Atlantic Salmon Federation  Fédération du Saumon Atlantique

November 1, 2021

The Honourable Brad James, M.L.A.
Chair of Law Amendments Committee
Province House,
Halifax, Nova Scotia

Dear Sir,

I am writing to you and the law amendments committee with respect to Bill No 57: Environmental Goals and Climate Change Reduction Act as a Nova Scotia citizen and on behalf of the Atlantic Salmon Federation (ASF).

ASF would like to express our support of this Bill as it is a very positive step forward for Nova Scotia. As you are aware we are in midst of a climate crisis that is threatening our species and important resources. By introducing this legislation, the NS Government is recognizing the severity of the crisis and is making serious commitments to address the situation. We are particularly happy to see the inclusion of water in the commitment to protect 20% of lands and water by 2030, the commitment to update the provincial environmental assessment process, and the commitment to implement an ecological forestry approach on Crown Lands. We are also glad that effort is being made in this bill "to promote and support climate change education and sustainability through the knowledge and teachings of Netukulimk and environmental stewardship with ongoing curricula renewal, the development of inclusive and accessible resources and professional learning that incorporates diversity and honours Etuaptmumk"

While we are overall supportive of the Bill, we would like to see several clarifications or amendments made prior to its final approval. The commitment to move away from coal to renewable energy is admirable but we are concerned as some forms of renewable energy, such as certain forms of hydroelectric and tidal power, can be very problematic for aquatic species. We would like to see that the commitment to renewable energy be better defined to ensure that these energy sources are ecologically sustainable.

We also applaud the government's commitment in this Bill to improve the aquaculture licensing process and provincial regulations to better consider environmental impacts. However, we are very concerned and disappointed that there is no language in the Bill to support moving away from the practice of open net pen aquaculture. Open net pen aquaculture has been scientifically shown to have negative impacts on wild Atlantic Salmon and coastal ecosystems. Other jurisdictions have recognized these impacts and are moving to remove this practice from their waters as part of their

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environmental and sustainability goals. We feel strongly that open net pen aquaculture cannot be considered low-impact sustainable aquaculture like certain land based and closed containment alternatives. We would like to see the Bill revised to include a commitment to transition away from open net pen aquaculture and to support other more environmentally sustainable aquaculture operations, several of which already exist in NS.

We were also disappointed that the Bill did not have any specific language pertaining to high impact industries such as open pit gold mining. These industries pose significant and persistent risks to aquatic life and are huge emitters of green house gases. We feel that their omission from the Bill runs counter to the commitments to reduce green house gases and move to net zero emissions. Given the potential impacts of this industry we would like to see the Bill express goals for the mining industry like it does for the forestry and energy sectors.

The commitment to implement an ecological forestry approach and the 2018 Lahey report are strong commitments that we are happy to see included in this Bill. However, we do not understand why there is a need for a two-year delay in implementation on Crown lands. We were also surprised that the Bill did address forestry on private lands. Approximately 70% of all land in NS is privately owned, so to make significant progress towards environmental goals and reduce climate change impacts, effort need to be made to address forestry on private lands. We would like this Bill to be revised to reflect this fact and to commit to developing a pathway to address forestry on private lands.

Despite our concerns and reservations, we want to emphasis that we are supportive of this Bill and are pleased that the NS Government is making serious commitments to protects our resources and address climate change. Thank-you for showing leadership on this issue. If you have any questions about this submission, then please do not hesitate to reach out to me.

Yours sincerely,

Kris Hunter
Program Director for Nova Scotia and Prince Edward Island
Atlantic Salmon Federation

cc
Honourable Tim Halman, Minister of Environment and Climate Change

About ASF:

The Atlantic Salmon Federation (ASF) is an international conservation organization established in 1948. The Federation is dedicated to the conservation, protection and restoration of wild Atlantic salmon and the ecosystems on which their wellbeing and survival depend.

ASF's headquarters are in St. Andrews, New Brunswick, Canada, with regional offices in each of the Atlantic provinces, Quebec, and Maine.

ASF has a network of six regional councils (New Brunswick, Nova Scotia, Newfoundland and Labrador, Prince Edward Island, Quebec, and Maine), which cover the freshwater range of wild Atlantic salmon in Canada and the United States.

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Overview of the Impacts of Salmon Farms on Wild Atlantic Salmon Populations

Growing domesticated salmon in sea cages in areas where there are wild Atlantic salmon invariably has negative impacts on local wild populations. These negative impacts have been well established by scientific studies (ICES 2016; Hutchinson 2006; Ford and Myers 2008). Salmon farms have been shown to impact wild Atlantic salmon populations in several ways which are briefly summarized here:

- **Farmed salmon escape and interbreed with wild populations**. Farmed Atlantic salmon have been selectively bred to improve commercially important traits (i.e. growth, feed utilization, filet quality) which results in them being poorly adapted to the natural environment (Solberg et al. 2013; Wacker et al. 2021). When farmed salmon escape and interbreed with wild salmon, the resulting offspring are genetically inferior to wild salmon and are therefore less fit for life in the wild (Flemming et al. 2000; McGinnity et al. 2003; Bourrett et al. 2011; DFO 2013b).

