ATLANTIC COALITION FOR AQUACULTURE REFORM [1]

April 23, 2012

ACAR c/o Ecology Action Centre

2705 Fern Lane
Halifax, Nova Scotia
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To whom it may concern,

We are writing out of great concern regarding the direction of the Nova Scotia Government in expanding open net pen salmon aquaculture in the bays and inlets of this province. Until recently, Nova Scotia has been a leader and innovator in shellfish aquaculture and has led the way in Canada in supporting closed containment operations.

We contend that aquaculture such as closed containment and small-scale shellfish aquaculture are much more responsible and innovative avenues to pursue, rather than open net pen salmon aquaculture, to help build rural economies in Nova Scotia and not jeopardize our environment and wild fisheries.

Our collective concerns regarding open net pen salmon aquaculture span the following:

- lack of public consultation or democratic decision making
- low number of jobs created as compared to other coastal industries and corporate profits prioritized over sustainable rural economic development
- significant tax payers subsidies for expansion and compensation for loss of farmed fish due to disease and escapes
- a growing body of peer reviewed scientific research documenting impacts of open net pen salmon aquaculture
- lack of adequate enforcement of existing operations and failures in the permitting process
- failure of the environmental assessments to follow guidelines established by federal government scientists.
- Recent research on seafloor sites post farming shows decrease in biodiversity and slow return to healthy seafloor conditions

We have included in this package detailed information on those concerns, and have included key details on these concerns below:

[1] The Atlantic Coalition of Aquaculture Reform is comprised of organizations from Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland. This letter is supported by and sent from the Nova Scotia members of ACAR.

1) **Lack of public consultation** on the provincial aquaculture strategy which was announced in the March 2012 Throne Speech. When there has been consultation, the significant opposition in coastal communities has not been heard or addressed. For example, of the 135 submissions to the environmental assessment process in St. Mary's Bay, 134 submissions were against the expansion. *(see Appendix I: Public Consultation Briefing)*
2) **Despite the promise of jobs, open net pen salmon farming generates the lowest number of full time equivalent jobs per million dollars of revenue** when compared to shellfish farming, tourism, recreational fishing and commercial lobster fishing. Open net pen aquaculture also jeopardizes rural jobs and livelihoods that are based on wild fisheries and recreational fisheries. *(see Appendix II: Economic Briefing)*
3) **Significant taxpayers subsidies and compensation are provided for development and compensation.** In Nova Scotia, we know that the provincial government will likely commit 35-50 million dollars to growing this industry, for the relatively few jobs produced. Aquaculture industry lobby groups have received 5 times the amount of funding as any small-scale wild fishery organization over the past decade. Between 1996 and 2004 in New Brunswick, $70.5 million of government funds were provided to companies for ISA compensation. *(see Appendix II: Economic Briefing)*
4) **There is a significant body of peer reviewed scientific research that clearly shows negative environmental impacts of open net pen salmon aquaculture** on the wild salmon stocks, water pollution and significant ecological degradation of the sea floor (at times to the point of "dead zones").*(see Appendix III: Science Briefing).*
5) **The Nova Scotia Department of Fisheries and Aquaculture has a track record of inadequate enforcement of its own regulations for monitoring and management** of open net pen salmon farming, and actions have not been taken when environmental indicators have exceeded regulatory levels (*see Appendix IV: Enforcement Briefing).*
6) **Current environmental impact assessments do not include key information that has been deemed necessary by scientists** in the federal Department of Fisheries and Oceans, in order to determine if a site might be acceptable for open net pen salmon farming. *(see Appendix V: Shoal Bay Checklist).*
7) **Research in Nova Scotia open net pen salmon sites shows a lack of recovery and a significant loss of marine diversity** (*see Appendix VI: Shelburne Harbour Impacts).*

We are also concerned at the significant lobbying and advocacy on behalf of the large scale open net pen salmon farming industry, which has the tools and financial means to be extremely effective in convincing government and elected officials that their industry will bring economic prosperity to rural Nova Scotia. This has not been the case for their current operations.

As residents of rural and urban Nova Scotia, owners and employees of coastal industries, conservation organizations and concerned citizens, we urge you to consider the information we have provided in decisions that are made regarding the expansion of open net pen salmon aquaculture in Nova Scotia. As an elected member of the legislature, we are asking that you consider our request to support a moratorium on open net pen salmon farming[2] until our collective concerns can be adequately addressed.

[2] The following organizations and businesses were signatories to the March 2012 letter asking for a moratorium on open net pen salmonid aquaculture: **Coalitions & Community Organizations** Association for

We have the opportunity to **not** make the same mistakes that have been made in other jurisdictions – Norway, Scotland, BC, Chile, New Brunswick to name a few – and to set a new course for Nova Scotia that is based on democratic processes, real rural economic development, empowerment of coastal communities and sustainable aquaculture development that includes closed containment operations and shellfish aquaculture.

This controversy surrounding open net pen aquaculture is being documented in a film that will be out shortly, and we will be organizing a screening for elected officials. A trailer for "Salmon Wars" can be viewed at http://tinyurl.com/SalmonWarstrailer.

The following organizations support this letter and would be more than happy to meet with you in your constituency office or while in Halifax when the legislature is sitting.

Sincerely,

Association for the Protection of the Eastern Shore
Atlantic Salmon Federation
Eastern Shore Fisherman's Protection Association
Ecology Action Centre
Friends of Shelburne Harbour
Nova Scotia Salmon Association
MAYDAY Shelburne County
St Mary's Bay Coastal Alliance

Preservation of the Eastern Shore, Atlantic Coalition for Aquaculture Reform, Canadian Parks and Wilderness Society – Nova Scotia Chapter, Citizens for Sustainable Aquaculture Now, Coastal Coalition of Nova Scotia, Conservation Council of New Brunswick, Eastern Shore Forest Watch Association, Ecology Action Centre, Friar's Bay Development Association, Friends of Port Mouton Bay, Friends of Shelburne Harbour, Fundy BayKeeper, Heavy Current Fishers Association, MAYDAY-Shelburne County, Partnership for the Sustainable Development of Digby Neck & Islands Society, Sierra Club – Atlantic Canada Chapter, St. Mary's Bay Coastal Alliance **Wild Salmon Organizations** Atlantic Salmon Federation**,** Nova Scotia Salmon Association**,** Antigonish Rivers Association (ARA)**,** Fédération québécoise pour le saumon atlantique **,** Cobequid Salmon Association**,** Cumberland County River Enhancement Association**,** Eastern Shore Wildlife Association**,** LaHave River Salmon Association**,** Margaree Salmon Association**,** Mushamush River Salmon Association**,** Musquodoboit River Watershed Society**,** New Brunswick Salmon Council**,** North Colchester River Restoration Association PEI Council of the Atlantic Salmon Federation**,** Queens County Fish & Game Association**,** Sackville Rivers Association**,** St. Mary's River Association**,** Trout Nova Scotia**,** Salmonid Council of Newfoundland and Labrador **Commercial Fishing Associations** 1688 Professional Lobster Fishermen Association**,** Eastern Shore Fishermen's Protective Association (ESFPA)**,** Fundy Fixed Gear Association**,** Fundy North Fishermen's Association**,** Guysborough County Inshore Fishermen's Association**,** Lobster Fishing Area 33**,** Lobster Fishing Area 34 **Tourism Operators** East Coast Outfitters, Canoe Kayak Nova Scotia, Gambrel Group Outdoor Adventures, Brier Island Whale and Seabird Tours, Freeport Whale and Seabird Tours

APPENDIX I: Public Consultation Examples from NS Communities

Coastal Strategy and Aquaculture Strategy

The Nova Scotia government and Department of Fisheries and Aquaculture spent significant time in coastal communities listening to people's ideas and input to create a Draft Coastal Strategy for Nova Scotia. Through this process, they completed a State of the Coast report, consulted with the public, let people know what they heard and posted all public comments. There process and results are readily available at http://www.gov.ns.ca/coast/.

