NASCO	**Council** ***Greenland Salmon Stressor Analysis***	**CNL(25)28** **Agenda item: 6.g)(i)**

NAALAKKERSUISUT
GOVERNMENT OF GREENLAND

GREENLAND SALMON STRESSOR ANALYSIS

THE KAPISILLIT SALMON

MINISTRY OF FISHERIES, HUNTING, AGRICULTURE AND SELF-SUFFICIENCY

Indhold

Introduction

The Kapisillit salmon (*Salmo salar*) is a unique and isolated population of Atlantic salmon found exclusively in the Kapisillit River, a tributary of the Nuup Kangerlua fjord in West Greenland. The Kapisillit salmon isGreenland's only documented spawning salmon population. This population faces threats such as climate change, habitat degradation, fishing pressure, and low genetic diversity.

The Kapisillit river in which the Kapisillit salmon are from, runs near the small settlement of Kapisillit, located about 75 kilometres northeast of Nuuk. The name Kapisillit itself comes from the Greenlandic word for "salmon," reflecting the long-standing connection between the community and the salmon.

Distribution

Salmon are widespread along most of the Greenland coast. The salmon caught in Greenland typically originate from all over the North Atlantic as they migrate to Greenland to feed. In Greenland, there is only one population of breeding salmon, which resides in the Kapisillit River at the bottom of the Nuup Kangerlua fjord. The Kapisillit River catchment area includes several large lakes that are relatively low in the terrain. The lower parts of the river therefore reach temperatures that make it possible for the salmon to breed.

The salmon in Kapisillit are genetically different from other salmon stocks in the North Atlantic and have been isolated for thousands of years. In the rest of the North Atlantic, salmon are widely distributed from Northeast America, Canada, Iceland, Northern Europe and to northeastern Russia.

Growth, age and reproduction

The average salmon can grow to 150-160 cm from snout to tail tip and can weigh up to 50 kg. However, it rarely weighs more than 25 kg, and the Kapisillit salmon hardly weigh much more than 7-8 kg. The age of the salmon can be read from growth rings deposited in the ear stones and scales. The oldest salmon known was 13 years old.

The salmon in the Kapisillit River grow slowly: A 1-year-old salmon is typically 5-7 cm; a 2-year-old is 8-11 cm; a 3-year-old is 12-14 cm, and a 5-6-year-old is 17-20 cm.

The salmon is an anadromous fish, i.e. it lives in both fresh and salt water. The eggs are laid in running fresh water in late autumn, where the fertilized eggs are buried in

“nests” of gravel with a particle size that protects the eggs from being washed away into the river. The eggs hatch the following spring. Spawning in the kapisillit river is also documented to occur in October- November. However, in the kapisillit river there is a risk of the eggs freezing in the nest during the winter. Historic records of salmon with running eggs in the spring (march) could indicate that a local adaptation to the arctic climate, where the eggs are carried by spring spawning females during the winter to prevent freezing. The salmon fry lives their first years in the river before they smoltification . The salmon can stay in the sea for one or more years before returning to the river as spawning fish.

Smoltification typically happens in the Kapisillit River when the salmon are 4-5 years old (some smoltify when they are 3 or 6-9 years old). After one year in the sea, the salmon has typically grown from about 17 cm to about 50 cm. One third of the young salmon then migrate back to the river, while the rest spend 2-3 (in some cases 4) years in the sea before migrating back to the Kapisillit River to spawn.

Kapisillit salmon typically spawn for the first time at 6-7 years of age (65 cm, approx. 3 kg). Spawning mainly takes place in the three lower reaches of the river from late October and November. The eggs hatch in May and June, depending on the water temperature. After spawning, the adult fish stay in the lakes before migrating back to the sea in the spring.

Food sources

In Kapisillit, salmon smolts mainly eat pupae and larvae of mosquitoes and flies, as well as insects that fall into the water. The largest smolts also eat smaller salmon fry and three-spined stickleback (*Gasterosteus aculeatus*). In Kapisillit fjord, salmon eat capelin, herring, as well as krill and other smaller fish and squid caught in the open water. Salmon stays in the upper 100 m of the water column, but they can also be found at depths of more than 700 meters.

Management

The Fisheries Act authorizes the Naalakkersuisut (Government of Greenland) to regulate all fisheries within its jurisdiction. Each year, the government sets TAC and fishing periods for fish stocks in Greenlandic waters and allocates these as quotas, in accordance with national laws and relevant international agreements.

