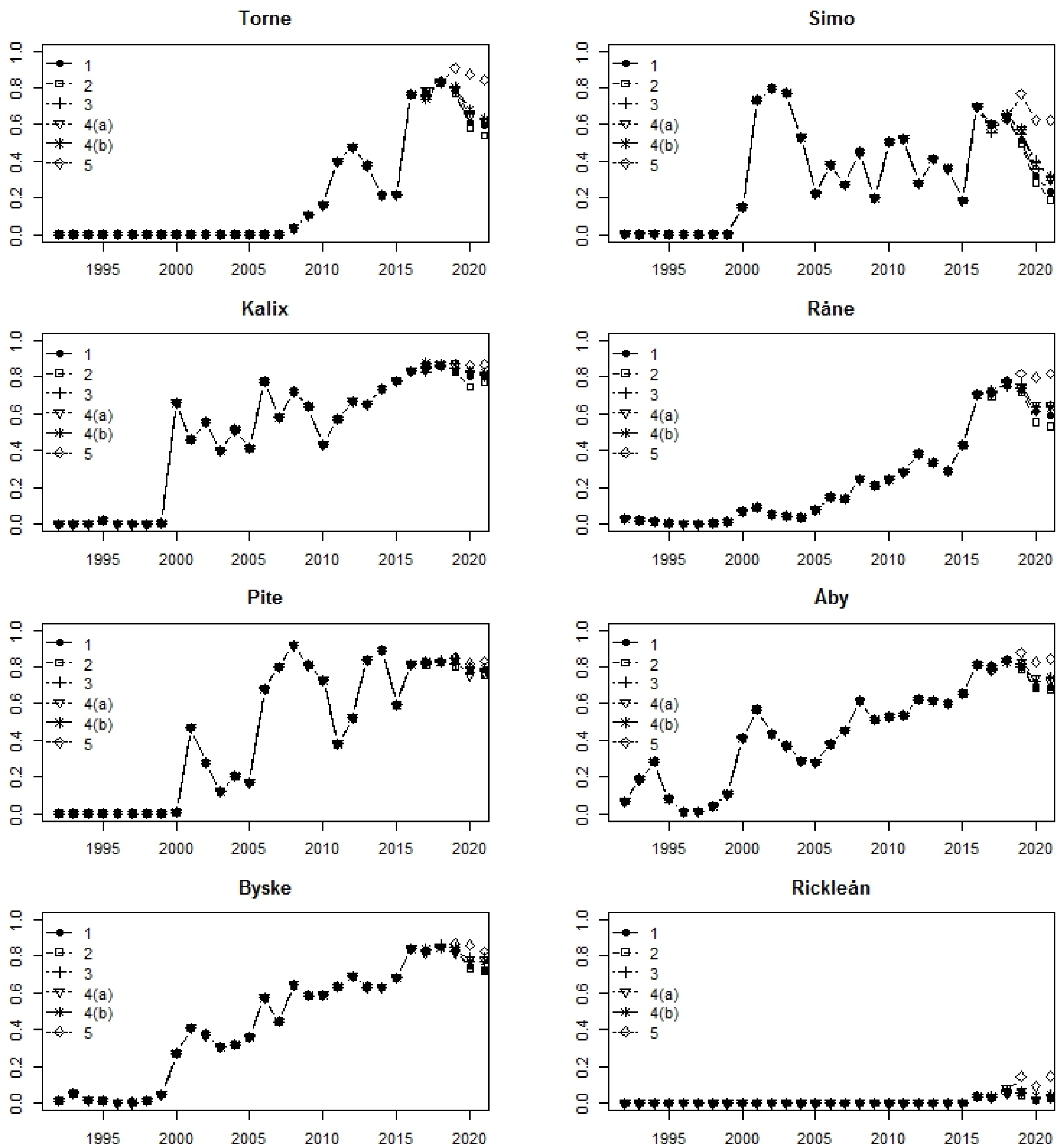

Figure 8.3.16.4a Salmon in Subdivisions 22–31. Probabilities for stocks to meet an objective of 75% of potential smolt production capacity under different projection scenarios. Fishing in 2016 mainly affects smolt production in the years 2019–2021.

