

Our File: 147371

August 31, 2016

VIA E-MAIL/COURIER

Office of the Premier

Honourable Dwight Ball
4th Floor, West Block Confederation Building
P.O. Box 8700
St. John's, NL A1B 4J6

Honourable Perry Trimper

Minister, Environment and Climate Change
4th Floor, West Block Confederation Building
P.O. Box 8700
St. John's, NL A1B 4J6

Dear Sirs:

**Re: Placentia Bay Atlantic Salmon Aquaculture Project (reg 183)
Release from Environmental Assessment (the "Placentia Bay Aquaculture
Project") – Section 107 Environmental Protection Act (EPA) – Appeal by
The Atlantic Salmon Federation (ASF)**

Enclosed herewith please find an Appeal pursuant to Section 107 of the EPA made by the ASF concerning the Placentia Bay Aquaculture Project.

Should you have any questions or comments about this appeal, please do not hesitate to contact the undersigned.

Yours very truly,



Michael J. Crosbie, QC

MJC/kp
Encl.



August 31, 2016

Honourable Perry Trimper
Minister, Environment and Climate Change
4th Floor, West Block Confederation Building
P.O. Box 8700
St. John's, NL A1B 4J6

Dear Minister Trimper:

Pursuant to s.107 of the Environmental Protection Act (EPA) we are writing to appeal the release the Placentia Bay Atlantic Salmon Aquaculture Project (reg. 1834) from environmental assessment. We are appealing on the grounds that the decision to allow this project to proceed without ordering an environmental impact statement is contrary to the principles, purpose, and requirements of the EPA and is therefore unreasonable and unlawful. We outline our argument in the paragraphs below.

The Environmental Protection Act

The purpose of the NL Environmental Protection Act (EPA) (Part X) is “to facilitate the wise management of the natural resources of the province and to protect the environment and quality of life of the people of the province” by ensuring that development projects proceed in an environmentally acceptable manner. The Crown is bound by the EPA (s.3.1), and in the case of conflict between the EPA and any other Act, the EPA prevails (s.4.1).

Decision options

The EPA requires any undertaking that may have an impact on the environment to be registered for environmental assessment. After an initial screening review, the EPA enables the minister (cabinet or courts) to decide on an appropriate response based on the circumstances. The EPA authorizes three options: a) release the project from further assessment; b) order an environmental preview report; or c) order an environmental impact statement (EIS). In the case of the Placentia Bay Aquaculture proposal, the least rigorous option was chosen and the project was released from further environmental assessment.

By what standard should the decision be evaluated?

Dunsmuir v. New Brunswick, 2008 SCC 9 demonstrates that the standard of review of an administrative outcome of this nature is reasonableness. “Reasonableness is concerned mostly with the existence of justification, transparency and intelligibility within the decision-making process and with whether the decision falls within a range of possible, acceptable outcomes which are defensible in respect of the facts and the law.” This definition implies that the evaluation becomes an “assessment of the range of options reasonably open to the decision maker in the circumstances” to “identify the outer boundaries of reasonable outcomes within which the decision maker is free to choose.” An unreasonable decision is

R. William Taylor – President

PO Box 5200 St. Andrews, NB Canada E5B 3S8 | PO Box 807 Calais, ME 04619-0807 USA

Tel 506 529 1034 | btaylor@asf.ca

one which is "*not supported by any reasons that can stand up to a somewhat probing examination*" (*Canada (Director of Investigation and Research) v. Southam Inc.*, 1997 1 SCR 748).

How are the circumstances surrounding the decision determined?

The circumstances surrounding the decision are created by the relevant information available at the time of the decision as well as the guidance provided by the EPA. The minister is expected to consider all credible sources of relevant information to make a fair and proper decision that is consistent with the purpose and direction provided by the EPA. Information sources include (but are not limited to): information provided by the proponent, information and advice provided by consulted government agencies, information obtained through the public consultation process, and available scientific information about the environment to which the project relates and/or about the activities proposed.

How is the relevancy of information determined?

The Environmental Assessment Regulations (EAR) provide significant guidance in determining the relevancy of information to the decision at hand. This guidance is in the form of specific conditions which must be met to demonstrate the reasonableness of each possible choice as well as 23 screening criteria which are to be used in determining whether those conditions are met (EAR s.23, s.24, s.25).

Our Argument

Considering the discussion above, it is our contention that:

1. The decision to release the undertaking from further environmental assessment does not meet the standard of reasonableness.
2. Given the circumstances and a proper application of the screening criteria, the only reasonable decision available was to order an environmental impact statement.
3. Because the undertaking was released without an environmental impact statement, the Environmental Protection Act has not been applied appropriately and its purpose to "protect the environment and quality of life of the people of the province and facilitate the wise management of the natural resources of the province" has therefore not been achieved.

We outline our arguments in support of each of these points below. Attachments A and B provide additional support for our argument in the form of detailed responses to each of the screening criteria (for release (EAR s.23) vs. EIS (EAR s.25)) contained in the Regulations as well as references to the scientific literature, where relevant.

1. The decision to release the undertaking from further environmental assessment does not meet the standard of reasonableness.

The EAR (s.23) set two conditions under which an undertaking can be released: (a) there are no environmental or public concerns; or (b) the environmental effects of the undertaking will be mitigated under an Act of the province or of Canada. The EAR provide 11 screening criteria to guide the decision as to whether releasing an undertaking is reasonable. Our analysis of each of those criteria indicates that this undertaking fails to meet all 11 of them; therefore, the decision is not defensible in respect to the facts or the law and cannot be justified given the information at hand. Our detailed analysis of those criteria is provided in Attachment A and summarized below:

a. There are no environmental or public concerns

There is clear evidence of both significant environmental and public concerns. The potential for this project to have significant negative impacts on wild salmon is supported by the large body of peer-reviewed scientific literature demonstrating, conclusively, that net pen salmon aquaculture impacts wild salmonids through a number of mechanisms. This is supported by the Newfoundland situation where recent science has demonstrated negative impacts from existing aquaculture operations on threatened south coast salmon stocks. Both DFO and COSEWIC acknowledge that aquaculture is a factor contributing to the decline of those stocks and threatening their future recovery. The proposed importation of triploid European strain salmon brings with it a new set of risks and potential impacts to those populations that are not clearly understood. DFO's review of this undertaking indicates that there are significant uncertainties and risks associated with this proposal and its potential impacts on wild salmon.

Likewise, this proposal has generated significant public opposition on the grounds that it will have unacceptable impacts on the environment and wild salmon populations of Placentia Bay. This opposition is readily observed in public and social media and has come from a wide cross-section of the public. Concern has also been expressed by a range of environmental groups both within and outside of the province. Undoubtedly, the department would have received a significant number of submissions through the public consultation process expressing these concerns.

Furthermore, the Miawpukek First Nation at Conne River have expressed concerns about this proposal, particularly the introduction of a non-native strain of salmon into the south coast waters of Newfoundland. However, the community has not been consulted by either the provincial or federal government, which they feel is inconsistent with current legislation and government policy.

Simply put, this undertaking will, among other things, introduce a new and potentially invasive strain of salmon into a fragile marine environment and a very fragile population of wild Atlantic salmon. Understanding the consequences of this decision and addressing the public's/First Nations' concerns - even if the prospect of ecosystem disruption is remote (which it is not) - is requirement under the EPA which was not met in this case.

b. The environmental effects of the undertaking will be mitigated under an Act of the province or of Canada.

Before receiving final approval, the undertaking must receive further permits, licenses, and approvals from the Provincial Department of Fisheries and Aquaculture (DFA) and Fisheries and Oceans Canada (DFO). These agencies are governed by the NL Aquaculture Act and Regulations and the Canadian Fisheries Act and Aquaculture Activities Regulations. However, there is strong evidence that the environmental effects of this project will not be mitigated under these Acts and Regulations for two broad reasons:

1. *These acts and regulations do not contain sufficient provisions to require the ministers of DFO/DFA to collect further information, develop mitigation measures, and design appropriate monitoring programs to ensure that the impacts of the project on wild salmon are mitigated.* Environmental protection is not contained within the stated purposes of the NL Aquaculture Act. Indeed, the Act lists development of the aquaculture industry in collaboration with the private sector and securing property rights of industry participants as its primary aims, which clearly prioritizes industry needs over environmental protection. Furthermore, a recent analysis conducted by Gardner Pinfold Consulting reveals that

compared to other jurisdictions, NL has some of the weakest aquaculture regulations in the north Atlantic with respect to protecting wild salmon. In particular, NL regulations are deficient in terms of: setting maximum sea lice loads; setting maximum number of escapes per license; limiting viral disease mortality and requiring a reduction plan; avoiding damage to the seafloor under cages; avoiding damage to critical habitats and sensitive species; maintaining water quality around the sea cage sites; publicly reporting sea lice loads, fish escapes, and disease outbreaks; and providing for meaningful public consultation and complaint resolution.

Likewise, the federal Fisheries Act contains only weak provisions to protect wild fish from the impacts of aquaculture. The Fisheries Act aims to prevent “serious harm” to fish which is narrowly defined as the death of fish or permanent alteration/destruction of habitat. However, most of the impacts from aquaculture occur without directly causing the death of fish (e.g., impacts from interbreeding, impacts from ecological interactions, etc.). Consequently, most of the expected impacts of this project on wild Atlantic salmon can not be mitigated by the Fisheries Act.

2. *These acts and regulations have not been sufficient to prevent previous net-pen aquaculture developments from significantly impacting wild salmon populations in NL.* There is a long and documented history of farmed salmon escaping from existing net pen operations in NL, and DFO and COSEWIC both conclude that aquaculture has contributed to the decline of salmon populations on the south coast. A recent study by DFO has found evidence of genetic introgression in south coast NL salmon populations, indicating that escaped farm salmon are interbreeding with wild fish. On a broader scale, there is a wealth of scientific information demonstrating that net pen salmon aquaculture and wild salmonids do not coexist without negative impacts on wild stocks, regardless of the regulations used to manage the industry. Indeed, the recent Gardner Pinfold analysis of aquaculture regulations indicates that even in jurisdictions with the highest regulatory standards (e.g., Norway) wild Atlantic salmon populations have suffered significant direct impacts from aquaculture.

A recent case involving three marine aquaculture proposals (shellfish) indicates that the NL Aquaculture Act and Regulations and the federal Fisheries Act and Aquaculture Activities Regulations are not considered to automatically mitigate the potential environmental impacts of aquaculture. For those undertakings an EIS was ordered, despite the fact that those farms would have to undergo a similar licensing and approvals process as the Placentia Bay salmon proposal. It is noted that those proposals are much smaller in scale than the Placentia Bay proposal, do not involve the importation of non-native animals, have no issues associated with animals escaping into the environment, and received significantly less public opposition. The decision to require an EIS for those projects sets an important precedent that seriously undermines any argument that the potential impacts of the Placentia Bay proposal will be mitigated by the remaining licensing and approvals process under provincial or federal Acts.

Conclusions

This undertaking does not meet the conditions or screening criteria for release as outlined in the EPA and EAR. There are clear concerns about the impacts of the project on wild Atlantic salmon and the broader environment, and a significant amount of public concern has been generated. The Aquaculture Act and the Fisheries Act (and the licensing and approval processes that they mandate) are not sufficient to mitigate the impacts that have been identified nor are they sufficient to further understand and

address the concerns of the public. Given the information available, the stated purpose of the EPA and the specific guidance provided by the EPA and EAR, the decision to release the project from further environmental assessment does not meet the standard of reasonableness because it cannot be justified or defended in respect to the facts and the law.

2. The only reasonable decision available was to order an Environmental Impact Statement.

The EAR (s.25) provide clear guidance as to when an Environmental Impact Statement (EIS) is required: *“Where the minister determines with respect to an undertaking that there (a) may be significant negative environmental effects; or (b) is of significant public concern, the minister shall require an environmental impact statement.”* The EAR (s.25) provide 9 screening criteria to guide the decision as to whether or not an EIS is required. Our analysis of each of those criteria indicates that this undertaking meets all of those criteria; therefore, the circumstances required an EIS to be ordered. Our detailed analysis of those criteria is provided in Attachment B and summarized below:

a. There may be significant negative environmental effects

As noted above and explained in more detail in Attachment A, there are clear and compelling scientifically-based reasons to believe that this undertaking will have significant negative impacts on wild Atlantic salmon and the broader environment. There are also clear and compelling reasons to believe that those impacts will not be mitigated by the remaining licensing and approvals processes as mandated under other Acts of the province or of Canada. This project involves the use of a number of new technologies (triploid European Atlantic salmon; lumpfish to control sea lice; new cage design) that have not been proven to perform as claimed by the proponent. These new technologies (especially the use of triploid and European strain fish) bring with them new and additional risks that are not well understood and have not been adequately assessed for compatibility with NL conditions or with the current licensing and approval process for aquaculture in NL.

This project will occur in an area which is identified and managed as an Ecologically and Biologically Significant Area, and wild Atlantic salmon in Placentia Bay have been assessed as “Threatened” by COSEWIC. Both DFO and COSEWIC have identified salmon aquaculture as contributing to observed declines in salmon populations. Both of these conditions (location in an environmentally sensitive area and impacts on rare/endangered species) are clear and specific triggers under the EAR for requiring an EIS. Likewise, DFO has noted that baseline information on wild salmon in Placentia Bay is lacking and recommended the collection of original field data regarding a number of aspects of this project including: baseline studies on the genetic structure of wild salmon populations; investigations into triploid performance and triploid-wild salmon interactions; field trials on the integrity of the proposed cage system; and research on ecological interactions between wild and farmed salmon. Lack of baseline data and the need for the collection of original field data are also clear and specific triggers for requiring and EIS.

b. The undertaking is of significant public concern.

Data collected by the NL government in 2014 indicates that public concern about the environmental impacts of aquaculture (and specifically the impacts on wild Atlantic salmon) has existed in the province for a number of years. Furthermore, this specific undertaking has generated significant public concern and controversy since being announced in 2015, as evidenced by comments made in public and social

media, and in submissions made to the minister through the public consultation phase of the screening review. Concerns expressed by the public have been numerous, ranging from broad concerns about the general environmental impacts to very specific concerns about the impacts on wild Atlantic salmon, especially concerning the proposal to import European strain fish.

