Standing Senate Committee on Fisheries and Oceans

c/o Maxwell Hollins, Clerk of the Committee

Tuesday February 17, 2015

Dear Senators,

We watched with interest the testimony provided to your Committee by Mike Meeker, the representative from the Northern Ontario Aquaculture Association. There were a number of statements that he made and some that he neglected to make that we would like to address, and in some instances, correct.

We were pleased to hear the industry representative state a few things.

* In reference to water quality he stated that, “Any operation is going to have an impact”. We agree with this statement as it relates to open net aquaculture as currently conducted in Ontario.
* The representative said that he was looking at closed containment in, “an attempt to find a way to overcome the cost problems in closed containment”. As we stated to you we see closed containment as the only truly sustainable way forward for this industry to grow while controlling their pollution. We will encourage the industry to review the work of AgriMarine which is testing a closed containment system in Ontario starting this winter. We also encourage government regulators to use their budget powers to support such forward looking practices for freshwater cage farms wanting to move to contained systems.

We were not so pleased to hear the industry representative make misstatements about our organization.

* He stated that, “They (referring to the GBA) claim to represent 500,000 people.” We have never made this claim and have always been very upfront on who we represent.
* In a reference to GBA he stated that our opinions are from people who “don't even know what a farm looks like, have never been on a farm.” A point of fact is that the Chair of our Aquaculture Committee and the Chair of our Fisheries Committee have both visited the industry representative’s farm and several of our science advisory committee members have been intimately involved in field studies in and around the existing fish farms.
* He stated that the industry would like to address our questions directly but we have never had a response from them to our rebuttal to their 2012 paper entitled, Phosphorus Output from Cage Aquaculture in Ontario. We have attached our rebuttal to this letter (Attachment A) for your information and reference.

On a more substantive nature we provide the following rebuttal to some of the industry representative’s points;

Lake Wolsey – The industry representative claimed that the phosphorous levels in Lake Wolsey have dropped since 1984. He neglected to point out that one study captured photographic evidence of algal blooms surrounding his Lake Wolsey cages (Hille, 2008). Within the water column of Lake Wolsey the lake-wide total phosphorus concentration increased from naturally oligotrophic levels (5 to 10ug/L) to greater than 50ug/L, well into the eutrophic range as documented by Hamblin and Gale (2002) and Milne (2012). These studies fly in face of his claim that phosphorus levels have dropped in Lake Wolsey since he began his operation. Another water quality factor is dissolved oxygen which for a healthy ecosystem should be above 10 mg/L. Milne (2012) reported concentration below 2 mg/L in the lower levels of Lake Wolsey which may be attributable to the loading of phosphorus from the fish farm.

Experimental Lakes – The industry representative spent considerable time talking about the learning on cage aquaculture that was done in the Experimental Lakes (ELA). Our scientist point out that it is difficult if not impossible to compare the biology of the ecosystem of a small shallow headwater lake in the Boreal forest to the ecosystem of a large deep Great Lake in the mixed forest zone. As Federal research funding was tied to studies in the ELA unfortunately DFO conducted no studies in the Lake Huron ecosystem when it operated ELA. Perhaps this is why, as the industry representative points out, “the information (from the ELA) hasn't been used at all by the regulators in this country”.

Escapees – The industry representative tries to minimize the impact of fish escapes by claiming, “we've lost fish and it's made no difference to the environment whatsoever.” Since rainbow trout were released into the Laurentian Great Lakes for recreational purposes over a hundred years ago there has been a systematic divergence of the selectively bred domestic strain from the wild/naturalized trout, Matthews et al. (2014). A recent study (Patterson and Blanchfield, 2013) has shown that escaped farmed fish can disperse in nearshore areas where there is potential for interaction with wild fish. Due to the more rapid growth rate of the domestic strain it could have a negative impact on the wild strain, contrary to the representative’s assertion that there is 'no issue' with escapees.

On a point of clarification the large (238,000) escape of farmed trout in 2005 occurred at one of the Coldwater Fisheries sites adjacent to Manitoulin Island not in Lake Ontario as the industry representative guessed.

Feast and Famine – The industry representative references the report “Feast and Famine” to try to make a point that most of the Great Lakes are nutrient deficient “one great big biological desert.” A detailed review of this report (Hinderer et al. 2011) reveals that the famine concept applies mainly to the open lake waters of Lakes Michigan and Ontario. There is no evidence that Georgian Bay is undergoing nutrient depletion as its open waters remain in the oligotrophic range throughout the year as determined by EC water quality surveys, (Figure 5, EC 2013). As a result there is no need for the aquaculture industry to 'fertilize' this lake and move it out of its natural state.

