***Ad Hoc* Review Group**

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Implementation Plan

European Union - Finland

NASCO Implementation Plan for salmon management in Finland

11 Feb 2008

1. Introduction

In Finland, there are two rivers discharging into the Barents Sea, northern Atlantic Ocean, that support populations of Atlantic salmon, the rivers Teno (Tana in Norwegian) and Näätämöjoki (Neidenelva in Norwegian). Both of them are border rivers between Finland and Norway. Therefore, the management of the rivers and their salmon stocks is based on bilateral agreements between the governments of the two countries. This could be primarily seen as strength as the resource is jointly looked after by two governments, but there are also drawbacks, most importantly the slow process in negotiating the bilateral agreement at the government level. The current management system is rigid for rapid responses to potential changes in salmon stock status.

Some reference is also made here to the potential salmon production in the River Tuloma system, which has its western headwaters in Finland and drains through north-western Russian Kola Peninsula into the Kola fjord, Barents Sea.

2. Aim

The governments of Finland and Norway, in their common agreement (1989), aim at maintain and enhance the anadromous salmonid stocks in the Teno river system through feasible fishery regulations. The aim of the agreement and the management measures is to conserve and maintain the anadromous salmonid stocks in a way that ensures the conservation of their biodiversity and natural production.

Corresponding aims are reflected in the bilateral agreement about fishery management in the River Näätämöjoki.

3. The resource

The River Teno system (70ºN, 28ºE) has a catchment area of 16 386 km² one-third of it being located in Finland. The river runs into the Barents Sea through Tanafjord. The main stem of the River Teno, and one of the three main headwater rivers, the River Inarijoki, form the border between northernmost Finland and Norway (Fig. 1). The maximum distance salmon can migrate from the sea is more than 300 km along three main headwater branches, the Inarijoki, Karasjoki and Iesjoki. More than 1200 km of different stretches of the river system are available for anadromous fish. The River Teno is the most important and one of the largest salmon rivers in Finland and Norway.

Juvenile Atlantic salmon coexists with 16 other fish species in the River Teno system, although the occurrence of other species than salmon in shallow riffle and rapid sections of the rivers Teno, Utsjoki and Inarijoki is low and their densities negligible. New introduced

species, bullhead (*Cottus gobio* L.) in the River Utsjoki has expanded its distribution since late 1970's (Pihlaja *et al.* 1998) and occurs frequently in areas with low salmon density but is seldom found in areas with high salmon density

The River Teno salmon stock complex consists of several sub-stocks in different parts of the large main stem and there are more than 20 tributaries supporting spawning stocks. It has been estimated that a great majority of the potential production areas is utilized by salmon stocks. The stock complex shows high level of heterozygosity allowing a large number of genetically distinct sub-populations (Vähä et al. 2007), and their genetic structure also seem to be stable over time (Vähä et al. in press). The Teno salmon show also very diverse life history traits including exceptionally large variation in freshwater residence time, age at maturity and the extent of ocean migration. The smolt ages vary between two and eight (mostly 3-5) and spawning run consist of maiden individuals with one to five sea-winters and repeat spawners (Fig. 2) resulting in an exceptional total of 96 life history combinations of smolt ages, sea ages and previous spawning times. Until today there are no rigorous estimates on the yearly smolt production of the entire Teno system but it has been believed to vary between 1 and 2 million.

The significance of the River Teno system to the entire wild salmon production in the North Atlantic area is substantial. The total salmon production of the River Teno system including both sea and river catches and the spawning escapement is estimated to be up to 600 tonnes out of which 139 tonnes on the average has been caught annually in freshwater (range 70-250 tonnes in 1972-2005; Fig. 3). Annual salmon catch in the River Teno system is the highest single river catch within the distribution area of Atlantic salmon, and it has accounted for up to 15% of all riverine Atlantic salmon harvests in Europe (1995–2001) and as much as 22% in 2001.

Näätämöjoki (Neidenelva in Norwegian; 69ºN, 29ºN, catchment area 2 962 km^2), which also empties into the Barents Sea is another transboundary border river between Norway and Finland (Fig. 1). Distribution of salmon in the River Näätämöjoki covers 110 km of different stretches of the river system in the main stem and in two major tributaries. Annual salmon catches in the River Näätämöjoki vary typically between 6 and 12 metric tonnes. Salmon stocks in the rivers Teno and Näätämöjoki are conserved, maintained and enhanced only by fishery regulation as all fish releases are prohibited in these systems.

