IP(08)11

Fisheries Management Focus Area Report

Norway

Focus Area Reports on Management of Salmon Fisheries – Norway

1 Introduction

1.1 Norway has 450 rivers that sustain or once sustained self-reproducing Atlantic salmon stocks, at present 407 of these sustain self-reproducing stocks (Table 1, Annex B). The wild salmon has historically been, and still is, important to Norwegian and Sami culture. As most salmon rivers are located away from the major towns/cities of Norway, wild salmon is of significant economic value especially to the rural countryside.

Table 1. Overview of rivers with self-reproducing salmon stocks. Regions as in Annex A. Rivers are listed in Annex B. In regions written in *italic*, new fishing regulations for 2008-2012 are not adopted (15 April 2008). Thus the number of rivers opened for fishing is not decided.

Region No.	Name of Region	Salmon rivers (*N*)	*National Salmon Rivers* (N)	Salmon rivers opened for fishing in 2008 (N)	Rivers with catches >1000kg (*N*)	Total catch (kg) 2007
1	*Kysten av Finnmark**	16	2		5	17228
2	*Indre Varangerfjord**	8	1		1	6002
3	*Tanafjorden**	3	3		3	50167
4	*Porsangerfjorden**	5	3		3	12679
5	*Fjordene i Vest-Finnmark**	7	2		2	20918
6	Kysten av Troms	14		14	0	1672
7	Fjordstrøkene i Troms	22	3	20	3	14530
8	Lofoten og Vesterålen	37	1	34	0	2984
9	Nordlandskysten sør for Vestfjorden	9		9	0	898
10	Ofoten og Indre Salten	24	1	21	1	6268
11	Indre Helgeland	13	2	8	0	1373
12	Kysten av Trøndelag	20		20	0	728
13	Fjordstrøk i Trøndelag	62	11	57	8	78187
14	Kysten av Møre og Romsdal	6		6	0	385
15	Fjordene i Møre og Romsdal	56	4	56	5	15119
16	Kysten fra Stad til Stavanger	3		2	0	869
17	Indre del av Fjordane	15	5	14	4	10592
18	Sognefjorden	10	4	6	2	3785
19	Indre Hordaland	19	2	9	1	6975
20	Indre Rogaland	15	1	14	5	12861
21	Jæren	14	4	13	6	29658
22	Agderkysten	9	1	8	5	18387
23	*Østlandet***	20	2		2	19243
Total (N)		407	52		56	331508

Total catch in 2007 out of the rivers represented above:	331508
Total riverine catch fangst in Norway in 2007:	339663
Catch from rivers not represented in the table	8155***

*Fisheries regulations for the rivers are not adopted for Finnmark county (15 April 2008), so numbers of rivers opened for fishing are not decided.

**Fisheries regulations are not adopted for Oslo and Akershus counties (15 April 2008), so numbers of rivers opened for fishing are not decided.

*** Salmon catches reported in rivers which are considered not to sustain self-producing salmon stocks. Probably mainly catches of escaped farmed salmon.

1.2 In 2007 the Norwegian Parliament adopted a Proposition to the conservation of wild salmon and the finalization of the *National Salmon Rivers and Salmon Fjords* scheme. In total 52 National Salmon Rivers and 29 National Salmon Fjords are now established. In

addition to a more concrete and strict management regime, especially for aquaculture in National Salmon Fjords, new measures for the conservation of the wild salmon resource in Norway were passed. The further spread of *Gyrodcatylus salaris* and interbreeding with escaped farmed salmon were identified as the two most severe threats to the further existence of wild Atlantic salmon stocks in Norway. Furthermore the bill pointed out the need for more restrictive regulations in salmon fisheries and to reduce mixed stock fisheries. The proposition established several guiding principles for regulations of the fisheries from 2008. It is also stressed that fishing right owners, organizations and other stakeholders are well incorporated into the process.

2 Description of the salmon stocks

Pre-fishery abundance

2.1 The total return of salmon to Norway has been estimated for the years 1984-2006 (Figure 1).

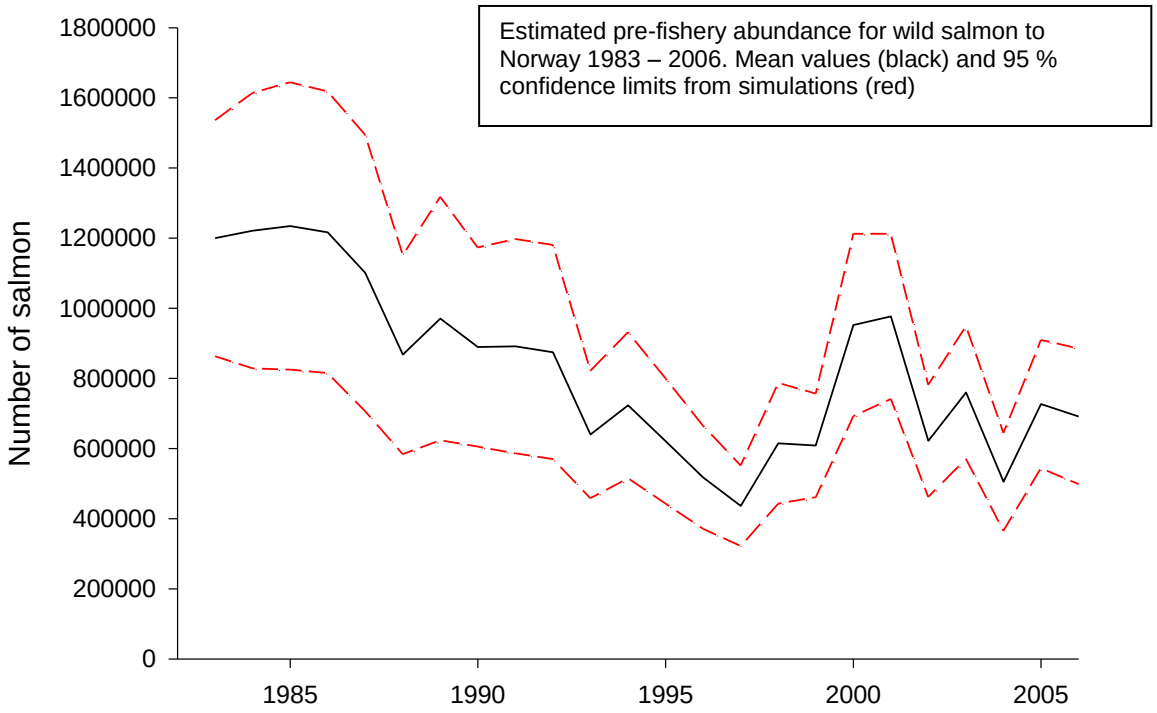


Figure 1: Estimated pre-fishery abundance for wild salmon to Norway 1983 – 2006. Black line, red line 95 % confidence limits from simulations

2.2 In order to detect regional variations the coastline has been divided into 3 regions; Southern Norway (from the Swedish border to Stadt, corresponding to region 16-23 in Table 1) (Figure 2), Mid Norway (from Stadt to Vesterålen corresponding to region 8-15 in Table 1) (Figure 3) and Nothern Norway (from Vesterålen to the Russian border, corresponding to region 1-8 in Table 1) (Figure 4).

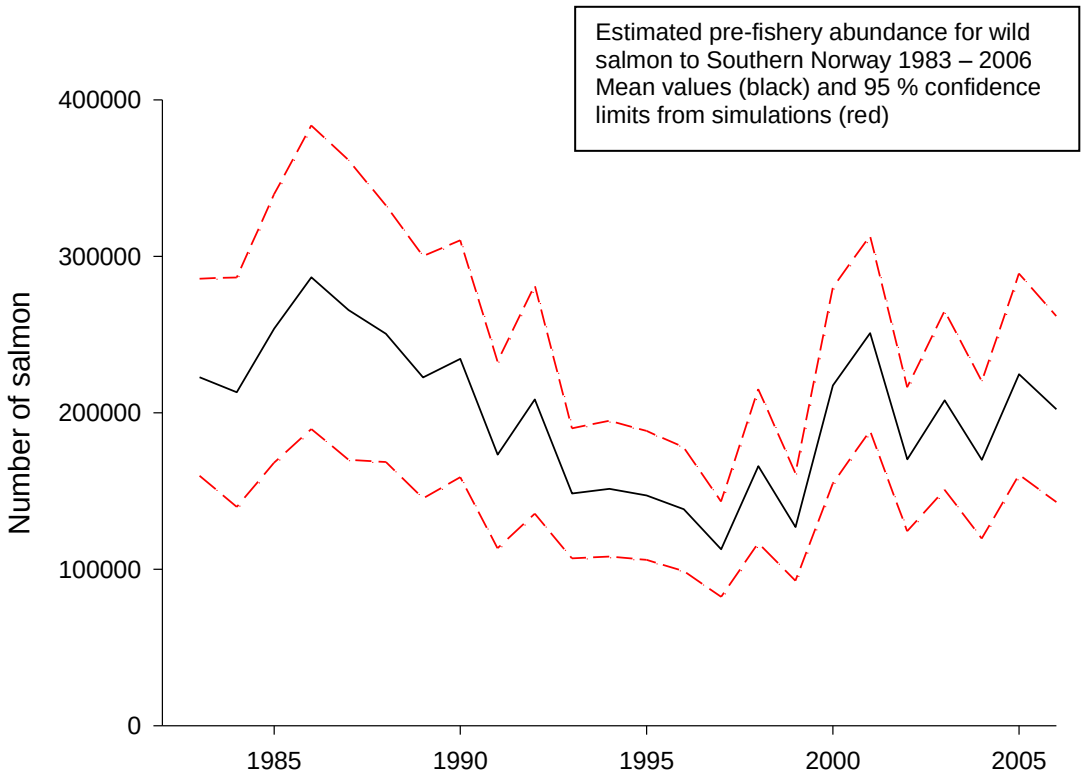


Figure 2: Estimated pre fishery abundance for wild salmon to Southern Norway 1983 – 2006.

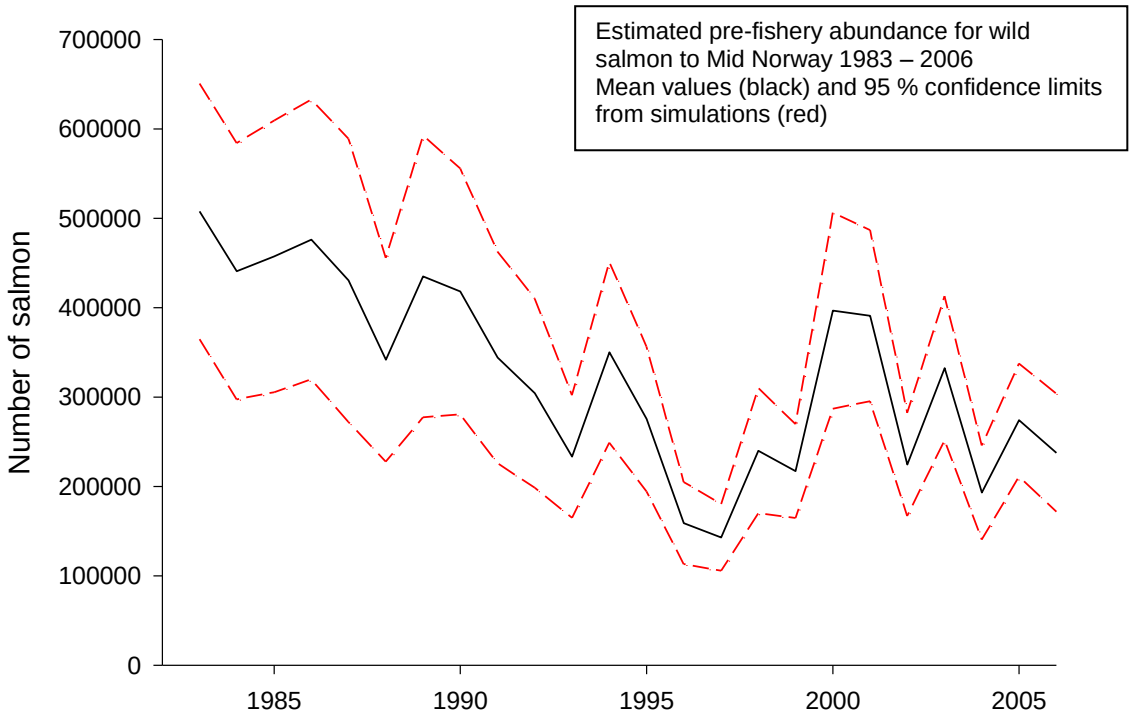


Figure 3: Estimated pre-fishery abundance for wild salmon to Mid Norway 1983 – 2006.

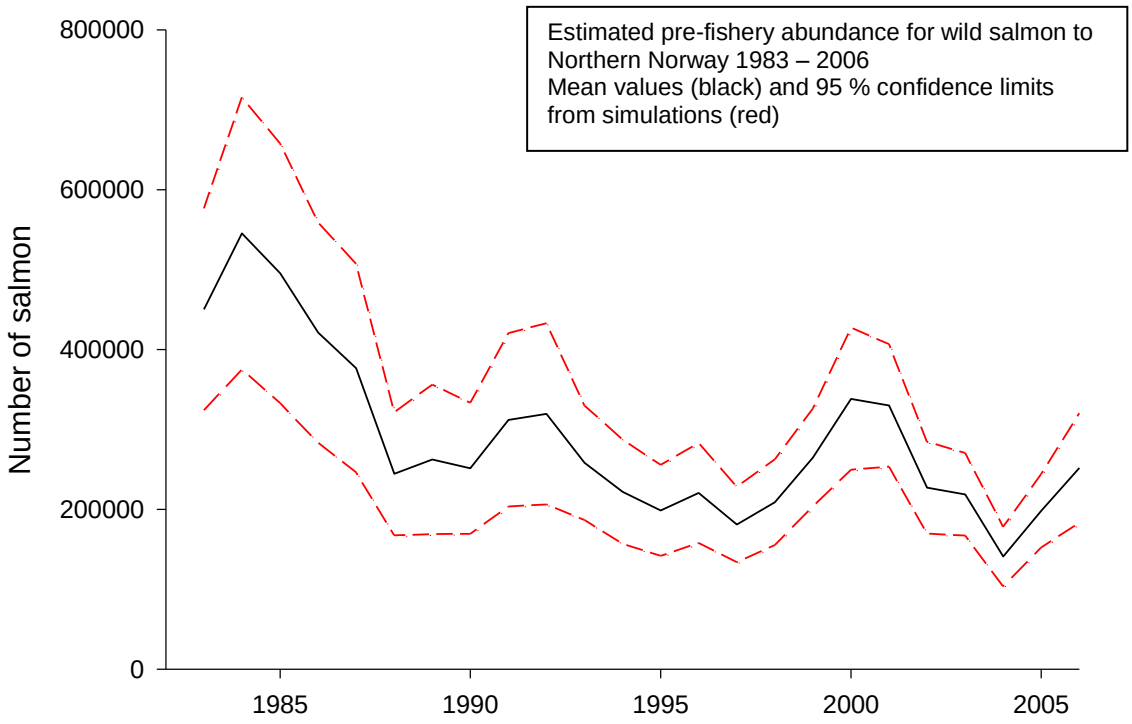


Figure 4: Estimated pre-fishery abundance for wild salmon to Northern Norway 1983 – 2006.

2.3 In 2007, the stock complex consisted to a remarkable low degree of 1SW salmon. The proportion of 1 SW salmon amongst the salmon smaller than 3 kg was lower than ever recorded before, probably due to a combination of low 1SW numbers and small size of 2SW fish (Fiske *et al* 2008). This is considered to be an serious warning signal, because it implies that the numbers of returning 2SW in 2008, as well as 3SW in 2009, is expected to be very low.

2.4 A complete list of salmon rivers sustaining self-reproducing salmon stocks is presented in Annex B. The list includes recent catches (2007), spawning targets and attainment of management targets for all significant Norwegian salmon rivers.

Stock diversity

2.5 In Norway there is generally only one yearly "salmon run", although it seems to be a small autumn run of salmon spawning not before the following year in e.g. River Alta and River Neiden (border river between Norway and Finland, named Näätämöjoki in Finnish). The salmon is widely distributed from the temperate South to the arctic North. There are numerous small populations and some large ones. There is large variation in phenotype and life history traits between stocks, reflecting the diverse conditions under which the salmon lives. A survey made by the Norwegian Institute of Nature Research in 2004 defined several categories of stocks based on duration of stay at sea and body size: "Typical grilse stocks" (consists predominantly of salmon that spends one winter at sea), "grilse stocks with large grilse", "2SW stocks (with a large component of salmon that spends two winters at sea), and

MSW stocks" (consists predominantly of salmon that spends two or more winters at sea) (Fiske 2004). The "typical grilse stocks" are found mainly along the coast line, while "2SW and MSW" stocks are found in the innermost parts of the fjords. Norway also has two stocks of landlocked salmon.

2.6 There has generally been few studies on diversity *within* specific Norwegian salmon rivers, but the stock complex of the border River Tana (Tenojoki in Finnish) stands out as an exception. This huge river system comprise of more than 30 distinct spawning stocks concerning morphological and genetic traits (Elo *et al* 1994; Vähä *et al* 2007), resulting in a huge variation with nearly 100 different combinations of smolt ages, sea ages and previous spawning times documented (Erkinaro pers. comm.).

2.7 The river Tana is one of the few remaining large river systems that still support abundant Atlantic salmon stocks with little or no human impact to the system, except for fishing (Johansen *et al* 2008). Nevertheless, catches in the Norwegian part of the river system have been alarmingly low over the last four years, and even though the numbers vary from year to year, there is a negative trend indicating that the return of large fish is decreasing over the last two decades. Estimated spawning stock sizes in relation to spawning stock targets indicate that spawning stocks have been far below spawning targets (down to 10%) for a number of years in almost all of the Norwegian tributaries. Some of those tributaries are rather big river systems.

Human impacts on salmon stocks

2.8 Based on recent research results, interbreeding between escaped farmed and wild salmon is now considered to be one of the two most severe threats to the long-term existence of wild Atlantic salmon in Norway. Some of the latest studies available also suggest that interbreeding with escaped farmed salmon may have an immediate and significant negative effect on productivity and survival on affected salmon stocks. This threat is not integrated into the category system (table 2) so far, but this will be done through the next revision in 2008/2009.

2.9 Simulations with a fixed proportion of 20 % escaped farmed salmon in a spawning stock suggest that substantial changes in the genetic structure of the affected stock will take place within ten salmon generations, or about 40 years (Hindar and Diserud 2007). Recovery of the wild population can take very long time, and populations may not recover at all, even after many decades of no further intrusions. Simulations of long-term effects of interbreeding with escaped farmed salmon suggest that the average proportion of escaped farmed salmon in spawning stocks should not exceed 5 %. In general the gene flow from escaped farmed salmon to wild salmon populations should be less than the natural gene flow commonly found between salmon populations. Naturally small stocks, or stocks weakened be human impacts will get extinct first and thereby reduce the overall salmon biodiversity at a stock level. This has already been documented in stocks in Western Norway.

2.10 The introduction of *spawning targets* and management targets in stock assessments done in preparation of the fishing regulations for 2008-2012 suggests that many salmon stocks did not meet spawning targets in previous years. Thus the presentation of the human impact factor *overexploitation* in the recently submitted Norwegian implementation plan is now considered to be misleading. As a consequence overexploitation is temporarily taken out of table 2. The

integration of spawning targets in the category system is expected to result in altered category assignment for many salmon rivers.

