Atlantic Salmon Federation Fédération du Saumon Atlantique

June 22, 2018

Joanne Sweeney, Project EA Chair
Department of Municipal Affairs and Environment
Environmental Assessment Division
West Block, Confederation Building
PO Box 8700
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RE: Placentia Bay Atlantic Salmon Aquaculture Project (#1834)

Dear Ms. Sweeney and Members of the Environmental Assessment Committee:

The Atlantic Salmon Federation (ASF) has reviewed the Environmental Impact Statement (EIS) submitted by Greig NL for the Placentia Bay Aquaculture Project. We are profoundly disappointed by the proponent's inadequate efforts to understand the local environment, predict and evaluate impacts, and monitor outcomes, particularly around issues related to wild Atlantic salmon. We conclude that the EIS does not address the concerns raised by the public, the issues identified by the Environmental Assessment (EA) Division during the screening review, the issues upon which the Supreme Court of Newfoundland and Labrador based its decision to order an EIS for the project, or the EIS guidelines issued by the EA Division. Therefore, we conclude that the EIS and component studies are deficient. Substantial additional work must be done by the proponent to meet the standards clearly defined in the guidelines.

Our review has identified numerous issues and deficiencies across four main areas: 1) Lack of original data collection to augment the information presented in the project registration document; 2) Evaluation of potential impacts is not rigorous, balanced, reasonable, or transparent, resulting in conclusions that are not justified; 3) Lack of meaningful detail about the proponent's approach to follow-up monitoring programs; and 4) Superficial evaluation of project alternatives with unjustified conclusions. We discuss these issues in detail in the sections below with particular attention to wild Atlantic salmon; however, we note that many of these issues also apply to other Valued Ecosystem Components (VECs).

1. Lack of original data collection to augment the information presented in the project registration document

The EA Division conducted a thorough review of the information provided by the proponent in their registration document (filed Feb. 19, 2016) as well as the information provided by members of the public and other government agencies including Fisheries and Oceans Canada (DFO), the Canadian Science Advisory Secretariat (CSAS), and the NL Wildlife Division as part of the screening review process. The EA Division's analysis of that information was presented in a detailed memorandum by Mr. Eric Watton to the Minister (the Watton Memo) on July 22, 2016. The memo clearly demonstrates that the EA Division recognized that understanding the present ecosystem and population ecology of wild salmon is critical for predicting, assessing,

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mitigating, and monitoring any project effects on wild Atlantic salmon. However, throughout that document, it was repeatedly stated that the necessary data on wild Atlantic salmon does not exist (see for example p. 15). One of the key recommendations arising from the analysis was that an EIS be ordered to (among other things) "require a study of baseline ecosystem and population ecology on the wild salmon of Placentia Bay" and "investigate and provide more information on the uncertainties, knowledge gaps, and recommendations provided in the CSAS report" (Watton Memo, pg. 48). The Watton Memo and the CSAS report (Science Response 2016/034) both identified several key areas where more data are needed, including:

- abundance of threatened southern Newfoundland salmon in Placentia Bay;
- migratory patterns and residency time of wild salmon in Placentia Bay;
- genetic structure of wild salmon in Placentia Bay;
- escaped triploid salmon dispersal, survival, feeding, movements into rivers, and interactions with wild Atlantic salmon;
- fitness differences between wild and escaped farmed salmon;
- the extent of competitive interactions between wild and escaped farmed salmon and the effects of these interactions on the survival of wild salmon and on local population demographics;
- statistical data on the effectiveness of the triploidy induction process;
- and potential reproductive success of failed triploids.

The need for more data on wild Atlantic salmon and other VEC's was clearly recognized by the EA committee when developing the EIS guidelines. For example, the guidelines require the proponent to conduct a component study on salmon to include "characterization of the current distribution, abundance, genetic population structure, morphology, health and fitness, and migratory patterns of wild Atlantic salmon in the waters of Placentia Bay" (EIS guidelines p. 10). Furthermore, the EIS guidelines clearly state that "the rationale for a component study is based on the need to obtain additional data to determine the potential for significant effects on a VEC due to the proposed undertaking, and to provide the necessary baseline information for monitoring programs" (EIS guidelines p. 22) and that "information and data generated shall be sufficient to adequately predict the effects of the undertaking on the VEC" (EIS guidelines p. 23).

In requesting information on things like abundance, genetics, and migratory patterns of wild salmon in Placentia Bay, the EA committee was clearly aware that such information does not currently exist. Indeed, the key reason why the EA Division originally recommended an EIS rather than an Environmental Preview Report was "because the information for areas of further study (e.g., baseline wild salmon data and other recommendations in the CSAS report) are not readily available" (Watton Memo p. 48). That, combined with the above cited instructions in the EIS guidelines, demonstrates a clear requirement that the EIS entails the collection of original data to fill the identified data gaps. This was not done.

The two key natural environment VEC component studies submitted by the proponent (Wild Atlantic Salmon and Fish and Fish Habitat) are "desktop literature reviews" with no attempt made to collect original data. Consequently, the data gaps identified in the screening review and CSAS report have not been filled, the evaluation of potential impacts on wild salmon is based on incomplete information and faulty assumptions (see section 2 below), baseline data are not available from which to develop monitoring programs (see section 3 below), and the requirements and objectives of the EIS guidelines have not been met.