Despite the fact that a significant amount of the feedback was regarding to the expansion of open net pen aquaculture, there is no inclusion of this activity nor application of the principles of the Coastal Strategy to open net pen development or regulation. The announcement of an Aquaculture Strategy in the March 2011 Throne Speech from the Province, ideally – would be a welcomed. However there has been no consultation on this strategy and the marked difference between the process followed for the Coastal Strategy is of significant concern. The open net pen aquaculture issue has divided communities, resulted in thousands of Nova Scotian's requesting a moratorium on expansion, catalyzed a growing coalition of organizations and businesses into opposing this industry and resulted in communities fighting against something rather than using their energy and resources to plan proactively for their future.

We are asking that the release of the draft Aquaculture Strategy be followed by a comprehensive, meaningful and open public engagement process.

Community Specific Examples

Because open net pen aquaculture siting requires an environmental assessment under the Canadian Environmental Assessment Act, there is a requirement to hold public meetings and engage other government departments. We provide below several specific examples from communities that detail where this process has been grossly flawed:

1. Eastern Shore: Citizen's Account of Consultation

On February 6th there was a public meeting held at the Sheet Harbour Legion to present the proponent's (snow Island Salmon a subsidiary of the Scottish Company, Loch Duart) proposal for 3 licenses to install open pen fish farms in shoal Bay, Spry Harbour, and Beaver Harbour. This session was moderated by a professional consultant who forbade the audience to react with either words or sounds.

The first part of the meeting was given over to the proponents and the licensing bureaucrats to present the proposal. There remained just one and a quarter hours for questions. Many members of the community who had questions did not get to pose them, for example, the President of the Sheet Harbour Chamber of Commerce. No one in the community judged that their questions were given adequate attention or answers. Several times the audience requested that a vote, for or against the proposal, be taken in the room. The moderator refused to do this. That meeting was the first and only public consultation required in the licensing process.

Since then the Association for the Preservation of the Eastern Shore (APES) has sent hundreds of objections and questions to Jason Flanagan at the federal Department of Transportation, the

Minister of Fisheries, the Premier, our MLA's Sid Prest and Jim Boudreau, and our MP, Peter McKay. We have received no satisfactory responses to our scientifically and economically informed questions and objections to this proposal. We have asked for meetings with the Premier and the Minister of Fisheries all to no avail. The president of APES and of the Chamber of Commerce wrote to ask that APES be included in the working group to study the licensing proposal. The proponent is included. We are not allowed to attend.

Many resources both bureaucratic and financial are given by both levels of government to the proponent facilitate their application. The community and APES receive no such aid and have had to reply to this application by relying purely on community donations and volunteer work. Unanimously, the community of the Eastern Shore is sorely disappointed by what they see as a democratic deficit in the process of granting a license to a foreign owned company to exploit their coastal waters for their own profit and in the process placing at risk our livelihoods and our quality of life. Over 3000 signatures have been collected asking for a moratorium on expansion of open net pen salmon aquaculture.

- submitted by Marike Finlay, Association for the Protection of the Eastern Shore

2. St. Mary's Bay: Public Consultation Concerns

Essentially there has never been a response from either the Minister or the NSDFA to any submission made by community members or the Alliance. We had submissions go in from various NGO's as well regarding the site application, and to date nothing has been responded to. We had the proponent falsely stating that the community and fishermen had been consulted. No fishermen in our communities ever expressed a positive opinion of this project. Minister Belliveau also in two separate meetings with the Alliance, falsely mislead us, knowing we were there speaking on behalf of our communities. We had our petition which we presented to him on the first meeting. Hundreds of letters also. He knowingly mislead us to think that his department had no say in the process while it was at the federal level and that only after the federal review, if it was approved, his department would then play a role in the decision.

After our sites were approved I had a conversation with Kevin LeBlanc of Transport Canada and he told me that at ANY time during the federal review the Minister could have requested one of two things: first that the review be stopped, and at that time Transport Canada would have closed the file and nothing more would have been done. Second he could have requested a higher level of assessment. Both of these requests could have been due to the high level of opposition and concern in the communities about the proposal. The Minister essentially lied to us that his hands were tied while Transport Canada looked at the application. Also the Minister assured us that although we had not heard back from his dept., once Transport Canada had completed its review, and the application then came to his department at that time ALL concerns would be addressed. This did not occur, he approved the application immediately after Transport Canada completed their screening. In all actuality there is no public consultation for aquaculture leases, it is just a term that is used by NSDFA that has no meaning or merit.

- submitted by Karen Crocker, St. Mary's Bay Coastal Alliance

<u>Concerns about Public Consultation in Shelburne</u>

1. Inner Shelburne Harbour sites Sandy Point, Hartz Point, Boston Rock under review 2009-2011: NO PUBLIC CONSULTATION WAS EVER HELD FOR THE 3 INNER HARBOUR SITES UNDER REVIEW:

1. Although the NSDFA flowchart (dated 2007, and online in 2009, 2010, and most of 2011) showed that a public consultation was required for sites under review, and
2. although we were told by Marshall Giles in a 2009 email where we should look online for the announcement of such a public consultation for the 3 Inner Harbour sites, and
3. although, after we pleaded to Minister Belliveau for a public meeting, we were told in an email (2011) from Minister Belliveau that public consultation was possible but that next steps had not yet been decided,

no public consultation was ever held for the 3 Inner Shelburne Harbour sites.

2. Jordan Bay, Blue Island, Middle Head sites: a public consultation was held in July, 2011. A document of 57 questions was formally submitted to Minister Belliveau before the meeting, with the request that answers to the questions be posted on the NSDFA website. What happened:

1. NO FISHERMAN'S QUESTIONS WERE ANSWERED DURING THE MEETING OR AFTERWARD.

2. NO RESPONSE WAS EVER GIVEN TO THE 57 QUESTIONS.

- submitted by Friends of Shelburne Harbour

Minister Belliveau has never attempted to contact or consult with fishermen in Shelburne. Last summer, 12 fishermen (from Shelburne County - including Jordan Bay) called Belliveau and set up their own meeting with him, well into the lease application process (he limited the number of fishermen who could attend).

They told Belliveau, in no uncertain terms, they were opposed to industrial aquaculture. He told them he supported that type of development and said it would bring jobs. He told them that all their concerns would be addressed at the public meeting, which never happened.

There have been at least two or three LFA #33 meetings since then, where Ernie Pierce, our Port Rep, spoke publicly against salmon feedlots - Belliveau was at one of those meetings.

Two fishermen from Green Harbour (they fish in JBay) have also called Belliveau several times and have met with him to express their opposition. Back in Feb 2011, an NSDFA rep paid them at least 2 visits to try to influence their position.