Currently, the government does not have established policies that adequately address the concerns expressed by the public. As noted above, there are a number of acts and regulations that govern the aquaculture industry in NL; however, these have clearly not been adequate to address the public's long standing concerns about escapes, diseases, and pollution associated with salmon aquaculture. The federal government does have a long standing policy of banning the importation of European strain salmon (consistent with international commitments made under the NASCO Williamsburg Resolution) due to concerns over genetic impacts on wild populations. However, this policy appears to have been ignored in the approval of this project. Likewise, the NL Aquaculture Act requires introductions to be assessed under the assumption that the animals will escape into the natural environment, which is appropriately done under a thorough and transparent EIS process.

Conclusions

The EPA and EAR provide clear and specific guidance as to when and EIS is required. Furthermore, the EPA provides little room for a discretionary decision when the conditions supporting an EIS are met: i.e., "the minister *shall* require an environmental impact statement" [emphasis added]. In this case, both broad conditions for an EIS (significant environmental impacts and public concern) are clearly met, as are the screening criteria to be used in determining the relevancy of information supporting that decision. Given the information available and the specific guidance provided by the EPA and EAR, the only reasonable decision under the circumstances (i.e., the only decision that is justifiable and defensible in respect to the facts and the law) is to order the proponent to prepare an environmental impact statement for the project.

- 3. Because the undertaking was released without an environmental impact statement, the Environmental Protection Act has not been applied appropriately and its purpose to "protect the environment and quality of life of the people of the province and facilitate the wise management of the natural resources of the province" has therefore not been achieved.**

The Environmental Protection Act provides a framework for environmental protection and preservation and contributes to the goal of sustainable development for Newfoundland and Labrador. The stated purpose of Part X of the Act (Environmental Assessment) is "to facilitate the wise management of the natural resources of the province and to protect the environment and quality of life of the people of the province" by ensuring that development projects proceed in an environmentally acceptable manner. The EPA is binding upon the Crown, its corporations, agents, administrators, servants, employees and agencies.

The EPA is based on a number of guiding principles which provide the basis for achieving the goals of environmental protection and preservation, and sustainable development. These include:

Sustainable Development: The principle of sustainable development respects the use of both renewable and non-renewable resources to satisfy human needs, improve the quality of life, and protect and preserve life-sustaining natural systems, without jeopardizing the needs of future generations.

Precautionary Approach: In order to achieve sustainable development, policies must be based on the precautionary principle. Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there is a threat of serious or irreversible damage to the environment, all reasonable environmental protection measures must be taken; lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (Bergen ministerial Declaration on Sustainable Development, 1990). The precautionary principle is codified in several items of domestic legislation (e.g., Oceans Act, S.C. 1996; c. Canadian Environmental Protection Act, 1999; Endangered Species Act, S.N.S. 1998).

Stakeholder Involvement: Everyone has an individual and collective obligation to protect the environment and make wise use of resources, and to participate in decisions that affect people and the environment.

As noted in *Labrador Inuit Association v. Newfoundland (minister of Environment and Labour) 1997*, the EPA, “*if it is to do its job, must therefore be applied in a manner that will counteract the ability of immediate collective economic and social forces to set their own environmental agendas. It must be regarded as something more than a mere statement of lofty intent. It must be a blueprint for protective action.*” Clearly, the courts view the EPA as binding the government to apply the legislation in a manner that facilitates the development of protective action by making reasonable decisions in accordance with the guiding principles and stated purpose of the legislation.

As outlined above and described in detail in the appendices, the Placentia Bay Aquaculture proposal has been released from environmental assessment without an EIS, leaving many uncertainties and many of the potential risks and impacts on threatened wild Atlantic salmon unassessed, poorly understood, and unmitigated. Furthermore, these risks and impacts are likely to remain that way, given the deficiencies in the licensing and approval process required under other Acts.

Consequently, the decision to release the undertaking without ordering an EIS is not consistent with the guiding principles or stated purpose of the EPA because, without the information that would be supplied through an EIS, it cannot be demonstrated: 1) that all reasonable protective measures have been (or will be) taken; 2) that appropriate measures have been taken to protect and preserve life-sustaining natural systems, without jeopardizing the needs of future generations; 3) that the public has had adequate opportunities to participate in the decision-making process and have their concerns addressed; 4) that the project, in its current form, constitutes a wise use of the province’s resource; and therefore 5) that the environment and quality of life of the people of the province have been protected.

Rather than the EPA being used as a blueprint for developing protective actions (i.e., by ordering an EIS to better assess and understand the potential risk and impacts and develop appropriate mitigation actions), responsibility for environmental protection has been passed to Fisheries and Oceans Canada and the Department of Fisheries and Aquaculture where promotion of the aquaculture industry is policy and where economic and social forces will likely take precedence. Thus, the EPA has not been applied in “*a manner that will counteract the ability of immediate collective economic and social forces to set their own environmental agendas.*” As a consequence, the government has failed to discharge its responsibility as mandated by the EPA to “*protect the environment and quality of life of the people of the province and facilitate the wise management of the natural resources of the province.*”

Conclusion

The Environmental Protection Act and Environmental Assessment Regulations provide clear guidance in determining the proper decision following an initial screening review of an undertaking submitted for environmental assessment. In the case of the Placentia Bay Aquaculture proposal, the decision to release the undertaking from further review without ordering an environmental impact statement does not meet the standard of reasonableness because the decision cannot be demonstrated to be justifiable, and it does not stand up to a probing examination based on the information available. Failure to use the EPA as a blueprint for developing protection actions through an EIS process means that many of the environmental impacts of the project will remain unassessed, poorly understood, and unmitigated, which is inconsistent with the purpose and guiding principles of the Act.

More generally, this case presents an excellent opportunity to address the practice of importing exotic species for domestication and production in an industrial or farmed setting. The scientific literature is very clear that exotic species, whether introduced intentionally or as fugitive “invasive” species, can have significant negative and irreversible environmental consequences. At a minimum, the introduction of any new species or strain into Newfoundland’s sensitive marine environment should not be permitted without an EIS.

The Atlantic Salmon Federation does not undertake this appeal lightly. We recognize the economic contribution of the aquaculture industry to the province of Newfoundland and Labrador, and we understand the benefits this project could bring to communities in Placentia Bay. ASF is not opposed to aquaculture development that is environmentally, economically, and socially sustainable, but we can not support projects when science indicates that wild salmon will be at risk. Clearly, we have some concerns about this project and, at this point, we do not feel that the risks have been adequately assessed or the impacts mitigated to the extent that they could be.

We also recognize that the salmon aquaculture industry in Newfoundland (and indeed across Canada) is suffering from a lack of public confidence, due largely to its real and perceived impacts on wild salmon. Approval to import an exotic strain of salmon into an area where wild salmon are threatened, without a full and transparent environmental assessment and despite significant public concern, does not help the situation. An environmental impact statement process that involves an open, transparent, science-based evaluation of the existing environment (including wild Atlantic salmon), potentially significant environmental effects, and proposed and additional/alternative mitigation measures as well as the design of effective monitoring programs would go a long way towards reducing environmental impacts of the project and towards restoring public confidence in the industry and the governments charged with regulating it. Such an approach would be consistent not only with the aims and intent of the EPA, but also with the high standard for environmental assessment that has been set by this government over the past 8 months.

With that in mind, and in light of the information and arguments that we have presented in this document and the Attachments, we respectfully request that the decision to release the project from further environmental assessment be revised and that the proponent be ordered to prepare an environmental impact statement in accordance with s.55 of the Environmental Protection Act.

Sincerely,

A handwritten signature in black ink, appearing to read "Bill Taylor". The signature is written in a cursive, flowing style with a prominent initial "B".

Bill Taylor

CC: Dwight Ball, Premier, Newfoundland & Labrador

Dominic LeBlanc, Minister of Fisheries and Oceans Canada

Attachment A: Evaluation of Screening Criteria for Release

In making a determination that there are (a) no environmental of public concerns or (b) the environmental effects of the undertaking will be mitigated under an Act of the province or of Canada, the minister may consider a number of screening criteria. These criteria, along with our analysis are presented below.

Criterion A1: The comprehensiveness of the description of the undertaking.

The proponent has not provided a description of the undertaking that is comprehensive enough to allow the expected environmental impacts to be identified, understood, and mitigated. Regarding wild salmon, the proponent makes an unsubstantiated claim that there will be no significant impacts on threatened wild salmon. However, that claim rests on a number of technologies (e.g., triploidy, new cage designs, the use of lumpfish to control sea lice) which have not been tested and proven in the local context (DFO 2016). Consequently, the proponent was not able to provide a comprehensive description of these technologies or how effective they will be for mitigating the expected impacts. Likewise, the proponent has acknowledged that there is potential for their project to have negative impacts on wild salmon but has provided no description or assessment of what those impacts might be. Instead, they have simply relied on their unproved statement that there will be no impacts and, consequently, used that argument to avoid providing a comprehensive description.

Criterion A2: Whether or not there is a demonstrated commitment by the proponent to conduct an environmentally sound undertaking.

The proponent claims that they will conduct an environmentally sound undertaking, however the veracity of that claim is questionable for two reasons:

1. *The parent company, Grieg Seafood, has a poor environmental and compliance record elsewhere. For example:*
 - a. In 2014, Grieg's UK subsidiary was expelled from the Scottish Salmon Producers Organization for importing live smolts without the quarantine period required under the Organization's code of good practice. This is considered by the Organization to be a high risk action with the potential for significant impacts on wild salmon as well as on the aquaculture industry in general. Grieg Seafoods justified their actions as a business decision. See: <https://www.undercurrentnews.com/2014/04/29/scottish-producers-organisation-expels-grieg-seafood-hjaltland-over-live-smolt-import/>
 - b. In 2011, the Norwegian food safety authority reported Grieg Seafood's Finnmark subsidiary for incorrect reporting to authorities. The authority raided the company, and Grieg was imposed fines of NOK 2.3 million for each of two salmon escapes and several breaches of the internal control system.
 - c. Further investigation stemming from the case in (b) above resulted in a manager at Grieg Finnmark being sentenced to 30 days in prison for intentionally submitting fictional information when reporting sea lice figures on three occasions in 2010 and 2011 (information was reported despite no counts having actually been done). The offence "represents a gross breach of confidence of the monitoring system" according to the prosecuting attorney. See: <https://www.undercurrentnews.com/2014/03/27/grieg-manager-risks-prison-over-fictional-lice-information/> and <https://www.undercurrentnews.com/2014/07/10/grieg-manager-given-prison-sentence-over-misleading-lice-reports/>

2. *The proponent's commitment to providing an environmentally sound undertaking is not supported by the information provided in their project registration.* As outlined in ASF's original submission to the department (see attached), there is a wealth of scientific information that demonstrates, conclusively, that salmonid aquaculture has significant negative impacts on wild salmonid populations through a number of mechanisms (ecological and genetic impacts from escapes, transmission of diseases and parasites to wild fish, pollution of important marine habitats, etc.) (see for example: Hutchinson 2006; Ford and Myers 2008; ICES 2016).

Despite this large body of knowledge, the proponent claims that their project will have no significant impacts on wild salmon because of the mitigation measures they propose. However, all of the mechanisms by which aquaculture has been demonstrated to impact wild salmon have not been addressed by the proponent, and the relevant scientific information has not been acknowledged or discussed by the proponent in their project description, in their assessment of the risks of the project, or in support of their claim of no significant impacts. Their claim of no significant impacts cannot be justified based on existing science or by the information provided by the proponent about their proposed mitigation methods.

Indeed, the weight of scientific evidence suggests that many of the claims regarding potential impacts and proposed mitigation measures made by the proponent are misleading or false (see attached ASF submission for full discussion). For example, the company claims that the use of triploidy will eliminate the potential for genetic interactions between farmed and wild fish without acknowledging that the process for inducing triploidy is not 100% effective (Benfey 2015; DFO 2016), meaning that a significant number of fertile European strain salmon will be placed into sea cages every year. Likewise, the proponent has failed to consider the indirect genetic interactions between wild and farmed salmon which, as DFO (2013b; 2016) points out, can cause significant impacts. In general, the proponent has failed to demonstrate that their proposed actions will not significantly impact wild salmon, and they have failed to acknowledge that that significant uncertainties and risks to wild salmon remain, despite their proposed mitigation measures.

Given the proponent's poor record elsewhere, their failure to use the existing scientific evidence to adequately discuss and evaluate the risks and potential impacts of the project on wild salmon in an objective and unbiased manner, and the lack of information provided about the effectiveness of the mitigation measures they propose, it is not reasonable to accept that they have demonstrated a commitment to conduct an environmentally sound undertaking. Indeed, they have simply made an unsupported claim about the lack of potential impacts from their project, and this claim appears to be intentionally misleading.

Criterion A3: The compatibility of the undertaking with other resource use in the area of the undertaking.

The undertaking will not be directly incompatible with existing resource use around wild Atlantic salmon (i.e., the operations will not directly interfere with existing salmon fisheries). However, the weight of scientific information strongly suggests that this project will have negative impacts on wild Atlantic salmon in Placentia Bay. If those impacts occur as expected, existing recreational salmon fisheries will be negatively impacted, resulting in a loss of ecological, social, and economic values. This loss is potentially significant, given that Placentia Bay currently has 19 scheduled salmon rivers which receive significant recreational fishing effort due to their location near the population center of the north east Avalon. Such impacts and loss of values have already occurred in salmon fisheries in Bay d'Espoir where the once-prolific Conne River no longer produces enough wild salmon to support recreational or subsistence

fisheries in most years. As noted elsewhere in this document, aquaculture operations in Bay d'Espoir have been cited by both DFO and COSEWIC as having a negative impact on the productivity of the salmon population in Conne River.

There is some concern that this undertaking might be directly incompatible with other fisheries resource use in the area. Local crab and lobster fishers have expressed concern about the proposed sea cage locations forcing them from their traditional fishing grounds, and the Fish Food and Allied Workers Union has called for more consultation with affected fishers (see:

<http://www.cbc.ca/news/canada/newfoundland-labrador/aquaculture-expansion-1.3307672>)

Criterion A4: Whether or not the undertaking occurs in an environmentally or other sensitive area.

As noted by the proponent, all of Placentia Bay has been identified as an Ecologically and Biologically Significant Area (EBSA), and is managed through the "Placentia Bay Integrated Management Plan" (PBIMP). The PBIMP has been developed to provide direction to the integrated and collaborative activities that take place within the Placentia Bay region, and centers on integrated, adaptive, ecosystem-based management, and collaborative governance (DFO 2007b). Despite acknowledging that Placentia Bay is an environmentally sensitive area that is managed under an integrated management plan, the proponent has not explained how their activities would fit into and be managed under that plan.

Criterion A5: The defined boundaries of the undertaking and whether or not the undertaking is contained within that area.

