Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River

Commission d'enquête sur le déclin des populations de saumon rouge du fleuve Fraser

Public Hearings

Audience publique

Commissioner

L'Honorable juge /
The Honourable Justice
Bruce Cohen

Commissaire

Held at:

Room 801
Federal Courthouse
701 West Georgia Street
Vancouver, B.C.

Thursday, August 25, 2011

Tenue à :

Salle 801
Cour fédérale
701, rue West Georgia
Vancouver (C.-B.)

le jeudi 25 août 2011

APPEARANCES / COMPARUTIONS

Brock Martland Jennifer Chan Kathy L. Grant	Associate Commission Counsel Junior Commission Counsel Junior Commission Counsel
Mitchell Taylor, Q.C. Jonah Spiegelman	Government of Canada ("CAN")
Clifton Prowse, Q.C. Tara Callan	Province of British Columbia ("BCPROV")
No appearance	Pacific Salmon Commission ("PSC")
Chris Buchanan	B.C. Public Service Alliance of Canada Union of Environment Workers B.C. ("BCPSAC")
Matt Keen	Rio Tinto Alcan Inc. ("RTAI")
Alan Blair	B.C. Salmon Farmers Association ("BCSFA")
No appearance	Seafood Producers Association of B.C. ("SPABC")
Gregory McDade, Q.C. Lisa Glowacki	Aquaculture Coalition: Alexandra Morton; Raincoast Research Society; Pacific Coast Wild Salmon Society ("AQUA")
Tim Leadem, Q.C. Judah Harrison	Conservation Coalition: Coastal Alliance for Aquaculture Reform Fraser Riverkeeper Society; Georgia Strait Alliance; Raincoast Conservation Foundation; Watershed Watch Salmon Society; Mr. Otto Langer; David Suzuki Foundation ("CONSERV")
Don Rosenbloom Katrina Pacey	Area D Salmon Gillnet Association; Area B Harvest Committee (Seine) ("GILLFSC")

APPEARANCES / COMPARUTIONS, cont'd.

No appearance	Southern Area E Gillnetters Assn. B.C. Fisheries Survival Coalition ("SGAHC")
No appearance	West Coast Trollers Area G Association; United Fishermen and Allied Workers' Union ("TWCTUFA")
No appearance	B.C. Wildlife Federation; B.C. Federation of Drift Fishers ("WFFDF")
No appearance	Maa-nulth Treaty Society; Tsawwassen First Nation; Musqueam First Nation ("MTM")
No appearance	Western Central Coast Salish First Nations: Cowichan Tribes and Chemainus First Nation Hwlitsum First Nation and Penelakut Tribe Te'mexw Treaty Association ("WCCSFN")
Brenda Gaertner Crystal Reeves	First Nations Coalition: First Nations Fisheries Council; Aboriginal Caucus of the Fraser River; Aboriginal Fisheries Secretariat; Fraser Valley Aboriginal Fisheries Society; Northern Shuswap Tribal Council; Chehalis Indian Band; Secwepemc Fisheries Commission of the Shuswap Nation Tribal Council; Upper Fraser Fisheries Conservation Alliance; Other Douglas Treaty First Nations who applied together (the Snuneymuxw, Tsartlip and Tsawout); Adams Lake Indian Band; Carrier Sekani Tribal Council; Council of Haida Nation ("FNC")
No appearance	Métis Nation British Columbia ("MNBC")

APPEARANCES / COMPARUTIONS, cont'd.

Nicole Schabus	Sto:lo Tribal Council Cheam Indian Band ("STCCIB")
Steven Kelliher	Laich-kwil-tach Treaty Society Chief Harold Sewid, Aboriginal Aquaculture Association ("LJHAH")
Krista Robertson	Musgamagw Tsawataineuk Tribal Council ("MTTC")
Lee Schmidt	Heiltsuk Tribal Council ("HTC")

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Vancouver, B.C. /Vancouver
(C.-B.)
August 25, 2011/le 25 août
2011

THE REGISTRAR: The hearing is now resumed.

KRISTI MILLER, recalled.

KYLE GARVER, recalled.

MR. MARTLAND: Mr. Commissioner, we resume with Mr. McDade's questions. And I'll just indicate, because I'm timekeeping, I have 31 minutes left in his allocation. Ms. Robertson has volunteered from her ten-minute allocation, so I won't be rising until the 41-minute mark, and he'll be using Ms. Robertson's time, Mr. McDade will, if he were to go over 31. Thank you.

MR. McDADE: It's a tight schedule, Mr. Commissioner. It's Gregory McDade for Dr. Morton and the Aquaculture Coalition.

CROSS-EXAMINATION BY MR. McDADE, continuing:

Q Let me start with some housekeeping, put in some documents that I want to make sure we don't miss. First can I have Aqua 15 up on the screen -- sorry, from Panel 2. Yes. Dr. Miller, that's an email of yours from October 5th, 2009?

DR. MILLER: Correct.

MR. McDADE: Can I have that marked as the next exhibit, please.

THE REGISTRAR: Exhibit 1525.

EXHIBIT 1525: Email from Kristi Miller-Saunders to Mark Saunders re Briefing report, October 5, 2009

MR. McDADE:

Q Aqua 16. Now, Dr. Garver, that's an email from Dr. Johnson to you from March 14th, 2011. Do you recognize that email?

DR. GARVER: Yes, I do.

MR. McDADE: Can I have that marked as the next exhibit.

THE REGISTRAR: Exhibit 1526.

EXHIBIT 1526: Email from Stewart Johnson to Kyle Garver, Simon Jones, re Cohn (sic) Commission Information for Laura Richards, March 14, 2011

MR. McDADE:
Q Can I have Canada document Tab 19, please. Dr. Miller, this is a document relating to Creative Salmon Ltd. You spoke yesterday about doing some testing of chinook from Creative Salmon. This is the farm you're referring to?
DR. MILLER: Yes, it is.
Q If we could go over to the next page, please, paragraph 4, at the bottom of the page. Apparently the salmon there are experiencing a mild to severe yellow jaundice that you were referring to.
DR. MILLER: Yes.
Q And you've said in an email that that's similar to what's been experienced in Chile?
DR. MILLER: Yes, there's publications about this same observation in fish in Chile.
MR. McDADE: Could I have that as the next exhibit, please.
THE REGISTRAR: Exhibit 1527.

EXHIBIT 1527: Aquaculture Collaborative Research and Development Program (ACRDP) Application Form re Creative Salmon Ltd.

MR. McDADE:
Q Could I have Aqua 5 up on the screen. Sorry, again from Panel 2. Yes, thank you. Now, that's a briefing note -- or that's an email between the two of you, from you, Dr. Miller, to you, Dr. Garver. You recognize that email, Dr. Miller?
DR. MILLER: Yeah, I recognize it as being from me, yes.
Q And that's dated November 12th, 2008?
DR. MILLER: Yes, it is.
Q And if we could go to the next page, it had an attachment to it. I believe it's a three-page attachment describing, comparing the symptoms that we see in this disease to salmon leukemia virus?
DR. MILLER: Yes.
MR. McDADE: Could we have that email and attachment marked as the next exhibit.

THE REGISTRAR: Exhibit 1528.

EXHIBIT 1528: Email from Kristi Miller-Saunders to Kyle Garver re briefing note, with attachment, November 12, 2008

MR. McDADE: Thank you.

Q Could we go to Aqua 2. All right, now I'm the one that's confused. Let's try Aqua 2 from Panel 1. No, I'm sorry, I'll come back to that.

Can we go to Aqua 6 from Panel 2. Yes, thank you. That's a briefing note dated November 13th of 2008. That's a request for funding from you, Dr. Miller.

DR. MILLER: It's an informal request for funding. There was not a pot of money that this was a request for funding from. This was given to Laura Richards to update her on the research and request that there's some funds to be put to this, yes.

MR. McDADE: All right. So can that be marked as the next exhibit.

MR. MARTLAND: In fact, before that's done, I'm not objecting, I'm simply raising that Exhibit 635, on our indication, may be the same, at least it bears the same title. So I don't know if we're in a position to crosscheck that, or whether we could do so at the break. If they're the same, the record can reflect that. If they're different, this can be marked separately. Thank you.

MR. McDADE: Thank you, Mr. Martland.

Q All right. Let me just, having done that housekeeping, switch gears for a second and ask a few questions of you, Dr. Garver on a slightly different topic in relation to how fish farms spread disease. Can we go to Exhibit 1364, please.

THE REGISTRAR: It is identical; the document's identical.

MR. MARTLAND: Mr. Giles has just identified it is the same document. So just so the record reflects, it's Exhibit 635. Thank you.

MR. McDADE: Yes, I believe that was put in through Dr. Richards then, was it.

MR. LUNN: Mr. McDade, can you give me the exhibit number again, please.

MR. McDADE: I think it's 1364, it's the Draft Summary Report from DFO.

Q If we could go to page 11 of that report, please. This is your -- this is a summary of your report to the draft -- or the DFO workshop, Dr. Garver, and just I was -- I just wanted to draw your attention -- I'm sure you won't disagree, since you said it, but that lab studies indicate that farmed fish can shed up to 200,000 viral particles per fish per hour. That's accurate?

DR. GARVER: During an IHN epizootic, this was a study that I've been currently conducting on the IHN virus, and we're interested in the transmission and dispersion of this virus. And as one of the components of that study, we've been looking at shedding rates of fish. And this was conducted in a laboratory trial in which we infected fish with IHNV. And what we've developed is a methodology which we can concentrate virus out of large quantities of water and then we can quantify how much virus is produced. And we did this during a die-off event, to simulate if an epizootic was -- would be occurring in a fish farm. And we did it with a certain size of fish, so these fish would be about a year into salt, which is commonly where we see disease.

So we tried to mimic what would possibly be occurring in an aquaculture setting, but it should be noted that this was done in a laboratory scale. And when we did that, we had about 30 percent mortality occurring in a tank. And when we look at the amount of virus per day, and we can calculate back per hour, based on the number of fish. And, yes, we did come up with an average at the -- now, this was at peak, so this isn't a constant. It's when we saw the highest amount. So this would be for 30 percent mortality, two times 10^5 particles per mil, is what we -- or virus particles per fish per hour is what we did calculate.

Q All right. And you're currently doing a study up in the Discovery Islands in terms of how fast particles move?

DR. GARVER: That's correct, yeah. It's part of this study. What we're really interested in is seeing how virus particles are dispersed through water. And there's various components of that, and to determine how particles are distributed, you must first determine how long or how stable they are in

the water, in other words, how long are they infectious outside of the host. And so we look at stability studies.

We also look at, as I discussed earlier, how much virus is produced from an infected fish. And then consequently how little virus is needed to re-infect the fish. And then ultimately to get an idea of how it's dispersed in a water area, we need to know what kind of currents are moving the virus through that area. And so I've been working with modellers at the Institute of Ocean Sciences, who would be Mike -- Dr. Foreman and Dario Stucchi. They have developed water circulation models and they're quite accurate once you put in the accurate biological data. And we couple the biological data with the physical -- physical oceanographic model and it really gives you a nice indication of how far the virus or the particles are being dispersed.

Q Well, I'll take you to your studies. I just want to get them into the exhibit record. I think they've been produced by other parties. Can I take -- can I ask, Mr. Lunn, if you'd put up the Commission document 489737 on the screen. Yes. Dr. Garver, it's sideways, but can you recognize that as your PowerPoint?

DR. GARVER: Yes. If you scroll down one, I might be able to -- so I believe this was a PowerPoint presentation that I gave at a Western Fisheries Disease meeting.

MR. McDADE: All right. Can I have that marked as the next exhibit.

DR. GARVER: And that was -- that was quite recent. That was in June of this year.

MR. McDADE: Yes.

THE REGISTRAR: Exhibit 1529.

EXHIBIT 1529: Garver, Risks of Infectious Hematopoietic Necrosis Virus (IHNV) dispersion associated with Atlantic Salmon Net Pen Aquacultures, June 2011

MR. McDADE:

Q Can we go to page 6 of that document -- sorry, page -- well, let's see what's on page 6. No, it's page 8. Again, so in terms of real numbers, Dr. Garver, here is a presentation you gave

showing, I guess, in theory that at a maximum level a fish farm could be shedding up to 60 billion viral particles per hour.

DR. GARVER: Yeah, this is what we call a back of the envelope calculation here. Again, this was in a laboratory study, and it's unfortunate we can't see the actual graph underneath it, but that's based on a peak shedding rate. So when you have maximum die-off, right before that die-off the fish would be shedding the most amount of virus. And so based on that 200,000 particles, so PFU is a measure of infectious unit of viruses, and we commonly say particles per fish per hour, and that's what we based it on.

If you have a farm that has approximately a million fish -- I've been told that that could be a bit high since I've done this calculation, but based on a site with a million fish, and they're experiencing a 30 percent infection, which based on some of the die-off events that could be -- that could be quite high, but nonetheless, we decided to do 30 percent because that's what we'd had in our challenge, and then you times that by the number of particles that we quantified in the water, and you do get 650 billion viral particles shed per hour.

It's actually quite interesting. The virus has really evolved to put out a lot of particles so that it can subsequently have a lot of particles out there to re-infect.

Q Okay. The next document I want to take you to, Dr. Garver, is the document that's on BCSFA's list as number 34. It should be another PowerPoint by you. Can you identify this one, as well?

DR. GARVER: Yeah, unfortunately I had two presentations with the same name. This was -- this could be the presentation that I gave to the Pacific Salmon Commission, or it could be the update.

MR. McDADE: Okay. Well, we'll mark it as an exhibit now, can we.

MR. TAYLOR: It may already be an exhibit, depending which one of these titled ones it is.

MR. McDADE: Well, I've seen a number of versions of this, and they're not all the same. I'd like to mark this one as an exhibit.

THE REGISTRAR: Exhibit 1530.

MR. McDADE:
Q If we could go to page 7 of that document there's a picture there. Is this in the study area?
DR. GARVER: You know, honestly this was just taken from an Internet site, so I don't believe this is in the Discovery Islands.
Q The Discovery Islands, though, are a place about as narrow as that in terms of the way in which fish swim through it, aren't they? I'll take you to your next --
DR. GARVER: As far as fish swimming through, I'm not an expert in their migration, but the Discovery Islands does have a lot of constricted passages, and that's one of the reasons we decided to do this study, because there's some -- some of the strongest currents in the world in this area. And so it presents a unique opportunity to develop an oceanographic model for this area.
Q Can we go to the next page.
MR. MARTLAND: I wonder if I can just do this by way of some housekeeping. I think that Canada's number 1 with respect to their list of documents for this panel is a document that's already Exhibit 1518, and I have CAN number 473075. I think that's what this screen showed. Mr. Lunn's nodding yes. So this is Exhibit 1518. I don't know if Mr. McDade had already marked this, and if that meant we have a duplicate just now? And, Mr. Registrar, I'm open, or, Mr. commissioner, to your direction. I'd suggest we simply take out or cancel the last marking of the exhibit and refer to 1518.
THE COMMISSIONER: I would prefer during the break if you and your learned friend would just put your heads together, and if you come to an agreement you can put that on the record after the break.
MR. McDADE: Yes, that would be fine. Thank you. Let's not mark it as an exhibit for now, then, just to keep the numbering clear.
THE REGISTRAR: Do you wish to withdraw 1530, then?
MR. McDADE: Yes.
THE REGISTRAR: Yes, that will be withdrawn.
MR. McDADE:
Q Can we turn to the next page, though, page 7. Yes. Sorry, that's the right page I'm looking for. This is a chart from your PowerPoint, Dr. Garver, but I understand that it appears to be taken from a presentation by Dr. Morton. And it

shows the decline in productivity, dating back to 1992 when fish farms came to the Discovery Islands; isn't that right?

DR. GARVER: I believe that's what the -- the grey line is showing, yes, and I believe Ms. Morton took that from the Pacific Salmon Commission.

Q All right. Can we go to Aqua 32 from Panel 1. This is again a progress report on this study.