2.11 There is limited knowledge about how various human activities affect diversity, except in cases were entire stocks have been lost. The best-documented case is the selective effect of gillnets. During the height of the drift net fishery in the 1970s and 80s, the fishing pressure was much higher on 2 SW salmon than on grilse. The biggest threats to salmon diversity today are the lethal parasite *G. salaris,* and crossbreeding between wild salmon and escaped farmed salmon.

2.12 At present there is a growing documentation that human induced mortality can cause large-scale and potentially permanent changes in life-history traits of fish populations. Relatively little information exists on this for salmon, but there is information that selectivity of the drift-net fishery caused population responses that may have influenced diversity.

2.13 In order to keep an overview of stock status and developments in stocks, the Directorate for Nature Management established a salmon stock registry in1993. The registry is based on information collected from a number of sources, including local salmon management authorities. This registry contains a category system for salmon rivers based on the condition of the salmon stock in relation to adverse human impacts. Category assignment is based on an overall assessment of all important factors affecting the stock's existence and production. Only rivers that have or have had a self-reproducing stock are categorized. The system underwent significant revision in 2002, which resulted in a reduction of the number of salmon stocks compared with the previous version of the system. An overview is given in table 2.

2.14 According to the categorisation of June 2007 (table 2) acidification, the parasite *Gyrodactylus salaris* and river regulation for hydropower purposes are the main reasons for salmon stocks becoming extinct or threatened by extinction. River regulation is the single most widespread adverse human impact factor in salmon rivers in Norway, resulting in both loss of stocks and significant reductions in the productive capacity of salmon rivers. High densities of sea lice caused by aquaculture activities affect survival of post-smolts, and are considered to have reduced adult returns significantly. Monitoring of sea lice infection levels on wild stocks is very limited and the numbers presented are therefore incomplete.

2.15 In 2007, 45 out of 450 wild stocks were recognized as extinct, 30 threatened and 32 near threatened. 52 Norwegian salmon stocks were affected by acidification.The introduction of *G. salaris* has been spread to 46 river systems, and 10 salmon stocks are regarded as lost. One third of the salmon rivers are developed for hydropower production, which has been identified as a significant negative factor for a total of 85 salmon stocks.

Table 2. Categorisation of salmon rivers (June 2007). The table shows the number of watercourses that have or have had self-reproducing salmon stocks by county and category, and the number of watercourses affected by various factors (only the impact-factor(s) which is decisive for assigned category is/are shown). One watercourse might be affected by several impact factors. *Overexploitation* is temporary taken out of table, because stock assessments in relation to spawning targets are not integrated in the categorisation from 2007. See Annex C for explanation of categories.

County	Number of watercourses with self-reproducing salmon stock	Category*									Factor decisive for assigned category									
		1	2	3a	3b	4a	4b	5a	5b	X	Hydro-Power development	Other habitat deterioration	Acidification	Pollution by agriculture	Other water pollution	*Gyrodactylus salaries*	Sea-Lice	Other Fish Diseases	Unknown factor	Other factors
Østfold	2							2			1	1	1	2	2					
Oslo og Akershus	10			8		2					3	7		4	6					
Buskerud	3				2			1								2				
Vestfold	3		2					1			1	1		1	1	1				
Telemark	3	1				1		1			3									
Aust-Agder	1		1								1									
Vest-Agder	9	3			6								8		1					
Rogaland	32	2		3	6	6		11		4	8	1	13	3	2				1	
Hordaland	25	6	8	2	4	1		3		1	7		10		2		12		1	
Sogn og Fjordane	32	5	1	2	1	5		18			7	1	9			1	16			
Møre og Romsdal	62		9			7		38	8		8	5				8				
Sør-Trøndelag	59	4		2		23	1	23	6		18	13		6	1					1
Nord-Trøndelag	31	4	4	4		2		16	1		9	1				2		1		4
Nordland	99	16	4	4		14	1	50	10		15	5	1	4	2	12	2	1		5
Troms	37	1	2	5		1		25	2			1				2				6
Finnmark	42	3	1			1		19	12	6	5	2								3
The whole country	**450**	**45**	**32**	**30**	**19**	**63**	**2**	**208**	**38**	**13**	**83**	**37**	**41**	**20**	**17**	**28**	**22**	**2**	**2**	**19**

3 Description of the fisheries

3.1 About 40% of the remaining overall catches in the North Atlantic are caught in Norwegian coastal waters, fjords and salmon rivers. The total weight of salmon caught in coastal and fjord fisheries are somewhat higher than in the river fisheries (Figure 8). However measured in numbers more wild salmon have been caught in riverine than in coastal and fjord fisheries since 1989, when the drift-net fishery was banned (Figure 9)

Salmon fisheries at sea

3.2 The total number of fishermen fishing with stationary gear has been reduced steadily for many years. In 2006 only 1380 fishermen fished with stationary gear in fjords and coastal waters, the lowest number recorded. The income from salmon fisheries has also been much reduced in recent years mainly due reduced value of the fish, about NOK 30-60 per kg in 2007.

3.3 The numbers of stationary gear has been reduced from about 3000 units in late 1990s and early 2000s, to about 2000 in 2007. The use of bend nets is now only allowed in Finnmark county. 806 gear units were used in 2005, giving a total catch of 132 tons (Anon.2006). The corresponding numbers for bag nets were 146 gear units, harvesting 29 tons of salmon.

3.4 In 2007 the reported catch from the sea fisheries was 426 tons, with a mean weight of 4,8 kg, compared to 4,2 kg in 2006 (http://www.ssb.no/emner/10/05/sjofiske/). In 2007 only 13 % of the catch was below 3 kg, 51 % was between 3 and 7 kg, where as 36 % was above 7 kg. In 2006 the distribution of the mentioned size groups was 20, 54 og 26 %, respectively. Catches were reduced in all counties except Hordaland and Finnmark.

3.5 Studies based on tagging and releasing salmon from bag net locations along the coast show f ex that salmon tagged at the island Sørøya at the outermost coast of Western Finnmark were recaptured in 30 rivers in Norway, and in addition 24 % were recaptured in Russian rivers, nearly 60 % were recaptured in rivers Alta (14 %) and Tana (44 %) (Hansen *et al* 2007). Salmon tagged at Karmøy at the outermost coast of Rogaland in the south-western part of Norway, were recaptured in 96 rivers. These studies indicate that catches in salmon fisheries along the coast consist of salmon from many rivers spread out over large parts of the country, which makes it difficult to identify the stocks contributing to the catch in any given fishing site along the coast (Table 4, blue line in Annex A). Catches in fjord fisheries are normally dominated by salmon migrating to rivers flowing into the same fjord (Table 5, red line in Annex A).

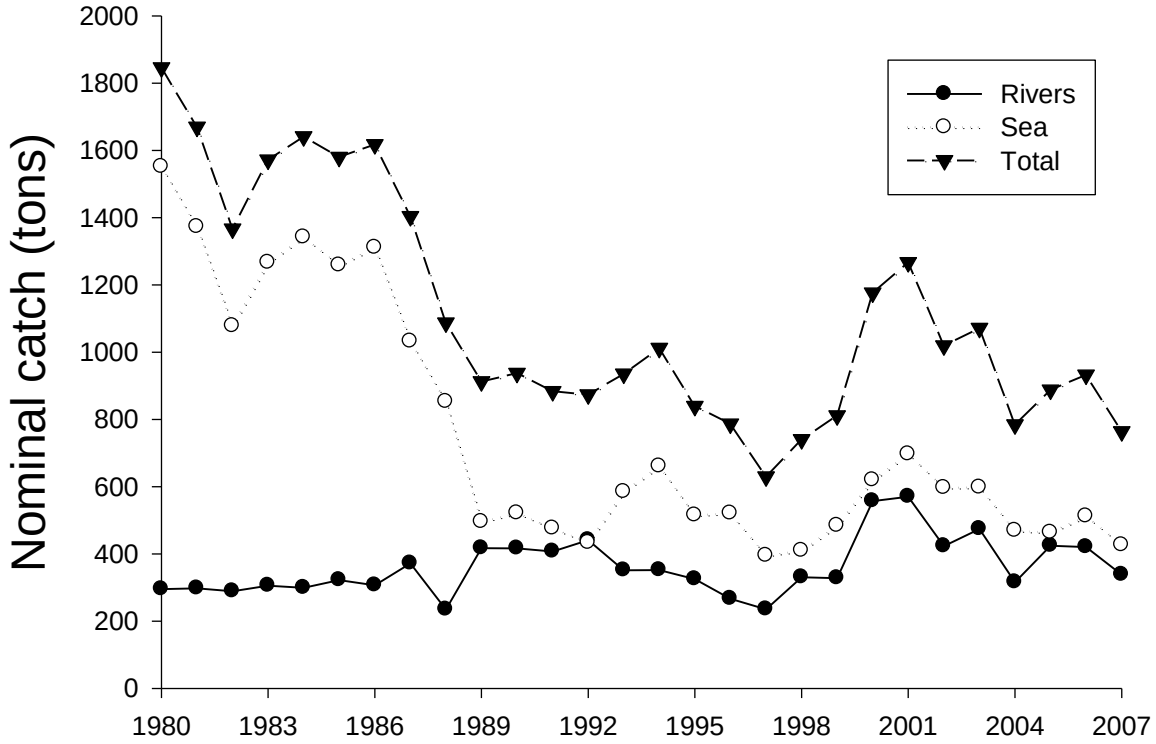


Figure 8. Nominal catches of Atlantic salmon in Norway 1980-2007 (escaped farmed salmon included). (Figure from Hansen *et al* 2008).

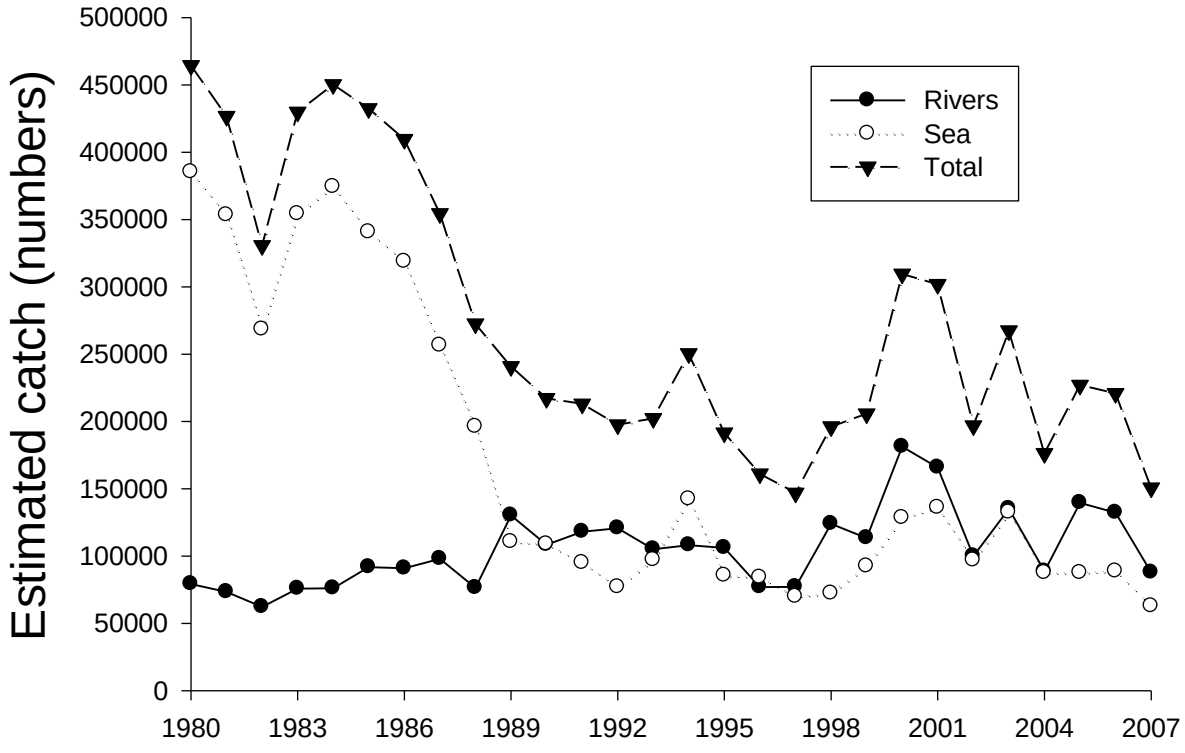


Figure 9. Estimated catches in numbers of wild salmon (1980-2007) (Figure from Hansen *et al* 2008).

Table 3. Number of stationary gear used in salmon fishery in the sea 1998 – 2007.

	Bag nets (N)	Bend nets (N)	Total gear (N)
1998	1865	1027	2892
1999	1651	989	2640
2000	1577	982	2559
2001	1976	1081	3057
2002	1696	931	2627
2003	1684	770	2454
2004	1546	659	2205
2005	1453	661	2114
2006	1283	685	1968
2007	1302	669	1971

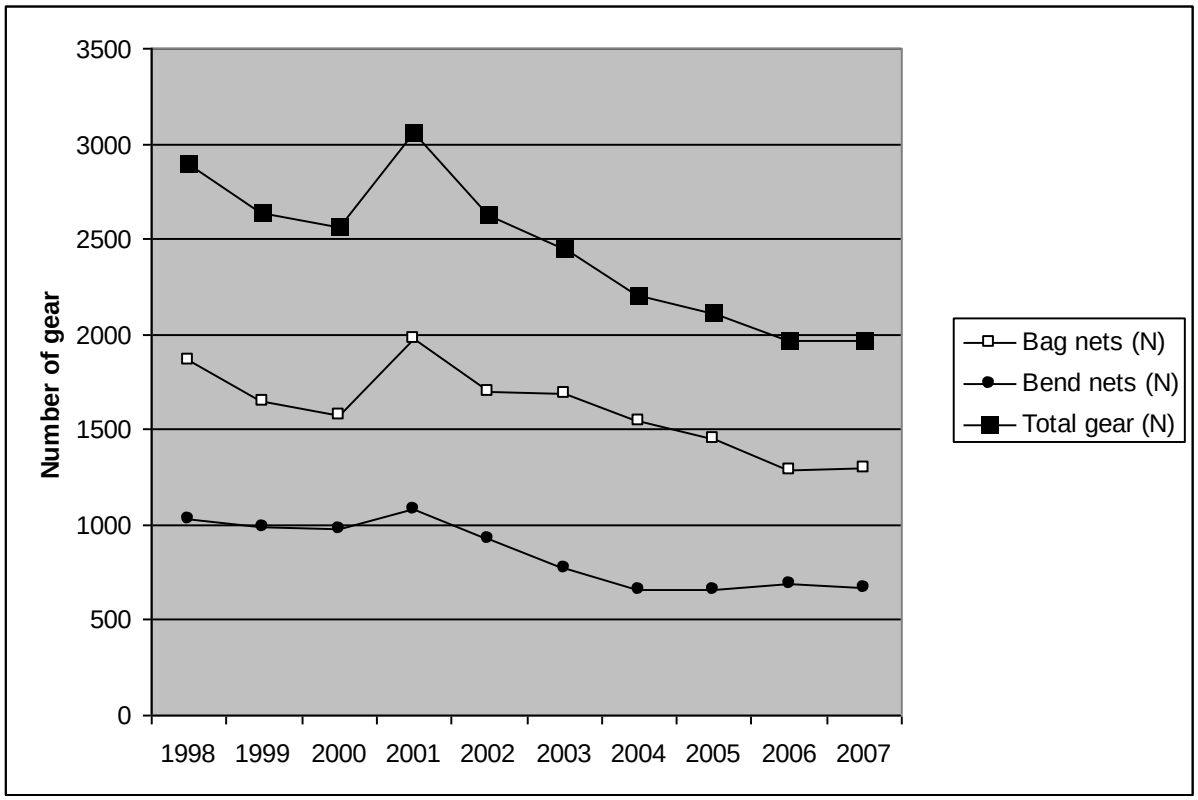


Figure 10. Number of stationary gear used in salmon fishery in the sea 1998 – 2007.

3.6 Tables 4 and 5 show that catches from sea fisheries in the coastal regions and fjord regions were almost equal in 2007. The catches from the fisheries in Finnmark county represent more than 50 % of the total coastal fisheries in 2007 (Table 4). Furthermore, the Tana salmon stocks represent a big part of the salmon complex harvested at sea with stationary gear in Finnmark. The coastal regions of Troms and Trøndelag also represent relatively high catches. The same is even more striking with regard to fjord fisheries, were the fjords of Finnmark and Trøndelag represent about 70 % of the total catch (Table 5).

Table 4. Overview of fisheries with stationary gear in the coastal regions, Annex A. Fishing days in 2008 are not decided upon.

Region (No.)	Name of region	Fishing days 2007 (N)	Fishermen 2007 (N)	Catch (Kg) 2007
1	Kysten av Finnmark	47/26*	258	108024
6	Kysten av Troms	21	68	25219
8	Lofoten og Vesterålen	20	45	6213
9	Nordlandskysten sør for Vestfjorden	20	41	5934
12	Kysten av Trøndelag	37	51	17050
14	Kysten av Møre og Romsdal	37/29**	33	8284
16	Kysten fra Stad til Stavanger	20/16**	65	12386
21	Jæren	37	40	11615
22	Agderkysten	37	105	14891
23	Østlandet	37	40	3497
Sum			746	213112

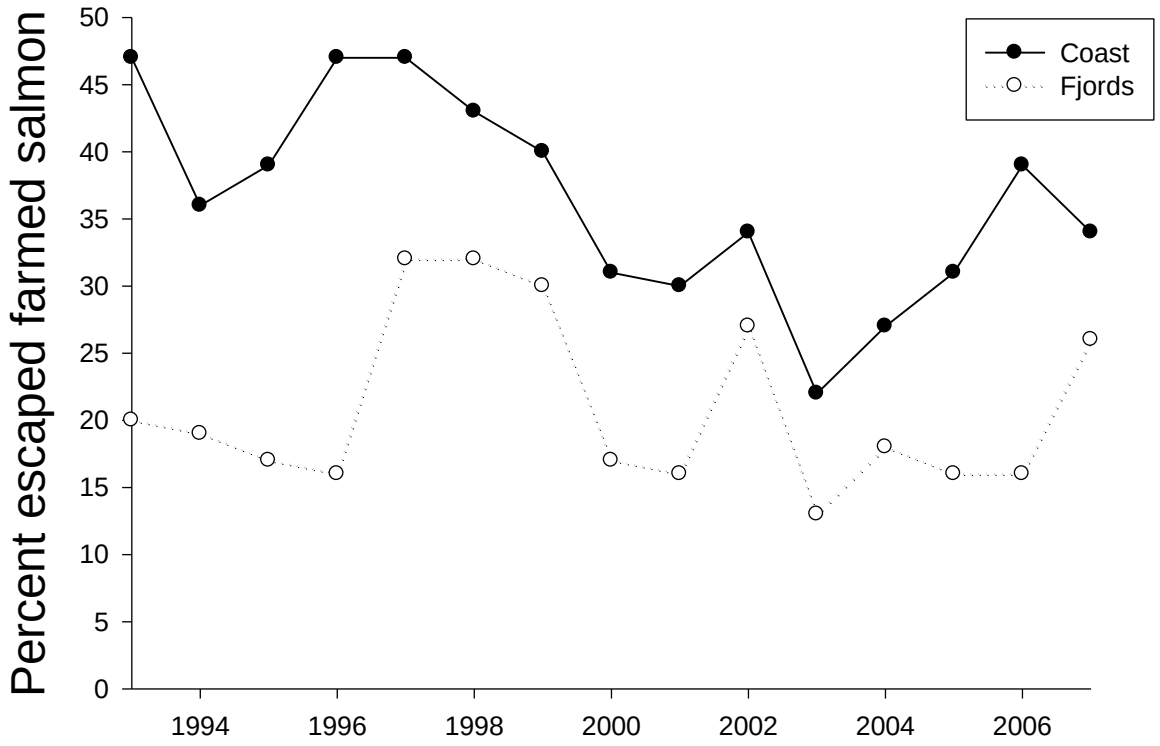
*) 47 was the number of fishing days for bag nets and 26 for bend nets, respectively.
**) Two numbers indicate a differentiation between two regulatory regimes within the region.