Every year, Naalakkersuisut decides when the salmon fishing season starts and how much fish that can be caught. Fishing in the Kapisillit River is only allowed for

personal use—not for selling. You need a license, which you can apply for through the Ministry of Fisheries and Hunting.

If you had a license last year and want to apply again, you must have submitted fishing reports from the previous season.

Fishing with nets within 1,000 meters of the river's mouth is prohibited, so is fishing with any equipment within 50 meters of the river's mouth. Inside the river and its connected lakes, you can only fish with a fishing rod using a single hook.

Fishing before the official start date or after the season has ended is strictly forbidden.

Reporting

According to regulations, there is a reporting obligation for everyone who fishes for salmon. This reporting obligation means that you must report your fishing activity every time you have cast your net or fished with a hook or fishing rod. If you have not been out fishing, or if you have fished and have not caught any fish, this is referred to as a zero catch, which must also be reported.

If you have caught any salmon, the reporting must be done as soon as possible. If you are to report a zero catch, this must be done no later than 14 days after the fishery is closed. The fishing season has

Catch history

Historic and current reporting does not provide sufficient information to separate kapisillit river salmon catches from the costal fisheries. Average catch is likely around 100 salmon (mainly grilse).

Scientific monitoring

The Greenland Institute of Natural Resources (GINR) is the primary institution responsible for conducting scientific monitoring and research on fish stocks in Greenland, including the Kapisillit salmon population. The Institute plays a key role in collecting data on salmon biology, distribution, population trends, and environmental conditions in the Kapisillit River system. Current monitoring is based on occasional (but not annual) electrofishing of parr densities in the river. However, a number of

historic and more recent investigations, is currently being reviewed and will provide the basis for scientific management advice in the future. Updated Scientific advice is expected in 2025, based on data collected from 1938- to present. A scientific advice based on

Location of the Kapisillit River and lakes. The river starts from the pin. From www.asiaq.maps.arcgis.com

Threats

The Kapisillit salmon represents Greenland's only known self-sustaining spawning salmon stock. While this population is not commercially fished, it holds ecological, cultural, and recreational importance. Like many fish species in the Arctic region, it faces a range of environmental and human-related pressures. Understanding these factors is essential for maintaining a healthy balance between local use and long-term sustainability.

Parasites and diseases

Unlike many countries with Atlantic salmon populations, Greenland does not have any salmon aquaculture or fish farming operations. As a result, the typical environmental risks associated with salmon farming—such as the spread of parasites and diseases, genetic mixing with escaped farmed salmon, and pollution

from feed and waste—are not present in Greenlandic waters. However, increased tourism involves a risk of accidental introduction of pathogens an parasites through dirty boots or fishing gear used in other parts of the world. It should be considered to demand disinfection of footwear and fishing gear of tourist and visitors to the river.

Climate change

Warmer river temperatures: Climate change is causing air and water temperatures in Greenland to rise, which can affect the salmon's spawning and survival rates.
One of the climate-related threats to the Kapisillit salmon population is the risk of drought and prolonged periods of low water levels in the river. Reduced precipitation can result in lower river flows. Shallow water can limit access to spawning grounds, expose eggs to temperature fluctuations and predation. For young salmon (fry and smolts), drought conditions can increase stress, restrict habitat availability, and slow growth due to limited food resources.

Invasive species

One of the emerging threats to the Kapisillit salmon is the potential invasion of pink salmon (*Oncorhynchus gorbuscha*), a non-native species that has been spreading rapidly across the North Atlantic in recent years. Originally from the Pacific Ocean, pink salmon was introduced to rivers in Russia in the mid-20th century for commercial fishing. Since then, they have expanded their range, with increasing numbers being reported in Norway, Iceland, the UK, and Arctic regions. In 2021, 5 pink salmon (had already spawned) were captured and removed from the kapisillit river. However, no records of pink salmon were reported in 2023 and eDNA samples from December 4th 2023 showed no indications of Pink salmon in the river.

Habitat degradation

The Kapisillit River is completely free from dams, hydropower development, and other human alterations. There are no artificial barriers that obstruct passage, and the river flows naturally from its lakes and into the Nuup Kangerlua fjord.