DR. GARVER: That's correct, yes.

MR. McDADE: Can we have that marked as the next exhibit.

THE REGISTRAR: Exhibit 1530.

EXHIBIT 1530: Garver, Discovery Islands Modelling Progress Report

MR. McDADE:

Q And if we could go to page 17 and so the study, I gather, releases particles from areas where generally there may or could be fish farms in the Discovery Islands, and then tracks it, up and downstream route.

DR. GARVER: That's correct, yes.

Q And that's what we're seeing on the screen here, that you tracked those for ten days. Could we scroll down to the next page. And so the white marks along these various passages are the passage of the particles?

DR. GARVER: This should -- yeah, we should give some background to these -- to these simulations. So these are simulations that Mike Foreman runs with the model, and this was very early days. We were just actually testing the model for the current flow, and we hadn't had any of the biological parameters associated with the particles during this time. So this, the graphs that you're viewing, is just a particle without any of the inactivation rates to it.

Q All right. So the purpose of the study is to see how many kilometres these particles will go?

DR. GARVER: Ultimately with once we couple all the biological parameters that we're establishing in the laboratory, once we overlay that onto the physical model, yeah, that -- that is the ultimate goal, to really get an understanding of how stuff -- how particles or pathogens are dispersed throughout the aquatic environment.

Q All right. Let me go, then, back to the document which was at Aqua 5, which we've marked as an exhibit, I believe. If we could go to page 3. Now, I've seen this phrase in a couple of documents from the same time, Dr. Garver, but since this was addressed to you at the time, I'm pointing this out. If you see the phrase in the second large paragraph:

> Given the potential devastating impacts of this disease on sockeye salmon, and possibly other Pacific salmon species, we propose research that will conclusively establish whether plasmocytoid (sic) leukemia... is ...the primary cause of river entry timing shifts...

Now, Dr. Garver, Dr. Miller strikes me as a relatively level-headed person not prone to a Chicken Little "the sky is falling" material. When a senior scientist at your Department says potentially devastating impacts, that's a significant finding for you, is it not?

DR. GARVER: I'm sorry, for me? You're --

Q Well, what I'm trying to do is get to the sense of what level of certainty do you need about a potentially devastating impact to the sockeye salmon, to actually take action, rather than more studies? What would it take to get you to actually recommend some action? How far do we have to go in proof?

DR. GARVER: Well, as I alluded to, and I think it has been brought out several times, we're following a scientific approach. So we need to establish that this sequence is indeed causing a disease.

Q And you're not prepared to recommend action to the senior people at DFO until you've done all of those laboratory studies and have found proof to your satisfaction?

DR. GARVER: Until I find that this virus is causing disease and that it is associated with the MRS, and that it is indeed transmissible, then I probably would not recommend action at this time. If -- we must understand that when you sequence an entire organism, you're going to find a lot of agents in there that are undefined. If we sequence your DNA, we'll find all kinds of viral

elements.
Q Well, Dr. Miller was at least hypothesizing that some 27 million salmon might have died from this in 2008. Wouldn't that be something that you would take some action about?
DR. GARVER: And that is indeed what we're doing, we're researching whether this sequence causes disease.
Q So for you, action, when millions of salmon are dying, is to take research.
MR. TAYLOR: Well, I'm going to get up at this point. Mr. McDade is asking a question of a scientist and the scientist is answering. Mr. McDade wants an answer from a manager, but a manager is not on the stand.
MR. McDADE:
Q So this is not -- do you feel, do you agree with that, Dr. Garver, that this is not your business as to what action is taken?
DR. GARVER: The management is aware of these briefing notes, these memos. I conduct science.
Q Well, we saw yesterday in a memo that Dr. Miller prepared to go to management, we saw all those comments from you trying to water that down. Why would you try and resist her telling senior management what her views were?
DR. GARVER: I gave my scientific opinion, that's what I -- that's my job. I weigh the evidence, and I put it out there. That's what they hire me for. I am a scientific person.
Q Well, when in the public health field when SARS was first discovered to be killing human beings at some risk, the virus hadn't been cultured and proven to the levels that you talk about, had it?
DR. GARVER: It had been identified --
Q But --
DR. GARVER: -- and it was definitively linked to the disease. So, yes, they did determine Cox's postulates.
Q Before public health people took any action? My suggestion to you is public health officials, when the health of human beings are involved, take action before the final proof of the virus is in.
MR. TAYLOR: This witness hasn't been put up as a public health expert, and Mr. McDade hasn't done anything to establish that he's going to have any basis of knowing what the question's about.
MR. McDADE: Well, let me re-ask the question, then, in

a different way.
Q Dr. Garver, does your Department have any guide whatsoever to suggest you take action before you have proof?
DR. GARVER: I'm sorry, can you rephrase that question?
Q Do you have any guide in your Department that suggests that you should take action in the absence of final proof? What level of risk does it take to actually start doing something?
DR. GARVER: I believe we are doing quite a bit.
Q Well, let me ask -- let me change gears again, then. One of the things I'm interested in is in 2008 and 2009, when Dr. Miller was raising the level of concern about this potential virus, she wanted to test in the fish farms for this MRS or SLV and you resisted that, didn't you?
DR. GARVER: I didn't resist testing.
Q So why -- why -- let me ask you, then, Dr. Miller. Why didn't you go out and test in 2009?
DR. MILLER: The feeling was that we didn't have an etiological agent. We hadn't identified an actual pathogen at that time that I was discussing this in 2008 and 2009. And I think it was very difficult to get across to the Fish Health community, you know, what is a genomic signature, what is the power of a genomic signature, how much can we derive in terms of realistic mechanisms from a genomic signature. And so the battle really was, you know, until you have an etiological agent, we really can't, you know, ask industry to test. We really can't move forward.

And so my -- I changed the direction of my program, and really my asking for funds at that time was so that I could change some of the direction of my program towards trying to identify an etiological agent. I'm funded by Genome BC in a large part. I went back to them and asked them, our board there, if the strategic direction of that research could change more towards these viral signatures and identifying a virus. They were uncomfortable with that at the time, our scientific advisory board. They wanted to keep the program as we had originally proposed. So that's why I went to DFO to try to get funds to actually try to identify a virus in association with that signature.

I think that, you know, the Fish Health

experts within DFO were not comfortable in continuing on or paying a lot of attention to this until we actually had a virus. I suggested there was a virus. We didn't have one at that time. We now do have a candidate virus. And so now we -- I am moving forward with Kyle and doing some challenge work using -- using tissue that is positive for the virus as the basis of the challenge.

But I think that there was a lot of reluctance to take any action based on a genomic signature, because people don't understand what is a genomic signature, and how well can you actually predict a mechanism from one. So, you know, I'm expecting and hoping that things will be different now that we've actually identified a virus associated with that. But we'll see.

Q Well, I may have misunderstood your testimony yesterday, but I heard that you tried to get the fish farmers to let you test and their veterinarians refused.

DR. MILLER: I was approached by Mary Ellen Walling right after the *Science* paper came out, probably in early February, and she wanted to know more about what we knew and what we had. And she said that there was some interest in the industry to go ahead and test for the signature we have. I was told later by one of the vets, by one of the companies, that they were advised against doing the testing by someone from DFO. So that's as far as it went. I didn't test their fish for the signature at the time. We only had the signature.

I wasn't highly resistant to that, because I do agree that it would be a lot better to test for an actual pathogen. And so I let that drop at the time.

As soon as well, you know, we've had the sequence of the virus for some period of time, about since the end of February. It's taken us a couple of months to get -- to get molecular tests up and running for it. We've now looked over 3,000 sockeye salmon samples and looked at the prevalence of this.

And I approached the Fish Health group in Laura Richard's office again in -- at the end of July, about moving forward and testing. And really my question was who would ask the industry

to provide samples for testing: would that come from me, would that come from management, would that come from Fish Health, and how do we move forward with this, and we had a discussion in Laura Richard's office about that. And it was clear from that discussion that it was a decision to be made by the Fish Health group. And at the time they were still uncomfortable with asking the industry to test, and that's what those emails, subsequent emails were about.

But very shortly thereafter we had a second meeting with Andy Thomson and said that he would take this to the leaders of the different salmon industry for Atlantic salmon, and he did the following week discuss it with the CEOs of the various companies. And they talked about it for some period of time and they finally agreed that they would submit to testing.

So that's about as far as it has gone. This is very recent.

Q Now I understand the Province is resisting that testing; is that right?

DR. MILLER: I have no idea what the Province is doing.

Q You don't, eh. Are you satisfied with the level of testing that the fish farmers have agreed to?

DR. MILLER: Well, I mean, you know, as I've said before, we're at the very early stages of designing a program. So I don't know what that program is going to look like yet, and I am sure hoping that Kyle and other Fish Health experts will aid in the design of that. And we are going to be working with the vets from the various companies to design that. But we have the go-ahead from the CEOs of the companies, which is important.

Q Now, I'm also informed, Dr. Miller, that you met with the fish farmers and with Dr. Laura Richards in the week of March 7th of this year, just before Dr. Richards testified here, to fully brief her on parvovirus. Did you do that?

DR. MILLER: To be honest, I was actually unaware that there was anybody from the aquaculture industry in that meeting. That meeting was, if you're talking about the same meeting, there was an update meeting for the PARR program, which Stewart talked about when he was on the stand earlier this week. This is a program that aims to collect sockeye

salmon, and other species from the Fraser River all the way up through the Broughton to better understand the distribution and abundance of sea lice, but piggybacked onto that program they're sampling to be able to test for other diseases. And Kyle is leading some of the virology work that will be done in conjunction with that program; I am obtaining samples to look at prevalence of this parvovirus. And so the meeting was to update on the activities in that program.

Now, I know that there has been some aquaculture industry money that has been provided to pay for some of the ship time to do the collections, and I was unaware when that meeting took place that there was anybody but DFO in that meeting.

Q So the question I had, though, is you were briefing Dr. Laura Richards, weren't you.

DR. MILLER: I don't recall if Dr. Laura Richards was there. Certainly Mark Saunders, the head of SAFE Division was there. He's the one who has taken sort of the lead on this PARR program. I don't recall if Laura Richards was there or not. If she was on the list, she was there, but I don't recall.

Q So why would you be briefing the salmon farmers (indiscernible - overlapping speakers).

DR. MILLER: Again, I didn't know that the salmon farmers were there. You know, they have, what I would say, a role in this program, but I was unaware if the salmon farmers were there or not.

Q So when Dr. Richards testified here in March, though, she had just been briefed with you -- from you about the parvovirus?

MR. TAYLOR: Well, that's not the evidence. The evidence is Dr. Miller doesn't know if Dr Richards was there.

DR. MILLER: I know I did talk to Dr. Richards on that day. I don't know that she was at that particular meeting. But that meeting came very shortly after we had really truly discovered this, this parvovirus, and I briefed Mark Saunders in the morning about that. We had this meeting in the afternoon, and I believe I had a second meeting in Laura Richard's office with Mark Saunders later in that afternoon. So what I don't know is if Laura Richards was at the meeting for the PARR and I

honestly did not know at the time that there were anybody associated with the aquaculture industry in that room. And in fact what I was told from Andy Thomson when he had talked to the leads of the various companies, that the only company that had an inkling that we had a virus was Marine Harvest.

MR. McDADE: Well, I have much more on this, Mr. Commissioner, but regretfully I'm out of time.

MR. MARTLAND: Mr. Commissioner, I have next counsel for the Conservation Coalition at 25 minutes.

MR. LEADEM: For the record Leadem, initial T., appearing for the Conservation Coalition.

CROSS-EXAMINATION BY MR. LEADEM:

Q Good morning, Dr. Garver, Dr. Miller. I represent a group of environmental groups, including the Watershed Watch, the Coastal Alliance for Aquaculture Reform, Georgia Strait Alliance, David Suzuki Foundation, Living Oceans, Mr. Otto Langer and the Fraser Riverkeepers.

I want to begin by looking at some emails with you if I could, Dr. Miller, and if we could have Exhibit number 1500, please. No doubt you recognize this email which we've already marked as an exhibit in these proceedings.

DR. MILLER: Yes, I do.

Q And I'm going to draw your attention to the paragraph, first paragraph where you say, you stated that -- and let me reference this. There's a meeting apparently that took place in Laura Richard's office between yourself, Dr. Richards, Dr. MacWilliams, and Dr. Johnson. Do I have that right?

DR. MILLER: Yes I believe Kyle Garver was there, as well.

Q You were there as well, Dr. Garver?

DR. GARVER: I believe so, if this is a meeting that was taken on recently?

Q Yes.

DR. MILLER: It would have been the day before this memo was written.

Q You'll see that the memo was written on July the 29th of this year, so I'm assuming that the meeting took place on July 28th of this year.

DR. GARVER: Yes, I was at this meeting, then.

Q All right. And I understand that the purpose of the meeting is to discuss this forthcoming testimony that you were going to have at this Commission, and generally some of your concerns that you raised about whether or not there would be testing of fish, net-raised fish; is that correct?

DR. MILLER: Yes. I initiated this conversation because I did feel that this was something that we hadn't done yet that needs to be done, and that this was something certainly that would come up in these hearings, and I didn't really have a clear understanding of what kind of process we had to take to be able to move forward and who would be the one to approach industry about this.

Q Right. So after the meeting you then write to one of your colleagues, Dr. MacWilliams, in which you state in part your recollection of what occurred at that meeting in which you attribute the following statement to Dr. MacWilliams that occurred at the meeting:

> You stated that until such a virus is accredited as an OIE rated disease, causing considerable observable mortality, and the molecular assay is validated and certified as such, one cannot ask industry to test their fish. Moreover, you stated that there is no benefit to testing, and if we were to ask industry to voluntarily submit fish for testing, that you would recommend to them that it would not be in their best interest to comply.

And that's an accurate reflection of what you heard Dr. MacWilliams say at that meeting?

DR. MILLER: It is. I took it down in notes at the meeting.

Q Could we now have Exhibit number 1501, please. Once again this references that same meeting, conversation in Laura Richards' office that we just discussed with reference to the previous email with Dr. MacWilliams, does it not?

DR. MILLER: Yes.

Q And this is an email that you sent to Dr. Stewart Johnson, and the statement that you attribute to his making in that meeting is:

My recollection of your reasoning was that there is no reason to test Atlantic salmon before we underwent large-scale screening of pink and chum salmon and understood the potential role this virus may have across multiple species of wild fish. Is this correct?

And that accords with your reference of what you heard Dr. Stewart Johnson say at that meeting, does it not?

DR. MILLER: Yes, it is.

Q And neither Dr. MacWilliams nor Dr. Johnson responded to your emails, did they?

DR. MILLER: Dr. MacWilliams didn't respond at all, and Dr. Johnson responded briefly and said we should meet about this, but that never happened.

Q All right. Now subsequent to that meeting in Laura Richards' office, I understand that the farmers have now agreed that they will actually provide samples of net-raised Atlantic salmon for you to test for the parvovirus; is that correct?

DR. MILLER: Yes, it is. I believe that Mark Saunders and Laura Richards decided that Andy Thomson should come into this conversation and so we had another meeting with Andy Thomson and went over most of this with him. I believe that Stewart Johnson was the only one in Fish Health that attended that meeting -- and but I'm not sure if you were there.

DR. GARVER: I was at that meeting, as well.

DR. MILLER: Oh, you were.

Q You were at the meeting, as well.

DR. MILLER: Okay, you were there. I couldn't remember.

Q Do you know whether anything was reduced into writing about this agreement to test fish, or whether it was simply on a handshake?

DR. MILLER: Oh, I have emails.

Q You have emails.

DR. MILLER: Yes, very definitely, but they would have been after I was asked for all the emails for this. This is very recent, and you can see that this is July 29th here.

MR. LEADEM: Through Commission counsel I'm going to request that Canada produce those emails.