Table 5: Overview of fisheries with stationary gear in the fjord regions, Annex A. Fishing days in 2008 are not decided upon.

Region (No.)	Name of region	Stocks exploited (N)	Fishing days 2007 (N)	Fishermen 2007 (N)	Catch (Kg) 2007
2	Indre Varangerfjord	8	47/26*	56	17358
3	Tanafjorden	3	47	42	17895
4	Porsangerfjorden	5	47	39	11910
5	Fjordene i Vest-Finnmark	7	47	88	36986
7	Fjordstrøkene i Troms	22	21	58	21182
10	Ofoten og Indre Salten	24	20	38	4922
11	Indre Helgeland	13	20	13	2049
13	Fjordstrøk i Trøndelag	62	37	122	71020
15	Fjordene i Møre og Romsdal	56	37/29**	73	18230
17	Indre del av Fjordane	15	16/0**	21	1958
18	Sognefjorden	10	0	4	765
19	Indre Hordaland	19	16/0**	12	2098
20	Indre Rogaland	15	29/16**	39	7890
Sum		259		605	214262

*) 47 was the number of fishing days for bag nets and 26 for bend nets, respectively.
**) Two numbers indicate a differentiation between two regulatory regimes within the region.

3.7 Monitoring has shown that escaped farmed salmon form a greater part of the salmon catches in the coastal than in fjord regions (Jensen *et. al.* 2006) (Figure 11). Escapees are also in general caught later in the season than wild salmon.



Figur 11. The mean estimated contribution (%) of escaped salmon in samples in fisheries with stationary gear 1 June – 4 August in coastal and fjord regions 1993-2007. The data are collected at the same fishing sites the whole time period (Figure from Hansen *et al.* 2008).

Riverine salmon fisheries

3.8 Table 1 gives an overview over the salmon rivers by regions (cf Annex A), catches in 2007, and the number of rivers which will be opened for fishing in 2008[1]. The highest proportion of rivers with very strict regulations is found in Western Norway (regions 18 and 19). Table 6 gives an overview of fish weight groups in the 2007 catches.

[1] In Finnmark and Oslo and Akershus counties, provisions for riverine fishery is not adopted by 14 April 2008.

Table 6. Salmon catches in rivers 2007 by weight groups. Number (N) of fish caught.

Region nr	Region	<3 kg (N)	3-7 kg (N)	>7 kg (N)	Total (N)
1	Kysten av Finnmark	2651	2315	334	5300
2	Indre Varangerfjord	1509	488	173	2170
3	Tanafjorden	5205	4890	1818	11913
4	Porsangerfjorden	1959	623	637	3219
5	Fjordene i Vest-Finnmark	3343	726	1182	5251
6	Kysten av Troms	441	129	42	612
7	Fjordstrøkene i Troms	1836	1142	599	3577
8	Lofoten og Vesterålen	1481	195	2	1678
9	Nordlandskysten sør for Vestfjorden	619	29	1	649
10	Ofoten og Indre Salten	1083	644	184	1911
11	Indre Helgeland	412	154	7	573
12	Kysten av Trøndelag	482	8		490
13	Fjordstrøk i Trøndelag	12453	5569	3794	21816
14	Kysten av Møre og Romsdal	241	13		254
15	Fjordene i Møre og Romsdal	2658	1540	436	4634
16	Kysten fra Stad til Stavanger	86	96	28	210
17	Indre del av Fjordane	799	1154	439	2392
18	Sognefjorden	95	156	302	553
19	Indre Hordaland	824	917	165	1906
20	Indre Rogaland	645	1658	438	2741
21	Jæren	8465	3274	198	11937
22	Agder-kysten	3852	2448	201	6501
23	Østlandet	839	2392	664	3895

3.9 Annex B gives a total list of the salmon rivers sustaining self-reproducing stocks. A total of 275 rivers were represented with catch statistics in 2007. About 100 more rivers were opened for salmon fishing.

3.10 With a few exceptions (rivers Numedalslågen, Mandalselva Neiden and Tana) rod and line is the only allowed gear for salmon fishing in the rivers. In the Norwegian-Finnish common border rivers Tana and Neiden the fishery represents for a significant part old Sami/skolte/kven subsistence practices, where a special seine is used in Neiden (20 days giving 1000-3000 kg 2002-2006). The river catch in the Tana, represents a large proportion of the total riverine catches in Norway. Mean catches in the Tana (Norwegian and Finnish catches included), are estimated to 139 tonnes between 1972 and 2006, ranging from 70 to 250 tonnes.

3.11 The proportion of escaped salmon in the river catches, and in spawning stocks are remaining high and has again showed an upward trend in later years (Figure 12).

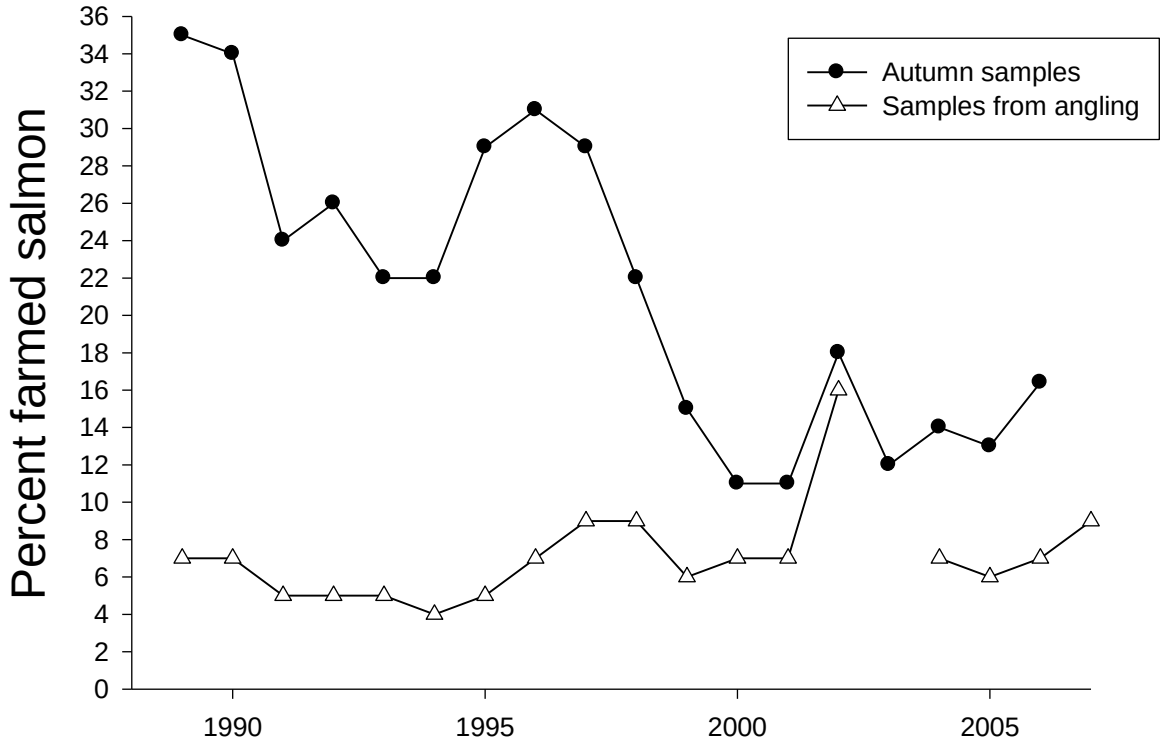


Figure 12. Estimated contribution (%) of escaped salmon in recreational fisheries 1989 – 2007 (no estimates from 2003), and in autumn samples from test-fishing at spawning grounds 1989-2006. (Figure from Hansen *et al.* 2008).

3.12 Estimates based on the number of national fishing licences bought (mandatory for salmon fishing) indicate that about 100.000 anglers yearly are fishing for salmon in Norway, corresponding to about 1 000 000 angler days and a CPUE of about one salmon per five angling days. The number of fishermen has been relatively stable in later years.

4 Regulations of the fisheries

Legal basis and management system

4.1 The responsibility for the management of wild Atlantic salmon and the regulation of salmon fisheries lies with the Ministry of environment (founded on the "Act Relating to Salmonids and Fresh-Water Fish etc". No. 47 of May 1992). The Directorate of Nature Management (DN) has the overall operative responsibility for fishery regulations regarding anadromous salmonids, and regulates the sea fisheries. The County Governors regulate the riverine fisheries based on guidelines from the Directorate. Fisheries in border rivers are based on bilateral agreements with Russia, Finland and Sweden, respectively.

4.2 Fishing regulations in Norway are based on the principle of general protection, which is established in Section 4 of the " Act Relating to Salmonids and Fresh-Water Fish etc." stating: *Anadromous salmonids are protected unless otherwise determined in provisions set out in or issued pursuant to this Act. The same applies to other fish in watercourses or parts of watercourses containing anadromous salmonids, ... ".*

4.3 The main provisions of the Act for regulatory measures are:

- Regulations defining permission to fish for anadromous salmonids. The provision decides what kind of gear is allowed in the rivers and at sea, and gives The Directorate for Nature Management the authority to determine how implements for fishing shall be designed and used, and to decide on fishing season.
- Regulations relating to implements used for fishing andromous salmonids, and to the duty to report and register. The provision contains definitions, rules on design and use of permissible fixed implements and of permissible sport and leisure fishing gear. All implements and gear not described here are prohibited.
- Regulations relating to seasons for salt-water fishing of anadromous salmonids (salmon, sea trout, char, etc.). The provision decides the fishing season in the sea fisheries in the various regions all over the country
- Regulations relating to seasons for fresh-water fishing of anadromous salmonides. The provisions are stated by the county governors, based on guidelines from The Directorate for Nature Management, and decide the fishing season and other regulatory measures in the rivers.

4.4 With a few exceptions fishing rights in fresh water belong to the owner of the shoreline. Along the coast owners of land with a shoreline have the right to fish with stationary gear.

4.5 Public fisheries regulations have primarily been based on regulations on fishing gears and fishing season. Bag nets are the only permitted gear in the coastal fishery, except in Finnmark county, where also bend nets are allowed. With a few exeptions (Numedalslågen, Tana and Neiden), only rod and line are permitted in the rivers.

Fishery regulations before 2008

4.6 Since 1986 there has been a substantial reduction in fishing effort with all kinds of stationary gear and driftnets in Norway. The most significant measure was the ban on the drift net fishery in 1989. The use of bend nets along the Norwegian coast was prohibited in parts of the country in 1997, and from 2003 the use of this gear was banned throughout the country, except in Finnmark. In the same period, the fishing season for bag nets was reduced in nearly all regions. The reduction varies from region to region dependent on the status of the stocks**.** In addition, there are established zones at sea outside river outlets where all fisheries, also marine fisheries, are restricted

4.7 The fishing season with stationary gear at sea has been from June/July to 4 August, tables 4 and 5 give an overview of the fishery at sea, with some details from the regulations, numbers of fishermen and catches in 2007. The season has been restricted in most counties due to weak stocks, and in some regions (region 16-19) in Western Norway the regulations are very strict.

4.8 In general, the outer time frame for fishing salmon in rivers has been from 1 June until the end of August. The vast majority of rivers have a shorter season than the outer frame. In addition to regulation on season, quotas, and restrictions on bait, are used in river regulations. Fishing right owners are allowed to further restrict fisheries, and have done so in a number of rivers.

4.9 The County Governor regulates riverine fisheries based on guidelines from The Directorate for Nature Management. The main guidelines for the period 2003 – 2007 were as follows:

- Fishing can be permitted when there is a surplus of salmon to exploit.
- Fishing on stocks that are threatened are not allowed. Fishing on vulnerable stocks should be strictly regulated or forbidden.
- Small stocks (numbers of ascending salmon 500 or less) should be given special protection.
- Fishing season and other regulations should prevent the diversity of the stocks. Measures should be brought into action if there are observations or indications on anything unnatural regarding composition and diversity.
- .Regulation regime should take into account trends and expectations of stock development and eventual uncertainties, c.f. the principles of the precautionary approach.

4.10 From the 1990s onwards, escaped salmon has contributed much to the total catches both in sea and rivers (figures 11-12). To reduce impact form escaped salmon, the authorities adopted a "second" fishing season at sea in parts of the country directed towards escaped salmon. The time frame vary depending on, among others, the period of wild salmon run and the amount of farmed fish present, but earliest start is 5 August and latest stop is 28 February. In this fishery it's allowed to use bend nets, and even other net gear in some regions in part of the season.

4.11 The assessment of status of stocks through a category system, where salmon rivers are classified based on the condition of the salmon stock in relation to adverse human impact, was first implemented into the management of salmon in 1993. The category system has been a very important part of the knowledge base on which the regulations rest. The main rule has been that fishing is closed in rivers and nearby sea-areas with threatened stocks, and strictly restricted in rivers and nearby sea-areas with vulnerable stocks, e.g. Table 2. See Annex C for explanation of categories.

4.12 In 2003, a 5-year regulatory regime was introduced for the first time to rationalize regulatory procedures. At the same time new and revised guidelines for the management of salmon fisheries was introduced. In connection to this, The NASCO Decision Structure for Management of North Atlantic Salmon Fisheries was used in adoption of the regulatory regime for the first time. In preparation for the 5-year regulatory regime, Norwegian Authorities undertook a comprehensive survey of the status of the stocks (the category system). Furthermore, the coast was divided into 25 regulatory zones, called "marine regulatory regions", allowing more detailed regulations, taking into account the status of the stocks within the zone.

4.13 Conservation limits or spawning targets have been available for only a limited number of rivers. Other indicators such as juvenile fish production, counts or estimates of salmon runs and spawning-stock sizes, catch pr unit effort and catch statistics have been used. Catch and

release has not been introduced as a regular management measure. Instead fishing pressure has been adjusted according to the current status of the stocks.

4.14 An important factor in the regulatory system is that fishing right owners can regulate the fisheries themselves within the framework set by the authorities. This is conditioned by they are well organized. And have well established procedures for catch statistics and control of the fisheries.

Catch reports and unreported catches

4.15 Duty to report catch data is regulated by The Act Relating to Salmonids and Fresh-Water Fish etc. Any person who has caught anadromous salmonids shall provide a catch report for use in official statistics. The report must be sent either directly to Statistics Norway (sea fishery) or to the fishing right owner (river fishery). Fishing right owners have to report the catch to the County Governor, where data for rivers are compiled and reported to Statistics Norway.

4.16 Catch reports and statistics have since 1993 consistently been divided into three weight classes: less than 3 kg, 3 - 7 kg, and more than 7 kg. It includes number and weight of the fish. Before 1993 it was divided into two weight classes. The weight classes correspond to a degree with number of winters at sea, and have been used to log trends in the population structure of the salmon stocks. In 2007 a great part of the salmon smaller than 3 kg was two sea winter fish. This suggests that assessing the year classes from the weight data would be more misleading in 2007 than in earlier years.

4.17 Escaped farm salmon are included in the catch statistics. Monitoring of percentage escaped fish in the fisheries is used to estimate the number of wild fish in the catches.

4.18 In riverine fishery regulations and as a voluntary action, there has been a growing tendency to release fish e.g. over a certain length. Before 2008 there has been no reporting system for released fish. Such a system will be implemented in 2008.

4.19 A system for reporting by-catch of salmon in marine commercial fisheries is not established, and the knowledge on by-catches from different types of these fisheries is limited. However, by-catch by marine commercial fisheries in home waters is in general not considered to be a major contributor to the total figure of unreported catches. Test fishing by mackerel gill nets, which are considered to be the most likely problem, has given information about by-catch of salmon in this type of fishery. Estimates are based upon these studies, reports on the increase or decrease of this fishery and an overall consideration of potential by-catch in other commercial fisheries. Trend in recent years: most likely stable.

4.20 The main approach to estimate unreported catch is to divide total unreported catch into components and then establish estimates for each component in relation to reported catches. Trends on the size of the fishery or catches from year to year are taken into account. In total we estimate the unreported catches to be about 30% of the total catches. The uncertainty is considered to be +/- 25% or in the interval between 22,5 – 37,5% of the total catch. Overall trends in all fisheries in recent years give reason to believe that unreported catches are slightly declining.

4.21 Total unreported catch is divided into the following components:

- Illegal takes in sea – about 20% of reported sea catch
- Legal takes in sea by bag net and bend net – about 20 % of reported sea catch
- Legal takes in sea by angling – about 15 % of reported sea catches
- Illegal takes in rivers – about 5% of reported river catches
- Legal takes in rivers, mainly by angling – about 15% of reported river catches
- By-catch in marine commercial fisheries – about 5% of reported sea catch

5 Guidelines for regulations of the fisheries 2008 – 2012

Background

5.1 The Parliamentary Bill on protection of wild salmon e.t.c. (St.prp. 32 (2006-2007)) establishes several guiding principles that imply significant changes in the regulations:

- Further reduction in mixed stock fisheries. The fisheries should be based on stocks that are at full reproductive capacity, and the fisheries on other stocks should be reduced to a largest possible extent.
- Use of spawning targets in fisheries regulations. Spawning targets should be met consistently.
- Reduction of the proportion of escaped farmed salmon in spawning stocks e.g. by reducing fishing pressure on wild fish.
- More strict regulations on threatened, vulnerable or reduced stocks that enters into the system with national salmon rivers.

5.2 *Spawning targets* have been introduced as an approach to setting management targets through reference points. In 2007 spawning targets as egg density needed to fulfill the productive capacity in 180 rivers were established (Hindar *et al.* 2007). These 180 rivers represent a significant part of the Norwegian salmon stock complex or ca 90 % of the yearly riverine salmon catches. Spawning targets will be developed for another 200 rivers during 2008. Detailed information on how the targets are is reported in Annex D.

5.3 Calculation of spawning targets are based upon data from nine rivers, in which stock-recruitment (SR) relationships are available (Hindar *et al.* 2007).

5.4 The highest spawning target was estimated for River Tana, where the female spawning biomass should be about 55 000 kg to meet the target of the whole river system.

5.5 These spawning targets represent a *first generation* of reference points, as they will be continuously modified according to forthcoming knowledge about the rivers and salmon stocks. This work has already started aiming at verifying or revising spawning targets the latest in due time before the next regulatory process.

Guidelines on mixed stock fisheries

5.6 To meet the demands that the fisheries should be based on stocks that are at full reproductive capacity, and that fisheries on other stocks should be reduced to a largest

possible extent, it will be necessary to reduce, and in some areas to ban, the sea fisheries for salmon.

- The status of all stocks that are exploited in a region should be taken into account when the regulatory regime is formulated.
- When the exploitation includes salmon from threatened or vulnerable stocks, or stocks which are under rebuilding, this should be specially emphasized, and even more so if any of the stocks are from national salmon rivers.
- Fishing in coastal regions should only be permitted when the fisheries in low degree influence on stocks that are not at full reproductive capasity, and the status of the stocks in nearby regions, counties and countries should be taken into account.
- In the fiords, the fisheries should be reduced when one or more of the stocks in the fiord are not at full reproductive capacity.