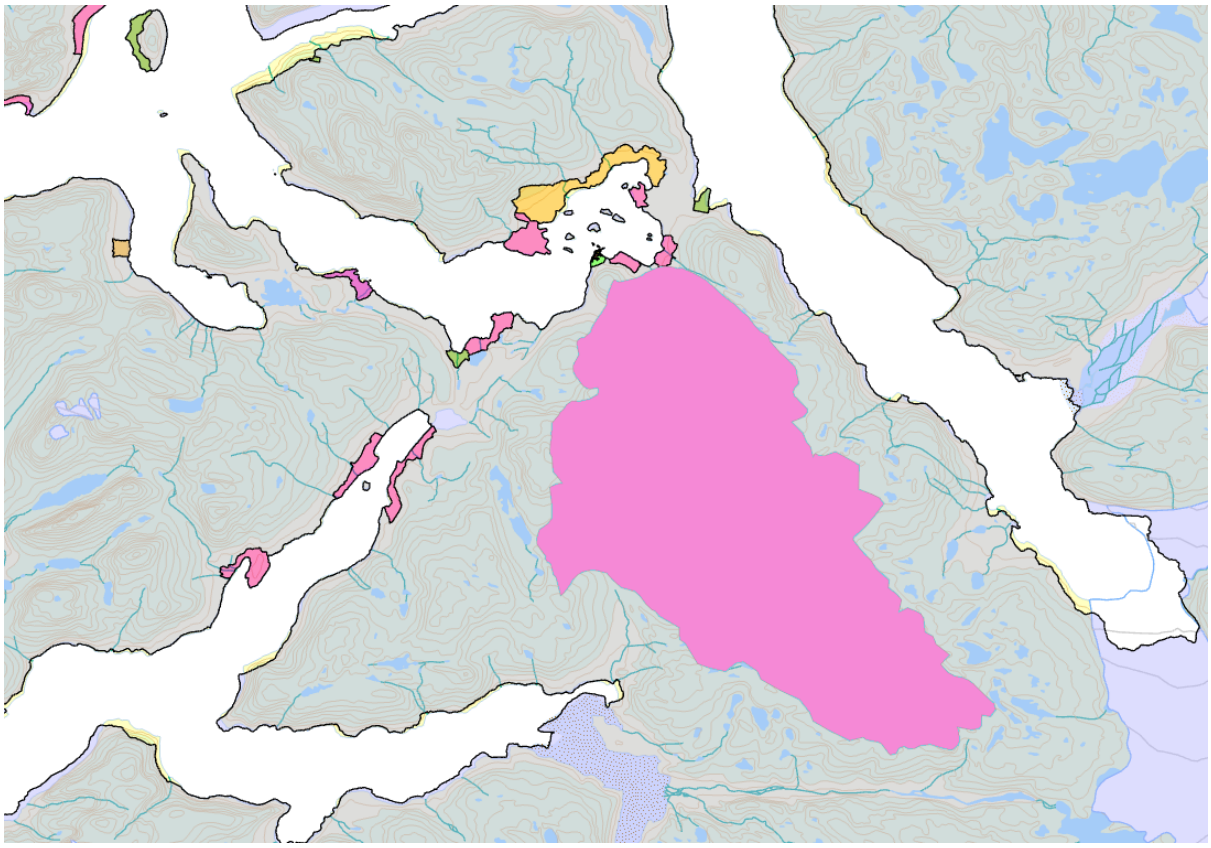
This lack of infrastructure is a major advantage for the Kapisillit salmon population. In many other countries, dams and channel modifications have disrupted salmon migration, and reduced access to spawning grounds. In contrast, the natural flow of the Kapisillit River allows salmon to migrate, spawn, and complete their life cycle.

The Kapisillit River and its surrounding watershed are designated as a potable water catchment area, meaning it is protected to ensure the safety and cleanliness of drinking water for local use. As such, strict regulations are in place to prevent contamination.

Within this protected zone, the following activities are prohibited:
- Use of motorized vehicles for transportation

- Use of motorized tools or equipment
- Construction of new buildings, roads, or trails
- Expansion of existing buildings or structures
- Operation of commercial businesses, institutions, or similar activities
- Keeping of animals or livestock
- Use, transport, or storage of substances that could potentially pollute the water

These restrictions help preserve both water quality and the conditions of the Kapisillit River.



Map of potable water catchment area from. The pink area is protected.