MR. TAYLOR: If it could be clear exactly what we're

talking about. What, I mean, there's many, many emails. You want emails to do with testing?
MR. LEADEM: No. Let me provide the foundation for your benefit, Mr. Taylor.
Q Essentially, we're referencing the fact that there was an agreement with the fish farm industry to provide samples for testing for the parvovirus, and that there was an agreement worked out and meetings to that effect; is that correct, Dr. Miller?
DR. MILLER: Yes. Andy Thomson was the one who attended the actual meetings. My emails were between Andy Thomson, Mary Ellen Walling and myself.
Q All right. Well, I'm going to ask that you produce the emails that you have in conjunction with those meetings and turn them over to Commission counsel, and he in turn can provide them to us.
DR. MILLER: Sure.
MR. LEADEM: And when Dr. Thomson --
MR. MARTLAND: And we will follow up with that request, and indeed Mr. Thomson is testifying I believe next week. Thank you.
MR. LEADEM: Yes, and I was going to reference that, and I expect that Andrew Thomson will be here to testify.
Q Could we now have Exhibit 628, please. Now, this might be -- this is an email that you sent to Mr. Saunders, Mark Saunders; is that correct, Dr. Miller?
DR. MILLER: Yes, it is.
Q And I'm going to ask you to scroll down to the bottom of the page, if I could, because there's an email sent November 4th, 2009 -- there's a chain of emails as often happens to emails, they get chained. And you say:

> Here are my proposed revisions. FYI, in case you do not already know, Laura does not want me to attend any of the sockeye salmon workshops that are not run by DFO for fear that we will not be able to control the way the disease issue could be construed in the press. I worry that this approach of saying nothing will backfire.

Let me just as an aside, it shows a remarkable degree of precision or prescience in saying that, because things have really backfired, haven't they?

DR. MILLER: I believe they have, yes.

Q Now, the discussion that you had with Laura, that was with Dr. Laura Richards; is that right?

DR. MILLER: Yes. This was at a time before the decision about whether DFO would be attending non-DFO meetings had taken place, and I, in the early days of those decisions, there was some understanding that even if DFO people were to go to this particular meeting, that it probably would not be wise for me to go. And this is really where my frustration was.

Q And this was a meeting of scientists. This was a meeting at which press was not going to be present; is that not correct?

DR. MILLER: I believe there was going to be some press present, so I think that was the issue. And I have to say that, you know, the worry here was as I understand it, that, you know, we had some data to indicate that there may be a disease issue in sockeye salmon. And at this time, of course, we had the signature, we did not have a disease agent, so there was a lot of caution about that. And we don't -- we didn't know anything about the distribution of this in aquaculture or in other -- in other species, or anything else.

And so I think the worry by the Department was that if we bring out that there could be a disease issue in sockeye salmon without really understanding how far and widespread it might be, or even having a disease agent at that time, and really have a validation that we actually had a disease, you know, the worry would be that it would be automatically be assumed to be associated with aquaculture, and we really didn't have any data about that. And so that, you know, I believe in my view that that is the issue that the Department was concerned about, was that we didn't have data for that and we shouldn't put this out until we understood more about it.

Q Right. And you're quite clear that Dr. Richards told you that you should not attend any of the sockeye salmon workshops that you were going to be having with external non-DFO scientists.

DR. MILLER: The PSC workshop, certainly, and anything that has any of the internal workshops here. But the external workshops, the think tanks by the universities, et cetera, the decision was not to include DFO scientists in those meetings. And you can see, I mean, I know it kind of came out yesterday that, you know, I said I wasn't muzzled, and, you know, I was not allowed to speak, and that was a large source of frustration for me. But in the end, the same umbrella was put on everybody else, as well.

Q Right. But it would have been of some benefit to you to speak to external researchers about the research that you were doing.

DR. MILLER: This is -- this is why I was putting up resistance to this.

Q Right. Could we have the transcript from March the 17th, page 29, line 22, please. Now, Dr. Richards has already testified in these proceedings, and she was asked specifically about this Exhibit 628. That was page 29, line 22, March 17th. Mr. Wallace, who was acting for the Commission in that case, sent her -- and there's a quote there from that express portion of the email exchange that I put to you, and the question from Mr. Wallace is:

> Can you comment on that...?

And the answer from Dr. Richards is:

> Well that's very much a misrepresentation.

You would not agree that that's a misrepresentation of what you heard from Dr. Richards, would you?

DR. MILLER: What I would have not known at the time was whose decision that was. It could have been at the RDG level. I mean, as I learned, and I only learned through the inquiry process, that the decision of not allowing me to speak to the press after the *Science* paper came out, came out of the Privy Council Office, and not from DFO. I had permission to speak from the Deputy Minister, and I believe the Minister's office. So what I am not aware as a scientist is at what level these decisions are made.

Q So your understanding is that it went all the way up to the Premier's (sic) office, to the PCO.
DR. MILLER: I learned that through this process here. I had heard something through the grapevine to that effect, but I didn't know anything firsthand.
Q I should have said Prime Minister.
DR. MILLER: But, and I -- but I did know that the Deputy Minister had signed off on it.
Q Could I now ask you to examine with me DFO598977. It's a memorandum from the Minister. So if you could scroll down to the bottom, I think we can probably -- let me ask you first, Dr. Miller, do you recognize this document?
DR. MILLER: It would be helpful to have a year on this.
Q That's why I'm going to take you to the bottom, and right to the very bottom of that first page, if you can highlight that portion. Can you blow it up just a touch more.
DR. MILLER: So this would have been the 2009 briefing note, the final version of it.
Q All right.
DR. MILLER: I think we've seen a few other versions of it.
Q Okay. So this is a briefing note that you would nave been working on; is that correct?
DR. MILLER: Yes. I mean, you should understand that briefing notes, the process of writing briefing notes, originally the scientists would start that process, but then there would be a lot of other individuals who would make revisions of those briefing notes. So, yes, I believe this is the final one. I actually never saw a copy of the final one.
MR. LEADEM: Could we have that marked as the next exhibit in these proceedings, please.
THE REGISTRAR: Exhibit 1531.

EXHIBIT 1531: Memorandum for the Minister, Indications of a Possibility of Infectious Diseases Associated With Poor Survival of Southern BC Salmon Stocks

MR. LEADEM:
Q Now, I'm sorry, I'm going to have to move along a little bit more quickly with you because I'm very limited in terms of my time with you. The next

email chain I want to show to you is DFO598952, please. And you would recognize this as an email that you sent to Dr. Gary Marty, who is a fish pathologist with the Province of British Columbia; is that correct?

DR. MILLER: Yes, it is.

Q And in the second paragraph of the lead email, after you ask him a question, you say:

> Christine McWilliams (sic) made the rather bold statement at a meeting that all pathologies relating to sockeye salmon mortality events could be ascribed to known pathogens, and in her view, all pathogens affecting sockeye are already characterized; i.e. there is no room for "novel undescribed" pathogens.

And you're asking Dr. Marty:

> Do you agree with this viewpoint?

And you go on to say:

> It would seem to me that there are likely mortality events (e.g. the jaundice syndrome in cultured Chinook here and in Chile, possible marine anemia--but I know that you don't believe it truly exists)...

So I just want to stop there. Did Dr. Marty -- why do you say to Dr. Marty, "I know you don't believe it truly exists," meaning the marine anaemia?

DR. MILLER: There's a variety of scientists who are questioning whether or not the histological signature associated with marine anaemia is actually an individual disease, or whether it's something that can be induced by a variety of different mechanisms, or I assume all pathogens, but I'm not sure if they think that there could be other mechanisms, as well. He'll be on the stand so you can ask him about that. But he was one of the people who -- he told me at an earlier meeting that he has never characterized any fish as having marine anaemia.

Q The next email that I want to take you to is

DFO590226.
THE COMMISSIONER: Was the prior email marked, Mr. Leadem?
MR. LEADEM: Sorry, did I not mark that last one as an exhibit? Thank you, Mr. Commissioner. Could that be marked as the next exhibit please.
THE REGISTRAR: That is 598952, is that correct?
MR. LEADEM: That's correct.
THE REGISTRAR: That will be marked as Exhibit number 1532.

EXHIBIT 1532: Email from Kristi Miller-Saunders to Gary Marty re FINAL "unblinded" FR sockeye histopathology results, 2011-2111, June 27, 2011

MR. LEADEM: So the next one, Mr. Lunn, and I apologize, I'm making you move around quite a lot, 590226. DFO590226, there we go.
Q Now, this appears to be an email from Dr. Richards to yourself dated January 11, 2011, just on the eve of the publication of your paper in *Science*; is that not correct?
DR. MILLER: Yes, it is.
Q And in the email that you sent to her on January 11th, which is down below her response, you say you're giving her a:

> ...heads up that the approvals for media interviews have not moved past Ottawa Communications yet...

So essentially you have a very important paper that's being published in a very prestigious journal, and you anticipate that media -- in fact, media are already contacting you, even though the paper is under embargo, because they want to interview you. And you're being told by Dr. Richards -- or you're being told that there have to go through -- you have to go through Ottawa to get approval to talk to the media; is that correct?
DR. MILLER: Yes, absolutely, there has to be media lines developed and apparently there was some issue with the acronyms in the media lines. We lost days of this just to make that something that Ottawa was happy with.

I mean, I have to say that I believe that DFO was onside with having me speak publicly about the work from that paper.
Q Yes.
DR. MILLER: And I think that the people were making their best efforts to have that happen, and it eventually was taken out of their hands.
Q And it was taken out of their hands by people in Ottawa.
DR. MILLER: Yes.
Q By Communications personnel with the Prime Minister's Office in Ottawa.
DR. MILLER: I believe it came from the PCO office, yes.
MR. LEADEM: Could that be marked as the next exhibit, please.
THE REGISTRAR: Exhibit 1533.

EXHIBIT 1533: Email chain between Laura Richards and Kristi Miller-Saunders re Media requests - science paper, January 11, 2011

MR. LEADEM: And the final email that I hope to be able to show to you is one dated January 12, 2011, the day after this one. It's DFO590969, please.
MR. LUNN: I'm sorry, Mr. Leadem.
MR. LEADEM: DFO590969?
MR. LUNN: I'm not finding that one.
MR. LEADEM: I have a hardcopy of it here. I don't know whether that would assist. Mr. Commissioner, I'm in your hands. I could show the witness a hard copy of it.
THE COMMISSIONER: If you could just describe on the record what it is.
MR. LEADEM: It's an email from Dr. Miller-Saunders to Dr. Scott Hinch, who has testified in these proceedings. It's dated January 12th, 2011 at 12:36 p.m. The subject is re comment on *Science* sockeye paper, and it responds from -- to an email from Dr. Hinch dated -- of the same date, at 11:26 a.m., and references a contact from Margaret Monroe, who is a newspaper reporter, I believe, with the *Vancouver Sun*, asking for a commentary from Dr. Hinch. Dr. Hinch is then asking Dr. Miller whether it's okay, because she's the lead author, as I understand it, on this paper, whether it's okay to contact directly Margaret Monroe.

And it relates to Dr. Miller-Saunders' response to Dr. Hinch.

THE COMMISSIONER: I think perhaps if you could read that response into the record so that (indiscernible - microphone off).

MR. LEADEM: Yes.

Q The response from Dr. Miller-Saunders is [as read]:

> Go ahead.
>
> The next part is redacted, so I'm not able to tell you what it is. And then it says:
>
> Make sure that you use the information we have about the signature present both in JDFS...

Which I understand is the Juan de Fuca Strait; is that right?

DR. MILLER: Correct.

Q

> ...and JS...

Which would be Johnstone Strait.

DR. MILLER: Johnstone Strait.

Q

> ...not specific to salmon passing aquaculture sites, and unpublished data that it's present in the QCI...

Queen Charlotte Islands, correct?

> ...or Haida Gwaii (DFO prefers that).

And that's all I was going to take you to.

DR. MILLER: The Haida Gwaii is what they prefer. They prefer that we don't refer to it as Queen Charlotte Islands, but Haida Gwaii.

Q Okay.

DR. MILLER: It doesn't -- that is not a comment on DFO preferring me to state that. I just, you know, I think it's important to -- and this is one of the reasons I wanted to be able to speak about the *Science* paper and the work of it we had, to be able to let people know what we do and don't know, and what we -- and the patterns that we're

observing and the patterns that we're not observing.

And, you know, I'm very interested in finding out whether or not this is also in Atlantic salmon, but I cannot automatically assume that it is, and I cannot automatically jump to an assumption that this is about fish passing salmon farms, because I have no data on that. And the data that I do have, or did have at the time for this paper suggested that this signature exists in the Haida Gwaii. It exists in salmon passing either way around Vancouver Island. And so I did not go into any detail about that in the *Science* paper, and I assumed that that would be something that would come up in conversations with the media. And so this was not something that I was told to do by DFO, but I thought it was important to be clear what data we have.

Q Yes, I understand that. Now, looking back on all of this, I mean, you've been under some incredible pressure and scrutiny as a result of your coming to testify here; is that not correct?

DR. MILLER: Oh, very definitely, yes.

Q Right. All of this could have been avoided if some of your superiors and if the people at PCO's office had just been a lot more transparent and allowed you to talk to other scientists and media about what it was that you were uncovering; isn't that fair?

MR. TAYLOR: I object. It calls for speculation.

MR. LEADEM: It's not speculation at all. She's been under some incredible scrutiny here, and I'm just asking her for her impression. It's not speculation at all.

MR. TAYLOR: No, the question is could this have been avoided. I have my own views on that, but that's not important. But it's speculation

MR. LEADEM: Well, I beg to differ.

MR. MARTLAND: For our part, Mr. Commissioner, I'd support the question. I think this witness from the vantage point of her perspective on what's unfolded. She's at the heart of this, and she may have her own perspective on it. I don't see a difficulty with the question put.

THE COMMISSIONER: In fairness to the witness, let's see if she feels she can answer that question, Mr. Leadem.

MR. LEADEM: Yes.
DR. MILLER: I think I can. I think that it was very frustrating to watch some of the media reports that came out. My colleagues at UBC did their utmost to talk to the media and inform them on the key messages in the paper, but they weren't genomics experts. They don't know a lot about viruses or about -- about how the -- how that hypothesis on the basis of what that was proposed. And so I think it would have been very useful if I had been able to speak to the media and just make it clear what we did and didn't know. And that was the most important thing, how far-reaching can we take this single study, you know, into various conclusions. And I had to sit back and watch the media take it in directions that I wouldn't have wanted it to go, based at least on the data that we have.

And, you know, you don't want the data to -- you know, to be so overstated that it becomes something that it wasn't. I mean, there were people who were suggesting that there was a genetic change to sockeye salmon populations, and that's not what genomics, what functional genomics shows. It only shows what genes are being turned on and off. It doesn't mean that there's a change at a DNA level.

And so those are the kinds of things that I found frustrating in this process, but I had to abide by the rules.

MR. LEADEM: I believe I'm out of time, Mr. Commissioner. Thank you, Dr. Miller.
MR. MARTLAND: Mr. Commissioner, I have counsel for the First Nations Coalition at 25 minutes. I'm not sure whether you prefer to take the break now, or to have her commence.
THE COMMISSIONER: I'm content if she is willing to commence now, that's fine.
MS. GAERTNER: Sure, I'm happy to begin, Mr. Commissioner. Dr. Miller and Dr. Garver, my name is Brenda Gaertner. I am legal counsel for the First Nations Coalition, and I didn't have a chance to introduce myself specifically. So let me just tell you, I work for the First Nations Fisheries Council, which is the provincial organization on fisheries. I also work for the Fraser River Aboriginal Fisheries Secretariat,

which is the Watershed in the Fraser River Organization for First Nations. I represent the Haida, and I represent people on the Vancouver Island, and then my clients begin at Chehalis at the Harrison and go all the way up to the headwaters of the river. And so that's the work that I'm doing today with you, or that's who I'm representing today as I ask my questions of you. I've been listening very carefully to your evidence yesterday and today, with their concerns in mind.

