

CNL(24)73

Pink salmon in rivers: current knowledge, overlap
and potential interactions with Atlantic salmon

Eva B. Thorstad (NINA), Tom Staveley (SLU) & Peder Fiske (NINA)

**SPAWNING
AND DEATH**



**RIVER ENTRY
AND
UPSTREAM
MIGRATION**



**JUVENILES UNTIL
SMOLT MIGRATION
TO SEA**

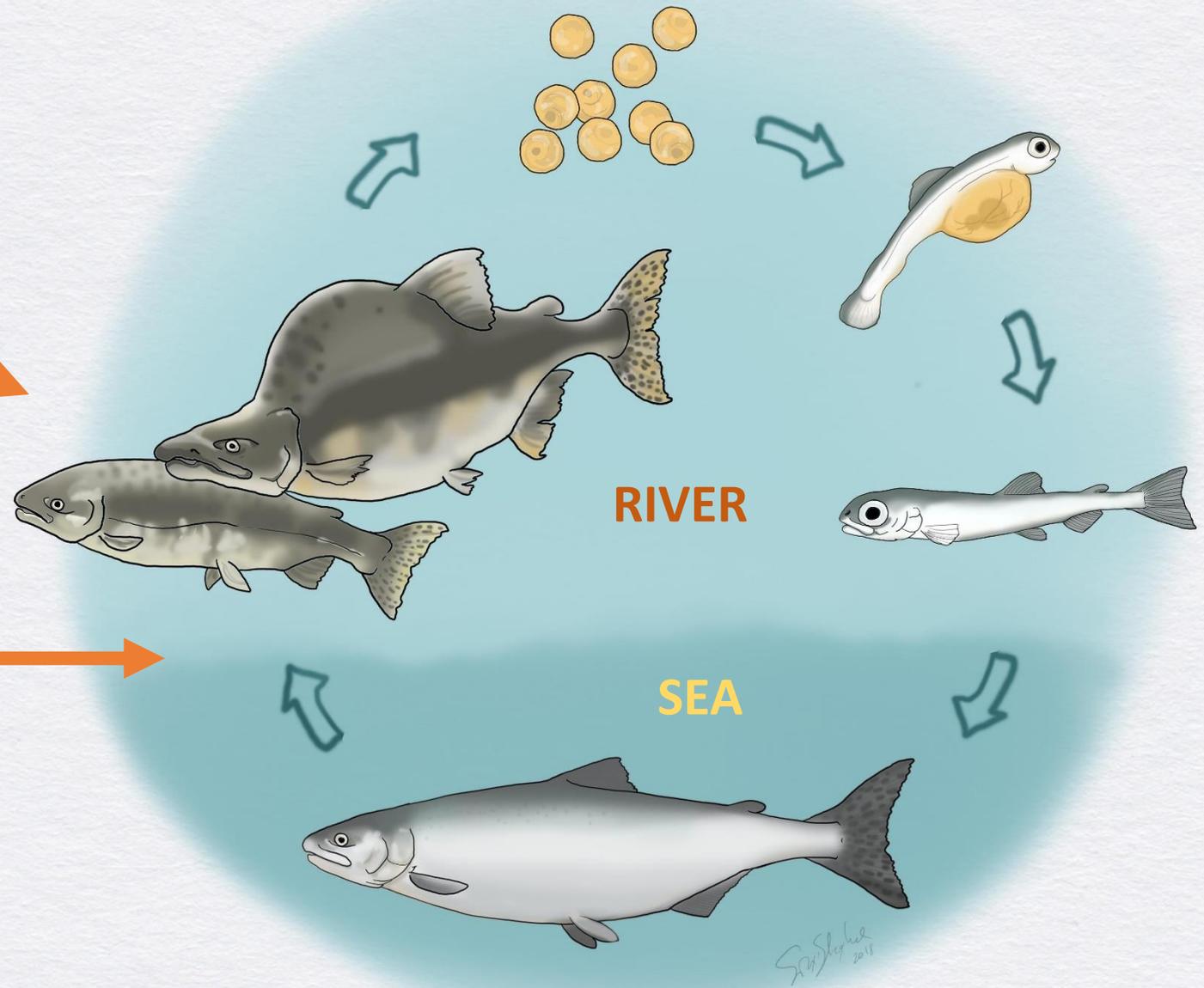


Illustration: Sigrid Skoglund, NINA

Pink salmon occur in large numbers in rivers in Northern Norway and Russia
By far outnumber Atlantic salmon in several rivers

The possibility for interactions between pink salmon and Atlantic salmon is large



Photo: Malin S. Høstmark, County Governor of Troms and Finnmark



Pink salmon are known for short migrations and sometimes intertidal spawning

but can also migrate hundreds of kilometres upstream - and are stronger swimmers than their reputation

Pink salmon can reach and spawn on most river stretches
where Atlantic salmon occur



Example: Pink
salmon migrate
> 200-300 km upstream
in Russian rivers Ponoj
and Tanya, and
Norwegian-Finnish river
Tana/Teno