While there are protective measures in place, increased tourism and human activities can potentially affect the area. Increased tourism and recreational fishing in the area may disturb salmon habitats, leading to stress and possible population decline.
Increased traffic, boat use, and off-trail movement can damage the surrounding areas, vegetation, and salmon spawning grounds. As the Kapisillit River is located within a potable water catchment area, any pollution from human activity—including litter, fuel spills, or improper waste disposal—poses a direct risk to drinking water quality and salmon habitat.

Even non-commercial fishing, if unregulated, can impact a small salmon population. Injuries from catch-and-release practices, unreported catches, and gear left in the river can harm both fish and habitat.

Limited genetic diversity & small population size
The Kapisillit salmon population is small and isolated, meaning it has low genetic diversity, which makes it vulnerable to environmental changes, diseases, and inbreeding effects.

Knowledge gaps and monitoring limitations
In 2016, it was estimated that there were almost 6,000 smolts in the river system at Kapisillit, and an annual production of adult 1SW grilse of 300 individuals. It is estimated that approximately 100 adult salmon are caught annually in the Kapisillit Fjord and River. Over the past 57 years, the salmon par population has been reduced by 52%. The population at Kapisillit is not fished commercially, but it is assumed that the decline is nevertheless due to heavy fishing pressure from gillnet fishing in Kapisillit Fjord and recreational fishing in the river.

Fishing pressure

In 2021, Naalakkersuisut introduced stricter regulations for salmon fishing in the Kapisillit River, aimed at protecting the salmon population. Fishing in the Kapisillit area is limited to non-commercial, personal use. All individuals must obtain a fishing license issued by Naalakkersuisut. You must have fulfilled the reporting obligations from the previous fishing season, if you want to apply for a license again. Fishing with nets is strictly prohibited within 1,000 meters of the Kapisillit River mouth. Only rod-and-line fishing with a single hook is allowed within the river itself. Other fishing methods, including multi-hook setups or nets, are not permitted.

When well-regulated and reported, these activities can remain compatible with long-term sustainability. Continued licensing, reporting, and education can help balance traditional use with long-term sustainability.

One of the challenges in managing the Kapisillit salmon population is the lack of reliable data on historical catch levels and current fishing pressure. The ministry has historical general catch data on all salmon catches, but the catch levels specially for Kapisillit river salmon are lacking. Although salmon have been fished in the area for decades, mainly for personal and local use, there are no consistent or detailed records of how much has been harvested over time. Even in recent years, data on catches remains incomplete due to inconsistent reporting and the absence of long-term monitoring programs.

This data deficiency makes it difficult to assess how fishing has influenced the salmon population and whether current harvest levels are sustainable. It also complicates efforts to evaluate the effectiveness of existing regulations.

In addition, the conservation limit, the minimum number of spawning salmon needed to maintain a healthy and self-sustaining population, has not been scientifically established for the Kapisillit stock. Without this benchmark, it is not possible to determine how close the population is to a critical threshold, or how resilient it is to environmental pressures and fishing activity.

However, recent analysis of size composition of catch and scientific monitoring indicates that the stock was historically composed of 40% grilse and 60 % MSW salmon. But in 2010/2011 the catches were based on >90 % grilse and <10% MSW salmon. Theis leads to the conclusion that fishing pressure is the likely cause of low adult survival.

Bycatch

While salmon are not a primary target for large-scale commercial fisheries in Greenland, they can still be caught accidentally in gillnets, trawl nets, and longlines used for other fish species. All licensed fishers in Greenland are legally required to report any bycatch, including unintended catches of salmon. This applies even when salmon are not the target species, such as in fisheries using nets or longlines. However, in practice, very few bycatch reports involving Kapisillit salmon are submitted.

The low number of reports could mean that bycatch incidents are rare—but it could also suggest underreporting. This uncertainty makes it difficult to understand how much unintentional fishing pressure the Kapisillit population may be experiencing.

Predation

Predators of Kapisillit salmon are arctic foxes, seabirds, seals, and whales. These predators target salmon at different life stages, from juveniles migrating to the sea to adults returning to spawn. In 2021, new protective measures were introduced regarding humpback whales (*Megaptera novaeangliae*) in Nuup Kangerlua fjord. This may also have indirect effects on the local salmon population.

Humpback whales forage in fjord systems in Greenland where capelin, and other small fish are abundant, species that also make up a significant part of the diet of Kapisillit salmon during their marine phase. There is also a possibility that salmon could be consumed unintentionally during feeding. While direct predation on salmon by humpbacks is likely limited, there is increased competition for food and potential incidental predation. The Kapisillit salmon has no native terrestrial predators that

specifically target salmon during their spawning runs. However, a number of bird predators (*Gavia immer* and Mergus serrator) are common in the area.