- submitted by MAYDAY Shelburne County

Letter from Shelburne County Residents to Minister Belliveau – April 2012

The Honourable Sterling Belliveau
Minister of Fisheries and Aquaculture

Dear Minister Belliveau,
In our email to you dated April 11, 2011, MAYDAY-Shelburne County asked that you honour the intent of the 30 day appeal period, once the decision is made regarding the open-pen finfish lease applications for Jordan Bay.

Transport Canada has not yet issued a decision on the Jordan Bay file CEAR ref.# 11-01-61095. However, as shown by the photo below, there are already approximately 60X5000 lb. anchors on site at a local trucking company's yard. There are also salmon cages at another "yard" in Shelburne.

Please provide MAYDAY-Shelburne County with a timely written response stating that you plan to honour the intent of the 30-day appeal period by NOT allowing deployment of any type of equipment into Jordan Bay. Our community is entitled to a 30 day appeals period, which we expect will be honoured.

Sindy Horncastle
Marilyn Moore
MAYDAY-Shelburne County
Jordan Bay, NS
1-902-875-4771
1-902-875-2541

APPENDIX II: Economic Briefing

Economic Risks of Open Net Pen Salmon Aquaculture
A Summary of Subsidies, Compensation and Job Creation Information

Compiled by S.D Fuller & Heather Grant, 2012

1. Job Creation

Expansion of open net pen salmon farming is frequently accompanied with the promise of jobs, particularly in rural and coastal areas where economies formerly reliant on wild fisheries are in decline. Despite claims of significant job creation, these operations actually create few new jobs. For example, both the Scottish and Norwegian salmon farming industries dramatically expanded production in the 1990's while at the same time decreasing employment. In the 1990s, BC's salmon farming industry tripled production while adding no new jobs. Fish farms in BC are following the trend set in Norway by becoming increasingly mechanized and thus needing fewer workers[3]. Additionally, as a result of the impacts of open net pen salmonid aquaculture on the marine environment and on wild salmon populations aquaculture jobs may come at the expense of jobs in the recreational and commercial fisheries.

[3] Marshall, D. 2003. Economics of Salmon Farming in BC. BC Centre for Policy Alternatives.) (http://www.policy.ca/policy-directory/Detailed/Fishy-Business_-The-Economics-of-Salmon-Farming-in-BC-568.html).

Comparative Job Creation /Sector

Table 1. Comparison of jobs created per million dollars of revenue in coastal industries.

Sector	FTE / Million $ in Revenue
NS Aquaculture (all)[4]	13.2
NL Aquaculture (all)[5]	5.8
NB Aquaculture (all)[6]	5.4
NS Open Net Pen Only[7]	6.7
NS Shellfish Only[8]	82.4[9]
Margaree River Angling (NS)[10]	28.0
Exploits River Angling (NL) [11]	35.5
Miramichi River Angling (NB) [12]	33.4
NS Lobster Fishery[13]	12.5
NS Tourism[14]	26.7

If the desired outcome of economic generation in Nova Scotia is jobs – then it is clear that open net pen aquaculture in both Nova Scotia and Newfoundland create an order of magnitude fewer jobs per million dollars in economic revenue, than other coastal industries including shellfish aquaculture, recreational salmon angling, commercial fishing for lobster and tourism (Table 1). Traditional industries that rely on good environmental quality are clearly a better investment should government funds be available, than industrial scale open net pen salmon farming.

[4] Data accessed from http://www.gov.ns.ca/fish/aquaculture/stats/ March 2012
[5] Department of Fisheries and Oceans Press Release, March 2012 http://www.dfo-mpo.gc.ca/media/npress-communique/2012/hq-ac09-eng.htm Data for shellfish jobs / millions not readily available.
[6] Data accessed from http://www.gnb.ca/0168/30/ReviewAquaculture2010.pdf April 2012 Data for shellfish jobs / millions not readily available.
[7] Data accessed from http://www.gov.ns.ca/fish/aquaculture/stats/ March 2012
[8] Data accessed from http://www.gov.ns.ca/fish/aquaculture/stats/ March 2012
[9] Shellfish aquaculture resulted in 203 jobs < 6 months and 204 jobs > 6 months, these numbers were combined to a total of 203.5 fulltime jobs.
[10] www.asf.ca/g-p2012/value-wild-**salmon**-final.pdf *Accessed March 2012*
[11] www.asf.ca/g-p2012/value-wild-**salmon**-final.pdf *Accessed March 2012*
[12] www.asf.ca/g-p2012/value-wild-**salmon**-final.pdf *Accessed March 2012*
[13] Lobster Council of Canada http://lobstercouncilcanada.ca/
[14] Tourism Industry Association of Nova Scotia, letter to Premier March 2012.

Additionally, there has been significant investment in the enhancement of wild salmon populations in Nova Scotia, and given the additional 50% mortality rate of wild salmon populations adjacent to open net pen salmon farms[15], caution in undermining conservation efforts is well advised. On the eastern shore, aquaculture expansion is taking place adjacent to West River Sheet Harbour where an intensive mitigation program to counteract the effects of acid rain on wild Atlantic salmon populations is underway. Since 2005, nonprofit groups have spent $700,000 to restore pH values of West River Sheet Harbour to the very acceptable range of between 5.5 and 6.0. The river now supports a much increased Atlantic salmon smolt run.

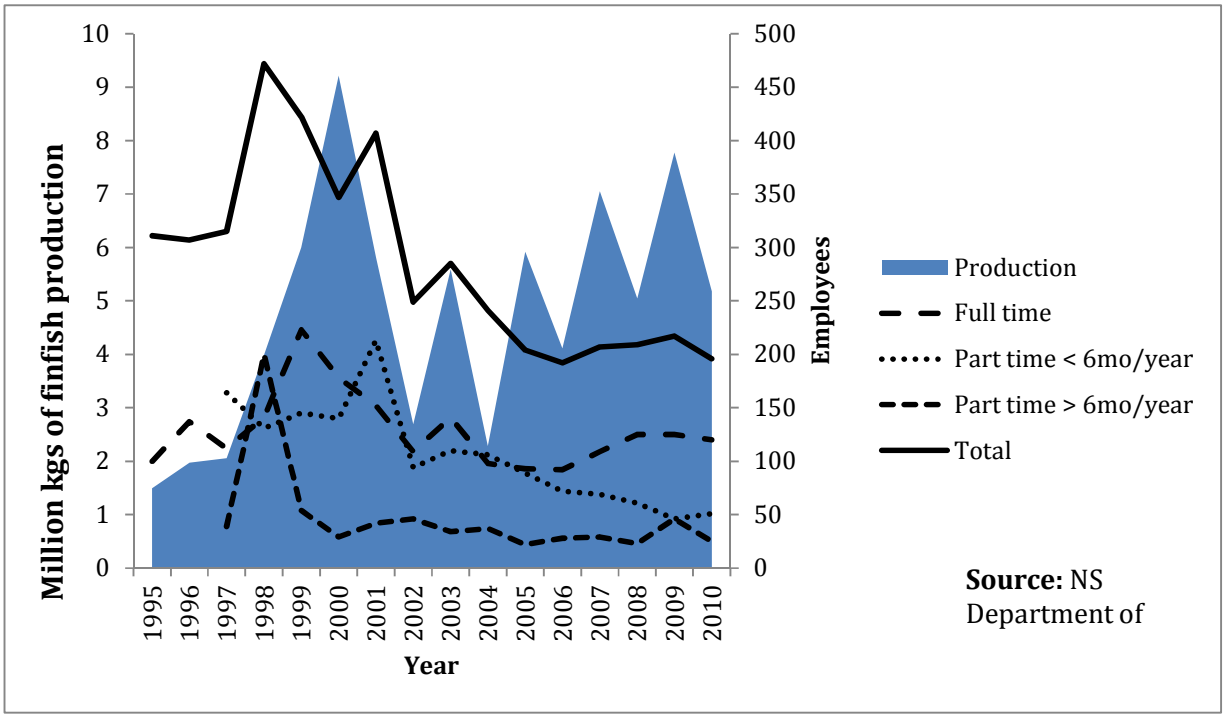

Figure 2. Aquaculture jobs related to millions of kg of finfish produced in Nova Scotia between 1995-2010.