CROSS-EXAMINATION BY MS. GAERTNER:

Q And I thought, given the troubles that you just referred to, you deserved a story. And in the First Nations world a story is often a great way of education on deeper ways of understanding things. And one of the things they taught me early in my work with them was that they used to ask me, "What's working you? What's getting you?" And for that they wanted to know how the ancestors were working me to understand what was at the bottom of things and understanding how to move forward. And that instinct was very important to them. You probably know some of these things, either from your direct work with First Nations or your understanding in British Columbia.

But last night, when I went to bed last night, and this morning when I woke up, what was working me very difficult -- in a very difficult way, Mr. Commissioner, was your evidence yesterday, Dr. Miller, about this being a smoking gun. And in addition to non-violent communication and my difficulty with how much we use that metaphor, I tried to understand what that metaphor meant last night and this morning. So I need to ask you that.

And before you answer, let me ask the question, and I'm not trying to put you on your spot, I'm trying to give you an opportunity to explain your evidence yesterday. Mr. Commissioner has heard a lot of scientists over the last number of months, over a year, many of whom you know, Dr. Trudel, Dr. Beamish, Dr. Irvine, many people who have come her and said to him there is not a smoking gun out there. And my clients also

believe there are a lot of contributing factors, and a lot of multiple factors affecting the long-term sustainability of Fraser River sockeye salmon. So can you explain to us, and can we get over that -- the edge that I felt last night and this morning, but what did you mean yesterday when you said that this was a smoking gun?

DR. MILLER: Actually, I had no intent of saying that in this hearing, that I mean I was a little backed in the corner on that one. And I should clarify, and when I agreed with Mr. McDade that what I really meant was that this could be a major factor. Not the major factor, because I also agree with others that there is no single major factor. And I think that I did put a lot of ifs, ands and buts in at the time that I made that statement. And the main one is that we have to be able to demonstrate that we have an infectious disease, that it causes mortality, that it causes mortality in that early marine phase, because that is where I'm focused on right now, is understanding whether or not we have a viral agent that is highly prevalent when fish, when sockeye salmon are moving into the Fraser River, and at a time when we know from oceanographic data and from the work of Dick Beamish and Marc Trudel that we have highly variable ocean conditions. Okay? And I do work closely with those colleagues.

And it is my view that if you take a fish that is already compromised and you put that fish into an environment that is highly stressful, that doesn't have a lot of food, that may not be the optimum temperature, that may have other things like sea lice and other things that they are up against, that you could weaken a fish to the point that they can't -- they simply can't take that level of stress.

And I do believe if we are able to demonstrate that this virus does cause disease and mortality in that early marine phase, and if it is activated under stress like it has been shown to be activated under stress in other species, this family of viruses, that there is a potential that it could be associated with high levels of mortality. That does not mean that it directly causes mortality. But if you weaken an animal, you start with a weak animal and then you weaken

it further by poor conditions in the environment, it is the accumulative effect of those stressors that likely causes the mortality that we are seeing in the early ocean environment. That is really what my feeling is on it. I don't think that one factor all by itself has caused this decline.

Q And, Dr. Garver, given that qualification, you might agree with Dr. Miller; is that correct?

DR. GARVER: That is correct.

Q Yes, okay. So then let's go to Exhibit 1512, which was Commission Tab 22. Because I think that's very important as a way of understanding the -- the way that your helpful work fits into the work of many other hardworking people.

DR. MILLER: I appreciate the opportunity to say that.

Q Yes. I'm sure you have. And so I want to take you, then, to page 5 of that exhibit, because the challenge, of course, with scientific inquiry is that it's linear and it may not always keep up with the environment around it, and the challenges there, and you say something quite -- I hope I've got the right page, Exhibit 1512 in the bottom of page 5, right at the bottom of the page, issue number 4. I'm going to ask you this question, given what you say there. You say:

> Mitigation would depend upon the mechanism.

Just hold on for a second. So given existing scientific and local knowledge of increasing stressors on Fraser River sockeye salmon, including toxic blooms, emerging chemicals of concern, new and old pathogens becoming activated or not in this environment, what did you mean by that statement, and how can we understand it?

DR. MILLER: We were asked by the Pacific Salmon Commission to answer these four questions. This wasn't a question that I specifically came up with. This was a question that everyone who came to this meeting was asked to address, I believe.

Q All right, well, I'll stop you there. That's a very important question for my clients, because scientific inquiry for scientific inquiry alone, is not as helpful to them. What's much more helpful to them is scientific inquiry that assists them in making better decisions about fisheries.

And so the question there was can manage -- any management reduce the effects. What can we do about this knowledge, is really how I interpret that question. And so at the bottom you say:

> Mitigation would depend upon the mechanism.

And I think it would be very helpful for us to understand what you meant.

DR. MILLER: Well, I mean, obviously what I meant was if this is not a pathogen, if what we're observing is not induced by a pathogen, it would -- what one would do about it would depend on what it was, what was causing this signature.

Q And if it is a pathogen?

DR. MILLER: If it is a pathogen, what -- the very top part of it was if it was a viral pathogen, it was shown to be from -- caused by a pathogenic agent, these are the kinds of things that one might be able to do to try to minimize the impact. But if we find that it is not a viral agent and something else, obviously whatever we can do about it will depend on what we determine causes it.

Q So essentially, as I read the earlier paragraph, you're trying to minimize vertical and horizontal transmission, if that's --

DR. MILLER: I'm trying to minimize the effects on sockeye salmon, and sockeye salmon are wild fish. We don't have a lot of sockeye salmon in hatchery systems, so it's very difficult to control disease in a wild fish. So my feeling was that if this was something that was also affecting chinook and coho, and at the time we know that we do see the signature in those species, although it seems to be reduced in coho, that maybe there's some degree of effect that we could have by trying to minimize it in hatchery systems.

You know, this again, we were asked to answer this question, and I could have left it blank and said until we know if there's a pathogen I can't really say anything about mitigation, but --

Q Don't feel defensive. Please don't feel defensive. I would have asked you this question even if you hadn't been asked it at the PSC, so because my client is interested in what we do with this knowledge, and what steps we can take. And we heard already, you were here earlier this week,

and you heard the evidence of the first panel. There are known pathogens already that are -- that have been vertically and horizontally transmitted, or are likely transmitted that way. They're already existing in the environment. This may be one more that's there. We don't know more than that. The question becomes then what can we do about that, what we as humans can do about it. And you suggested that depended on the mechanism, and so if it's -- tell us more about that.

DR. MILLER: It depended on whether this was a pathogen or something else. That's what I meant about mechanism, it wasn't that --

Q Okay.

DR. MILLER: It said, if the signature is a result of something other than a pathogen, what do we do to mitigate it? Well, it's very difficult to determine how you mitigate something if it's -- until you know what it is you're mitigating.

Q Right. And given the complexities of accumulate impacts and multiple factors, even if we know it's a pathogen, it's going to be very difficult to mitigate.

DR. MILLER: Yes. And I would say Kyle is probably -- Dr. Garver is probably the better person to ask about how you mitigate a pathogen. You know, a lot of my program is --

Q All right, I'll go to Dr. Garver --

DR. MILLER: Okay.

Q Dr. Garver, perhaps you can help us because it is a challenge, I think, to mitigate pathogens in a wild stock and deal with it, given the large migratory route of Fraser River sockeye. So perhaps you could help us understand, what types of things should the Commissioner be looking at, given the type of information that's here and the public concerns and First Nation concerns about pathogens and growing knowledge of pathogens. What can we do, where are we looking to find some help?

DR. GARVER: Yeah, it's a great question. It is very difficult to mitigate disease in wild populations. There are some things that we can do. We do a lot of -- I can speak particularly to viral diseases, which once they're in a population, it is hard to eliminate that pathogen from a population. But you can track it. We have genetic typing now

where we can do epidemiological studies, so we can confine it to a certain watershed by eliminating movement of fish from one watershed to another. You can't necessarily -- there are vaccination programs, but the technology to vaccinate millions of fish is not there yet. But once it's in a population, you then move into a mode of keeping it in that population and eliminating the spread to other populations.

And you also have to determine what are the factors that predispose it to disease. As you heard in the past three days, disease is not necessarily -- doesn't equate to the presence of a pathogen. So just the mere presence of a pathogen does not give you disease. So you need to know the factors that contribute to actual impacting, the impacts of disease on that population. And if you know that, sometimes you can avoid those factors. You can make those factors less amiable to disease.

Q So when I asked questions of the - oh, sorry, I'm having - yeah, in the earlier panel about managing human behaviour around the exposure of pathogens and the transfer of pathogens earlier this week, what are our options about managing human behaviour? Like, what can we do differently? Is it -- is it would be precautionary to make sure that everything we do along the migratory route of the Fraser River sockeye is not contributing to any new or exchange of pathogens? Is that obviously something we have to take good care with?

DR. GARVER: I think, yeah, you know, biosecurity is always a measure with disease. That's one of the first and foremost things that you implement is strict biosecurity, if you know what the disease agent is and how to prevent it, and to eliminate its spread. So biosecurity is always a foremost. Other than that it's really hard without a specific pathogen to recommend methods to eliminate it without knowing the biology behind each pathogen.

Q I just have one quick question perhaps before we go to the break, Mr. Commissioner. I just wanted to understand in the linear work that you were recommending we do, or obviously need to do, Dr. Garver, yesterday you were talking about needing

to know next through laboratory studies whether it's infectious. If I understand it correctly, a laboratory study may not be determinative of whether or not a pathogen is infections. It's just -- it won't be infectious in the particular test. It could still be infectious in the wild; is that correct?

DR. GARVER: There is a possibility of that, but typically if it's an infectious disease, you can usually replicate that in a laboratory. It may take several challenges or several experiments to manipulate the parameters such that it would mimic an environmental setting. But usually if it's infectious, you can determine that quite easily in the laboratory setting.

Q And as I also understand the evidence, right now we know that the signature is present in some Fraser River sockeye salmon and not in others. For example, so far you have not found it in the Harrison stock, Mr. Miller -- Dr. Miller, sorry, but you'll agree with me that we're going to have to do a fair bit of work to even determine whether within the conservation units of the Fraser River sockeye salmon where this virus may or may not be.

DR. MILLER: Yes, that is correct. I mean, we've looked at a fairly large number of stocks, but we don't always have very large sample sizes for every stock. Obviously the samples, if we're collecting fish in the lower river, or in the marine environment, you know, we see the very abundant stocks, but we don't see the very small stocks. So it will take some work to understand exactly where it is and what its prevalence is. And as Kyle has alluded to previously with IHN, that prevalence levels may change in different years.

But we looked at the Harrison fish over three years, 2008, 2009 and 2010, and we have samples now for 2011. We've looked at 156 fish, and not found it in Harrison at all. Any other stock where we've looked at that number of fish we have found it.

MS. GAERTNER: Would this be an appropriate time?

THE REGISTRAR: The hearing will now recess for 15 minutes.

(PROCEEDINGS ADJOURNED FOR MORNING RECESS)

(PROCEEDINGS RECONVENED)

THE REGISTRAR: The hearing is now resumed.

MS. GAERTNER: Thank you, Doctors. I have only about 12 minutes left with you, and so I'm going to focus the remainder of my questions primarily on a second component of the Commissioner's work here and our work here which is to look towards recommendations on how we can more collaboratively work together for the long-term sustainability of Fraser River sockeye salmon. So that's my goal in dialogue with you in the next ten minutes. It's only a short time, but we'll see what we can do.

Q I'm going to go first to your c.v. which is Exhibit 1510, Dr. Miller. I note that you're the leading expert in cutting-edge research. You have a $5.3 million budget from 2008 to 2012 on genomic tools for fisheries management, including the development of biomarkers associated with health. In particular, one of the places you heard us get to in the earlier panel was how we can spend a lot of time talking about pathogens, but an important component of that is to talk about health, and the biomarkers of health.

So I'm wondering if you would agree with me that in your work going forward and using this cutting-edge research, it would be very useful to work closely with First Nations who have a keen awareness of *in situ* identification of biomarkers of health. They know how to look at the fish, they know what the signs the fish are seeing (sic), they see changes in that fish, sometimes very subtle and sometimes very much at the population level.

Do you agree with me that that type of *in situ* eyes is extremely helpful when developing priorities for the type of research you're looking at for biomarkers on health?

DR. MILLER: I absolutely agree. My lab has worked with First Nations quite extensively in our Genetic Stock Identification Program, making sure that we have baselines that include enough samples from stocks of interest to First Nations, and we have also processed mixed-stock samples for First Nations.

In terms of health, I think it's not very clear here, but my program is not all about

disease. We look at other -- I mean, genomics can look at a wide variety of different physiological factors. Other kinds of things that we saw that differentiated 2007 and 2008 fish were indicates of immunosuppression, indications of reduced oxygen availability, hypoxia, which we're interested in whether that could come from the harmful -- the exposure to harmful algae blooms which we were able to amplify off of some of their gills. They appeared to have a higher metabolic rate. There was some indication that there may have had reduced feeding and growth.

It is very important to our genomics program that we have other information about fish as well that doesn't necessarily just pertain to genomics. I can't stress that enough, that having people in the field who are seeing these fish and seeing indications of pale gills or other sorts of things externally on this fish are very, very important and I absolutely welcome the involvement of First Nations information in that.

Q And having worked with First Nations, you'll appreciate that there has been a history of distrust that has occurred between First Nations and the Department of Fisheries and Oceans. Would you agree that it would be useful to have direct and iterative engagement between DFO Science researchers and First Nations for the transparent exchange of information?

DR. MILLER: I believe that that already exists with our Stock ID Program. This is a fairly -- so my answer is yes, I do believe that that would be a positive move forward. I think that my lab, in particular, has already had some success in that regard.

Q I'm going to come to you in a second, Dr. Garver, I'm not leaving you out.

I'll just go one step further. Would you also agree that an oversight committee in which the federal government, the provincial government, First Nations, stakeholders, environmental groups were all charged with reviewing DFO scientific research agenda setting priorities, working with the experts, reviewing results would be a useful way of exchanging information in a timely way and ensuring a balanced approach to research?

DR. MILLER: I certainly wouldn't stand against that,

no.
Q Dr. Garver, do you accept both of those recommendations and would you support those?
DR. GARVER: Yes, I would, and I can comment as well, as our program, at least the Virology Program is quite involved in multiple fish health projects with the First Nations. In particular, my research group is working on a project right now with the Okanagan First Nation Alliance looking and assessing disease, in enhancing the Okanagan River sockeye stock. So we already do, at least in my program, we do have an exchange where the scientists are collaborating and interacting with the First Nations directly.
Q And that's helpful?
DR. GARVER: Yeah, it's very helpful.
Q Thank you. And I want to go one step further 'cause there is a concern that I have been developing about -- which came up with this potential new virus. As I understand, Dr. Kristi (sic), you started your research in 2008. The analysis was completed by 2009, that this could be a virus, and here we are in 2011 and in fact just days before your coming to give evidence, and you're now getting access to -- you're getting a commitment to access to fish at the net-pen farms.
Would you agree with me that it would also be extremely useful and helpful for a timely protocol of exchange of information with the farms on a regular basis, not waiting for political interplay, not waiting for anything else, but that we have a protocol in place between the Department of Fisheries and Oceans that allows you to get at those fish as soon as you need to, in order to ensure timely research?
DR. MILLER: Yes, I would agree that that would be helpful. I guess I had not known what the protocol was in terms of approaching the industry --
Q And so if you had a protocol in place and the industry had agreed to it and the Department of Fisheries had agreed to it, and First Nations had agreed to it, that would be extremely useful for you, wouldn't it?
DR. MILLER: Yes, it would.
Q Thank you. Could I just now go to Exhibit 1517. This is just a question about all the things that

you've been doing, Dr. Miller, to get your information out. I don't see in the material I was able to review, and I can appreciate there may be way more material than we were able to review out there, that in your next steps and in your review of things, you'd make an effort to make sure that your information which is cutting edge is getting directly to First Nations. Is that because you don't see that as your job, or what is it? Why is it that in all of the work that you're doing, we don't have -- I think we need to talk to First Nations directly on this?