Photo: Eva B. Thorstad

Upstream migration and spawning



- High densities of pink salmon may lead to
- competition for space
 - out crowding
 - aggressive attacks from pink salmon

This may lead to migration delays, and altered behaviour and distribution of Atlantic salmon



Atlantic salmon seem reluctant to enter areas with high densities of pink salmon

Example: Thousands of pink salmon gathered in the mouth of River Syltefjordselva

Atlantic salmon
stayed
downstream of the
pink salmon and
did not move
upriver before the
pink salmon were
removed

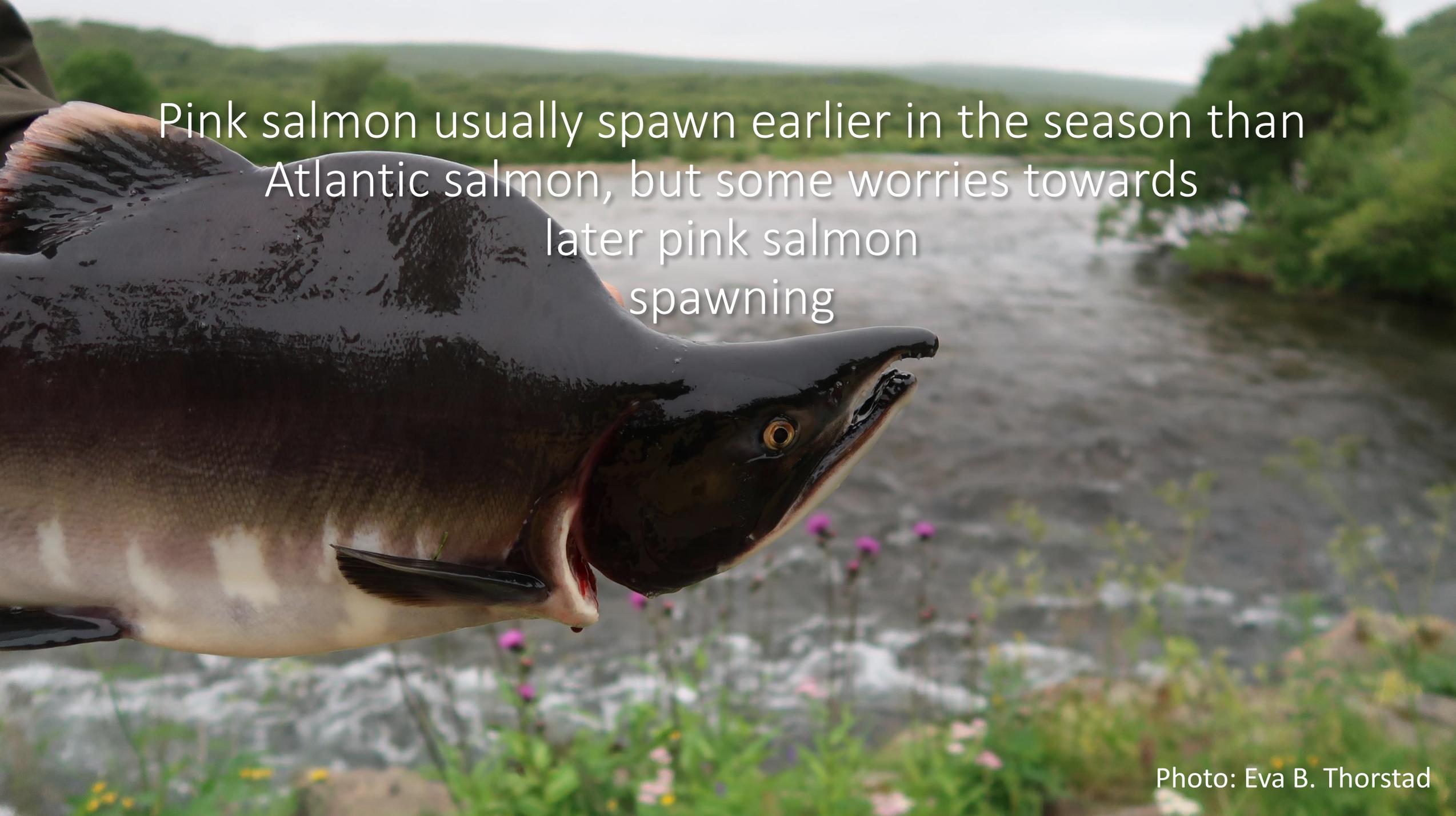




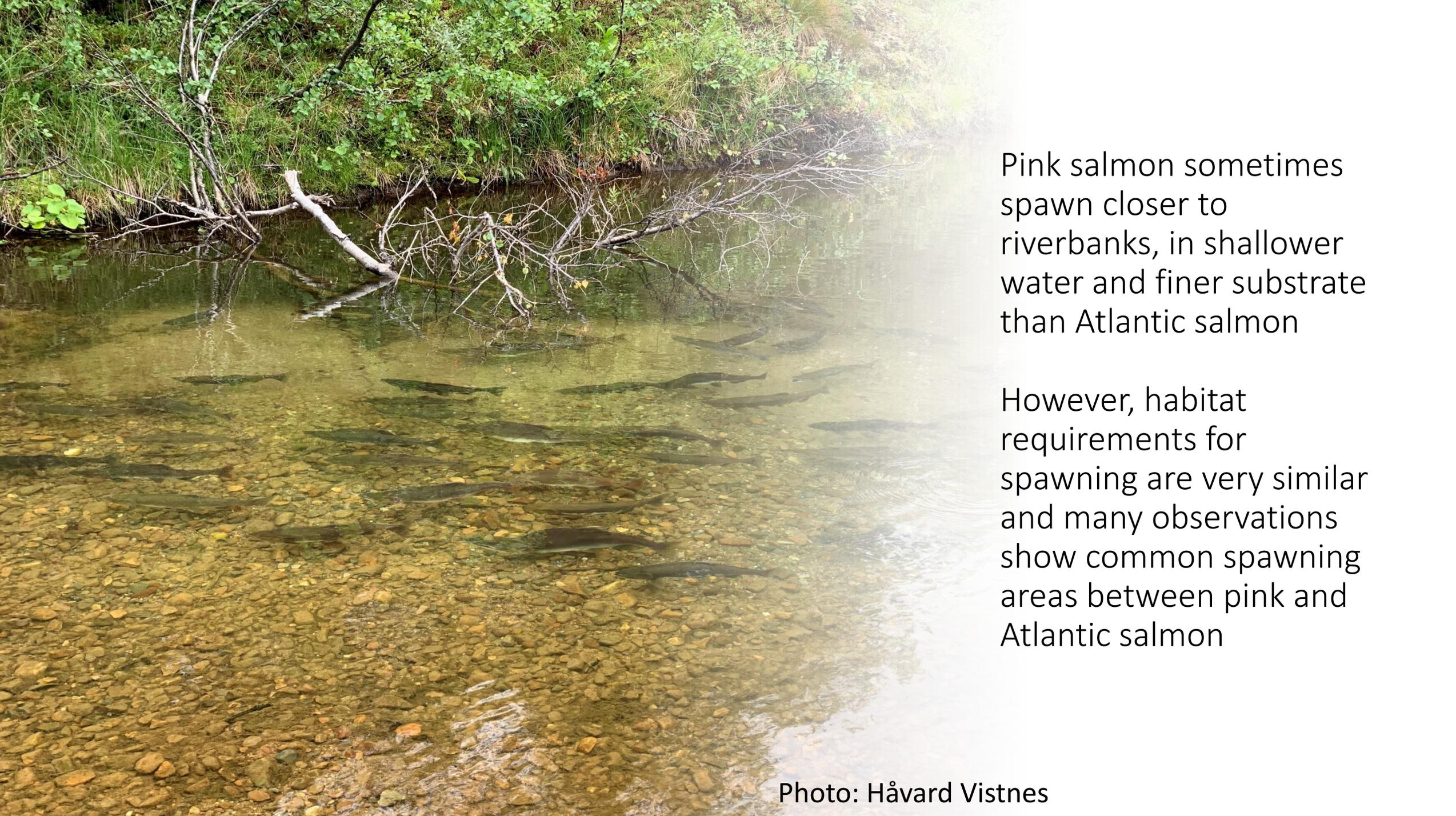
**Female pink salmon attacking male sockeye salmon. Photo by Manu Esteve in Quinn (2005),
The behavior and ecology of Pacific salmon and trout, University of Washington Press**

Pink salmon can be aggressive at their spawning sites and have been reported to attack Atlantic salmon

Could cause Atlantic salmon to move to less suitable river sections



Pink salmon usually spawn earlier in the season than Atlantic salmon, but some worries towards later pink salmon spawning



Pink salmon sometimes spawn closer to riverbanks, in shallower water and finer substrate than Atlantic salmon

However, habitat requirements for spawning are very similar and many observations show common spawning areas between pink and Atlantic salmon