Future Growth – The industry representative proposes to increase open cage fish farm production in Georgian Bay tenfold. At the current levels of aquaculture production the industrial loading of the pollutant, phosphorus, is about 10% of that permitted for Georgian Bay by the Canada-US Water Quality Agreement. (EC, 2012). A 10 times growth factor would mean that this industry would monopolize the entire phosphorus loading allocation to Georgian Bay leaving no permissible loading for river and land runoff, municipal sewage discharge and atmospheric deposition. It is worth pointing out that the Water Quality Agreement's phosphorus loading applies to the entire lake volume whereas the current aquaculture loading is restricted to the nearshore zone representing a small fraction (2-3%) of the total volume of the Bay.

Organic Standards – The industry representative speaks about the organic certification he has for some of his fish production. He specifically states that, “I'm the only organic rainbow trout grower in Canada, according to the Canadian standards.” The standard that he references is one that has been developed by the Canadian Aquaculture Industry Alliance (CAIA) which is a national industry association, headquartered in Ottawa that represents the interests of Canadian aquaculture operators, feed companies and suppliers, as well as provincial finfish and shellfish aquaculture associations. In the CAIA literature it is clearly stated that their organic standard for freshwater Trout “is not referenced in government regulation at this time. Organic aquaculture products may not carry the Canada Organic logo at this time.

We would like to point out that there has been considerable work done over many years under the leadership of the World Wildlife Foundation to develop international standards for sustainable practices for cage aquaculture of freshwater Trout. This was done through the establishment of an international Freshwater Trout Dialogue that brought together industry, scientists and regulators to review and debate standards. The Aquaculture Stewardship Council took over the responsibility for the international Trout Dialogue from WWF in 2012 and published standards for Trout certification in early 2013 (copy of document including standards below).

<http://www.asc-aqua.org/upload/ASC%20Freshwater%20Trout%20Standard_v1.0.pdf>

Our science advisory panel has reviewed these standards and determined that the Ontario cage farms do not meet at least one of these standards, the phosphorous output, and possibly more. We are attaching a worksheet (Attachment B) that shows that Ontario farms discharge 12.3 kg of phosphorous released per metric ton of fish produced whereas the standard calls for a maximum of 5 kg of phosphorous released per metric ton of fish produced. We believe that Canada should adhere to the international standard for organic freshwater trout rather than have its own less rigorous standard.

Precautionary Principle – The industry representative tries to argue for growth of his industry using the precautionary principal, “If we grow, and we find that we are having an impact because we measure everything, then we'll use adaptive management, which is a precautionary principle to us.” We are concerned that such approach could result in a situation where we hit a tipping point beyond which the environment cannot fully recover. To earn the right to use public commons such as Great Lakes water should require adherence to the true definition of the precautionary principle which states that the [burden of proof](http://en.wikipedia.org/wiki/Legal_burden_of_proof) that an action it is *not* harmful falls on those taking an action. We feel that the industry still has a way to go on this measure. In Attachment C we have attached a picture of the La Cloche channel where a cage farm was in operation for nine years ending in 1989. The sediment under the former cage sites contained enough fish sediment related methane to continue to melt the ice above the cage sites for over 10 years.

Over the past 20 years, DFO, other govt agencies, academia and industry has given 10’s of millions of dollars to fund attempts to help the freshwater aquaculture industry decrease its phosphorous load, coldwater disease and escapes that are related to open net cage technology.

We believe most Canadian would agree the time has come for our governments to help this industry expand using closed contained systems through which they can grow truly organic and sustainable trout for our consumption. This would put Canada at the forefront of the International Trout farming industry and keep our freshwater resources clean.

