

Special Session on Habitat Protection and Restoration

Árni Ísaksson:

Freshwater Habitat in Iceland
Status, Protection and Restoration



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**NASCO NINETEENTH ANNUAL MEETING
TORSHAVN, FAROE ISLANDS, JUNE 2002**

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Presentation by Iceland

Introduction

Since salmon spawn and spend a large part of their life in freshwater, the status of the freshwater habitat is one of the prerequisites for the existence of healthy salmon populations. It is the deterioration of this habitat in many salmon producing country, which is one of the main reasons for the worldwide decline of Atlantic salmon through past centuries and decades.

Habitat is defined as the “type of environment in which an organism or group normally lives or occurs”. By this definition any biological, chemical or physical changes in the salmonid environment can be considered changes in habitat including factors ranging from pollutants to increased predation and fishing effort.

The Icelandic salmon resource is highly valuable in economic terms. It has been estimated that the minimum direct and indirect annual revenue from salmon angling amounts to 30 million US \$, which corresponds to \$ 1000,- per angled salmon. This is clearly a valuable resource, which must be conserved and protected.

In this paper I will try to describe the status of the Icelandic freshwater habitat as well as the state of the salmon resource itself. The major factors, which have and can potentially affect the salmon habitat will be described as well as the actions which have been taken to prevent or reduce their impact.

Status of the Salmon Resource

Figure 1 shows the location and some vital statistics for the major salmon angling rivers in Iceland. The river systems concerned are indicated with blue lines. The areas in northwestern and eastern Iceland are high in elevation and have relatively few salmon rivers. The primary species in those areas is arctic charr.

The major facts and conclusions to be drawn regarding the status of the salmon stocks are the following:

- The average angling catch in these 62 rivers for the last 25 years is 31.500 salmon, which is slightly above catches in recent years (approx. 30.000) .
- The number of rods is highly restricted and the the total number of salmon rods is 336, which are distributed over the 62 major salmon rivers shown. This is equivalent to 5,5 rods per river.
- The average annual salmon catch per permitted rod for the whole country is close to 90 but varies considerably between rivers and localities based on salmon abundance and the size and nature of the river.
- The catch per rod is thus exceeding 100 salmon in the best salmon areas in western Iceland, which corresponds to one salmon per rod per day during the 100 day salmon season.

- The low catch per rod in southern Iceland is due to the great number of rods on the “Hvítá”, a large glacial river system with low salmon catchability.
- Approximately 75 % of the salmon angling catch in southern Iceland is from the Rangá systems, which is entirely based on smolt releases. Catches per rod on that system are thus comparable to those in western Iceland.
- As in many other countries salmon abundance and return rates from the sea have been declining since the early 1990s, especially in the two-sea-winter component, which particularly affects northern Iceland.
- This is of great concern to management authorities as well as stakeholders in the light of the fact that no sea fishery for salmon is permitted within Icelandic territorial waters.
- Despite the apparent decline in salmon abundance there is no indication of spawning deficiency in major salmon rivers.
- In general it can thus be concluded that the Icelandic salmon resource is in an acceptable state and not threatened.

Factors affecting the quality of salmon habitat

The main factors which frequently affect the riverine habitat of salmonids and their relevance to the Icelandic situation are shown in figure 2. The factors are listed clockwise in the order of decreasing importance. The main relevant points are the following:

1. Soil erosion

Possible effects: Increases flash flooding and siltation.

- Soil erosion has been a serious problem in Iceland for centuries. At the time of the settlement in the 9th century a large part of Iceland was presumably covered with vegetation.
- The settlers used any available wood for fire and grazing of animals affected the lowland areas.
- Increased sheep herding during the latter part of last century created erosion problems even in the interior of Iceland.
- Human activity, wind, water and frost have thus acted in combination to enhance soil erosion.
- This is being restored to some extent through fertilization and seeding of inland areas.

2. Land drainage

Possible effects: Increases flash flooding and extends low water periods.

- During the latter part of the 20th century many wetlands in Iceland were dried up through canalization to create fields for farmers.
- This changed the habitat of various wetland birds and reduced the capacity of the lowland areas to act as a water reservoir for rivers.