Summarization of threats

The Kapisillit salmon population is exposed to a variety of environmental and human-driven pressures. Due to its small size, genetic isolation, and limited habitat range, even moderate disturbances can have long-term consequences. Below is an overview of the key threats currently affecting this unique population.

Unlicensed fishery, unreported or misreported catches are of great concern. Improved reporting including mandatory reporting of total length of the salmon can greatly improve the management of the Kapisillit river salmon.

Climate change is causing noticeable shifts in air and water temperatures across Greenland. Warmer river temperatures can disrupt salmon spawning and egg development. In addition, reduced precipitation raises the risk of drought, leading to lower river flows, limited access to spawning grounds, and increased stress on juvenile salmon.

Invasive species also pose a growing concern. The pink salmon has been spreading across the North Atlantic. While not strongly present in Greenlandic rivers, its expansion raises concerns about potential impacts if it were to establish in the Kapisillit system.

The habitat quality of the Kapisillit River remains high due to the absence of dams and other large-scale modifications. It is also protected as a potable water catchment area, were strict regulations limit development and pollution. However, rising tourism and recreational activity can threaten the area if not properly managed.

Genetic isolation is another significant concern. The Kapisillit salmon do not interbreed with other salmon populations, which limits their genetic diversity. This reduces their capacity to adapt to environmental stress and increases their vulnerability to disease and inbreeding.

Bycatch is another area of concern. Although commercial fisheries do not target salmon, the species can be caught unintentionally in gear set for other fish. By law, bycatch must be reported, but few reports are received, raising the possibility of underreporting and unmonitored pressure on the stock.

Lastly, natural predation from seabirds, seals, whales, and arctic foxes is a normal part of the ecosystem. However, new whale-watching regulations introduced in 2021 have increased the risk of predation by humpback whales in Nuup Kangerlua.

Control

The Greenland Fisheries and Hunting Control (GFJK) is responsible for overseeing compliance with fisheries regulations through both on-the-ground inspections and administrative monitoring.

Control of coastal salmon fisheries is conducted through the following main activities:

- On-site inspections of fishing activities along the coast.
- Monitoring of local market sales.
- Registration and verification of submitted fishing reports.

Administrative oversight is managed by GFJK's central office in Nuuk. Here, officials review and validate all incoming reports submitted as part of the mandatory reporting requirements.
GFJK also maintains a dedicated corps of fisheries inspectors who conduct inspections both at sea and during landings. During the salmon fishing season, targeted inspection campaigns are carried out. These may include random checks of fishing gear, vessels, landings, and direct sales from boats.

GFJK holds the authority to close fisheries when necessary. In such cases, closure notices are communicated via press releases and direct text messages to all licensed fishers.

GFJK may file a police report in case of violation of the fishing regulations. Any violation of the provisions of applicable legislation may result in a fine.

Conclusion

The Kapisillit salmon is a unique Greenlandic population of Atlantic salmon, isolated from other stocks and only found only in the Kapisillit River. Its ecological and cultural importance is widely recognized, and its continued endurance depends on sensible management.

Our overall assessment identifies fishing pressure, climate change, and the potential threat of invasive pink salmon as the three most significant risks to this population. While fishing in the area is regulated, incomplete catch data and limited monitoring

make it difficult to fully understand the impact of current fishing practices. Climate change is altering river conditions in ways that could disrupt salmon reproduction and growth. Meanwhile, the growing presence of pink salmon elsewhere in the North Atlantic presents a new, uncertain threat to local ecosystems.

At the same time, it is important to acknowledge the strengths of the current situation. The Kapisillit River remains free from dams, pollution, and commercial development. Strict protections as a potable water catchment area help maintain high habitat quality. There are also no salmon aquaculture facilities or known widespread diseases affecting the population. These factors offer a valuable foundation for conservation.

However, knowledge gaps remain, especially in terms of population size, spawning success, and the long-term effects of environmental change. Addressing these gaps through improved monitoring and research will be essential.

Balancing the traditional use of this resource with long-term sustainability is possible, but it will require continued attention, flexible policy tools, and early action in response to emerging threats. With informed management and broad stakeholder engagement, the Kapisillit salmon population can be maintained for future generations.