DR. MILLER: I think given that there was this Commission ongoing and I don't know what my directive would have been within DFO about what groups to this about (sic). Obviously I hadn't approached the aquaculture industry, I hadn't approached First Nations. I did see some direction on that.

There certainly would have been some members of the First Nations aware of this work who are involved in the Fraser Panel at Pacific Salmon Commission because I did -- they funded some of this research and I have talked to them about this although not since we've identified this virus. So there would have been some information through that route.

We also had a portion of our Genome BC, which targeted doing some social sciences and kind of getting -- learning how to work well with managers, with First Nations, with stakeholders and we did do a little bit of dialogue with First Nations within that program. That wasn't me directly, but -- so the intent was absolutely to engage various groups and absolutely including First Nations.

Q You just haven't been able to get to that because of this Commission?

DR. MILLER: No, there's a social scientist who was working with me at University of British Columbia, and he did engage a variety of First Nations in his work.

Q I see, it -- I'm running out of time, I'm confident of that. I want to just ask two quick questions on this exhibit. If you could go to EE on page 10 of this, and this is the one that actually, as I read it, is your most recent one

even though the date at the top of it was incorrect. So this is --

DR. MILLER: Yes, I'm sorry about that.

Q -- as I understand it -- that's okay. And you've got the moving forward there. But you mention "uncertainties for funding" in that paragraph, and I'm just wondering have those uncertainties for funding been clarified now? Is the program in severe jeopardy? What's happening here?

DR. MILLER: We have no funding to work on sockeye salmon at the present time, but part of the reason for that within the Department is that the major funding that I have used from the Department for working on genomics is the Genomics Research and Development Initiative funding, and that has not been approved by Treasury Board yet. So we all have proposals into that, but there's no money in the bank essentially at this time.

So, at the time, right now, I actually have no departmental money or outside money to work on sockeye salmon from the Fraser River.

Q That's extraordinarily sad, Dr. Miller, and hopefully we'll be able to persevere and see how we can go forward in those circumstances.

At the bottom of page 8 in Exhibit -- in the same exhibit, if you go to "W", this just may be just a correction but that we need to -- oh, hold on. Bottom of -- I have as a quote that -- oh, there it is in your title, "Analysis of 2008 smolt contrast studies reveal the physiological divergence between the years starts in the freshwater environment."

I just wanted to make sure, is it true that things will start in the freshwater environment? Do we know that? We actually don't know where things are starting, do we?

DR. MILLER: One can contrast the physiology of the fish in various years, and this question was are there physiological divergences that we see among fish from those two different years. Are those restricted to the marine environment where we know that had a very challenging - or at least my colleagues suggest - that there was a very challenging marine environment in 2007, and a very good marine environment coast-wide for all salmon species in 2008.

So the question was: Do we see from the

genomics perspective a physiological divergence that is exclusive to the marine environment? So the fish come out of the fresh water in the same -- in very similar condition, and do we see divergence that's exclusive to the marine environment? What we found in two of the three tissues that we looked at was that we saw strong physiological divergence between those fish before they left fresh water as well as in the marine environment. So we are still analyzing these data.

We've done a lot of analysis on what differentiates fish in the marine environment, and we're now just starting to look at what are the factors that are differentiating fish in the freshwater environment. Why do we have fish coming out in such different condition from fresh water.

One of the differences was that fish, in 2007, had a much stronger MRS signature than they did in 2008. Although the MRS was there in 2008, more of the fish were affected before they left fresh water in 2007 in multiple tissues. But I do not believe that that is the only thing, and we're still analyzing that data. So the point --

Q We don't have enough information right now to know where it starts. We know it's active in fresh water and we know it's active in the marine, but we don't know where it starts. We --

DR. MILLER: Physiology will tell you where. By doing genomics - and obviously this has to be done over multiple years - but using functional genomics, we will be able to assess where physiological divergence begins.

Q So where physiological signs start. The signs --

DR. MILLER: Where the signs --

Q -- in the fish.

DR. MILLER: -- of divergence among fish in different years, where do we begin to see those signs.

Q Right.

DR. MILLER: Because that is one of the points of the program. If we can identify physiological states that may undermine performance -- one of the questions in the program is where do we begin to see those signs? Is it emanating out of the freshwater environment, or do we not see those signs until fish hit the marine environment.

Q Sorry, I think I just -- I'm sorry, I'm using up more than my time, but I'm not clear enough with my question, and so I'm just going to try it one more time, Dr. Miller, and be patient with me if you may.
DR. MILLER: It's okay.
Q But what I'm trying to understand is we don't know where the fish - at this point in time - where they're contacting this, if they're contacting it. All we know is where the physiological signs might start.
DR. MILLER: Oh, you're -- if you're talking exclusively of the MRS, the Mortality Related Signature -- I was talking in more general terms of all aspects of physiology.
Q So this is what you're talking about here in "W", aren't you? You're talking about the MRS?
DR. MILLER: I was talking about overall physiological divergence and the MRS as one component of the physiological divergence that we observe.
MS. GAERTNER: All right. I really do need to sit down. I've done my best to try to clear this up.
MR. MARTLAND: I have Ms. Robertson for five minutes.
MS. ROBERTSON: Krista Robertson for the Musgamagw Tsawataineuk Tribal Council.

CROSS-EXAMINATION BY MS. ROBERTSON:

Q Dr. Miller and Dr. Garver, just so you know, the Musgamagw Tsawataineuk Tribal Counsel represents over 2000 First Nations members who reside in the Broughton Archipelago. I just have a very few questions for you.
MS. ROBERTSON: Mr. Lunn, if you could pull up Tab 10 of the Aquaculture list of documents?
Q Dr. Miller, do you recognize this document?
DR. MILLER: Yes.
Q So is this your proposal?
DR. MILLER: This again is something that we were asked to put together by Mark Saunders, the head of the SAFE Division in a variety of different research areas. If we were to move forward with trying to determine whether or not specific hypotheses could be factors in these declines, what's the research that we need to move forward? That was the question that we were asked. We were all asked to put in general proposals.

There wasn't a pot of money that we were putting these proposals into, but this was for the Department so that they had on record what research the scientists believed needed to be done. So, yes, I wrote this in response to that.

Q Thank you. And if we could go to the second page of the document and highlight section 3(b).

MR. MARTLAND: And as Mr. Lunn does that, I'll just put on record this is Exhibit 639. It's already in as an exhibit.

MS. ROBERTSON: It's already Exhibit 639? Okay. I won't mark it then.

Q So if we could just look at -- Dr. Miller, if you could look at 3(b). What you're doing there is you're proposing a budget of $18,750 to test whether or not Atlantic salmon carry the signature; is that correct?

DR. MILLER: That's correct.

Q Now, was that funding denied at that time?

DR. MILLER: As I said, there wasn't a pot of money available. This was the Department asking the scientists to put in what work they believed needed to be done to further validate or refute some of the hypotheses that were put forward. I don't believe the Department has ever obtained any pot of money to work on sockeye salmon from the Fraser River during this inquiry. There have been small amounts of money that I have obtained, and I think Mark Saunders, the division head of SAFE has really been a fantastic supporter of my program. Where he's been able to find money, especially trying to go after the identification of a virus associated with the signature, he has obtained some departmental funds. So I have obtained some funding, not specific funding for this element.

Q Thank you.

MS. ROBERTSON: Mr. Lunn, if you could bring up Exhibit 1526, please?

Q So this is an email from Dr. Stewart to Dr. Garver, and the email is asking Dr. Garver to make comments on a briefing note for Dr. Laura Richards in preparation for her testimony for this Commission just a few days later; is that correct, Dr. Garver?

DR. GARVER: That looks correct.

MS. ROBERTSON: And if we could go to the last page of that document, Mr. Lunn? And if you could please

highlight the second-to-last paragraph there? It says:

> In a meeting last week Dr. Miller informed us that she had obtained parvovirus sequences from livers of fish showing this genomic signature. The [This] type of virus hasn't been previously reported from fish, but [it] is known from other lower vertebrates.

It says:

> In attendance was Dr. Brian Riddell as well as representatives from the BCSGA --

I think that should probably read the BCSFA. Do you agree with that? That would be a typo, the B.C. Salmon Farmers Association and Marine Harvest?

DR. GARVER: I would assume so, yes. I should point out, though, that I wasn't at this meeting.

MS. ROBERTSON:

Q I just -- so Dr. Miller, you were at that meeting?

DR. MILLER: Yes, I was.

Q I just want to ask about this, because I frankly find it astounding that industry representatives, a stakeholder group, would be present at a briefing meeting between DFO scientists and DFO management. Were there any other interest groups present at that meeting as far as you were aware?

DR. MILLER: They were not introduced to me and I don't know who these people were that attended the meeting, or -- I don't know them to see them. So this was a meeting, there was quite a few people in the meeting around the table. There wasn't a round-table that I recall where everyone said who they were and where they were from.

Brian Riddell was there. I know Brian Riddell, he used to be my boss, and he's from the Pacific Salmon Foundation. They have been working collaboratively on the PARR project as well in providing some of the funding for the boats.

So again, as I've said before, I was actually unaware that the aquaculture industry individuals were at this meeting but, I mean, we were all asked to provide an update as to where our research that potentially pertains to the PARR

program was going, what our newest findings were. My program is really parallel to the PARR program. I don't obtain any direct funds from the PARR program. I do obtain samples from them. So I was asked by my manager, Mark Saunders, to present some of the new data that we had.

Q All right, thank you. And just one last question, then. Dr. Miller, what, if any, trends are you seeing in your research on the signature in 2010 and 2011? Are you in a position to speak to that?

DR. MILLER: Very high.

MS. ROBERTSON: Thank you. Those are my questions.

MR. MARTLAND: I have Ms. Schabus at five minutes now.

MS. SCHABUS: Mr. Commissioner, Nicole Schabus, co-counsel for Sto:lo Tribal Council and Cheam Indian Band.

CROSS-EXAMINATION BY MS. SCHABUS:

Q Just a very quick follow-up question on the penultimate question of my learned friend. When talking about that PARR meeting, you did not see or recognize any First Nations leaders in the room?

DR. MILLER: I did not.

Q And you're not aware of any of them having been present at the meeting, or informed about this?

DR. MILLER: No. I mean, I was simply someone who was asked to come to the meeting. I wasn't someone who was setting up the meeting.

Q Now, Dr. Miller, you started your genomics research into the en-route mortality of Fraser River sockeye salmon in 2004, 2005?

DR. MILLER: We got the instrumentation for the lab in 2004, but we didn't really do any studies until 2005.

Q But you were looking for your funding already. You were putting your proposal --

DR. MILLER: Absolutely, yes.

Q -- on at that time. Now, and one of the things that you were responding to was the stated need or problem by high-level fisheries managers with the problem with predictability due to in-river mortality of fish, right?

DR. MILLER: Correct.

Q And so the problem with being able to predict that and also make associated management decisions,

right?
DR. MILLER: Correct.
Q Now, when we are talking about that problem, the Pacific Salmon Commission Fraser River Panel refers to as the difference between estimate issue, right?
DR. MILLER: Yes.
Q And that refers actually to what you're referring to as en-route mortality of the fish, right?
DR. MILLER: Yes. That's highly variable between years.
Q Okay. Now, by 2004, we had actually been looking at over a decade of declining productivity of Fraser River sockeye salmon stocks since the early 1990s and increased en-route mortality, right?
DR. MILLER: Yes. And my colleagues at UBC, Scott Hinch and Tony Farrell had been working on this previous to my joining them.
Q They were working on physiology?
DR. MILLER: They were working on physiology and David Patterson was also doing work in the river on physiology.
Q But by 2004, it was clear that there was greater en-route mortality than the models were actually taking into account.
DR. MILLER: Yes, that was the issue.
Q The forecasting. The Department of Fisheries and Oceans, and the Pacific Salmon Commission actually supported your genomic research starting in 2004, 2005.
DR. MILLER: Yes, they did.
Q And they were looking at and supporting functional genomics as a way of looking at overall fish health to help better predict en-route mortality and get to the bottom of this issue.
DR. MILLER: Yeah, the amount of money I would have obtained in that year was sort of a proof of concept, that this technology would provide useful information. In 2006 and 2007 where the years that we actually had a fairly decent amount of funding in a large collaborative -- I think $1.1 million dollar project. It was only a very small portion to me.
Q But you could actually do some sampling. But you were quite innovative or resourceful in actually getting your hand on samples before then and drawing from other programs like the radio-tagging

program and the studies that were done on physiology in-river to actually accumulate more data.

DR. MILLER: I was because there was already a program with David Patterson from DFO and Scott Hinch and Tony Farrell, so they very generously provided me samples before I was really involved with them.

Q So it's given you a head start, and also an opportunity to further test your hypothesis, right?

DR. MILLER: Yes. I mean, I didn't -- I've run experiments on 2003 fish, but not in 2003. So, yes, I was able to get backlog samples from fish that I could then analyze.

Q Now, you heard from what I'm going to dub the first disease panel that they were calling for a broader approach to looking at overall fish health that takes into account environmental conditions, presence of pathogens that interact and all the variable factors we've been talking about, right?

DR. MILLER: And I completely agree with that.

Q And I actually suggest that's what your doing for your multi-disciplinary research.

DR. MILLER: Yes, it is.

Q And based on your research to date, you would agree that we are looking at a major fish health issue that can help explain the high levels of en-route mortality, right?

DR. MILLER: It is my opinion that we may be looking at a major fish health issue that includes fish health in response to environmental change.

Q Of course. That's why I was phrasing it that way.

DR. MILLER: Exactly.

Q Now, your research can help us actually better understand those causes for en-route mortality, right?

DR. MILLER: I think that it will, yes.

Q And it can also assist with better management decisions?

DR. MILLER: We are in the process of taking some of the genomic data that we have and putting it into models. So that is our intent, is to provide information to managers that will increase the precision of their escapement estimates.

Q And it's fair to say that we are looking at cutting-edge research that's multidisciplinary, has room for further involvement and inclusion of

indigenous knowledge, and also currently has multiple funding sources.

DR. MILLER: Yes, and I've stated that before. Absolutely, yes.

MS. SCHABUS: I'd like, Mr. Lunn, to bring up Exhibit 1517 - this is going to be my last question - and take you to the very last page and the very last paragraph, actually. The very last paragraph of Exhibit 1517.

Q Dr. Miller, you'll see it in a second. Probably -- it says it on the top, and if necessary, we'll take you to the first page. But I take it you recognize it as the timeline that you actually have to develop at the request of Dr. Richards regarding your research and the outcome, right?

DR. MILLER: Yes.

Q And it takes us basically to where we are today?

DR. MILLER: Yes.

Q And so taking you to the very last paragraph and basically the very last sentence, you're stating a very serious issue that your program currently is in severe jeopardy. I'm going to ask you to comment on two things that are raised in those two paragraphs. Namely, you're speaking about the funding of the Genomic Research Development Initiative through DFO and your current -- I'm just going to ask you to comment on two things.

Do you have a commitment for funding of GRDI from DFO now, and the other is the issue of accessing external funding, including Pacific Salmon Commission funding through contribution agreements and whether that issue has been resolved.

DR. MILLER: I do not currently have GRDI money. Nor does anyone else in the Department because the Treasury Board submission has not been passed. The issue with using what we call SPA money or external funds to fund indeterminate staff has not been resolved. Therefore, I am very uncertain about how we will move forward as a group, because we have 11 indeterminate staff that we have, for a number of years, been paying with external funds, largely, some of them, through the Pacific Salmon Commission for our Stock ID program, and our Stock ID program provides real-time in-season information about stocks that used to open and close fisheries. That funding model that we have

been using to fund that whole program is now absolutely in jeopardy because we do not have a way to pay the technical staff.

MS. SCHABUS: Thank you. Those are all my questions.

MR. MARTLAND: Thank you. Mr. Commissioner, in the time allocations we circulated, we had not included Mr. Rosenbloom, but I said if we found time, we'd secure some for him. I've done that, he has ten minutes.