Example:

These are pink salmon juveniles,
Atlantic salmon eggs, and
one-year old Atlantic salmon juveniles
caught at the same site



Known to migrate to sea
as 3 cm smolts when the
yolk sac is used up –
therefore thought to not
compete with Atlantic
salmon juveniles

But.....

Photo: Eirik Frøiland,
County Governor of Troms and Finnmark

Seems more common that smolts start feeding and remain in the rivers for some weeks or months before migrating to sea in the Barents and Atlantic region than in the Pacific



Photo: Håvard Vistnes



Photo: Rune Muladal



If pink salmon feed in the rivers this may cause competition with Atlantic salmon for food resources and hiding places



Photo: Rune Muladal



On the other hand,
Atlantic salmon may
feed on eggs and
juveniles of pink
salmon



Pink salmon start to decompose already before they die, and all die after first spawning



Photo:
Håvard
Vistnes



Photos: Eva Thorstad

Transport of organic matter and nutrients
from marine to freshwater environments



Photos: Eva Thorstad

Nutrient-rich rivers: Excess nutrients and increased oxygen demand may result in hypoxia and negative consequences for the river ecosystems by eutrophication

Nutrient-poor rivers: Extra nutrients lead to increased productivity, which may eventually enhance the growth of juvenile Atlantic salmon.