  Escaped farmed salmon have been observed in rivers in all regions where salmon farming occurs (Thorstad et al. 2008). Some estimates suggest the annual number of escapes from salmon farms in the North Atlantic may outnumber the total population of adult wild Atlantic salmon (Glover et al. 2017). Large-scale studies in Norway (Glover et al. 2013; Karlsson et al. 2016) and Canada (Wringe et al. 2018; Bradbury et al. 2020a) have demonstrated the significant extent to which interbreeding can occur when salmon farming overlaps with wild populations.

  The viability and recovery of wild Atlantic salmon populations is threatened by the introduction of genetic material (i.e., genetic introgression) from farmed fish (Glover et al. 2020; Wacker et al. 2021). Long-term population level consequences of introgression include erosion of genetic diversity, reduced productivity, decreased resilience, and declining abundance (Hindar et al. 2006; Glover et al. 2017; Skaala et al. 2012, 2019; Sylvester et al. 2019). Several studies have demonstrated a decrease in the total productivity of wild salmon following introgression of farmed salmon genes (Fleming et al. 2000; McGinnity et al. 1997; McGinnity et al. 2003; Wacker et al. 2021).

- **Sea lice proliferate in salmon farms and are transmitted to wild fish.** Sea lice are a naturally occurring parasite on wild Atlantic salmon. When farmed salmon are stocked into open net pens they pick up sea lice from the environment which leads to frequent infestations and outbreaks within the farm. This increases the abundance of sea lice in the local area which has been demonstrated to increase the abundance of lice on wild salmon (Frazer 2009) and to increase mortality (especially of smolts) in wild populations (Krkosek et al., 2007; Thorstad et al. 2015).

  Numerous studies have demonstrated a link between salmon aquaculture and sea lice infestations on wild salmonids (Helland et al. 2012, 2015; Middlemas et al., 2010, 2013; Serra-Llinares et al. 2014). Elevated levels of sea lice on wild salmonids have been found up to 30km from salmon farms (Thorstad et al. 2015). Smolt mortality attributable to salmon lice has been demonstrated to result in a significant reduction in adult returns (Shepherd and Gargan 2017) and to influence the achievement of conservation requirements for affected stocks (Gargan et al. 2012, Krkošek et al. 2013; Shepherd and Gargan 2017). Sea lice infestation also imposes sub-lethal physiological impacts, including reduced swimming speed (Wagner et al., 2003), osmoregulatory failure (Grimnes and Jakobsen, 1996;) and slower post-smolt growth (Skilbrei and Wennevik, 2006; Skilbrei et al., 2013).

- **Salmon farms and escaped fish have negative ecological interactions with wild salmon.** These interactions include interfering with mating and competition for food and space (Naylor et al. 2005) and escapees spreading parasites and diseases to wild fish (Naylor et al. 2005; Krkosek et al., 2006; Krkosek et al., 2007). These interactions can lead to changes in productivity of native

salmon populations through processes affecting growth and survival (Lacroix and Flemming, 1998; Hindar and Flemming, 2007).

- **Diseases and pathogens proliferate in salmon farms and are transmitted to wild fish.** The Atlantic salmon farming industry has the capacity to play a central role in transportation and transmission of pathogens to wild salmon (Garseth et al. 2013). Transmission of pathogens and diseases from aquaculture to wild fish can occur through populations that are infected at the hatchery source, through infected escapees, and through wild fish migrating or moving within plumes of an infected pen or disease outbreak (Madhun et al. 2015; Naylor et al. 2005; Johnsen and Jensen 1994). There is a continual emergence of viruses in net-pen salmon aquaculture (Kibenge 2019) prompting increasing concern about the impacts of these diseases on wild Atlantic salmon populations and other marine wildlife (Bouwmeester et al. 2021).
- **Salmon farms alter the local environment thereby changing the selective pressures to which locally-adapted wild populations are subject.** Changes in selective pressures can lead to decreased survival, reductions in population size, increased genetic drift, and a lowering of long-term adaptive capacity in wild populations (Ferguson et al. 2007; Verspoor et al. 2015; DFO 2013b). Bradbury et al. (2020b) identified several examples of altered selective landscapes and genetic changes in wild salmon resulting from ecological processes associated with salmon farming, predominately through pathogen or parasite transmission leading to reductions in wild population abundance.

Collectively, these impacts have been correlated with significant declines in wild salmon populations. A global study by scientists at Dalhousie University found a reduction in survival or abundance of wild populations (of both salmon and sea trout) of more than 50% per generation on average, associated with salmon farming (Ford and Myers 2008). Such declines have significant social and economic impacts as recreational, commercial, and First Nations fisheries are reduced or eliminated (Wiber 2012; Naylor et al. 2005). Naylor et al. (2005) conclude that risks to wild populations, ecosystems, and society are highest where salmon are farmed in their native range, when large numbers of salmon are farmed near small natural populations, and when exotic pathogens are introduced with farmed fish.

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