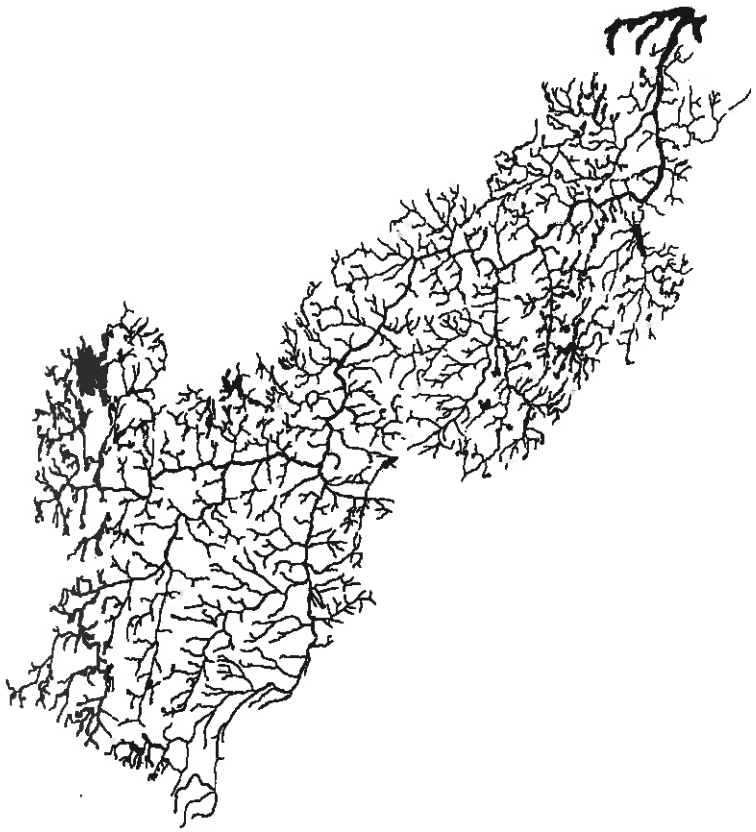
Interim Report of the

Norwegian-Finnish Working Group on Monitoring and Research

on the Atlantic Salmon Stocks in the River Tana



April 2007

Introduction

The River Tana salmon; position and status

The subarctic River Tana (Teno in Finnish, Deatnu in Sami) forms the border between northernmost Norway and Finland (70°N, 28° E). The river drains an area of 16 386 km^2 (of which almost 70% is in Norway) and more than 1 000 km of the river system are accessible to salmon (Erkinaro et al. 1997). In addition to the productive main stem, there are more than 30 tributaries supporting distinct spawning stocks (Berg 1964; Moen 1991; Elo et al. 1994), and by use of polymorphic microsatellite markers high genetic differentiation among stocks from the different tributaries has been revealed (Vähä *et al.* in press).

The annual salmon catches in the river have fluctuated between 70 and 250 t with an average of 140 t, equivalent to up to 50-60 000 salmon harvested yearly with multi-sea-winter (MSW) fish representing an average of 40% of the catch. The sea fisheries along the Finnmark coast present nearly 200 tonnes per year of which more than 65 % constitutes Tana salmon. The total salmon production of the river Tana system then including both river and sea catches and the spawning escapement is estimated to be up to 600 tonnes (NOU 1999). Thus, although one of the northernmost Atlantic salmon rivers in the world, the river Tana today supports the largest wild stock of Atlantic salmon in the world, and despite documented high rates of exploitation, it is still characterized by important contributions of 3, 4, and even some maiden 5SW spawners.

Salmon fishing in the River Tana system has been regulated since 1873 by bilateral agreements between Finland and Norway. The general fishery agreement is concluded between the governments of Finland and Norway, and this agreement primarily regulates the local fisheries and their fishing rights. Regional authorities in both countries regulate the tourist angling, and these regulations can be amended on a yearly basis. The latest general agreement, concluded in 1990, states for instance, that the fishing season commences May 20 and terminates August 31. Net fishing is allowed three days per a week and drift net fishing can take place only in the beginning of the season until June 15. All fishing is prohibited for one day in a week.

