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Note: Bold un-indented text below to be spoken during The Standing Committee on Fisheries and Oceans (FOPO) May 12, 2020. Non-bold indented text is included in written submission to be translated but not spoken. It informs my spoken sections. It would be helpful if committee members had access to the document below in pdf electronic format because it includes e-links to evidence.

I've worked on salmon farming issues for almost 16 years for Watershed Watch.

I believe this case study illustrates an unreported suppression of science by DFO to protect the salmon farming industry, at the risk of wild salmon. My written submission includes evidence, e-links and context, and is on www.watershedwatch.ca

1. In 2012, the independent Cohen Commission made strong recommendations and reversed the burden of proof onto DFO to show salmon farms are a minimal risk.

In 2012 the Cohen Commission published their final report and recommendations.

I calculated the total cost of the Cohen Inquiry, including government engagement, at over \$37 million dollars.

A couple striking recommendations stand out that highlight the incredible value of independent, at-arms-length from government bodies and investigations in the quest for truth.

Paraphrasing recommendation 3. and its preface information: The Commission identified a potential conflict of interest in DFO that may impede its ability to conserve wild salmon and it recommended that the promotion of salmon farming be removed from DFO by the government. Unfortunately for Canadians, I'll show you evidence the government of Canada has failed this recommendation.

Actual Recommendation 3. "The Government of Canada should remove from the Department of Fisheries and Oceans' mandate the promotion of salmon farming as an industry and farmed salmon as a product."

Paraphrasing recommendations 18 and 19, they concluded salmon farms in the Discovery Islands may be a risk to wild sockeye salmon and unless DFO can show they are of minimal risk, they should be removed by September 30th, 2020, or sooner if evidence arises.

Actual recommendations 18 and 19:

18. If at any time between now and September 30, 2020, the Minister of Fisheries and Oceans determines that net-pen salmon farms in the Discovery Islands (fish health

sub-zone 3-2) pose more than a minimal risk of serious harm to the health of migrating Fraser River sockeye salmon, he or she should promptly order that those salmon farms cease operations.

19. On September 30, 2020, the Minister of Fisheries and Oceans should prohibit net-pen salmon farming in the Discovery Islands (fish health sub-zone 3-2) unless he or she is satisfied that such farms pose at most a minimal risk of serious harm to the health of migrating Fraser River sockeye salmon. The Minister's decision should summarize the information relied on and include detailed reasons. The decision should be published on the Department of Fisheries and Oceans' website.

These recommendations embody the precautionary principle, and reverse the burden of proof onto DFO to come-up with evidence.

I was on the steering committee of the first 5 CSAS risk assessments.

I expand on my concerns with the CSAS process and other concerns in two published articles I recommend you read.

Integrity of the DFO's science advisory process in question.

<https://policyoptions.irpp.org/magazines/april-2018/integrity-of-the-dfos-science-advisory-process-in-question/>

Will new fisheries minister respect salmon science?

<https://policyoptions.irpp.org/magazines/october-2018/will-new-fisheries-minister-respect-salmon-science/>

After the 5th risk assessment, I refused to be on any more.

2. Did DFO change the risk assessment plan mid-way to avoid inconvenient science?

I recall hearing there would be 10 pathogens assessed and a cumulative assessment to evaluate the combined and interactive effects of all 10 pathogens.

The first CSAS risk assessment meeting was on IHN virus in December 2016.

There are at least two DFO website references that state more than 9 risk assessments were planned.

References to DFO's original plan to conduct 10 risk assessments and synthesis risk assessment of caused by pathogens:

<https://www.dfo-mpo.gc.ca/ae-ve/audits-verifications/18-19/CESD-Report1-eng.html>

"A plan has been developed to deliver the remaining nine individual peer-reviewed disease risk assessments, as well as a peer-reviewed risk assessment of the synthesis of the risk to Fraser River Sockeye salmon from pathogens that have caused disease on

Atlantic Salmon farms in the Discovery Islands, prior to September 2020.” (Note: The 1st risk assessment on IHNV was already completed at the time this was written, hence the use of “remaining”.)