Sincerely,





Claudette Chabot Bob Duncanson

Chair - Aquaculture Committee Executive Director

Georgian Bay Association Georgian Bay Association

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**Attachment A**

GBA’s Response to NOAA’s Paper : Phosphorus Output from Cage Aquaculture in Ontario (Revised July 2012)

Note to the reader: GBA’s Phosphorous Fact sheet was initiated after reading

the Northern Ontario’s Aquaculture Association’s (NOAA’s) own Fact Sheet, *Phosphorus Output from Cage Culture in Ontario, July 2012.* The NOAA document contains a number of questionable and unsubstantiated assertions which allege that the effect of the cage culture of rainbow trout in Lake Huron is minimal or non-existent. The GBA has been watching developments in the cage aquaculture industry since the late 1990’s. In those years, there has been little expansion of the freshwater farming industry. However, the demand for freshwater farmed production of fish is steadily increasing. , Given our massive freshwater resources, Canada should be world leaders. Our policy should be to preserve the coveted natural resource that is Canada’s freshwater lakes, especially our Great Lakes that we share with our American neighbours. Leaders of both countries are committed to treaties and agreements fashioned for conservation and preservation of our shared waters. Georgian Bay and its North Channel to Lake Huron is a unique, fragile, finite water basin in this system. It is one of the cleanest of the Great Lakes. Our governments should aim to keep it this way to avoid the considerable expenditure that has been incurred cleaning up areas in other Lakes such as Lake Erie. Phosphorous is the nutrient of concern in this fact sheet. Here are the facts that we have compiled to offset some industry-driven claims….

**Freedom of speech notwithstanding, it is incomprehensible that the NOAA could declare there is no objective scientific evidence of any significant, negative environmental impacts, evidence of the negative environmental impacts of open net aquaculture in Lake Huron quite clearly does exist.**

There is the case of the net pen operation located in La Cloche Channel where the undesirable anoxic (low oxygen) condition of the water was attributed to this operation and was documented by Hamblin and Gale (2002) and Clerk et al. (2004) in two refereed journals.

At the net pen farm located in nearby Grassy Narrows, Milne (2008) documented that it took approximately nine years, after operations ceased in 1999, for most of the accumulated fish deposits and excess feed to dissipate and that some detectable deposits of fish manure on the lake bed near the cage location still remained. Close to 1/3 of the phosphorus occurring in the surrounding waters was attributed to this fish farm.

The net pen farm located in the embayment known as Lake Wolseyturned that lake’s total phosphorus concentration from the naturally oligotrophic, meaning low concentration, which supports the normal low plant growth characteristic of healthy lakes, to levels well into the mesotrophic range, meaning moderate levels of phosphorus resulting in the moderate overgrowth of plants. In other words, phosphorus levels reached the “the impacted water quality” range, as documented by Hamblin and Gale (2002) and Milne (2012).

Hamblin and Gale (2002) also documented that near-farm phosphorus concentrations had reached hypereutrophic levels in Lake Wolsey, meaning the water was determined to be excessively rich in phosphorus, a nutrient which supports excessive plant growth. This is a concern since such nutrient rich waters are at risk for algal bloom growths and oxygen deficiency, and can also become generally undesirable for drinking water and other needs.

It should be noted that the *Canada-US 2012 Great Lakes Water Quality Agreement’s Annex 4 on Nutrients (Environment Canada, 2012)* states as a lake ecosystem objective, that the waters of

Lake Huron should be maintained in an oligotrophic state and that algal species which produce toxins that pose a threat to humans or ecosystem health, such as cyanobacteria, should be maintained at healthy levels in the nearshore waters of Lake Huron. According to the *Lake Huron Bi-national Partnership, (2011)*, a massive wildlife die-off occurred in Georgian Bay in 2011. Net pen aquaculture is operated in nearshore waters. Since phosphorus contributes to water quality conditions that can facilitate the growth of algae, it would be responsible and prudent to be concerned about the phosphorus loading into nearshore waters including phosphorus from fish farm operations. Negative environmental impacts associated with fish farm operations have been documented and have led to ongoing research in Canada and internationally on ways to minimize or eliminate the negative environmental impacts of aquaculture.

**The NOAA states that concerns about phosphorus from fish farms have been based on a “misrepresentation of reality” and asserts that “Aqua-Cage Fisheries [farm] has the equivalent impact on Parry Sound as the annual leaf litter from about 80 hectares of deciduous forest”.**

* In reality, Milne found that leaf litter did not release nearly the amount of bioavailable nutrients, such as phosphorus, as the fish farm did, and that leaf litter accounted for only 0.3% of the 1,130 kg of phosphorus input to Lake Wolsey (2012).