Guidelines on spawning targets

5.7 Spawning targets are set for 181 salmon rivers in Norway, and the spawning stocks are estimated in the same rivers. Estimates of spawning stocks in the rivers are based on catch statistics, the size distribution of females, and exploitation rates. The target for management of a river is that the spawning stock should be on, or above, the spawning target in at least three out of four following seasons.

- The county governor shall in co-operation with the fishing right owners assess exploitation rates in individual rivers, and take this into account when spawning stocks are assessed.
- Exploitation rates vary from river to river and from year to year. The precautionary approach should always be used when exploitation rates are assessed.
- Data and information of comparable rivers in the region can be used to assess exploitation rates. In rivers with scarce data material 50% should be used as exploitation rates if no information exist indicating that the rates differ from 50%.
- If the spawning stock has been below the spawning target in more than one of the four last years (2003-2006), measures should be brought into action to increase the stock to attain the spawning target as soon as possible.

5.8 A dramatic decrease of 1SW salmon was reported in 2007, and this must be taken into account when the situation is evaluated, and when regulatory measures for the actual period is considered.

Guidelines to reduce escaped farmed salmon in spawning stocks

5.9 Escaped farmed salmon that takes part in the spawning and have severe impact on genetics and production. These guidelines are based on a scientific report from The Norwegian Institute for Nature Research:

- Regulations shall contribute to the reduction of number of escaped salmon taking part in the spawning.
- In situations with frequently more than 5% escapees in the spawning stock, action should be taken to decrease the strain of escapees.
- In situations with frequently more than 20% escapees, strong measures are necessary.
- This could bee to postpone the fishing season at sea and in rivers to protect wild salmon from exploitation, reduced quotas/bag limits for wild salmon, or command to

release female salmon/all salmon which are regarded to be wild salmon from external characters.

- In years or situations when there is reason to expect high numbers of escapees, or this are registered, extraordinary measures should be put in place.
- The need for regulatory measures should bee seen in connection with other measures that are put in to place to reduce the number of escapees participating in the spawning.

National Salmon Rivers and National Salmon Fjords

5.10 The salmon stocks in national salmon rivers and fiords shall be given a special protection against human activities that can harm the wild salmon stocks. Fishing regulations in rivers and areas included in the scheme should be based on the same general principles as other rivers and coastal areas. However, threatened, vulnerable, and reduced salmon stocks included in the system should have more strict regulations. Threatened and vulnerable stocks shall not be exploited. This means that a fishery should not be permitted unless it is substantiated that such stocks not are exploited. The salmon run shall be assessed in the middle of the fishing season in these rivers, aiming to detect eventual signs of stock depletion. If this is the case, extraordinary measures shall be brought into action.

Preconditions for regulatory changes within the 5-year period

5.11 As for the previous 5-year period the guidelines on preconditions for making regulatory changes within the nest five year period were relatively strict, and as follows: *The fisheries regulations shall, in principle, be fixed for five years. However, there might be situations that urge for immediate changes. Serious changes in adverse human impacts, like for instance the introduction of Gyrodactylus salaris to a river system, or an unpredicted collapse in the salmon run in general or in single stocks, can imply a need to change regulations within the 5-year period.*

5.12 However several factors have changed or become evident through the last couple of months that might make it more likely that changes will take place also within the coming five year period. One is the alarmingly low catches in the 2007 season and especially the situation for one sea-winter fish, another is the announcement of a possible introduction of a concession system as a basis for a new regulatory regime for sea fisheries with stationary gear.

The role of sosio-economical factors (guidelines for local process)

5.13 A number of organisations representing fishing right holders, public interests and conservation interests are involved in different aspects of salmon management. In order to facilitate stakeholder participation and influence in salmon management, a number of local and regional councils have been established. On a national level salmon advisory and consultation meetings are normally held twice a year. National organizations of fishing right holders, recreational and commercial fishing interests, nature conservation, aquaculture and hydropower industries, and relevant authorities are represented. Over the last decade, local management bodies in salmon rivers have been given greater responsibility, especially local river-by-river organizations of landowners and fishing right holders.

5.14 Thus the guidelines on incorporating socio-economic factors in fisheries management were followed to some extent. Stakeholders were indentified both at a national, regional and local level and the whole regulatory process was designed to secure stakeholder involvement and participation.

5.15 The process for the fisheries regulatory regime 2008 – 2012 started in 2006, when a plan of progress towards final regulatory decisions by March 2008 was presented, discussed and agreed at a national salmon management advisory and consultation meeting. The County Governors decide on regulations for the river fisheries and give advice to the Directorate for nature management on regulations for the sea fisheries. County Governors had to follow guidelines on how the process should be conducted in order to secure satisfactory stakeholder involvement. Thus regional and local stakeholders where, as well as the national salmon management and advisory meeting, involved during all stages. There were also conducted formal hearing processes both with regard to river regulations and regulation of the sea fishery.

5.16 A formal consultation process with the Sami Parliament was also conducted in order to secure that Sami interests were well informed. Two meetings were held focussing on the regulatory regime for the sea fishery in the county of Finnmark. The meetings were conducted in an open and constructive way, but no agreement between the Sami Parliament and the Directorate for nature management could be achieved.

5.17 Based on studies from 1997 and 1999 exploring economic aspects of the "commercial" sea fishery for salmon, an assessment of the economic consequences of the proposed regulations of the sea fishery was conducted. Based on these studies and a consideration of developments in this fishery in later years, it was concluded that only a small proportion of the sea fishermen are likely to have an economic surplus of their activity, indicating that other than economic reasons are the most important driving forces for this fishery. The hearing process also revealed that social and cultural reasons and values might be more important for this fishery than economic reasons.

5.18 In relation to regulations of river fisheries it was an option to decide strict bag limits like one fish pr day and/or a few fish pr week or season, rather than shorting the fishing season. As an incentive these opportunities to choose between regulatory alternatives were given to rivers with a satisfactory local management, whereas rivers without such management were left with a shorter fishing season.

6 Fishery regulations from 2008 and the forthcoming years

6.1 On the background of the parliamentary bill and the guidelines, specially having in mind the status of 1SW salmon in 2007, the directorate has put forward a proposal on regulations of the sea fisheries for anadromous salmonids for the period 2008-2012. Substantial reductions of the fishing season are proposed. Proposed reductions vary from region to region dependent on the stock status and former regulations, but are as a rule between 14 days and one month. In addition, it is suggested to reduce the number of days of weekly fishing in some regions. The reduction in fishing season implies in most region a more strict regulation than the percentage of reduction measured in fishing days indicates, because the start of season is postponed. In many cases a large proportion of the salmon run will have passed through regions before the fishery is opened. In the Trondheimsfjord, for instance, the present fishing season is from 1 June to 4 August. The Directorates proposes a fishing season from 20 June to 4 August. More than 60% of MSW salmon is caught before 20 June in this area.

6.2 The majority of County Governors have decided on river regulation, see Annex E. The regulations are based on guidelines from the Directorate which partly are the same as for the period 2003 – 2007, see above 4.9. In addition, The County Governor also must take into account of guidelines on spawning targets/management targets, on reducing escaped farmed salmon in spawning stocks, and on national salmon rivers. The main new regulatory measure used to reduce exploitation in the period 2008 – 2012 compared to the period 2003 – 2007, are quotas. In addition to quotas, the seasons are shortened or postponed in most rivers, and a total on about 50 rivers are not opened to salmon fishing.

Table 7. Overview over regions and fishing season of salmon fisheries with stationary gear in the sea for 2003 – 2007, and proposal for the period 2008 – 2012. The fishing season targeting escaped salmon is not listed.

County/Region	**Fishing season 2003 – 2007**	**Fishing days**	**Proposal 2008-2012**	**Fishing days**
Østfold – Vest Agder				
Østlandet	01.06 – 04.08	37	15.06 – 20.07	20
Agderkysten	01.06 – 04.08	37	15.06 – 20.07	20
Rogaland				
Jæren	01.06 – 04.08	37	01.07 – 04.08	20
Indre Rogaland	01.07 – 04.08	29/16*	15.07 – 04.08	12
Kysten av Rogaland (Part of region 16)	08.07 – 04.08	20/16*	15.07 – 04.08	12
Hordaland				
Kysten av Hordaland (Part of region 16)	08.07 – 04.08	16	Not opened	0
Indre Hordaland	08.07 – 04.08	16/0*	Not opened	0
Sogn og Fjordane				
Kysten av SF (Part of region 16)	08.07 – 04.08	16	15.07 – 04.08	12
Sognefjorden	Not opened	0	Not opened	0
Indre del av Fjordane	08.07 – 04.08	16/0*	20.07 – 04.08	8
Møre og Romsdal				
Fjordene i Møre og Romsdal	15.06 – 04.08/ 01.06 – 04.08	37/29*	01.07 – 04-08	20
Kysten av Møre og Romsdal	15.06 – 04.08/ 01.06 – 04.08	37/29*	10.07 – 04.08	15
Sør-/Nord-Trøndelag				
Kysten av Trøndelag	01.06 – 04.08	37	07.07 – 04.08	17
Fjordstrøk i Trøndelag	01.06 – 04.08	37	20.06 – 04.08/ 15.06 – 04.08	25/29*
Nordland				
Lofoten og Vesterålen	01.07 – 04.08	20	15.07 – 04.08	12
Nordlandskysten sør for Vestfjorden	01.07 – 04.08	20	15.07 – 04.08	12
Ofoten og Indre Salten	01.07 – 04.08	20	15.07 – 04.08	12
Indre Helgeland	01.07 – 04.08	20	15.07 – 04.08	12
Troms				
Kysten av Troms	15.06 – 04.08	21	10.07 – 04.08*	11
Fjordstrøkene i Troms	15.07 – 04.08	21	15.07 – 04.08*	11
Areas with specific protection regimes	3 days weekly		3 days weekly	9
Finnmark				
Indre Varangerfjord (Bag net/Bend net)	15.05 – 04.08/	47/26	10.06 – 04.08/	24/15
Tanafjorden	01.06 – 15.07		07 – 04.08	
Porsangerfjorden		47/26		24/15
Fjordene i Vest-Finnmark		47/26		24/15
Kysten av Finnmark		47/26		24/15
		47/26		24/15
	4 days weekly		3 days weekly	

* Indicating a differentiation between regulatory regimes within the region. Note also that the regulatory regions 2003-2007 are different from those in 2008-2012. An exact comparison of fishing days is therefore in some cases difficult. Nevertheless the table gives a reasonable overview.

7 Monitoring and evaluation

7.1 To evaluate the status of salmon stocks and the efficiency of management measures, a number of monitoring and evaluation programmes are implemented (c.f. Implementation plan):

- *National Salmon Rivers* and *National Salmon Fjords*. Monitoring (yearly) and evaluation
- limed salmon rivers and rivers subject to acid precipitation, including rehabilitation of salmon stocks
- sea lice infestations in fish farms
- sea lice infestations on wild and escaped salmon and sea-trout?
- presence of *Gyrodactylus salaris* in rivers and inland fish farming facilities
- epidemic surveillance of *G. salaris* as part of regional eradication programmes
- restoration of salmon stocks in rivers chemically treated to eradicate *G. salaris*
- general assessment of stock size, composition, and juvenile production
- sea survival
- status of salmon stocks in regulated rivers

7.2 In addition catch statistics, as described in chapter 5, are historically the most important source of information to assess stock developments. There is an ongoing effort to improve catch statistics and in 2008 the collection of information on fishing effort and released fish in riverine salmon fisheries will be introduced. The estimation of unreported catches, by-catches in other fisheries and illegal fisheries are still challenging.

7.3 Trends in numbers of fishermen participating in rod fisheries will be estimated based on the number of national fishing licence fees paid. The number of fishermen using stationary gear in sea fisheries and the number and type of gear used will be registered on an annual basis. The development of a concession system as a basis for a new regulatory regime for sea fisheries with stationary gear has been announced. The goal is to have such a system in place before the 2010 fishing season.

7.4 In later years methods to monitor adult salmon in rivers have developed resulting in new and better possibilities to estimate salmon runs and spawning stock sizes. Monitoring tools are: Fish counters, video counters, diving and other visual counting methods from river banks and different fish marking techniques. All these methods are currently used.

7.5 Direct counts of all ascending salmon can only be done in a limited number of rivers. Fish-counters are already installed in a number of rivers (about 40), specially associated with fish ladders.

7.6 Nevertheless, the main source of information on spawning stock sizes will be based on catch statistics combined with information on exploitation rates. This information will be collected and studies on exploitation rates will be conducted in as many rivers as possible.

7.7 A monitoring programme on stock dynamics of adult salmon based on sampling at 15 sea-fisheries sites and 50 rivers will be maintained. Sea age distribution will be monitored in all National salmon rivers and about 20 other rivers. Also the monitoring of escaped farmed salmon in fisheries and spawning stocks will be maintained and if possible strengthened.

7.8 The category system as a tool for stock assessment will be further developed i. a. by integrating spawning targets/management goals and the occurrence of escaped farmed salmon in spawning stocks into the system.

Spawning targets and assessment of spawning stocks

7.9 As mentioned before spawning targets are currently set for about 180 salmon rivers. Spawning targets for another 200 rivers will be added during 2008. These spawning targets represent a *first generation* of reference points, and will be developed further according to forthcoming knowledge. A scientific program will be initiated in 2008, aiming to establish a standard methodology and procedure to assess spawning stock sizes each year.

Assessment of salmon run in National Salmon Rivers

7.10 In addition to the yearly monitoring, from 2008 onwards the salmon run will be assessed in the middle of the fishing season at least in all *National Salmon Rivers*. If it is likely that spawning targets might not be met extraordinary measures will brought into action. The measures should be discussed and pre-agreed to ensure that they can be brought into action very quickly.

Evaluation project on fishery regulations

7.11 For the next five year regulatory period, the effects and consequences of the fisheries regulation regime will be evaluated by research institutes through the initiation of a evaluation project. The goal of this project is to document and assess effects of the new regulation regime on the salmon stocks, behaviour of commercial fishermen and anglers, economical and socio-cultural aspects in general with a special focus on cultural aspects for Sami people. The project will report on a annual basis. In addition results from the project will also serve as a knowledge base concerning the possible development and introduction of a concession system for fishing with stationary gear at sea.

References

Anon. 2006. St.prp.nr 32. Om vern av villaksen og ferdigstilling av laksevassdrag og laksefjorder. Det kongelige miljøverndepartement.

Erkinaro, J., Økland, F., Moen, K. & Niemelä, E. 1999. Return migration of the Atlantic salmon in the Tana River: distribution and exploitation of radiotagged multi-sea-winter salmon. Boreal Environment Research 4, 115-124.

Fiske, P. Hansen, L.P., Hårsaker, K., Lund, R.A., Næsje, T.F., Sandhaugen, A.I., & Thorstad, E.B. 2001. Beskatning og selektiv fangst. *In:* Laksefiskeboka. Om sammenhenger mellom beskatning, fiske og verdiskaping ved elvefiske etter laks, sjøaure og sjørøye-NINA Temahefte 20: 1-100.

Fiske, P. 2004. Bestandssammensetning av villaks. In: Jensen, A.J. (ed.). 2004. Geografisk variasjon og utviklingstrekk i norske laksebestander. – NINA Fagrapport 80. 79pp.

Hansen, L. P., Fiske, P., Holm, M., Jensen, A. J. & Sægrov, H. 2006. Bestandsstatus for laks i Norge. Rapport fra arbeidsgruppe. Utredning for DN, 2006-3:1-48.

Hansen, L. P., Fiske, P., Holm, M., Jensen, A. J. & Sægrov, H. 2007. Bestandsstatus for laks i Norge. Rapport fra arbeidsgruppe. Utredning for DN, 2007-2:1-54.

Hansen, L. P., Fiske, P., Holm, M., Jensen, A. J. & Sægrov, H. 2008. Bestandsstatus for laks 2008. Rapport fra arbeidsgruppe. Utredning for DN (in prep.).

Hindar, K., Diserud, O., Fiske, P., Forseth, T., Jensen, A.J., Ugedal, O., Jonsson, N., Sloreid, S.-E., Arnekleiv, J.V., Saltveit, S.J., Sægrov, H. & Sættem, L.M. (2007). Gytebestandsmål for laksebestander i Norge. NINA Rapport 226, 1-78.

Hindar, K. & Diserud, O. 2007 Sårbarhetsvurdering av ville laksebestander overfor rømt oppdrettslaks. NINA Rapport 244: 45pp.

Jensen, A.J , Fiske, P., Hansen, L.P., Holm, M. & Sægrov, H. 2006. Evaluering av gjeldende regioninndeling for sjølaksefiske. Notat utarbeidet av Arbeidsgruppen for bestandsstatus for laks.

Jensen, A.J., Finstad, B., Hvidsten, N.A., Jensås, J.G., Johnsen, B.O., Lund, E., & Solem, Ø. 2007. Fiskebiologiske undersøkelser i Auravassdraget. Rapport for prosjektperioden 2004-2006. – NINA Rapport 241. 63 pp.

Johansen, M., Erkinaro, J., Niemelä, E., Heggberget, T.G., Svenning, M.A. & Brørs, S. 2008. Atlantic salmon monitoring and research in the Tana river system. Outlining a monitoring and research program for the River Tana within the framework of the precautionary approach. Final Report of the Norwegian-Finnish working group on monitoring and research in Tana. 64 pp.

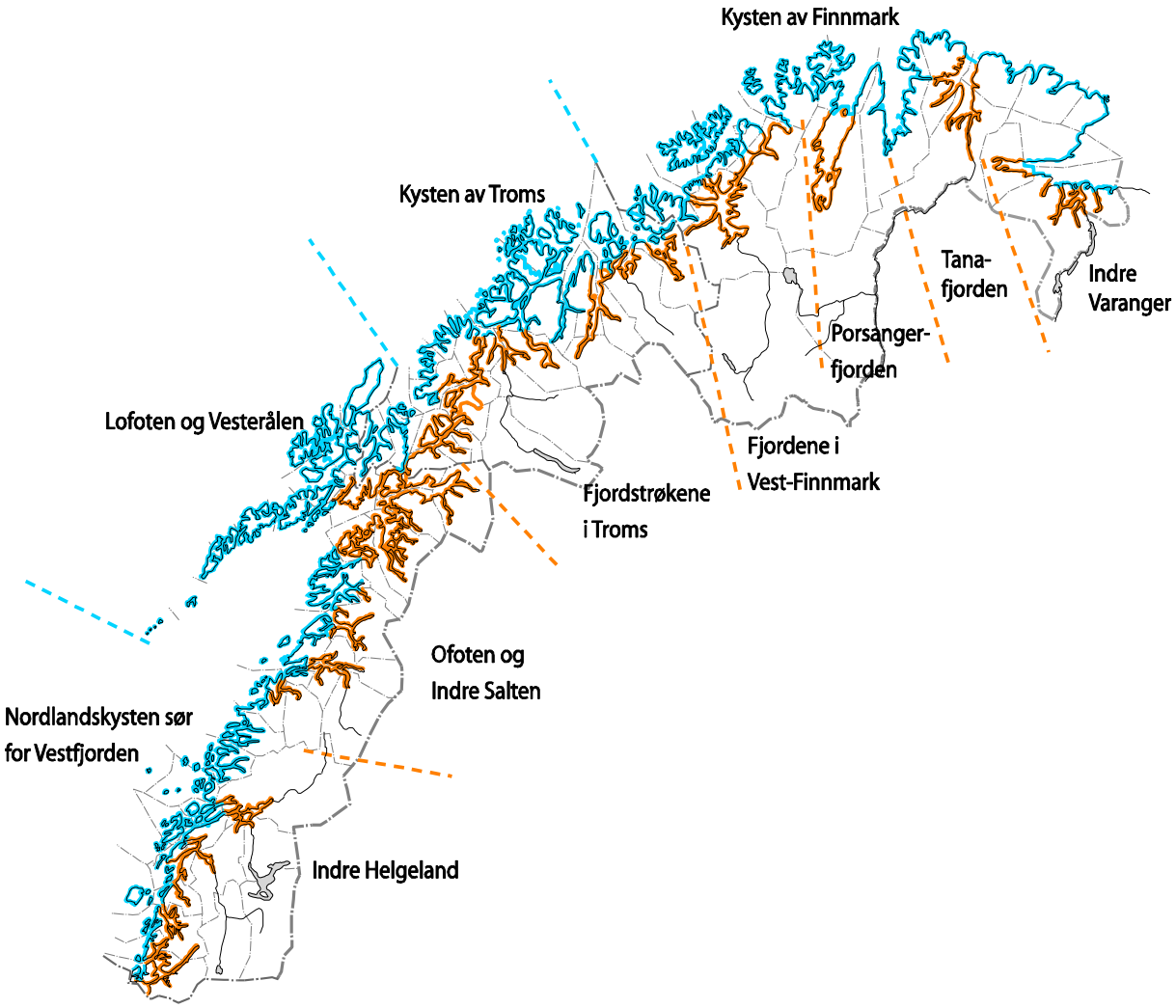
Karppinen, P., Erkinaro. J., Niemelä, E, Moen, K. & Økland, F. 2004. Return migration of one-sea-winter Atlantic salmon in the River Tana. Journal of Fish Biology 64, 1179-1192.