The proposed grow-out activities would occur throughout Placentia Bay. One of the major concerns around net pen salmonid aquaculture is that farmed fish escape and have negative genetic and ecological interactions with wild salmon (Ford and Myers 2008; Bourrett et al 2011; McGinnity et al. 2003; DFO 2013b). As pointed out by DFO (2016), there is little information available about the potential extent and pattern of dispersal of salmon that escape from this project. However, salmon are a highly migratory species, capable of travelling thousands of kilometers in the marine environment. Scientific studies have demonstrated that escaped farmed Atlantic salmon disperse quickly after escape and spread over relatively large areas, including into the open ocean and into rivers containing populations of wild Atlantic salmon (Solem et al. 2012; Hansen 2006; Hansen and Youngson 2010). Consequently, there is a strong possibility that the impacts of this project on wild Atlantic salmon could extend well beyond the confines of Placentia Bay.

Criterion A6: The technology to be employed for the undertaking and whether or not it is environmentally benign.

The undertaking will employ a number of technologies that are new to the aquaculture industry in Newfoundland. Of particular concern is the plan to import a non-native strain of salmon eggs from Europe. As noted by DFO (2013b), the use of European strain salmon in Newfoundland aquaculture operations poses significant risks to wild salmon. This risk is heightened when wild populations are at low levels of abundance, which is the case for salmon on the south coast of Newfoundland (DFO 2016). The proponent plans to treat the eggs with high pressure to render them sterile (triploid) in an effort to reduce the risk to wild salmon from interbreeding. However, as also noted by DFO (2016), the process to induce sterility is not 100% effective, meaning that some fertile individuals will be placed into sea cages with the potential to escape and interbreed with wild salmon. Consequently, although the use of sterile fish may reduce the potential for interbreeding with wild fish, the risk is not eliminated. Furthermore, the consequences of any interbreeding would be more serious than if a local strain of salmon was used.

DFO has recognized that the potential for genetic impacts remains despite the planned use of triploid fish and are sufficiently concerned to recommend a genetic monitoring program be developed (DFO 2016). There are also potential issues with the possibility that triploid fish can be more susceptible to diseases which can then be concentrated and passed to wild fish as well as uncertainties around the potential ecological interactions between triploid and wild salmon (DFO 2013b; 2016). As DFO has pointed out, many of these risks are as yet unknown because sufficient data have not been collected for proper assessment and evaluation (DFO 2016). For these reasons, the use of triploidy cannot be considered an environmentally benign technology at this point. Indeed, the use of triploid European strain salmon brings with it a set of new and poorly understood risks that require further assessment and evaluation.

In making a determination that the environmental effects of the undertaking will be mitigated under an Act of the province or of Canada, the minister may consider a number of screening criteria.

Criterion A7: Issues of concern relating to the environmental effects of the undertaking.

As ASF described in our original submission to the department (attached), there is a wealth of scientific information about the impacts of net pen aquaculture on wild salmon and the local environment (ICES 2016), and aquaculture has already been demonstrated to be having a negative impact on wild salmon populations in Newfoundland (DFO 2016). Science has demonstrated, conclusively, that net pen salmon farming has a negative impact on wild salmonids through a number of mechanisms including:

1. Domesticated salmon escape and interbreed with wild populations which reduces the productivity and resilience of wild populations (Glover et al. 2013; Bourret et al. 2013; Bourret et al 2011; McGinnity et al. 2003; DFO 2013b; Fleming et al. 2000; McGinnity et al. 1997);
2. Escaped domesticated salmon have negative ecological interactions with wild salmon such as interfering with mating and competition for food, and spreading parasites and diseases to wild fish (Naylor et al. 2005; Krkosek et al., 2006; Krkosek et al., 2007; Thorstad et al. 2008);
3. Sea lice and other parasites become concentrated in salmon farms and are transmitted to wild fish, increasing mortality (especially of smolts) in wild populations (Krkosek et al., 2007; Krkosek et al. 2013; Thorstad et al. 2015; Helland et al. 2012, 2015; Middlemas et al., 2010, 2013; Serra-Llinares et al. 2014; Gargan et al. 2012).
4. Salmon aquaculture presents risks of increasing disease outbreaks, proliferating possible disease transmission routes in the environment, and decreasing the immunity of wild fish to disease (Naylor et al. 2005; Johnsen and Jensen 1994; Madhun et al. 2014)
5. Salmon farms alter the local environment thereby changing the selective pressures to which locally-adapted wild populations are subjected, leading 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; Goodbrand et al. 2011);
6. There are broader environmental concerns about pollution from fish waste, fish feed, and chemicals that extend into the local environment. These concerns are more general in nature, encompassing Atlantic salmon as well as other species and the broader environment (Samuelson et al. 2014; Oh et al. 2015).

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 high 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.

As noted in Criterion A6 above, some of these issues are potentially exacerbated by the use of European strain salmon (the consequences of interbreeding are likely greater for European strain salmon compared to the use of a local strain, and there are potential issues with disease introduction), and by the use of triploids (uncertainties with respect to triploid disease resistance and potential to spread pathogens to wild populations). Indeed, as noted above (and elsewhere by DFO (2016)), the use of triploid European strain salmon brings with it a new set of risks and potential impacts which are poorly understood at this point.

Criterion A8: Whether or not licences, certificates, permits, approvals or other documents of authorization required at law will mitigate the environmental effects referred to above.

Before receiving final approval, the undertaking must receive further permits, licenses, and approvals from the NL Department of Fisheries and Aquaculture (DFA) and Fisheries and Oceans Canada (DFO). These agencies are governed by the NL Aquaculture Act and Aquaculture Regulations (administered by the NL minister of Fisheries and Aquaculture) and the Canadian Fisheries Act and Aquaculture Activities Regulations (administered by the minister of Fisheries and Oceans Canada).

The approval and permitting process will not be sufficient to mitigate the environmental effects referred to above for three reasons:

1. *Acts and regulations governing the approval and permitting process do not contain sufficient provisions to require the ministers of DFO/DFA to assess, understand, or mitigate the threatening processes and/or impacts identified.*

NL Aquaculture Act. The purposes of the NL Aquaculture Act are to: 1) promote, in consultation with the private sector, the prudent and orderly development of the aquaculture industry; 2) secure property rights of aquaculture businesses; 3) minimize conflicts with competing uses; and 4) facilitate cooperative decision making between various levels of government. None of these purposes state or imply that environmental protection in general (or the protection of wild salmon specifically) is to be given a priority in the administration and application of the Aquaculture Act. These stated purposes do imply, however, that the interests of the private sector (i.e., aquaculture companies such as the proponent of this project) are to be given priority in aquaculture development and decision making. Consequently, when conflict between environmental protection and the interests of the private sector occur, it is clear that the Aquaculture Act authorizes the minister of Fisheries and Aquaculture to prioritize industry development and the needs of the private sector over environmental protection.

The NL Aquaculture Act does allow the minister of DFA to incorporate environmental protection provisions into licensing conditions, but no such conditions are required by the act. Likewise, the Act does not require the minister to assess and understand potential environmental impacts before issuing a license, except in the case of introductions of non-native species or strains where the Act directs the minister to ensure that the introduction has been assessed under Part X of the Environmental Protection Act (under the assumption that the animals proposed for introduction or transfer will escape into the natural environment). Clearly, the Aquaculture Act

is intended to defer to the Environmental Protection Act for the proper assessment and mitigation of environmental impacts from introductions, and those impacts must be assessed under the assumption that containment systems will fail.

Federal Fisheries Act. Likewise, the federal Fisheries Act contains only weak provisions to protect wild fish from the impacts of aquaculture and does not require the minister of DFO to assess, understand, or mitigate the identified threatening processes or impacts. The Fisheries Act does contain provisions to prevent “serious harm” to fish. However, serious harm to fish is narrowly defined as the death of fish or permanent alteration/destruction of habitat. Most of the impacts from aquaculture identified in Criterion A7 occur without causing “serious harm” as defined by the Act. For example, interbreeding between wild and farmed salmon does not result in the death of the wild fish involved in the interbreeding. Interbreeding and subsequent genetic introgression does, however, result in reduced fitness in the offspring produced, reduced population-level resilience and, eventually, decreased population size and possibly extirpation. Likewise, diseases such as ISA or HSMI may impact reproductive success of wild fish without actually killing the fish. Negative ecological interactions produced by escapees such as competition for food and spawning space/partners can also lead to significant fitness impacts without resulting in death to wild salmon. Consequently, given the definition of “serious harm” contained in the Fisheries Act, most of the potential impacts identified in Criterion A7 will not be mitigated by the Fisheries Act because the impacts occur without directly causing the death of wild fish or permanent alteration of fish habitat.

As noted in Criterion A7, sea lice spread from salmon farms have been shown to infect and kill juvenile salmon as they migrate past cages (Krkosek et al., 2007; Thorstad et al. 2015). In theory, the Fisheries Act should serve to mitigate these impacts because they fit the definition of “serious harm” and therefore should be prevented under the act. However, neither the Fisheries Act nor the Aquaculture Activities Regulations contain provisions for the monitoring, reporting, or mitigation of wild salmon deaths due to sea lice transmitted from salmon farms. The Aquaculture Activities Regulations do authorize the deposition of toxic chemical by farms for sea lice control, but farms are not required to take any steps to monitor, prevent, or report the deaths of wild salmon due to farm-produced sea lice. The Aquaculture Activities Regulations also contain some provisions to reduce general environmental impacts (i.e., pollution from feces and/or feed); however, those provisions do nothing to mitigate impacts on wild salmon discussed in the paragraph above.

- 2. The regulatory environment under which aquaculture operations in Newfoundland operate do not meet internationally accepted standards for preventing impact on wild Atlantic salmon. A recent study conducted by Gardner Pinfold (2016) examined and compared the salmon aquaculture regulatory environment in eastern North America (NL, NS, NB, ME), British Columbia, and Norway in terms of the effectiveness at preventing impacts on wild salmon. The purpose was to identify “best practice” regulations across jurisdictions and promote information sharing and common standards. Regulations relevant to reducing impacts on wild salmon and their environment were compared to the internationally accepted standards as set by the Aquaculture Stewardship Council (ASC) Salmon Standard (the standards were developed through a collaboration between NGOs and the aquaculture industry, and numerous aquaculture farms outside of NL are currently undergoing voluntary assessment against the criteria to seek ASC accreditation).*

Results of the analysis demonstrated that Newfoundland has a weak regulatory environment in terms of protections offered to wild salmon (only NB scored marginally lower than NL. All other jurisdictions (NS, BC, ME, and Norway) scored higher, with Norway significantly ahead of all other jurisdictions examined). Of the 11 regulations examined, NL met the “best practice” standard on only two (prohibiting the use of genetically modified salmon and documenting therapeutants use). NL regulations were found to be deficient in terms of: setting maximum sea lice loads; setting maximum number of escapes per license; limiting viral disease mortality and requiring a reduction plan; avoiding damaging to the seafloor under cages; avoiding damage to critical habitats and sensitive species; maintaining water quality around the sea cage sites; publicly reporting sea lice loads, fish escapes, and disease outbreaks; and providing for meaningful public consultation and complaint resolution (Gardner Pinfold 2016).

3. *Existing Acts and regulations have not been sufficient to prevent aquaculture operations from having significant impacts on wild Atlantic salmon in Newfoundland.* Atlantic salmon populations on the south coast of Newfoundland have been assessed as “Threatened” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Both COSEWIC and DFO have identified existing salmon aquaculture sea cage sites in Bay d’Espoir/Fortune Bay as having an impact on populations in those areas, contributing to the observed declines, and being a factor leading to the “Threatened” listing (DFO 2013a).

Recent research by DFO has confirmed that impacts on wild salmon from aquaculture are still occurring in Newfoundland. For example, in 2013 there was a major escape event (20,000 fish) (DFO 2016). In that same year, a significant number of farmed salmon were found in Garnish River on the Burin Peninsula (Southern Gazette 2013). DFO recently confirmed the presence of escaped farm fish in at least 12 rivers on the south coast, and in 2015 a brief survey by DFO found more than 150 escaped aquaculture salmon in three salmon rivers near aquaculture sites in Fortune Bay (DFO Personal Communication). Recent research on the genetic integrity of wild south coast Newfoundland salmon conducted by DFO has found evidence of genetic introgression from farmed salmon, indicating that escapees from farms that are entering rivers are successfully interbreeding with wild fish (DFO 2016).

Criterion A9: whether or not sufficient detail of the undertaking has been provided to determine the level of the known environmental effects of the undertaking;

As noted above, net pen salmon aquaculture is known to have significant negative impacts on wild Atlantic salmon through numerous mechanisms (ICES 2016). Likewise, existing aquaculture operations have been demonstrated to negatively impact local populations of wild salmon in Newfoundland (DFO 2013a; 2016). Despite this, the proponent has not provided enough detail to allow the level of these effects to be determined for this project. Indeed, rather than provide an open and transparent science-based discussion of these known impacts and the likelihood that they will occur, the proponent has simply claimed that none of these known impacts will occur in this project, and provided incomplete and misleading information in support of that claim. In particular, the proponent has provided incomplete and misleading information about the risks associated with the importation and use of European strain salmon and the level of risk reduction associated with the use of triploidy to render them sterile. Likewise, they have provided insufficient information about the effectiveness of other proposed mitigation measures such as the proposed “escape proof” containment system and the use of lumpfish for sea lice control.

These significant information deficiencies were highlighted by DFO (2016) where they noted that:

- Uncertainties remain with respect to the effectiveness of the triploidy induction process and thus with the number of fertile individuals that will be put into sea cages.
- Uncertainties remain with respect to triploid disease resistance and potential to spread pathogens to wild populations. They acknowledged that triploids are more susceptible to pathogens which can spread to surrounding waters where wild fish can be exposed and become infected. They concluded that it is difficult to accurately predict susceptibility of triploid European salmon to endemic pathogens in NL environmental conditions, and that the ultimate potential impact on wild fish populations remains unknown.
- Because triploid and European origin salmon have not previously been used in the NL aquaculture industry, the ecological and indirect genetic risks relative to diploids are largely unknown.
- Lack of data on the effectiveness of the containment system under NL conditions makes it difficult to predict the number of escapes that will occur.
- Lack of data on the status of wild salmon populations in Placentia Bay makes it difficult to predict the level of impacts, design appropriate mitigation strategies, and monitor impacts.
- There is uncertainty around fitness differences between farm, wild and farm-wild hybrids in the wild; the extent of competitive interactions between farm and wild fish in the wild; their effect on the survival of wild fish, and the impact of local population demographics on interaction outcomes.
- There is uncertainty regarding the fate of escaped farm-origin fish in the marine and freshwater environments, including post-escape dispersal patterns, survival, feeding, and their movements into wild salmon rivers, timing of maturation and maturation success.