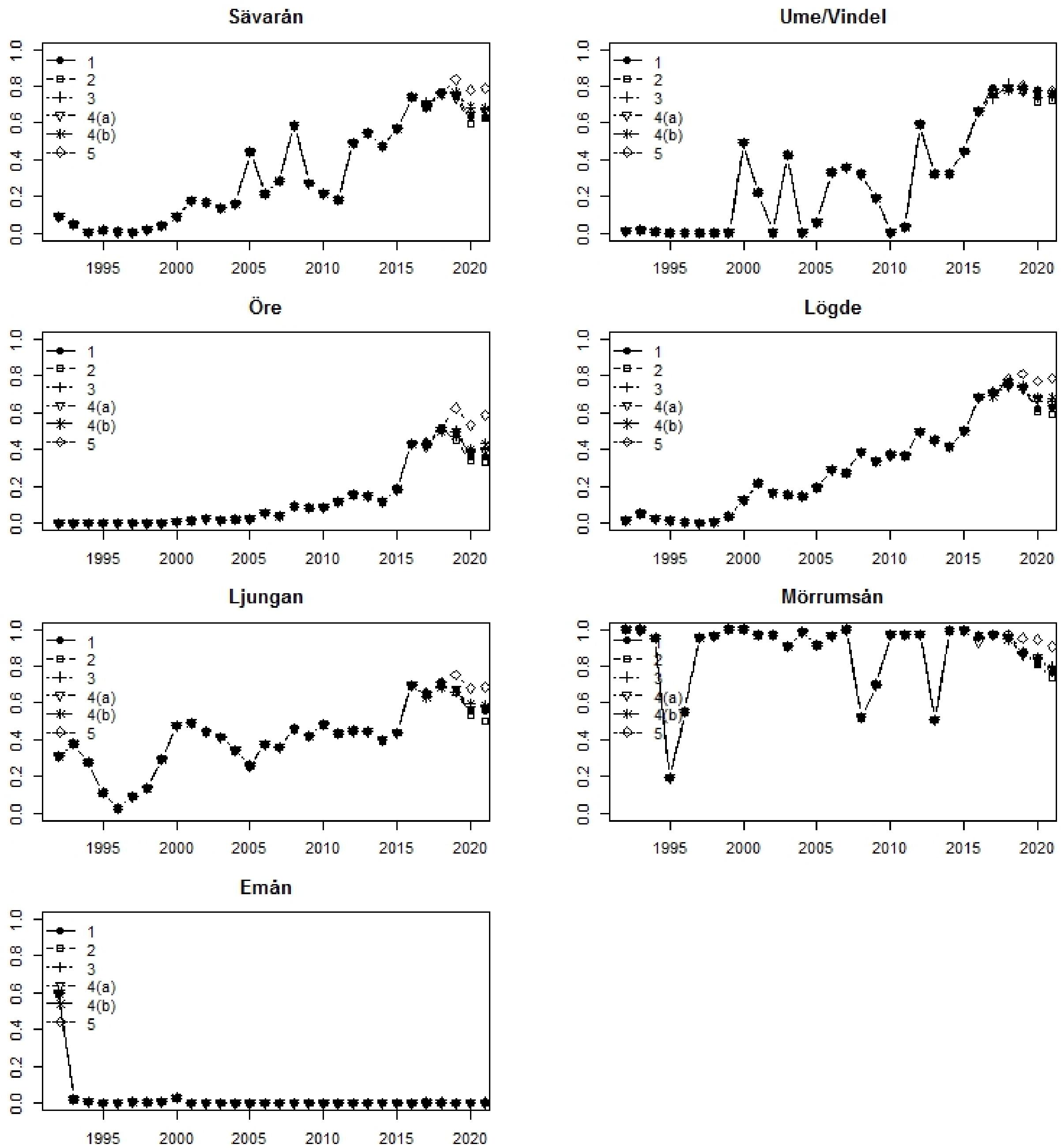

Figure 8.3.16.4b Salmon in Subdivisions 22–31. Probabilities for stocks to meet an objective of 75% of potential smolt production capacity under different projection scenarios. Fishing in 2016 mainly affects smolt production in the years 2019–2021.