It is important to recognize that the proponent has been allotted a significant amount of time to complete the EIS. Of the 3 years plus 2 optional one-year extensions available, the proponent used 2 months and 10 days to compete the EIS. While we recognize that some important information cannot be collected prior to beginning the phased production plan (e.g., behaviour of escaped fish and their interactions with wild salmon), much of the information vital to predicting, mitigating, and monitoring the impacts of the project on wild salmon can be collected within the EIS timeframe. We discuss a number of key examples below:

a) Migration patterns and habitat use of wild salmon within Placentia Bay are key to understanding the potential impacts from the project and designing appropriate monitoring programs. As noted by the proponent, the closer migrating juvenile and adult salmon approach the cages, the more likely they are to pick up parasites and diseases. Timing of migration past cages is also important because outbreaks of diseases and parasites are more likely to occur at particular times of the year. Most of the proposed cage locations are in prospective salmon migratory routes, but as the proponent points out multiple times in the EIS, “Atlantic salmon migratory corridors in Placentia Bay have not been identified in the literature” (Wild Salmon Component Study, p4). Furthermore, the proponent continues to identify this data gap as limiting their ability to accurately predict impacts: “Key gaps include: (1) data related to the migration routes of wild salmon, both smolts and returning adults, within Placentia Bay; and (2) data related to time spent by and activities of wild salmon within Placentia Bay.” (EIS p. 344).

   Surprisingly, the proponent goes on to note that “a study planned for Placentia Bay this year will hopefully provide some information on migratory corridors in the bay” but no further details are provided. This raises serious questions about the proponent’s commitment to conducting a thorough and robust EIS. If this study is imminent and will provide the necessary data, why has the EIS been submitted before it has been completed? This is highly inappropriate given that the EIS is predicated on the “need to obtain additional data to determine the potential for significant effects on a VEC” and because the proponent has been instructed that “information and data generated shall be sufficient to adequately predict the effects of the undertaking.” Once the EIS has been approved and construction started it will be too late. These data are needed now, at the assessment stage. A study to provide the necessary data is planned for the near future, therefore the proponent should be required to ensure that these data are appropriately incorporated into the EIS. Data and knowledge gathered could require substantial changes to siting and mitigation measures and could materially change the project that is described in the EIS. Therefore, doing those studies after the EIS is completed is of little value.

b) Abundance of threatened wild salmon in Placentia Bay is a key piece of information necessary for evaluating and assessing impacts: populations with higher abundance will be more resilient to impacts, and outcomes will ultimately be measured in terms of changes in abundance on a population-by-population basis. The EA Division concluded that there is “insufficient information available to make an accurate assessment of how many threatened Southern NL wild salmon there are in Placentia Bay” (Watton Memo p. 17). The EA Division also concluded that “angling returns are not reliable and do not reflect actual population size data” (Watton Memo p. 18). Contrary to this clear and direct statement, the proponent continues to rely only on angling license returns for estimating abundance: “Recreational salmon fishing data for most rivers in Placentia Bay are probably the best available indicator of salmon abundance within the study area” (Wild Salmon

Component Study p. 7). The proponent then goes on to present a table of catch statistics for individual rivers from 2012-2016, but provides no actual estimates of population abundance in these rivers. Clearly, the information provided is not sufficient to fill the data gaps identified in the screening review and **does not meet the criteria described in the EIS guidelines.**

Collection of abundance data for the key rivers in Placentia Bay is not difficult and could easily be done within the time allocated for EIS preparation. For example, juvenile abundance can be estimated using electrofishing surveys; smolt runs can be enumerated/estimated using counting fences or rotary screw traps; adult returns can be enumerated using counting fences or snorkel surveys. All of these methods are currently used in Newfoundland and/or the Maritimes and could easily be applied to rivers in Placentia Bay. The proponent could easily design a study to estimate abundance of wild salmon in Placentia Bay and use this information to predict and evaluate impacts and design appropriate monitoring programs within the allotted timeframe.

c) Data on the genetic structure of wild salmon populations is vital for predicting and monitoring direct and indirect genetic impacts from the proposal. Due to lack of data, the CSAS report recommended that the proponent conduct baseline studies to characterize the genetic structure of existing populations in Placentia Bay. This was reflected in the EIS guidelines (p. 19). The proponent's response to this is one paragraph pointing the reader to four references which have described the genetic structure of the South Newfoundland Atlantic Salmon Population (Wild Salmon Component Study p. 5). Little detail is provided here, particularly for Placentia Bay populations which are a subset of the South Newfoundland population. This information is clearly not adequate for predicting or monitoring impacts and therefore **does not meet the criteria outlined in the EIS guidelines.**

Characterizing the genetic structure of Placentia Bay salmon populations would not be difficult, it simply requires collecting appropriate samples from Placentia Bay rivers and having them analyzed by an expert in population genetics. There is no reason why this could not be done and the results incorporated into the EIS within the allotted timeframe.

An EIS is only as good as the data upon which it is constructed. One of the principle reasons why the EA Division recommended the EIS to the Minister and why the Newfoundland and Labrador Supreme Court ordered the EIS was to fill the data gaps (particularly those regarding wild salmon) identified in the screening and CSAS reviews. The EIS guidelines issued to the proponent clearly require the collection of original data when existing information is not sufficient for predicting, evaluating, mitigating, and monitoring impacts. Likewise, the time allotted for the proponent to collect the necessary data is sufficient to facilitate the design and implementation of rigorous and robust studies. The only conclusion that can be reached is that the proponent has chosen to ignore the EIS guidelines. This is unacceptable. The component studies provide little information that was not already considered in the screening review and therefore leave most of the data gaps unfilled. Consequently, the resulting evaluation of impacts and mitigation strategies are lacking depth and rigour and the conclusions cannot be justified.

Above, we have discussed three key areas relevant to wild salmon where original data collection is required and where the necessary studies can be conducted within the required EIS timeframe. There are likely data gaps concerning other VECs. We recommend that the component studies be judged as "deficient" and sent back to the proponent with specific instructions to follow the EIS guidelines as previously outlined.