All of these uncertainties and information deficiencies, as well as the false and misleading claims made by the proponent, mean that the level of the known (and unknown) impacts on wild Atlantic salmon cannot be accurately determined.

Criterion A10: Whether or not the means of determining further information have been identified

Despite the significant uncertainties and information gaps that remain (see above), there has been no plan or proposal put forward by the proponent or the minister to collect further information. Likewise, the remaining licensing/approval process for the project does not mandate the collection of the information necessary to appropriately assess, understand, and mitigate the identified impacts.

As noted in Criteria A9 above, DFO (2016) has identified a significant number of information gaps and uncertainties that remain with this project and, in response, have made a number of recommendations for further information to be collected prior to production including:

- Collection of information about the fate of released triploid salmon through a mandatory monitoring program.
- More research to collect information on ecological interactions between wild and farmed salmon.
- Evaluation and testing of the proposed cage system prior to stocking to collect data to confirm the integrity of this system in the NL environment.
- Application of DNA methods to enable genetic identification of individual families and forensic investigation of escapes back to the farm of origin.

- Scientific investigations of triploid performance and triploid-wild salmon interactions conducted prior to commencement of commercial operations.
- Baseline studies to characterize the genetic structure of existing salmon populations in Placentia Bay prior to commercial production.

Although DFO has clearly identified a number of significant information gaps and made numerous recommendations for research and monitoring studies, the actual means of collecting this necessary information have not been identified. Given that this proposal has now been passed to DFA for licensing, there is no further mechanism that mandates or facilitates the design and implementation of the necessary studies. Given that much of the information highlighted by DFO as necessary would need to be collected (or begun to be collected) prior to commencement of the project, the only way to properly develop the means of collecting that information is through an environmental impact statement process.

Criterion A11: The environmental effect of the technology to be used and mitigating factors of the technology.

There a number of novel technologies to be used that the proponent claims will eliminate the risks to wild salmon including: triploid European strain fish, “escape proof” cages, and lumpfish for sea lice control.

Triploid fish. The use of triploid fish will, to some extent, help mitigate the risk of interbreeding with wild salmon because most escapees will likely be sterile. However, as noted by the process to induce triploidy in the fertilized eggs is not 100% effective and testing every fish that goes into the sea cages is not possible (Benfey 2015; DFO 2016). Consequently, there will be some (the exact number of which will be unknown) fertile salmon placed into sea cages in Placentia Bay ever year. The success rate of the triploidy induction process is variable but typically ranges from 96% to 99%. With 7 million fish stocked into sea cages every year, a 99% effectiveness rate equates to 70,000 fertile fish stocked into Placentia Bay per year. Likewise, the use of all-female triploids also reduces the level of risk relative to using both sexes (Benfey 2015); however, the proponent apparently plans to use both sexes initially and transition to all females over time. This proposed use of both sexes initially reduces the level of mitigation associated with using triploids.

A most concerning aspect of this project is that the application of triploidy technology has been used to justify the importation of European strain salmon for the project. This is particularly concerning because the consequences of interbreeding between local wild populations and this non-native strain could potentially be severe and irrevocable (DFO 2013b). As noted by DFO, periodic introductions of even a few escaped fertile European strain fish into a small local population could extirpate the adaptive structure of that population very quickly (DFO 2016). The Canadian government has a long standing policy of banning the importation of European strain salmon for use in sea cage aquaculture (consistent with international commitments made under the NASCO Williamsburg Resolution) due to concerns over genetic impacts on wild populations. In the past, the government has recognized the importance of maintaining this ban in rejecting a number of previous applications to import and use triploid European strain salmon elsewhere in eastern Canada. Likewise, the province of NL has a policy of preventing the introduction of non-native species and strains to protect native biodiversity.

As discussed above and elsewhere in this document, the use of triploidy technology does not fully mitigate the risk to wild salmon from genetic introgression because some of the fish stocked into sea cages will not be sterile and will therefore be capable of interbreeding with wild salmon should they

escape (Benfey 2015; DFO 2016). Furthermore, the use of European strain fish brings with it additional risks because the consequences of interbreeding are heightened when non-native strains breed with local wild strains, and because of uncertainties with respect to triploid disease resistance and increased potential to spread pathogens to wild populations (DFO 2016). Likewise, the ecological and indirect genetic risks associated with using triploid fish are also largely unknown (DFO 2016). As noted in Criterion A6, the use of triploid European strain fish cannot be considered environmentally benign.

“Escape Proof” Cages. The proponent intends to use a new cage design which they claim is “escape proof.” Such a technology, if it exists, would mitigate the risks of direct genetic and ecological interactions between wild and escaped farmed salmon (but not indirect interactions). However, as DFO has pointed out, the proposed containment system has not been tested under local conditions, therefore the mitigating effect of this technology is not known. It is unlikely, however, that any net pen containment system will be 100% effective at preventing escapes especially from large scale events (eg., due to severe weather, equipment failures, or human error). Likewise, cage construction will have little impact on (generally underreported) periodic releases of small numbers of fish during farm operations. Studies have shown that frequent small scale losses may be more problematic than sporadic large-scale escape events (Baskett et al. 2013; DFO 2016). The proponent claims that their containment equipment and practices will contribute to this project having insignificant impacts on wild salmon; however, they have provided very little information about the effectiveness of the equipment, how they intend to minimize escapes through farm practices, what estimated escape rates are, or any assessment of possible threats that would result in large-scale escape events (e.g., storms, ice, predators, accidents, etc.). DFO has recommended further testing of the cages under local conditions prior to commercial production to better understand these issues; however, no such condition was added to the release from environmental assessment.

Lumpfish for sea lice control. As noted previously, sea lice produced in and expelled from salmon farms can have a major negative impact on wild Atlantic salmon. Farms usually attempt to control sea lice through the use of drugs and pesticides. The proponent plans to use a novel approach to control sea lice: stocking cleaner fish such as lumpfish in cages with salmon to consume the sea lice to reduce infection rates. This technology, however, has not been proven to work on a commercial scale (in experimental situations, lumpfish have been found to consume sea lice when stocked with Atlantic salmon, but they have also been found to consume more salmon feed pellets than lice (Imsland et al. 2014)). Regardless of whether lumpfish stocked with the cages salmon actually consume sea lice, the proponent has provided no discussion of the likely effectiveness of this method, nor have they explained how this method will mitigate the expected impacts of sea lice on wild Atlantic salmon, nor have they provided any general assessment of the likely impacts of sea lice on wild salmon.

The proponent indicates that lumpfish will be stocked at a density of 15 per 100 smolt. With 7 million smolt stocked per year, this will require the proponent to source and maintain a population of over 1 million lumpfish. However, the proponent has not provided any information on where the lumpfish will be sourced. If these are to be caught locally, this raises the question of what impact this might have on local lumpfish populations. If these are to be sourced from outside of the province, then this would represent another introduction of non-native genetic material to the province. In general, the proponent has provided no discussion about the potential environmental impacts of this component of the project, and sufficient information has not been provided to understand and evaluate what those impacts might be. As noted for the use of triploid technology in Criterion A6, the use of lumpfish as cleaner fish cannot be considered to be environmentally benign at this point, because sufficient information has not been provided to understand its potential impacts or mitigative effect.

Attachment B: Evaluation of Screening Criteria for Environmental Impact Statement

In making a determination that there may be significant negative environmental effects; the minister is directed to consider a number of screening criteria. These criteria, along with our analysis are presented below.

Criterion B1: Whether or not the environmental baseline information provided with respect to the undertaking is sufficient for predicting environmental effects.

There is very little baseline information provided about wild Atlantic salmon in the project area. The proponent does provide a description of the status of salmon stocks on the south coast of Newfoundland and quotes both the COSEWIC Technical Summary and DFO Recovery Potential Assessment documents. This information, however, is not specific to salmon populations in Placentia Bay and is not sufficient for predicting the specific impacts of this project on those populations. As noted above, the proponent has made a claim that the project will have no significant impacts on wild salmon in Placentia Bay; however, they have not substantiated this claim through the provision or analysis of information about wild salmon populations in the bay and how those populations would (or would not) interact with their proposed operations. Although the size and location of the proposed sea cage operations would strongly suggest that there will be significant interactions with wild salmon (and other marine species), the information provided by the proponent is not sufficient to predict the environmental impacts on these species. Likewise, the proponent has not adequately discussed the potential impacts on salmon and other marine species. Instead, they have simply stated that there will be minimal impacts in all cases but provide no data to substantiate these claims.

DFO's review of the ITC risk assessment concludes that there are significant gaps in terms of baseline information about wild Atlantic salmon in the project area (DFO 2016). In particular, DFO pointed out that, although Placentia Bay salmon populations are part of the south coast unit which has been assessed as "Threatened" by COSEWIC, the status and genetic characteristics of those populations is largely unknown due to lack of data (DFO 2016). Lack of these data mean that monitoring the direct and indirect impacts of the project on wild salmon will not be possible.

Criterion B2: Whether or not original field data collection is required.

Predicting and mitigating the impacts of this project on wild salmon will require information on a range of issues including (but not limited to): salmon population sizes (for juveniles and adults) for the rivers flowing into Placentia Bay; timing of migrations of juvenile and adult salmon through Placentia Bay; migration routes of adults and juveniles through the bay; habitat use by adults and juveniles within the bay; and genetic distinctiveness of salmon populations within the bay. These data have never been collected for salmon populations in Placentia Bay, with the exception of some periodic monitoring of adult returns in Northeast Placentia River. Consequently, predicting the impacts of this project on wild salmon, understanding if/how those impacts can be mitigated, and monitoring the outcomes of the project and mitigation measures would require the collection of original field data prior to the implementation of the project as well as the implementation of ongoing data collection for the life of the project.

It is important to note that DFO specifically noted a number of areas where data were lacking, and specifically recommended a number of field studies be conducted before the project was approved. These include collecting baseline information on the genetic makeup of salmon populations in Placentia Bay, more research on ecological interactions between wild and farmed salmon, Scientific investigations of triploid performance and triploid-wild salmon interactions, and further field study of the integrity of

the proposed cages system to test its suitability to local conditions prior to commercial production (DFO 2016).

Criterion B3: Whether or not the undertaking would be located in an environmentally sensitive area.

All of Placentia Bay has been identified as an Ecologically and Biologically Significant Area (EBSA), and is managed through the “Placentia Bay Integrated Management Plan” (PBIMP) (DFO 2007a). The PBIMP has been devised to provide direction to the integrated and collaborative activities that take place within the Placentia Bay region, and centers on integrated, adaptive, ecosystem-based management, and collaborative governance (DFO 2007b). Despite acknowledging that Placentia Bay is an environmentally sensitive area that is managed under an integrated management plan, the proponent has not explained how their activities would fit into and be managed under that plan, and they have not acknowledged the cumulative effects of their proposed operations on the bay given the other stressors that the bay is currently experiencing.

Criterion B4: Whether or not hazardous or toxic substances in combination with unknown or experimental technology are intended to be used with respect to the undertaking.

Net pen salmon farming makes extensive use of drugs and chemicals (which are toxic to the environment) to control diseases and parasites. The chemicals may be contained in the fish feed or released directly into the environment, and have been demonstrated to impact marine life in areas surrounding salmon farms (e.g., Samuelsen 2015). The release of deleterious substances which may harm or kill fish/fish habitat outside of the fish farm is authorized by the federal Aquaculture Activities Regulations.

The proponent aims to reduce the need for the use of toxic chemicals to control sea lice by using an unproven (i.e., experimental) lice control method (i.e., use of lumpfish as cleaner fish), and stated that “only as a last resort will therapeutants be used to control sea lice.” However, the proponent has failed to provide any details on the effectiveness of this experimental lice control method, nor have they provided any discussion as to its likely applicability to the NL situation (where, to the best of our knowledge, it has never been tested in commercial scale operations). Consequently, it is not possible to assess this method’s effectiveness at controlling sea lice, and it is therefore not possible to know or predict the frequency with which toxic chemicals will be released into the environment in an effort to control sea lice; the amounts clearly depend on the success of the experimental lice control methods proposed.

Likewise, the proponent has provided no information in their registration document regarding the types and amounts of chemicals to be used for lice/disease control or otherwise. We note that the company has been ordered to provide to Health Canada a list of all regulated substances to be used prior to commencement of the project. Given that this information was clearly not available or requested during the limited environmental assessment that has occurred for this project, the potential impacts of toxic chemicals on the environment have clearly not been adequately assessed.

Criterion B5: Whether or not the undertaking emissions, discharges or effluent may exceed limits imposed by law;

Net pen salmon aquaculture farms release significant amounts of untreated discharges and effluents into the marine environment. In addition to the toxic chemicals used to control diseases and parasites (see Criteria B4 above), all unconsumed fish feed and all fish feces are discharged directly into the ocean without any form of treatment. As part of the licensing and approvals process, the proponent will be

required to prepare and submit a waste management plan that complies with all applicable regulations. However, as noted in Criteria A8, current regulations around monitoring the sea bed and water quality for evidence of pollution do not meet the internationally established “best practice” standards and are therefore unlikely to be effective at preventing localized pollution. It is not possible to conclude whether or not the amounts of discharges and effluents produced by this project will exceed limits imposed by law because a) the proponent has provided no estimates of discharge and effluent levels; and b) there are no laws limiting the amount of feed, fish waste, or other effluents discharged into the environment by salmon aquaculture operations in Newfoundland.

Criterion B6: The environmental effects of the undertaking upon rare or endangered species.

As noted in Criterion A7, there is a vast amount of scientific evidence indicating that that this project will have significant negative impacts on wild salmon. Atlantic salmon in Placentia Bay are part of the south coast designatable unit that has been assessed as “Threatened” by COSEWIC and is currently being considered for listing under the Species At Risk Act. DFO and COSEWIC have identified aquaculture as a threat to the survival and recovery of these populations (DFO 2013), and all available scientific evidence suggests that this project will have impacts on populations in Placentia Bay through a number of mechanisms (ICES 2016). Rather than provide an in-depth assessment of the risks of their proposal to these populations, the proponent has simply stated that their project will not have significant impacts on wild Atlantic salmon. As we have discussed above and in our original submission to the department, this claim cannot be substantiated by the information provided by the proponent or by the extensive scientific information on the impacts of aquaculture on wild salmonids. We note that the proponent has identified 14 other species that have been identified as “Endangered”, “Threatened” or “Special Concern” and has also stated that the project is unlikely to have any impact on these species without providing a rigorous assessment of the risks for any of them. Given the inaccurate and misleading claims about the potential impacts of this project on Atlantic salmon as discussed above, it is impossible to accept their claims about the potential impacts on other rare or endangered species.