Finfish production varies on a two year cycle between grow outs and harvest. Over time the number of full time jobs has declined, even as production has increased since 2007.

Case Study: Example of Jobs Promised in Shelburne County[16]

–Cooke promised 350 processing jobs before end of 2011

[15] Ford, J. S., & Myers, R. A. (2008). A global assessment of salmon aquaculture impacts on wild salmonids. *PLoS Biology, 6*(2), e33.

[16] See analysis by Herschel Specter, Aquaculture Chronicles January 2012 *www.saveourcoastalfishery.com/docs/aq-vol1.pdf*

–Need 3 million fish for plant / expected by 2013? 2014?

–Cooke plants in NB operating under capacity, and investment in automation in NB and NL has reduced shifts by 50% (960-3600 fish / hr/ employee)

–Without automation, 7-26 fish / hr / employee

–Max 60 jobs.

2. Subsidies & Compensation

Open net pen salmon farming tends to increase government revenue, but not necessarily above government expenditures on the industry.

- The salmon farming industry in Canada and BC continues to receive subsidies from senior levels of government. Provincial and federal government support (in subsidies, promotion of the Industry, and research) to aquaculture exceeded $110 million in New Brunswick between 1997 and 2002[17], in addition to Governments' unrecovered regulatory costs. Recent data for tax revenue to government is not available, but 1993 and 1996 figures show that BC collected $5 million in taxes and fees in those two years.[18]
- According to CFIA "the amount of compensation is based on an animal's market value (up to a maximum amount as stipulated in the *Compensation for Destroyed Animals Regulations*). Compensation amounts are intended to reflect the reasonable depreciated value that an owner could expect to receive for the animal or thing on the current Canadian market."[19] While salmon is not listed, the maximum amount of compensation for unlisted animals is $30.00.[20]

[17] Harvey and Milewski 2008 and references therein. Salmon Aquaculture in the Bay of Fundy: An unsustainable industry". Available as a download on our website (conservationcouncil.ca).
[18] Marshall, D. 2003. Economics of Salmon Farming in BC. BC Centre for Policy Alternatives.) (INSERT url).
[19] http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/compensation/eng/1313712524829/1313712773700

[20] Maximum amounts: http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-233/page-1.html#h-2

Nova Scotia Subsidies to Aquaculture 2000-2010

Data Sources[21]

- Atlantic Canada Opportunities Agency (ACOA)
- Office of Auditor General of Canada
- Department of Farm Credit Canada
- Department of Finance Canada (DFC)
- Department of Fisheries and Oceans Canada (DFO)
- Department of Freshwater Fish Marketing Corporation
- The Community Development Trust Fund
- Nova Scotia Farm Loan Board
- Fisheries and Aquaculture Loan Board
- Nova Scotia Business Inc. (NSBI)
- Department of finance and Statistical Division

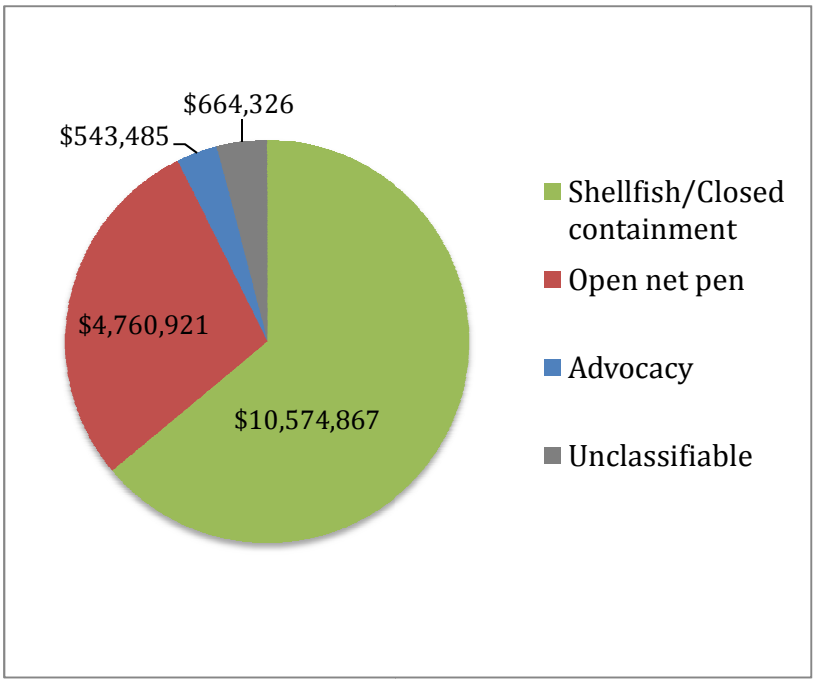

Figure 3. Summary of subsidies & loans to the aquaculture industry in Nova Scotia between 2000-2010.

The majority of investment in aquaculture in Nova Scotia over between 2000-2010 has been in shellfish aquaculture, with less than half to open net pen. This is a result of the fact that NS hasn't had large-scale open net pen aquaculture and has focused on more sustainable fish and shellfish farming methods.

[21] This information is not comprehensive, but represents all publicly available data.

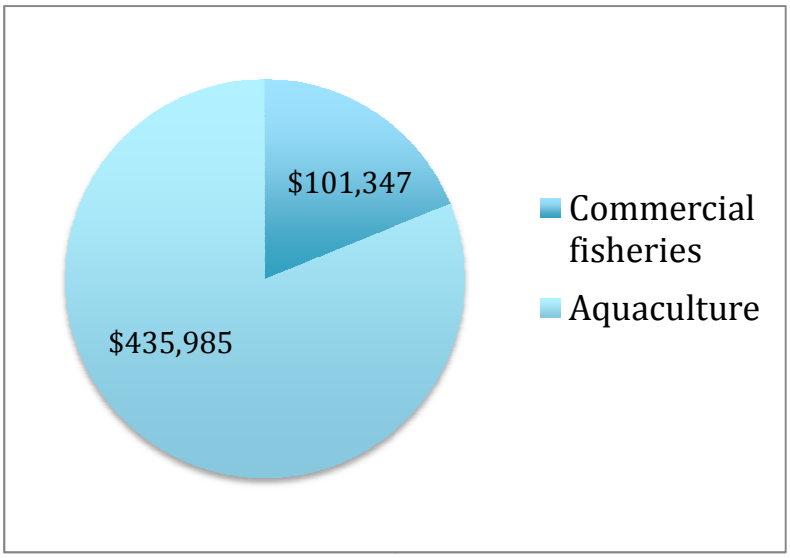

Figure 4. Total funding to NS industry associations between 2000-2010.

