

The Benefits and Impacts of Net-cage Salmon Farming: **An internet literature review**

Executive Summary

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The purpose of this review is to provide a broad overview of the benefits and negative impacts of net-cage salmon aquaculture in British Columbia. The Yukon Salmon Committee has an interest in BC's net-cage salmon farms based on annual permits that allow the export of Yukon River chinook salmon milt to a BC aquaculture operation. The YSC will be holding public consultations on this issue in 2004 and this review will help provide background information for the Committee and the general public on the issues.

Economic and social impacts

The economic benefits — and especially jobs — created by net-cage salmon farming in rural coastal areas where economic opportunities are few are the industry's greatest attraction for governments and communities.

In BC net-cage salmon farming supports 900 direct jobs (about 7.5 jobs per farm). Industry proponents claim that an additional 2,600 or more indirect jobs are supported by the industry; skeptics suggest that about 1,000 indirect jobs are supported by industry operations.

The massive increase in salmon farming worldwide over the past 20 years has pushed down the price of all salmon — farmed and wild — by approximately two thirds. The dropping prices have had a large negative impact on the economics of the wild salmon fishery.

Industry proponents argue that salmon farming (and other aquaculture) has the important worldwide social benefit of helping to reduce hunger. Skeptics point out that salmon is marketed as a luxury good, not a basic foodstuff, and that the industry relies on 4 pounds of other wild fish (anchovies, mackerel etc.) as feed to produce 1 pound of salmon.

Eight BC coastal First Nations are involved in salmon farming while other First Nations have opposed the industry due to fears of its negative environmental impacts.

Environmental impacts

There has been surprisingly little long-term scientific research done on many of the environmental issues around net-cage salmon farming. These issues will only be resolved satisfactorily when the research is done.

Industry advocates acknowledge some negative environmental impacts but question the level of long-term risk. They also argue that the effects of fish farms on wild salmon are no different from hatcheries and salmon-enhancement programs.

Parasites and disease

The diseases and parasites found on fish farms also occur in many — usually most — wild populations and are considered enzootic (indigenous) to BC. Fish farms do not create the diseases and parasites found at them. But high-density net-cage salmon farming likely creates conditions that amplify the risk of infection. Sea lice infestations have recently been a contentious topic in BC and illustrate the difficulty in proving direct links between salmon farming and outbreaks of parasites and disease in wild salmon stocks.

Exotic species: Atlantic salmon in fish farms

Net-cage salmon farming in BC began in the early 1970s with operations that farmed Pacific salmon, first coho and then chinook. But by the late 1980s, Atlantic salmon had displaced the Pacific as the most commonly farmed fish in BC because they have been selected and bred to be more docile, they grow faster, and they spawn over a longer period. Pacific salmon now make up approximately 14% of farmed salmon in BC with chinook salmon alone totalling about 12% of all farmed salmon and coho totalling about 2%.

Escapes of Atlantic salmon and the possible implications for wild Pacific salmon have long been a concern in BC. Industry proponents have argued that escaped Atlantic salmon are unable to survive long in the wild, compete successfully against their wild Pacific cousins, or successfully spawn. However, the discovery of juvenile Atlantic salmon in the wild demonstrates that farmed salmon can escape and survive in salt water, migrate to fresh water and spawn successfully, and that their offspring can also survive in fresh water.

Escapes of farmed Pacific salmon and genetic diversity

Unlike farmed Atlantic salmon, farmed Pacific salmon can interbreed with wild Pacific salmon. Many believe this threat to the genetic integrity of wild Pacific salmon stocks is far greater than the threats associated with escaped Atlantic salmon, particularly as interest in chinook salmon farming is increasing in BC.

The long-term viability of mixed wild and escaped farm salmon populations is unknown but the risk of hybridization is extreme: the fish are increasingly homogenized as the natural variations among the wild populations are lost, and the hybrids are ill-adapted to local conditions. However, some researchers have argued that Pacific salmon hatchery programs pose a greater risk to genetic adaptation than fish farms due to the sheer numbers of cultured fish released into the wild and the transfer of hatchery fish throughout the Pacific Northwest over many years.

Environmental impact of fish farm wastes

Waste from fish farms includes fecal material, urine, uneaten feed, chemical residues (from antibiotics, pesticides, net-cleaning agents) and marine organisms falling off the nets. The decomposition of the waste causes chemical changes in the sediments under the pens and can result in oxygen reduction or depletion. These changes in the seabed may affect the marine organisms naturally occurring in the area.

There is no consensus on how much impact fish farm waste has on the farm's local environment and how widespread or long-lasting that impact is. Some studies show that the seabed under the pens

returns to its natural state within weeks of a halt in production. Others show it takes much longer. Most studies demonstrate that the impacts on the seabed do not extend more than a few hundred metres from the pens. Much appears to depend on the location of the pens and on their maintenance.