Criterion B7: The economic importance of a resource to which the undertaking relates.

The Atlantic salmon resource has significant economic importance to the people of Newfoundland and Labrador. The province has 186 scheduled Atlantic salmon rivers which produce a combined catch (recreation and subsistence, retained and released) of approximately 50,000 to 60,000 salmon per year. An important (but not the only) measure of the economic importance of the resource is the amount of money people spend on their recreational salmon fishing activity. A report prepared by Gardner Pinfold Consultants indicates that the Gross Domestic Product (GDP) value for wild Atlantic salmon in NL in 2010 was approximately \$33 million. In that year, anglers spent approximately \$27 million on salmon angling (Gardner Pinfold 2011). Currently, there is no estimate of the amount of money spent on fishing in the 19 rivers that flow into Placentia Bay; however, in 2014, those rivers had a total of ~3,575 rod days of recreational salmon angling effort, suggesting that expenditures for salmon fishing on those rivers is likely to be significant. We note, however, that there is potential for this project to have impacts on wild salmon outside of the Placentia Bay area, especially if a European strain of salmon is introduced and fertile individuals escape into the wild. Consequently, any estimate of the economic importance of the resource should not be limited to the fishing activity that occurs in Placentia Bay.

In making a determination that an undertaking may be of significant public concern, the minister is directed to consider the following criteria.

Criterion B8: Whether the public acceptability of the undertaking is seriously questioned.

Public concern over the acceptability of salmon aquaculture and its impacts on wild salmon (and the environment in general) has been growing throughout the province for many years. This concern is based on the impacts directly observed by members of the public on the natural environment as well as growing public awareness of scientific studies that have conclusively demonstrated a range of environmental impacts of salmon aquaculture, particularly significant impacts on wild salmon and the fisheries they support. Such concern has been increasingly expressed in numerous public media outlets over the past number of years, even in the absence of specific plans to expand the salmon aquaculture industry in the province. In 2013, the Newfoundland government engaged in a public consultation process in support of developing a new aquaculture strategy for the province: 80% of respondents to the online questionnaire said that the salmon aquaculture industry has a poor or very poor reputation, and respondents expressed significant concerns over the impacts on wild salmon and the overall sustainability of the industry (Government of Newfoundland and Labrador 2014).

We note that the MOU between Grieg and the province generated significant controversy when it was announced in October 2015. Likewise, the initial registration of the hatchery component of the project for environmental assessment generated significant opposition from the public, culminating in the proponent being required to register the entire project, including the sea cage grow-out component. Public sentiment at that time was that the entire project needed to be registered so that the environmental impacts of the sea cage component could be properly assessed. Likewise, the registration and subsequent release of the entire project has again resulted in many members of the public questioning the acceptability of the project in various public and social media. Given the breadth and depth of the concerns expressed, the public is not likely to accept anything less than a full EIS for this project.

Criterion B9: Whether government policy has been established to address public concerns.

Existing government policy is not sufficient to address the public concerns regarding this project. The provincial government released a Sustainable Aquaculture Strategy in 2014 to guide future policy and investment decisions aimed at fostering the success of the industry. This document, however, provides only general direction for policy development and does not contain any specific policies that would address the public's concerns over this specific project. The fact that significant public concern over salmon aquaculture remains two years after the release of the aquaculture strategy document indicates that the Aquaculture Strategy has not been effective at addressing public concerns.

Regarding issues of escapes, the government has a Code of Containment for the Culture of Salmonids in Newfoundland and Labrador which was implemented in 1999 and updated in 2014. The primary objective of the code is to minimize the escapes of farmed salmon. However, as noted above, the code of containment and the practices used by aquaculture operators have not been successful at preventing farmed salmon from escaping and entering south coast rivers that contain populations of wild salmon; significant numbers of farmed salmon were found in Fortune Bay rivers near aquaculture sites as recently as 2015 (with recent reports of farmed salmon sightings indicating there has been another major escape in the summer of 2016). Furthermore, a recent study by DFO has confirmed that escaped farmed salmon have interbred with wild populations on the south coast (DFO 2016). The Code of Containment requires that escape events are reported to the Department of Fisheries and Aquaculture; however,

these events are only reported to the public on an annual basis, long after the escape events have occurred. The Code of Containment is clearly not sufficient for addressing public concerns regarding escapes and their impacts on wild salmon.

Regarding the introduction of European strain salmon, the government has an Introductions and Transfers Committee which is responsible for reviewing applications for intentional introductions and transfers of live aquatic organisms into captive facilities and the waters of Newfoundland and Labrador. The committee operates under the National Code of Introductions and Transfers of Aquatic Organisms, which is designed to protect aquatic ecosystems while encouraging responsible use of aquatic resources for the benefit of Canadians. The application for the importation of European strain eggs is required to be assessed under this Code. However, we note that the Newfoundland Aquaculture Act (Section 8) also requires the impact of introductions to be assessed in accordance with the Part 10 of the Environmental Protection Act, and that such assessment must be made *under the assumption that the animals will escape into the natural environment*. Given the likelihood that some of those escaped salmon will be fertile, the introduction of European strain salmon must be assessed under the assumption that fertile European strain salmon will escape into Placentia Bay each year. Given the lack of baseline information that has been identified by DFO (2016) (e.g., on the status and genetic composition wild salmon in the project area, lack of information about fate of escaped farmed salmon, lack of information about the potential ecological interactions between wild and fared salmon, etc.), it is not possible to address the public's concerns about the potential impacts of the introduction of European strain salmon without first collecting this information through an environmental impact statement.

The Federal Government has signed onto an international ban through NASCO (The Williamsburg Resolution) on the importation and use of European strain salmon in aquaculture until scientific information confirms that the risk of adverse genetic effects on wild Atlantic salmon stocks is minimal. Prior to this undertaking, all applications for introduction of European strain salmon (triploid and non-triploid) for use in net pen aquaculture in Canada have been denied. These agreements and permit denials indicate a long standing policy of preventing the introduction of foreign strain salmon into Canada until such time as it can be scientifically justified. Given the concerns expressed by the public (and by DFO) regarding the importation of European strain salmon, the only appropriate way to address these concerns is through a thorough and transparent EIS process.

References

- Baskett, M.L., S.C. Burgess, and R.S. Waples. 2013. Assessing strategies to minimize unintended fitness consequences of aquaculture on wild populations. *Evolutionary Applications* 6: 1090-1108.
- Benfey, T.J. 2015. Biocontainment measures to reduce/mitigate potential post-escape interactions between cultured European-origin and wild native Atlantic salmon in Newfoundland. DFO Can.Sci. Advis. Sec. Res. Doc. 2015/003.
- Bourret V, O'Reilly PT, Carr JW, Berg PR, Bernatchez L. 2011. Temporal change in genetic integrity suggests loss of local adaptation in a wild Atlantic salmon (*Salmo salar*) population following introgression by farmed escapees. *Heredity*, 106, 500–510.
- Bourret, V., Kent, M.P., Primmer, C.R., Vasemagi, A., Karlsson, S., Hindar, K., McGinnity, P., et al. 2013. SNP-array reveals genome-wide patterns of geographical and potential adaptive divergence across the natural range of Atlantic salmon (*Salmo salar*). *Molecular Ecology*, 22: 532-551.
- DFO. 2007a. Placentia Bay-Grand Banks Large Ocean Management Area Ecologically and Biologically Significant Areas. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/052.
- DFO. 2007b. Placentia Bay Integrated Management Plan. DFO/2007-1292.
- DFO. 2013a. Recovery Potential Assessment for the South Newfoundland Atlantic Salmon (*Salmo salar*) Designatable Unit. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/007.
- DFO. 2013b. Potential Effects Surrounding the Importation of European Origin Cultured Atlantic Salmon to Atlantic Salmon Populations and Habitats in Newfoundland. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/050.
- DFO. 2016. Propose use of triploid European-strain Atlantic salmon in marine cage aquaculture in Placentia Bay NL. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2016/034.
- Ferguson A., et al., editors. 2007. *The Atlantic Salmon: Genetics, Conservation and Management*. Blackwell, Oxford.
- Fleming, I.A., Hindar, K., Mjølnerod, I.B., Jonsson, B., Balstad, T. and Lamberg, A. 2000. Lifetime success and interactions of farm salmon invading a native population. *Proceedings of the Royal Society of London Series B-Biological Sciences*, 267: 1517-1523.
- Ford J.S., Myers R.A. 2008. A global assessment of salmon aquaculture impacts on wild salmonids. *PLoS Biol* 6(2)
- Gardner Pinfold. 2011. *Economic Value of Wild Atlantic Salmon*. Gardner Pinfold Consultants Ltd. Halifax.
- Gardner Pinfold. 2016. *An International Regulatory Review to Support Consistent and Improved Management of the Impacts of Sea Cage Salmon Aquaculture*. Gardner Pinfold Consultants Ltd. Halifax.
- Gargan, P. G., Forde, G., Hazon, N., F., R. D. J. & Todd, C. D. 2012. Evidence for sea lice-induced marine mortality of Atlantic salmon (*Salmo salar*) in western Ireland from experimental releases of ranched smolts treated with emamectin benzoate. *Canadian Journal of Fish and Aquatic Sciences*, 69: 343-353.
- Glover, K.A., Pertoldi, C., Besnier, F., Wennevik, V., Kent, M., and Skaala, Ø. 2013. Atlantic salmon populations invaded by farmed escapees: quantifying genetic introgression with a Bayesian approach and SNPs. *BMC Genetics*, 14:4.
- Goodbrand et al. 2013. Sea cage aquaculture affects distribution of wild fish at large spatial scales. *Canadian Journal of Fisheries and Aquatic Sciences*, 2013, 70(9): 1289-1295
- Government of Newfoundland and Labrador. 2014. *A summary of what we heard*. Newfoundland and Labrador Department of Fisheries and Aquaculture. St. John's.
- Hansen L.P. 2006. Migration and survival of farmed Atlantic salmon (*Salmo salar* L.) released from two Norwegian fish farms. *ICES Journal of Marine Science*: 63:1211-1217.

- Hansen L.P., Youngson A.F. 2010. Dispersal of large farmed Atlantic salmon, *Salmo salar*, from simulated escapes at fish farms in Norway and Scotland. *Fish Manag Ecol* 17:28–32
- Helland, I.P., Finstad, B., Uglem, I., Diserud, O.H., Foldvik, A., Hanssen, F., Bjørn, P.A., et al. 2012. What determines salmon lice infections on wild salmonids? Statistical calculations of data from the national salmon lice surveillance program 2004–2010 (in Norwegian). NINA Report, 891. 51 pp.
- Helland, I.P., Uglem, I., Jansen, P.A., Diserud, O, H., Bjørn, P.A. & Finstad, B. 2015. Statistical and ecological challenges of monitoring parasitic sea lice infestations in wild salmonid fish stocks. *Aquaculture Environment Interactions*, 7: 267-280.
- Hutchinson P, editor. 2006. Interactions between aquaculture and wild stocks of Atlantic salmon and other diadromous fish species: science and management, challenges and solutions. Proceedings of an ICES/NASCO Symposium held in Bergen, Norway, 18–21 October 2005. *ICES J Mar Sci* 63:(7).
- ICES. 2016. Report of the Workshop to address the NASCO request for advice on possible effects of salmonid aquaculture on wild Atlantic salmon populations in the North Atlantic (WKCULEF), 1–3 March 2016, Charlottenlund, Denmark. *ICES CM 2016/ACOM:42*. 44 pp.
- Imsland, A.K., P Reynolds, G. Eliassen, T.A. Hangstad, A.V. Nytra, A.Foss, E. Vikingstad, T.A. Elvegard. 2014. Notes on the behaviour of lumpfish in sea pens with and without Atlantic salmon present. *J. Ethol* 32: 117
- Johnsen BO and Jensen AJ. 1994. The spread of furunculosis among salmonids in Norwegian rivers. *J Fish Biol* 45: 47–55
- Krkosek, M., J. Ford, A. Morton, S. Lele, R.A. Myers, & M. Lewis, 2007. Declining wild salmon populations in relation to parasites from farm salmon. *Science* 318, 1772-1775.
- Krkosek, M., et al. 2006. Epizootics of wild fish induced by farm fish. *Proceedings of the National Academy of Sciences of the USA*. 103, 15506-15510.
- Krkošek, M., Revie, C.W., Gargan, P.G., Skilbrei, O.T., Finstad, B., and Todd, C.D. 2013. Impact of parasites on salmon recruitment in the Northeast Atlantic Ocean. *Proceedings of the Royal Society B: Biological Sciences* 280: 20122359.
- Madhun A. S., Karlsbakk E., Isachsen C. H., Omdal L. M., Eide Sørvik A. G., Skaala Ø., Barlaup B. T. 2014. Potential disease interaction reinforced: double-virus-infected escaped farmed Atlantic salmon, *Salmo salar* L., recaptured in a nearby river. *Journal of Fish Diseases*.
- McGinnity, P., Stone, C., Taggart, J. B., Cooke, D., Cotter, D., Hynes, R., McCamley, C., et al. 1997. Genetic impact of escaped farmed Atlantic salmon (*Salmo salar* L.) on native populations: use of DNA profiling to assess freshwater performance of wild, farmed, and hybrid progeny in a natural river environment. *ICES Journal of Marine Science*, 54: 998-1008.
- McGinnity P, et al. 2003. Fitness reduction and potential extinction of wild populations of Atlantic salmon, *Salmo salar*, as a result of interactions with escaped farm salmon. *Proc R Soc Lond B Biol Sci* 270: 2443–2450
- Middlemas, S.J., Raffell, J.A., Hay, D.W., Hatton-Ellis, M. & Armstrong, J.D. 2010. Temporal and spatial patterns of sea lice levels on sea trout in western Scotland in relation to fish farm production cycles. *Biology Letters* 6, 548–551.
- Middlemas, S.J., Fryer, R.J., Tulett, D. & Armstrong, J.D. 2013. Relationship between sea lice levels on sea trout and fish farm activity in western Scotland. *Fisheries Management and Ecology*, 20: 68–74.
- Naylor R. et al. 2005. Fugitive salmon: assessing risks of escaped fish from aquaculture. *BioScience* 55:427-437.
- Oh, E.S., G.J. Edgar, J.B. Kirkpatrick, R.D. Stuart-Smith, N.S. Barrett. 2015. Broad-scale impacts of salmon farms on temperate macroalgal assemblages on rocky reefs. *Marine Pollution Bulletin* 98: 201-209.