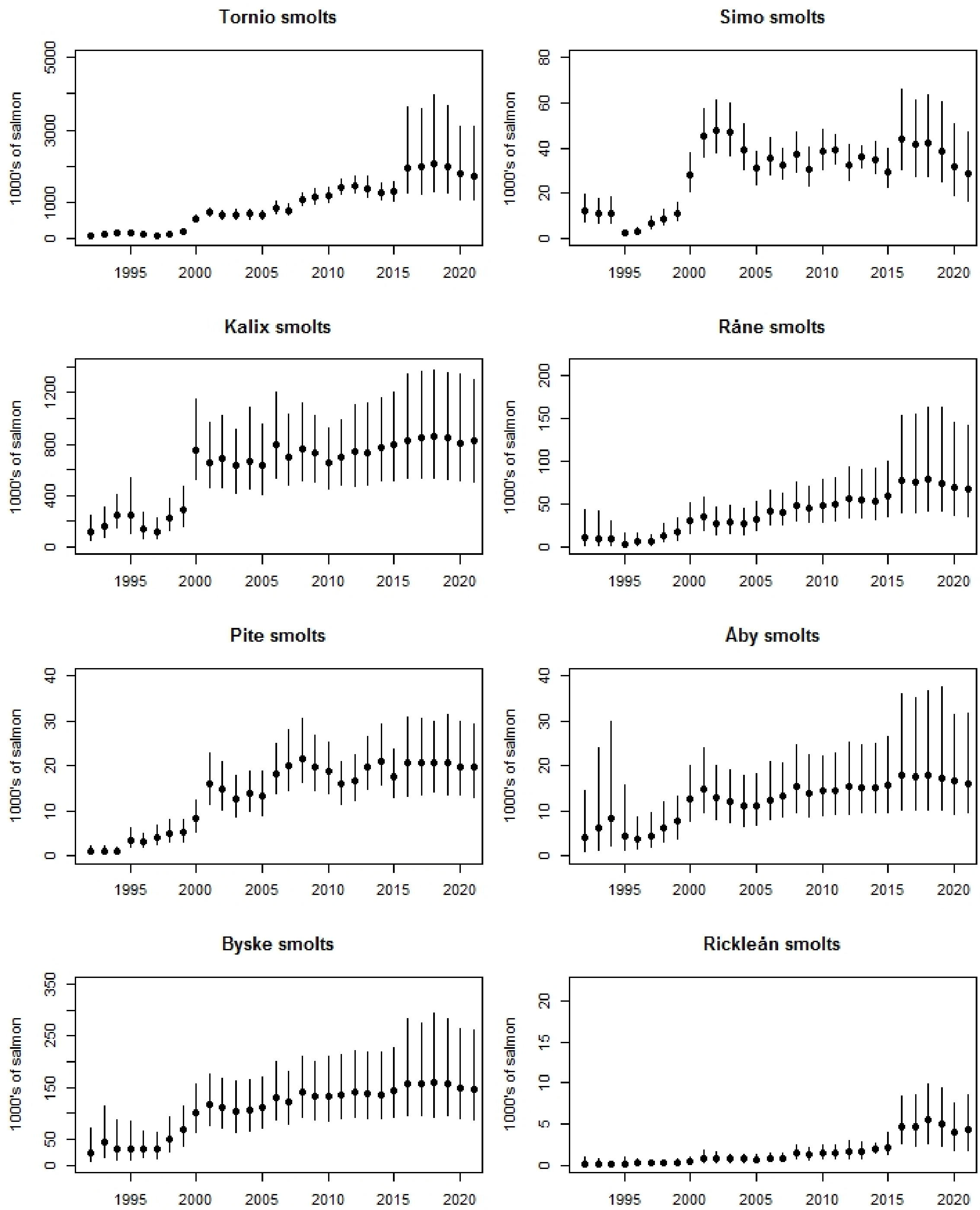

Figure 8.3.16.5a Salmon in Subdivisions 22–31. Median values and 90% probability intervals for smolt abundances in different rivers in projection Scenario 1. Fishing in 2016 mainly affects smolt production in the years 2019–2021.