The salmon fisheries include various fishing methods such as weir, gill net, seine, drift net and rod and line. The net fisheries are practiced by local people and it is permitted by fishing rights based on land owning, agriculture production or inherited rights. The rod catch comprises only c. 50% of the catch. However, in recent years, rod effort has increased whereas the numbers of nets have declined. Fishing in the lower section is mixed-stock fishery throughout the season, whereas this is true for the upper section until the second half of July, when stocks from the tributaries have mostly ascended into their spawning rivers. In the upper section, fishing in August is directed to sub-stocks reproducing mainly in the main stem. According to two telemetry tagging experiments in the early 1990s, harvest rates in the river fisheries could reach the levels of more than 60% (Erkinaro et al. 1999; Karppinen et al. 2004).

In salmon rivers in both the northeast and northwest Atlantic, return rates has decreased significantly the last 50 years, whereas the salmon stocks of the river Tana fluctuate in a cyclic manner with no clear declining trend. The same tendency has been seen in the salmon rivers of the Kola peninsula, suggesting that the Tana river together with the other salmon rivers in the Barents Sea areas constitute the most important production area of wild Atlantic salmon in the world. However, with the potential for overexploitation (included within-river mixed exploitation) of the Tana salmon stocks, impacts from salmonid aquaculture, the expanding oil industry in the

Barents Sea, and uncertain consequences resulting from global climate change (Bigg 2000; Drinkwater 2000), it is important to monitor the dynamics of salmon populations in one of the few remaining large river systems that still support abundant salmon stocks with little or no human impact to the system, except for fishing. Attention should be focused specially on monitoring of the size and composition of the spawning stocks, recruitment, smolt production, survival rates and exploitation.

Management and conservation of the invaluable Tana salmon stocks is a matter of bilateral collaboration between Norway and Finland. Such collaboration has a long tradition and, as a new approach in further strengthening the common efforts, authorities in Norway and Finland have decided to establish a working group for reviewing the past and present efforts and to develop plans and recommendations for future actions.

The Norwegian-Finnish working group on monitoring and research on the River Tana salmon

Based on the recommendations of joint meetings in 1999 and 2005 between representatives of Norwegian and Finnish authorities, a temporary working group on stock monitoring and research in Tana, referred to as the Group later in this report, was formally established in 2006. The group consists of members from the Directorate for Nature Management (DN; Sturla Brørs), County Governor of Finnmark (FF; Morten Johansen), Norwegian Institute for Nature Research (NINA; Tor G. Heggberget, Martin Svenning) and Finnish Game and Fisheries Research Institute (FGFRI; Eero Niemelä, Jaakko Erkinaro (chair)).

The mandate of the working group was to draft a stock monitoring and research program for salmon in Tana river system. The program should aim to meet the data requirements of NASCO (North Atlantic Salmon Conservation Organization): *Decision Structure for Management of North Atlantic Salmon Fisheries,* and the *River Inventory.* In addition, the working group should propose procedures and routines for keeping watch on threatening factors (diseases and parasites etc.), and advice on how to improve catch statistics.

The goal of the final report of the Group, due by the end of 2007, is to recommend research and monitoring in the Tana river system to meet the data requirements of NASCO and thereby also establish a basis for long term sustainable management of the Tana salmon stocks.

The aim of the present, interim report is limited to suggest activities for 2007 including both new activities and ongoing activities that should be continued or expanded.

NASCO's Decision Structure for Management of North Atlantic Salmon Fisheries

NASCO and its contracting parties have agreed to adopt and apply a Precautionary Approach to the conservation, management and exploitation of salmon. The Decision Structure is developed by NASCO to provide a basis for more consistent approaches to the management of exploitation of Atlantic salmon. It proposes the use of *reference points* such as *conservation limits* (i.e. the number of spawning salmon below which the stock would decline markedly) and *management targets*. The key point is that indicators of declining stock status (e.g. few spawning salmon, decreasing salmon catches when the fishing effort is constant, low juvenile density) can release

management decisions to avoid excessive exploitation. If the status of the stock is uncertain, the precautionary approach should be used to prevent irreversible effects on the stocks.

One crucial question by using the Decision Structure in salmon rivers, is if the fishery is directed towards one or several stocks. The basic assumption in this report is that the salmon fishery in Tana is a mixed stock fishery; i.e. salmon fished in the main stem may have its origin in the different parts of the main stem *or* in the tributaries (see above). For every individual stock the Decision Structure includes both abundance criteria (stock size) and diversity criteria (e.g. age structure, run-timing, fecundity).