- Samuelsen, O.B, B. T. Lunestad, R. Hannisdal, R. Bannister, S. Olsen, T. Tjensvoll, E. Farestveit, A.Ervika. 2014. Distribution and persistence of the anti sea-lice drug teflubenzuron in wild fauna and sediments around a salmon farm, following a standard treatment. *Science of the Total Environment*, 508: 111-121.
- Serra-Llinares, R.M., Bjørn, P.A., Finstad, B., Nilsen, R., Harbitz, A., Berg, M. & Asplin, L. (2014) Salmon lice infection on wild salmonids in marine protected areas: an evaluation of the Norwegian 'National Salmon Fjords'. *Aquaculture Environment Interactions*, 5, 1-16.
- Solem, Ø., Hedger, R.D., Urke, H.A. et al. 2013. Movements and dispersal of farmed Atlantic salmon following a simulated-escape event. *Environ Biol Fish* 96: 927
- Southern Gazette. 2013. <http://www.southerngazette.ca/News/Local/2013-05-21/article-3252854/DFO-confirms-farmed-salmon-found-in-Garnish-River/1>
- Thorstad, E.B., et al. 2008. Incidence and impacts of escaped farmed Atlantic salmon *Salmo salar* in nature. NINA Special Report 36. 110 pp.
- Thorstad, E.B. et al. 2015. Effects of salmon lice *Lepeophtheirus salmonis* on wild sea trout *Salmo trutta* — a literature review. *Aquaculture Environment Interactions* 7: 91–113.
- Verspoor, E., et al. 2015. The potential direct and indirect genetic consequences for native Newfoundland Atlantic Salmon from interbreeding with European-origin farm escapes. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/030.
- Wiber et al. 2012. Impact of Aquaculture on Commercial Fisheries: Fishermen's Local Ecological Knowledge. *Human Ecology* Volume 40, Issue 1, pp 29-40

Attachment C: ASF submission to the NL Department of Environment and Conservation as part of the public consultation under the screening review of the Placentia Bay Aquaculture project.



March 23, 2016

Mr. Bas Cleary
Director of Environmental Assessment
Department of Environment and Conservation
P.O. Box 8700
St. John's, NL
A1B 4J6

Dear Mr. Cleary,

The Atlantic Salmon Federation (ASF) is, at present, opposed to the proposal by Grieg NL Seafarms (reg. 1834) to establish an Atlantic salmon aquaculture operation consisting of 11 sea cage grow-out sites in Placentia Bay on the south coast of Newfoundland.

Given the long and scientifically-documented history of the negative impacts of sea cage salmon aquaculture on wild salmonids, we have serious concerns about the potential impacts of this project on threatened wild Atlantic salmon populations on the south coast of Newfoundland. We are particularly concerned that the proponent has not adequately assessed the risks of their proposed activities, and has provided insufficient, inaccurate, and misleading information in claiming that their activities will have no impact on wild salmon. ASF believes that this proposal requires significantly more study, assessment, and public input before any decision to allow it to proceed can be made, and that such efforts are best undertaken through the preparation of an Environmental Impact Statement (EIS) under Part 10 of the Environmental Protection Act. We outline our concerns and recommendations below. This submission is organized in the following manner:

A. Background on Placentia Bay and Threatened South Coast Salmon

B. Overview of the Impacts of Salmon Farms on Wild Salmon Populations

C. ASF's Concerns Regarding the Proponent's Claim Regarding the Risks to Wild Salmon

Five Reasons to Reject the Proponent's Claim of Insignificant Impacts on Wild Atlantic Salmon:

1. The claim that genetic interactions will be eliminated by using triploid fish is misleading.
2. The proponent has not provided adequate information about how they will prevent and/or recapture escapes.
3. The proponent has not provided adequate information on how they will control disease and parasites.
4. The proponent has inappropriately sited sea-cage sites near salmon rivers and migratory routes.
5. The proponent has failed to address the incremental and cumulative impacts on threatened salmon populations.

D. An Environmental Impact Statement is Required

E. Conclusions

A. Background on Placentia Bay and Threatened South Coast Salmon

There are 19 scheduled salmon rivers flowing into Placentia Bay. These rivers are part of the south coast Atlantic salmon Designatable Unit IV that is currently being considered for listing as “Threatened” under the Species at Risk Act.

The Department of Fisheries and Oceans (DFO) recognizes salmon aquaculture as a major potential source of habitat degradation and mortality of wild Atlantic salmon on the south coast of Newfoundland. The DFO Recovery Potential Assessment for Newfoundland south coast salmon concludes *“Even small numbers of escaped farmed salmon have the potential to negatively affect resident populations, either through demographic or genetic changes in stock characteristics. There have been many reviews and studies showing that the presence of farmed salmon results in reduced survival and fitness of wild Atlantic salmon, through competition, interbreeding and disease”* (DFO 2013a).

Placentia Bay is considered and managed as an Ecologically and Biologically Significant Area (DFO 2007a), and currently has no salmon aquaculture. The extent to which salmon populations in Placentia Bay are affected by aquaculture operations in Fortune Bay and Bay d’Espoir is not known.

B. Overview of the Impacts of Salmon Farms on Wild Salmon Populations

Growing domesticated salmon in sea cages in areas where there are wild salmonids (salmon and sea trout) invariably has negative impacts on local wild populations. These negative impacts have been well established by scientific studies (Hutchinson 2006; Ford and Myers 2008; DFO 2013a). Salmon farms have been shown to impact wild populations in a number of ways which are briefly summarized here:

- **Domesticated salmon escape and interbreed with wild populations.** Escapees have been observed in rivers in all regions where salmon farming occurs. More than 750,000 salmon have escaped from sea cages on the south coast of Newfoundland since fish farming started, and DFO has confirmed that farmed salmon are now in at least a dozen south coast rivers. Genetic studies have demonstrated that farmed salmon have displayed introgression (i.e., introduction of genes from farmed salmon into local wild populations) in Europe (Glover et al. 2013), New Brunswick (Bourret et al. 2013), and Newfoundland (DFO personal communication). Introgression reduces the fitness and local adaptation of wild populations (Bourret et al 2011; McGinnity et al. 2003; DFO 2013b). Data from controlled studies have indicated a decrease in the total productivity of smolts from a river following introgression of farmed salmon (Fleming et al. 2000; McGinnity et al. 1997). Long-term consequences of introgression across river stocks are expected to lead to reduced productivity and decreased resilience.
- **Escaped domesticated salmon have negative ecological interactions with wild salmon** such as interfering with mating and competition for food (Naylor et al. 2005), and spreading parasites and diseases to wild fish (Naylor et al. 2005; Krkosek et al., 2006; Krkosek et al., 2007).
- **Sea lice and other parasites become concentrated in salmon farms and are transmitted to wild fish**, increasing mortality (especially of smolts) in wild populations (Krkosek et al., 2007; Thorstad 2015). Elevated levels of sea lice on wild salmonids have been found up to 30km from salmon farms, and mortality attributable to salmon lice can lead to an average of 12–29% fewer salmon spawners (Thorstad 2015). Chemicals used to treat sea lice infections in sea cages are carried outside of the farm, killing the juvenile stages of crustaceans which may provide important food sources for wild salmon and other fish. Numerous studies have demonstrated a link between fish farming activity and sea lice infestations on wild salmonids (Helland et al. 2012, 2015; Middlemas et al., 2010, 2013; Serra-Llinares et al. 2014). Studies suggest that sea lice induced mortality has an impact on Atlantic salmon returns, which may influence the

achievement of conservation requirements for affected stocks (Gargan et al. 2012, Krkošek et al. 2013).

- **Salmon aquaculture presents risks of increasing disease outbreaks, proliferating possible disease transmission routes in the environment, and decreasing the immunity of wild fish to disease.** 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 (Naylor et al. 2005; Johnsen and Jensen 1994).
- **Salmon farms alter the local environment thereby changing the selective pressures to which locally-adapted wild populations are subjected,** leading 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).

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 (Myers and Ford 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 high 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.

C. ASF's Concerns Regarding the Proponent's Claim Regarding the Risks to Wild Salmon

On page 96 of their registration document, the proponent makes the following claim regarding potential risks and impacts of this project on threatened populations of wild Atlantic salmon in Placentia Bay:

"The proponent fully acknowledges the seriousness of the risk / threat of extirpation of South Newfoundland Atlantic salmon which encompasses the region of Placentia Bay as proposed in this undertaking. It is with this acknowledgement that the proponent will reduce the risk or threat of its operations to local wild stocks of Atlantic salmon to that of insignificance. The proponent will reduce the risk of potential of harm to insignificance by engaging directly to eliminate risk by compounding a number of initiatives that individually should suffice to eliminate risk."

As noted in Section B above, there is an abundance of scientific evidence demonstrating that sea cage salmon aquaculture has significant impacts on wild salmon populations, and that those impacts typically lead to the decline or elimination of local wild populations and the fisheries they support. It is within that context that the proponent's claim that their project will pose an insignificant risk to threatened populations of wild salmon must be evaluated. If their claim is accurate, this would be the first sea cage salmon farm to co-exist with wild salmon with insignificant impacts on wild populations, which would represent a significant departure from the norm. Given the long history of negative impacts from aquaculture on wild salmon, the proponent will need to prove - using evidence that is strong, clear, and compelling - that the issues and impacts identified above will be avoided by their operations before their claim of no impacts can be accepted.

Upon close examination of the information provided by the proponent as well as the scientific literature regarding the interactions between aquaculture and wild salmon, we conclude that the proponent's claim of insignificant impacts from their operations is not justified by the methods they propose and/or

the information they have provided. We believe that the proposed project will pose significant risk to threatened wild salmon populations and outline our concerns below.

Five reasons to reject the proponent's claim of insignificant impacts on wild Atlantic salmon.

1. The claim that genetic interactions will be eliminated by using triploid fish is misleading.

The proponent is proposing to import and use a European (Icelandic) strain of salmon. The use of European strains in salmon sea-cage operations in Canada is currently prohibited because the risk of genetic impacts is greater (than if local strains are used) due to the genetic differences between local and European strains. The proponent claims that the use of sterile all-female triploids will result in a "100% reduction of risk to local wild stock should they escape" (p105) because triploids are sterile and therefore cannot interbreed with wild fish, thereby eliminating the potential for harmful genetic interactions.

However, we believe the proponent has significantly understated the genetic risks associated with the use of triploid European salmon because:

- a) **The procedure to produce triploids is not 100% effective.** Triploid individuals are produced by subjecting fertilized eggs to pressure, but the process is not always 100% effective, meaning that some individuals will be diploid and will therefore be able to breed with wild fish. Studies have found that the process typically produces batches that are 98% (or greater) triploids. The proponent cites a recent review by Benfey (2015) to justify their claim that there will be zero risk to wild salmon from the use of triploid Icelandic strain fish. However, Benfey states "in any case, it cannot be assured that all-triploid groups will always result from even the best standard operating procedures... by using all female triploid populations, approximately 99.9% of the farmed population should never reach sexual maturity".

With 7,000,000 salmon proposed to be put into sea-cages annually, even a 99.9% rate of effectiveness would equate to ~7,000 fertile Icelandic strain female salmon reaching sexual maturity in sea-cages in Placentia Bay every year. This is likely close to the total number of wild salmon that return to Placentia Bay rivers on an annual basis. If only a small proportion of those fertile fish escape and interbreed with wild Placentia Bay salmon at some point during the life of the project, the impacts on threatened wild salmon populations could be severe and irrevocable. Ongoing escapes leading to interbreeding over multiple years would have larger impacts. The proponent has not acknowledged that the use of triploid fish does not eliminate the risk to wild salmon, and they have not acknowledged that the consequences of interbreeding might be increased by the use of European strain fish.

- b) **The proponent has failed to consider indirect genetic effects that can arise even when farmed salmon are sterile and/or do not escape into the wild.** Indirect genetic interactions arise when cages full of domesticated salmon change the local environment (e.g., through parasites or diseases) in a way that alters the selective pressures to which locally-adapted wild populations are subjected (i.e., local wild populations begin to adapt to artificial conditions created by the salmon farm). This 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). These effects are believed to be more severe when local wild populations are at low levels of abundance, as is the case with salmon on the south coast of Newfoundland.
- c) **Lack of contingency plan should the triploid fish not perform as expected.** The use of triploid Atlantic salmon in sea cage aquaculture operations is new to Newfoundland and has not been

extensively tested here. The ability to create triploids is not new, but they have not been used extensively in sea-cage operations to date because they have tended to perform less well than non-sterile diploids (Benfey 2015). The proponent does not discuss the possibility that triploids will not perform well in the Newfoundland situation, nor do they discuss their contingency plans should triploids fail to perform as expected. Given the massive investment in infrastructure for this project, one can only assume that the contingency plan will be to use non-sterile diploid strains. Consequently, the potential for non-sterile diploids to eventually be used in this project is real, and would dramatically change the proponent's claim that there can be no genetic interactions with wild fish (regardless of whether North American or European diploids are used). More information is needed about contingency plans in case the triploids do not perform as expected and the risks to wild salmon from those contingency plans.

2. The proponent has not provided adequate information about how they will prevent and/or recapture escapes.

As noted by the proponent, incomplete containment practices in sea cages lead to the risk of farmed salmon escaping into the wild. In addition to genetic interactions as noted above, escaped farm salmon can have negative ecological interactions with wild salmon, and can spread diseases and parasites to wild salmon. Preventing farmed salmon from escaping from sea cages is one of the ongoing challenges for the salmon aquaculture industry worldwide (Thorstad et al. 2008).

The proponent claims that their containment practices will contribute to this project having insignificant impacts on wild salmon; however, they have provided very little information about how they intend to minimize escapes, what estimated escape rates are, or any assessment of possible threats that would result in large-scale escape events (e.g., storms, ice, predators, accidents, etc.). Instead, they simply state that they will meet the NL code of containment and Norwegian standards for "escape proofing" cages, and provide links to or copies of the cited documents and information obtained from net-pen manufacturers.

We note, however, that both Newfoundland and Norway continue to have significant issues with salmon escapes from sea cage aquaculture operations, indicating that existing standards, regulations, and codes are not highly effective at preventing escapes. In Newfoundland, DFO has confirmed the presence of escaped farm fish in at least 12 rivers on the south coast. In 2013 there was another major escape event from an aquaculture site on the south coast of Newfoundland with fish from that escape turning up in Garnish River. In 2015, a brief survey by DFO found more than 150 escaped aquaculture salmon in three salmon rivers near aquaculture sites in Fortune Bay (DFO Personal Communication), indicating that escape events are still occurring.