The large River Tuloma (catchment area 21 140 km^2) discharges into the bottom of the Kola fjord, the Barents Sea, close to the city of Murmansk. The large majority, 84%, of the watershed is on the Russian territory; only the headwaters of the two main branches, the Rivers Lotta (Lutto) and Nota (Nuorti) are on the Finnish side. The River Tuloma has been one of the largest and most important Atlantic salmon rivers running to the Barents Sea, larger than any other river system in the Kola Peninsula. In the late 19^{th} century, the annual salmon catch of the Tuloma river has been several dozens of metric tonnes, most likely exceeding 100 t. According to some historical Russian catch estimates, the annual salmon catch in the Finnish territory only may have been at a level of 15 t. A hydropower dam and a fish way were built at the outlet of the river in 1939s and the fish pass is still operational. After the construction of the Upper Tuloma hydropower dam in 1960's, the majority of the watershed area was left outside Atlantic salmon production. The watershed area above the Upper Tuloma dam (88% of the catchment area) is mostly wilderness with very few roads and negligible human population.

4. Fishery and management

Marine fisheries

After the closure of the Norwegian marine drift net fishery in 1989, salmon of the rivers Teno and Näätämöjoki ares still subject to marine exploitation with numerous bag nets and bend nets during its feeding and homing migration along the Northern Norwegian coastline. This is clearly indicated by smolt tagging experiments in the River Teno mainstem in 1970s', when 45 % from recaptures of adult salmon were taken from the sea (10 % from Tanafjord, 35 % mainly in other coastal areas; unpublished data, Finnish Game and Fisheries Research Institute).

There has been a steady decline in effort of the Norwegian coastal fisheries, e.g. the number of gear units in operation on the northernmost coast in Finnmark has declined *c*. 25% over the last decade. In the Tanafjord, there were 219 bag nets and bend nets operating in the salmon fishery in 2003, whereas the annual average in 1994-1996 was 294 gears. At the same time, however, the coastal salmon catches in Finnmark have roughly doubled (Sturla Brørs, County Governor in Finnmark, Norway).

Smolt tagging in the 1970s' indicated that marine salmon fishing targeted mainly to 2SW salmon (58 %) and to lesser amount to 1SW (23 %), 3SW (17 %) and 4SW (2 %) salmon. After the drift net fishery was prohibited in 1989 the number of 2SW salmon increased in catches of the River Teno system. Smolt tagging experiments indicate that the coastal fishing in Tanafjord exploit more MSW salmon (2SW 35 %, 3SW 20 %) than small salmon (1SW 45 %) compared to the catches in the River Teno, where 1SW, 2SW and 3SW salmon comprise 65 %, 13 % and 22 %, respectively. Moreover, recent information collected in 2003 in the Tanafjord and in the River Teno salmon fisheries indicates that the sea fishing in coastal areas harvest relatively more large salmon than the fishing in the River Teno.

River fisheries

The River Teno salmon stocks are exploited in the river with various fishing methods including weir, gill net, seine, drift net and rod and line. The net fisheries are practiced by local people, mostly native Sámi people, and it is permitted by fishing rights based on land owning or inherited rights. Licences for some 15–20 000 angling days have been sold yearly over the recent years, more than 80% of those typically on the Finnish side.

Within the entire river system with tributaries included, the average proportions of different methods in salmon catches (in weight) in 1980–2002 have been 59% for rods, 20% for weir, 9% for gill net and 12% drift net. In both Finland and Norway the proportion of salmon catch with rod and line fishing has increased since 1980's, whereas in Finland the proportion in gill net fishing and in Norway the proportion in drift net fishing has declined over the past two decades.

Fluctuations in the salmon catches of recreational fishermen, as in all fisheries, are at least partly dependent on the fishing effort. The number of recreational fishermen is unlimited and no quota or bag limit policies are practiced either in sport fishing or in different net

fishing methods used by local fishermen. However, there is typically a positive relationship between the salmon stock abundance and the effort of recreational fishermen, even if their fishing effort shows a general long-term increase.