Photos: Eva Thorstad

Whether enhanced juvenile growth may be regarded as positive or negative for population growth may vary among populations

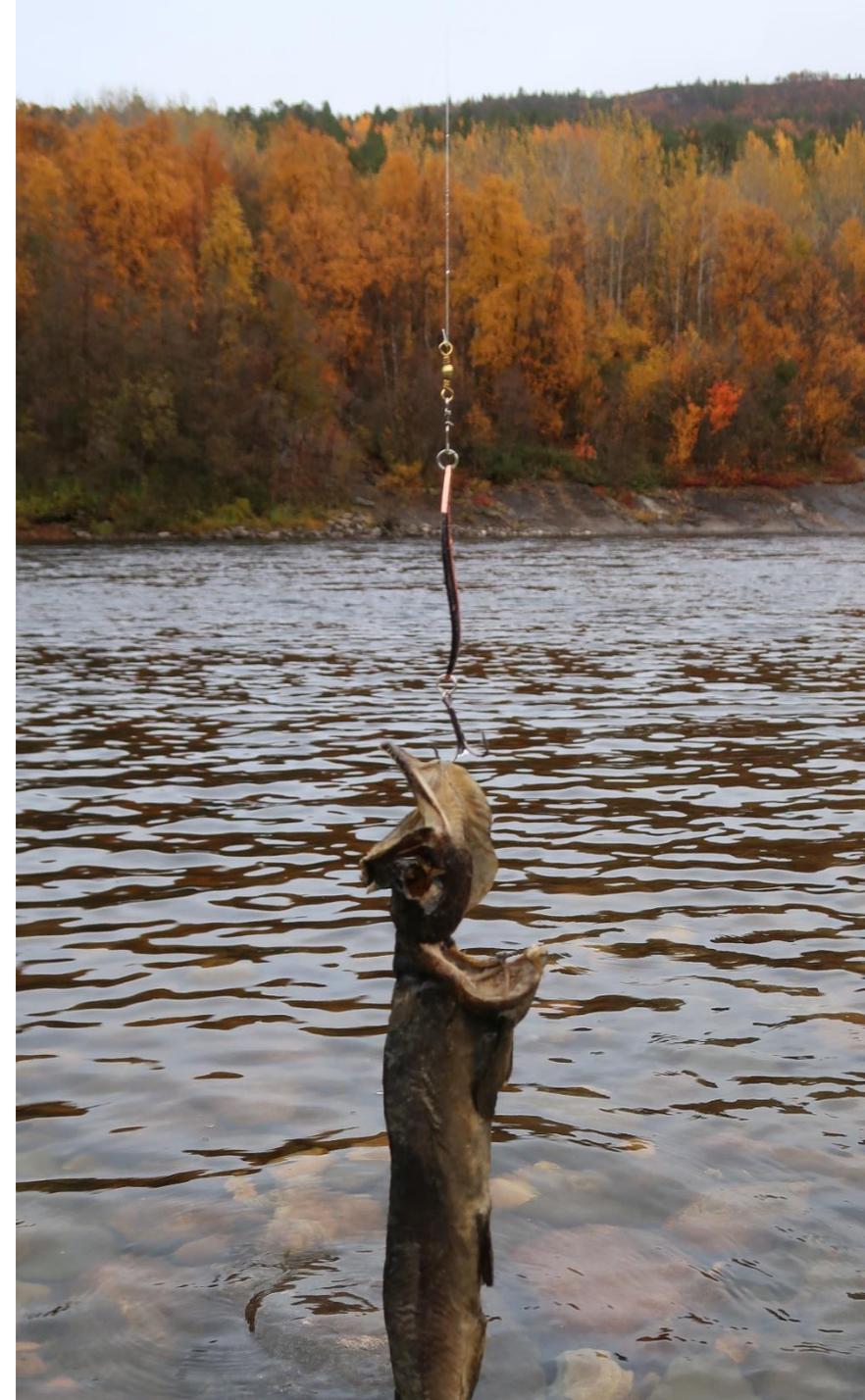
The worst-case scenario may be that Atlantic salmon smoltify at an earlier age and size, which may lead to lower marine survival in Atlantic salmon



Recreational anglers in Norwegian rivers report widespread dislike of pink salmon

High abundance of pink salmon likely negatively affect Atlantic salmon angling and its economic value