Overall, the proponent has not provided sufficient information to enable the risks of escapees or the consequences of such escapes to be assessed, and they have not demonstrated that their proposed containment methods are an improvement on the inadequate methods currently used in Newfoundland. No discussion has been included on the threats and risks around escape events, and no information has been provided on specific actions the proponent will take to minimize escapees on a day-to-day basis. Likewise, no discussion of the potential for recapture or of specific recapture plans has been provided. Therefore, it is impossible to accept the proponent's claim that initiatives around escape prevention will eliminate the risk to wild populations.

3. The proponent has not provided adequate information on how they will control disease and parasites.

As noted by the proponent, incomplete husbandry practices lead to the risk that farmed salmon will become infected by disease or parasites. These diseases/parasites can then be transmitted to wild salmon either by farmed fish that escape into the wild, or through interactions between sea-cages

and wild salmon as wild fish migrate past the cages. There is also evidence that parasites (e.g., sea lice) can be carried by ocean currents and thereby transmitted to wild fish that do not directly interact with sea-cages (Thorstad et al. 2015).

Despite identifying incomplete husbandry practices resulting in disease risk as a threat to local threatened wild salmon populations, and claiming that their practices will contribute to reducing the risk of the project to wild salmon to “insignificance”, the proponent has provided little information about how their husbandry practice will achieve this. The proponent provides 5 pages of description of their planned husbandry practices, but that description contains little discussion or explanation of how those practices will reduce the risks of disease and parasite transmission to wild fish compared to practices currently used in Newfoundland and elsewhere.

The proponent does indicate that lumpfish will be used to control sea lice and indicates that this will be a transfer of technology from Norway to Newfoundland. However, no further details are provided as to what this procedure for controlling sea lice entails, how effective it is in Norway, how effective it is expected to be in Newfoundland, how it will help reduce the impacts of this project on wild salmon, and whether the use of this technology might bring new or additional risks to wild salmon. Likewise, no specific alternative lice control methods have been described for use in the case that the lumpfish plan is ineffective, except to say that functional feeds will be used, that vaccines will be used when they are available, and that therapeutants will be used as a last resort. No details are provided about the effectiveness of these possible alternative methods, about the specific type and quantity of chemical therapeutants to be used, or about the tendency of sea lice to become immune to therapeutants after a few years. Likewise, no justification is provided to support the argument that these methods will help eliminate the impacts on wild salmon.

The proponent has also failed to consider issues of disease infection in the sea cages, the potential for diseases to be transmitted to wild salmon populations, and how the risk of disease transmission may be heightened by the use of both European strain and triploid fish. We note that Infectious Salmon Anemia (ISA) has been a problem in Newfoundland aquaculture sites (and elsewhere) for many years and there are concerns about the potential for salmon farms to amplify and transmit virulent strains to wild populations. Yet, ISA and its potential impacts on wild salmon (or on the production of farmed salmon) have not been mentioned by the proponent in the registration document.

There is some evidence that inducing triploidy in Atlantic salmon lowers their resistance to diseases, thereby raising the risk that they can become sources of infection to other fish due to the accumulation of higher pathogen loads and/or changes in their behaviour which makes them more likely to spread the pathogen (Benfey 2015). There are also concerns that salmon eggs imported from Europe could carry strains of ISA or other pathogens that are not currently in Newfoundland. The spread of such diseases to threatened wild populations would pose a significant risk; however, none of these risks have been discussed by the proponent. The proponent provides little information on how they will control ISA and other diseases or how they will prevent diseases from being transmitted to wild salmon. Likewise, they have provided no indication that their husbandry practices are superior to those already in use elsewhere, and therefore no justification for their claim that their husbandry practices will eliminate the risk to wild salmon.

4. The proponent has inappropriately sited sea cage sites near salmon rivers and migratory routes.

The risks of salmon aquaculture having a negative impact on wild salmon are heightened when farms are placed near salmon rivers or along the migratory routes of wild salmon. Proximity to the mouths of salmon rivers increases the risk that aquaculture escapes will find their way into those rivers and have negative genetic and ecological interactions with wild fish. Proximity to migratory

routes increases the risk that migrating salmon (outgoing smolts or incoming adults) will pick up parasites and/or diseases from sea-cages. Proximity to salmon rivers and/or migratory routes also increases the risk that migrating salmon will be attracted to sea cages thereby increasing their exposure to parasites, diseases, predators, drugs, and chemicals used in the farming process (Goodbrand 2013). Although there is no accepted minimum distance for siting sea cages in relation to salmon rivers, as noted previously, farmed salmon have been confirmed in many rivers on the south coast including Garnish River on the Burin Peninsula, which is approximately 25km from the nearest existing salmon aquaculture site.

We note that all of the proposed 11 sea cage sites are located along possible or likely migratory routes for wild salmon. Sea cages in the Merasheen, Red Island, and Long Harbour Bay management Areas (BMAs) are located along the likely migratory routes for salmon entering and leaving the five scheduled salmon rivers at the head of Placentia Bay (including Piper's Hole River, the largest scheduled salmon river in Placentia Bay). The Merasheen and Red Island BMAs are located approximately 22km and 26km from the mouths of the rivers at the head of the bay. The Long Harbour BMA is located approximately 16km from the mouths of North East Placentia and South East Placentia rivers. And the proposed Rushoon BMA is located immediately adjacent (<2km) to the mouths of Nonesuch Brook, Cape Roger River, and Bay de L'eau River.

The proponent has provided no indication that they are aware of which rivers in Placentia Bay contain runs of wild salmon or that they understand the migratory routes and habitat use of wild salmon in Placentia Bay. They have provided no justification for the location of these sites in proximity to salmon rivers, no discussion of the potential risks posed to these stocks by the proposed locations of the sea cages, and no assessment of alternative sites that would reduce the risks to wild salmon.

5. The proponent has failed to address the incremental and cumulative impacts on threatened salmon populations.

As noted by both DFO and COSEWIC (and cited by the proponent), south coast salmon populations are currently experiencing numerous stressors, all of which contribute to depressed population size and to the assessment of these populations as Threatened. Some of these stressors are understood (e.g., aquaculture, legal and illegal fisheries in marine and freshwater) while others are known but less well understood (e.g., declining survival in the marine environment). Despite acknowledging the existence of these multiple stressors, the proponent has evaluated their claim of insignificant impacts in isolation, without considering how their proposed project will contribute incrementally to the combination of past, present, and future stressors on these threatened populations. When populations are at depressed levels and under stress, as is the case with south coast salmon, even seemingly small additional stresses can have a large impact because of the cumulative nature of stressors. Given that this proposal represents a significant expansion (in both production and geographic area) of one of the identified existing major stressors on threatened south coast salmon, it is not acceptable for the impacts (however minor the proponent might claim them to be) to be assessed in isolation, without considering the cumulative impacts of the aquaculture industry (and other stressors) on these populations.

D. An Environmental Impact Statement is Required

Section 25 of the Environmental Assessment Regulations provides clear guidance to the minister as to when an Environmental Impact Statement is required: *"Where the minister determines with respect to an undertaking that there (a) may be significant negative environmental effects; or (b) is of significant public concern, the minister shall require an environmental impact statement."*

The Regulations list nine criteria that the minister can examine when determining if there may be negative environmental impacts or significant public concern. With respect to wild Atlantic salmon, the proposal fails seven of those criteria. Therefore, there is sufficient evidence of both negative environmental impacts and significant public concern to require an environmental impact statement.

Environmental Criteria

Criterion A: Whether or not the environmental baseline information provided with respect to the undertaking is sufficient for predicting environmental effects.

There is very little baseline information provided about wild Atlantic salmon in the project area. The proponent does provide a description of the status of salmon stocks on the south coast of Newfoundland and quotes both the COSEWIC Technical Summary and DFO Recovery Potential Assessment documents. This information, however, is not specific to salmon populations in Placentia Bay and is not sufficient for predicting the specific impacts of this project on those populations. As noted above, the proponent has made a claim that the project will have no significant impacts on wild salmon in Placentia Bay; however, they have not substantiated this claim through the provision or analysis of information about wild salmon populations in the bay and how those populations would (or would not) interact with their proposed operations. Although the size and location of the proposed sea cage operations would strongly suggest that there will be significant interactions with wild salmon (and other marine species), the information provided by the proponent is not sufficient to predict the environmental impacts on these species. Likewise, the proponent has not adequately discussed the potential impacts on salmon and other marine species. Instead, they have simply stated that there will be minimal impacts in all cases but provide no data to substantiate these claims.

Criterion B: Whether or not original field data collection is required.

Predicting and mitigating the impacts of this project on wild salmon will require information on a range of issues including (but not limited to): salmon population sizes (for juveniles and adults) for the rivers flowing into Placentia Bay; timing of migrations of juvenile and adult salmon through Placentia Bay; migration routes of adults and juveniles through the bay; habitat use by adults and juveniles within the bay; and genetic distinctiveness of salmon populations within the bay. To the best of our knowledge, these data have never been collected for salmon populations in Placentia Bay, with the exception of some periodic monitoring of adult returns in Northeast Placentia River. Consequently, predicting the impacts of this project on wild salmon, understanding if/how those impacts can be mitigated, and monitoring the outcomes of the project and mitigation measures would require the collection of original field data prior to the implementation of the project as well as the implementation of ongoing data collection for the life of the project.

Criterion C: Whether or not the undertaking would be located in an environmentally sensitive area.

As noted by the proponent, all of Placentia Bay has been identified as an Ecologically and Biologically Significant Area (EBSA), and is managed through the "Placentia Bay Integrated Management Plan" (PBIMP). The PBIMP has been devised to provide direction to the integrated and collaborative activities that take place within the Placentia Bay region, and centers on integrated, adaptive, ecosystem-based management, and collaborative governance (DFO 2007b). Despite acknowledging that Placentia Bay is an environmentally sensitive area that is managed under an integrated management plan, the proponent has not explained how their activities would fit into and be managed under that plan. Likewise, the proponent has not acknowledged the cumulative effects of their proposed operations on the bay given the other stressors that the bay is currently experiencing.

Criterion F: The environmental effects of the undertaking upon rare or endangered species.

Atlantic salmon in Placentia Bay are part of the south coast designatable unit that has been assessed as "Threatened" by COSEWIC and is currently being considered for listing under the Species At Risk Act.

Rather than provide an in-depth assessment of the risks of their proposal to these populations, the proponent has simply stated that their project will not have significant impacts on wild Atlantic salmon. As we have discussed extensively in Section C above, this claim cannot be substantiated by the information provided by the proponent or by the extensive scientific information on the impacts of aquaculture on wild salmonids. We note that the proponent has identified 14 other species that have been identified as “Endangered”, “Threatened” or “Special Concern” and has also stated that the project is unlikely to have any impact on these species without providing a rigorous assessment of the risks for any of them. Given the inaccurate and misleading claims about the potential impacts of this project on Atlantic salmon as discussed above, it is difficult to accept the claims about the potential impacts on other rare or endangered species at face value.

Criterion G: The economic importance of a resource to which the undertaking relates.

The Atlantic salmon resource has significant economic importance to the people of Newfoundland and Labrador. The province has 186 scheduled Atlantic salmon rivers which produce a combined catch (recreation and subsistence, retained and released) of approximately 50,000 to 60,000 salmon per year. An important (but not the only) measure of the economic importance of the resource is the amount of money people spend on their recreational salmon fishing activity. A recent report prepared by Gardner Pinfold Consultants indicates that the Gross Domestic Product (GDP) value for wild Atlantic salmon in NL in 2010 was approximately \$33 million. In that year, anglers spent approximately \$27 million on salmon angling (Gardner Pinfold 2011). Currently, there is no estimate of the amount of money spent on fishing in the 19 rivers that flow into Placentia Bay; however, in 2014, those rivers had a total of ~3,575 rod days of recreational salmon angling effort, suggesting that expenditures for salmon fishing on those rivers is likely to be significant. We note, however, that there is potential for this project to have impacts on wild salmon outside of the Placentia Bay area, especially if a European strain of salmon is introduced and fertile individuals escape into the wild. Consequently, any estimate of the economic importance of the resource should not be limited to the fishing activity that occurs in Placentia Bay.

Public Concern Criteria

Criterion A: Whether the public acceptability of the undertaking is seriously questioned.

Public concern over the acceptability of salmon aquaculture and its impacts on wild salmon (and the environment in general) has been growing throughout the province for many years. This concern is based on the impacts directly observed by members of the public on the natural environment as well as growing public awareness of scientific studies that have conclusively demonstrated a range of environmental impacts of salmon aquaculture, including significant impacts on wild salmon and the fisheries they support. Such concern has been increasingly expressed in numerous public media outlets over the past few years, even in the absence of specific plans to expand the salmon aquaculture industry in the province. In 2013, the Newfoundland government engaged in a public consultation process in support of developing a new aquaculture strategy for the province: 80% of respondents to the online questionnaire said that the salmon aquaculture industry has a poor or very poor reputation, and respondents expressed significant concerns over the impacts on wild salmon and the overall sustainability of the industry (Government of Newfoundland and Labrador 2014).

We note that the MOU between Grieg and the province generated significant controversy when it was announced in October 2015. Likewise, the initial registration of the hatchery component of the project for environmental assessment generated significant opposition from the public, culminating in the proponent being required to register the entire project, including the sea cage grow-out component. Public sentiment at that time was that the entire project needed to be registered so that the environmental impacts of the sea cage component could be properly assessed. Likewise, the registration of the entire project has again resulted in many members of the public questioning the acceptability of

the project in various public and social media. Given the breadth and depth of the concerns expressed, the public is not likely to accept anything less than a full EIS for this project.

Criterion B: Whether government policy has been established to address public concerns.

Existing government policy is not sufficient to address the public concerns regarding this project. The provincial government released a Sustainable Aquaculture Strategy in 2014 to guide future policy and investment decisions aimed at fostering the success of the industry. This document, however, provides only general direction for policy development and does not contain any specific policies that would address the public's concerns over this specific project. The fact that significant public concern over salmon aquaculture remains two years after the release of the aquaculture strategy document indicates that the Aquaculture Strategy has not been effective at addressing public concerns.