Most typically, the biological reference points are defined as the target number of eggs deposited per m^2. Other reference levels can also be considered, such as juvenile salmon density, number of smolts, and number of spawning adults, against which compliance of yearly monitoring information is assessed.

Setting of biological reference points, at its best, conservation limits and spawner targets based on a stock-recruitment relationship, is by no means an easy task. True s-r information is not available for the Tana salmon stocks at present but is gradually building from the video monitoring of Utsjoki (see below). A recent approach to establish spawning targets for all Norwegian rivers, a project conducted by NINA and other Norwegian institutions, has transferred s-r relationships from few rivers and extrapolated this information across a large number of Norwegian rivers, including the Tana (Hindar et al.). This modeling approach is promising but requires better and higher-resolution information, at least from a large, versatile river system like the Tana. The Group noted, that the data requirements for this approach include, at least, and as the first priority, the following variables that can be tackled both by the present data and the below suggestions for new data collection:

- Catch statistics, better resolution in space and across sea age groups
- Fishing mortality, in general and for different sub populations
- Sex ratio, especially in tributaries
- Female salmon size (sea age) distribution
- fecundity
- production area (a need to clarify the definition)

In summary, it was seen necessary to collect a minimum set of information from each relevant tributary of the Tana, including

- Area (total, productive and spawning)
- Smolt age and sea age distributions
- Juvenile densities
- Sex ratio (adult salmon)

The Group considered the data requirements for the NASCO *River Inventory* less urgent at the moment. The inventory is aimed at assisting in measuring and improving progress in meeting the objective of the Action Plan of maintaining and eventually increasing the current productive capacity of Atlantic salmon habitat. Habitat degradation is currently not a major threat to the salmon in Tana. However, a basic knowledge of the whole river system is asked in the River Inventory, and therefore the Group suggests that activities facilitating filling such possible gaps in information should be prioritized in 2007 and further. Some related issues are dealt with in *Activities in 2007*. The Group will give a more thorough consideration of the *River Inventory* in the final report.

Activities in 2007

1. Juvenile salmon monitoring

To monitor changes in the juvenile salmon production (densities), permanent electrofishing sites have been established in different stretches of the river: 10 sites in the River Inarijoki/Anárjohka,, 12 sites in the River Utsjoki/Ohcejohka and 35 sites in the River Tana main stem. Sites have been electrofished annually at the same time of the summer using the same field methods in 1979–2006. The monitoring programme also provides information on the occurrence and densities of other fish species and on the long-term growth variations of juvenile salmon based on scale measurements.

In addition to the long term monitoring of the juvenile salmon abundance in the mainstem Tana, Utsjoki and Inarijoki, information from a number of tributaries has been collected over the years. However, there is no continuous monitoring in these tributaries and in some tributaries, even important ones, very little or no data on juvenile salmon abundance exist. This lack of information is especially pronounced in some Norwegian tributaries.

In defining biological reference points, e.g. spawning target for the Tana, especially when increasing the precision to a tributary (sub-stock) level, more information on the juvenile salmon production and production areas in the tributaries are needed. The Group has reviewed the status of knowledge across different parts of the Tana system and concluded a list of prioritization as follows:

First priority: Kárášjohka (with Bávtajohka), Iešjohka, Máskejohka
Second priority: Lákšjohka, Válljohka, Gorzzejohka
Third priority: Luovttejohka, Baisjohka, Leavvajohka

Kárášjohka
This large tributary is one of the main salmon-producing areas of the Tana. The river is a well known fishing area, particularly for its large-sized salmon. As a start in filling the lack of knowledge in some of the important tributaries, a first-ever larger-scale survey on juvenile salmon and their habitats in Kárášjohka was conducted in 2006. In recent years, both local people and regularily visiting tourists have become increasingly worried about the status of the salmon stock in Kárášjohka, reporting significant declines in catches. This has especially been the case in some of the upper areas and one of the main tributaries of the Kárášjohka, the Bávtajohka.

Iešjohka
This is a large tributary of Kárášjohka that has historically also been known for its large-sized salmon. Here also we have received signals about declining stocks, perhaps even more declining than the stocks in Kárášjohka. Locals fishing in the uppermost parts of Iešjohka report that the salmon here have all but disappeared.