In 2010, the value of NS commercial fisheries was $487 million, nearly 12 times that of the NS aquaculture industry ($41.3 million). Nova Scotia is home to approximately 15 professional commercial fisheries associations, yet only received two subsidies which amounted to less than a quarter of the amount granted to the Aquaculture Association of NS, the only aquaculture association in NS, over eight subsidies. The value of these industries is clearly not reflected in the proportion of funding given to their respective associations and advocacy groups… Government funding for lobbying / advocacy …

Compensation

Examples of Costs of ISA outbreak 1996-2004 in New Brunswick[22]

- 1996-1997: a combined federal and provincial total of $40.5 million was paid to the aquaculture industry following the first kill of salmon as a result of ISA detection.
- 1999: Federal government and provincial governments contributed a total of $25 million dollars under the terms of the Disaster Financial Assistance Arrangements.
- 2006: Following two years of 'negotiations' with the province, DFO finally contributed another $10 million to cover losses as a result of ISA.

[22] Harvey and Milewski 2008 and references therein. Salmon Aquaculture in the Bay of Fundy: An unsustainable industry". Available as a download on our website (conservationcouncil.ca).

Total subsidies to compensate for ISA outbreak in NB (1996-2004): $75.5 Million

Additional funding in NB to open pen aquaculture industry $34 million

Salmon Slaughters in New Brunswick as a result of ISA infection

- Between 1997-1999, ~ 4.5 million fish were slaughtered at 65 sites in New Brunswick.
- In 2000, 9 farms were infected and 200,000 fish slaughtered.
- In 2001, 15 sites were infected and 1.5 million fish slaughtered.
- In 2002, 16 sites were infected and 2.4 million fish were slaughtered.
- In 2003, the sites infected began to drop to 10 and 405,000 fish were slaughtered.
- In 2004, only 1 site was infected.

Profit Margins

• Open pen salmon aquaculture is profitable,~ 50% profit margin to investment.
• Attractive to province because of increase in GDP; but profits go to few businesses.
• Significant externalities are not accounted for: no taxes on in water facilities, waste not treated, natural environment used as farming facility.
• Closed containment profit margin ~ 5%, externalities paid for, environmental impact not insignificant.

3. Environmental Costs

Currently the following environmental costs are not considered as part of doing business in open net pen salmon aquaculture, which is far different than any other farming operation which has to account for much more of its resource use.

- Waste – volume factor of sewage from open net pen salmon farms is ~ 20% of total production volume.
- Water quality
- Benthic environment / anoxia / sulphide levels (diversity & production)
- Wild salmon mortality (Ford & Myers)
- Pesticides on juvenile lobsters
- Sea lice on wild salmon (mechanisms outlined in Ford & Myers)

4. Impacts on commercial species

To date, there has been little to no study on the impacts of open net pen salmonid aquaculture on the following:

- Quality of lobster / urchins caught around aquaculture nets
- Impacts of pesticides / perception in Asian markets
- Low price for Atlantic salmon as Chilean production increases

This is a significant oversight in light of the importance of fisheries to Nova Scotia, and particularly lobster as an export to other countries. Import costs must also be taken into account when future production, jobs and GDP are estimated for the open net pen salmon farming industry.

APPENDIX III: Science Briefing

As new and relevant science becomes available, it will be added to this document. This review is not meant to be an exhaustive review of the literature, however it is intended to cover the most recent and pertinent research on the impacts of open net pen salmon aquaculture.

General Impacts

- A meta-analysis of wild salmon mortality in rivers adjacent to salmon farms found an increase of 50% mortality over populations with no farming near by (Ford & Myers 2008). The study collected data globally, and proposed several mechanisms for this increase mortality, several of which are discussed below.
- The February 2012 Royal Society of Canada report on Canadian marine diversity summarizes peer reviewed literature and makes the following conclusions regarding the impacts of aquaculture in Canada on biodiversity.

Major Findings on Aquaculture impacts on Canadian Biodiversity (RSC 2012)

- Aquaculture of finfish (e.g., salmon) and shellfish (e.g., mussels) typically affect marinebiodiversity at localized scales (less than tens of kms), although farther-reaching impacts are possible.
- Wild bottom-dwelling organisms and their habitat can be affected by organic wastes and chemical inputs, such as antibiotics, anti-foulants, and pesticides.
- Exchange of pathogens between farmed and wild fish can seriously threaten the persistence of wild fish populations.
- Interbreeding between wild fish and escapees of the same species threatens the reproductive capability and recovery potential of wild populations of conservation concern.
- Open-sea net pens have far greater potential and realized negative consequences to marine biodiversity than closed-containment facilities.
- The primary biodiversity concern associated with shellfish aquaculture is the farming of non-native species in Canadian waters and the high density of culture in some regions.

Pollution

- With such a high concentrations of fish, large amounts of waste will inevitably accumulate on the bottom under a sea cage. In a study on the effects of rainbow trout (*Oncorhynchus mykiss)* sea cages in Ontario, the invertebrate abundance beneath the cages was significantly reduced (Rooney and Podemski, 2009). There was also a reduction in species richness as a result of organic loading, though both these effects were quite localized.
- Farms in shallower coastal waters tend to have smaller footprints, their impacts tend to be much more intense due to decreased dispersal of waste in shallower waters (Giles, 2008).
- The feed given to farmed Atlantic salmon contains a number of trace metals, including copper, zinc and cadmium, and concentrations of these metals in the sediments below sea cages show high levels of contamination by these metals in a study on Scottish salmon farms (Dean et al 2007). These levels exceeded those deemed acceptable by the Scottish Environmental Protection Agency suggesting that the abundance of these metals would

likely have adverse effects. In this case, the high levels of zinc were directly associated with the fish farm.

- Copper, which is also used in anti-fouling on the sea cages, has been found to have significant effects of the physiology of spiny lobsters, causing alterations to the muscle, gills and heart, as well as having impacts at a cellular level by creating chromosomal aberrations (Maharajan et al. 2011; Maharajan et al. 2012). These effects could seriously impact the survival of American lobsters in the proximity of salmon farms.
- Both zinc and copper have toxic effects on some marine copepods and could also affect recruitment of lobsters by decreasing the survival of larvae (Bielmyer et al. 2006; Lauer & Bianchini 2010; Wong & Pak 2004).
- Current speed and depth of cage siting are key variables in determining the extent of impact to the benthic environment (Borja et al., 2009).
- Sulphide levels beneath cages vary with season and with distance from cages (Chang et al., 2011).