Niemelä, E., Erkinaro, J., Julkunen, M., Hassinen, E., Länsman, M. & Brørs, S. 2006. Temporal variation in abundance, return rate and life histories of previously spawned Atlantic salmon in a large subarctic river. Journal of Fish Biology 68, 1222-1240.

Vähä J-P, Erkinaro J, Niemelä E & Primmer CR (2007) Life-history and habitat features influence the within-river genetic structure of Atlantic salmon. Molecular Ecology 16, 2638-2654.

Annexes

Annex A.



Annex A.1. Map of Northern Norway showing regions of coastal (blue line) and fjord (red line) areas. Regions correspond to those listed in table 1.

AnnexA.2. Map Southern Norway showing regions of coastal (blue line) and fjord (red line) areas. Regions correspond to those listed in table 1.

Annex B. List of salmon rivers distributed on regions, with the *National Salmon Rivers* in **bold**. Rivers written in red are not opened for fishing in 2008, rivers written in blue the regulations are not decided for 2008. The list is based on categorization in 2007, existing data on spawning targets for 181 rivers and catch statistics in 2007. The list contains rivers that sustain self-producing salmon stocks. Extinct stocks are not included. The management target is defined as attained (A) if the spawning target is attained in at least three out of four years in the period 2003 – 2006, NA=management target *not* attained. For rivers Neiden and Tana, only catches from Norwegian side are represented in the table, c.f. note below table.

Region	River name	Category	Spawning target (eggs)	Spawning target (Kg of females)	Catch 2007 (N)	Catch 2007 (Kg)	Attainment of mngm. target 2003-2006
1	Grense Jakobselv	5b	900760	621	316	791	NA
1	**Vestre Jakobselv**	**5a**	**1536200**	**1059**	**1380**	**4542**	**A**
1	**Komagelva**	**5b**	**3119380**	**2151**	**1308**	**4666**	**NA**
1	Skallelva	5a	827110	570	386	1479	NA
1	Sandfjordelva	X			30	74	
1	Vesterelva med Ordo	5a	1965960	1356	879	3003	NA
1	Risfjordvassdraget	5a	296180	204	92	258	NA
1	Sandfjordelva	5b	618050	426	302	635	NA
1	Futelva	5a			8	16	
1	Storelva	5a	1799330	1241	297	1024	NA
1	Veidneselva	5a			201	462	
1	Lille Porsangerelva	5a			76	177	
1	Tømmervikvassdraget	X			11	22	
1	Lafjordelva	2					
1	Snefjordvassdraget	X			7	47	
1	Sør-Tverrfjordelva	X			7	32	
2	Karpelva	5b	299790	207	72	100	NA
2	Sandneselva	5a					
2	**Neidenelva**	**5b**	**4288000**	**2957**	**1605**	***4889***[2]	**A**
2	Munkelva	5a	288630	199	96	198	NA
2	Klokkerelva	5a			38	67	
2	Nyelva	X					
2	Bergebyelva	5a			135	353	
2	Vesterelva	5b	407780	281	224	395	A
3	**Kongsfjordelva**	**4a**	**1597840**	**1102**	**1021**	**3328**	**NA**
3	**Tanaelva**	**5b**	**98560570**	**54756**	**10110**	***44315***[3]	**NA**
3	**Langfjordelva**	**5b**	**3105880**	**2142**	**782**	**2524**	**NA**
4	**Børselva**	**5b**	**3985500**	**2749**	**985**	**2592**	**NA**
4	**Lakselva**	**5b**	**4965444**	**3424**	**1227**	**6664**	**NA**
4	**Stabburselva**	**5b**	**2343380**	**1616**	**999**	**3410**	**NA**
4	Ytre Billefjordelva	5a			8	13	
4	Smørfjordelva	5a					
5	Russelva	5a			79	179	
5	**Repparfjordelva**	**5b**	**4786170**	**3301**	**2866**	**6891**	**NA**
5	Kvalsundelva	5a					
5	Lakselva i Kviby	5a			59	118	
5	**Altaelva**	**5a**	**22805320**	**12130**	**2247**	**13730**	**NA**
5	Eibyelva	5a					
5	Transfarelva	X					

[2] Catches in River Neiden from Norwegian and Finnish fisheries combined: 7245 Kg
3 Catches in River Neiden from Norwegian and Finnish fisheries combined: 7245 Kg
3 Catches in River Tana from Norwegian and Finnish fisheries combined: 100494 Kg

6	Rotsundelva	5a			50	216	

Annex B cont.

Region	River name	Category	Spawning target (eggs)	Spawning target (Kg of females)	Catch 2007 (N)	Catch 2007 (Kg)	Attainment of mngm. target 2003-2006
6	Jægervatnvassdraget	5a			64	259	
6	Breivikvassdraget	5a			70	258	
6	Vannareidvassdraget	5a			91	190	
6	Skipsfjordvassdraget	5a	260100	179	100	164	NA
6	Skogfjordvassdraget	5a			116	287	
6	Skittenelva	5a					
6	Tønsvikelva	5a					
6	Tromvikvassdraget	5a			7	13	
6	Straumselvvassdraget	5a					
6	Finnsetervassdraget	X			37	53	
6	Bunkanvassdraget	5a			6	10	
6	Langvatnvassdraget	5a			46	118	
6	Lakselva (Gullesfjord)	5a			25	104	
7	Burfjordelva	3a			23	68	
7	**Kvænangselva**	**5a**	**623320**	**430**	**334**	**1066**	**NA**
7	**Reisavassdraget**	**4a**	**5294800**	**3652**	**840**	**3355**	**NA**
7	Oksfjordvassdraget	5a			119	482	
7	Manndalselva	3a			3	19	
7	Signaldalselva	2			10	24	
7	Nordkjoselva	5a			43	180	
7	**Målselvvassdraget**	**5b**	**4000000**	**2759**	**1524**	**7229**	**NA**
7	Lakselva (Aursfjorden)	5a	130760	90	23	25	NA
7	Rossfjordvassdraget	5a			38	163	
7	Laukhellevassdraget	X	2765660	1907	190	668	NA
7	Åndervassdraget	5a	548600	378	37	61	NA
7	Vardnesvassdraget	5a			1	2	
7	Tennelvvassdraget	5a	372400	257			NA
7	Grasmyrvassdraget	5a			57	87	
7	Lysbotnvassdraget	5a	486740	336	150	382	NA
7	Skøelvvassdraget	3a	533250	368	59	200	NA
7	Brøstadelva	3a			5	16	
7	Salangsvassdraget	2	2524280	1741	80	416	NA
7	Løksebotnvassdraget	5a			27	47	
7	Spansdalselva	3a					
7	Rensåvassdraget	5a			14	40	
8	Ramsåa	5a			60	136	
8	Toftenvassdraget	5a					
8	Bleiksvassdraget	5a			16	32	
8	Stavevassdraget	5a			10	21	
8	Skogvollvassdraget	5a			45	77	
8	Steinsvassdraget	5a					
8	Melavassdraget	5a			17	36	
8	Nøssvassdraget	5a					
8	Kobbedalselva	5a			7	11	
8	**Roksdalsvassdraget**	**5b**	**1576760**	**1087**	**401**	**726**	**A**
8	Åseelva	5a			23	40	
8	Tuvenelva	2					
8	Ryggedalsvassdraget	5a			24	37	

Annex B cont.

Region	River name	Category	Spawning target (eggs)	Spawning target (Kg of females)	Catch 2007 (N)	Catch 2007 (Kg)	Attainment of mngm. target 2003-2006
8	Selnesvassdraget	5a			3	4	
8	Holmstadvassdraget	4a			10	23	
8	Lahaugvassdraget	5a					
8	Oshaugvassdraget	5a					
8	Indre Straumfjordvassdraget	5a			5	6	
8	Gryttingvassdraget	4b			3	6	
8	Vikelva	5a			15	24	
8	Alsvågvassdraget	5b	348830	241	40	74	NA
8	Borgevassdraget	4a					
8	Farstadvassdraget	4a					
8	Helosvassdraget med Lyngedalsvassdraget	5a			12	17	
8	Grunnførfjordelva	5a					
8	Vestpollvassdraget	5a			30	47	
8	Lakselva i Godfjorden	5a					
8	Buksnesvassdraget	5b	830760	573	341	619	
8	Storelva (Lovik)	4a			108	191	
8	Gårdselvvassdraget (Gårdselva)	5b	423880	292	251	440	A
8	Forfjordelva	4a			40	52	
8	Roksøyvassdraget	5a	395920	273	20	33	NA
8	Sørdalselva	5a					
8	Osvollvassdraget	5b	296660	205	63	125	A
8	Kjerringnesvassdraget	5b	407060	281	93	143	NA
8	Fiskefjordvassdraget	4a			39	59	
8	Kaljordvassdraget	5a			2	5	
9	Skjelvareidvassdraget	5a					
9	Hopvassdraget	5a			18	43	
9	Fjærevassdraget	4a	163920	113	160	215	A
9	Futelva	5a			110	124	
9	Laksådalsvassdraget	5a			11	24	
9	Reipåvassdraget	5a			185	242	
9	Spildervassdraget	5a	340740	235	143	219	A
9	Silavassdraget	5a			20	29	
9	Færsetvassdraget	3a			2	2	
10	Teinvassdraget	5a					
10	Heggedalselva	5a			8	22	
10	Sneiselvvassdraget	5a			16	21	
10	Kongsvikelva	5a			13	18	
10	Myklebostadvassdraget	5a			14	14	
10	Tårstadvassdraget	5a			207	315	
10	Laksåvassdraget	5a			48	54	
10	Elvegårdselva (Bjerkvik)	5a	249160	172	69	221	
10	Skjoma	3a			2	14	
10	Rånavassdraget	5a			45	167	
10	Kjellelva	5a			78	164	
10	Forsåvassdraget	5b			118	246	A

Annex B cont.

Region	River name	Category	Spawning target (eggs)	Spawning target (Kg of females)	Catch 2007 (N)	Catch 2007 (Kg)	Attainment of mngm. target 2003-2006
10	Stabburselva og Draugelva	5a			29	37	
10	Forsåelva	5a	469160	324	118	246	
10	Varpavassdraget	5b	315400	218	42	85	
10	Sagpollvasssdraget	4a			6	7	
10	Bonnåga	4a			17	46	
10	Laksåga (Nordfjorden)	3a			13	58	
10	Lakselva (Valljorda)	5a					
10	Lakselva i Valnesfjord	5a			22	46	
10	Saltdalsvassdraget	4a	3458820	2385	173	806	NA
10	Lakselva	4a			88	254	
10	Valneselva	5a			84	204	
10	**Beiarvassdraget**	**5b**	**2470240**	**1704**	**701**	**3223**	**A**
11	Flostrandvassdraget	5a			114	231	
11	Ranelva	2					
11	Aunelva	5a					
11	Halsanelva	2					
11	Hestdalselva	2					
11	Lakselvvassdraget	5a			11	40	
11	Sausvassdraget	5b	1087920	750	117	254	NA
11	Eidevassdraget	5a			24	44	
11	Åelva (Åbjøra)	3a	1382610	954	221	602	
11	Storelva (Tosbotn)	4a			75	181	
11	Bogelva	4a					
11	Urvollvassdraget	5a			11	21	
11	Terråkelva	4a					
12	Storelva (Lonet)	2					
12	Sitterelva	5a					
12	Storelva (Jøssund)	5a					
12	Skjellåa	5a					
12	Steinsdalselva	5b	1749940	1207	417	601	NA
12	Straumsvassdraget	4a					
12	Einardalselva	5a					
12	Nordskjørelva	5a					
12	Håvikelva	5a					
12	Sunnskjørelva	4a					
12	Revsneselva	4a					
12	Teksdalselva	4a	71520	49			A
12	Okla	4a					
12	Bottengårdelva	4b					
12	Terningelva	4a					
12	Grytelva	5a					
12	Sagelva (Laugen)	5a					
12	Kvernavassdraget (Kvernavatnet)	5a					
12	Lakselva (Fillan)	5a					
12	Åelva	5a	632495	436	73	127	N
13	Horvenelva	3a			16	25	
13	Årforelva	5a					

Annex B cont.

Region	River name	Category	Spawning target (eggs)	Spawning target (Kg of females)	Catch 2007 (N)	Catch 2007 (Kg)	Attainment of mngm. target 2003-2006
13	Sjølstadelva	5a					
13	Kongsmoelva	5a	888820	613	84	94	NA
13	Nordfolda	3a					
13	Langbogelva	5a					
13	Kvistenelva	3a			7	8	
13	Salvassdraget	5a	1155960	797	480	875	NA
13	Sagelva (Salsnes)	5a					
13	Vetterhuselva	5a					
13	**Namsen**	**5a**	**27048560**	**18654**	**4910**	**16126**	**A**
13	**Årgårdsvassdraget**	**5a**	**7781360**	**5366**	**2169**	**2476**	**NA**
13	Bogna	4a	1855980	1280	414	460	NA
13	Aursunda	3a	947880	654	133	75	NA
13	Oksdøla	5a	749200	517	133	142	NA
13	**Stordalselva**	**5b**	**4480380**	**3090**	**1364**	**2025**	**NA**
13	**Norddalselva**	**5b**	**1209000**	**834**			**NA**
13	Grytelva	5a					
13	Imselva	5a					
13	Mørrevatnet	5a					
13	Oldenelva	5a	256040	177	231	439	-
13	Nordelva	5b	833880	575	71	127	NA
13	Osaelva	5a					
13	Skauga	4a	1708940	1179	312	534	NA
13	Hasselelva	4a					
13	Flyta	4a					
13	Prestelva	4a					
13	Mossa	2					
13	Tangstadelva	5a					
13	Moldelva	5a					
13	**Steinkjerelva med Byaelva**	**2**	**2527860**	**1743**	**144**	**616**	**NA**
13	**Figga**	**2**	**1554230**	**1072**			**NA**
13	**Verdalsvassdraget**	**5b**	**5823915**	**4016**	**316**	**1553**	**A**
13	Levangerelva	4a	1497160	1033	163	234	NA
13	**Stjørdalselva**	**5a**	**9805740**	**6763**	**1324**	**5788**	**A**
13	**Nidelva**	**4a**	**3957800**	**2730**	**708**	**2705**	**A**
13	Homla	5a	363080	250	77	99	NA
13	Sagelva	4a					
13	Storelva	3a					
13	**Gaula**	**5b**	**37434000**	**25817**	**4455**	**25124**	**A**
13	Vigda	4a	448000	309	588	638	NA
13	Børselva	4a	198200	137	374	380	NA
13	**Orkla**	**5b**	**27421120**	**18911**	**3266**	**17457**	**A**
13	Skjenaldelva	4a					
13	Tennelva (Tennelelva)	5a					
13	Lena	4a					
13	Størdalselva	5a					
13	Grønningselva	5a					
13	Fremstadelva	4a					
13	Steinsdalselva	5a					

Annex B cont.

Region	River name	Category	Spawning target (eggs)	Spawning target (Kg of females)	Catch 2007 (N)	Catch 2007 (Kg)	Attainment of mngm. target 2003-2006
13	Åstelva	5a					
13	Slørdalselva	4a					
13	Tannvikelva	5a					
13	Bergselva	4a			8	14	
13	Snilldalselva	5a			1	3	
13	Venelva	3a					
13	Holla	4a					
13	Hagaelva	4a					
13	Søa	4a			39	65	
13	Haugelva	4a					
13	Fjelna	5a			29	105	
13	Staursetelva	5a					
14	Hustadelva	4a	644370	444	39	79	NA
14	Farstadelva	5a					
14	Sylteelva	5b	588320	406	198	267	NA
14	Vatneelva	5a					
14	Hildreelva	5a	28920	20	17	39	NA
14	Vågselva	5a					
15	Aureelva	5a					
15	Todalselva	5a					
15	**Surna**	**4a**	**7012180**	**4836**	**503**	**2582**	**NA**
15	Bævra	5a					
15	Todalselva	4a			29	103	
15	Søya	4a	1200040	828	120	252	NA
15	Storelva (Hanemsvatnet)	5a					
15	Ulsetelva	5a					
15	**Drivavassdraget**	**2**	**8805940**	**6073**	**255**	**1297**	**NA**
15	Litledalselva	2			21	101	
15	Usma	2			12	30	
15	Batnfjordselva	2			35	54	
15	Vågsbøelva	5a	498110	344	114	140	NA
15	Vassgårdselva	5a					
15	Oselva	5b	1293040	892	166	324	NA
15	Oppdølselva	5a					
15	Istadelva	5a					
15	Røa (Hovdenakken)	5a					
15	Eira	4a	1409680	972	337	1265	NA
15	Visa	5a	268860	185	24	87	NA
15	Mittetelva	5a					
15	**Raumavassdraget**	**2**	**7562540**	**5216**	**79**	**366**	**NA**
15	Skorgeelva	2			18	37	
15	Isa	2					
15	Innfjordelva	2			3	4	
15	Måna	5a	526560	363	108	347	NA
15	Tressa	5a	380400	262	116	232	
15	Skorgeelva	5a			18	37	
15	Tennfjordelva	5a	501700	346	113	207	NA
15	Solnørelva	5a	184960	128	73	102	NA

Annex B cont.