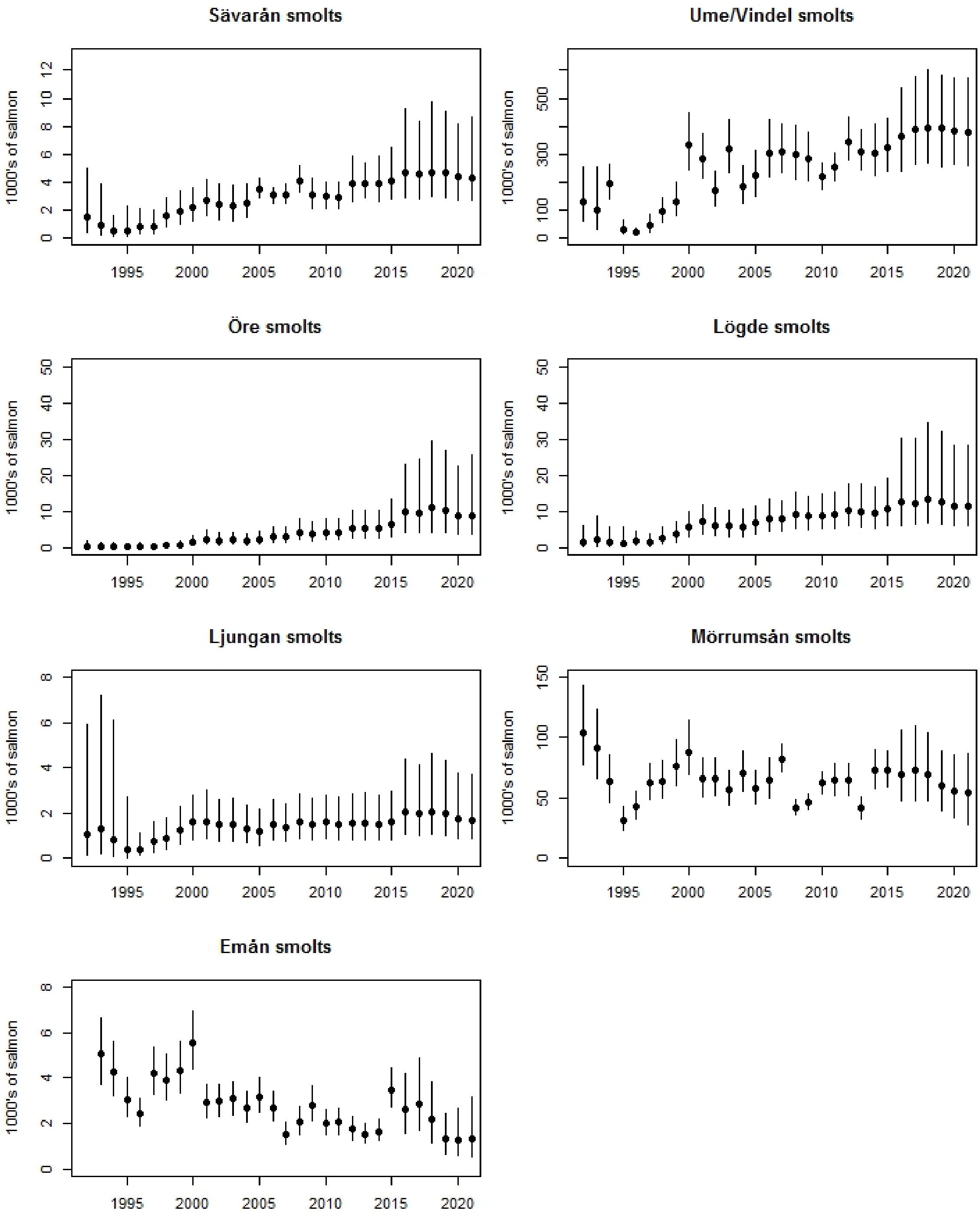

Figure 8.3.16.5b Salmon in Subdivisions 22–31. Median values and 90% probability intervals for smolt abundances in different rivers in projection Scenario 1. Fishing in 2016 mainly affects smolt production in the years 2019–2021.