2. Evaluation of potential impacts is not rigorous, reasonable, balanced, or transparent, resulting in conclusions that are not justified

Prediction and evaluation of potential environmental effects is the core of any EIS. This information is used to determine and evaluate proposed mitigation and monitoring strategies and, ultimately, the overall acceptability of the project. If effects prediction is not done well, the EIS is ultimately of little value or utility. This importance is reflected in the extensive instructions provided to the proponent in the EIS guidelines which include requirements that predicted effects be defined quantitatively where possible, application of the precautionary principle, and the rationale be explicit and presented in terms of the ecological context and level of knowledge.

As discussed extensively above, the EIS is entirely deficient in terms of information regarding ecosystem and population ecology of wild salmon needed to make meaningful predictions of effects or to design an appropriate mitigation and monitoring program. In cases where vital information is lacking, the precautionary approach dictates that potential effects are evaluated under the assumption that potentially harmful interactions will occur (i.e., that interbreeding between wild and farmed salmon <u>will</u> occur, that migrating salmon <u>will</u> move past, [or be attracted to] sea cages, that disease and parasite transfer <u>will</u> occur, that escaped farmed salmon <u>will</u> interact ecologically with wild salmon). While the lack of information is acknowledged to a certain extent by the proponent, the significance of the missing information is not acknowledged. Most concerning is that the precautionary approach is not applied in these situations. When information is lacking, the proponent assumes that this information would demonstrate no significant negative interactions between wild and farmed salmon with little, (or at times incorrect) rationale for making such assumptions. These assumptions then form the basis of their conclusions. This is highly inappropriate and not at all consistent with the EIS guidelines. The proponent should not be permitted to avoid collecting the data necessary to predict and evaluate effects and then assume that these data would support their position (i.e., no impacts). The lack of data accentuates the need to apply the precautionary approach. The proponent needs to collect the required data; where that is not possible the assessment should be conducted under the assumption that harmful interactions between wild and farmed salmon will occur.

In addition to the lack of data collection per the EIS guidelines and inappropriate assumptions, the evaluation of impacts section in the EIS is neither rigorous nor transparent. In many cases it is not clear how the ratings (e.g., significant vs. non-significant; level of confidence) are arrived at. When a rationale is provided, it is often not well described or is based on inadequate data or faulty assumptions; in other words, it is not scientific. In general, the assessment of effects appears to be highly subjective with no evidence that the same conclusions would be reached if the analysis was repeated by someone with a different perspective. The conclusions regarding wild salmon, (i.e., that none of the identified interactions or impacts will be significant) are not justified by the analysis. Below we provide a critique of some of the key potential effects that have been inadequately assessed and predicted.

a) Genetic pollution resulting from interbreeding between wild and escaped farmed salmon has been identified as a key concern. The proponent claims that there is no possibility of genetic interaction between wild and escaped farmed salmon because the farmed salmon will be 100% sterile triploid fish. However, as noted in the CSAS report, the current scientific literature indicates a failure rate of up to 2% in the triploidy induction process, meaning 2% of fish could be fertile. If 2% of the fish used in this project are indeed capable of interbreeding with wild fish, the risk profile of the project changes significantly. A 2% triploidy failure rate would result in 140,000 fertile farmed salmon of European origin stocked into sea cages each year at peak production. The proponent counters this by claiming that their egg supplier has developed new methods of triploidy induction/verification that result in fish that are 100% sterile and female. However, no evidence to support this claim has been presented, and few details about the actual triploidy induction process have been provided (the egg supplier claimed proprietary rights and declined to provide details). A search of the egg supplier's website and of the scientific literature revealed no proof of this claim.

The lack of quantitative data on the effectiveness of the triploidy induction process leads the proponent to conclude that the impacts of farmed salmon escapes on wild salmon will be non-significant "*assuming* the triploid all-female egg induction process is 100% effective" [emphasis added] (EIS p. 439). As noted above, this assumption has not been justified and is not consistent with the current scientific literature. Consequently, the conclusion of non-significant effects is not justified by the information provided.

Obtaining quantitative scientific data to validate the assumption of 100% sterile/female should not be difficult. Surely the egg supplier has quantitative data on the actual induction failure rate and the probability that their two-stage verification process will detect failures. Likewise, it should not be difficult for the proponent to verify that the eggs obtained from the supplier are 100% triploid and female. This could be tested by obtaining shipments of eggs from random batches and having the triploidy/female status of each egg independently tested. If a sufficiently large random sample reveals a rate of 100% triploidy/female, then the assumption would be justified. If the testing reveals that some small percentage of the eggs received from the supplier are not triploid and/or female, then the observed percentage should be used in the prediction and evaluation of negative effects. Given the public and scientific concern about the potential for genetic pollution and the likely outcomes for wild salmon if such interbreeding was to occur, it is difficult to understand why the proponent has not provided robust quantitative data to justify the claim of 100% triploidy/female.

b) Further to the points above, we also note that the EIS guidelines state that "mitigation failure should be discussed with respect to risk and severity of consequences" (p.27). However, we are unable to find a discussion of the risks and consequences should this key mitigation strategy fail to produce 100% triploid all-female stock. Given that the consequences of interbreeding with wild salmon would likely be severe, this is a glaring omission and therefore **does not meet the criteria outlined in the EIS guidelines.**