MR. ROSENBLOOM: Thank you very much. My name is Don Rosenbloom and I appear on behalf of Area D Gillnet, Area B Seiner.

CROSS-EXAMINATION BY MR. ROSENBLOOM:

Q I first want to take this opportunity to compliment both of you as scientists for your contribution to this body of science that hopefully will lead to a more sustainable resource. Appreciating that my clients are commercial fishermen, they very much appreciate your work.

I regret to have to raise with you, however, that last night certain matters came to my attention that I wish to raise with you in particular, Dr. Miller. In raising these matters with you, I want to make very, very clear that in no way do I want my remarks to be interpreted to any way speak to the integrity of either your science or the integrity of the testimony you've given over these two days, and I want that very clear.

However, a matter came to my attention yesterday, last evening, which led me to inform both the Commission this morning before the inquiry and, indeed, counsel for the Department of Justice, that I would be raising this matter.

The information that's come to my attention is -- and I don't want to be adversarial with you and I want to sort of lead it out and make it as quick as possible, and hopefully you'll agree with me that your husband indeed plays a role in the aquaculture industry here in British Columbia. In particular, I'm focused on a company called Island Scallops Limited, and that your husband heads that company; is that not correct?

DR. MILLER: Yes, shellfish culture, yes.

Q Yes. And this company, as I have done my research, is a company that is in the field of aquaculture both in terms of scallops, in terms of many other specie of shellfish and in terms of fin fish, in particular sablefish; is that not correct?
DR. MILLER: They did some work in sablefish a number of years ago, but they don't -- they're not in sablefish culture at the present time. It's all about shellfish.
Q And it is my information that, for example, when one researches the company, it's sometimes referred to as the largest private marine research hatchery and the first fully-integrated shellfish producer in Canada. That would be pretty accurate, would it?
DR. MILLER: It's no longer private.
Q Okay. Other than that, you would agree with me it's the largest in Canada?
DR. MILLER: I don't know that, but it's very large, yes.
Q Fair enough. Thank you very much. And it's further my information, in terms of the investigation that we've conducted between last evening and today, that this company, Island Scallops Ltd., which is out of Qualicum Beach on the Island, is indeed a subsidiary of a parent company and that back in the year 2007, that period approximately, the parent company was Edgewater Foods International. You're familiar with that company name?
DR. MILLER: Yes, I am. That was out of the U.S.
Q And it's -- yes, indeed, registered out of Nevada, correct?
DR. MILLER: Correct.
Q And from our research out of Nevada, is it not also correct that at least in that period of time in 2007, you were an employee of that company?
DR. MILLER: No, I have not been an employee of that company. I have never obtained any financial contribution from that company. We have done a little bit of genetic work to look for any indications of inbreeding in their scallops to make sure that they weren't inducing negative consequences to the fitness of the scallops that were in the program.
Q Would it surprise you if I told you that the

registration of that company refers to you as Chief Scientific Advisor?
DR. MILLER: But it's not a paid position. This is just I was providing advice, genetic advice about scallops.
Q Fine, but Dr. Miller, you aren't surprised to hear that the company holds you up -- held you out in 2007 as Chief Scientific Advisor.
DR. MILLER: Yes, and that's fully disclosed to DFO. There's nothing --
Q Yes.
DR. MILLER: -- under the carpet about that. That is in full knowledge of DFO.
Q Fair enough, and I don't want anything that our exchange is to be suggesting that in any way you have misconducted yourself. I want to make that very clear.
Now, let's go on from 2007. The parent company for Island Scallops is now a company called Ocean Smart Incorporated out of Maryland; is that not correct?
DR. MILLER: Yes, I mean these are -- yes, that is correct.
Q And you wouldn't be surprised if that company also holds you out as the Chief Scientific Advisor?
DR. MILLER: I actually don't know that they do.
Q All right. But you do scientific advisory work for them, don't you?
DR. MILLER: I have done work on the genetics of the scallops and we are working with six different industry partners right now on the effects of ocean acidification on marine shellfish, and their company is one of the six companies that's involved in that program. I have a post-doc leading that program.
Q And your expertise obviously would be of great assistance to that company, obviously.
DR. MILLER: I have, through my career done research for a variety of different purposes, mostly genetics research. We have my -- our lab has done a lot of the genetic profiling for the aquaculture -- for the salmon aquaculture industry as well.
Q Yes.
DR. MILLER: You know, as a DFO scientist, we work to -- we do work for a variety of different stakeholder groups.
Q That's fair enough. But I'm trying to bring this

to a more personal level. This is your husband's company that you are providing this scientific advice to, is it not?
DR. MILLER: My lab is providing scientific advice at the present time to six companies, his being one of them.
Q Yes. And it also -- would it surprise you to know that when one does research, Ocean Smart Incorporated out of Maryland, that you are referred to as a "significant employee"?
DR. MILLER: I was unaware. I'm not actually an employee, so I would be surprised by that. I --
Q You -- sorry, yes. You have never received any income from either of three companies, Island Scallops Limited, Edgewater Foods or Ocean Smart Incorporated?
DR. MILLER: That is correct.
Q And I assume from that you are not a shareholder of any of those three?
DR. MILLER: No, I'm not.
Q Thank you. But your husband is, obviously.
DR. MILLER: Yes, he is.
Q And he is a major shareholder of those companies, or those companies when they were active.
DR. MILLER: Yes, he is.
Q And the current active parent company is Ocean Smart Incorporated?
DR. MILLER: Yes.
Q And you agree with me that clearly this company's entire foundation of enterprise is aquaculture?
DR. MILLER: Shellfish culture, yes.
Q Yes. But the company also gives advice, does it not, in the sablefish industry in terms of farming?
DR. MILLER: They did a couple of years of proof of concept work on sablefish. They were never a fully-fledged sablefish production company.
Q But your husband has given advice to that industry, hasn't he --
DR. MILLER: I don't believe he --
Q -- at conferences?
DR. MILLER: I don't believe he does provide any further advice with it comes to marine fish.
Q Further advice from what, I'm sorry?
DR. MILLER: Well, I mean, they worked on that, I don't know, seven years ago or something. They were one of the first companies that tried to get that, the

sablefish culture up and running in B.C., but it's a very expensive enterprise as many individuals might know, and they decided not to continue pursuing it and just stick to shellfish.

Q I see. Finally, on this topic, I simply felt that it was incumbent upon me to have all this on record, that it should have been stated at the commencement of your testimony and so I'm doing it now to complete the record, and I thank you very much for your response to my questions.

If I am given two or three more minutes? I'm given three minutes.

We've talked a lot about funding, and as we listen to the testimony of both of you in respect to where we're at in the research and all these big questions that remain unanswered and the work that you feel is in the public interest to be done to start connecting the numbers to make a lot of sense out of this and hopefully bring some positive results to the resource. We've had testimony given here throughout this inquiry of the shortage of funds. We have had the Deputy Minister Clair Dansereau speaking to five percent reduction dictated by Treasury Board and so on. Are either of you optimistic that in the next three, four years, you are going to receive the kind of funding from DFO that you believe is necessary to take these next incremental steps with your research.

First of all, Dr. Miller?

MR. TAYLOR: I object. Mr. Rosenbloom can ask what they know about what they will have, as well as what they do have. But to ask are they optimistic is simply an exercise in speculation.

MR. ROSENBLOOM:

Q Do you have any confidence that you're going to receive this funding that you feel is necessary?

MR. TAYLOR: My objection went to that he's not asking what they know. He's asking what they want or could or might speculate or have optimism towards.

MR. ROSENBLOOM: I think it's important for the record that this inquiry, where there are scientists who are testifying of work that they feel has to be done to take the next incremental steps of what's been before us, we should be aware of whether they feel there are ways and means where they will receive that kind of funding.

THE COMMISSIONER: I was just going to suggest that --
MR. ROSENBLOOM: I wonder if your mike could be put on? I'm sorry.
THE COMMISSIONER: I apologize, Mr. Rosenbloom.
MR. ROSENBLOOM: Thank you.
THE COMMISSIONER: What I was going to say, I thought where you were coming to now would be helpful to me, that's ways and means. In other words, there is a process, that they've already testified to, in place for receipt of funds. Perhaps you can just get them to let us know where they're at in that process, because there is a process in place that they've already mentioned.
MR. ROSENBLOOM: Yes, indeed.
Q And the answer to that is...?
DR. MILLER: The process, in terms of receipt of funds for the present time now, or are you talking well into the future?
Q No, I'm talking about now into the next year to two years. You've spoken about the fact you have no funding right now.
DR. MILLER: Right now, it's somewhat insecure. You know, until we have a solution towards how we're going to fund our staff, we have to come up with all of the money to fund 11 indeterminate staff out of DFO-only money, and we've never done that before. We've always funded them largely through external funds from the Pacific Salmon Commission, Genome British Columbia, even First Nations, other stakeholder groups.

Now we can no longer do that, so we are told by upper management that there will be solutions, that our staff will be somehow covered, but I haven't heard any concrete plans on how that's going to take place.

So I have been approached by a number of groups to do other work, using external funds -- again, work that is within the mandate of DFO and carries on, on the work that we're doing here, but I really can't accept funding from these groups until I know how my staff are going to be covered.

So I'm in an insecure place, and I'm not the only one -- my group is not the only one affected. We just happen to have the most staff affected potentially of any single group. So I am assuming that there will be some solution to the Pacific Salmon Commission issue and that they may make an

exception. I'm hoping that we can still work with the Pacific Salmon Commission so that we can provide the Fisheries Management advice that they actually need to open and close fisheries.

I do think that because I think that is important enough, that there will be some solution that will be let. That still leaves the genomics program very wide open.

Q It's a little troubling right now, isn't it?

DR. MILLER: It is troubling, and it's stressful.

Q Thank you. Dr. Garver, do you have anything to say in respect to the funding situation?

DR. GARVER: So far, during my science career, funding is a perpetual problem. It's very expensive to do research. There is often limited funds to seek money through, and so you always have to have research that is of interest to multiple agencies and multiple funding groups to get research dollars. Yeah, funding has always been a problem in my program, and I presume it will continue.

MR. ROSENBLOOM: I thank you very much for both of you answering my questions.

MR. MARTLAND: Mr. Commissioner, there's re-examination first by Canada and then by Ms. Chen.

CROSS-EXAMINATION BY MR. TAYLOR:

Q Let me start by addressing what Mr. Rosenbloom decided that he felt the need to raise, Dr. Miller, with you. You alluded to this, I think, but I just want to be clear. With regard to the companies that he spoke of, Island Seafood, Edgewater and Ocean Smart, have you made known to the Department of Fisheries and Oceans your husband's role in that and any connection that you have had, as you've described?

DR. MILLER: Absolutely.

Q And have you been given clearance on all counts?

DR. MILLER: Yes, I have.

Q And so you fully disclosed, I take it?

DR. MILLER: I fully disclosed, yes.

Q And they fully agreed.

DR. MILLER: Yes.

Q And are you aware that there's a formal disclosure and process -- that is to say it's not just a matter you had a chat with a manager, you made a formal disclosure, did you?

DR. MILLER: Yes, it had quite -- it was a few years back, but yes, there has been a formal disclosure.
Q All right. I think it's important to remove that cloud that was unfortunately put in place by Mr. Rosenbloom.
I want to turn to funding, if I may. Are either of you familiar with the acronym ACRDP?
DR. MILLER: Yes. Aquaculture Research and Development Initiative Funds.
Q All right.
DR. GARVER: I'm aware of that as well.
Q All right. Whoever wants to go first, are either of you aware of a current initiative for funding from industry to do research with regard to aquaculture and impacts and so forth?
DR. MILLER: Yes. I mean that has been one of the goals of that fund for a number of years. I don't know if something new --
Q All right. What does it do, then? What does this fund do? What is it?
DR. MILLER: I don't know if you want to speak to that.
Q And do either of you benefit from it in your labs?
DR. GARVER: I have had a few ACRDP program fund grants, whatever you would like to call them. My understanding is - and the way I've always used it - is to approach a research question -- a good example is some of the research investigations I was describing earlier with viral dispersion from a net-pen site. You take a research question that you're interested in, and in our case, understanding viral transmission in an aquatic environment. It's also a concern, obviously, with the aquaculture industry. So you form a collaboration such that it's a mutual benefit to both parties, in this case, DFO and the aquaculture, to get these answers out.
So the industry does put in a certain contribution, monetary contribution, and DFO puts in a certain contribution. By doing that, you're able to obtain research funds that then allow you to answer a question regarding something of interest to all parties.
Q All right. Thank you. And did you say that your lab has received some benefit in that regard?
DR. GARVER: Yeah, particularly the viral dispersion model that we're working on right now. That is funded through ACRDP and involves marine harvest,

Grieg Seafoods and Mainstream Canada.
Q All right. What about your lab, Dr. Miller? Do you participate in that?
DR. MILLER: Yes. And especially this year, because I was told I needed to find internal departmental money. ACRDP is one of the programs where there is money available and I can fund my staff. So as a consequence, and due to some of the needs that existed, I have two projects. One I've already disclosed as the Creative Salmon Project using genomics to try to understand a jaundice disease syndrome that they're experiencing, and the second is looking at ocean acidification effects on shellfish in the Strait of Georgia.
Q All right. In terms of funding and your lab, Dr. Miller, the people that you spoke of, I think 11 in number, are they at work right now?
DR. MILLER: Yes, they are.
Q And salaries being paid, I take it?
DR. MILLER: Salaries being paid right now, yes.
Q And management's aware of this issue, are they?
DR. MILLER: Yes. Salaries, we have a one-year reprieve from Pacific Salmon Commission funding, and we are able to pay salaries for this year, using Pacific Salmon Commission funds.
Q All right. I think you spoke to some of this, but to be clear, management is taking steps to address this issue so far as you know?
DR. MILLER: Yes. I believe that they are in discussions in Ottawa about it.
Q This is a Department-wide issue, I take it?
DR. MILLER: It is a Department-wide issue, but there is no other single lab that has more than one or two staff members that have this issue.
Q And I gather what this has to do with is there's a rule, and there's now some facts that have come to light about funding sources, and a fix needs to be found; is that really what it comes down to?
DR. MILLER: Yes. And this has been something that's been ongoing for about a year and a half.
Q Dr. Garver, you were asked some questions by Mr. McDade about whether you thought fit to take action when certain levels of information are given to you. Do you have a decision-making role in fisheries management?
DR. GARVER: I do not.
Q Dr. Miller, you spoke of the 2007 smolts that you

have studied and found the signature in. Do you, from memory, have the number to mind, how many smolts were there that were studied in that year?

DR. MILLER: We only had available to us about 12 smolts that were sampled leaving Chilko Lake, so in the freshwater environment, and ten smolts from the Fraser River that were sampled in Hecate Strait around the end of June, about June 29th, and we also had ten samples that were from west coast Vancouver Island stocks that were sampled at that same location.

MR. TAYLOR: All right. Thank you.

MS. CHAN: Mr. Commissioner, I note the time. I have only two questions in re-examination.

RE-EXAMINATION BY MS. CHAN:

Q Yesterday, Dr. Miller, counsel for the province asked you if the presence of a partial parvovirus DNA sequence means that the full sequence is there, or is it that the partial DNA sequence could be there by chance. I understand your answer was to say that the fact that the partial parvovirus DNA sequence was there would not be by chance. I just want to follow up on the first part of that question which was: Does the presence of a partial parvovirus sequence necessarily mean that the full sequence is also there?

Because we have Dr. Garver here as a virologist, perhaps if I could ask you for your answer first, Dr. Garver, and then Dr. Miller if you have a follow-up to that.

DR. GARVER: A partial sequence does not necessarily mean a full sequence. Identification of a partial sequence does not necessarily mean a full sequence is there. It depends on -- also you can get some indication of how real it could be by alignments and size of it. Typically, as Dr. Miller alluded to, there are endogenous viral sequences in our genomic material, we all have them. Typically they're relatively short. So those sequences don't equate to a full length virus.