<https://www.dfo-mpo.gc.ca/cohen/report-rapport-2018-eng.htm>

“For example, on September 25, 2018, DFO announced a new science review to assess the risks of piscine reovirus (PRV) transfer from Atlantic salmon farms in the Discovery Islands area to Fraser River sockeye. The review will include domestic and international scientific experts from government, academia, Indigenous communities, ENGOs, and industry. The report will be reviewed by the Canadian Science Advisory Secretariat in early 2019, and the final report will be made publically available following this review. This is 1 of 10 risk assessments being undertaken by DFO to understand the risk of pathogen transfer associated with aquaculture activities in the Discovery Islands.”

When DFO (including Jay Parsons) held a press conference on September 28, 2020, to reveal their evidence of minimal risk, we learned there were only 9 risk assessments, and assessments on sea lice or cumulative effects weren’t done. Did DFO change the plan?

I believe some in DFO had premeditated conclusions of minimal risk before the CSAS assessments were complete. If this is the case, I suggest this violates SAGE principles and frankly is much worse.

In July 2015, DFO Drs. Jones and Garver began lab studies on the effects of salmon lice, (*L. salmonis* - a species of sea lice) on sockeye and the cumulative interactions with IHNV virus.

This research was published in science journals in 2019.

Long, A., Garver, K.M. and Jones, S.R.M. 2019. Differential effects of adult salmon lice *Lepeophtheirus salmonis* on physiological responses of sockeye salmon and Atlantic salmon. *Journal of Aquatic Animal Health* 31:75-87.

<https://afspubs.onlinelibrary.wiley.com/doi/10.1002/aah.10053>

Long, A., Garver, K.M. and Jones, S.R.M. 2019. Synergistic osmoregulatory dysfunction during salmon lice (*Lepeophtheirus salmonis*) and infectious hematopoietic necrosis virus co-infection in sockeye salmon (*Oncorhynchus nerka*) smolts. *Journal of Fish Diseases* 42:869-882.

<https://onlinelibrary.wiley.com/doi/10.1111/jfd.12989>

The two studies made conclusions pertinent to Cohen’s recommendations 18 and 19:

These quotes are taken from the abstracts of the studies above.

“infection with *L. salmonis* caused a profound physiological impact to Sockeye Salmon characterized by loss of osmoregulatory integrity and a stress response.”

“we conclude that the reduced survival in co-infected sockeye salmon resulted from the osmoregulatory consequences of the sea lice infections which were amplified due to infection with IHNV.”

The DFO PARR website link that refers to this project and these two studies is:
<https://www.dfo-mpo.gc.ca/aquaculture/rp-pr/parr-prra/projects-projets/2014-P-12-eng.html>

A third study on another species of sea lice, *C. clemensi*, and its effects on sockeye was also started in 2015 by Dr. Jones, but was terminated early.

<https://www.dfo-mpo.gc.ca/aquaculture/rp-pr/parr-prra/projects-projets/2015-P-02-eng.html>

I believe DFO started to explore the effects of sea lice and cumulative effects of multiple pathogens on sockeye and found inconvenient findings and may have dropped risk assessments on these subjects in relation to Cohen recommendations 18 and 19.

3. DFO appears to obfuscate and cherry-pick science and misdirect Canadians and news media away from inconvenient science and precautionary action.

After DFO’s media conference on September 28, 2020, they were criticized for concluding minimal risk without a sea lice and cumulative risk assessment.

Here are two news reports where DFO staff including Andrew Thomson respond to this criticism:

<https://www.nationalobserver.com/2020/10/01/news/critics-slam-dfo-discovery-island-fish-farms-decision>

“DFO insists steps have already been taken to control sea lice problems. There’s already an extensive range of research available on sea lice which DFO relied on in February to update a sea lice management regime, said Andrew Thomson, DFO’s Pacific regional director of fisheries management.”

What “extensive range of research available on sea lice” was DFO and Andy Thomson referring to?