There is some historical information about Iešjohka, including some juvenile salmon sampling in its middle and lower reaches (1973, 1979, mid-1990s, 2006). However, updated information is needed for the whole river, and especially there is a lack of information in upper parts of the river system, upstream of Suoššjávri. A good habitat mapping of the river has been done in 1996 (Mattsson 1997).

Máskejohka
Máskejohka is a large tributary in the lower part of the Tana system producing substantial catches of salmon. Total registered catch in 2006 was 1 423 kg, of which 105 kg was salmon larger than 7 kg. Máskejohka main stem flows from Máskejávri, and two main tributaries, Geassájohka (with the sub-tributary Uvjaladnjajohka) and Ciicujohka flow into Máskejávri. There is little knowledge on juvenile salmon production available from Máskejohka. Some electrofishing was done in 1998 in Ciicujohka, no juveniles were found then.

The Group suggests that based on the general survey conducted in Kárášjohka in 2006, sampling sites for long term monitoring should be selected and the monitoring by electrofishing should be started in 2007. The Group further suggests that similar surveys should take place in both Iešjohka and Máskejohka in 2007. Similarly, the results of the surveys should be used as basis in establishing a permanent juvenile salmon monitoring programme in these rivers in the future.

Luovtejohka
Some earlier information about Luovtejohka is available, as electrofishing surveys in 1986 and 2000-2002 found lots of juvenile salmon of different age classes. However, as this river is not included among the ones in which a fishing licence is explicitly required, we have no knowledge about actual catches. There is a waterfall in Luovtejohka approximately 6 km from the river mouth with a fish ladder. This ladder functioned well during the 1980s and 90s, but the lack of maintenance has led to the ladder now being so worn out that it probably isn't possible for fish to ascend. The height of the waterfall makes it impossible for salmon to pass without help from the ladder. There is a question today of whether to remove the ladder completely or restore it.

To assess whether or not Luovtejohka should be classified as a river with anadromous fish, we need to establish some basic knowledge. This is also necessary when deciding what to do with the fish ladder. For these reasons, Luovttejohka will be included in the diving program in Tana in 2007. In addition, a basic habitat and electrofishing survey will be performed.

Gorzzejohka
This is a tributary of Inarijoki/Anárjohka that have a nice stock of 1SW fish, with historical catches reporting quite a few MSW fish as well. It is one of the least known areas of the Tana river system, and we aim to fill in some of the gaps in knowledge this year. For this reason, diving and a basic electrofishing survey will be done in the lower parts of Gorzzejohka in 2007.

Juvenile salmon surveys on other tributaries (second and third priorities) should be considered in later years.

Electrofishing methods
The Group suggests that the electrofishing methods used in the suggested surveys and new monitoring programs should follow the lines of and be comparable with those used in the almost 30 year long time series accumulated from the main stem Tana, Inarijoki and Utsjoki, and with similar monitoring programs in Norwegian salmon rivers.

2. Video monitoring in the river Utsjoki

Index rivers is the most useful way to manage anadromous fish stocks whereby management targets can be derived, the status of stocks evaluated, and forecasts made of subsequent adult returns. So far the only long-term index river monitoring in Norway takes place in the two very

small rivers (Imsa and Talvik river), with an average run of less than 70 adult salmon per year. In the same two rivers, the population has been manipulated by releasing juveniles, for instance.

A new monitoring site was established in 2002 at the outlet of a large tributary of the Tana, the River Utsjoki, where the total numbers of smolts descending as well as the numbers of adult salmon ascending have been counted by video monitoring annually from 2002 to 2006. This operation has been part of a research project, "Laks i Nord", which is funded by the Norwegian Research Council through the Wild salmon programme, first in 2002-2005 and now from 2007 to 2010. The video monitoring of smolt and adult salmon run in the river Utsjoki (index river) will/should also be continued from at least up to 2010.

It is highly important to expand the time series of smolt and adult abundance information, at the River Utsjoki, in order to better understand and associate fluctuations in abundance with actual trends in survival. Thus, the data produced by the monitoring in river Utsjoki, represent biological reference points to complete the information required in relation to the decision structure (see Introduction).