**The NOAA claims that leaf litter is much more harmful than fish waste because of the volatile compounds it releases on decomposition”.**

* Considering the positive contribution of trees to the environment, comparing the impact of phosphorus released in an artificially created environment which has been inserted into an ecosystem, to volatile compounds which have been released from leaves in evolved, adapted ecosystems, would seem to be an invalid comparison.

**While the NOAA is correct in stating that one of the most frequently cited concerns is the amount of phosphorus released into the environment by cage farms and the potential deleterious impact of this on water quality and lake ecosystems, it suggests that these concerns are based on misrepresentations of reality. This is incorrect.**

* The calculations used by the critics of the freshwater net pen industry for determining the total phosphorus load into Lake Huron from aquaculture operations are not “based on a gross overestimation of phosphorus content in feed, poorer feed conversion than those actually achieved by commercial fish farms, or a poor understanding of the fate of the phosphorus in the ecosystem”. Concerns are based on the fact that:
  + Fish farm operators appear to overfeed and manually feed fish rather than implement the use of mechanical feeders in conjunction with underwater cameras which would not only minimize the environmental impact of overfeeding but also reduce their feed costs.
  + In the case of manual feeding, the most diligent strategies to control overfeeding are imprecise and may, in some cases, include bonuses to employees when low FCR’s are achieved. This would seem to confirm there is inconsistency in achieving optimal FCR’s. (Feed Conversion Ratios are measurements of the efficiency at which feed mass is converted into body mass.)
  + Inadvertent overfeeding appears to be sufficient to support escaped fish, as evidenced by the large numbers of sport fisherman observed immediately adjacent to these cages.
* In light of manual and overfeeding practices and the presence of escaped fish, one must question the validity of feed conversion ratio calculations in open net as a valid measurement of the actual amount of feed and phosphorus being loaded into the water.

**The NOAA states that, “The real effect on the ecosystem is ignored” that “Lake Huron is an oligotrophic ecosystem in which several nutrients are probably limiting growth of the natural food chain.”**

In fact, The Canada-US 2012 Great Lakes Water Quality Agreement: Annex 4 on Nutrients*,* *(Environment Canada, 2012)* states as a lake ecosystem objective that the waters of Lake Huron be maintained in an oligotrophic state. There is sufficient natural loading of phosphorus to maintain a healthy oligotrophic ecosystem without the addition of excess phosphorus from the aquaculture industry.

**The NOAA states that phosphorus is a nutrient, not a toxic compound and that “too much is a problem but too little is also a problem.”**

* Additional phosphorus from fish farms does not benefit the ecosystem of Lake Huron as seems to be implied, nor is it inert. Apatate phosphorous can degrade and become soluble under certain conditions. Close to one third of excreted phosphorus is soluble.

**The NOAA acknowledges that phosphorus is a problem which can lead to excess nuisance algae growth and other eutrophication problems. In defense of the status quo, it states that algae have not been observed at current cage sites**.

* In fact, while, blue-green algae may blow to and thrive along shorelines and in areas where the water is shallow, slow moving, and warm, it may also be present below the surface in deeper cooler water. This will continue to be a valid area of public concern since blue-green algae have been a problem, having appeared in many areas in the Great Lakes, and pose significant risks to humans and wildlife as previously discussed herein. Until scientific investigation validates that the risk to the public is non-existent, it would be socially irresponsible to minimize or ignore this potential threat to public safety.

**The NOAA suggests that it is a cheap trick to compare fish farm waste to human and terrestrial farm animal waste.**

* To our knowledge, fish farm waste has not been compared to human sewage other than comparing the large amounts of detrimental phosphorus contained in fish farm waste to the relatively modest amounts of phosphorus discharge loads from municipal sewage treatment plants. We are not aware of any intention to reference disease organisms, odour, or other nasty compounds as claimed by the NOAA.

**The NOAA claims that there is a lack of measured effect of aquaculture related phosphorus on water quality.**

* + In fact, there are several cases of the measured effect of aquaculture related phosphorus to water quality, as noted previously herein.

**The NOAA tried to make a strong case for farming trout in Georgian Bay based on extensive on-site scientific observation and analysis in the Experimental Lakes Area (ELA).**

* + - The ecosystems of the ELA lakes are so unlike those of Lake Huron that the findings of the ELA experiments cannot be used for analysis of this issue in Lake Huron.
    - In fact, lakes that are suitable for net pen aquaculture are those having high rates of sedimentation so that any phosphorus remaining after rapid flushing is buried in the sediment load. Georgian Bay is certainly not one of those lakes as it has both a very long flushing time and extremely low sedimentation rates.