3. Gravel mining

Possible effects: Changes river topography and increases siltation.

- Rivers carry a great deal of gravel downstream especially in high velocity mountain areas.
- Gravel can be mined without environmental problems in certain rivers and areas.
- Caution should be exercised in highly productive salmon rivers and gravel mining carried out under the supervision of experts.

4. New predators

Possible effects: Increased concentration of predators on rivers.

- Mink was introduced to Iceland for culture in the 1930s and again in the 1970s.
- Mink are now observed around most rivers in Iceland and are likely to cause considerable problems on small rivers, especially for smolt and trout size fish.
- Sea gull populations have increased around populated areas and are a known menace for migrating smolts.

5. Agricultural pollution

Possible effects: Can cause enrichment in certain low-flow rivers. Is beneficial for the productivity of many rivers.

- Agricultural pollution is due to agricultural waste from farms and the run-off from fertilized fields.
- Not a problem on most rivers.

6. Sewage pollution

Possible effects: Can cause enrichment in certain low-flow rivers.

- Poorly treated sewage only flows into few major main-stem rivers.
- Mostly applies to a few municipalities on Iceland's south coast.

7. Fish farm runoff

Possible effects: Can cause pollution and create an escapee problem as well as disease risks.

- Some smolt and charr farms in Iceland are located on rivers.
- Very few fish farms are located on salmon rivers.
- Pollution and escapee problems must be solved through appropriate filtering techniques.

8. Sea-cage escapees and ranching

Possible effects: Ecological and genetic effects on natural salmonid populations.

- Rearing in sea-cages is limited to non-salmon areas and commercial ranching is non-existent.
- Escapees are currently not a problem in Iceland.

9. Hydroelectric projects

Possible effects: Can block migration of fish and limit spawning grounds

- Hydroelectric projects are mostly located in Iceland's interior areas.
- Such developments are currently not a threat to salmonids.
- Can create a better environment for salmon through removal of glacial debris.

10. Acid rain

Possible effects: Can disrupt the biological function of salmonids.

- Acidic rain has not been observed in Iceland.
- The Icelandic basalt is an alkaline rock, which tends to neutralize acid.
- Is currently not a problem for salmonid populations in Iceland.

Existing and planned management measures

The major activities affecting the freshwater habitat in Iceland are shown in table 1 along with the existing and planned management measures and the responsible authorizing agencies. The main points are the following:

- Building of fish ladders and fishing holes as well as the reinforcement of river banks must be permitted and approved by the Directorate of Freshwater Fisheries. These activities are normally permitted upon the recommendation of the relevant fishing association and the project must be designed by an expert. Fish ladders have opened up large new spawning and nursing areas for salmon above impassable waterfalls.
- Gravel mining in or close to rivers needs the approval of the Directorate of Freshwater Fisheries. There are efforts underway to reduce gravel mining, control site selection as well as the quantity taken and introduce river improvement technology.
- Road culverts can be a problem with respect to salmonid migration and are under observation through environmental impact statements.
- Construction of channels to drain wetlands, which is controlled by the Environmental and Planning Agencies, has been greatly reduced but limited measures have been introduced to bring the wetlands back.
- Fish farms need a license both from the Environmental Agency and the Directorate of Freshwater Fisheries and through that process there are efforts underway to introduce rotating screen filters on all farms with outflow into rivers.
- Relatively few small towns on Iceland's south coast spill sewage into large mainstem rivers. Some effort is underway to put in sewage treatment facilities.
- Most hydroelectric projects are harnessing glacial rivers in Iceland's interior, which has proven benign for the salmon populations. There are no plans to put hydroelectric projects on major salmon rivers.