3. Genetic analyses

Salmon populations of the Tana river system are highly genetically structured. There are some earlier studies based on enzyme electrophoresis that have partly been published (Ståhl & Hindar 1988, Elo et al. 1994) but also accumulated data that have not been analyzed and published as of yet. These studies have revealed F_{ST} values* of 4,8 – 5,4 % between samples from different parts of the river system. Such levels are similar to what is commonly found between rivers on the Norwegian coast. A recent study using DNA microsatellites has indicated pairwise F_{ST} values between inferred populations ranging from 1,5% to 20,1% with an average of 9,2% (Vähä et al., in press). These results further confirm the very large genetic differentiation between the sub-populations of the Tana salmon stock complex and also that homing of salmon within the Tana system is very accurate at least to a tributary level.

The high genetic differentiation is likely enabling successful identification of individuals of different sub-population origin in samples of mixed stock fisheries. A first attempt to analyze such unknown samples will take place in 2007 in collaboration between Craig Primmer's group at the University of Turku, Finland, and the FGFRI. Similarly, analysis of mixed stock samples in the main stem fisheries will be used to identify the contribution and hence relative level of exploitation of Utsjoki salmon to correct survival estimates obtained from video monitoring operations (see above). Analyses successfully assigned 96% of the salmon to the correct tributary of origin within the Utsjoki watershed (Vähä et al., in press), which provides a promising possibility to assign the Utsjoki salmon also from the catches in the main stem Tana, below the Utsjoki river mouth. This sub-project is funded by Laks i Nord, FGFRI and the University of Turku, and will be conducted in 2007,

(*F_{ST} refers to the proportion of the total genetic variance contained in a subpopulation relative to the total genetic variance. Values can range from 0 to 100% (or from 0 to 1). High F_{ST} implies a considerable degree of differentiation among populations.)

4. Catch statistics

Finland

Annually, after the fishing season, catch information of Atlantic salmon have been collected from all the groups of fishermen by mail inquires. Catches are reported by fishing methods (drift net,

weir, gillnet, seine, rod) and by area (Tana main stem, tributaries). The annual collection of statistics also includes various information of the fishermen. In 2007, emphasis will be placed in sending the inquires as soon as possible after the fishing season. This will speed up the process and improve the quality of the estimates. In 2006, reporting rate of the Finnish tourist anglers was 69% and that of the local fishermen 72%

Norway
The catch statistics methodology in Norway has changed extensively in the last 4 years. The old system with mail inquires was replaced in 2004 with an internet-based system that allows catches to be reported immediately. To increase the reporting, a deposit system was also introduced at the same time. In 2006 approximately 70% of the tourists and 60% of the locals delivered reports. Two things will be done to improve catch statistics in 2007: (1) the deposit will be increased from NOK 100 to NOK 300, and (2) LBT (Laksebreveierforeningen) will review the catch reports given by all the locals with fishing rights and make sure that each report is as accurate as possible.

5. Catch sampling

A catch sampling program (scales, fish length, weight, sex etc), operated by FGFRI, has been going on since 1972 in the Tana main stem and tributaries. In the later 10 years, this scale sample collection has included Norwegian fishermen from the lower section of the River Tana and the rivers Kárásjohka and Iešjohka (a collaboration between FF, LBT and FGFRI since 1997). The whole catch sampling program has provided a long time series of data on the development of the salmon stocks, and is thus a highly prioritized program to continue. The collaboration agreement will therefore be extended to a new 10 year period starting in 2007. Some changes will be introduced in the program to increase the quality and resolution of the samples: (1) new envelopes, easier to use for the locals, will be made, (2) the previous list of participants will be reviewed, and new potential participants will be asked to join the program, and (3) a system that enables the tourist fishermen to participate in the scale sampling will be introduced (e.g. by giving out scale envelopes when tourist fishermen are buying their licenses, and providing a reward for each envelope that is returned). An important improvement here is that more information will be collected about the salmon stocks in tributaries.

6. Kelt tagging

Recently, ICES has recommended co-ordinated tagging and tracking studies on smolts, adult salmon as well as kelts using DST tags. Here, the Laks i Nord project will conduct a pilot study to examine the feasibility and success of using data storage 'pop-up' satellite tags to examine movements and marine distribution patterns of previous spawning salmon from the River Tana.