Sea Lice and Wild Salmon

- Sea lice are copepod crustaceans which live on the outside of salmon and feed on their mucous, skin and blood. Though most ocean-going adult salmon carry sea lice, juveniles in coastal waters do not (Chapter 5, Royal Society of Canada 2012).
- Migrating juvenile pink (*Oncorhynchus gorbuscha*) and chum salmon (*Oncorhynchus keta*) were sampled as they passed a salmon farm on their migration to the open ocean. Infection pressure for sea lice was up 73 times greater near the farm than ambient levels; likelihood of infection was found to be above ambient levels up to 30 km surrounding the salmon farm. Additionally, sea lice already infecting the wild juveniles were able to reproduce during their migration and re-infect the juveniles which increases the range of the farm's effect on infection to 75 km Krkošek et al. (2005).
- Fish infected with sea lice face increased mortality due to a reduced ability to avoid capture and a general decline in fitness, which can result in increased predation risk (Krkošek et al. 2011).
- There is evidence that the increased abundance of sea lice on fish farms has had a negative impact on the general productivity of wild salmon populations in the Broughton Archipelago, BC (Krkošek et al. 2011a), though this is still a matter of some debate.
- While there has been little research done on the effects of sea lice surrounding salmon farms on the east coast of Canada, it is unreasonable to assume that performing the same studies here would not yield similar results. Of course, there are ways of controlling sea lice by way of pesticides which unfortunately introduce a number of additional problems.

Pesticides

- The most common treatment for sea lice is the coating of food pellets with a chemical called emamectin benzoate, also known as SLICE®. Research on the effects of SLICE® on non-target species is relatively limited.
- In Nova Scotia, the main concern surrounding the use of SLICE® is its potential impacts on the American Lobster (*Homarus americanus*) which is an incredibly important to the area as

a commercial species. Research shows the lethality of emamectin benzoate to American Lobsters at standard industry concentrations is quite low (Burridge et al. 2004).

- However, there is significant evidence of other harmful but non-lethal effects. Waddy et al. (2002) found that 44% of female lobsters exposed to small doses of emamectin benzoate moulted prematurely, and those which were carrying eggs aborted their brood. This would seriously affect the reproductive ability of wild lobsters near salmon farms and could have a profound effect on Nova Scotia's lobster fishery.
- The question of whether wild lobsters would eat enough of the medicated salmon feed to induce premature moulting still remains to be conclusively answered (Waddy et al. 2007; Waddy et al. 2007a).
- All referenced studies have been performed on adult lobsters, but the effects of this pesticide on lobster larvae is yet to be confirmed.
- In 2009 Slice® ceased to be effective treating sea lice in southwest New Brunswick, leading to increased reliance on other treatment option (Burridge et al., 2010).
- In New Brunswick, in addition to Slice®, a number of pesticides have been administered through "bath treatments", which is the application of a sea lice treatment product directly to the water containing the fish either in a tarped pen (enclosed bottom), skirted pen (open bottom) or a well boat.
- Salmosan® (active ingredient azamethiphos) is currently approved for emergency use in New Brunswick, Nova Scotia, and Newfoundland and Labrador. Burridge et al. (2008) shows that repeated short term exposure to azamethiphos can have lethal and sub-lethal effects on American lobsters.
- Alpha Max® (active ingredient Deltamethrin, a pyrethroid insecticide) was approved for emergency use in 2009 and 2010, but is currently not in use. Fairchild et al. (2010) report that "Pyrethroid insecticides are among the most toxic insecticides known" and that "Among the pyrethroid insecticides, deltamethrin is often the most toxic to crustaceans" (p.iv). In lab conditions Fairchild et al. (2010) found lobsters to be susceptible to deltamethrin at much lower concentration than the recommended treatment dose.
- In 2009 and 2010 there were a number of incidents of dead and dying lobsters found in traps pens and pounds in southwestern New Brunswick. Cypermenthin, a pesticide used in salmon aquaculture but not approved for use in Canada, was detected on these lobsters. A New Brunswick based salmon aquaculture company and three of its executives are facing significant charges under the Fisheries Act in relation to these lobster kills.

Disease

- Because sea lice reduce the fitness of salmon, it leaves them vulnerable to other parasites and disease. The most problematic disease in Atlantic-based salmon aquaculture is the infectious salmon anemia virus (ISA). As the name suggests this causes severe anemia in the fish caused by a binding of the virus to red blood cells. Once infected, there is no treatment and the fish will die. ISA is easily transmitted by blood, feces or possibly passive transmission from seawater (Nylund et al. 1994).
- Sea lice are likely the most prevalent cause of ISA transmission between fish. The virus can be passed from salmonid parent to offspring through vertical transmission (Vike et al. 2008).
- Though the ISA virus is endemic to the Atlantic, transmission and prevalence of this disease is greatly increased on salmon farms due to the high density at which the fish are kept. This

poses a huge threat to wild salmon stocks which are already struggling, as it increases the chance of infection and therefore death, particularly when the farm is located near an estuary frequented by a wild population.

Escapes & Gene Transfer

- Open net pen fin fish farming can lead to frequent escapes which can occur as a result of storms or equipment malfunctions. Escapes can have severe impacts on wild populations of salmon. Morris et al. (2008) compiled a series of studies and found that escaped farmed salmon had been found in 87% of the rivers studies within a 300 km radius of aquaculture sites in eastern North America. This included 11 rivers that were home to endangered populations.
- Fleming et al. (2000) found that farmed Atlantic salmon (*Salmo salar*) were competitively and reproductively inferior to their wild counterparts, with less than one-third the reproductive success. Despite their decreased ability to compete, the farm fishes still were able to compete with the native population, as its productivity decreased by more than 30%.
- Hindar et al. (2006) developed a model from a number of experiments on the effects of escaped farmed salmon and their simulations showed significant changes in wild salmon populations within only a few generations and that recovery from this would be quite unlikely.
- McGinnity et al. (2003) found that the interaction and hybridisation of farmed and wild salmon caused an overall fitness depression and could result in the development of an "extinction vortex" in a vulnerable wild population.
- Burridge et al. (2011) assessed the temporal changes in the genetic make up of a population of Atlantic salmon in the Bay of Fundy. The study found a decrease in loci under selection over time, suggesting that the genetic integrity of the wild population may be altered. This could lead to a decrease in the population's adaptive ability.
- In a review of numerous studies, Carr and Whoriskey (2000) stated that one particular population from the Magaguadavic River in the Bay of Fundy was extremely fragile as a result of small egg depositions and reduced numbers of juveniles.
- In a study of other freshwater streams in New Brunswick, Carr and Whoriskey (2006) found that freshwater hatchery escapees were found in 75% of streams near hatcheries. In the Magaguadavic River, escapees outnumbered wild juveniles in most years.
- Suggestions from the Carr and Whoriskey (2000) review included improving gear to completely eliminate escapements, sterilizing the fish used in aquaculture or creating emergency response teams to trap escapees soon after the event.
- Negative effects by escaped farmed salmon on wild Atlantic salmon populations have been scientifically documented. Negative effects include both ecological interactions and genetic impacts of inter-breeding. A large number of studies point to negative effects, and outcomes for wild populations are either mostly negative and at best neutral. It has been shown that inter-breeding of farm with wild salmon can result in reduced lifetime success, lowered individual fitness, and decreases in production over at least two generations (Thorstad et al., 2008)

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APPENDIX IV: NSDFA ENFORCEMENT FAILURES

A full report on enforcement failures by the Nova Scotia Department of Fisheries and Aquaculture is available here: http://friendsofshelburneharbour.org/uploads/Letter21.pdf. Below is a summary of the full report.