c) Genetic pollution resulting from interbreeding between wild and escaped farmed lumpfish has been identified as a concern by the EA committee. The proponent states that "the potential effect of an escape of juvenile lumpfish is not of concern with respect to genetic integrity of and ecological interaction with wild lumpfish given their sexual maturity status and their broodstock is from Newfoundland waters" (EIS p. 440) and therefore concludes that effects of escaped lumpfish on wild lumpfish will be non-significant. This statement and conclusion are based on incorrect assumptions not consistent with basic biology and the wealth of scientific information about domestication of wild animals. The lumpfish will be juveniles when they escape, but if they survive long enough in the wild they will eventually become sexually mature and breed with wild lumpfish. Given that the proponent has presented no evidence that escaped lumpfish will not survive in the wild long enough to become mature, it is not acceptable to assume that this will not happen. Likewise, the claim that there will be no effects because the farmed lumpfish come from local broodstock is not consistent with the current literature demonstrating that even a single generation of domestication in fish can alter the expression of hundreds of genes (e.g., Christie et al. 2016). Again, the proponents have presented no information refuting the current literature and supporting their assumption that there will be no genetic differences between wild lumpfish and the domesticated strain(s) they plan to use. In the absence of such information, the precautionary approach dictates that one assume there are differences that could result in impacts and conduct the effects prediction accordingly. Given these issues, there is no basis for the conclusion that genetic impacts on wild lumpfish will be non-significant. Considering the status of lumpfish in Placentia Bay and the known impacts on wild animal populations of interbreeding with domestic animals, this component of the analysis needs significant revision.

d) The spread of parasites (primarily sea lice) from sea cages and the resulting impacts on wild salmon is a major concern. The EIS guidelines require the proponent to provide "a literature review of the effects of disease and parasites from farmed salmon on wild Atlantic salmon" and to conduct a comprehensive analysis of the potential effects of "the transfer of disease and parasites between farmed salmon and wild Atlantic salmon and between farmed salmon and other fish." **Neither of these requirements of the EIS Guidelines has been met.**

While the Wild Atlantic Salmon Component Study contains a section titled "Sea Lice", most of it deals with sea lice control measures. The very brief section that does deal with the impacts of lice transfer from farmed salmon to wild salmon does little more than acknowledge that lice can be transferred from sea cages to wild salmon – there is no review of the extensive literature demonstrating the significant impacts of sea lice transfer on wild salmon (see for example: ICES 2016; Shepard and Gargan 2017). Much important information is missing from this very superficial review including discussion of the magnitude of impacts from sea lice infestations that spread from fish farms to wild salmon, and the correlation between lice levels in cages and impacts on wild salmon. Important questions remain unanswered: At what level do lice infections begin to cause problems for individual wild salmon smolts and adults? To what levels should sea lice in cages be controlled in order to avoid impacting wild salmon? What operational and monitoring practices are most effective for controlling sea lice at levels to avoid impacting wild salmon? Without answers to these questions, many of which exist in studies that have not been reviewed, the literature review provided by the proponent does not provide sufficient information to support the evaluation of potential effects from the project or the proposed mitigation measures.

The sea lice literature review includes a discussion of the use of lumpfish as a lice control method in sea cages. However, the information contained in this review is also inadequate to understand the method's effectiveness and therefore its potential to mitigate the impacts of sea lice on wild salmon. The review provides some evidence that cleaner fish can reduce lice infestations in cages, however the question of whether this reduction is sufficient to mitigate the impacts of the lice on wild salmon is not addressed. An important point here is that reducing sea lice infestations in sea cages to levels adequate for the production of farmed salmon does not necessarily mitigate the impacts of sea lice on wild salmon. To understand whether lice control measures work to mitigate impacts on wild salmon, one must also have knowledge of the infestation levels above which wild salmon begin to become impacted and the levels at which lice will be limited to in the cages. **That information has not been provided by the proponent.**

As noted previously, the proponent's analysis of the potential effects of the transfer of disease and parasites between farmed salmon and wild Atlantic salmon is highly inadequate for the following reasons:

i. The potential effects of lice impacts is buried within effects assessments surrounding feeding of farmed salmon (EIS p. 378) and not directly assessed. Given the scientific and public concern about the potential impacts of sea lice transfer on wild salmon, this is highly inappropriate. Sea lice impacts need to be assessed as a stand-alone item (probably works best under "Presence of Farmed Salmon" [p. 379]).

ii. The use of cleaner fish is inappropriately viewed as a mitigation measure for the control of sea lice on wild Atlantic salmon. Cleaner fish, and other lice control methods, are used primarily as a mechanism to keep sea lice at levels adequate for the profitable production of farmed salmon. Indeed, all lice control methods discussed by the proponent are aimed at fish production, not mitigation of environmental impacts. While there is some literature cited by the proponent that suggests a positive relationship between lice levels and likelihood of impacts on wild salmon, no quantitative information has been provided to indicate at what level lice must be limited to in order to prevent impacts on wild salmon. We note that significant information about the direct effects of sea lice on wild salmon is available (e.g., ICES 2016), and that other salmon farming jurisdictions have used such information to regulate sea lice levels within cages for the purpose of protecting wild salmonids (e.g., Faroe Islands http://www.nasco.int/pdf/2018%20papers/APRs/CNL_18_21_APR_Faroe%20Islands.pdf). Given the paucity of information provided by the proponent, there is no way to verify that the use of cleaner fish and other lice control methods will be effective for mitigating sea lice impacts on wild salmon.

iii. The use of cleaner fish is incorrectly viewed as having a positive impact on wild salmon (EIS p. 380). A positive impact on wild salmon would be one that increases their abundance, productivity, or resilience (or some other measure of wild salmon health). The use of cleaner fish may have a positive impact on sea lice levels which in turn may reduce the likelihood of impacts on wild salmon (although as noted above, the proponent has not adequately demonstrated that relationship). At best, the use of cleaner fish can be considered a potential harm-reduction measure, but in no way can it be considered to have a positive impact on wild salmon. This absurd argument demonstrates the lack of knowledge, rigour, and scientific integrity with which this effects assessment has been conducted.