So there is some indication if you have a larger sequence, even though it may not be full length, you can hedge your bet that that's a full length viral sequence.

But, no, a partial does not necessarily indicate a full length.

Q From the answer you gave me, is it your bet that the full sequence is there?

DR. GARVER: As of now, there's 2,400 bases is what you have now?

DR. MILLER: A little over 2,200.

DR. GARVER: Yeah, I would hedge my bet that a full length sequence could be obtained upon further going in and sequencing.

Q I'm going to move to my next question unless Dr. Miller, if you --

DR. MILLER: Yeah, I'd like to add to that. If a virus is endogenous, which means that it's within the genome of the fish, it's in the DNA of the fish. And if it's in the DNA of the fish, it is in every cell in that fish. Every cell has the same component of DNA. We do not find this sequence in every tissue within a fish. We have never found it in DNA fin clips. We see it in specific tissues and only in specific individuals. Within individuals, we do not see it in every tissue. So therefore, there absolutely no evidence that this is endogenous.

My second point is we actually have one primer set that does amplify a very short piece of this virus from RNA which suggests that there is some level of transcription occurring of this sequence in salmon. This is something that we're working on some more that would suggest when a virus is active. So this is very, very early stages of that, but so far, I do believe that the data are pointing to an active virus.

Q Okay. My second question is today counsel for the First Nations Coalition asked you, Dr. Garver, what can we do in terms of controlling human activity along the migratory route, and I understood that your answer was to say that biosecurity would be helpful. I just want to follow on that and ask you what did you mean specifically in terms of biosecurity measures in that context?

DR. GARVER: Well, again, without the knowledge that the virus is there and whether it differs between different watersheds, it's a bit premature to implement management strategies. But you could control movement of fish from one watershed to

another if you're -- whether it's live fish or carcasses and that would be something that the Introduction and Transfer Committee would be overseeing and monitoring and making sure that diseases aren't spread from watershed to watershed.

MS. CHAN: Mr. Commissioner, I believe that concludes the evidence for this panel, and noting the time, perhaps if it's appropriate to adjourn to 2:00.

THE COMMISSIONER: Yes. Thank you very much, Ms. Chan, and thank you to Commission counsel. I particularly want to thank Dr. Miller and Dr. Garver for attending at the Commission and for providing your evidence and for answering the questions of all counsel. Thank you very much.

THE REGISTRAR: The hearing is now adjourned until 2:00 p.m.

(PROCEEDINGS ADJOURNED FOR NOON RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: The hearing is now resumed.

MR. MARTLAND: Mr. Commissioner, Brock Martland. With me is Kathy Grant. We're appearing in relation to the aquaculture hearings that are now starting. With respect to one procedural matter at the outset, Mr. Lunn, if you could put on screen, please, the Policy and Practice Report on the Regulation of Aquaculture. And once that appears, I'll ask that that be marked, technically not as an exhibit, as a PPR in these proceedings, please. That's fine indeed. We can set that aside. And I don't mind. Indeed, it's not necessary for my questions today so we can do that in due course.

With respect to the start of today's proceedings, I'll just take a moment to offer really a comment to situate the evidence that we're leading here. First of all, as you appreciate, Mr. Commissioner, through these hearings, we have had a series of different scientific topics, specific reports that have been prepared for the Commission, commissioned by the Commission if you will, and they've been referred to and put in evidence as the Commission's technical reports. They're also made available publicly on the Commission's website.

For the aquaculture hearings, the process

that we've employed has been different than that used for other reports that have been put before you. First of all, the context for most of, indeed for all of these reports, was an application for fish health and fish farm production data, which resulted in your order dating to December of 2010. At that point, Dr. Josh Korman who's here was engaged to organize that data and prepare a quantitative analysis.

We made efforts to identify a single author, who could look to do really a qualitative analysis of the question of aquaculture impacts but also taking into consideration the fish farm and fish health data that I've referred to. That attempt to locate a single non-controversial expert or author for that report proves to be challenging and perhaps more than challenging, impossible to locate a single person who did not attract significant controversy and make that a very challenging process. The result of our work and our efforts on that front was to do something deliberately quite different, which was to engage three different authors to prepare reports on the understanding that they would be approaching this from a different view and also taking into account the participants that had input in the process of suggesting who might be authoring those reports.

So first of all, today's hearings on aquaculture commence with the four authors of the Project 5 reports. I'll be leading their evidence. My examination will run the rest of today and perhaps spill into tomorrow morning. If I might begin then by asking these witnesses please be affirmed.

JOSH KORMAN, affirmed.

BRENDAN CONNORS, affirmed.

DON NOAKES, affirmed.

LARRY DILL, affirmed.

THE REGISTRAR: Would you state your name, please?
DR. KORMAN: Josh Korman.
DR. CONNORS: Brendan Connors.
DR. NOAKES: Don Noakes.

DR. DILL: Larry Dill.
THE REGISTRAR: Thank you. Counsel?
MR. MARTLAND: Thank you. Mr. Lunn, I'll ask for number 4 from Commission's list of documents to be put up, please.

EXAMINATION IN CHIEF ON QUALIFICATIONS BY MR. MARTLAND:

Q And Dr. Korman, I'll begin with you. You, first of all, when we -- I don't see these fish in a moment. I expect you'll see your own c.v. appear on screen. I see it there. Is that correct? That's your c.v.?
DR. KORMAN: Yes.
MR. MARTLAND: I'll ask this be marked as the next exhibit, please.
THE REGISTRAR: Exhibit 1534.

EXHIBIT 1534: *Curriculum vitae* of Josh Korman

MR. MARTLAND:
Q In a summary form, Dr. Korman, you obtained both your Master's of Science degree in biological oceanography in 1989 and your PhD in zoology in 2009 from the University of British Columbia?
DR. KORMAN: Yes.
Q You worked as a systems ecologist with ESSA from 1990 to 1993. In the period of '93/'94, you worked as a research associate with Dr. Peterman at the School of Resource and Environmental Management at Simon Fraser University. And since 1993, you've worked as a fisheries ecologist with Ecometric Research; is that right?
DR. KORMAN: Correct.
Q In 2011, you became an adjunct professor with the Fisheries Centre at UBC and at a general level your research has focused on the effects of flow regulation on salmonid populations in rivers downstream of hydro electrical dams, on the evaluation of fisheries management policies, fisheries stock assessment and the statistical analysis of fisheries data; is that right?
DR. KORMAN: Yes.
Q And sir, you were one of the senior authors of the 1993 provincial review of salmon farming and your Master's thesis focused on the potential

eutrophying effects of salmon farms in the Campbell River area; is that right?

DR. KORMAN: Correct.

MR. MARTLAND: And Mr. Commissioner, based on this witness' c.v., his background and qualifications, Commission counsel ask to have him qualified as an expert in salmonid stock assessment and in statistical analysis, in particular of population level fisheries data.

THE COMMISSIONER: Yes, thank you, Mr. Martland.

MR. MARTLAND: Mr. Lunn, if you could put on screen, please, number 5 on our list of documents? And we'll all have to read carefully under the title as to the author of each of these reports. This one is called 5A.

EXAMINATION IN CHIEF BY MR. MARTLAND:

Q Dr. Korman, you recognize this as being your report prepared for the Commission?

DR. KORMAN: Yes, I do.

MR. MARTLAND: If this might be the next exhibit, please?

MR. McDADE: I'm rising to speak, Mr. Commissioner. It's Greg McDade from the Aquaculture Coalition. I told Mr. Martland that we had an issue if he chose to proceed in this way and the issue is this. I don't think this report should be marked at this time as an exhibit. I think it should be marked if and when the data upon which it's based are marked. As I understand the report, and I don't have any issue with Dr. Korman's qualifications, but I understand he's been engaged to do a statistical organization of a body of data that have been, at least one key part of it, has been marked only for identification. Unless that data becomes an exhibit, this should not either. His evidence is entirely derivative from a body of data.

So until that body of data is produced and becomes an exhibit before the Commission, it's our position that this derivative report should be marked for identification, if admitted at all. The normal course, what would have been the proper course, I would have thought, would be to put the data in that this is based upon and then the report speaks for itself. Absent that, we have no

way of measuring whether this report has any validity at all. So my submission to you is that this should be marked for identification until whatever data it is he's relied upon is produced as an exhibit.

MR. TAYLOR: In the normal course of a trial in litigation, an expert report is marked if the witness is qualified as an expert. This witness has been. And as Mr. Commissioner well knows, there are expert working files that are behind any expert report and they can be made available for counsel and they are sometimes used for cross-examination. The working files support the expert report, not the other way around. Mr. McDade's submission appears to be that the working material, if you like, has to go in before the expert report goes in and I think that's backwards. I support Mr. Martland in tendering the report in question as an expert report and it should be marked as an exhibit. Mr. McDade can cross-examine on working material or data behind it later on.

MS. CALLAN: Mr. Commissioner, Callan, C-a-l-l-a-n, appearing on behalf of Her Majesty the Queen. I would adopt and support Mr. Taylor's position that in the normal course of a trial or other hearings, often expert reports are tendered and the supporting information or background that they rely upon is not admitted into evidence.

MR. LEADEM: Mr. Commissioner, Leadem, initial T., for the record. I would adopt the argument of Mr. McDade, that the report is merely derivative in nature and that unless and until we have the actual data that's properly tendered as an exhibit in these proceedings and not simply marked for identification purposes, we're in the same predicament with respect to this report. It should be marked for identification and we should move on accordingly.

MR. ROSENBLOOM: Yes, Don Rosenbloom for the record. I, too, support Mr. McDade in respect to his submission. If indeed Mr. McDade can be given an assurance by this Commission that the database that is now currently marked for identification will indeed form part of the body of evidence prior to, obviously, the closing of evidence in this proceeding, then surely everybody will be

comfortable dealing with this report and with the cross-examination of the document that's currently in identification. But otherwise, one is left with the danger that a report is filed and the data upon which it is based is not within the evidentiary base of these proceedings and is not cross-examined upon. Thank you.

MR. BLAIR: For the record, Alan Blair appearing for the B.C. Salmon Farmers Association. I think the process that Mr. Martland has adopted is perfectly the correct procedure in seeking to have this expert report marked as an exhibit and I adopt the remarks of Mr. Taylor for Canada.

MS. GAERTNER: Mr. Commissioner, Brenda Gaertner for the First Nations Coalition. I'd like to submit that we deal with the substance rather than the process here and if we can get the data, which I understand is here, obviously it will need to be part of the cross-examination, could be tendered in evidence at the same time.

MR. MARTLAND: Mr. Commissioner, I'll offer, if I might, just a few points here. First, just to clarify, it's true that Mr. McDade alerted me to a concern. I took his concern as being with our marking as an exhibit the spreadsheet that Dr. Korman prepared and I was going to do that, it's on our list of documents, as marking that as an exhibit in these proceedings, as opposed to an exhibit for ID. We had a discussion around that. I must have misheard him or misunderstood. I didn't understand that to be the proper admission of this as a report as an exhibit.

With respect to the question raised at a broad level, in my respectful submission, it cannot be the case that all underlying data must already be in evidence for a report or a document that is secondary or draws on other information to be put in as an exhibit in legal proceedings generally and, in particular, in the context of a public inquiry. With respect, though, to anticipate the concern around Mr. McDade, which I take in large measure to be what Mr. Rosenbloom said looking for some assurance or some understanding that the fish health data that underlies the analysis that was done here be put into evidence, rather than tiptoeing around that question perhaps we should try to, if not address

that right now, see if we have significant disagreement.

To be clear, from Commission counsels' perspective, our approach was to rely on Dr. Korman's spreadsheet and on his report. And our view was that that was the extent of what we needed to ask our questions based on our view of these matters. No surprise, that's not a view that's shared by all counsel here. Mr. McDade has said in clear terms that he needs more than that for him to ask all the questions and cover the evidence that he seeks to ask. I've identified for sometime now with all document holders, if you will, that philosophically in a public inquiry, information would come to light and be made part of the public record unless there's a significant reason for that not to be the case.

Now, the practicality is something I can't comment on with respect to putting abundant amounts of spreadsheet or data that's been collected in as an exhibit. But assuming we can overcome the practicality at a general level, we don't have a difficulty with that sort of information being made public. I'll pause to observe, and I'm afraid I don't have the references at hand, I believe though in the course of evidence on Monday or Tuesday in the Disease Panel, through questions by Mr. Leadem, some of these fish databases or information out of those databases has already been put in as exhibits proper in these proceedings and no one objected at that point.

So perhaps I might, through the Commission, inquire if other counsel raise any objection at a broad level to what Mr. McDade is seeking to do and perhaps Mr. McDade can confirm that I'm right in understanding what he's asking and will be asking to do is to have the fish health database information marked as an exhibit in these proceedings.

MR. TAYLOR: Mitchell Taylor. Speaking for the participant Canada, I'm not completely sure what Mr. McDade is trying to get in at the moment or how it relates to what's already gone in. There's some material in the back of Dr. Korman's report that links to this and that. I don't know if that's what we're talking about. That's, in large

measure, provincial material. But I think at the very least we need to get some clarity as to what's being proposed and then we can consider our position. I've been given no notice of this so I have no idea exactly what Mr. McDade is trying to get in.

THE COMMISSIONER: Given the comments of all counsel and in particular Mr. Martland, my suggestion to counsel would be this. We'll mark this report, at this stage of the process this afternoon, for identification purposes but during the break, if counsel could have a discussion around apparently an issue that rests with all counsel about what exactly it is that Mr. McDade is addressing in terms of having before the Commission. And if that can be resolved then we can move on and I can decide exactly what to do with your respective submissions. But at this point, I would suggest we move on by marking this for identification purposes and letting counsel have that discussion.

MR. MARTLAND: Thank you, Mr. Commission.

THE REGISTRAR: That document will be marked for identification, SS, double S.

MARKED SS FOR IDENTIFICATION: Project 5A June 2011 Salmon Farms Korman - Final

MR. MARTLAND: I think I should only seek to do as much then for the two following documents. Number 11 on our list of documents is a corrections sheet that Dr. Korman prepared to correct a few details in his report. You'll see that on screen.

Q First, I'd like to confirm, Dr. Korman, this is indeed the corrections that you had provided to the Commission?

DR. KORMAN: I don't think that's the correct corrections sheet.

Q Okay. Indeed that's the 5B so I must have the wrong note here, if you'll bear with me for a second. No, indeed, thank you for pointing that out.

MR. MARTLAND: I'll set that document aside and that's a question I will be asking Dr. Connors about that. Indeed I assume, Dr. Connors, you recognize that as being your corrections sheet?

DR. CONNORS: I do.

MR. MARTLAND: All right. I won't address that in

terms of putting that in as a document now.
Q With respect to number 13 on Commission's list of documents, this is a spreadsheet, Dr. Korman, and I've made reference to it before. I take it there's a large spreadsheet that you developed. And in sort of an overview way, if you could tell us simply what this spreadsheet is and what it contains, please?
DR. KORMAN: Yes, so this spreadsheet is, first of all, a compilation of the raw data that was provided to me by the province, BCMAL, and from the B.C. Salmon Farmers Association. So there's a series of sheets that compile data across the years into single sheets. And then from that there's a series of sheets where I've analyzed that data in a summary type of way to come up with inner-annual statistics, for example, on sea lice densities. So basically it's a compilation of raw data combined with some summary tables. So it does, in fact, contact a lot of the information that I think you folks are arguing about.
MR. MARTLAND: All right. And because of that, I'm going to ask only to have it marked as an exhibit for identification, please.
THE REGISTRAR: It'll be marked as TT, double T.

MARKED TT FOR IDENTIFICATION: Spreadsheet prepared by Josh Korman

MR. MARTLAND: Next, I will turn, please, to Dr. Noakes, and I'll ask for number 2 on Commission's list of documents to be put up, please.