Effort of the various fishing methods can vary yearly, which can result in varying size-selective exploitation. Extreme flow in summer can prevent the use of weir and gill net. Similarly, late brake-up of ice followed by high and late spring flood can prevent effective drift net fishing, which is permitted from May 20 until June 15. Nevertheless, there are significant correlations in the catch between fishing methods indicating that environmental circumstances in general are stable enough allowing undisturbed fishing for all fishing methods throughout the summer, and run size may generally drive the success of all fisheries.

In the River Näätämöjoki, fisheries for salmon mostly comprise rod and gill net fisheries. Gill nets are operated only on the Finnish side whereas a traditional seine net, “käpälä”, is at use on the lowermost part of the river on the Norwegian side.

Fisheries management

Salmon fishing in the Teno and Näätämö river systems has been regulated since 1873 by bilateral agreements between Finland and Norway. General fishery agreements for both river systems are concluded between the governments of Finland and Norway, primarily regulating the local fisheries and their fishing rights. These agreements have been negotiated between the relevant authorities in both countries, in particular Ministries of Foreign Affairs, Ministry of Forestry and Agriculture (Finland) and the Norwegian Ministry of the Environment (Norway).

The latest general agreement for the River Teno, concluded in 1989, states e.g. that the fishing season commences on 20 May and terminates on 31 August. Net fishing is allowed for three days per week and drift net fishing can take place only from the beginning of the season until 15 June. All fishing is prohibited for one day per week (Sunday night-Monday night).

Tourist angling is regulated by regional authorities in both countries (Department of Environmental Affairs, Office of the County Governor of Finnmark, Norway, and the Fishery Unit, Employment and Economic Development Centre in Lapland, Finland). These regulations can be amended on a yearly basis. Currently, there are changes underway in Norway in that local people, including the Sámi organisations, will have stronger role in regional management of salmon stocks than before. This may bring along new elements to the bilateral management scheme of the border rivers.

Fisheries on salmon originating from the rivers Teno and Näätämöjoki have been regulated also in the ocean. The most important management actions include the prohibition of the high seas salmon fishing since 1984 in North Atlantic through NASCO convention. Norway has taken further steps in improving salmon stocks by closing entirely the drift net fishery at sea since 1989 and by limiting coastal net fisheries.

Socioeconomic importance of salmon fisheries

Salmon fisheries in rivers Teno and Näätämöjoki have a great social and cultural importance to the local people, especially to the native Sámi people. Although the net fisheries are mostly not true commercial fisheries anymore, the impact of salmon catches to the household economies should not be underestimated. The importance of the recreational tourist fisheries to the local economy is substantial; an estimated value of a rod-caught salmon is c. 200 euros per kg.

Information on the socio-economic aspects of the recreational salmon fishing in the River Teno has been collected by the Finnish Game and Fisheries Research Institute for several times over the past two decades: in 1981-82, 1985, 1991, 1996 and 2002. In connection with the yearly, routine postal questionnaires on their salmon catch, the fishermen have been asked about the costs during their salmon fishing trips, both locally in the river valley and during the journey. Information on the motivation, values, opinions and attitudes connected to the salmon fishing has also been collected.

5. Status of the salmon stocks

Monitoring of the salmon stocks in the rivers Teno and Näätämöjoki are based on long-term investigations carried out jointly by Finnish and Norwegian authorities. The long-term monitoring programme includes:

- estimating the juvenile salmon abundances at permanent sampling sites (since 1979 for Teno, since 1990 for Näätämöjoki),
- catch and fishery statistics (present form since 1972)
- catch samples (since 1972)

These programmes are carried out by the Finnish Game and Fisheries Research Institute and the County Government of Finnmark, Norway.

In the absence of true measures of the salmon run sizes, the salmon catch is considered to represent a surrogate of abundance. The lack of catch quotas for any fisheries in these rivers and significant correlations in the Atlantic salmon catches between fishing methods indicate that the estimated numbers of salmon caught may reflect actual variations in the populations. In addition, significant relationships between the estimated numbers of salmon in the catches and the abundance of juveniles in subsequent years indicate that the catch may be realistic surrogate of the stock size (Niemelä et al., 2005).

In contrast to many areas around the North Atlantic Ocean, the salmon stocks of these northern rivers do not show a long-term decline but cyclic oscillation. The salmon catch of the Näätämöjoki show even an increasing trend over the past 30 years (Niemelä et al. 2004). Moreover, estimated abundances of 1SW and 2SW salmon and the previous spawners in the Teno have increased over the past 15 years (Niemelä et al. 2004, 2006). However, the estimated abundance of 3-4 SW salmon in the Teno seem to have somewhat decreased since the 1970s (Niemelä et al. 2004, 2006).

