

Dear Mr. Austin,

The Coastal Alliance for Aquaculture Reform's science board is pleased with the appointment of the Special Committee on Sustainable Aquaculture, and is glad to learn that the Committee has begun a series of public meetings along BC's coast.

Independent scientists and academics in Europe and British Columbia (BC) have produced overwhelming evidence identifying several risks salmon farms pose to wild salmon. Parasites and escaped salmon are among the most immediate of these threats. We herein summarize the most prominent scientific literature on these issues, and provide recommendations to the Committee.

#### PARASITES

Several studies have correlated local salmon farming with lethal sea lice infestations on wild juvenile salmonids (1-4), including a recent study published in the Proceedings of the Royal Society of London B whose findings provide definitive proof (5). So severe have these infestations been on wild salmon, that population declines of 98% have been recorded in high farm density areas on BC's coast (6). While these parasites occur naturally in BC waters, the actual prevalence of lice found on juveniles in areas remote from salmon farms (Skeena region) is 2.7% (7), compared to >90% in high farm density areas (Broughton Archipelago) (2). Wild fish are highly mobile and disperse over wide areas, minimizing the opportunities for parasites to find a host. However, sea lice thrive in the factory-like conditions of salmon farms (8-9), where up to a million fish are densely packed at any one site. Repeated infestations are transforming the farms into year-round sea lice reservoirs (an unnatural occurrence) (10). As wild juvenile salmonids migrate past farms on their seaward way, they swim through swarms of sea lice and become lethally infected. A single louse is enough to kill a juvenile salmonid (11).

This is not a new story. Sea lice infestations on wild salmon have closely followed the development of the salmon farming industry, globally. Dr. Patrick Gargan (the senior research scientist with Ireland's central fisheries board) warned BC of the impact sea lice had on populations of wild salmon and sea trout in Ireland and other European countries in 2000 (12). Moreover, many studies have correlated salmon farming with sea lice infestations on wild juvenile salmonids in Europe (e.g., Scotland [13]; Ireland [14]; Norway [15-16]). The scientific community regards these studies as irrefutable: the most thorough of which sampled a total of 3166 sea trout from 42 estuaries throughout the entire Irish coastline over 5 years (14). This study found significantly higher sea lice infestations of juvenile sea trout in estuaries containing lice-infested farm salmon. There are countless other publications correlating salmon farms with sea lice infestations, and the subsequent declines of wild salmon and sea trout (17-28). Yet no published articles have held up to scientific scrutiny that suggest infestation sources other than fish farms.

Despite public denial by government officials of sea lice transfer from farm to wild salmon, Fisheries and Oceans Canada researchers were among 25 scientists to agree that, based on the weight of evidence:

- 1) Salmon Farms contribute sea lice to wild fish;
- 2) In Central BC there are more sea lice on wild fish near farms;

- 3) Sea lice can kill juvenile fish even at low infestation levels and evidence suggests that levels that appear to be lethal are found near fish farms;
- 4) There is suggestive evidence of population impacts [on wild salmon] (29).

#### ESCAPES

Farmed salmon have been escaping from net-pens since 1987 due to the precarious nature in which they are kept. Although the true number of escapes is unquantifiable, more than 400,000 Atlantic salmon are reported to have escaped (30), in addition to unaccounted-for escapes estimated at more than 1 million (31). Escaped Atlantic salmon have been found as far north as coastal Alaska (32), are now found in all major drainages on Vancouver Island (33), compete directly with wild salmon for habitat and food (34-38), predate on wild salmon fry and eggs (39), and are successfully reproducing in wild salmon spawning rivers (40-41). While there is no hard evidence that wild-spawned Atlantic salmon juveniles are capable of going to sea and returning as adults to complete their life cycle, there is also no evidence to suggest they won't. Based on the weight of scientific evidence, escaped Atlantic salmon pose a significant risk of colonizing all wild salmon spawning rivers along BC's coast.

#### OTHER IMPACTS

Impacts on wild salmon and their marine environment as a result of salmon farming in BC, extend far beyond parasite infestations and escaped exotic fishes. Scientists have revealed the transfer of diseases from Atlantic salmon to wild Pacific salmon (42-43), aversions of marine mammals to regions where farms disperse high amplitude sound (44), impacts on Pacific Herring (45), and elevated mercury levels in rockfishes near farms (46). Many studies in Europe have also identified extensive nutrient and chemical contamination on benthic communities beneath farm pens (47-52). Given time and a focused research priority, the actual extent of habitat degradation caused by salmon aquaculture in BC will be highlighted.

The committee must realize that research results are always suggestive, never conclusive, and it is the weight of evidence from several studies combined that is important. This weight of evidence has enabled the scientific community to conclude that sea lice from farms are infecting wild fish, escaped Atlantic salmon are competing with wild Pacific salmon, and salmon farming in BC is significantly impacting wild salmon and their marine environment.

#### RECOMMENDATIONS STEMMING FROM THE SCIENCE

We, as the science panel for the Coastal Alliance for Aquaculture Reform, believe this weight of evidence is sufficiently robust to invoke precautionary actions with regards to salmon aquaculture in BC. We respectfully request that your committee make the following recommendations in your May 2007 report:

- 1) No new net-cage permits for salmon farms;
- 2) Clear migration and rearing areas for juvenile wild salmon;
- 3) Transition industry to closed tanks
  - a) require all new finfish licenses to use closed tank technologies,
  - b) establish a fund for closed tank innovation and implementation,

c) formally support federal funding and provide provincial funding for Agrimarine Middle Bay commercial demonstration.

We feel there should be no new net-cage permits issued for salmon farms on BC's coast, especially in farm free areas such as the central and north coast. Areas such as the Skeena, Kitimat, Bella Coola, and Bella Bella, are wild salmon strongholds, where coastal communities rely heavily on the wild salmon fishery. Open net-cage salmon farms place these salmon populations at risk of parasite infection, escaped Atlantic salmon colonization, and disease transfer. At minimum, scientists need to have a more thorough understanding of where essential salmon habitat exists for new areas proposed for salmon aquaculture expansion. Very little information is presently known for the entire central and north coast with regards to important salmon habitat, and this base-line ecological information is fundamental towards ensuring wild salmon are protected for future generations.

We strongly recommend that migration routes and rearing areas for juvenile wild salmon remain free of salmon farms. The small body size of juvenile wild salmon leave them highly vulnerable to parasite infection during March to June, as they migrate through farm areas on route to the open ocean. As an interim measure, and at minimum, all salmon farms that presently occupy migration and/or rearing areas must be fallowed of farm fish over 1 year in age during March to June. Farm fish over this age carry significantly higher levels of sea lice, and the present use of SLICE or other chemical therapeutants is simply not an adequate, or sustainable, method of protection. Fallowing is a proven practice shown to significantly reduce lice levels in farm areas, though we do advocate for its adherence to strict scientific guidelines.

Closed tanks are the only viable way we can ensure wild salmon and their marine habitat are safe from the salmon aquaculture industry. As stated above, the present use of open net-pens enables parasites and diseases to transfer from farm to wild fish, exotic fishes to escape, and contaminants to accumulate in the marine environment. All present local ecological concerns can be addressed with the appropriate transition of the salmon farming industry to closed tanks. We suggest the provincial government provide funding for pilot projects that focus on closed tank innovation and implementation, and formally support federal funding for Agrimarine Middle Bay commercial demonstration. It is time for the government to lead the salmon aquaculture industry towards a more ecologically sound approach to raising fish.

Thank you for considering our concerns.

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