Region	River name	Category	Spawning target (eggs)	Spawning target (Kg of females)	Catch 2007 (N)	Catch 2007 (Kg)	Attainment of mngm. target 2003-2006
15	Ørskogelva	5a	143160	99	61	92	NA
15	Valldalselva	5b	1172060	808	126	585	NA
15	Vagsvikelva	5a			25	44	
15	Stordalselva	5a	1049520	724	220	816	NA
15	Tafjordelva	4a					
15	Norddalselva	5a			12	40	
15	Eidsdalselva	5a			110	323	
15	Korsbrekkelva	5b	209100	144	175	782	A
15	Strandaelva	5b	497440	343	340	1370	-
15	Velledalselva	5b	702200	484	270	763	A
15	Aureelva	5b	468160	323	244	391	NA
15	Norangdalselva	5a	184360	127			
15	Vikelva (Bjørke)	5a	244710	169	61	230	A
15	Bondalselva	5b	844520	582	314	1015	A
15	Hareidsvassdraget	5a	563100	388			NA
15	**Ørstaelva**	**4a**	**1961600**	**1353**	**225**	**520**	**NA**
15	Storelva (Nordre Vartdal)	5a					
15	Storelva (Søre Vartdal)	5a	469240	324			-
15	Kilselva	5a					
15	Øyraelva	5a					
15	Austefjordelva	5a	337840	233	55	167	NA
15	Austefjordvassdraget	5a			13	28	
15	Steinsvikelva	2					
15	Norddalselva	5a					
15	Oselva (Syvde)	5a	251500	173	13	28	NA
15	Åheimselva	5a	678220	468	226	358	NA
16	Ervikelva	5a	178680	123	90	245	A
16	Osenelva	5a	1477280	1019	120	624	NA
16	Kvaleelva	X					
17	**Eidselva**	**5a**	**1106420**	**763**	**263**	**1333**	**A**
17	Hjalma	5a			13	28	
17	**Strynselva**	**5a**	**1565180**	**1079**	**156**	**1086**	**NA**
17	Loelva	5a	184480	127	33	175	NA
17	**Oldenelva**	**5a**	**219540**	**151**	**49**	**308**	**NA**
17	Gloppenelva	5a	642320	443	155	885	NA
17	Ryggelva	5a			20	94	
17	Åelva og Ommedalselva	5a	315600	218	151	910	A
17	Hopselva i Hyen	5a			45	146	
17	Jølstra	4a	1671840	1153	33	156	NA
17	**Nausta**	**5a**	**3147600**	**2171**	**540**	**1711**	**NA**
17	**Gaula i Sunnfjord**	**5a**	**2092220**	**1443**	**507**	**2344**	**NA**
17	Kvamselva i Sunnfjord	5a	249360	172	14	27	NA
17	Flekkeelva	4a	401605	277	205	928	A
17	Dalselva (Dale)	5a			208	461	
18	Ytredalselva	3a					
18	Daleelva	3b	392600	271	62	363	A
18	**Årøyelva**	**4a**	**185400**	**128**	**34**	**261**	**A**
18	Sogndalselva	5a	165840	114	44	248	A

Annex B cont.

Region	River name	Category	Spawning target (eggs)	Spawning target (Kg of females)	Catch 2007 (N)	Catch 2007 (Kg)	Attainment of mngm. target 2003-2006
18	Mørkridselva	3a					
18	**Lærdalselva**	**2**	**7274360**	**5017**	**147**	**1264**	**NA**
18	Aurlandselva	4a	864440	596	9	74	NA
18	**Flåmselva**	**5a**	**283780**	**196**	**18**	**100**	**NA**
18	**Nærøydalselva**	**5a**	**743420**	**513**	**149**	**1087**	**NA**
18	**Vikja**	**4a**	**61840**	**43**	**90**	**388**	**A**
19	Frøysetelva	3b			55	234	
19	Ekso	3b	209340	144	1	6	NA
19	**Vosso**	**2**	**3060220**	**2110**	**1**	**8**	**NA**
19	Daleelva	4a	282320	195	36	179	A
19	Storelva	3a	241960	167	160	570	A
19	Loneelva	5a	221460	153	103	255	A
19	Tysseelva	3b	358180	247	120	376	NA
19	Oselva	5a	1231320	849	246	790	NA
19	Steinsdalselva	2			15	64	
19	Granvinselva	2	271180	187	9	49	NA
19	Eio med Bjoreio	2	619580	427	11	55	NA
19	Kinso	2			37	213	
19	Opo	2	1156400	798	34	168	NA
19	Jondalselva	2					
19	Øyreselva	3b					
19	Rosendalselva	2	143880	99	47	207	NA
19	Uskedalselva	X			97	274	
19	Fjæraelva	3a			54	225	
19	**Etneelva**	**5a**	**1485920**	**1025**	**880**	**3302**	**A**
20	Vikedalselva	4a	1067280	736	283	1028	A
20	Rødneelva	3b			72	297	
20	**Suldalslågen**	**4a**	**3360780**	**2318**	**434**	**2780**	**NA**
20	Ulla	4a	257380	178	138	603	A
20	Hålandselva	5a	172140	119	160	684	A
20	Førre	3a					
20	Vormo	5a	434640	300	377	1402	A
20	Hjelmelandselva	5a			42	132	
20	Årdalselva	4a	1293660	892	483	2427	A
20	Jørpelandselva	3b			52	177	
20	Lyseelva	3b			25	101	
20	Espedalselva	3b	939700	648	675	3230	A
20	Imsa	X					
20	Høleåna	5a					
20	Storåna	3a					
21	Frafjordelva	3b	346000	239	100	426	A
21	Dirdalselva	3a	450040	310	539	2358	A
21	**Figgjo**	**5a**	**3256320**	**2246**	**1819**	**5624**	**A**
21	Orreelva	5a					
21	**Håelva**	**5a**	**2640600**	**1821**	**1697**	**4292**	**A**
21	N. Varhaugelv	5a	120600	83	82	122	A
21	S. Varhaugelv	5a	105200	73	76	92	A
21	Kvassheimelva	5a	96600	67			NA

Annex B cont.

Region	River name	Category	Spawning target (eggs)	Spawning target (Kg of females)	Catch 2007 (N)	Catch 2007 (Kg)	Attainment of mngm. target 2003-2006
21	**Bjerkreimselva**	**4a**	**6262480**	**4319**	**5029**	**11055**	**A**
21	Fuglestadelva	5a	560775,96	387	173	420	NA
21	**Ogna**	**4a**	**1684740**	**1162**	**1558**	**3046**	**A**
21	Hellvikelva	X					
21	Hellelandselva	X			78	134	
21	Sokndalselva	3b	1248520	861	786	2089	A
22	Kvina	3b	2719000	1875	500	1452	NA
22	Lygna	3b	2739440	1889	297	662	NA
22	Audna	3b	1754410	1210	793	1830	NA
22	**Mandalselva**	**3b**	**7475020**	**5155**	**2184**	**6690**	**NA**
22	Otra	3b	3394200	2341	2063	5868	A
22	Tovdalselva	3b	5395780	3721	368	1078	NA
22	Nidelva	3b	2411300	1663	261	713	NA
22	Vegårsvassdraget	3b			35	94	
22	Gjerstadelva	2					
23	Skienselva	4a	2169640	1496			NA
23	Herrevassdraget	5a	116040	80			NA
23	**Numedalslågen**	**5a**	**17828760**	**12296**	**2184**	**10354**	**NA**
23	Aulivassdraget	2					
23	Sandevassdraget	2					
23	Drammenselva	3b	6314590	4355	1282	7132	A
23	Lierelva	3b	716120	494	69	171	NA
23	Åroselva	5a	357600	247	1	8	NA
23	Askerelva	4a					
23	Sandvikselva	3a	480040	331	40	130	NA
23	Neselva	3a					
23	Hoffsbekken	3a					
23	Lysakerelva	3a			13	32	
23	Akerselva	3a			9	14	
23	Ljanselva	3a					
23	Gjersjøelva	4a					
23	Årungselva	3a					
23	Hølenelva	3a					
23	Glomma	5a	1391640	960	164	746	NA
23	**Enningdalselva**	**5a**	**328120**	**226**	**133**	**656**	**A**

Management target attained: 51 rivers
Management target not attained 111 rivers

Annex C.

Categories for rivers based on the condition of anadromous salmonids in relation to adverse human impact, including guidelines on fisheries management for each category.

Category X: Stock status unknown

Guidelines on fisheries regulations
If the river has as self-reproducing stock the fishery should be regulated in accordance with the guidelines for the lowest most likely category, higher than category 1.

Category Y: Sporadic appearance of anadromous salomids

Guidelines on fisheries regulations
In such rivers juvenile fish production is very low and stock dynamics deviate from rivers with self-reproducing stocks, e. g. there will be no clear correlation between juvenile salmon production and salmon runs. A large proportion of the fish run may be descended from other rivers, and the run of adult fish might vary a lot from year to year. The fish will not be regarded an evolutionary unit, meaning it cannot develop or sustain specific genetic adaptions.

The interest for a fishery is often very low and the need for specific fisheries regulations must be assessed in each case. The management goal is to maintain a certain appearance of the species in the river. In many cases the general framework of regulatory measures is sufficient.

Category 1: Lost stock
Rivers where the stock has been lost as a result of human impact
The category concerns loss of stocks in nature. Rivers where a salmon stock is being re-established, e.g. through stocking with fish from the gene bank or with fish of other origin, are categorized as normal with notes on its reestablishment.

Guidelines on fisheries regulations
These rivers have earlier sustained a self-producing stock. Anadromous fish species may appear sporadically in the river as described for category Y and the fisheries should be managed accordingly.

In rivers where stocks are re-built or under re-building, fisheries should be regulated according to the new category assignment.

Category 2: Threatened stock
Rivers where the stock is at high risk of becoming lost as a result of human impact
The stock is affected by human impact factors that have both sufficient damaging potential and scale to threaten the stock with loss. This will often be the case when the stock is exposed to human impact factors that inflict high death rates, e.g. *G. salaris* and river acidification.

The category does not include rivers where the stock is maintained through alleviating actions see Category 3b).

Guidelines on fisheries regulations

There shall be no fishery on stocks at high risk of becoming lost, except in cases where the fishery has a specific objective as to combat disease and/or to collect brood-stock. A fishery targeting other species can be allowed in rivers with a threatened stock, if effective measures to minimize by-catch are implemented, combined with effective mandatory release of fish from the threatened stock. Adequate supervision, control routines on by-catch and information has to be established locally. By-catch is referring to fish from the stock considered to be threatened. Whether these requirements are fulfilled or not, is decided by the County Governor.

Category 3: Vulnerable stock
Rivers where the stock can become threatened as a result of human impact

3a: Rivers where the stock is near threatened
A moderate increase in potential or scale of human impact factors can result in the stock becoming threatened. The chances that alleviating actions will be successful are much higher than in the case of threatened stocks.

3b: Rivers where the stock is maintained
Rivers where the stock is maintained by alleviating actions (liming, stocking, etc.), and can become threatened if these actions cease.

Guidelines on fisheries regulations
Vulnerable stocks are exposed to adverse human impact to an level close to becoming threatened and should as a main rule not be exploited. A fishery can be opened on stocks from rivers where measures are implemented that compensate for the adverse impact (liming, stocking). In special cases a limited fishery can be opened even if such measures are not implemented, given the level of adverse impact and the stock status is stable, and there is a harvestable surplus.

Category 4: Reduced stock
Rivers with considerably reduced young fish production and/ or adult fish stock resulting from human impact
These are rivers with reduced stocks that do not qualify for lower categories.

4a: Rivers with considerably reduced young fish production
The category also includes rivers where measures are undertaken to compensate for the reduced production (stocking, liming, opening of new anadromous stretches, etc.).
The reduction in production can be attributed to a reduction in the rivers capacity to produce salmon, and/or to a reduction in productive ability of the stock, e.g. due to reduced numbers of spawners. The causes of the reduction shall be noted. The reduction in production is regarded as considerable when it is easy to detect and is of size order 10% or more.

Guidelines on fisheries regulations
If the reduction of juvenile fish production solely is due to a reduction in the productivity capacity of the river, f ex because of hydro power regulation, the fisheries regulations should be adjusted accordingly in order to avoid any risk of overexploitation. If spawning targets are not met, the exploitation of the stock must be reduced, irrespective of the cause, and if necessary the stock should not be exploited at all.

4b: Rivers with greatly reduced adult fish stock, but where young fish production is not considerably reduced

These are rivers where the adult fish stock is strongly reduced by human impact factors other than a sustainable fishery.

Guidelines on fisheries regulations

These are rivers where the harvestable surplus is greatly reduced. The fishery should be adjusted accordingly in order to avoid any risk of overexploitation, and, if necessary the stock should not exploited at all.

Category 5: Moderate or lightly affected stock

Rivers where the stock is moderately or lightly affected by human impacts

5a: Rivers where stocks require special concern

Rivers where moderate changes in human impact may negatively affect the productivity of stocks.

Guidelines on fisheries regulations

The fishery should be adjusted to a level in order to avoid lower category assignment.

5b: Rivers where stocks do not require special concern

Guidelines on fisheries regulations

Maximum fishing season can be applied and in many cases the general framework for regulatory measures for fisheries will be sufficient.

In the categorization process it is noted whether a stock is considered to be numerous or few in number (e.g. more or less than 500 ascending wild salmon yearly). Small stocks (e.g. <500 wild salmon) should have special protection, which means a more limited fishery than large stocks (e.g. >500 wild salmon). A fishery on very small stocks should be very cautious, and if necessary the stock should not be exploited at all.

Not to be cited without permission from the authors
International Council for North Atlantic Salmon
the Exploration of the Sea Working Group 2008
Working Paper 2008/42

Setting of spawning targets for Atlantic salmon (*Salmo salar*) populations in Norway

Kjetil Hindar[1#], Ola Diserud[1], Peder Fiske[1], Torbjørn Forseth[1], Arne J. Jensen[1], Ola Ugedal[1], Nina Jonsson[2], Svein-Erik Sloreid[2], Jo Vegar Arnekleiv[3], Svein Jakob Saltveit[4], Harald Sægrov[5] and Leif Magnus Sættem[6].

[1]*Norwegian Institute for Nature Research (NINA), N-7485 Trondheim, Norway*
[2]*NINA Oslo, Gaustadalléen 21, N-0349 Oslo, Norway*
[3]*Norwegian University of Science and Technology, Museum of Natural History and Archeology, Department of Natural History, N-7491 Trondheim, Norway*
[4]*Freshwater Ecology and Inland Fisheries Laboratory (LFI), Natural History Museum, University of Oslo, PO Box 1172 Blindern, N-0318 Oslo, Norway*
[5]*Rådgivende Biologer AS, Bredsgården, Bryggen, N-5005 Bergen, Norway*
[6]*The County Governor of Moere and Romsdal, Fylkeshuset, N-6404 Molde, Norway*
[#]email: kjetil.hindar@nina.no

Summary

We suggest spawning targets for Atlantic salmon (*Salmo salar*) populations for 80 major Norwegian rivers, chosen among rivers prioritised by management for protection of wild salmon. Based on analyses of Stock-Recruitment (SR) relationships in nine rivers, presented in an accompanying Working paper (Diserud et al., 2008), we suggest that spawning targets for salmon populations in Norway can be grouped into four categories of egg densities being, respectively, approx. 1, 2, 4 and 6 eggs/m$_2$ wetted area. Wetted area was estimated by GIS methods from digital geographic data in scale 1:50,000, calculated from the river mouth in the sea to migratory barriers mapped by Norwegian management authorities. Assessment of productivity (category of egg density) was for most rivers based on catch statistics converted to catch per area, smolt age distribution, and other available knowledge about the river. From the spawning target (eggs/m$_2$) we estimated the number of eggs necessary to seed the whole river, and the number of females needed to meet that number. For some large watercourses, we estimated spawning target by considering parts of the watercourse (tributaries) separately. The spawning targets for most of the 80 watercourses treated in this report, lie between 2 eggs/m$_2$ and 4 eggs/m$_2$. The highest total spawning target is found in the River Tana (Teno in Finnish), where the female spawning biomass should be around 55 000 kg to meet the target for the whole river system. Other watercourses with a high total spawning target are the rivers Gaula, Orkla and Namsen where the female biomass should exceed 18 000 kg per year, and the rivers Numedalslågen and Alta where the female biomass should exceed 12 000 kg per year. This must be considered a *firstgeneration* spawning target for the populations in question. The two major limitations to setting precise spawning targets are believed to be estimation of productive area (as part of the wetted area) and estimation of the number of spawners from information on catch.

Introduction

The status of Atlantic salmon (*Salmo salar*) populations is of major interest in both international and national fisheries management (NASCO, 1998; Hansen et al., 2006). The North Atlantic Salmon Conservation Organisation (NASCO) has defined a precautionary approach to salmon management as being achieved mainly through the use of biological reference points for each river, which defines a lower bound (Conservation Limit) or a target point (Management Target) for the number of spawners that achieve management objectives (NASCO, 1998). In this context, the management target (or spawning target) is a reference point that takes account of uncertainties in the data used to set the conservation limit and ability to manage fisheries to achieve the required number of spawners in the population (Crozier et al., 2003).

This working paper presents a first attempt to setting spawning targets for major salmon populations in Norway. In doing so, we build on the approach taken by ICES that biological reference points can be deduced from knowledge about the relationships between number of spawners (stock, S) and the number of recruits (R) in the population. In an accompanying Working paper (Diserud et al., 2008), we describe our approach to modelling stockrecruitment
(SR) relationships from nine salmon rivers in Norway where we believe sufficient
data exist to establish reliable relationships between the spawning population and the subsequent recruitment. Our work has previously been reported in Norwegian (Hindar et al., 2007). In that report, we provided spawning targets for 80 major salmon rivers in Norway. This was subsequently followed up by calculating spawning targets for another 100 salmon rivers (K. Hindar et al., unpublished). The goal is to provide a *first-generation* spawning target for all Norwegian salmon rivers by 2009.

For the vast majority of rivers, spawning targets must be set from limited knowledge about the river and its salmon population (Prévost & Chaput, 2001). The simplest transfer of spawning target from data-rich to data-poor rivers is by assuming that the target for egg deposition is the same – per wetted area – in each river. If so, spawning targets for every river can be deduced on the basis of determining an area-specific reference point for one population, and transferring this reference point to other rivers by appropriate scaling of the area accessible to upward migrating salmon in each watercourse. This approach was used to suggest reference points for Canadian rivers, based on the supposition that 2.4 eggs per m^2 salmon-accessible area was sufficient to secure optimal recruitment of salmon (Elson, 1957; Chadwick, 1985). In a well-studied Norwegian river, the Imsa, Jonsson et al. (1998) found a much higher target for egg density, indicating that more than 6 eggs per m^2 were needed to secure optimal recruitment.

In an analysis of 13 salmon-producing rivers in Europe with stock-recruitment information, Prévost et al. (2003) suggested that geographical location (latitude) is an easily accessible characteristic of all rivers that could be used to transfer reference points from data-rich to data-poor rivers. Latitude is also biologically relevant since it in some broad-scale analyses is associated with smolt age and likely production capacity for juvenile salmon (Metcalfe & Thorpe 1990). In a Bayesian analysis of SR-relationships from egg (S, spawners scaled to egg number per m^2) to egg (R, pre-fishery abundance scaled to eggs) in the 13 rivers, Prévost et al. (2003) found a tendency for increasing optimal stock size (egg density at maximum sustainable yield, MSY) with increasing latitude between 43 ^{o}N and 64 ^{o}N. They also noted significant variation among rivers within a narrow latitudinal range, and considerable withinriver
uncertainty in some rivers (R. Lærdalselva at 61 ^{o}N, the only Norwegian river in the analysis, being among them). For Norwegian high-latitude rivers, then, the predicted optimal stock size for a data-poor river at 60 ^{o}N or 65 ^{o}N is to a large extent determined by observations from an Icelandic river (R. Ellidaár) at 64 ^{o}N (Prévost et al., 2003). The uncertainty associated with this prediction, as well as the observation that other northern (Icelandic) rivers may have very low egg deposition rates (Crozier et al., 2003; ch. 4), suggests that alternative strategies must be employed to suggest spawning targets for Norwegian rivers.