Similarly to the catch estimates, the juvenile indices in both river systems also show a cyclic fluctuation, which is in good accordance with the estimated earlier and subsequent adult salmon abundances (Niemelä et al. 2001, 2005).

A recently established video monitoring site at the outlet of the large tributary, the River Utsjoki, has indicated increasing smolt numbers over the past two years. The adult salmon counts at the monitoring site have been well in accordance with other, independent indices of run sizes (catch statistics, spawner counts).

Despite the lack of a general declining trend in the total abundance of salmon in the Teno system, historical information suggests that the earlier distribution area of *c.* 1 200 km of adult salmon in the River Teno system has declined, covering today *c.* 900 km. This indicates too high exploitation especially on sub-populations in the uppermost tributaries and headwaters. It is likely that some stocks adapted to the uppermost distribution areas have become threatened or extinct. Recently, concerns have been raised especially about the status of some MSW salmon stocks in the tributaries of the system.

6. Threats to the salmon stocks

Fisheries

Even if the weekly fishing time and the length of the fishing season have been reduced over the years since the first regulations in 1873, the technical development has improved the net fishing methods. Fishing effort in the River Teno on the Finnish side has increased particularly in rod fisheries by the increase of recreational fishermen from 200 anglers in 1953 to 10500 anglers in 2002. Fishing days of anglers have increased from *c*. 600 in 1953 to 37 500 and 2002. Similar development has taken place on the Norwegian side where fishing days of anglers have increased from 1500 in 1980 to 8300 in 2002. However, the proportion of recreational fishery of the total catch is typically at the level of 15-30% and is not therefore considered a major threat for the salmon stocks. Nor does the recreational fishery selectively exploit specific, valuable fractions of the population complex, such as small vulnerable populations or large MSW spawners with large contribution to the total egg deposition.

The economical value of salmon in 1970s' and 1980s' and even until early 1990s' for people living in the Teno river valleys was extremely high resulting in great interest in fishing and extensive exploitation. According to tagging experiments, harvest rates in the river fisheries could have reached the levels of 60–70% (Erkinaro et al. 1999; Karppinen et al. 2003). However, there has been an obvious change in salmon harvesting in latest years as many local commercial salmon fishermen have shifted to earn their incomes through recreational fishermen by renting out fishing boats and fishing camps and by offering guiding services. At the same time the price of wild salmon has declined significantly and effort in traditional net fishing methods has decreased accordingly. Drift netting remains the only net fishing method where effort has not declined and even young men seem to be interested in practicing it.

Aquaculture

The development of salmon aquaculture in North Atlantic and in particular on the Northern Norwegian coast has raised concerns about the possible negative impacts of the escaped wild salmon to the wild salmon stocks of the River Teno system. Although the monitoring programme has revealed only very low proportion of escaped fish in the catches during the fishing season (June-August), mostly varying between 0.1-0.5%, occasional sampling after the fishing season (September-October) has indicated much higher proportions of farmed

fish, up to almost 50% in some samples. In addition, most of the escaped farmed salmon are found in the river fisheries in August, which also indicates late entry of these fish. This pattern raises concerns about the possibility that the fishery-dependent sampling may fail to detect the actual impact of escapees on the River Teno salmon populations and calls for more focused sampling programmes during the autumn and in the spawning grounds.

All aquaculture activities and transfers of live fish and eggs from other catchments are strictly forbidden in the catchment areas of the rivers Teno and Näätämöjoki.

Gyrodactylus salaris

The lethal parasite *Gyrodactylus salaris* has not been found in the rivers Teno and Näätämöjoki despite intensive monitoring programme, which started in early 1990s. New legislation and guidance for preventing the spread of this parasite have been introduced in both Finland and Norway during recent years. Widespread education programmes have been started in recent years in order to improve the public awareness of the *Gyrodactylus*, its effects on Atlantic salmon stocks, and the measures required to prevent its spreading. This has included distribution of information in different forms, e.g. roadside signs, video tapes, leaflets handed out in various places, e.g. together with issuing salmon fishing licenses etc.