Summary:

In spite of environmental failures at every previously licensed fish site in Shelburne Inner Harbour, and

1. with a history of allowing KCS/Cooke Aquaculture to violate its legal leases resulting in one of the three new sites already becoming pre-contaminated,
2. with no scientific basis presented to support pollution prevention or mitigation claims,
3. with compromised audits of high contamination measurements which did not provide root cause analyses but instead suggested useless corrective actions,
4. with reliance on faulty input from DFO and TC,
5. with multiple failures to release 2010 monitoring data requested by concerned citizens,
6. and in spite of detailed warnings from the Ecology Action Centre and concerned citizens:

the Minister and his staff went ahead and licensed three new sites in Shelburne Inner Harbour in the shadow of three severely contaminated sites.

Details:

1. **NSDFA failed to enforce lease boundaries in Shelburne Inner Harbour.**
    - **Sandy Point**: NSDFA failed to enforce its own lease at the old Sandy Point site by allowing KCS/Cooke Aquaculture to place fish cages outside the legal lease boundaries and also into the ice boom area where the lease strictly and explicitly forbade them to go.
    - **Boston Rock**: NSDFA failed to enforce its own lease at the old Boston Rock site by allowing KCS/Cooke Aquaculture to place all its fish cages completely outside this site's legal lease boundaries.
        - Some of these illegally relocated fish cages "invaded" the proposed area of the new Boston Rock site wherein they produced very high contamination levels. NSDFA's failure to enforce its own legal lease boundaries led to the pre-contamination of the new Boston Rock site.
2. **NSDFA did not demand or provide any systematic scientific analysis for pollution prevention in the future. As reward for polluting the old sites, NSDFA awarded the polluter, KCS/Cooke Aquaculture, three brand new sites.**
    - Every previous fish site in Inner Shelburne Inner Harbour has exceeded monitored environmental limits multiple years. Dead zones have been created. NSDFA did nothing to prevent this or correct this.
    - Monitoring never led to mitigation.
    - The Minister of NSDFA licensed three new sites in Shelburne Inner Harbour which are just meters away from the closed polluted sites they replaced. NSDFA never presented a scientific basis showing that the three new sites won't also become contaminated, and one new site already has, due to NSDFA's lax lease enforcement.

3. **NSDFA allowed compromised "third party" external auditing. These audits of the Sandy Point and Boston Rock sites in 2010 did not demand root cause analyses.**

- NSDFA, contrary to its own requirements, permitted external audits of the above sites that totally lacked third party independence. In fact, the group that conducted the audit was the same group that collected the environmental data in the first place.
- These compromised audits failed to determine the root cause of the 2010 high contamination levels at the old Sandy Point and Boston Rock sites. Instead they suggested minor corrective actions which were shown by comments in the Minister's record to be ineffective. The NSDFA Minister did not reject these compromised and useless audits.

4. **NSDFA relied on faulty procedures and analyses by federal agencies DFO and TC.**
   - The Department of Fisheries and Oceans (DFO) and Transport Canada (TC) also failed to carry out their responsibilities.
     - DFO never required corrective actions when fish sites in Shelburne Inner Harbour exceeded their environmental limits, year after year.
     - DFO's support for the three new sites in Shelburne Inner Harbour was inconsistent with their own aquaculture siting guidelines.
     - TC failed to address possible navigational risks posed by illegally relocated fish cages and failed to prevent the accumulation of noxious material on property that is within their jurisdiction. (The seabed under old and new Boston Rock and Hartz Point sites is owned by Transport Canada).
     - Both DFO and TC gave their approvals to the new sites in Shelburne Inner Harbour based on claimed mitigation processes, processes which should have been collated and analysed by NSDFA. These claimed mitigation processes have been shown to be ineffective, based on information that was at hand within the Minister's own department. But the Minister relied on the faulty input from these federal agencies in reaching his decisions in spite of being warned about the DFO effort in a detailed letter from the Ecology Action Centre (EAC).
5. **NSDFA withheld unfavourable 2010 monitoring data from the public.**
   - The 2010 environmental monitoring data for the old Sandy Point and old Boston Rock sites were repeatedly requested by citizen stakeholders. NSDFA hid these data by failing to provide the requested information. During the appeal to the Supreme Court, these data were discovered in the Minister's Record; they showed very significant contamination had taken place at these sites in 2010.
6. **NSDFA brushed off detailed warnings from the public about the proposed sites as well as detailed warnings addressed to the Minister from the Ecology Action Centre regarding DFO's defective environmental report on the new sites.**
   - There is no indication whatsoever in the Minister's Record that he ever took into serious consideration any submittal containing data or analyses from the public or from the EAC. All that was ever received was a "thank you for your submittal" letter.

APPENDIX V: Environmental Impact Assessment Insufficiencies

A. Shoal Bay Site and Hargrave checklist

This checklist is based on the criteria put forward by the Decision Support System for Environmental Assessment of Marine Finfish Aquaculture published by Fisheries and Oceans Canada and developed by L.I. Doucette and B.T. Hargrave. In this system, responses to questions on the ecosystem and siting of the potential are score on an A to C scale, where a score of A or B+ gives a positive score, and B- or C gives a negative score. For the purposes of this checklist, scores of A or B+ were considered acceptable. Most questions had a range of responses from A to C though some were simply yes or no questions. For some questions, an undesirable response has an over-riding effect on the score and means that the decision to approve the lease is unacceptable.

This checklist is meant only to give a snapshot of how closely EIA guidelines are being followed by those who implemented them. The qualitative scoring of the responses to these questions is more complicated than this checklist would show, however for a open net fin fish farm to be approved under DFOs EA Decision Support System, the vast majority of these criteria should be fulfilled.

Below, we have reviewed the Environmental Impact Assessment for the Shoal Bay site on the Eastern Shore, conducted by Sweeney International Management Corporation for the siting of the permits requested by Loch Duart. It is clear that there is insignificant information to even complete the checklist, let alone assess whether or not the criteria are sufficiently within the established parameters.

Criteria	✔
Closest shellfish closure is >10 km away	✔
No commercial species or macroalgal beds within 300m* *No info on macroalgal beds, lobster/ potential mackerel fishery within 1 km, claims lobster don't like muddy bottom around proposed site*	?
No finfish lease within 3 km†	✔
No marine protected area within 5 km*	✔
No endangered species within 5 km (where mitigation can't be applied) † *Are endangered species (Piping Plover and Roseate tern) within 5km, claim to keep 500m from shore and travel at reduced speeds when passing Plover beaches, will not leave food uncovered to attract predators of endangered birds*	?
No river discharge into inlet/bay that would create stratification *Not addressed in EIA*	?
No sill in the inlet/bay system *Not addressed in EIA*	?
Less than 50 people live within 1 km of the site *Not addressed in EIA*	?
No industry within 5 km of the site *Not addressed in EIA*	?
No critical fish habitat (spawning, nursery, migration route) within 1 km† *Not addressed in EIA*	?
Cage is less than 5 m above the bottom, less than 30% of time due to tides (Unacceptable If more than 50%†) *Not addressed in EIA*	?