In an accompanying paper, we (Diserud et al., 2008) have suggested to base predictions about spawning targets on egg-to-juvenile density data modelled for nine Norwegian rivers, which can loosely be categorised into egg deposition rate from less than 1.5 eggs/m^2, 1.5 to 3 eggs/m^2, 3 to 5 eggs/m^2 and more than 5 eggs/m^2.

We have developed spawning targets for 80 important salmon-producing rivers in Norway. These rivers have been assessed for inclusion in the list of National salmon rivers and National salmon fjords which were suggested as an overarching, protective measure by the

Wild salmon committee of Norway (NOU, 1999). Of these rivers, 52 were selected for this type of protection by the Norwegian Parliament (St.prp. 32, 2006-2007).

Methods

GIS-based models for estimation of wetted area

Estimation of wetted area has been done following the method developed by Erikstad et al. (1998; 1999). They used digital topographical maps in the N50-series from the Norwegian Mapping and Cadastre Authority in the scale 1:50,000. Erikstad et al. (1998) showed that data from the N50 series gave good and stable estimates of wetted area of parts of selected rivers in Norway. At this scale, rivers are represented by polygons where they are wider than 12 m and the area of these stretches can be calculated by means of GIS methods. More narrow stretches are represented by lines in the 1:50,000 maps, and only the length can be calculated. However, the river line database often contains information about river width class, which allows area estimation.

The areas shown in the 1:50,000 topographical maps of Norway can best be described as the wetted area at normal discharge (Lars Erikstad, NINA Oslo, pers. comm.).

All areas have been estimated based on knowledge about the geographical position of physical hindrances to upward migration of salmon. These positions are collected in a database maintained by the Directorate for Nature Management, and most of them have been verified in the field.

Lakes have been shown to be important rearing habitats for salmon in some lakes in northern Norway (Halvorsen, 1996), and may show high salmon juvenile densities in shallow areas of lakes not dominated by brown trout (*S. trutta*). Juvenile salmon are also known from some lakes in southern Norway. Lakes on the salmon-producing stretch were treated as follows: Potential use of the lake by salmon juveniles was judged from catch information, and the potential productive area was judged by information about fish community and lake morphometrics. We measured the perimeter of each lake from topographical maps in 1:50,000, and assumed they are salmon-producing in a 10 m broad belt from the banks with a juvenile density similar to the river.

As the Stock-Recruitment relationships of the nine rivers (Diserud et al., 2008) were developed with the above method of calculating salmon-producing areas, we have made few extra assumptions about wetted areas that are clearly unproductive for salmon.

Variation in productivity

There is considerable variation in production among salmon populations, even after the effect of area (scale) has been excluded (Crozier et al., 2003). In a survey of 13 European rivers, Prévost et al. (2003) found that the number of eggs spawned varies from less than 1 egg to more than 30 eggs per m^2 wetted area. Estimates of smolt production in Norwegian rivers vary from less than 3 to more than 15 smolt per 100 m^2 wetted area (Berg, 1977; Jonsson et al., 1998).

Causes of variation in productivity of salmon populations are relatively well understood (Elliott, 2001), but they are manifold and not easily transported from well-studied to little studied rivers.

The number of anadromous spawners in each watercourse is known from only a handful of rivers in Norway (Hansen et al., 2006). In a number of rivers, however, there exist estimates of riverine catch rates which can be used to translate catch statistics into numbers of spawners (Hindar et al., 2007). Since the catch statistics is recorded for the large majority of Norwegian rivers, and is assumed to be relatively precise for many of them, we have based some of our considerations of productivity on catch data.

For Canadian rivers, Chadwick (1985) demonstrated some of the strengths and weaknesses of an area-based approach by illustrating the relationship between the mean number of anadromous salmon in the catches and the area for juvenile salmon production. Even with

large variation among rivers in these data, he showed clear regional differences in catch per area and also that area explained a relatively large proportion of the among-river variation in catch (62 % in Newfoundland and Labrador, and 86 % in the Maritime Provinces, respectively).

We have performed a similar analysis of catches of salmon in Norwegian rivers between 1979 and 2005. As Chadwick, we get a large spread of the data points (**Figure 1**), but also a clear trend of increasing catch with increasing area. More interestingly, it seems that the variation among rivers is larger for rivers with small to moderate wetted areas (< 200 ha) than in rivers with wetted areas larger than 200 ha (with one marked outlier).

Figure 1. *Mean annual number of salmon caught by anglers (Laksantall_mean) during 1979-2005 in relation to wetted area (ha) of the salmon-producing stretch of Norwegian rivers.*

It is possible that the weight of the catch is a more informative variable than number of salmon, since the weight of salmon is more directly related to egg deposition than number of salmon. Also, it is possible that the maximum catch is a better indicator of the production capacity of each river. The relationship between maximum catch and area is illustrated for Norwegian rivers in **Figure 2**. There seems to be a less clear tendency for smaller and larger rivers to differ in area-specific maximum catch than in area-specific mean number of fish caught. The regression line approximates 1.5 eggs/m^2 assuming that the spawning population equals the catch, and that the females represent half of the catch (by weight).

Figure 2*. Maximum annual catch of salmon (in kg) during 1979-2005 in relation to wetted area (in ha) of the salmon-producing stretch of Norwegian rivers.*

The number of outmigrating smolts gives a measure of how a river system functions with respect to producing salmon. This number is known from trap records in two Norwegian rivers, R. Imsa and R. Halselva (Jonsson et al., 1998, Jensen, 2004), and is being estimated by video recording or mark-recapture in other rivers (some of which are included in Diserud et al., 2008).

More commonly, the number of juvenile salmon is estimated using electrofishing. We know about more than 100 rivers where this has been attempted. So far, however, the estimates from electrofishing have only limited use as a tool in setting spawning targets, firstly because their aim has been to document temporal changes in density (often associated with hydropower regulation or some other human-mediated change) rather than spatial variation, and secondly, because of problems with up-scaling from small electrofishing areas to the whole river. Combining electrofishing with other types of information about the river will likely change this situation in the future.

Categorisation of rivers by expert judgement

Based on the modelling of stock-recruitment relationships in Diserud et al. (2008), the following classes of area-specific spawning targets are suggested for Norwegian salmonproducing
rivers:

- 1 egg per m^2 (< 1.5 eggs per m^2)
- 2 eggs per m^2 (1.5 – 3 eggs per m^2)
- 4 eggs per m^2 (3 – 5 eggs per m^2)
- 6 eggs per m^2 (> 5 eggs per m^2)

In practise, the setting of spawning targets for each of the 80 rivers, were done by an expert judgement among 4 or more of the authors of this Working paper. For some rivers, the available information allowed a relatively detailed comparison with one of the nine rivers with SR data, whereas for other rivers little information was available except catch statistics (catch per area) and the two national reports assessing Norwegian rivers for protection (Nasjonale lakseelver og nasjonale laksefjorder 2001; DN 2004). We also consulted literature that has surveyed a large number of rivers in Norway (e.g. Berg 1964; Sægrov 2001a, 2001b) in addition to river-specific reports.

Having set the area-specific spawning targets (eggs per m^2), we used the GIS-based wetted area, and a common slope for the fecundity/weight regression for female salmon (1450 eggs/kg; two exceptions being the R. Alta and R. Tana, where the slope is 1800 eggs/kg) to calculate the weight of females meeting the spawning target for each river. This was translated into number of female salmon by consulting average weights in the national catch statistics, and unpublished information on the size and sea age of sexed individuals (P. Fiske, A. J. Jensen et al., NINA, unpublished).
Before the results presented here were released in a report (Hindar et al., 2007) the tabulated spawning targets were checked by consultation among all County Fishery Officers in Norway.

Results

Spawning targets for 80 Norwegian rivers

The 80 rivers are presented with name and Norwegian river code from R. Enningdalselva (001.1Z) in south-eastern Norway along the coast to R. Neiden (244.Z) in north-eastern Norway (**Table 1**). For the rivers that cross national borders (R. Enningdalselva, R. Tana [234.Z] and R. Neiden) we only possess digital map information about the Norwegian part of the river. In additon, we have sought information from Swedish sources (R. Enningdalselva; Fiskeriverket 1999) and Finnish sources, respectively (R. Tana and R. Neiden; Niemelä et al., 1999; J. Erkinaro & E. Niemelä, RKTL, pers. comm.) to present spawning targets for the whole river.
For some rivers, all of them commented in the table, we have used other type of information about area than that obtained from digital maps. In R. Tana, information about the main river and some tributaries is based on estimation of productive area (Niemelä et al. 1999), whereas other tributaries are based on wetted area. In a few other rivers, parts of the area have been subtracted because it is considered un-productive for juvenile salmon.
Large and/or diverse watercourses have been treated by setting spawning targets for parts of the river, and summing them to a total spawning target. There are several reasons for doing so; among them, different productivity of the main stem and some tributaries, genetic substructuring
of the salmon population, spatial variation in spawning areas and number of
spawners, and temporal variation in migration within the watercourse (Ståhl & Hindar, 1988; Crozier et al., 2003; Einum & Nislow, 2005).
Most rivers have been given spawning targets between 2 eggs/m^2 and 4 eggs/ m^2. Translated into biomass and numbers of female spawners per river, R. Tana has the highest spawning target (**Table 1**). In that watercourse, we suggest that 55 000 kg female salmon per year (12 500 females) is necessary to meet the spawning target, which has been set at 1 egg/m^2 to 6 eggs/m^2 for different parts of the watercourse. Other watercourses with high total spawning targets are the rivers Gaula, Orkla and Namsen where the female biomass should exceed 18 000 kg per year in each, and the rivers Numedalslågen and Alta where the female biomass should exceed 12 000 kg per year.
In rivers with small wetted areas and big fish, a small number of females may be sufficient to meet the spawning target, e.g. 17 female salmon in R. Årøyelva (077.Z). In those rivers, other factors than SR-relationships may set the conservation limit, since smaller numbers of individuals are increasingly vulnerable to genetic drift and demographic and environmental stochasticity. This is not further discussed here, but is treated by Crozier et al. (2003, ch. 6) and Hindar et al. (2004).
The 52 rivers recently selected as National salmon rivers for Norway (St.prp. 2006-2007) have a total spawning target at 255 000 kg female salmon (56 000 females). In the remaining rivers tabulated, the total spawning target is 25 000 kg female salmon (7500 females).
The salmon populations in several of the rivers treated in Table 1, are currently being threatened by factors such as *Gyrodactylus salaris*, watercourse regulation, escaped farm

salmon and/or sea lice. These threats are not reflected in the calculation of spawning target, unless they have a direct effect on the wetted area where juvenile salmon can be produced.

Estimates of smolt production and the actual number of spawners

The setting of spawning targets for 80 rivers can be used to make some predictions about smolt production, and also about the degree to which the spawning target is met in the various rivers.

Using assumptions about annual survival of juvenile salmon, and average age at smolting, a potential smolt number can be estimated for each river from the number of eggs at spawning target for the river. This has been done for all of the 80 rivers (Hindar et al., 2007; their Table 4) but is not presented in this paper. For the largest salmon-producing watercourse, R. Tana, we have estimated a potential smolt production at 1.1 million smolt annually, and for the 52 rivers selected as National salmon rivers we have estimated a total potential smolt production of approx. 7 million smolt.

Using assumptions about the riverine exploitation rate of salmon, and the sex and age composition of the catch, the official catch statistics can be used to estimate the biomass (and egg number) of the spawning population in each river. This has been done for the 80 rivers listed here for the years 1993-2006 (P. Fiske et al., unpublished), showing whether or not the spawning target has been reached, assuming 30 %, 40 % or 50 % exploitation rate in fresh water.

A new group of 100 rivers have now been subjected to the same type of analysis as described above. The total number of rivers treated (180) likely represents more than 90 % of wild salmon production in Norway. This allows other types of analyses, such as a comparison of the summation of river-specific spawning targets with broad-scale estimates of pre-fishery abundance for Norwegian waters.

Discussion

The spawning targets presented here, using the methods outlined in an accompanying Working paper (Diserud et al., 2008), must be treated as *first-generation* spawning targets for Norwegian rivers. They are based on stock-recruitment relationships for only nine rivers, and a broad-brush approach to estimation of wetted area and area-specific productivity for the remaining rivers.

The two most important tasks for making more precise *second-generation* spawning targets are likely to be: (1) a more precise evaluation of productive wetted area and (2) a better assessment of spawning population from catch statistics.

Productive area has been the focus of some local investigations, but the methods are not standardised. Some new developments in this area are worth mention here. A relatively simple and objective classification system for Norwegian rivers has recently been developed (Borsányi et al., 2004). This meso-scale habitat system classifies river stretches into 10 classes according to four criteria (water speed, water depth, surface waves and gradient). A preliminary investigation of this system's ability to describe variation in juvenile fish production, suggests that it is not sufficiently developed to describe spatial variation in production (O. Ugedal, NINA, pers. obs.).

Other approaches are based on detailed characterisation of substrate (particle-size distribution, embeddedness, etc.), but may be difficult and time-consuming to apply. A new system, focusing on quantifying shelter for individual fish of varying sizes (Finstad et al., 2007), seems promising in describing variation in juvenile density and habitat profitability for individual fish. In combination with one or more of the methods described above, this may be one way to proceed to find estimates of productive area within rivers. In addition, further development in GIS-based approaches, such as estimating gradient from terrain models in a higher resolution than generally available today (Erikstad et al., 1998; 1999) may add value to the work finding standardised measures of productive capacity.

Spawning populations of salmon have only been relatively well known in small rivers. A big challenge is to determine their number and spatial distribution in the larger and more diverse rivers. Other challenges are to improve the catch statistics, to follow temporal changes in fishing effort and angler behaviour (e.g. catch-and-release), and reporting of catch. Further, we intend to use information from well-known rivers to look for associations between exploitation rate and environmental factors, which might be used to make more precise predictions for rivers with little information.

Having shown that rivers with reasonable good stock-recruitment data are subject to quite large process variation in SR-relationships (Diserud et al., 2008), we suggest that giving very narrow predictions about spawning target is a futile exercise. A precautionary approach to management from the setting of spawning targets in Table 1, is therefore – when in doubt – to lift a river one category (e.g. from 2 to 4 eggs/m^2) or manage the river from the upper level of the interval for the category (e.g. 3 eggs/m^2 for the 2^{nd} category given by 1.5 - 3 eggs/m^2). Taking such considerations into account, we believe that the method developed in this and the accompanying Working paper (Diserud et al., 2008), can be used to present first-generation spawning targets for Norway's 400 salmon-producing rivers.

References

Berg, M. 1964. *North Norwegian salmon rivers*. Tanum, Oslo. 300 pp. (In Norwegian; English summary)

Berg, M. 1977. Tagging of migrating salmon smolts (*Salmo salar* L.) in the Vardnes river, Troms, Northern Norway. Rep. Inst. Freshw. Res. Drottningholm 56: 5-11.

Borsányi, P., Alfredsen, K., Harby, A., Ugedal, O. & Kraxner, C. 2004. A meso-scale habitat classification method for production modelling of Atlantic salmon in Norway. Hydroécologie Applique 14: 119-138.

Chadwick, E. M. P. 1985. Fundamental research problems in the management of Atlantic salmon, *Salmo salar*, in Atlantic Canada. J. Fish Biol. 27 (Suppl. A), 9-25.

Crozier, W. W., Potter, E. C. E., Prévost, E., Schön, P.-J. & Ó Maoiléidigh, N. (Editors) 2003. A coordinated
approach towards the development of a scientific basis for management of wild Atlantic salmon in the North-East Atlantic (SALMODEL). *Final Report, CEC Contract QLK5-CT1999-01546*, Queen's University of Belfast, Northern Ireland, U.K. 431 pp.

Direktoratet for naturforvaltning 2004. Nasjonale laksevassdrag og laksefjorder. Ferdigstilling av ordningen. Høringsnotat, Direktoratet for naturforvaltning, Trondheim, April 2004. 147 pp. (In Norwegian)

Diserud, O. H., Hindar, K., Fiske, P., Forseth, T., Jensen, A. J., Ugedal, O., Jonsson, N., Sloreid, S.-E., Arnekleiv, J. V., Saltveit, S. J., Sægrov, H. & Sættem, L. M. 2008 Stock-recruitment models for Atlantic salmon (*Salmo salar*) populations in Norway. – ICES NASWG Working paper.

Einum, S. & Nislow, K. H. 2005. Local-scale density-dependent survival of mobile organisms in continuous habitats: an experiment using Atlantic salmon. Oecologia 143: 203-210.

Elliott, J. M. 2001. The relative role of density in the stock-recruitment relationship of salmonids, s. 25-66 i Prévost, E. & Chaput, G. (Red.). *Stock, recruitment and reference points – Assessment and management of Atlantic salmon.* Hydrobiologie et aquaculture, INRA, Paris.

Elson, P. F. 1957. Number of salmon needed to maintan stocks. Can. Fish-Cult. 21, 18-23.

Erikstad L., Sloreid S. E. & Hansen L. P. 1998. Fysiske kartparametre til bruk i en modell for beregning av produksjon av laksesmolt i vassdrag. NINA Oppdragsmelding 533: 1-22. (In Norwegian; English summary)

Erikstad L., Sloreid S. E. & Hansen L. P. 1999. Estimering av produksjon av laksesmolt i norske vassdrag ved hjelp av GIS. NINA Oppdragsmelding 602: 1-10. (In Norwegian)

Finstad, A.G, Einum, S., Forseth, T. & Ugedal, O. 2007. Shelter availability affects behaviour, sizedependent
and mean growth of juvenile Atlantic salmon. Freshwater Biology 52: 1710-1718.

Fiskeriverket 1999. Västkustens laxåar. Fiskeriverket Information 9:1999. Fiskeriverket, Göteborg. 156 pp. (In Swedish; English summary)

Halvorsen, M. 1996. Lake use by Atlantic salmon (*Salmo salar* L.) parr and other salmonids in northern Norway. Dr. scient. thesis, Tromsø Museum, University of Tromsø.