Habitat degradation

The environmental conditions in rivers Teno and Näätämöjoki is generally very good with little major human-induced disturbances (e.g. Niemelä et al. 2001; Sivonen 2006). The environmental issues are addressed in Finnish-Norwegian collaboration between the relevant environmental authorities, especially in the Finnish-Norwegian Border River Commission. Some activities on habitat enhancement, e.g. culvert restoration and erosion protection, have been carried out recently in the Teno system (Erkinaro 2003; Erkinaro & Erkinaro 2006) and continuation of some of those actions will be considered in bilateral meetings between the authorities. Habitat issues will also be addressed in the proposed new bilateral expert group (see below).

7. Future processes in monitoring and management

In 2006, a joint Finnish-Norwegian working group, with members from both countries, was established to draft a salmon stock monitoring program, including knowledge requirements and research collaboration, that will meet the future challenges for a sustainable management of the River Teno salmon. The mandate of the working group is to draft a stock monitoring and research program for salmon in Teno river system. The program should aim to meet the data requirements of NASCO's *Decision Structure for Management of North Atlantic Salmon Fisheries,* and the *River Inventory*. In addition, the working group will propose procedures and routines for keeping watch on threatening factors (diseases and parasites etc.), and advice on how to improve catch statistics

The final report of the working group was delivered in January 2008 suggesting several modifications to the current salmon stock monitoring program. The working group adopted a new approach for establishing spawning targets, recently developed by Hindar et al. (2007) for 180 Norwegian salmon rivers, as a starting point in developing tailored biological reference points for the different populations of the River Teno stock complex. Following the information needs of the *Decision structure*, planning of the future monitoring program includes evaluation of the compliance with the set reference points, taking into account the abundance criteria, diversity criteria and the means to address the selectivity of fisheries, other threatening factors, and evaluation of the effects of the taken management actions. Implementation of this plan should take place after the river-specific modifications of the spawner target model have been carried out, tentatively planned for 2009. After this, the five-year monitoring regime of salmon fisheries will come into effect, following the cycle of the new Norwegian management plan. The relevant authorities in Finland and Norway have tentatively agreed to start planning these actions in spring 2008.

A joint Finnish-Norwegian expert group consisting of key scientists and managers has been planned to replace the present preparatory working group in 2008, and take responsibility of steering the bilateral monitoring of the salmon stock status and corresponding research activities. A more thorough review of the stock status is planned to take place every fifth year, the next one planned tentatively for 2012, following the Norwegian five-year cycle in salmon stock management that has come into effect in 2008. The present management regime with the bilateral agreements between the governments does not allow fast reactions to advice; only tourist angling can be bilaterally regulated on a yearly basis by the regional authorities in both countries. Therefore, the expert group is planned to prepare suggestions towards evaluating possibilities for alternative, more flexible management regimes that could allow implementation of NASCO Agreements, Guidelines and Resolutions. At this stage, it is too early to foresee the timing of such change.

In the case of the River Tuloma, there is a need for further cooperation between Finland and Russia and for a common fishery agreement. In addition, problems related to overcoming the hydroelectric dam and salmon access to the production areas are to be discussed and solved in the future. There are also questions related to the salmon stock re-building, e.g. concerning the possible donor stocks and related veterinary regulations. Further efforts will take place in strengthening the collaboration between the countries and for planning a bilateral salmon stock rebuilding programme.