Regarding issues of escapes, the government has a Code of Containment for the Culture of Salmonids in Newfoundland and Labrador which was implemented in 1999 and updated in 2014. The primary objective of the code is to minimize the escapes of farmed salmon. However, as noted above, the code of containment and the practices used by aquaculture operators have not been successful at preventing farmed salmon from escaping and entering south coast rivers that contain populations of wild salmon; significant numbers of farmed salmon were found in Fortune Bay rivers near aquaculture sites as recently as 2015. Furthermore, a recent study by DFO has confirmed that escaped farmed salmon have interbred with wild populations on the south coast (DFO personal communication). The Code of Containment requires that escape events are reported to the Department of Fisheries and Aquaculture; however, the Department's website does not report escapes after 2013. The Code of Containment is clearly not sufficient for addressing public concerns regarding escapes.

Regarding the introduction of Icelandic strain salmon, the government has an Introductions and Transfers Committee which is responsible for reviewing applications for intentional introductions and transfers of live aquatic organisms into captive facilities and the waters of Newfoundland and Labrador. The committee operates under the National Code of Introductions and Transfers of Aquatic Organisms, which is designed to protect aquatic ecosystems while encouraging responsible use of aquatic resources for the benefit of Canadians. The application for the importation of Icelandic strain eggs would need to be assessed under this Code. However, we note that the Newfoundland Aquaculture Act (Section 8) also requires the impact of introductions to be assessed in accordance with the Part 10 of the Environmental Protection Act, and that such assessment must be made under the assumption that the animals will escape into the natural environment. Given the likelihood that some of those escaped salmon will be fertile (as outlined in Section C above), the introduction of Icelandic strain salmon must be assessed under the assumption that a minimum of 7,000 fertile Icelandic strain salmon will escape into Placentia Bay each year. An Environmental Impact Statement ordered under Part 10 of the Environmental Protection Act is the only framework in which the impacts of such an introduction can be appropriately assessed.

Regarding parasite and disease issues and the placement of sea cages near salmon rivers and migratory routes, the government currently has no policy to address the public's concerns over how these issues will impact wild salmon.

E. Conclusions

The proposal by Grieg NL Seafarms to develop a salmon aquaculture project in Placentia Bay represents a significant expansion of the salmon aquaculture industry in an area where wild Atlantic salmon have been assessed as "Threatened" by the Committee on the Status of Endangered Wildlife in Canada. Despite a long and scientifically documented history of salmonid sea cage aquaculture producing significant negative impacts on wild salmon and the fisheries they support, the proponent claims that

their Placentia Bay project will pose no risk to wild salmon populations. Careful consideration of the information provided by the proponent and the scientific literature regarding the interactions between farmed and wild salmon leads us to conclude that the proponent's claim is not justified and that this project poses serious risk to threatened wild salmon populations. These risks need to be fully investigated and considered in decisions about the acceptability and viability of this project. Likewise, there has been significant concern expressed by the public about the potential impacts of this project. Failure to acknowledge the public's concerns and provide further opportunities for public engagement through an EIS process would not be consistent with the intent or wording of the Environmental Protection Act, and would leave approval of this project open to legal challenge.

For the reasons outlined in this submission, we believe that the Environmental Protection Act requires the Minister to order the completion of an Environmental Impact Statement (EIS) before any decision to approve this project is made. With respect to wild Atlantic salmon, we believe the EIS should include, at a minimum, the following:

1. *Full and detailed analysis and assessment of all of the potential risks to wild salmon, including all of those identified above and any identified by other parties.* Such a risk assessment should be based on the collection of significant original data on wild salmon and their habitat in the proposed project area, including within the freshwater habitat of rivers that flow into Placentia Bay. To fully understand and incorporate natural variability, baseline data would need to be collected over a number of years prior to implementation of the project.
2. *Assessment and development of potential monitoring and mitigation measures for all of the identified risks to wild salmon.* Such measures should include (but not be limited to): regularly monitoring local rivers to check for the presence of escaped farm salmon, genetic monitoring to regularly check for interbreeding between wild and farmed salmon, monitoring of sea lice levels on wild salmon (juveniles and adults), and monitoring wild populations for the presence of diseases transmitted from farmed salmon. As noted above, collection of extensive baseline data over a number of years would be necessary to monitor and understand the ongoing impacts of the project on wild salmon. Also included here must be the assessment of potential mitigation measures should negative impacts on wild salmon be discovered, as well as the penalties to be paid by the proponent should negative impacts be demonstrated.
3. *Assessment of the potential socio-economic impacts on the recreational salmon fishing industry/anglers.* As outlined above, salmon angling has high social and economic importance to the people of the province. Given the global history of salmon aquaculture negatively impacting wild salmon and the fisheries they support, and the significant risks posed by this project, there are very strong reasons to believe that this project will negatively impact the amount and quality of salmon angling opportunities in the project area and beyond, leading to significant social and economic impacts. We note that the Environment Protect Act (s.2(m)) explicitly includes people and the social, economic, recreational, cultural and aesthetic conditions and factors that affect them in the definition of "environment". Consequently, assessment of social and economic impacts of the salmon angling community (as well as other individuals, groups, or communities potentially impacted by this project) is required under the EPA.
4. *Evaluation of potential alternatives to the sea cage grow-out operations, specifically: the use of land-based closed containment grow-out facilities which would eliminate most of the environmental impacts of this project.* We note that the proponent plans to grow a proportion of smolts to 1.5kg in the land-based closed containment freshwater hatchery before transferring them to sea cages. The ability to grow salmon to that size in land-based closed-containment facilities represents a significant transfer of new technology to Newfoundland. We also note that

the technology to grow salmon to market size in land-based closed containment facilities currently exists and is being used commercially in Canada and elsewhere, and that at least a dozen land-based closed containment facilities are in various stages of operation and/or construction worldwide. Given this, it is difficult to understand the need to use sea cage grow out facilities, given the significant environmental issues associated with them. The proponent should be required to undertake an in-depth assessment of the feasibility of using land-based facilities and, if sea cages are still considered necessary, provide strong justification why they need to use those outdated and environmentally destructive facilities when more sustainable options are available.

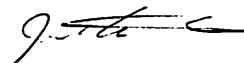
5. *Given the level and scope of the concerns expressed by the public, the ongoing environmental assessment process should include significant opportunities for meaningful input by members of the public.* Opportunities for public engagement should include (but not necessarily be limited to): comment on the terms of reference for the EIS, opportunities to engage directly with the proponent and government during the preparation of the EIS, and opportunities to comment on the EIS documents as part of the final decision to approve or reject the proposal. Given the value of wild salmon to people throughout the province and the widespread public concerns about this project, opportunities to meet directly with the proponent and/or government (through public meetings or hearings, etc.) should not be limited only to the immediate project area (as they have been to date).
6. *The proposal should be referred to the Department of Fisheries and Oceans – Salmonid Section, Science Division for their assessment and input.* DFO has a long history of researching and monitoring wild salmon populations on the south coast of Newfoundland, including wild and farmed salmon interactions. DFO is currently undertaking a process to decide whether to recommend south coast salmon for listing under the Species At Risk Act, and has expressed concerns about the impacts of aquaculture on those populations. Given their expertise and responsibilities, scientists from DFO’s Salmonid Section should be engaged at all future stages of the environmental assessment process.

Thank you for consideration of our concerns and recommendations. Please do not hesitate to contact us at any time should you have any questions or wish to further discuss this proposal with us.

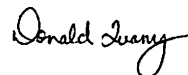
Sincerely,



Dr. Stephen Sutton
Coordinator,
Community Engagement



Jonathan Carr
Executive Director,
Research and Environment



Don Ivany
Director,
NL Programs

References

- Benfey, T.J. 2015. Biocontainment measures to reduce/mitigate potential post-escape interactions between cultured European-origin and wild native Atlantic salmon in Newfoundland. DFO Can.Sci. Advis. Sec. Res. Doc. 2015/003.
- Bourret V, O'Reilly PT, Carr JW, Berg PR, Bernatchez L. 2011. Temporal change in genetic integrity suggests loss of local adaptation in a wild Atlantic salmon (*Salmo salar*) population following introgression by farmed escapees. *Heredity*, 106, 500–510.
- Bourret, V., Kent, M.P., Primmer, C.R., Vasemagi, A., Karlsson, S., Hindar, K., McGinnity, P., et al. 2013. SNP-array reveals genome-wide patterns of geographical and potential adaptive divergence across the natural range of Atlantic salmon (*Salmo salar*). *Molecular Ecology*, 22: 532-551.
- DFO. 2007a. Placentia Bay-Grand Banks Large Ocean Management Area Ecologically and Biologically Significant Areas. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/052.
- DFO. 2007b. Placentia Bay Integrated Management Plan. DFO/2007-1292.
- DFO. 2013a. Recovery Potential Assessment for the South Newfoundland Atlantic Salmon (*Salmo salar*) Designatable Unit. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/007.
- DFO. 2013b. Potential Effects Surrounding the Importation of European Origin Cultured Atlantic Salmon to Atlantic Salmon Populations and Habitats in Newfoundland. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/050.
- Ferguson A., et al., editors. 2007. *The Atlantic Salmon: Genetics, Conservation and Management*. Blackwell, Oxford.
- Fleming, I.A., Hindar, K., Mjølnerod, I.B., Jonsson, B., Balstad, T. and Lamberg, A. 2000. Lifetime success and interactions of farm salmon invading a native population. *Proceedings of the Royal Society of London Series B-Biological Sciences*, 267: 1517-1523.
- Gardner Pinfold. 2011. *Economic Value of Wild Atlantic Salmon*. Gardner Pinfold Consultants Ltd. Halifax.
- Gargan, P. G., Forde, G., Hazon, N., F., R. D. J. & Todd, C. D. 2012. Evidence for sea lice-induced marine mortality of Atlantic salmon (*Salmo salar*) in western Ireland from experimental releases of ranched smolts treated with emamectin benzoate. *Canadian Journal of Fish and Aquatic Sciences*, 69: 343-353.
- Glover, K.A., Pertoldi, C., Besnier, F., Wennevik, V., Kent, M., and Skaala, Ø. 2013. Atlantic salmon populations invaded by farmed escapees: quantifying genetic introgression with a Bayesian approach and SNPs. *BMC Genetics*, 14:4.
- Goodbrand et al. 2013. Sea cage aquaculture affects distribution of wild fish at large spatial scales. *Canadian Journal of Fisheries and Aquatic Sciences*, 2013, 70(9): 1289-1295
- Government of Newfoundland and Labrador. 2014. *A summary of what we heard*. Newfoundland and Labrador Department of Fisheries and Aquaculture. St. John's.
- Helland, I.P., Finstad, B., Uglem, I., Diserud, O.H., Foldvik, A., Hanssen, F., Bjørn, P.A., et al. 2012. What determines salmon lice infections on wild salmonids? Statistical calculations of data from the national salmon lice surveillance program 2004–2010 (in Norwegian). NINA Report, 891. 51 pp.
- Helland, I.P., Uglem, I., Jansen, P.A., Diserud, O, H., Bjørn, P.A. & Finstad, B. 2015. Statistical and ecological challenges of monitoring parasitic sea lice infestations in wild salmonid fish stocks. *Aquaculture Environment Interactions*, 7: 267-280.
- Hutchinson P, editor. 2006. *Interactions between aquaculture and wild stocks of Atlantic salmon and other diadromous fish species: science and management, challenges and solutions*. Proceedings of an ICES/NASCO Symposium held in Bergen, Norway, 18–21 October 2005. *ICES J Mar Sci* 63:(7).
- Johnsen BO and Jensen AJ. 1994. The spread of furunculosis among salmonids in Norwegian rivers. *J Fish Biol* 45: 47–55

- Krkosek, M., J. Ford, A. Morton, S. Lele, R.A. Myers, & M. Lewis, 2007. Declining wild salmon populations in relation to parasites from farm salmon. *Science* 318, 1772-1775.
- Krkosek, M., et al. 2006. Epizootics of wild fish induced by farm fish. *Proceedings of the National Academy of Sciences of the USA*. 103, 15506-15510.
- Krkošek, M., Revie, C.W., Gargan, P.G., Skilbrei, O.T., Finstad, B., and Todd, C.D. 2013. Impact of parasites on salmon recruitment in the Northeast Atlantic Ocean. *Proceedings of the Royal Society B: Biological Sciences* 280: 20122359.
- McGinnity, P., Stone, C., Taggart, J. B., Cooke, D., Cotter, D., Hynes, R., McCamley, C., et al. 1997. Genetic impact of escaped farmed Atlantic salmon (*Salmo salar* L.) on native populations: use of DNA profiling to assess freshwater performance of wild, farmed, and hybrid progeny in a natural river environment. *ICES Journal of Marine Science*, 54: 998-1008.
- McGinnity P, et al. 2003. Fitness reduction and potential extinction of wild populations of Atlantic salmon, *Salmo salar*, as a result of interactions with escaped farm salmon. *Proc R Soc Lond B Biol Sci* 270: 2443–2450
- Middlemas, S.J., Raffell, J.A., Hay, D.W., Hatton-Ellis, M. & Armstrong, J.D. 2010. Temporal and spatial patterns of sea lice levels on sea trout in western Scotland in relation to fish farm production cycles. *Biology Letters* 6, 548–551.
- Middlemas, S.J., Fryer, R.J., Tulett, D. & Armstrong, J.D. 2013. Relationship between sea lice levels on sea trout and fish farm activity in western Scotland. *Fisheries Management and Ecology*, 20: 68–74.
- Naylor R. et al. 2005. Fugitive salmon: assessing risks of escaped fish from aquaculture. *BioScience* 55:427-437.
- Serra-Llinares, R.M., Bjørn, P.A., Finstad, B., Nilsen, R., Harbitz, A., Berg, M. & Asplin, L. (2014) Salmon lice infection on wild salmonids in marine protected areas: an evaluation of the Norwegian 'National Salmon Fjords'. *Aquaculture Environment Interactions*, 5, 1-16.
- Thorstad, E.B., et al. 2008. Incidence and impacts of escaped farmed Atlantic salmon *Salmo salar* in nature. *NINA Special Report* 36. 110 pp.
- Thorstad, E.B. et al. 2015. Effects of salmon lice *Lepeophtheirus salmonis* on wild sea trout *Salmo trutta* — a literature review. *Aquaculture Environment Interactions* 7: 91–113.
- Verspoor, E., et al. 2015. The potential direct and indirect genetic consequences for native Newfoundland Atlantic Salmon from interbreeding with European-origin farm escapes. *DFO Can. Sci. Advis. Sec. Res. Doc.* 2015/030.
- Wiber et al. 2012. Impact of Aquaculture on Commercial Fisheries: Fishermen's Local Ecological Knowledge. *Human Ecology* Volume 40, Issue 1, pp 29-40