iv. Inadequate data has been provided to understand how wild salmon smolts and adults will interact with sea cages and sea lice dispersed from cages. Wild salmon will be more likely to be infected by parasites and diseases the closer they approach the cage sites (or currents carrying sea lice from cages) and the longer they remain in the vicinity. However, as noted in the previous section, no information about wild salmon migratory patterns or residence time within Placentia Bay has been provided, and the significance of this missing information is not recognized by the proponent and incorporated into the analysis. Instead, unfounded assumptions about residence times and migratory routes are used to downplay the potential for wild salmon to pick up parasites and disease from sea cages (e.g., EIS pp. 440; 447).

v. The effects of sea lice on wild salmon under the scenario of mitigation failure have not been assessed. As noted previously, the EIS indicates that "mitigation failure should be discussed with respect to risk and severity of consequences" (EIS Guidelines p. 27). The proponent does note that sea lice levels may increase despite the use of cleaner fish and other methods (EIS p. 100). Indeed, uncontrolled sea lice outbreaks are common in the salmon aquaculture industry, and it is under these conditions that most damage is likely to be done to wild salmon populations (e.g., Shepard and Gargan 2017). The proponent describes some of the additional measures that might be used if outbreaks occur (EIS p. 100), however, it is not clear at what levels of infestation these alternative options will be implemented nor how effective they will be at preventing infection in wild fish during an active outbreak. Without incorporating situations of sea lice outbreaks into the effects prediction and evaluation, conclusions about the potential residual impacts on wild salmon populations are meaningless.

vi. No meaningful analysis of available information from the current industry on the south coast of Newfoundland with regards to sea lice has been conducted. Despite acknowledging that the current provincial Code of Containment requires sea lice counts as requested from the provincial veterinarian, indicating the presence of such information from current industry sites, the proponent provides no information about the current situation with regard to sea lice presence and prevalence in the existing industry. Without this quantitative information, it is not possible to understand the extent of the potential problem or to evaluate the veracity or effectiveness of the proponent's proposed lice control techniques.

e) Impacts of the use of pesticides and antibiotics on the marine environment are a public and scientific concern, and the proponent was specifically directed to evaluate the potential impacts of these and other deposits on the environment (EIS guidelines, p.24). Although the proponent provides a cursory evaluation, this has not been adequately addressed in the EIS. Instead, the proponent makes a number of unsupported and contradictory claims in order to avoid a detailed discussion about the potential impacts of pesticides and antibiotics on the Placentia Bay environment. For example, the proponent claims they will use no pesticides (Wild Salmon Component Study p. 30), but then contradict themselves when they acknowledge the use of agents like emamectin benzoate as a last resort (Wild Salmon Component Study p. 51). We note that Fisheries and Oceans Canada recently released information demonstrating extensive use of pesticides in the existing Newfoundland and Labrador industry (https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383). In light of this information, the lack of contextual information about the prevalence of sea lice at existing sea cage sites in NL (see section vi. above), and the lack of evidence that proposed mitigation measures (cleaner fish) are adequate to control seal lice, the statement that pesticides will not be used is unreasonable and contradictory. We note again that the EIS guidelines state "mitigation failure should be discussed with respect to risk and severity of consequences" (EIS Guidelines p. 27). Mitigation failure for sea lice control means a lice outbreak, and lice outbreaks likely mean extensive use of pesticides. Failure to evaluate the potential impacts of pesticide use under the scenario of mitigation failure is **not consistent with the guidelines provided to the proponent.**

Likewise, data collected by Fisheries and Oceans Canada shows widespread use of antibiotics in the existing industry, indicating persistent and serious problems with disease (https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383). The proponent claims on its website that no antibiotics will be used (https://www.griegnl.com/faq/), however in the EIS the proponent admits antibiotics will be used as required (Wild Salmon Component Study p. 50). Given the data released by DFO, it is reasonable to conclude that "as required" is likely to be "extensive". The proponent concludes that there will be no significant impacts of antibiotics despite no detailed discussion or evidence being presented about the effect of antibiotic use on the receiving environment, wild species, or human health. Given the concerns about excessive use of antibiotics in the aquaculture industry and the resulting impacts on the humans and the environment, this is a glaring omission.

f) Ecological interactions (e.g., competition for food and space) are a concern when large numbers of fish escape from sea cages. The proponent claims that "escaped salmon are not expected to interact ecologically with wild salmon" (EIS pp. 440, 447). However, very little rationale is provided for that statement except to say "competition for resources is likely to be minimal given that migrating wild salmon are focused on either getting to the open ocean on the offshore to feed or returning to natal rivers to spawn" and "the potential for ecological interaction […] is limited assuming the wild salmon spend minimal time in the Placentia Bay marine environment" (EIS p. 440). No information has been presented to support these statements and assumptions.

As has already been noted, lack of information on wild salmon migrations through and use of Placentia Bay has been identified as problematic by CSAS, the EA Division, and the proponent, but despite this, the proponent has made no attempt to collect the relevant data in support of the EIS and as outlined in the EIS Guidelines. Furthermore, the CSAS review identified other relevant data gaps: 1) uncertainty about the extent of competitive interaction between farmed and wild salmon, their effects on survival of wild fish, and the impact of local population demographics on interaction outcomes; and 2) uncertainty regarding the fate of escaped farm-origin fish in the marine and freshwater environment including post-escape dispersal patterns, survival, feeding, and their movements into wild salmon rivers.

Given these data gaps and uncertainties, the reality is that the proponent has no way of knowing what the interactions between escaped farm salmon and wild salmon will be, or what outcomes might result. Rather than collect relevant data and conduct a thorough and robust analysis of potential interactions and effects, they have ignored uncertainties and relied on baseless assumptions to reach unsupported conclusions. Again, it is necessary to point out that where data are lacking, the precautionary principle dictates that the analysis be conducted under the assumption that harmful interactions will occur; to do otherwise would be irresponsible and not consistent with the principles of environmental assessment.