When you go to the DFO media release of September 28th, 2020:

<https://www.canada.ca/en/fisheries-oceans/news/2020/09/government-of-canada-consulting-with-first-nations-in-discovery-islands.html>

Then go to the “Work to support recommendation 19” e-link:

<https://www.dfo-mpo.gc.ca/cohen/recomm-19-work-travaux-eng.html>

Then go to “Scientific research on sea lice.” Logically, this would be the place to objectively and transparently list all available research to conclude sea lice are of minimal risk. Let’s look closely at this link:

<https://www.dfo-mpo.gc.ca/aquaculture/sci-res/species-especes/sea-lice-poux-eng.htm>

The first 4 items starting with Innovation largely deal with exploratory and investigative approaches to potentially controlling lice on farms. An incredible amount of Canadian dollars have been spent on trying to control sea lice. Sea lice plague the industry in many countries and it’s a constant battle with no clear full-proof solution. In fact, a study came out a few weeks ago by Godwin et al. that suggests resistance to the long standing drug used in B.C. is failing due to resistance. My own personal monitoring of industry reporting indicates B.C. salmon farms regularly exceed the average 3 motile threshold designated by DFO during the juvenile outmigration period.

Godwin et al study: <https://www.nature.com/articles/s41598-022-07464-1>

Narwhal story discusses Godwin et al study:

<https://thenarwhal.ca/bc-sea-lice-farmed-salmon-data/>

Look at the “Sea Lice on Wild Salmon” section. This appears to link to DFO research projects, but no external studies are listed.

A significant body of at least 13 studies conducted by researchers outside of DFO, published in scientific, peer-reviewed journals strongly suggests that amplified levels of parasitic sea lice from salmon farms can infect, kill or impede the growth of juvenile wild salmon, decrease their population productivity and drive B.C. wild salmon populations toward extinction.

Connors B.M., Krkosek M., Ford J., and L.M. Dill. 2010. Coho salmon productivity in relation to salmon lice from infected prey and salmon farms. *Journal of Applied Ecology* 47: 1372-1377.

<https://besjournals.onlinelibrary.wiley.com/doi/10.1111/j.1365-2664.2010.01889.x>

Godwin, S.C., Dill, L.M., Krkosek, M., Price, M.H.H., Reynolds, J.D. 2017. Reduced growth in wild juvenile sockeye salmon infected with sea lice. *Journal of Fish Biology* 91: 41-57. <https://onlinelibrary.wiley.com/doi/10.1111/jfb.13325>

Krkosek, M., J.S. Ford, A. Morton, S. Lele, R.A. Myers, and M.A. Lewis. 2007. Declining wild salmon populations in relation to parasites from farm salmon. *Science* 318:1772-1775. <https://www.science.org/doi/10.1126/science.1148744>