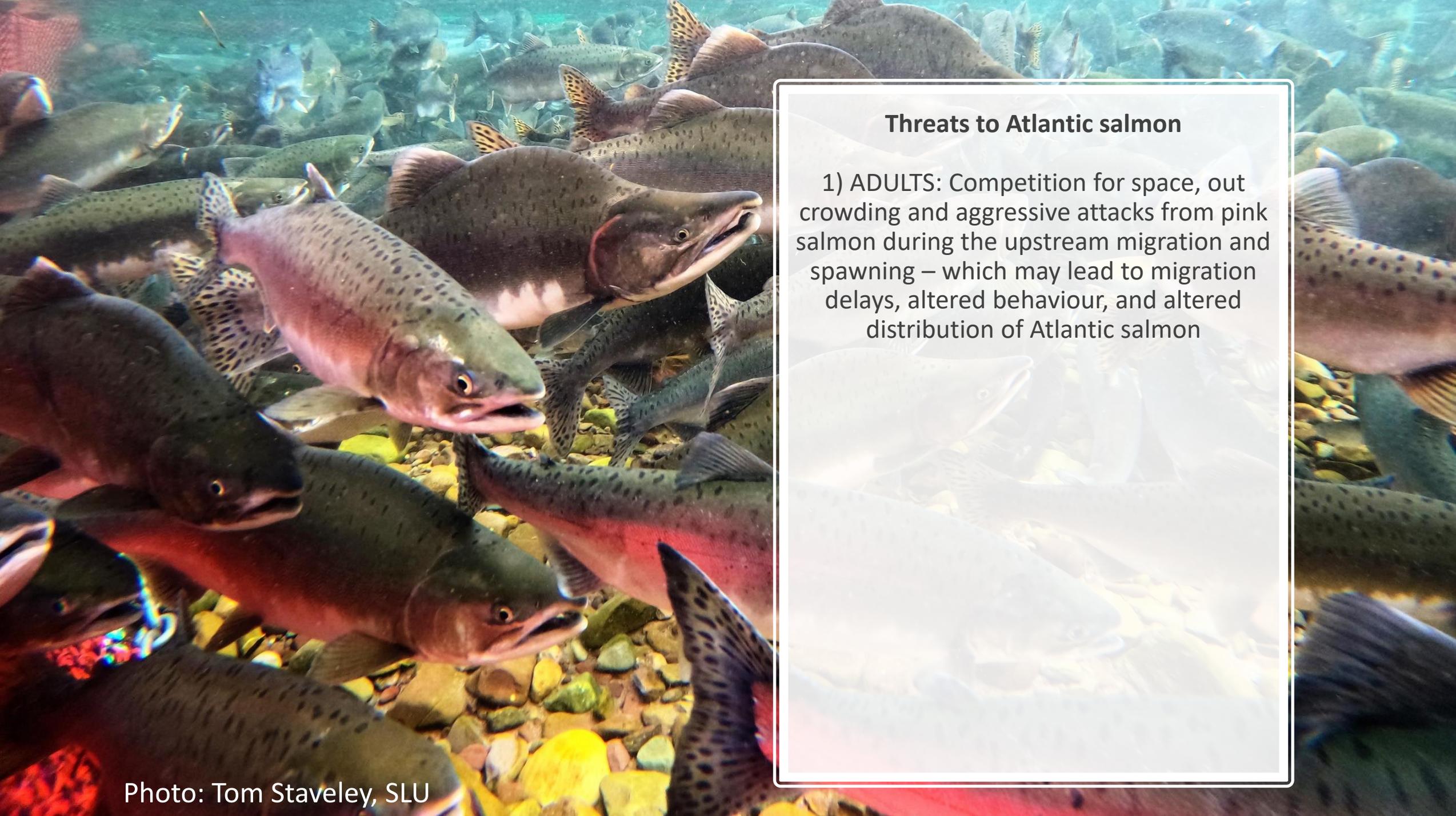
Photos: Eva B. Thorstad





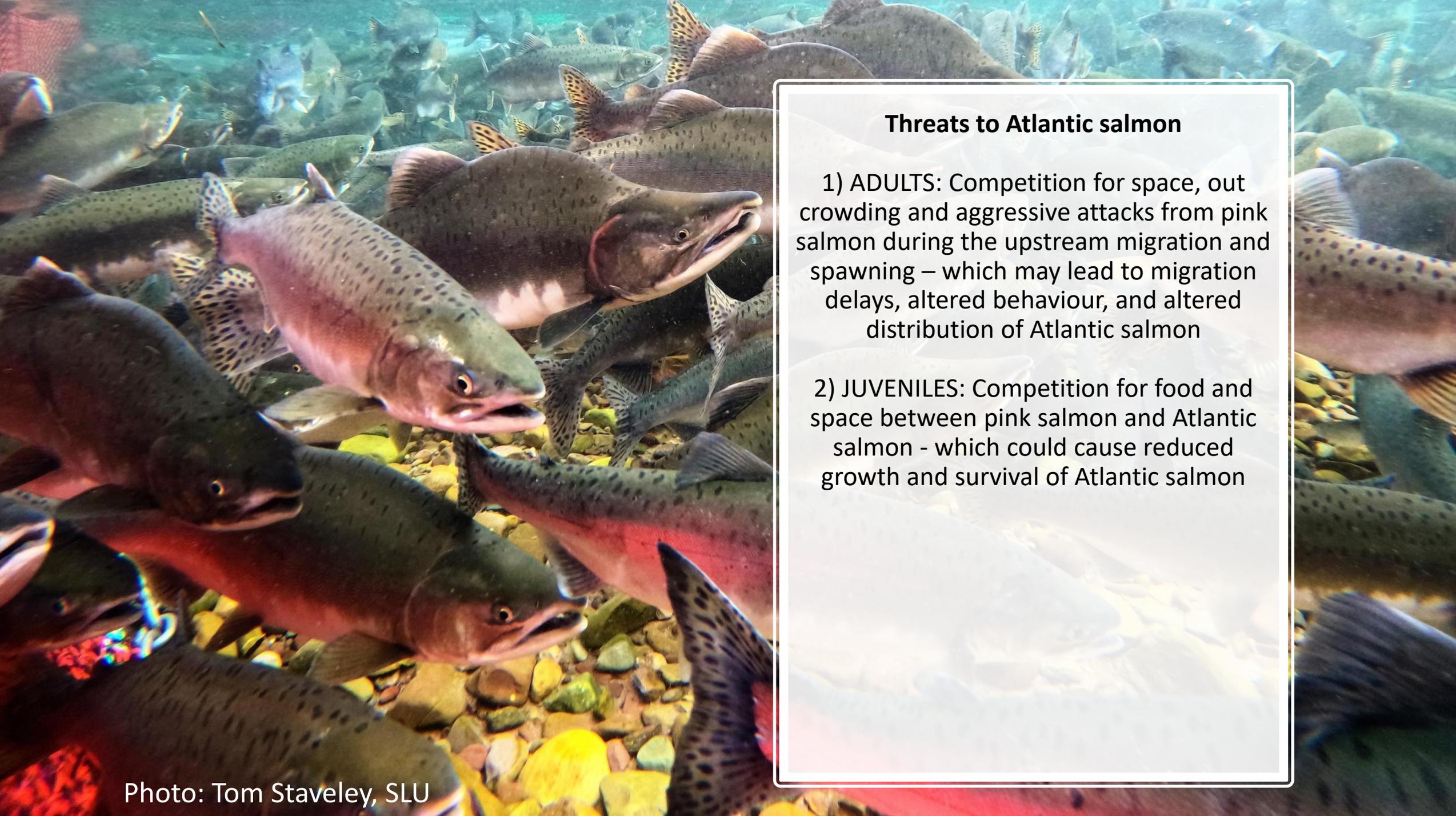
Conclusions

Photo: Tom Staveley, SLU



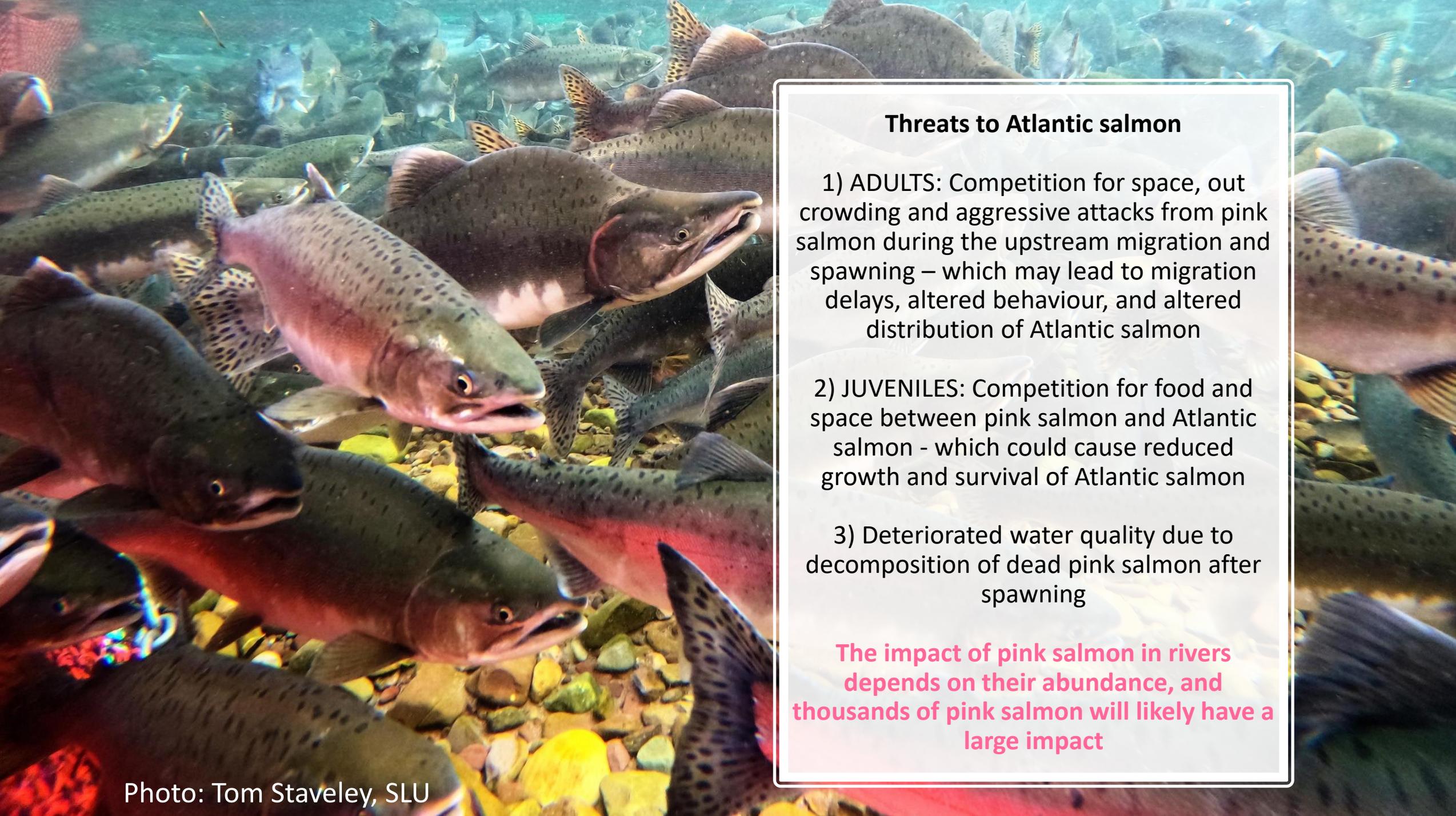
Threats to Atlantic salmon

1) ADULTS: Competition for space, out crowding and aggressive attacks from pink salmon during the upstream migration and spawning – which may lead to migration delays, altered behaviour, and altered distribution of Atlantic salmon



Threats to Atlantic salmon

- 1) ADULTS: Competition for space, out crowding and aggressive attacks from pink salmon during the upstream migration and spawning – which may lead to migration delays, altered behaviour, and altered distribution of Atlantic salmon
- 2) JUVENILES: Competition for food and space between pink salmon and Atlantic salmon - which could cause reduced growth and survival of Atlantic salmon



Threats to Atlantic salmon

- 1) ADULTS: Competition for space, out crowding and aggressive attacks from pink salmon during the upstream migration and spawning – which may lead to migration delays, altered behaviour, and altered distribution of Atlantic salmon
- 2) JUVENILES: Competition for food and space between pink salmon and Atlantic salmon - which could cause reduced growth and survival of Atlantic salmon
- 3) Deteriorated water quality due to decomposition of dead pink salmon after spawning

The impact of pink salmon in rivers depends on their abundance, and thousands of pink salmon will likely have a large impact