**The NOAA states the phosphorus content of trout feed has “tremendously decreased over the past 30 years”.**

* While this may be true, according to Moccia et al. (2007), the fact remains that phosphorus still composes 3% of fish manure, 40% of which is soluble, (Podemski, 2011).

**The NOAA asserts that a large portion of the phosphorus in feed is indigestible and excreted in an “environmentally inert form”. The inference seems to be that if the fish cannot digest the phosphorus, other biota such as benthic organisms and bacteria cannot either**.

* There is no observational evidence for this. In fact, Milne (2008) measured a 2 cm per year decrease in the thickness of the manure pile on the bottom of the decommissioned Grassy Narrows farm and documented the “impacted water quality” as previously discussed.

**The NOAA states that Ontario fish farmers have “partnered with, (Canadian experts) and opened their doors to world-class scientists and experts from the Federal and Provincial Governments, and from leading Canadian universities,” and that Ontario fish farmers have been active players in research aimed at making sure that their enterprises are as environmentally sustainable as possible.** It would be reasonable to expect the NOAA has access to the most recent information and technologies being utilized elsewhere in Canada to successfully address and reduce the environmental impacts of fish farming.

* It is regrettable that these newer, sustainable and less polluting fish farm technologies as outlined by ECO (2012) have not been universally implemented.

Those concerned with sustaining the natural resource industry and preserving the life of aquatic ecosystems are more than justified in their efforts to reduce negative impacts of the aquaculture industry when their farming practice is in open net pens that discharge all waste directly into the Great Lakes. So far Canada continues to lag far behind the continuous advancements in the aquaculture industry in other countries, such as Denmark and Norway. Open water net pen methods of culturing fish are old and outdated in this age of concern for natural, organic, and sustainable food production. Any systems that are open to the surrounding waters pose a high risk to both the valuable stock the farmers have invested in for their profits (risks of disease transfer, water quality degradation, oxygen depletion) and the native aquatic environment. More and more water quality concerns are documented. As Canada grows this industry, it behooves us to support, even become a leader, in the implementation of evolving technologies using closed-contained systems to eventually replace the net pens. Today’s consumer (and their offspring) are becoming increasingly concerned with how, where, and why their food comes to them. Now more than ever food production has become of great concern to the consumer, who has in turn become a more vigilant steward of their own well-being. The modern consumer has become more and more concerned and aware that human health is directly related to environmental health (our shared waters and farmlands).

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The following two pictures are from a research report published by Kelly Amber Hille in 2008 on the effects of cage aquaculture on epilithic biofilms.

The portion of her report that focuses on Lake Wolsey concludes in part, “even though the aquaculture operation may not be the main impacting agent on the system, it still plays a part. Every new invasion, every added nutrient and every physical change to the system adds stress to this already highly disturbed system.”



Phytoplankton bloom in the near-shore region of Lake Wolsey adjacent to fish farm.

Photo by K. Hille Septemebe4r 2006



Aquaculture cage and Phytoplankton bloom at Lake Wolsey.

Photo by K. Hille September 2006

**Attachment B**

**Worksheet Calculating Phosphorus Released in Ontario Cage Farms**

The following analysis follows the procedure outlined in the FTAD Final Draft Standards – January 2012, Appendix II-A. The analysis assumes that all biomass removed from the cage farm is accounted for in the Feed Conversation Ratio, and that no biosolids removal is implemented.

The analysis demonstrates that Ontario cage farming practices will discharge 12.8 kilograms of phosphorus for every metric tonne of biomass removed. This is approximately triple the required standard specified in Indicator 3.3.8 of the FTAD Final Draft Standard.

***Basic Formula from FTAD Final Draft Standard Appendix II-A:***

***Where:***

***Given:***

*This is an arbitrary unit of feed consumption used for calculation purposes.*

*This is typical phosphorus concentration in Ontario Rainbow trout feed.*

*Phosphorus concentration in trout specified in Appendix II-A.*

*Typical feed conversation ratio for Ontario cage farmers.*

*Ontario cage farmers do not implement biosolids removal.*

***Finally:***

**Attachment C**

La Cloche Channel 10 years after the fish farming cages were removed. The methane created by the fish manure in the sediment below the cage sites was still sufficient to melt the ice above where the cages used to be. Fish farming using open net technology is not a benign practice.