Mean peak current speed is under 2 cm/s less than 20% of the time (Unacceptable If more than 40%†) *Mean peak current speed not calculated*	?
Percent saturation of dissolved oxygen in late summer/early fall (annual minimum) is greater than 85% *Measured in Halifax, not Shoal Bay, percent saturation not given*	?
Secchi disc depth is greater than 6m *Not addressed in EIA*	?
Silt+clay in dry sediment weight is less than 50% *Not addressed in EIA*	?
Sediment's organic matter content is less than 10% *Not addressed in EIA*	?
Total sulfide in sediment is less than1300 um *Not addressed in EIA*	?
Sediment redox potential is greater than 0 mV *Not addressed in EIA*	?
4 or more sediment sampling locations in lease area *Not addressed in EIA*	?
Current meter observation length was longer than 7 days	✔

*Indicates a yes or no question where the undesirable response still produced a score of B+ and thus should be weighted less heavily if not checked when considering the overall results of the checklist

†If these criteria are not fulfilled then the site is deemed unacceptable overall and should not be approved

B. Review of EIA's for Shelburne Harbour Site

Table 1: Summary of Findings Using DFO MFADSS Methodology

Issue	Sandy Point proposed site 0602X	Hartz Point proposed site 1192X	Boston Rock proposed site 0983X
1A. Adequacy of cage depth during day of measurement, bottom of predator net	C (-3) (Unacceptable)	A (+3)	A (+3)
1B. Adequacy of cage depth during day of measurement, weighted plastic ring	C (-3) (Unacceptable)	B- (-1.5)	B+ (+1.5)
2. Current speed (data absent from EIA)[a]	C (-3) (Unacceptable)	C (-3) (Unacceptable)	C (-3) (Unacceptable)
3. Finfish aquaculture within 3 km	C (-3) (Unacceptable)	C (-3) (Unacceptable)	C (-3) (Unacceptable)
4. Critical fish habitat within one kilometer	C (-3) (Unacceptable)	C (-3) (Unacceptable)	C (-3) (Unacceptable)
5. Endangered species within 5 km	C (-3) (Unacceptable)	C (-3) (Unacceptable)	C (-3) (Unacceptable)
6. Sulphide level	A[b] (+3)	A[c] (+3)	B+[d] (+1.5)
7. Redox level[a]	C (-3)	C (-3)	B- (-1.5)
8. River discharge into Shelburne Harbour	B- (-1.5)	B- (-1.5)	B- (-1.5)
9. Shellfish closures in the area	C (-3)	C (-3)	C (-3)
10. Industries within 5 km	B- (-1.5)	B- (-1.5)	B- (-1.5)
11. Number of people living within 1 km	B- (-1.5)	A (+3.0)	A (+3.0)
TOTAL[e]	Sandy Point, 0602X	Hartz Point, 1192X	Boston Rock, 0983X
1. Number of "Sole unacceptable" results	5	4	4
2. Numerical score[f]	-24	-13.5	-12

a. Current-flow data for the proposed Hartz Point site was provided in an August 25, 2009 addendum to the EIA. We were not informed of the existence of the EIA addendum when this table was submitted to CEAA on June 15, 2010. No current flow data was ever presented for either the Sandy Point nor the Boston Rock proposed sites. If the August 25, 2009 data had been available to us in June, 2010, Hartz Point would not have received an unacceptable rating in row 3 and the total number of "site unacceptable" results for Hartz Point would been 8, and its overall environmental score would still have been negative, but less so.

b. Past readings predict future readings: the present Sandy Point site had a mean sulphide reading of 5018 uM for the entire site. This is B- rating, and very close to C rating of 6000 uM.

c. Past readings predict future readings: the present Hartz Point site had mean sulphide reading of 1850 uM for the entire site. This is B- rating (1300-5999 uM).

d. Past readings predict future readings: the present Boston Rock site had mean sulphide reading of 1215 uM for the entire site. This is close to B- rating (1300-5999 uM).

e. Two redox numbers were given in the proponent's EIA: it was learned later that it is probably more correct to take the mVNHE redox values rather than the mV redox values. Therefore the redox level is more accurately portrayed as receiving scores of A for all three proposed sites. However, past readings predict future readings: all three present sites, situated right next to the proposed sites, have redox values *of* less than -100 mVNHE, giving failing scores of C.

f. Total numerical results and scores do not include values from row 1B, "adequacy depth including plastic rings", since this issue was not included in the DFO MFADSS. Row 1B row is included in order to illustrate the lower rating that would have been assigned to Hartz Point and Boston Rock had the plastic rings been included in the MFADSS methodology.

g. Not every variable from the DFO MFADSS was evaluated because the necessary data were not in the proponent's EIA or its addendum. Thus the total score reported is not the total score possible if all the questions had been addressed.

APPENDIX IV: Shelburne Harbour Seafloor Sampling of Aquaculture Sites

1. **Letter to Sterling Belliveau, April 10th, 2012**
2. **McGregor Geoscience Report available at friendsofshelburneharbour.org**

April 10, 2012

The Hon. Sterling Belliveau
Minister, Fisheries and Aquaculture
NS Department of Fisheries and Aquaculture
P.O. Box 2223
Halifax, NS
B3J 3C4

sent via e-mail

Dear Minister:

Please find attached the results of the first year of a multi-year research program in the inner Shelburne Harbour area to examine the process and rate of recovery of the seafloor environment after a salmon farm has ceased production. This research is part of my longstanding interest in improving the effectiveness of environmental monitoring of marine finfish aquaculture operations and the environmental review process for marine finfish aquaculture sites approved sites.

The results indicate that the former Sandy Point salmon farm in Shelburne Harbour has left behind an area of seabottom that is highly contaminated with organic waste and, consequently, it has a very low biodiversity rating.

In addition, biodiversity at the reference site falls in the reduced/very low biodiversity rating despite being more than one kilometer from the most impacted area of the farm. The biodiversity rating is based on an assessment tool developed by a DFO expert (Hargrave 2006, Hargrave et al. 2008). The results at the reference site suggest that decades of organic loading from riverine inputs, fish plants, sewage plants and, in the last two decades, salmon farm waste may have transformed the Inner Shelburne Harbour area to a state of organic enrichment and contamination.

The results further suggest that the entire inner Shelburne Harbour area may not have the capacity to assimilate organic waste load from multiple farm sites. The end result of sustained, cumulative organic waste loading may prove disastrous for salmon farm operators in Inner Shelburne Harbour and further deplete biodiversity in the area.

I note that a new salmon farm site is in operation just 200 metres north of my sampling area. In short course, this site will likely experience the same environmental impacts as the site I sampled since it is located in an area of similar oceanographic and hydrographic conditions. Apart from measuring sulphides and redox, what monitoring and remediation provisions are in place for the new site to ensure that damage to the benthic environment does not reach the level it has at the old Sandy Point site?

While I expect the sediment chemistry, such as sulphide levels, at the old Sandy Point site to recovery to levels acceptable under the NS Standard Operating Procedures for marine fish farms, my experience in New Brunswick and that of researchers elsewhere indicates that a much long time frame for biological recovery of the sediments will be needed; just how long will be the subject of future study.

I would be pleased to meet with you and your staff to discuss my research at your and their convenience.

In the meantime, I would like to request a copy of the results of environmental monitoring done under the Province's Standard Operating Procedures for marine aquaculture at the old Sandy Point site (#0602) in 2011, as well as environmental monitoring data for 2004-2010 for two former sites (Boston Rock #0983 and Hartz Point #1192) in Inner Shelburne Harbour. This information will be helpful in planning my sampling program for 2012.

Sincerely,
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Enclosure: **Aquaculture Survey and Macro-Invertebrate Analysis Report - Sandy Point, Shelburne Harbour. April 10, 2012. McGregor GeoScience Ltd.**

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