Conclusions

- This paper shows that the freshwater habitat as well as salmon stocks in Iceland are in a reasonable state but great care should be exercised in order to safeguard the rivers, especially close to populated areas. There are examples of rivers with a recent reduction in salmon catches, which can probably be linked to their location within or close to urban areas. With the current expansion of urban regions and limited precautionary measures in place, rivers in the vicinity of the greater Reykjavík area could be endangered within a few decades .
- Although many adverse factors affecting salmon have been identified within the marine habitat, the safeguarding of freshwater habitat is of utmost importance as it is indispensable for the reproduction of salmon and is in many cases controllable by humans in contrast to the marine environment, which is mostly beyond our control.

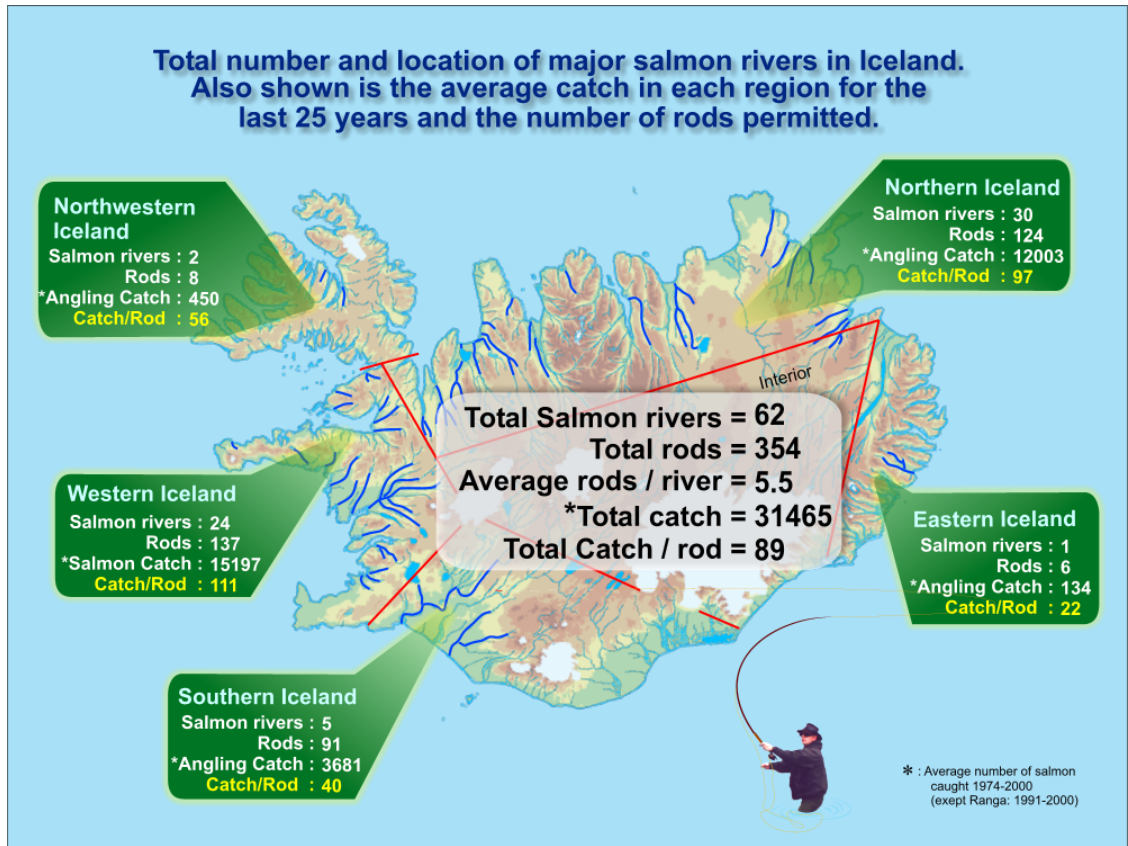


Figure 1

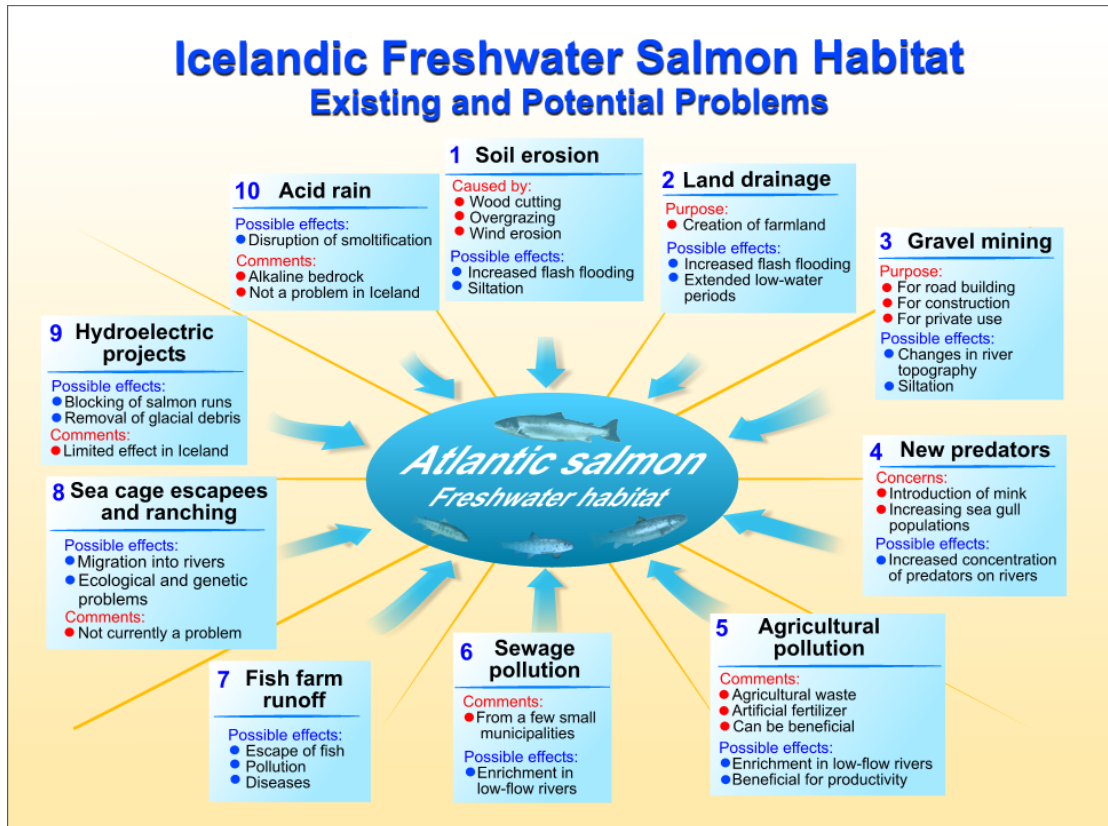


Figure 2

Table1. Projects affecting Icelandic Salmon Habitat
Existing and planned Management Measures

Nature of Activity	Existing practice and planned management measures	Authorizing agency
Fish ladders	Have greatly increased the usable area of salmon habitat	Directorate of Freshwater Fisheries
Creation of fishing holes	Permitted but has to be approved by the river association and designed by an expert	Directorate of Freshwater Fisheries
Reinforcement of river banks	Permitted but has to be approved by the river association and designed by an expert	Directorate of Freshwater Fisheries
Gravel mining in or close to rivers	Permitted but has to be approved by the river association. There are existing efforts to reduce gravel mining, control site selection and magnitude and introduce river improvement technology	Directorate of Freshwater Fisheries
Construction of road culverts	Partly controlled through environmental impact statements	Directorate of Freshwater Fisheries, Planning Agency
Land drainage through canalization	Construction of channels to drain wetlands has mostly been stopped but limited efforts have been introduced to bring wetlands back	Environmental Agency, Planning Agency
Fish farms on rivers	Planned to introduce rotating screen filters in all fish farms with outflow into rivers	Environmental Agency, Directorate of Freshwater Fisheries
Rural towns on rivers	Relatively few small towns on Iceland's south coast spill sewage into main-stem rivers. Some effort under way to put in sewage treatment plants	Planning Agency, Environmental Ministry
Hydroelectric projects	Keep hydroelectric development off major salmon or trout rivers	Planning Agency, Environmental Ministry