- Krkosek, M., M. A. Lewis, A. Morton, L. N. Frazer and J. P. Volpe. 2006. Epizootics of wild fish induced by farm fish. *Proceedings of the National Academy of Sciences USA* 103:15506-15510. <https://www.pnas.org/doi/full/10.1073/pnas.0603525103>
- Krkosek, M., M.A. Lewis, and J.P. Volpe. 2005. Transmission dynamics of parasitic sea lice from farm to wild salmon. *Proceedings of the Royal Society of London Series B* 272:689-696. <https://royalsocietypublishing.org/doi/10.1098/rspb.2004.3027>
- Morton, A., Routledge, R., and Krkosek, M. 2008. Sea lice infestation of wild juvenile salmon and herring associated with fish farms off the east-central coast of Vancouver Island, British Columbia. *North American Journal of Fisheries Management* 28:523-532. <https://afspubs.onlinelibrary.wiley.com/doi/abs/10.1577/M07-042.1>
- Morton, A. and R. Routledge. 2005. Mortality rates for juvenile pink *Oncorhynchus gorbushca* and chum *O. keta* salmon infested with sea lice *Lepeophtheirus salmonis* in the Broughton Archipelago. *The Alaska Fisheries Research Bulletin* 11:146-152.
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https://www.google.com/url?client=internal-element-cse&cx=014418750362661335818:urkqvwnkizk&q=https://www.adfg.alaska.gov/static/home/library/pdfs/afrb/mortv11n2.pdf&sa=U&ved=2ahUKEwj_xaffktX3AhU5D0QIHTluARsQFnoECAIQAQ&usg=AOvVaw0xA1_lezEvNd59HJmhErYh
- Morton, A., R. Routledge, and R. Williams. 2005. Temporal patterns of sea louse infestation on wild Pacific salmon in relation to the fallowing of Atlantic salmon farms. *North American Journal of Fisheries Management* 25:811-821. <https://afspubs.onlinelibrary.wiley.com/doi/abs/10.1577/M04-149.1>
- Morton, A., R. Routledge, C. Peet and A. Ladwig. 2004. Sea lice (*Lepeophtheirus salmonis*) infection rates on juvenile pink (*Oncorhynchus gorbushca*) and chum (*Oncorhynchus keta*) salmon in the nearshore marine environment of British Columbia, Canada. *Canadian Journal of Fisheries and Aquatic Sciences* 61:147-157. <https://cdnsciencepub.com/doi/10.1139/f04-016>
- Morton, A.B, and R. Williams 2003. First report of a sea louse, *Lepeophtheirus salmonis*, infestation on juvenile pink salmon, *Oncorhynchus gorbushca*, in nearshore habitat. *Canadian Field-Naturalist* 117:634-641. <https://www.canadianfieldnaturalist.ca/index.php/cfn/article/view/834>
- Price, M.H.H, Proboyszcz S.L, Routledge R.D., Gottesfeld A.S., Orr C., Reynolds J.D. 2011. Sea Louse Infection of Juvenile Sockeye Salmon in Relation to Marine Salmon Farms on Canada's West Coast. *PLoS ONE* 6(2): e16851. <https://doi.org/10.1371/journal.pone.0016851>

Price, M.H.H., Morton, A. and J.D. Reynolds. 2010. Evidence of farm-induced parasite infestations on wild juvenile salmon in multiple regions of coastal British Columbia, Canada. *Canadian Journal of Fisheries and Aquatic Sciences* 67: 1925–1932
<https://cdnsiencepub.com/doi/10.1139/F10-105>

Peacock, S. J., Bateman, A. W., Krkosek, M., Connors, B., Rogers, S., Portner, L., Polk, Z., Webb, C. and Morton, A. (2016), Sea-lice parasites on juvenile wild salmon in the Broughton Archipelago, British Columbia, Canada. *Ecology* 97: 1887.
 doi:10.1002/ecy.1438 <https://esajournals.onlinelibrary.wiley.com/doi/10.1002/ecy.1438>

One paragraph in the “Sea Lice on Wild Salmon” section generally encompasses a sockeye and sea lice research project:

“A multi-year research project examines the effects of single and repeat sea lice (*Lepeophtheirus salmonis*) infections on the health of juvenile pacific salmon of various species under laboratory conditions. Researchers are looking at the susceptibility and lethal infection level of juvenile Sockeye, Coho, and Chum Salmon to sea lice as well as their immune responses.”

However, it talks about it as if it is still in progress. No findings are included in the paragraph.

Directly above this description of sockeye research, another project description, includes findings from a previous Dr. Jones study that reports resistance to sea lice infection by pink salmon. Why did DFO not report the findings of the completed sea lice and sockeye study here too? Was it because they were inconvenient findings? Is this not cherry picking and illustrative of a pro-salmon farming industry bias?

When you click the “research abstract” link under this sockeye project that appears to be still in progress, it goes to the wrong project.

<https://www.dfo-mpo.gc.ca/aquaculture/rp-pr/parr-prra/projects-projets/2009-P-06-eng.html>

The correct DFO link describes a completed 2010 project and findings of significant negative impacts on pink, chum and sockeye from sea lice.

This correct DFO link can be found by searching on DFO’s website and a direct link is here:

<https://www.dfo-mpo.gc.ca/aquaculture/rp-pr/parr-prra/projects-projets/2010-P-01-eng.html>

“The immune responses to exposure to *L. salmonis* were very different among fish sizes. Harmful effects of the sea lice infection were identified in the smaller fish. Larger sized fish responses indicated greater immunity to infection. Just over 80 percent of the

exposed pink and chum salmon died. While sockeye salmon had no deaths, there was clear evidence of declining health and weight, particularly at 21 and 28 days.”

