

Assessment of the risk to Norwegian biodiversity and aquaculture from spread and establishment of Pink salmon

Background

Pink salmon (*Oncorhynchus gorbuscha*) is an anadromous salmonid with a natural distribution in the Northern Pacific Ocean, from the Sacramento River in California and northwards to Makenzie River in Canada. On the Asian-Pacific Coast, there is natural populations of pink salmon from the Jena-, and Lena- rivers in arctic Russia in the North, to North Korea in the South. Pink salmon was for the first time introduced to the Western parts (White Sea and Barents Sea) of Russia in 1956, in four rivers. The species spread rapidly, and in 1960 more than 76,000 individuals were recorded in 23 rivers within Russian territories. During the summer and spring periods of 1960, Pink salmon was also caught over a large area of the North Atlantic. In Norway, the species was registered as far south as Jæren, and a total of 20-25 tone was caught in Norway, mainly in Finnmark.

Between 1961 and early 2000, there were only a few registered observations of Pink salmon in Norway. Since then there has been a gradual increase, with the majority of the observations coming from Finnmark. In 2007-2008 the first registered spawning of Pink salmon was recorded in Jakobselv in East Finnmark.

By 2017, the species had spread further south into the Atlantic than what had previously been recorded for this species. Pink salmon was found in large quantities all along the Norwegian coast, but also in large parts of continental Europe. Spawning individuals have been recorded in many rivers in Eastern Finnmark, but whether these represent self-sustaining populations remains unknown. Because of this increase in migrating Pink salmon, a registration scheme was initiated and a total of 6,170 Pink salmon was caught and registered in 2017. An additional 5,285 individuals were recorded from direct observations and cameras in fish ladders the same year.

Over the last few decades there has been a significant increase in farming of Atlantic salmon (*Salmo salar*) outside the Kola peninsula, and based on this, a great concern is that migrating Pink salmon may introduce parasites and infectious diseases from these farms to Norwegian territories, including aquaculture and populations of wild Atlantic salmon.

Pink salmon has a two-year life cycle, and the smolt migrate to sea shortly after hatching in the spring. Direct competition for food with Atlantic salmon and trout has thus not been expected. However, recent research from Russia suggest that the migrating smolt scavenges the riverbed for food on their way out to sea. It is therefore unclear which consequences an increased population of Pink salmon will have on native species.

Pink salmon is assessed as having "high ecological risk" on the Norwegian Biodiversity Information Centre's list of alien species.

Both in Norway and in other countries, several different methods (snorkeling, harpooning, and net fishing) have been tested in order to stop the Pink salmon from migrating up the rivers, and thus prevent further spread and establishment. However, the efficiency of these methods as well as their impact on native species remain unknown.

Terms of reference

The Norwegian Environment Agency requests the Norwegian Scientific Committee for Food and Environment to:

- 1) Identify potential hazards associated with increasing amounts of pink salmon (regardless of establishment) in Norwegian waters.
- 2) Identify areas and habitats that are best suited for, and thus most vulnerable to, spread and establishment of pink salmon
 - a. under current climate conditions.
 - b. during the next 50 years (given different scenarios for climate change).
- 3) Assess the consequences of spread, and potentially establishment, of pink salmon in Norwegian rivers on
 - a. biodiversity in Norway
 - b. aquaculture species (i.e., Atlantic salmon)
 - c. productivity of native salmonid populations
- 4) Assess the probability for pink salmon to
 - a. regularly spread to Norwegian waters.
 - b. establish self-sustaining populations in Norway.
 - c. introduce pathogenic agents to wild and farmed fish in Norway.
 - d. have other negative impacts on biodiversity in Norway (identified under ToR #1).
- 5) Characterize the risk of negative impact from spread, and potentially establishment, of Pink salmon in Norway for
 - a. Biodiversity in Norway
 - b. aquaculture species (i.e., Atlantic salmon)
 - c. productivity of native salmonid populations
- 6) Assess various mitigation measures to prevent spread and establishment of pink salmon in Norway, including the risk of negative impacts on native species associated with these measures.

General remarks

The Norwegian Environment Agency asks that the time frame for the risk assessment of adverse effects on biodiversity should be 50 years, or five generations for species with a generation time of more than 10 years. This is in accordance with the time perspective considered by the Norwegian Biodiversity Information Centre.

If there is data to suggest density dependent factors, that is that the species only becomes a problem when it reaches a particular population size or density, this should be included in the assessment.

Biodiversity is defined as "ecosystem and species variability and intra-species genetic variability, and the ecological relationships between ecosystem components" (Section 3, letter c in the Nature Diversity Act). The species ability to survive in Norwegian climate, the possible impact on ecosystems and other species, in addition to the risk associated with hitchhiking organisms, should be presents as part of the risk assessment for adverse effects on biodiversity.

Known effects on ecosystem services should be mentioned in the report, even though this is not part of the risk assessment for biodiversity and aquaculture.

formaterte: spellingerror, Skrift: (Standard) Calibri, (asiatisk) Calibri, Skriftfarge: Tekst 1, Skriftype for kompleks skrift: Calibri, Engelsk (USA)

formaterte: spellingerror, Skrift: (Standard) Calibri, (asiatisk) Calibri, Skriftfarge: Tekst 1, Skriftype for kompleks skrift: Calibri, Engelsk (USA)

Formatert: Listeavsnitt, Nummerert + Nivå: 2 + Nummeringsstil: a, b, c, ... + Start på: 1 + Justering: Venstre + Justert ved: 0.99" + Innrykk ved: 1.24"

formaterte: spellingerror, Skriftfarge: Tekst 1, Engelsk (USA)

formaterte: spellingerror, Skriftfarge: Tekst 1, Engelsk (USA)

The risk assessment is to be written in English, with an extended summary in Norwegian. We ask that the report be published no later than xx.xx.2019

Recent publications and documents that is of relevance to the assignment

- Fangst av pukkellaks i Norge sommeren/høsten 2017 – datarapport pr. 15.02.2018
NINA-Notat 19.01.2018: 1-16
- Status of stocks and management of pink salmon fisheries in the Russian North
Fra internasjonalt pukkellaksseminar i Finnmark 08.02.2018: 1-5
- Is transplanted of the pink salmon successful in Russia? What factors have an impact on establishment of self-reproducing stocks.
Fra internasjonalt pukkellaksseminar i Finnmark 08.02.2018: 1-7
- Pink salmon and interaction with competitive species, epidemiology and other aspects
Fra internasjonalt pukkellaksseminar i Finnmark 08.02.2018: 1-7