> It is worth noting that the emergency scenario (2,000,000 farmed salmon accidentally released in early summer) would release 400 times the estimated Placentia Bay wild salmon population at a time when both smolt and adult wild salmon would be present in the bay. The proponent's conclusion that there will be no significant impacts from such a large-scale spill is based on an overly simplistic analysis with no supporting data. This will not satisfy the public and scientific concerns that have been repeatedly expressed about the possibility of a catastrophic spill.

In summary, the effects assessment portion of the EIS is very poorly conducted. The analyses suffer particularly from lack of relevant data, frequent reliance on unsupported or faulty assumptions, lack of transparency and rigour, simplistic arguments, and a general failure to apply the precautionary principle. In the paragraphs above we have outlined a few key examples where these issues exist; however, we note that one or more of these issues apply to most of the effects assessed in the EIS. Given these weaknesses, it is not surprising that no significant impacts from this project have been identified despite the overwhelming scientific evidence demonstrating significant risks and impacts everywhere else in the world that this industry operates. The analyses and conclusions presented in the EIS are not likely to answer the concerns of the public, the scientific community, or the courts.

3. Lack of meaningful detail about the proponent's approach to follow-up monitoring programs

Follow-up monitoring program design is an integral part of an environmental assessment. A high-quality monitoring program is necessary to ensure mitigation strategies are working and that there are no unexpected or unanticipated impacts from the project. A good monitoring program is also essential for assuring the public that their concerns are being taken seriously and that any unanticipated effects from the project will be promptly detected and remedied. Within that context, the EIS guidelines instructed the proponent to describe their proposed approach to environmental and socio-economic monitoring in order to "verify the accuracy of the predictions made in the assessment of the effects as well as the effectiveness of mitigation measures" (EIS Guidelines p. 29). The guidelines require the proponent to describe their approach for monitoring in terms of the objectives, sampling design, methodology, frequency, duration, reporting, procedures to assess effectiveness, recovery programs (where necessary), and a communication plan to describe the results to interested parties (EIS Guidelines p. 30). The proponent was also directed to consider the development of monitoring plans to address a range of issues, including direct and indirect genetic and ecological interactions between escaped farmed salmon and wild Atlantic salmon.

It is recognized that the EIS guidelines permit the proponent to finalize the actual Environmental Effects Monitoring Program (EEMP) subsequent to EIS completion (but prior to construction). However, the EIS does require the proponent to describe their proposed approach for monitoring according to the criteria noted above and explained fully on pages 29 and 30 of the EIS guidelines. Rather than provide the required details on their proposed approach, the proponent has simply stated that "the EEMP will clearly outline the objectives of monitoring, methodology, criteria for adaptive management, identification of procedures to test the efficacy of mitigation measures and follow-up monitoring, and a communication plan for disseminating findings" (EIS p. 475). This is not acceptable. The purpose of requiring the proponent to fully describe their proposed approach to monitoring in the EIS is to give the environmental assessment committee and members of the public the opportunity to understand and comment on the proposed approach before the details of the EEMP are finalized. By not including the requested details, the proponent is depriving the EA committee and the public of this important opportunity.

We note that the proponent has provided one paragraph briefly describing their approach to monitoring movement of farmed salmon into scheduled salmon rivers in the event of an accidental escape (EIS p. 476). This plan for monitoring the impacts of the project on wild Atlantic salmon is wholly inadequate and demonstrates a disturbing lack of concern about the potential impacts on wild salmon and a lack of commitment to transparency and environmental protection in general. Below, we outline a number of reasons why the proposed monitoring plan for wild Atlantic salmon is deficient.

a) It is not sufficient to monitor movement of escaped farmed salmon into rivers only after reportable escape events. The proponent acknowledges that small-scale losses will likely occur, and that such ongoing losses could be more problematic than infrequent major escapes (EIS p. 434). We also note that escapes of less than 100 individuals are not reportable events in Newfoundland, (assuming they are even noticed). Within that context, it is important to have ongoing monitoring of the movements of escaped farmed salmon into the rivers of Placentia Bay.

b) Likewise, it is also important to understand and monitor the migratory and residence patterns of wild salmon in Placentia Bay both before and after production. As Goodbrand et al. (2013) demonstrated in a study on the NL south coast, the presence of sea cages containing farmed salmon can affect the distribution and abundance of wild fish across large spatial scales. That is, salmon farms can act as "bird feeders", drawing in and concentrating wild fish thereby potentially exposing them to parasites, diseases, and predators as well as disrupting normal migratory patterns.

c) We reiterate the stated purpose of the EEMP "to verify the accuracy of the predictions made in the assessment of the effects as well as the effectiveness of the mitigation measures" (EIS Guidelines p. 29). Clearly, there is an expectation that monitoring programs be designed for areas of concern and for any mitigation procedures that have been proposed. This has not been done. Within that context, there are a number of other areas where monitoring plans are needed:

    i. Disease and parasite transfer from farmed to wild salmon are key public and scientific concerns, and the proponent has proposed several actions to mitigate these impacts. Furthermore, the proponent's effects assessment predicts that after mitigation there will be no significant impacts on wild Atlantic salmon from either parasites or diseases. Consequently, it is clear that the EIS guidelines require the proponent to monitor the impacts of parasites and diseases on wild salmon in order to verify the accuracy of their predictions and evaluate the effectiveness of the proposed mitigation measures. This would need to be done by directly monitoring lice and disease loads directly on wild salmon.