I believe this Dr. Jones (and company) 2010 work may be the precursor project to the two sockeye and sea lice studies published in 2019.

No e-link in the “Sea Lice on Wild Salmon” section directly links to the Drs. Jones and Garver work on sockeye, sea lice, IHN virus and cumulative effects project published in 2019.

The project can be found on DFO’s website with a search and the direct link is:

<https://www.dfo-mpo.gc.ca/aquaculture/rp-pr/parr-prra/projects-projets/2014-P-12-eng.html>

Is this not misdirection or obfuscation?

An ATIP includes a January 2017 statement from DFO Dr. Ian Keith to Adrienne Paylor:

“How can DFO Science not share with their health management counterparts that they have data indicating that sockeye are the most susceptible species of Pacific salmon.”

This suggests DFO Science knew about this impactful sea lice research but weren’t sharing it.

This ATIP was originally accessed by Alexandra Morton:

Download ATIP:

<https://watershedwatch.ca/wp-content/uploads/2022/05/A-2018-00799-Ian-Keith-sockeye-e-at-risk-.pdf>

Another ATIP from October 1, 2020 includes questions from a Canadian news reporter to DFO (and includes Timothy Sargent). They ask to see the information DFO relied on to conclude sea lice are of minimal risk.

Download ATIP:

<https://watershedwatch.ca/wp-content/uploads/2022/05/1-A-2020-01839-DSP-FINAL-sea-lice-not-a-pathogen.pdf>

This ATIP was also originally accessed by Alexandra Morton.

The reporter asks: “Q2. Can you provide me with the DFO summary of risk assessment and science advice report for sea lice? Or the equivalent summary that would outline DFO’s assessment of the risk sea lice from farms pose to wild salmon.”

This ATIP is an F.Y.I. to Timothy Sargent, current Assistant Deputy to the Minister of Fisheries and appears to include answers to the reporter’s questions with approvals from

7 senior DFO staff in Ottawa and the current Regional Director for DFO, Pacific Region, Rebecca Reid.

DFO responds to this question with two e-links and neither direct the reporter to the Jones and Garver sea lice, IHN virus and sockeye research:

<https://www.dfo-mpo.gc.ca/aquaculture/sci-res/spr-eng.htm>

https://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2014/2014_006-eng.html

Is this not obfuscation, cherry-picking and misdirection by some in DFO at the expense of precautionary action to conserve wild salmon?

Recommendations

1. The federal government of Canada should immediately make a policy decision based on all the available science in and outside DFO, the precautionary principle and the mandate to conserve wild salmon, to not renew all B.C. open-net salmon farms when they expire on June 30th, 2022.
2. In 2018, the Office of the Chief Science Advisor of the Government of Canada set up an Independent Expert Panel on Aquaculture Science to:

“provide advice and recommendations to the Minister of Science and the Minister of Fisheries and Oceans on: (1) the appropriate use of scientific evidence in decisions concerning aquaculture; and (2) the transparent and effective public communication of the underlying scientific evidence and rationale for policy and regulatory decisions related to impacts on the marine environment.”

https://www.ic.gc.ca/eic/site/063.nsf/eng/h_97649.html

It came out with its final report and recommendations in December 2018:

https://www.ic.gc.ca/eic/site/063.nsf/eng/h_97725.html

It appears this panel was not completely successful in repairing problems in DFO related to aquaculture science.

An independent, transparent and external-to-DFO investigation (comprised of individuals that pass rigorous conflict of interest screening) should be conducted of DFO staff involved in any and all activities related to, leading up to, and after the September 28th, 2020 DFO media conference concluding minimal risk. Severe penalties should be applied to all that violate DFO SAGE principles and Fisheries and Oceans Canada Values and Ethics Code.

3. A truly independent and transparent science advice body should be implemented, to directly advise decision makers and recommend further research without influence from vested interests inside or outside DFO. COSEWIC may provide a useful model.