We advocate the use of previous spawners (kelts) for two reasons. First, the contribution of previous spawners to the catch and escapement of salmon to the River Tana has been increasing in recent years, particularly in the multi-sea-winter (MSW) component (Niemelä et al. 2004; Niemelä et al. 2006a, 2006b). The second reason is because of the availability and ease of capture of large 2- and 3SW previous spawners in the Tana system. The pilot study proposes to apply thirty (30) 'pop-up' satellite tags. Tagging will take place in lower part of Tana during the two last weeks of May 2007. Tags will be programmed to 'pop-up' and transmit information at three different time intervals between the period when fish are tagged and released (late May 2007) and when previous spawners (earlier kelts) re-enter the River Tana again in late May or

early June 2008: 8 tags at 90 days following release (late August 2007); 10 tags at 180 days following release (late November 2007); and the remaining 12 tags 270 days following release (late February 2008). This will potentially provide insight into the distribution and marine habitat characteristics (temperature, salinity, depth) utilized by this life-stage up to the late summer period (90 day release), early winter (180 day release), and spring period (270 day release) several months prior to when most of these fish would have subsequently returned to the river.

In addition to the pilot study with 'pop-up' archival tags, we also propose to apply conventional archival or data storage tags (DST) to out migrating kelt. We plan to combine the pop-up tagging of kelts in Tana with DST-tagging (100 kelts) as well as tagging 500 kelts with spaghetti-tags.

7. PIT-tagging of juvenile salmon in small streams

Being able to identify the primary nursery habitats for juveniles in salmon populations is of prime importance for managers, especially as river systems are coming under pressure from anthropogenic disturbances. The smaller streams in river systems are especially vulnerable. Earlier studies from the Tana river system show that salmon parr migrate in large numbers into small streams in which no spawning occurs. These small streams can therefore be of great importance for the production of salmon. A new project on this, funded by the Norwegian Research Council, lead by the Norwegian Fishery College, University of Tromsø, will start in 2007. Three previously studied streams will be chosen, and through a combination of traps, individually unique PIT tags, electrofishing, stable isotope tracing and manipulative experiments parameters like growth, survival, energy budgets, migratory choice and production will be investigated. This project adds to the data requirements of the Decision Structure by increasing the resolution of the knowledge about the juvenile salmon production.

8. Tagging experiments for estimating exploitation rates of salmon in the Tana

The basic assumption in this report is that the salmon fishery in Tana is a mixed stock fishery; i.e. salmon fished in the main stem may have its origin in the different parts of the main stem *or* in the tributaries (see Introduction). Thus, referring to the NASCO Decision Structure (DS) in salmon rivers, the Tana fishery is probably directed towards stocks from more than 30 tributaries, totally including at least 30 stocks.

According to DS, and as well to any management goal for the Tana river, estimates of the exploitation rates for the most important stocks must be conducted. Thus the group recommend a tagging program on ascending salmon in combination with genetic/ecological studies of scales. By, for instance, radio tagging (internal tagging), detailed information about proportions of the different stocks entering the Tana, exploitation rates of stocks from the different tributaries etc can be defined. The radio tagging should be combined with genetic analyses and scale analyses of salmon from different parts of the river system. By analyses of scales from radio tagged fish and fish caught during fisheries in several parts of the Tana, both information of catch rates and origin of salmon will be obtained. This combined information will also be essential for the future development of knowledge-based management model for the Tana salmon.

The tagging sites and methods used for tagging should be compatible with earlier fish telemetry studies performed in the Tana system, so the results from earlier work can be included in the new analysis.

The tagging program should be initiated in 2008, but some preparatory work as well as the design of the tagging program should be conducted in 2007. This includes establishment of tagging sites, formalities connected to tagging and handling of the fish, number of tagged fish needed, methodology for genetic and scale sampling, costs of the study etc. In 2008, a strong MSW fraction of Tana salmon is expected, and tagging should be carried out both on early and late migrating salmon. A more detailed description of the fish tagging programme will be given in the final report from the Working Group

Threatening factors for the Tana salmon with regards to activities in 2007 in relation to data requirements for NASCO's Decision Structure

Gyrodactylus salaris

The parasite *G. salaris* is not yet found in Finnmark. The nearest Norwegian localities with *G. salaris* are Skibotnelva and Signaldalselva in Troms. In Finland and Sweden it is found in several rivers flowing into Bottenvika. The parasite is present in areas flowing into the Torne river and also in connection to the Enare lake. Some headwaters of the Tana river are situated very close to source areas of River Tornionjoki/Torneälv where the parasite belongs to the native fauna, and River Paatsjoki/Pasvik system where the parasite has once been detected in a fish farm.