    ii. Ecological interactions between wild and escaped farmed salmon are also key public and scientific concerns that have been assessed by the proponent to be non-significant. As noted previously, we have serious concerns about this conclusion based on lack of data regarding the movements and interactions of both wild and escaped farmed salmon in Placentia Bay. Some of the data required to accurately assess ecological interactions cannot be collected prior to production (e.g., movement, distribution, feeding, etc. of escaped farmed salmon). This is clearly an area where follow-up investigation and monitoring is required.

    iii. The proposed monitoring program does not address the salmon-related key issue that forms the basis for the EIS i.e., "preserving the genetic integrity and biological fitness of wild Atlantic salmon" (EIS Guidelines p. 15). While monitoring things like the movements of farmed salmon into wild salmon rivers and lice and disease loads on wild salmon are vital for understanding the environmental impacts of the project and effectiveness of mitigation strategies, monitoring these issues does not directly measure impacts on genetic integrity or biological fitness. Measuring impacts on these dimensions requires monitoring relevant indicators e.g., genetic population structure and abundance of wild salmon populations. As noted above, sufficient baseline data on these variables have not been collected to facilitate the design of relevant monitoring programs.

iv. While not salmon-related, we note that the proponent has been directed to consider a monitoring program for the direct and indirect genetic and ecological interactions between escaped farmed lumpfish and wild lumpfish; however, this was not mentioned in their brief description of their proposed monitoring program. Given the status of lumpfish and the issues we have identified with the effects assessment related to genetic interactions of wild and farmed lumpfish (see point 2c above), there is clearly a need for a monitoring program on lumpfish.

The design of monitoring programs is an integral part of the environmental assessment process. We note once again that the stated purpose of monitoring is to "verify the accuracy of the predictions made in the assessment of the effects as well as the effectiveness of mitigation measures" (EIS Guidelines p. 29). Since this project was first registered for environmental assessment, the proponent has repeatedly claimed that it will have no significant environmental impact – a claim which contradicts a large and constantly increasing body of evidence from everywhere in the world this industry operates, including evidence of significant impacts on the genetic integrity of wild south coast Newfoundland salmon. Ultimately, the only way to prove this claim is through the design and implementation of a rigorous and robust science-based monitoring program. That the proponent has chosen to not commit to such a program is highly concerning and calls into question their ability to deliver on their claims and their commitment to ensuring environmental protection.

We also note that the proponent's claim of no impacts on wild salmon has not been well received by the public and has provided the basis for significant mistrust and public opposition. The proponent's failure to back their claims with an appropriate monitoring program will not answer the concerns of the public. Indeed, it is likely to further compound mistrust and opposition. Conversely, a well-designed and transparent monitoring program that verifies the proponent's claims would go a long way to reducing public opposition to the project (and to the proponent's plans for future expansion). Given this, the proponent's failure to design an appropriate monitoring program can only be viewed as a deliberate attempt to avoid scrutiny and transparency, and as a lack of commitment to environmental protection. This is unacceptable and runs counter to the principles of environmental assessment and to the specific instruction provided to the proponent.

4. Superficial evaluation of project alternatives with unjustified conclusions

The proponent was directed to analyze advantages and disadvantages of alternative methods of carrying out the undertaking, with specific reference to, (among other things) land-based vs. sea farm operations. This was included largely based on extensive public comments questioning "why land-based closed containment was not discussed or made compulsory as an alternative" (Watton Memo p. 14). The EIS guidelines provide significant guidance for this analysis, including the requirement to provide sufficient rationale and information to justify rejection of alternatives. The proponent concluded that land-based grow out was not a viable alternative. However, the analysis in support of this conclusion is highly superficial, based on incomplete and contradictory information and an unclear rationale.

Here we provide a number of examples where the proponent makes unsupported, unquantified, and irrational statements and arguments in support of their rejection of the land-based alternative:

a) p. 112 – "Sea cages utilize ocean currents to move water […] therefore, reducing the carbon footprint of production" and p. 117 "The carbon footprint of salmon produced at land-based aquaculture facilities is twice that of salmon produced in traditional open net pen systems (Liu 2016)". What is the evidence that the carbon footprint of sea cages will be lower than that of land-based production for this project? Many factors go into calculating carbon footprint like the source of electricity, use of boats, and the distance of sea cages from land-based hatcheries and processing plants. Furthermore, the proponent misrepresents the information presented by Liu (2016). To arrive at the conclusion that land-based has twice the carbon footprint as net pen, Liu (2016) used a scenario in which the electricity for the land-based system was generated with significant reliance on coal and gas. However, Liu (2106) also notes that the carbon footprint of a land-based system using electricity generated by 90% hydropower/10% coal is 45% lower than the coal/gas scenario. Given that most (if not all) of the electricity that would be used to power land-based facilities on the Burin Peninsula would come from hydro and that there would be no need to use boats (powered by fossil fuels) under a land-based scenario, the proponents have provided no basis for concluding that the carbon footprint of land-based grow out would be higher than that for sea-cages in this project. If the proponent wishes to use carbon footprint arguments to justify sea-cages over land-based, they need to provide quantitative information for each of the specific scenarios being compared. The paper they cite (Liu 2016) provides a detailed methodology for conducting such an analysis.

b) p. 112 – "In the marine environment, fish can be stocked at densities that use less than 4% of the cage space […] this activity produces less stress and consequently a healthier fish." This statement has been made without providing any evidence that sea cages produce less stressed and healthier fish. One could easily argue (as land-based producers do) that the fully controlled environment of a closed system is less stressful for the fish because they are not exposed to uncontrollable variations in temperature and oxygen concentration nor are they exposed to parasites and diseases prevalent in the natural environment. Indeed, it is for these reasons that fish grow faster in land-based systems. The proponent should not be permitted to make statements such as this without providing supporting evidence.

c) p. 117 – "A total land-based facility would require an extensive amount of land, electricity, and water." This statement seems to suggest this as a reason for rejecting the land-based alternative. However, the proponent has not provided any analysis of the availability or cost of these resources and how they compare to the availability/costs of resources required for sea cages. Neither land, nor water, nor electricity are likely to be in short supply in Newfoundland during the life of the project. Furthermore, the proponent does not appear to have any issues using large amounts of land, electricity, and water for their hatchery and post-smolt facility. If unavailability of these resources is a reason for rejecting the land-based grow-out alternative, a clearer rationale and quantitative analysis need to be provided.

d) p. 117 - "the provision of marine water that replicates the natural environment of the ocean is essential for the adult stage of Atlantic salmon" and p. 112 "the marine environment is an ideal culture environment for Atlantic salmon as this is their natural habitat." These statements reflect a lack of understanding of basic salmon biology. Atlantic salmon is a freshwater species that may or may not have an anadramous (i.e., sea going) form. That is, they can complete their life cycle entirely in freshwater without the need for migration to marine waters. Furthermore, the suggestion that Placentia Bay is the "natural habitat" for adult Atlantic salmon is also misleading. As the proponent notes elsewhere in the EIS, Atlantic salmon migrate through Placentia Bay during spring and summer but are not resident there. Indeed, it would be highly unusual to find a wild Atlantic salmon in Placentia Bay over winter because inshore waters do not provide suitable salmon habitat during that time. Salmon need to migrate elsewhere to find optimal water temperatures and prey. Holding salmon in cages in inshore waters for extended periods is neither essential for salmon nor is it providing them with their "natural habitat." Statements such as this should not be used to justify the need for sea-cage grow out. Although they fail to acknowledge it, the proponent is surely fully aware that salmon are currently being commercially produced in land-based freshwater systems. These statements are clearly intended to mislead the public into believing that sea cages are a necessary component of salmon aquaculture when, in fact, they are not.

e) pp. 116-117 – the proponent claims significant technical challenges with growing salmon in land-based systems including:1) difficulties growing fish past 1kg; 2) problems associated with early maturation of males; and 3) the need to stock at higher densities in RAS systems. However, information provided by the proponent elsewhere in the EIS contradicts these claims: on p. 112 they note that they will grow post-smolts past 1kg (up to 1.4kg) in their land-based RAS facility; on p. 115 (and many other places throughout the document) the proponent explains that they plan to use all-female fish, thus eliminating any concerns about early maturation of males; and despite citing the need to grow fish at higher densities as a disadvantage to land-based systems, on p. 116 they claim that the potential for higher stocking densities is an advantage of land-based systems Thus, none of the technical challenge they cite as reasons for rejecting land-based systems appear to be valid.

f) p. 117 – the proponent claims that the economics of land-based operations are not favourable compared to net pens; however, they provide very little quantitative information to justify this conclusion. They claim that the cost of a land-based system would be 5.5 times higher than marine based cage systems, but do not adequately explain how they arrived at this figure. We note that a reference previously provided by the proponent (Liu 2106) indicates that the costs associated with construction are higher for land-based facilities (by approximately 80%) but that the cost of production is approximately equal to that of sea cages. This information does not seem to support their conclusion that a land-based system would be 5.5 times higher. If the proponent wishes to use economic factors as a reason for rejecting land-based alternatives, they need to provide quantitative economic information for each of the specific scenarios being compared. Liu (2016) provides a detailed methodology for conducting such an analysis.

g) table 2.24 – the proponent scores "regulatory issues" as a -1 indicating that land-based alternatives perform less well on this dimension than sea cages. The only justification for this scoring is found

> on page 118 where they statea that, “it may well be that regulators would be challenged to deal with compliance issues for such a facility.” This justification is nothing more than complete and unfounded speculation. Clearly, the proponent has no idea how regulators would respond to a land-based grow out facility. We point out, however, that the proponent plans to use land-based facilities for both smolt production and post-smolt production. Clearly, neither the proponent nor the regulators see any insurmountable compliance issues with those facilities. On what basis does the proponent claim that regulators will be challenged to deal with compliance issues for a land-based grow-out facility? If the proponent wishes to score the land-based alternative poorly on the basis of regulatory issues, more information and a stronger rationale are needed.

Based on significant public concern, the proponent was required to analyze land-based alternatives and provide a clear justification for rejection. However, as described above, the analysis provided by the proponent is highly superficial and misleading. Indeed, the proponent has not even acknowledged the massive growth in investment in land-based RAS salmon farming projects over the past two years. We note that since the Placentia Bay project was first registered for environmental assessment, three land-based RAS projects which collectively aim to produce up to 130,000 metric tonnes/year have been announced for the eastern seaboard of the United States (which, as noted in the EIS, is the primary market for Newfoundland aquaculture salmon). Given the public awareness surrounding these projects, it is highly unlikely that the public will find the analysis and rejection of the land-based alternative to be very convincing.

Conclusions

In summary, the Atlantic Salmon Federation reiterates our profound disappointment with the EIS submitted by Grieg NL Seafarms for the Placentia Bay Aquaculture Project. The EIS was deemed necessary by the EA Division, the conservation community, First Nations, many members of the general public, and the Supreme Court of Newfoundland and Labrador. The documents provided and the information and arguments contained within are an insult to all of those individuals and organizations and to the threatened wild Atlantic salmon of southern Newfoundland. The EIS does not adequately address the issues which formed the basis on which it was ordered, nor does it meet the minimum standard for acceptance as specified in guidelines issued to the proponent. To accept this EIS without requiring the proponent to conduct further work would make a mockery of the entire environmental assessment process. The EIS should be deemed deficient by the EA committee and sent back to the proponent to conduct the work necessary to meet the EIS guidelines.

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

Sincerely,

Dr. Stephen Sutton
Coordinator,
Community Engagement

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