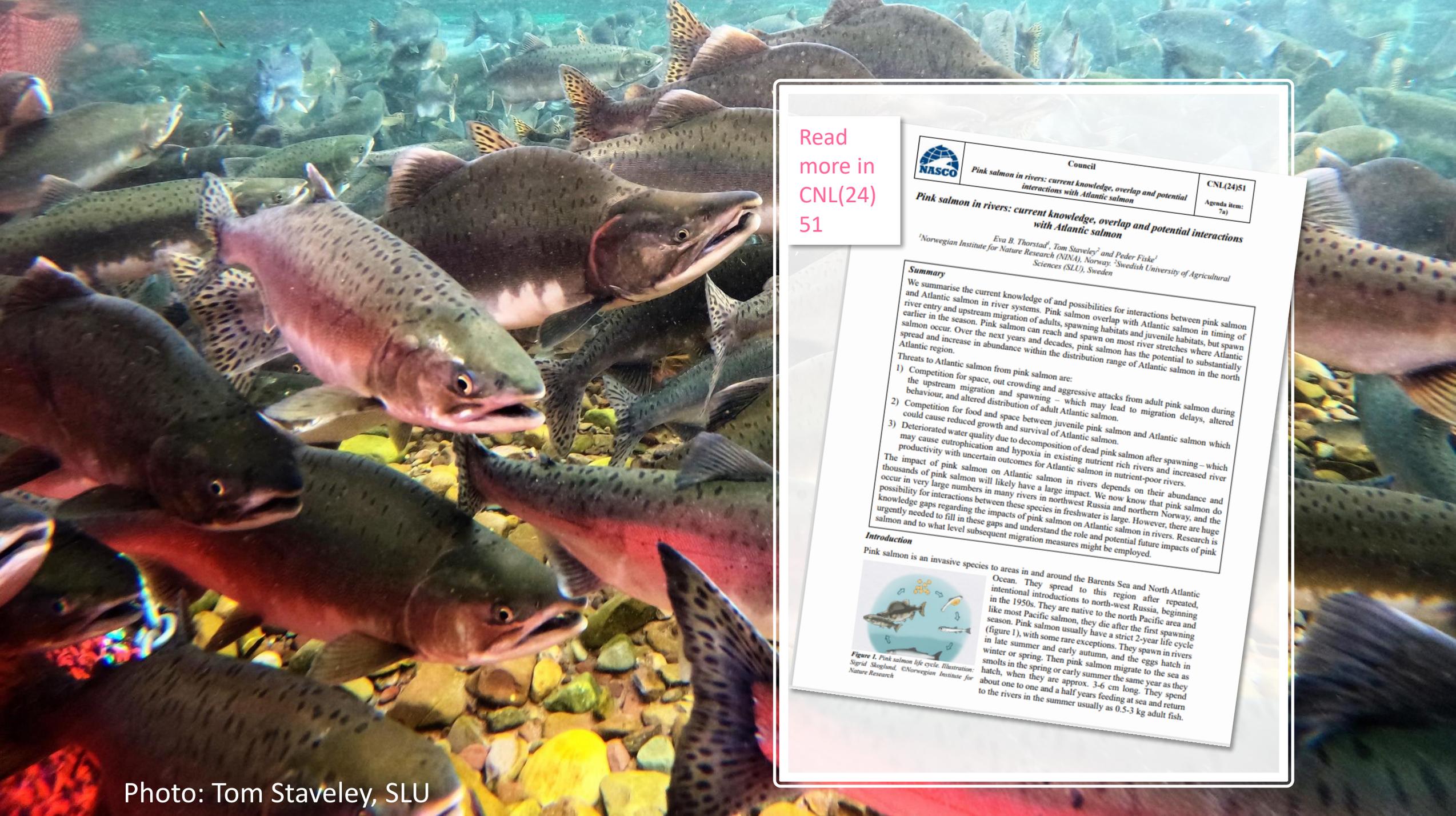


Over the next years and decades, pink salmon has the potential to substantially spread and increase in abundance within the distribution range of Atlantic salmon



Huge knowledge gaps
regarding the impacts of
pink salmon on Atlantic
salmon

Research is urgently needed to fill in
these gaps and understand the role
and potential future impacts of pink
salmon



Read
more in
CNL(24)
51



Council
Pink salmon in rivers: current knowledge, overlap and potential interactions with Atlantic salmon

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Agenda item:
7a)

Pink salmon in rivers: current knowledge, overlap and potential interactions with Atlantic salmon

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Summary

We summarise the current knowledge of and possibilities for interactions between pink salmon and Atlantic salmon in river systems. Pink salmon overlap with Atlantic salmon in timing of river entry and upstream migration of adults, spawning habitats and juvenile habitats, but spawn earlier in the season. Pink salmon can reach and spawn on most river stretches where Atlantic salmon occur. Over the next years and decades, pink salmon has the potential to substantially spread and increase in abundance within the distribution range of Atlantic salmon in the north Atlantic region.

Threats to Atlantic salmon from pink salmon are:

- 1) Competition for space, out crowding and aggressive attacks from adult pink salmon during the upstream migration and spawning – which may lead to migration delays, altered behaviour, and altered distribution of adult Atlantic salmon.
- 2) Competition for food and space between juvenile pink salmon and Atlantic salmon which could cause reduced growth and survival of Atlantic salmon.
- 3) Deteriorated water quality due to decomposition of dead pink salmon after spawning – which may cause eutrophication and hypoxia in existing nutrient rich rivers and increased river productivity with uncertain outcomes for Atlantic salmon in nutrient-poor rivers.

The impact of pink salmon on Atlantic salmon in rivers depends on their abundance and thousands of pink salmon will likely have a large impact. We now know that pink salmon do occur in very large numbers in many rivers in northwest Russia and northern Norway, and the possibility for interactions between these species in freshwater is large. However, there are huge knowledge gaps regarding the impacts of pink salmon on Atlantic salmon in rivers. Research is urgently needed to fill in these gaps and understand the role and potential future impacts of pink salmon and to what level subsequent migration measures might be employed.

Introduction

Pink salmon is an invasive species to areas in and around the Barents Sea and North Atlantic Ocean. They spread to this region after repeated, intentional introductions to north-west Russia, beginning in the 1950s. They are native to the north Pacific area and season. Pink salmon usually have a strict 2-year life cycle (figure 1), with some rare exceptions. They spawn in rivers in late summer and early autumn, and the eggs hatch in winter or spring. Then pink salmon migrate to the sea as smolts in the spring or early summer the same year as they hatch, when they are approx. 3-6 cm long. They spend about one to one and a half years feeding at sea and return to the rivers in the summer usually as 0.5-3 kg adult fish.



Figure 1. Pink salmon life cycle. Illustration: Sigrid Skoglund, ©Norwegian Institute for Nature Research



Thank you for listening!

Photo: Tom Staveley, SLU