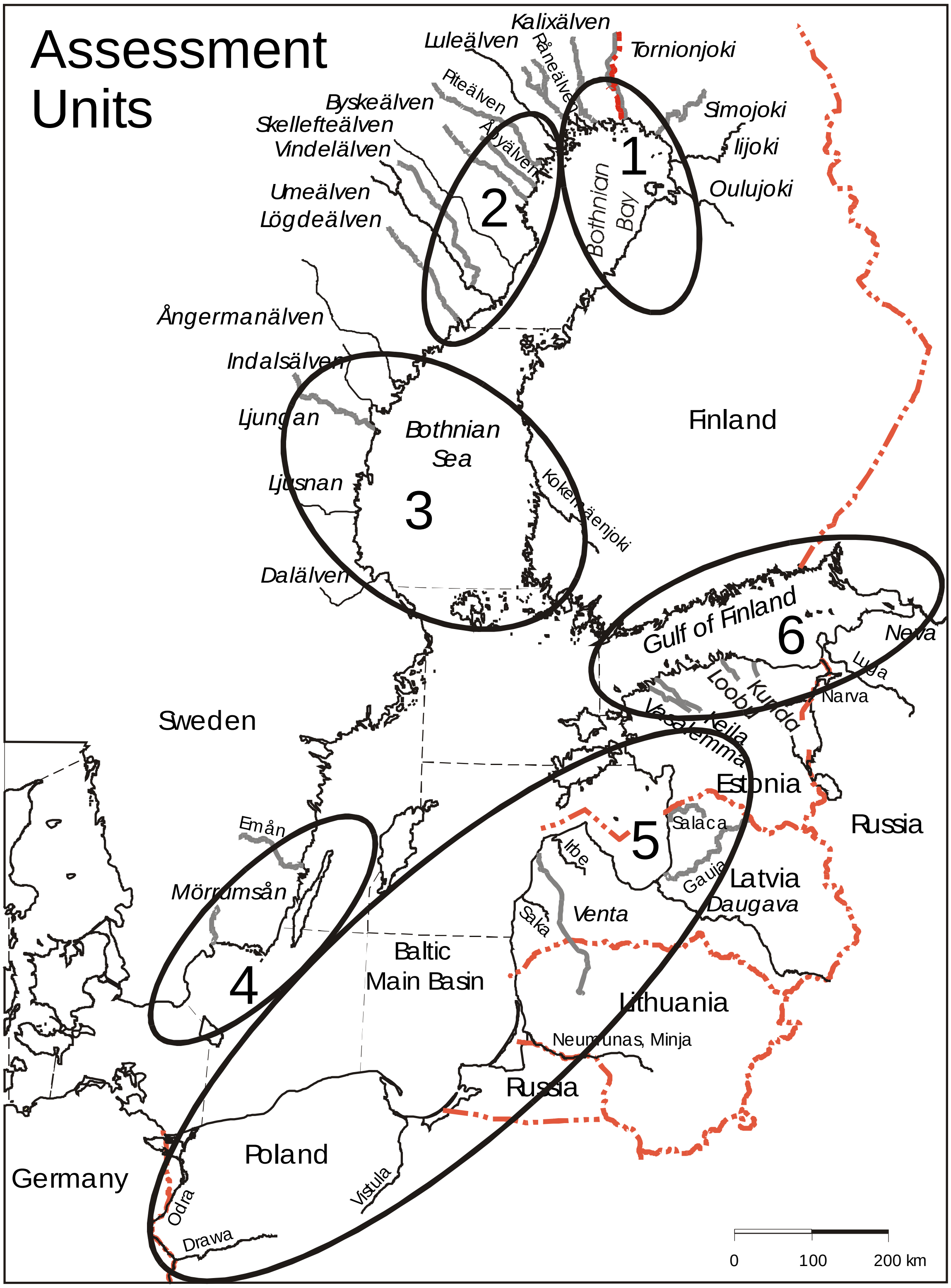

Figure 8.3.16.6 Salmon in Subdivisions 22–31. Grouping of salmon stocks in six assessment units in the Baltic Sea. The genetic variability between stocks of an assessment unit is smaller than the genetic variability between stocks of different units. In addition, the stocks of a particular unit exhibit similar migration patterns.

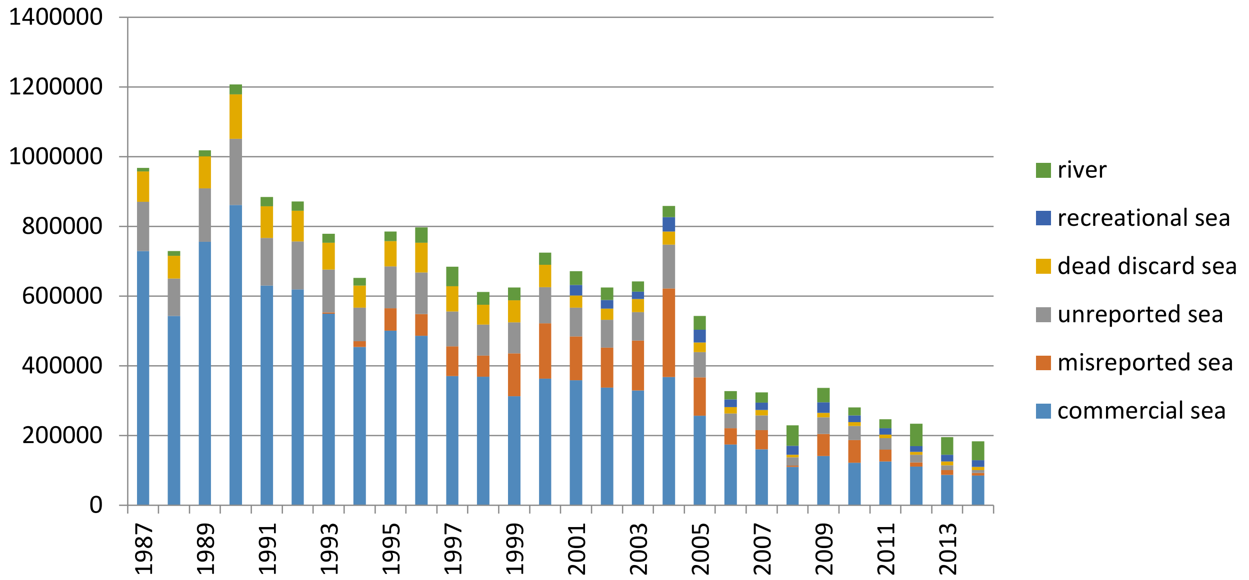

Figure 8.3.16.7 Salmon in Subdivisions 22–31. Total removals (dead catch) in numbers in Subdivisions 22–31 in the years 1987–2014: river catches (mainly recreational, but including also some commercial fishing) and removals at sea (split into commercial and recreational nominal landings, unreported and misreported landings, and dead discards). Commercial sea catch also includes recreational sea catch in 1987–2000.

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