As of now, the only options with regards to the parasite are preventative measures. Fishermen visiting the river are receiving information about the parasite, and on the Norwegian side they are also required to disinfect their fishing equipment before they are allowed to buy a fishing license. This is unfortunately still not a requirement on the Finnish side, but each fisherman's responsibility for having clean/dry equipment has been strongly emphasized in the new (2003) Finnish veterinary regulations.

Proliferative kidney disease

Highly reduced catches as well as significant mortality in some southern Norwegian salmon rivers such as Åbjøra (Nordland county) and Jølstra (Sogn & Fjordane) were in 2006 suspected and recently found to be associated with proliferative kidney disease (PKD) (Forseth *et al.* 2007, Torbjørn Forseth and Tor Atle Mo, personal comm.). A pilot screening was planned to include Tana in 2006, but could not be carried out. This pilot screening should be accomplished in 2007, associated with other monitoring or with screening of *G. salaris*, to confirm whether or not this disease could be a threatening factor for Tana salmon.

Cottus gobio

The bullhead (*Cottus gobio*) is a newly introduced fish species to the Tana river system. It was observed first in Utsjoki in 1979, and has increased its distribution in that tributary since. It has been observed in the main river at two places: (1) at the river mouth of Utsjoki, and (2) in the Storfossen/Alaköngås area.

There have been some studies of the potential interactions between bullheads and juvenile salmonids. It is found to be frequent in areas with low salmon density but is seldom

found in high abundances in areas with a high salmon density (Gabler 2000), but decisive answers about its impact on salmon are still lacking. Focus will be kept on the bullhead in the yearly monitoring of juvenile salmon, especially to see if the observations from Storfossen represent a new establishment.

Escaped farmed salmon

Ascent of escaped farmed salmon into Norwegian rivers is widely recognized as one of the main threats facing wild salmon stocks today. Autumn registrations of the amount of farmed salmon present have been conducted throughout Norway since 1985, and high proportions have been recorded from several rivers.

In Tana, registrations of farmed salmon have been done from two sources: (1) the regular scale samples taken from fishermen during the summer, and (2) monitoring fishing close to the river mouth during the autumn (90/91, 96/97 and 03/04). The proportion of farmed salmon during the summer has been very low, well below 1%. In the autumns of 1990 and 91, the proportions were at their highest, 43-47%, but the number of fish in samples were only 19 and 7, respectively. The proportion was 0-13% in the other autumn investigations, still with low total numbers of fish (8-21).

With the formal ratification of the Tana fjord as a national salmon fjord, all aquaculture in the fjord is closed.

The Group does not specifically recommend any extra monitoring of escaped salmon the autumn 2007. However, monitoring during the fishing season will continue through the scale sampling program.

Water quality

The Tana river is flowing through a valley with human settlements on both sides and with extensive agricultural activity both in the lower and upper areas. With this human activity, the potential for eutrophication and pollution makes it necessary to have a focus on water quality. This will be taken care of by the implementation of the European Water Framework Directive. That work will start up in Tana now in 2007.

Overexploitation

In addition to fishing with rods, traditional fishing methods with different types of gillnet are still widely employed in the Tana river. The combined exploitation rate both in the fjord and within the river is thus potentially very high, and the Group recognizes the need to keep an eye on this to avoid possible overexploitation of the salmon stocks in the river.

In recent years, the number of fishermen using gillnets both in the fjord and in the river have declined. In the early 90s, over 300 fishermen were registered fishing in the fjord, while only 55 were registered in 2006. We have some information about the number of locals fishing with gillnet in Tana since the mid-80s, and recently, Rune Muladal from LBT has taken the initiative to collect and systematize information about the number of locals that fished in 2006.

Concluding remarks

The main suggestions for 2007 from the Group are based on the recognition of a mixed stock fishery on the Tana salmon stock complex within and outside the Tana system. Future monitoring and research, therefore, should aim at focusing on new and increased knowledge that enables a sustainable future management of the Tana salmon on a sub-stock level.

The Working Group will continue its work towards a final report to be finished by the end of 2007. The final report will include recommendations on a permanent monitoring program for juvenile and adult Tana salmon, consideration of threatening factors, the need for future research, organisation of the activities, collaboration and communication on all levels (local, regional, national, international).

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