Halvorsen, M., Gravem, F. & Kristoffersen, K. 1994. Fiskeribiologiske undersøkelser i Reisaelva. Fylkesmannen i Troms, Tromsø. Rapport nr. 58. 54 pp. + appendix. (In Norwegian)

Hansen, L. P., Fiske, P., Holm, M., Jensen, A. J. & Sægrov, H. 2006. Bestandsstatus for laks. Rapport fra arbeidsgruppe. – Utredning for DN 2006-3. 48 pp. (In Norwegian; English summary)
Hindar, K., Tufto, J., Sættem, L. M. & Balstad, T. 2004. Conservation of genetic variation in harvested salmon populations. – ICES Journal of Marine Science 61: 1389-1397.
Hindar, K., Diserud, O., Fiske, P., Forseth, T., Jensen, A. J., Ugedal, O., Jonsson, N., Sloreid, S.-E., Arnekleiv, J. V., Saltveit, S. J., Sægrov, H. & Sættem, L. M. 2007 Spawning targets for Atlantic salmon populations in Norway. – NINA Report 226. 78 pp. (In Norwegian; English summary)
Hvidsten, N. A., Johnsen, B. O., Jensen, A. J., Fiske, P., Ugedal, O., Thorstad, E. B., Jensås, J. G., Bakke, Ø. & Forseth, T. 2004. Orkla - et nasjonalt referansevassdrag for studier av bestandsregulerende faktorer hos laks. Samlerapport for perioden 1979 - 2002. NINA Fagrapport 79. 94 s.
Jensen, A. J. (ed.) 2004. Geografisk variasjon og utviklingstrekk i norske laksebestander. NINA Fagrapport 80. 79 pp. (In Norwegian)
Jonsson, N., Jonsson, B. & Hansen, L.P. 1998. The relative role of density-dependent and densityindependent
survival in the life cycle of Atlantic salmon *Salmo salar*. Journal of Animal Ecology, 67, 751-762.
Metcalfe, N. B. & Thorpe, J. E. 1990. Determinants of geographical variation in the age of seaward migrating salmon, Salmo salar. *J. Anim. Ecol.* **59**, 135- 145.
NASCO. 1998. North Atlantic Salmon Conservation Organisation. Agreement on the adoption of a precautionary approach. Report of the fifteenth annual meeting of the Council. NASCO, Edinburgh. CNL(98)46, 4 pp.
Nasjonale laksefjorder og laksevassdrag. 2001. Grunnlagsmateriale for departementenes arbeid. − Materiale vedrørende nasjonale laksevassdrag er utarbeidet i samarbeid mellom Direktoratet for naturforvaltning og Norges vassdrags- og energidirektorat. Materiale vedrørende nasjonale laksefjorder er utarbeidet i samarbeid mellom Direktoratet for naturforvaltning, Fiskeridirektoratet og Statens Dyrehelsetilsyn. Direktoratet for naturforvaltning, Trondheim, March 2001. 256 pp. (In Norwegian)
Niemelä, E., Julkunen, M. & Erkinaro, J. 1999. Densities of the juvenile Atlantic salmon (*Salmo salar* L.) in the subarctic Teno River watercourse, northern Finland. Boreal Environment Research 4: 125-136.
NOU 1999. Til laks åt alle kan ingen gjera? Om årsaker til nedgangen i de norske villaksbestandene og forslag til strategier og tiltak for å bedre situasjonen. Norges Offentlige Utredninger, 1999:9. Statens forvaltningstjeneste, Oslo. 297 pp. (In Norwegian; English summary)
Prévost, E., & Chaput, G. (ed.). 2001. Stock, recruitment and reference points – Assessment and management of Atlantic salmon. Hydrobiologie et aquaculture, INRA, Paris. 223 s.
Prévost, E., E. Parent, W. Crozier, I. Davidson, J. Dumas, G. Gudbergsson, K. Hindar, P. McGinnity, J. MacLean & L. M. Sættem. 2003. Setting biological reference points for Atlantic salmon stocks: transfer of information from data-rich to sparse-data situations by Bayesian hierarchical modelling. ICES J. Mar. Sci. 60: 1177-1193.
St.prp. nr.32 (2006-2007). Om vern av villaksen og ferdigstilling av nasjonale laksevassdrag og laksefjorder. Miljøverndepartementet, Oslo. 144 pp. (Proposition to the Stortinget, the Norwegian Parliament; in Norwegian)
Ståhl, G. & K. Hindar. 1988. Genetisk struktur hos norsk laks: status og perspektiver. Rep. 1-1988, Fiskeforskningen, Direktoratet for naturforvaltning, Trondheim, 57 pp. (In Norwegian)
Svenning, M.-A., Kanstad Hanssen, Ø. & Halvorsen, M. 1998. Etterundersøkelser i Målselvvassdraget med hensyn på tetthet av laksunger og fangst av voksen laks. NINA Oppdragsmelding 526: 1-24.
Sægrov, H. 2001a. Laksebestandane i Hordaland. Vedlegg III til Skurdal, J., Hansen, L. P., Skaala, Ø., Sægrov, H. & Lura, H. 2001. Elvevis vurdering av bestandsstatus og årsaker til bestandsutviklingen av laks i Hordaland og Sogn og Fjordane. Utredning for DN 2001-2, 40 pp. (In Norwegian)
Sægrov, H. 2001b. Laksebestandane i Sogn og Fjordane. Vedlegg II til Skurdal, J., Hansen, L. P., Skaala, Ø., Sægrov, H. & Lura, H. 2001. Elvevis vurdering av bestandsstatus og årsaker til bestandsutviklingen av laks i Hordaland og Sogn og Fjordane. Utredning for DN 2001-2, 41 pp. (In Norwegian)

Table 1. *Setting of spawning target (ST) for 80 rivers in Norway. Spawning targets given as 1, 2, 4 or 6 eggs/m$_2$ must be read as lying within the intervals < 1.5, 1.5-3, 3-5 and > 5 egg/ m$_2$. This reasoning also applies to figures deduced from the spawning target.*
In rivers where spawning targets have been developed for parts of the river, the separate parts are given in italics whereas the sum is not.

River no.
River
Spawning target egg/m2
Wetted area (m2)
Eggs required to meet ST
Total female biomass to meet ST (kg)
Mean weight of females (kg)
Number of females to meet ST
Comments
001.1Z Enningdalselva 1 328120 328120 226 6 38
012.Z Drammenselva 1 6314590 6314590 4355 6 726 *G salaris*
015.Z Numedalslågen main river 2 7455210 14910420 10283 5.5 1870
Numedalslågen tributaries 6 486390 2918340 2013 5.5 366
015.Z Numedalslågen total 7941600 17828760 12296 2236
016.Z Skienselva 1 2169640 2169640 1496 3 499 Trib Bøelva, Heddøla and Falkumselva
016.4Z Herrevassdraget 2 58020 116040 80 3 27
020.Z Tovdalselva 2 2697890 5395780 3721 2.4 1551 Recently recolonised
0.22Z Mandalselva 2 3737510 7475020 5155 2.5 2062 Recently recolonised
027.6Z Ogna 6 280790 1684740 1162 2.4 484
027.Z Bjerkreimsvassdraget 4 1401090 5604360 3865 2.5 1546
*Bj-Fotlandsv. perimeter.*10m 4 164530 658120 454 2.5 182 Lacustrine juveniles*
027.Z Bjerkreimsvassdraget total 1565620 6262480 4319 1728
028.3Z Håelva 6 338770 2032620 1402 2.7 519
*Håelva perimeter*10 6 101330 607980 419 2.7 155 Lacustrine juveniles*
028.3Z Håelva total 440100 2640600 1821 674
028.Z Figgjo 6 542720 3256320 2246 3 749
033.Z Årdalselva 2 646830 1293660 892 4 223
036.Z Suldalslågen 2 1680390 3360780 2318 8 290
038.Z Vikedalselva 4 266820 1067280 736 3 245
041.Z Etneelva 4 371480 1485920 1025 3.3 311 Alternative estimate in Sægrov 2001a
River no.
River
Spawning target egg/m2
Wetted area (m2)
Eggs required to meet ST
Total female biomass to meet ST (kg)
Mean weight of females (kg)
Number of females to meet ST
Comments
050.Z Eidfjordvassdraget 2 309790 619580 427 6 71 Alternative estimate in Sægrov 2001a
055.7Z Oselva 4 307830 1231320 849 2.7 315 Alternative estimate in Sægrov 2001a
060.4Z Loneelva 6 36910 221460 153 2.1 73 Alternative estimate in Sægrov 2001a
062.Z Vosso 2 1311910 2623820 1810 10 181 Alternative estimate in Sægrov 2001a
*V-lakes perimeter*5m 2 218200 436400 301 10 30 Lacustrine juveniles.* Alternative estimate in Sægrov 2001a
062.Z Vosso total 1530110 3060220 2110 211 (incl area in trib)
070.Z Vikja 2 30920 61840 43 4 11 Dominated by releases. Alternative estimate in Sægrov 2001b

071.Z Nærøyelvi 2 371710 743420 513 6 85 Alternative estimate in Sægrov 2001b
072.2Z Flåm 2 141890 283780 196 6 33 Alternative estimate in Sægrov 2001b
073.Z Lærdalselvi 4 1818590 7274360 5017 7.26 691 Alternative estimate in Sægrov 2001b. *G salaris*
077.Z Årøyelva 4 46350 185400 128 7.5 17 Alternative estimate in Sægrov 2001b
083.Z Gaularvassdraget 2 1046110 2092220 1443 3.3 437 Alternative estimate in Sægrov 2001b
084.7Z Nausta 4 786900 3147600 2171 3 724 Alternative estimate in Sægrov 2001b
086.Z Åelva og Ommedalselva 2 157800 315600 218 4.5 48 Alternative estimate in Sægrov 2001b
087.Z Gloppenelva 2 321160 642320 443 5 89 Alternative estimate in Sægrov 2001b
088.1Z Olden 2 109770 219540 151 8 19 Alternative estimate in Sægrov 2001b
088.Z Stryn 2 782590 1565180 1079 7.3 148 Alternative estimate in Sægrov 2001b
089.Z Eidselva 2 553210 1106420 763 5 153 Alternative estimate in Sægrov 2001b
095.Z Ørstaelva 4 490400 1961600 1353 2.3 588
097.12Z Bondalselva 4 211130 844520 582 2.1 277
098.3Z Strandaelva 2 248720 497440 343 2.1 163
103.Z Rauma 2 3781270 7562540 5216 7 745 *G salaris*
104.Z Eira 2 704840 1409680 972 4.8 203
109.Z Driva 2 4402970 8805940 6073 7.6 799 *G salaris*
112.Z Surna 2 3506090 7012180 4836 5 967
121.Z Orkla 4 6855280 27421120 18911 6 3152 Alternative estimate in Hvidsten et al. 2004
River no.
River
Spawning target egg/m$_2$
Wetted area (m$_2$)
Eggs required to meet ST
Total female biomass to meet ST (kg)
Mean weight of females (kg)
Number of females to meet ST
Comments
122.Z Gaula main river 4 7732920 30931680 21332 5.5 3879 25 % of area considered un-productive
Gaula tributaries 4 1625580 6502320 4484 5.5 815
122.Z Gaula total 9358500 37434000 25817 4694
123.Z Nidelva 4 989450 3957800 2730 6.5 420
124.Z Stjørdalselva 2 4902870 9805740 6763 5 1353
127.Z Verdalselva 2 2911958 5823915 4016 4.2 956 *25 % of area considered un-productive*
128.3Z Figga 2 599970 1199940 828 4 207 G salaris
*Lake perimeter*5m 2 177145 354290 244 4 61 Lacustrine juveniles*
128.3Z Figga total 777115 1554230 1072 268
128.Z Steinkjervassdraget 2 1263930 2527860 1743 3.5 498 *G salaris*
135.Z Stordalselva 4 1030960 4123840 2844 2.2 1293
*Lake-perimeter*5m 4 89135 356540 246 2.2 112 Lacustrine juveniles*
135.Z Stordalselva total 1120095 4480380 3090 1405
(no no.) Nordalselva 2 604500 1209000 834 1.6 521
138.Z Årgårdsvassdraget 4 1945340 7781360 5366 1.6 3354
139.Z Namsen-main river 1 12588460 12588460 8682 5.5 1578
Namsen-Sanddøla 1 3824460 3824460 2638 5.5 480
Namsen-Høylandsvassdr 4 1560420 6241680 4305 6 717
Namsen-other trib 4 1098490 4393960 3030 2 1515
139.Z Namsen total 19071830 27048560 18654 4291
144.Z Åbjørvassdraget 1 1382610 1382610 954 2.6 367
148.2Z Sausvassdraget 4 271980 1087920 750 2.6 289
151.Z Vefsna 4 2286042 9144168 6306 6 1051 *40 % of area considered un-productive*. *G.salaris*
156.Z Ranavassdraget 1 1771810 1771810 1222 5 244 *G salaris (Rotenone treatment 2003-2004)*
161.Z Beiarelva 1 2470240 2470240 1704 5 341
163.Z Saltdalselva 1 3458820 3458820 2385 5 477

165.7Z Fjærevassdraget 6 27320 163920 113 1.65 69
170.5Z Varpavassdraget 4 78850 315400 218 1.65 132
River no.
River
Spawning target egg/m2
Wetted area (m2)
Eggs required to meet ST
Total female biomass to meet ST (kg)
Mean weight of females (kg)
Number of females to meet ST
Comments
178.62Z Roksøyelva 6 38460 230760 159 1.65 96
*Roksøyelva perimeter*10m 4 41290 165160 114 1.65 69 Lacustrine juveniles*
178.62Z Roksøyelva total 79750 395920 273 165
178.7Z Buksnesvassdraget 4 67390 269560 186 1.65 113
*Buksnes perimeter*10m 4 140300 561200 387 1.65 235 Lacustrine juveniles*
178.7Z Buksnesvassdraget total 207690 830760 573 347
186.2Z Roksdalsvassdraget (Å-elva) 6 135720 814320 562 1.65 340
*Roksdal perimeter*10m 4 190610 762440 526 1.65 319 Lacustrine juveniles*
186.2Z Roksdalsvassdraget total 326330 1576760 1087 659
194.5Z Tennelva 4 51500 206000 142 2 71
Tennvatn littoral 4 41600 166400 115 2 57 Lacustrine juveniles
194.5Z Tennelva total 93100 372400 257 128
194.6Z Ånderelva 2 274300 548600 378 2.5 151
194.Z Laukhellevassdraget (Lakselva) 2 1382830 2765660 1907 3.3 578
196.Z Målselv 2 2000000 4000000 2759 5 552 Productive area from Svenning et al. 1998
202.11Z Skipsfjordvassdraget 2 130050 260100 179 2.8 64
205.Z Skibotnvassdraget 2 1180520 2361040 1628 6 271 *G salaris*
208.Z Reisa 2 2250290 4500580 3104 7 443 Prod area 40-45 % of wetted (Halvorsen et al 1994)
209.Z Kvænangsvassdraget 2 311660 623320 430 2.5 172
212.2Z Halselva 1 261750 261750 181 4 45
212.Z Alta 4 5701330 22805320 12130 9.5 1277
213.Z Repparfjordelva 1 4786170 4786170 3301 5.6 589
223.Z Stabburselva 2 1171690 2343380 1616 5.6 289
224.Z Lakselva 2 2482722 4965444 3424 9.5 360
225.Z Børselva 1 3985500 3985500 2749 5.6 491
233.Z Langfjordvassdraget 2 1552940 3105880 2142 5.5 389
River no.
River
Spawning target egg/m2
Wetted area (m2)
Eggs required to meet ST
Total female biomass to meet ST (kg)
Mean weight of females (kg)
Number of females to meet ST
Comments
234.Z Tana-main river 2 19060000 38120000 21178 5 4236 Prod area from Niemelä et al. 1999

Tana-Anárjohka 2 8300000 16600000 9222 4 2306 Prod area from Niemelä et al.1999
Tana-Utsjoki 6 600000 3600000 2000 2.25 889 Prod area from Niemelä et al. 1999
Tana-Kárásjohka 2 10351020 20702040 11501 6 1917
Tana-Iesjohka 2 5175610 10351220 5751 6 958
Tana-Láksjohka 4 745365 2981460 1656 1.5 1104 25 % of area considered un-productive
Tana-Máskejohka 4 1069238 4276950 2376 4 594 25 % of area considered un-productive
Tana-Leavvajohka 1 502680 502680 279 2 140
Tana-Válljohka 1 618090 618090 343 2 172
Tana-other trib 1 808130 808130 449 2 224
234.Z Tana total 47230133 98560570 54756 12539
236.Z Kongsfjordelva 2 798920 1597840 1102 4.2 262
239.Z Komagelva 2 1559690 3119380 2151 4 538
240.Z Vestre Jakobselv 1 1536200 1536200 1059 5.7 186
244.Z Neiden 2 2144000 4288000 2957 5.1 580 GIS in Norway. J Erkinaro (RKTL) suggest 233 ha total productive area

Annex E: Report on changes in fisheries regulations of riverine fisheries between the periods 2003-2007 and 2008-2012 in rivers with self-reproducing salmon stocks

County ØSTFOLD (Provision adopted) Part of region 23

Fishing season	Not opened for salmon	Up to 4 weeks	4 to 6 weeks	6 to 8 weeks	8 to 10 weeks	Full season
Number of rivers 2007						3 (13 weeks)
Number of rivers 2008						3 (12 weeks)

Other regulations	Bag limit 1 salmon per day	Up to 2 salmon	Up to 10 salmon per season			
Number of rivers 2007		1	1			
Number of rivers 2008		1	1			

Summary of restrictions introduced by local management, fishing right holders, and other remarks:

Fishery in the river Enningdalselva is regulated through a bilateral agreement with Sweden. The agreement is under revision and it is proposed to reduce the fishing season with one week (from 13 to 12 weeks). Catch quotas in the river Enningdalselva were in 2007 up to 2 salmon per day and up to ten pr season for every angler. Personal bag limit of one salmon pr day for every beat (applies the whole season). It is expected that the same regulations will apply in 2008 also. Fishermen are requested to release brown female salmon.

The dayly catch in the rivers Glomma, Aagaardselva og Tista is usually low. Very few anglers catch more than on salmona day or more than 5 per season. Therefore no further bag limits are introduced in those rivers.

County OSLO OG AKERSHUS (Provision not adopted) Part of region 23

Fishing season	Not opened for salmon	Up to 4 weeks	4 to 6 weeks	6 to 8 weeks	8 to 10 weeks	Full season
Number of rivers 2007	1		3			6
Number of rivers 2008	4					6

Other regulations	Bag limit 1 salmon per day	Up to 2 salmon	Other, describe			
Number of rivers 2007						
Number of rivers 2008						

County BUSKERUD (Provision adopted) Part of region 23

Fishing season	Not opened for salmon	Up to 4 weeks	4 to 6 weeks	6 to 8 weeks	8 to 10 weeks	Full season
Number of rivers 2007						4
Number of rivers 2008						4

Other regulations	Bag limit 1 salmon per day	Up to 2 salmon	Other, describe			
Number of rivers 2007						
Number of rivers 2008						

Summary of restrictions introduced by local management, fishing right holders, and other remarks:

Rivers Drammenselva and Lierelva
Both rivers are infected with *G. salaries*. Salmon stocks are maintained through voluntarry contributions by local angling and river-owners associations.
River Åroselva
The fishery is naturally retricted due to long periods with very low water-levels, when fishing is not possible.
River Numedalslågen
The fishing season in the river both in county of Buskerud and Vestfold are reduced with 3 weeks in the beginning and 1 week in the end compared to 2007. Nevertheless the season is 12 weeks from 2008 onwards

County VESTFOLD (Provision adopted) Part of region 23

Fishing seson	Not opened for salmon	Up to 4 weeks	4 to 6 weeks	6 to 8 weeks	8 to 10 weeks	Full season
Number of rivers 2007						4
Number of rivers 2008	2					2

Other regulations	Bag limit 1 salmon per day	Up to 2 salmon	Other, describe			
Antall elver 2007						
Antall elver 2008						

Summary of restrictions introduced by local management, fishing right holders, and other remarks:

The fishing season is reduced with:
- Rod fishery: 15 days lower part and 30 days upper part of the river
- Cultural/historical fisheryKulturhistorisk fiske: Floatations: reduced season with 1 week, "Gip" (Trap): reduced season with 1 week introduced a catch quota 450 kg, Seine: reduced season with 1 week, reduced catch quota with 10% (450 kg), "Mælkast" (Draft nets): reduced season with one week, Drift nets, reduced quota with 10% (180 kg)

County TELEMARK (Provision adopted) Part of region 23

Fishing season	Not opened for salmon	Up to 4 weeks	4 to 6 weeks	6 to 8 weeks	8 to 10 weeks	Full season
Number of rivers 2007						5
Number of rivers 2008						5*

Other regulations	Bag limit 1 salmon per day	Up to 2 salmon	Other, describe			
Number of rivers 2007	0	0				
Number of rivers 2008	0	2	Dayly closure between 22 pm and 7 am**			

Summary of restrictions introduced by local management, fishing right holders, and other remarks: