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To whom it may concern,

The Atlantic Salmon Federation welcomes the opportunity to provide comments on the Marbase Clearerfish Hatchery proposal (reg. 2062). Our interest in this proposal stems from the claims made by the proponent that this undertaking will form an important component of the salmonid aquaculture industry that will have a net environmental benefit by improving the management of sea lice in salmon cages. If these claims hold true and the use of lumpfish does lead to better sea lice control and reduced impacts on wild Atlantic salmon, this would indeed be a step forward that we would support.

We are concerned, however, that the registration document submitted by the proponent does not offer sufficient justification for these claims, appears to have omitted significant information that calls the validity of these claims into question, and has not provided sufficient information to understand the potential negative environmental effects. We are also highly concerned about public statements made by the proponent to the effect that environmental assessment of this undertaking is an unnecessary hurdle that serves only to delay progress and prevent economic prosperity (Anon, 2019). These comments, along with the proponent's attempts to generate public and political pressure to influence the outcome of the screening review, lead us to believe that the proponent has little respect for the environmental assessment process and its goals of environmental protection and wise use of the province's natural resources. The proponent also does not seem to grasp the importance of the environmental assessment process for supporting economic prosperity and sustainable development. This leaves us with little confidence that the registration document is as comprehensive as it needs to be to ensure a proper assessment or that the proponent is committed to conducting the undertaking in an environmentally sound manner.

The Atlantic Salmon Federation had significant involvement in the early stages of developing the open net-pen salmon aquaculture industry in eastern Canada. Our involvement was anchored in the belief that salmon aquaculture would lead to reduced commercial fishing pressure on wild Atlantic salmon stocks. Since discontinuing our research into salmon husbandry, we have watched the salmon aquaculture industry grow exponentially across the North Atlantic with significant unintended consequences on wild salmon from farm escapes, sea lice, and diseases. Growth of the salmon farming industry in eastern Canada has occurred with very little formal

environmental assessment which has undoubtedly contributed to the growing environmental impacts and eroding social license observed today.

The development of lumpfish farming for sea lice control essentially represents the development of another aquaculture industry within the salmon aquaculture sector. Like salmon farming, lumpfish aquaculture will come with a range of potential risks and benefits. As such, every reasonable step should be taken to ensure that the environmental impacts are minimized and the expected benefits realized. The environmental assessment process is the most appropriate framework in which to do the required analysis. As the first large-scale commercial lumpfish hatchery proposed for development in Canada, this project presents an opportunity to ensure the lumpfish farming industry develops in an environmentally sound manner that does not repeat the mistakes made in the development of the salmon farming industry.

We note that the proponent claims that the environmental effects associated with deployment of lumpfish into sea cages have already been considered in the Grieg EIS. While lumpfish did form a small component of the Grieg EIS, this should not absolve the current proponent from the responsibility of providing information to facilitate the understanding of the potential environmental impacts of the lumpfish hatchery proposal. The use of lumpfish in the Grieg proposal was for a specific project in a specific location under specific conditions whereas the current proposal is to produce and sell lumpfish for use in a wide range of locations under variable conditions. It is not reasonable to assume the conclusions reached in the Grieg EIS will necessarily apply more broadly, and the proponent has provided no justification for why this should be the case. Furthermore, the analysis conducted for the Grieg EIS is almost two years old. A significant amount of research and development has occurred since that time that has produced new information about lumpfish husbandry, efficacy of lumpfish for sea lice control, and the real and potential environmental impacts of using lumpfish as cleaner fish in salmon cages. None of this new information has been taken into account by the proponent.

We submit that the Marbase Cleanerfish Hatchery proposal needs a thorough environmental review to objectively assess its potential costs and benefits and to ensure that the expected benefits are likely to materialize, that unintended consequences are minimized and mitigated, and that social license is granted. Unfortunately, the registration document submitted by the proponent is not adequate to enable such an assessment. Below, we outline some of the key issues that need to be addressed further.

- 1. Claims about the efficacy of lumpfish for lice control have not been justified.** This undertaking is predicated on the notion that lumpfish are effective at controlling sea lice to the point that their use provides a “net environmental benefit”. The proponent claims that “ The use of cleaner fish produces prolonged reductions in sea lice presence in sea cages while imposing no stress on the farmed fish” but provides zero evidence in support. We note that the use of cleaner fish (including lumpfish) for lice control has been under development for a number of years, and significant scientific research evaluating its costs and benefits has been produced. While the literature does suggest that the use of cleaner

fish has the potential to contribute to sea lice control strategies under certain conditions (e.g., Imsland et al. 2018), the long term benefits remain unclear. For example, Barrett et al. (2019) reviewed the efficacy of cleaner fish at 488 sites in Norway. They concluded that the use of cleaner fish generally lead to a slight decline in sea lice infection following cleaner fish stocking, but that the effect was small and highly variable, and lice population growth rates remained positive on average, even when large numbers of cleaner fish were used. There is also emerging evidence that sea lice adapt to predation by cleaner fish through the evolution of translucence which renders them less visible (Soltveit, 2018), calling into question the long-term prospects for cleaner fish use. Furthermore, as the proponent acknowledges, the use of lumpfish for lice control has been under investigation in NL for a number of years. However, the proponent has provided no information about the results of these trials in support of the claim that the use of lumpfish will provide a net environmental benefit in the local context (i.e., reduced transmission of sea lice to wild salmonids; reduced deposition of deleterious substances to treat lice infestations).

As we discuss below, significant environmental and ethical concerns regarding the use of lumpfish as cleaner fish remain. Given these concerns, we do not feel that the proponent has justified the claim that lumpfish work to control sea lice to the point that there is a net environmental benefit. The proponent should be required to provide a more compelling argument, based on an objective review of the available evidence, that the benefits of developing a lumpfish aquaculture industry will outweigh any potential environmental and ethical costs.

- 2. The registration document does not address the potential impacts on wild lumpfish populations.** Wild lumpfish have been assessed as “Threatened” by the Committee on the Status of Endangered Wildlife in Canada. As noted above, the growth of the salmon aquaculture industry has resulted in well documented unanticipated negative impacts on wild salmon throughout the North Atlantic, including in NL. This raises the obvious question of what the impacts of lumpfish farming might be on wild lumpfish. There are several possible pathways in which this project could reasonably be expected to negatively impact wild lumpfish:
- If broodstock are to be collected from wild populations this could result in impacts on those populations. The proponent indicates that during start-up operations they will rely on the Ocean Sciences Centre and commercial fishers for the collection of fertile females, however no further information is provided and questions remain e.g., How many wild lumpfish will be collected? Will this collection be ongoing? What is the plan for obtaining eggs/broodstock after the start-up phase if and when they are required? Will the importation of eggs/broodstock from other jurisdictions ever be considered? Not enough information has been provided in the registration document to understand these issues and therefore assess the potential impacts of the use of wild fish as broodstock on wild lumpfish populations.
 - It has been documented that lumpfish are susceptible to a range of diseases, and that their use as cleaner fish is now considered a new route of emergence of viruses

in fish aquaculture (Kibenge 2019; Saraiva 2019; Powell et al. 2017). There is potential for known and emerging diseases to be amplified in farmed lumpfish and spread back to wild populations. This could occur both from the hatchery (via effluent or escapes) or when lumpfish are placed into the salmon cages. The proponent does acknowledge that they will be required to develop a fish health plan, an environmental protection plan, and a biosecurity plan, but no such plans are provided for review. These plans will only be as good as the proponent's understanding of the possible risks associated with disease transfer. The registration document fails to demonstrate that the proponent has sufficient understanding of this issue, the potential for impacts on wild lumpfish, or the range of mitigation options available. This undertaking should not be released from environmental assessment until the proponent has demonstrated such understanding AND submitted these plans for examination by the EA Division and the public.

- Domesticated lumpfish will eventually escape from the hatchery and/or sea cages and interbreed with wild lumpfish. Interbreeding between wild and escaped farm salmon has been documented across the North Atlantic, including in NL, resulting in significant impacts on wild populations (ICES 2016; Wringe et al. 2017). This raises obvious questions about the potential for these types of negative impacts from this undertaking on wild lumpfish populations. Nevertheless, this issue has not been acknowledged or addressed in the registration document. While this issue could be partly addressed at the sea-cage level (i.e., minimizing escapes), important mitigative actions could be incorporated into the design and operation of the hatchery e.g., development of sterile lines to prevent interbreeding; collection of wild broodstock for every generation to minimize domestication; measures to prevent escapes from the hatchery, etc. Again, not enough information has been included in the registration document to demonstrate that the proponent is sufficiently aware of the risk, concerned about possible impacts, or willing to take appropriate mitigative action.

3. The proponent has not considered the potential impacts on wild Atlantic salmon. There are several pathways through which this undertaking could impact wild salmon. First, as noted above, lumpfish are susceptible to a range of diseases, many of which can be transferred to salmon either directly from sea cages or indirectly through hatchery effluent. Second, we are concerned about how the use of lumpfish for lice control might influence the transmission of lice from sea cages to wild salmon. Key unanswered questions include: Do any species of sea lice infect lumpfish and, if so, what is the risk that this will serve to increase sea lice transmission to wild salmon in some circumstances? How will sea lice adaptation to cleaner fish predation (e.g., by evolving translucence) influence current lice monitoring and control procedures (e.g., will translucence make counting/monitoring lice loads less effective?). While we recognize that some of these questions may currently be unanswerable, we are concerned that the proponent has not acknowledged that these potential issues exist nor taken any steps to address them. Clearly, the potential for this undertaking to have negative impacts on wild Atlantic salmon (and other wild species)

needs to be considered when determining whether or not this proposal is likely to have “net environmental benefits”.

4. There are significant ethical and animal welfare issues that have not been addressed.

These lumpfish will be grown for the sole purpose of eating sea lice in salmon cages, which only the juvenile stages do. They are not used for human consumption and they cannot be reused in the salmon cages. Lumpfish in hatcheries and sea cages are highly susceptible to a range of diseases and deformities and there are significant concerns about their welfare in the sea cages (Powell et al. 2018; Paradis et al. 2019; Johannesen et al. 2018). Lumpfish grown in both hatcheries and sea cages are likely to have very high mortality rates. Those that do survive to the end of their usefulness are culled and disposed of.

These are serious issues that have been hidden from the public by the proponent’s failure to acknowledge and discuss them in the registration document. The public is being asked to comment on the acceptability of this undertaking, therefore they deserve full disclosure on these issues. The proponent should be required to describe more fully the details of the proposed operation so that these issues are made apparent. Key questions include: What are the expected mortality rates in the hatchery, during shipment, and in sea cages? What are the potential sources of mortality? How exactly will mortalities be disposed of? How will lumpfish that have outlived their usefulness be disposed of? What types of animal welfare issues have been identified where lumpfish have been used as cleaner fish elsewhere? How will these welfare issues be avoided or mitigated in this undertaking?

5. Insufficient information has been provided to demonstrate that the water used in the hatchery will be of sufficient quality.

The proponent indicates in their proposal that they plan to pump seawater from the harbour located adjacent to their hatchery in Mortier Bay, and will do so using a flow-through system to supply their hatchery operations. Under Section 3.1.4 of their proposal - Environmental Setting – the proponent states, “The adjacent (near dock) marine environment is characterized by fine sediments that show evidence of some contamination”. But the proponent provides absolutely no data showing the degree of contamination at this site or the make-up of this contamination. Considering that their proposed hatchery site was a major industrial site for over 50 years, it is quite likely that this harbour contains a range of toxic chemicals and is seriously contaminated. The proponent also indicates that the bottom of the harbour at this site is made up mostly of silt, which we suggest can easily be moved around by currents and tidal action, thus allowing the silt and contaminants embedded in it to be sucked into their intake pipes. Furthermore, the proponent goes on to say Under Section 3.1.4 – “The waters of Mortier Bay receive sewage discharges at 38 nearshore locations; however, water quality appears to be acceptable in meeting marine water quality standards based on one suite of samples collected from the candidate hatchery saltwater intakes and outlet locations.” With regard to this issue, they also indicate in their proposal that there are several sources of water quality data available from Mortier Bay, yet the proponent does not provide any of this data. Instead, the proponent only provides data that their company obtained, which was collected at only two individual points from the entire bay (one at the location of their proposed

intake site and the other at the location of their proposed outlet site). Considering that there are 38 sewage discharge sites in Mortier Bay and that the proponent admits that the harbour adjacent to their hatchery is contaminated, it is unfathomable that the proponent does not provide any other data regarding water quality or benthic contaminants. Under the circumstances, it is not acceptable that the proponent says, “the water quality appears acceptable”. The proponent must be required to provide all other water quality data available, and data on contaminants that are available. Furthermore, if there are gaps in this data the proponent must be required to collect and provide that missing data, such that the general public, the EA Committee, and the Minister can use this information to properly assess the environmental risks associated with this proposal.

- 6. The proponent has not demonstrated that the hatchery design uses the best available technology to minimize disease spread to wild fish.** As noted above, the spread of diseases to wild fish from the hatchery is a concern. The proposed hatchery will operate using a flow-through system that will pump seawater from the local harbor into the tanks being used to raise the lumpfish. Based on our research this is the worst possible system that could be used in an operation like this. First, using seawater that is at such a high risk of contamination to begin with (see #5 above) and using a less than ideal filtration system as is being proposed, will significantly increase the risk of introducing harmful pathogens and parasites from the marine environment into the hatchery tanks, and visa versa when the hatchery water is released back into the ocean. Second, as noted above, lumpfish are very susceptible to pathogens and bacterial infections and there are few treatments to address them. Consequently, every effort must be made to reduce this risk. There are other more environmentally friendly water systems/sources available to minimize such threats, including the use of aquifer based RAS Systems, yet the proponent makes absolutely no reference to such alternatives. Rather they simply say, they chose a flow-through system because it is more energy efficient, but again they provide no documentation to substantiate this statement. Providing information on such alternatives is a requirement under environmental assessment legislation.

Likewise, the proponent proposes to use a less than adequate filtration system to treat the water being pumped into and out of their hatchery. In fact, the proponent plans to use a 50 micron filtration system to treat the sea-water. Considering that natural clean seawater contains a wide range of pathogens and parasites, and the fact there are 38 sewage discharge outlets flowing into Mortier Bay, we submit that this 50 micron filtration system is grossly inadequate, and will permit many types of pathogens and parasites to bypass this filtration process. This constitutes a very serious threat to their operation and the marine environment in general. As mentioned above, lumpfish by nature are very susceptible to pathogens, and currently there is a lack of knowledge about lumpfish immunology. As we understand it, 99.9% reduction in the intake of pathogens is only possible when using a water supply that is already fairly free of pathogens, unlike the sewer infected water they plan to use from Mortier Bay. There are more effective filtration alternatives for treating such water. For example, there are 0.4 micron filtration systems currently available and in use. Yet, the proponent provides no such information on these alternatives and no

discussion of the risks of using a 50 micron filter. Considering the circumstances noted above, and the risks involved with the filtration system they are proposing to use, the proponent must be required to provide information on other alternatives available.

It must also be noted that the water filtration system being proposed by the proponent will not be effective to address the presence of viruses. Such viruses will undoubtedly be present in seawater and cannot be eliminated through filtration. In fact, viruses are quite difficult to kill and require treatment via purification using high temperatures for extended periods of time. Not only are these viruses a threat to the lumpfish exposed to the intake water, but these viruses may become amplified in the hatchery. This poses an additional threat to the marine ecosystem since the filtration system being proposed will not be effective to kill the viruses in the outlet water when it is discharged back into the ocean. In the main body of their proposal the proponent provides absolutely no information on how they will address the presence of viruses in their intake water or in their outlet water. However, under the section of their proposal labelled Attachment 1- Project Summary Description – at the end of their proposal they make the following statement: “Dedicated features of the facility include a saltwater supply drawn from and discharging to Mortier Bay. Water treatment will include temperature adjustment, ultra-violet and screen filtration, purification and aeration”. However, they do not provide any other information on the purification process to be used or its expected efficacy. Again, it is critical that they provide this information such that the public and the Minister can assess the threats that viruses may have on the marine environment and in the Lumpfish hatchery itself.

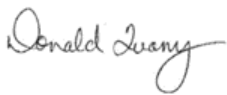
- 7. Public consultation conducted by the proponent has been inadequate.** Under Section 3.4.5 of their proposal - Potential Resource Conflicts - The proponent states: “Given the location of the hatchery and the level of activity associated with its operation, there is minimal potential for resource conflicts”. We very much beg to differ with this claim based on the various threats that we have identified above regarding their proposal. Furthermore, it is interesting to note under Appendix F -Table 1 – dealing with public consultations – that, other than provincial, federal, and municipal governments, the only members of the public that was consulted was the Newfoundland Aquaculture Industry Association (NAIA). Since NAIA represents the aquaculture farm owners, all of whom belong to foreign companies outside of NL, it appears that the proponent has conducted very little if any public consultations. They certainly have not consulted with the many groups and organizations in this province that have been quite critical of aquaculture operations in this province, including wild salmon conservation groups like NL-CAR, SCNL, and ASF. Again, we take this as evidence that they are trying to avoid dealing with major concerns associated with their proposal, by skirting around the requirements of the environmental assessment legislation. This is totally unacceptable, and they must be required to hold public meetings throughout the province and with concerned groups before any approval for their proposal is considered.

In conclusion, it is our opinion that the description of the project is incomplete and thus the public and the Minister are prevented from appropriately assessing the potential environmental

impacts as per Section 23 of the Regulations. The proponent's conclusion that "the potential negative impacts are minimal and can be addressed through existing regulatory mechanisms" is not supported by the information provided in the registration document or by information about the use of lumpfish as cleaner fish that can be gleaned elsewhere. Our own examination of the proposal and the relevant scientific literature suggests to us that there is potential for significant environmental impacts from the project as currently described.

Social license for the salmon aquaculture industry is being eroded across Canada resulting in the federal government's plan to remove open net pen salmon farms from British Columbia by 2025 due to environmental concerns. We acknowledge that the use of cleaner fish in salmon aquaculture may have the potential to reduce the impacts of the salmon aquaculture industry on wild salmon and the environment. As the first large-scale commercial lumpfish hatchery for Canada, this undertaking will set the stage for the development of the lumpfish/cleaner fish aquaculture industry in the Atlantic provinces. If the use of lumpfish is not supported by science and/or is not done in the most ethical and environmentally sustainable way possible, there is a high likelihood it will lead to further erosion of the social license for open net pen aquaculture on the east coast of Canada. We hope that both the EA Division and the industry will see further environmental assessment of this proposal as a necessary and valuable step in the sustainable development of this industry.

Sincerely,



Don Ivany



Dr. Stephen Sutton

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