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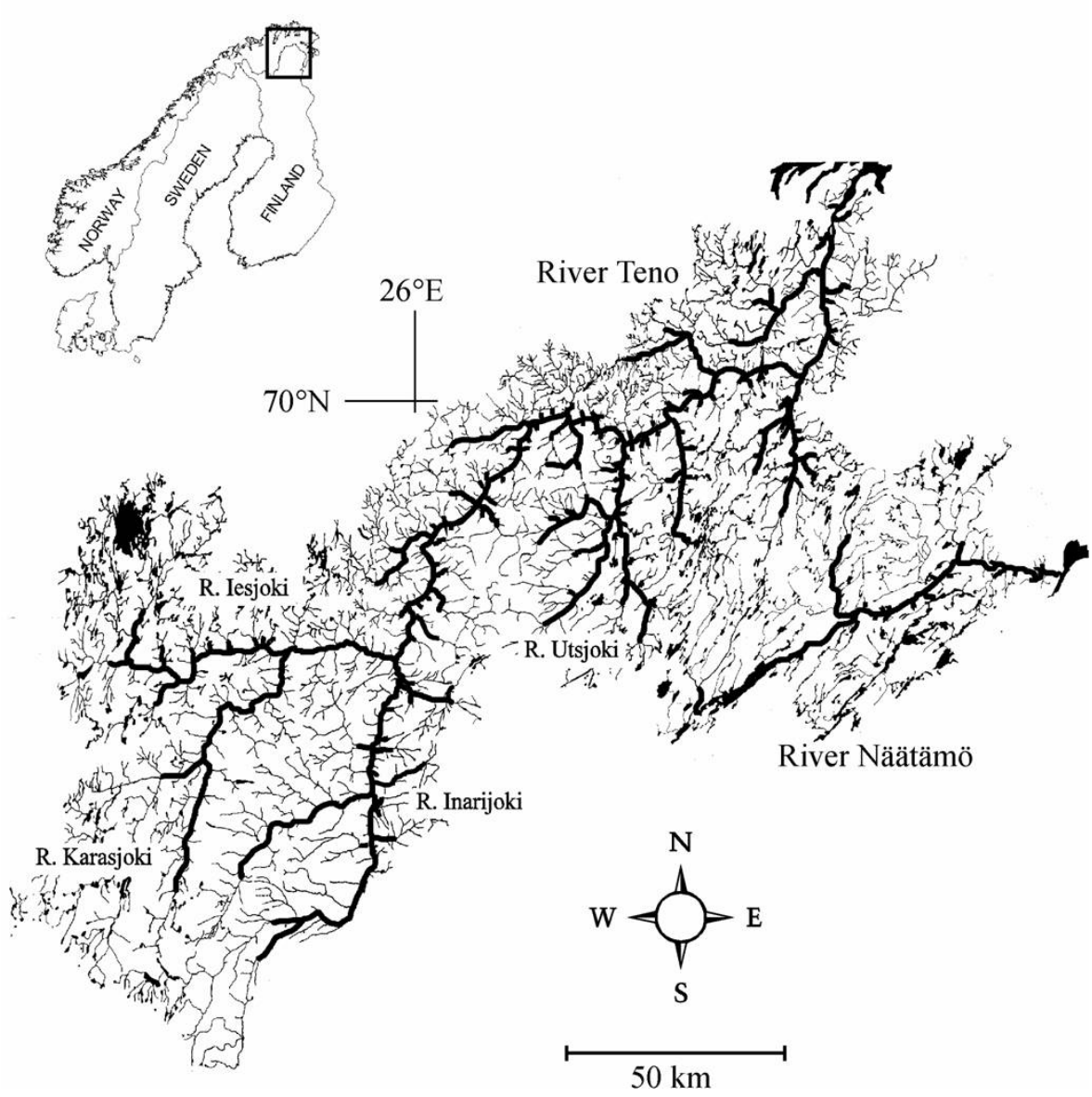

Fig. 1. The rivers Teno and Näätämöjoki in the northernmost Finland and Norway. Distribution area of Atlantic salmon is indicated by thick black lines.

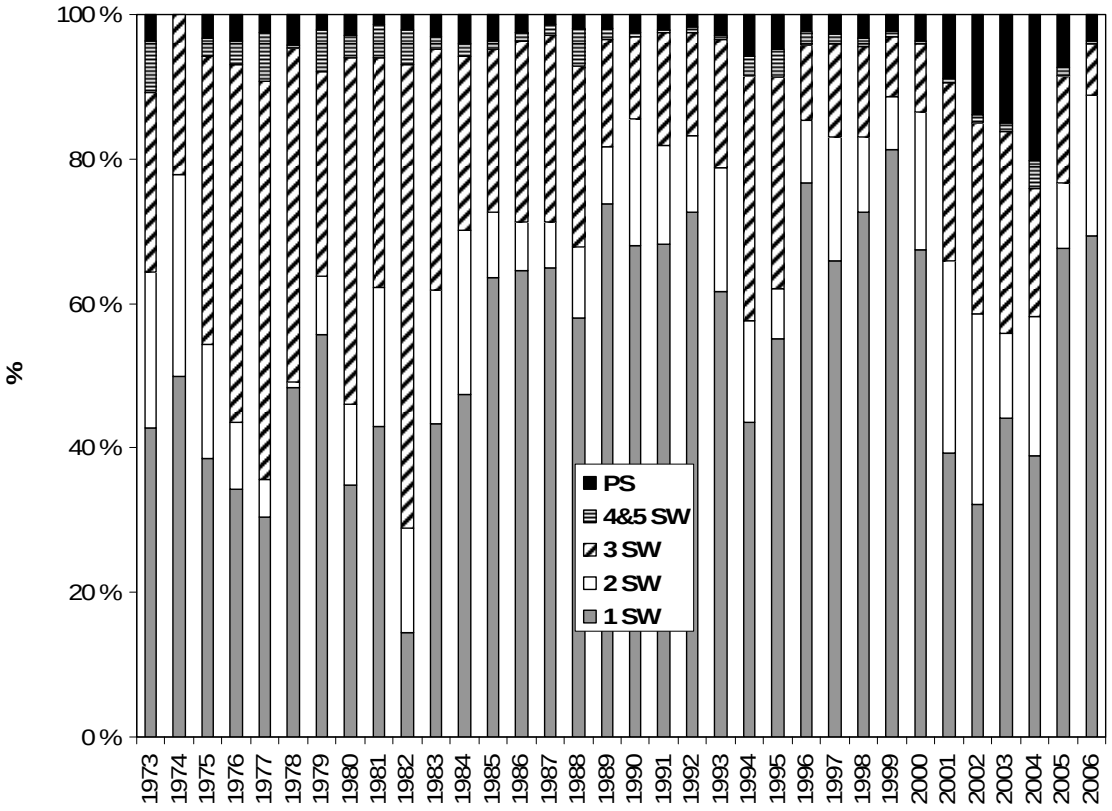

Fig. 2. Sea age distribution (%) of Atlantic salmon in the River Teno. PS=previous spawners.

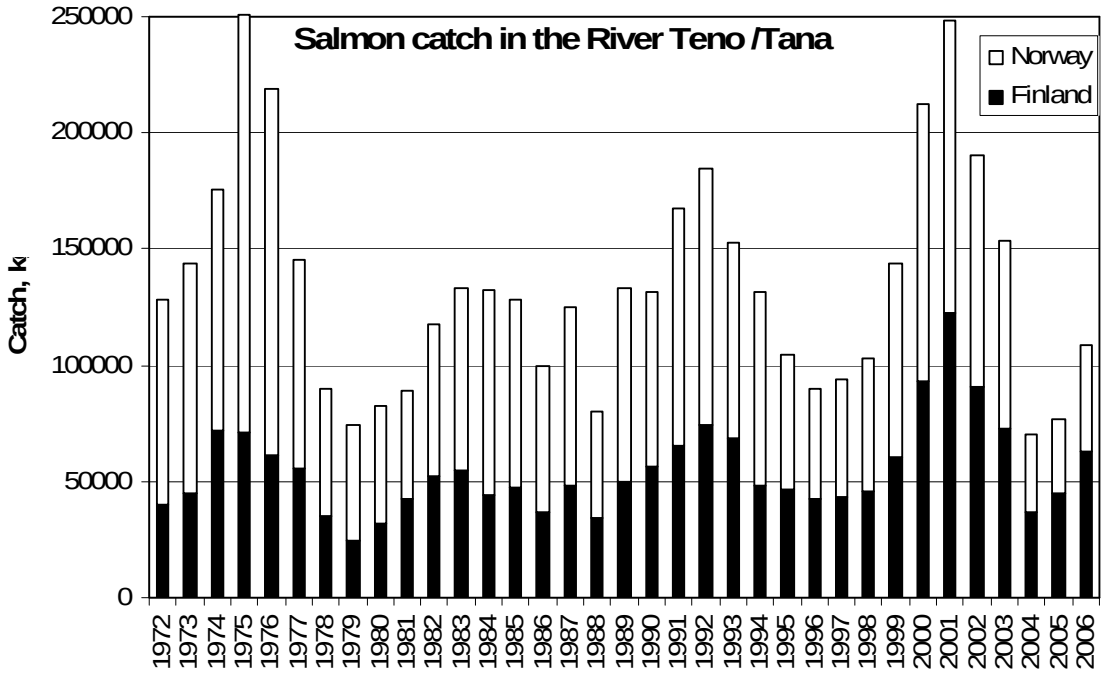

Fig. 3. Atlantic salmon catch in the River Teno.