EXAMINATION ON QUALIFICATIONS BY MR. MARTLAND:

Q Dr. Noakes, you'll recognize that, sir, as your c.v.; is that right?
DR. NOAKES: Yes, that's correct.
MR. MARTLAND: Thank you. I'll ask this be marked, please.
THE REGISTRAR: Exhibit 1535.

EXHIBIT 1535: *Curriculum vitae* of Don Noakes

MR. MARTLAND:
Q Dr. Noakes, you received your PhD in systems design engineering from the University of Waterloo

in 1985. You have almost 20 years of experience at the Department of Fisheries and Oceans. You first worked as a fisheries scientist with DFO, then acted in the positions of head of the Salmon Division and director of the Biological Science Branch, both at the PBS, or Pacific Biological Station; is that right?

DR. NOAKES: That's correct.

Q From 1995 to 2003, you served as the director of PBS and head of the Aquaculture Branch. You have contributed to a number of fisheries science organizations, including the North Pacific Anadromous Fish Commission, the International Pacific Halibut Commission, the Science Council of British Columbia's Fisheries Renewal B.C. Science Review Panel, and the Aquaculture Collaborative Research and Development Committee; is that right?

DR. NOAKES: That's correct.

Q From 2003 to 2008, you were both a professor and the dean of the School of Advanced Technologies and Mathematics at Thompson Rivers University; is that right?

DR. NOAKES: That's correct.

Q And you're currently a professor of mathematics and statistics and the associate vice-president of Research and Graduate Studies at Thompson Rivers?

DR. NOAKES: That's correct.

Q You've published broadly on issues relating to wild salmon populations and aquaculture and you are currently editor-in-chief of the American Fisheries Society's Journal of Marine and Coastal Fisheries?

DR. NOAKES: That's correct.

Q Your current research interests include studying the effects of climate change on marine fish populations, early marine survival of Pacific salmon and socioeconomic aspects of natural resource management?

DR. NOAKES: That's correct.

MR. MARTLAND: Based on this witness' background and his c.v. and qualifications, I'm asking, Mr. Commissioner, that he be qualified as an expert in salmon population dynamics, and I'll pause to say this next language varies slightly from what I had provided to counsel in the last few days because of back-and-forth both with the witness and counsel. I'm proposing he be taken as an expert

in salmon population dynamics, including wild salmon/farmed salmon interactions, fisheries climate interactions and in statistical analysis including time series analysis.

THE COMMISSIONER: Thank you, Mr. Martland.

EXAMINATION IN CHIEF BY MR. MARTLAND:

Q With respect to number 7 on our list of exhibits, again, Dr. Noakes, you'll see the same template that this is your technical report for the Commission; is that right?

DR. NOAKES: That's correct.

MR. MARTLAND: I'll ask this be marked as the next exhibit, please.

THE REGISTRAR: Exhibit 1536.

EXHIBIT 1536: Technical Report 5C - Impacts of salmon farms on Fraser River sockeye salmon: results of the Noakes investigation

MR. MARTLAND: I hope to get the right set of corrections this time when I do this. Number 12 on the list of documents, Mr. Lunn.

Q You'll see this is in an email format, Dr. Noakes, but I take it when you look at this you'll see that these are corrections and clarifications that you've identified with respect to your report that are set out in that email?

DR. NOAKES: Yes, there was one additional correction as well.

MR. MARTLAND: Okay. So first, let me have this document, please, marked as the next exhibit.

THE REGISTRAR: Exhibit 1537.

EXHIBIT 1537: Email from Donald Noakes, subject "minor corrections"

MR. MARTLAND:

Q Secondly, because I don't want to forget about doing it later, what is the additional correction that you mentioned that you did?

DR. NOAKES: There was a small typo. Instead of having a "now", it should have been a "know".

Q Okay.

DR. NOAKES: And I sent an email to Patricia Woodruff.

Q Okay. And perhaps we'll follow up at the break

with you. Do you know offhand where that --
DR. NOAKES: It was actually in one of the appendices.
Q Okay. So if someone reads a mistaken "now" they'll "know", so to speak.
MR. MARTLAND: Next, number 10 on the Commission's list of documents.
Q Dr. Noakes and Dr. Connors, unwittingly we unleashed a little bit of tennis between the two of you in terms of a call and response on the criticisms in responses to reports. I'll ask Dr. Connors about his in a moment. But number 10 on our list, Dr. Noakes, you'll see this is your response to what Dr. Connors had to say. Yours is dated August 10 of this year; is that correct?
DR. NOAKES: That's correct.
MR. MARTLAND: I'll ask this be marked, please, as the next exhibit.
THE REGISTRAR: Exhibit 1538.

EXHIBIT 1538: Noakes response to Connors dated August 10, 2011

MR. MARTLAND: Mr. Lunn, if you could bring up number 1 next on our list of documents?

EXAMINATION IN CHIEF ON QUALIFICATIONS BY MR. MARTLAND:

Q Dr. Dill, you'll recognize, sir, your c.v.?
DR. DILL: I do.
MR. MARTLAND: I'll ask this be the next exhibit, please.
THE REGISTRAR: Exhibit 1539.

EXHIBIT 1539: *Curriculum vitae* of Larry Dill

MR. MARTLAND:
Q And to, in a longwinded way, narrate some of your background, Dr. Dill, you obtained your PhD in ecology from the University of British Columbia in 1972, having previously obtained a Master's of Science and Fisheries in 1967, also from UBC. You've served as a professor of biological sciences at Simon Fraser University since 1985 and a professor *emeritus* since 2007. Is that right?
DR. DILL: That's correct.
Q I understand you have over 40 years of experience in biological sciences and your research is

primarily on behavioural ecology, specifically the effects of predation risk on foraging and habitat selection behaviours, as well as the influence of adaptive decision-making by individuals on population and community characteristics?

DR. DILL: That's correct.

Q You have served on the B.C. Pacific Science Forum Science Advisory Committee and you are a co-author of the World Wildlife Federation Salmon Aquaculture Dialogue Report on Sea Lice?

DR. DILL: There's just one correction. It was the B.C. Pacific Salmon Forum.

Q I'm sorry. The Pacific Salmon Forum. That makes more sense.

DR. DILL: Otherwise, that's correct.

Q All right. Thank you. You have an extensive list of peer-reviewed publications including publications relating to predation, parasites and fish farms, as well as salinity and temperature effects on sea lice and salmon?

DR. DILL: That's correct.

Q In the course of your work, you've supervised numerous graduate students and other research personnel and you are a fellow of the Royal Society of Canada?

DR. DILL: That's correct.

MR. MARTLAND: On the basis of that background and this witness' c.v. and qualifications, I ask that he please be qualified as an expert, and again notifying counsel that the proposed language is slightly different, in behavioural ecology, predator/prey relationships and ecological factors affecting wild fishes, including parasites and fish farms.

THE COMMISSIONER: Thank you.

MS. CALLAN: Callan appearing on behalf of Her Majesty the Queen in Right of the Province of British Columbia.

CROSS-EXAMINATION ON QUALIFICATIONS BY MS. CALLAN:

Q Just to clarify, Dr. Dill, you're not a veterinarian?

MR. MARTLAND: Sorry. Just for the record, is this an objection?

MS. CALLAN: It is an objection.

MR. MARTLAND: Thank you.

DR. DILL: I am not a veterinarian.
MS. CALLAN:
Q And you would not consider yourself to be an expert on fish disease or fish health?
DR. DILL: I do not.
Q And you would defer to a fish health expert's opinion or a veterinarian's opinion on what or what is not a risk to sockeye, as far as disease is concerned?
DR. DILL: No, I would not defer because I think there are ecological considerations that have to be taken in that a veterinarian cannot speak to.
Q And would you agree that you're not an expert on diagnosing disorders such as infectious salmon anemia or infectious salmon anemia virus and would have to defer to another expert?
DR. DILL: I certainly would on diagnosis, yes.
MS. CALLAN: Those are my objections. And based on that, I am comfortable, as long as Dr. Dill is clearly identified as not an expert in fish disease.
MR. MARTLAND: I'll just do this slowly to make sure it's clear. I didn't hear an objection to the proposed language. I'd like Ms. Callan to tell me if I'm wrong in my understanding.
MS. CALLAN: I'm comfortable with the language provided as long as it's clear that that doesn't confer anything beyond that in the areas of fish disease and fish health.
MR. MARTLAND: Thank you. So I can repeat it, if that's helpful, but I will ask to have this witness qualified on the basis I have outlined.
THE COMMISSIONER: Yes, very well.

CROSS-EXAMINATION ON QUALIFICATIONS BY MS. GAERTNER:

Q Mr. Commissioner, I'm sorry for rising but the qualification the Province has made and the answers given, I wasn't sure I understood it, fish health and ecological factors are related, aren't they, Dr. Dill?
DR. DILL: That's why I said I would not defer to a veterinarian on questions of fish health. I would defer in terms of diagnosis.
MS. GAERTNER: All right. Thank you.
MR. MARTLAND: On the basis I've outlined, and given the non-objection that I heard, I'll ask to have

Dr. Dill qualified as stated, please.
MS. GAERTNER: Yes, I think we've established that.
MR. MARTLAND: Thank you. Now, I think I did not yet go to number 8 on our list of documents.

EXAMINATION IN CHIEF BY MR. MARTLAND:

Q Dr. Dill, you'll recognize this as being your technical report for the Commission, sir?
DR. DILL: Yes, I recognize it.
MR. MARTLAND: I'll ask this be marked as the next exhibit, please?
THE REGISTRAR: Exhibit Number 1540.

EXHIBIT 1540: Technical Report 5D - Impacts of salmon farms on Fraser River sockeye salmon: results of the Dill investigation

EXAMINATION IN CHIEF ON QUALIFICATIONS BY MR. MARTLAND:

Q Dr. Connors, it's your turn. Number 3 on our list of documents, I expect is your c.v. In a moment I think you'll see that. And I'll confirm, sir, that's your c.v.?
DR. CONNORS: I do.
MR. MARTLAND: I'll ask this be marked as the next exhibit, please.
THE REGISTRAR: Exhibit 1541.

EXHIBIT 1541: *Curriculum vitae* of Brendan Connors

MR. MARTLAND:
Q In brief, Dr. Connors, you obtained your PhD in ecology from Simon Fraser University in 2011. Among other distinctions in 2011, you received a mathematics of information technology and complex systems internship; is that correct?
DR. CONNORS: Correct.
Q You're currently a post-doctoral fellow in the School of Resource and Environmental Management at SFU and your research has included work on disease, mediated interactions between wild and farmed salmon, as well as the ecology and evolution of Pacific salmonids and host parasite systems?
DR. CONNORS: Correct.

Q You're the author on several publications that have examined interactions between sea lice and farmed and wild salmon and you've presented your work both at national and international conferences; is that right?
DR. CONNORS: Correct.
Q You've served as a reviewer for the Canadian Journal of Fisheries and Aquatic Sciences and Current Zoology?
DR. CONNORS: Correct.
Q Among other memberships, you belong to the American Fisheries Society?
DR. CONNORS: Correct.
MR. MARTLAND: With respect to this witness, I ask, Mr. Commissioner, that he, in light of his c.v. and background and qualifications, be qualified as an expert, and to alert counsel the only change here is one of shuffling words to make the language easier to read, I hope, but we'll see if that optimism is misplaced, an expert in statistical analysis, fish population dynamics with a particular research emphasis on wild salmon/farmed salmon interactions.
THE COMMISSIONER: Thank you, Mr. Martland.
MR. MARTLAND: Thank you. Mr. Lunn, if you could please bring up number 6 on our list of documents?

EXAMINATION IN CHIEF BY MR. MARTLAND:

Q And Dr. Connors, you'll recognize this, sir, as being your technical report to the Commission?
DR. CONNORS: I do.
MR. MARTLAND: Mr. McDade, I just perhaps should inquire because this report likewise is based on the same dataset. I would expect in light of that he may have the same objection.
MR. McDADE: Yes, I think that's appropriate, Mr. Martland.
MR. MARTLAND: So perhaps in light of that I could suggest this likewise be treated as an exhibit for ID.
THE REGISTRAR: It'll be marked as UU, double U.

MARKED UU FOR IDENTIFICATION: Technical Report 5B - Examination of relationships between salmon aquaculture and sockeye salmon population dynamics

MR. MARTLAND: And to be consistent then, I'll next go to number 11, which I mistakenly went to beforehand.
Q But number 11 on our list of documents, Dr. Connors, that's your corrections sheet?
DR. CONNORS: Correct.
MR. MARTLAND: This likewise, I'd suggest, should be marked as an exhibit for ID.
THE REGISTRAR: VV, double V.

MARKED VV FOR IDENTIFICATION: Errata to Technical Report 5B

MR. MARTLAND: Number 9 on our list of documents, I referred to the back-and-forth between Drs. Connors and Noakes.
Q And number 9 on the list you'll see with the date of July 27 of this year, Dr. Connors, this is your response to the criticisms and points that Dr. Noakes made in his technical report; is that right?
DR. CONNORS: That is correct.
MR. MARTLAND: I'll ask this be marked as an exhibit proper, please.
THE REGISTRAR: Exhibit 1542.

EXHIBIT 1542: Response to Noakes' criticisms of Connors' statistical analysis dated July 27, 2011

MR. MARTLAND:
Q With respect to finally getting into some questions on your evidence today, perhaps at the outset I'll take a few minutes just to sketch out how I plan to go about asking questions given the time constraints that we face. I'd like to start by not so much rolling up our sleeves and getting into documents, as asking a series of questions with a view of trying to articulate in terms of your conclusions and your view of the Fraser River sockeye question here, whether you indeed in your reports, and I'm thinking here primarily of Dr. Dill and Dr. Noakes, if, in your reports, in many respects you agree on a number of issues. In asking questions at the outset, I will tell you I do plan to come back and give you the opportunity to comment on each of these possible impacts or

factors in greater detail later on.
Is it fair to say that vis-à-vis Fraser River sockeye, in your reports, you find that there is insufficient evidence to find a link between fish farms and the overall decline in Fraser River sockeye in a number of respects? First of all, on the effects of waste from fish farms on both the benthic and pelagic habitat?
DR. DILL: Yes, I would agree that those factors are unlikely to be driving declines of Fraser River sockeye.
DR. NOAKES: Yes, I'd agree with that statement.
Q Secondly, with respect to the effect of Atlantic salmon escapes or escapees, I suppose, on Fraser River sockeye, Dr. Dill?
DR. DILL: I think it's very unlikely that escapees are implicated in the decline of Fraser River sockeye salmon.
Q Dr. Noakes?
DR. NOAKES: I'd agree with that statement.
Q And just to be clear, am I right, Dr. Dill, because there is a distinction between escapes and escapees, but broadly speaking, "escape" might refer to the event whereas "escapees" refers to the lucky or unlucky fish who make it out.
DR. DILL: That's how I'm using the term.
Q With respect to sea lice, setting aside or at least with the footnote with respect to the possibility of sea lice serving as a vector for transmission of disease, would you agree that there is an insufficient body of evidence to find a link between fish farms and the overall decline in Fraser sockeye?
DR. NOAKES: I'd agree with that statement.
DR. DILL: Yes, I would agree with that as well, with some of the *provisos* that I hope will come up later in the questions.
Q And I'll make sure I give you a chance to make those. Certainly with respect to other issues, with respect to the sufficiency of the data and more broadly with respect to the comfort or lack of comfort you take from the regulatory regime, it's fair to say that it's at that point where the two of you part ways in terms of where you agree or disagree. Is that a fair way to put it?
DR. NOAKES: I would characterize it as that, yes.
DR. DILL: I would characterize it as that as well,

although there is also a disagreement over the admissibility of the evidence for long-term declines.

Q Dr. Korman, I'd like to ask you some questions. And at the outset, I'd like to, and I will focus these first questions on you, sir. The first item of business is to make sure that I address what I take to be a mistake that Dr. Sonja Saksida identified to you very recently in an email exchange. We've provided the email exchange to counsel. I don't need to put it in for the purpose of my questions, I don't think. But I'll rather ask if I can simply confirm my understanding of this. Perhaps the best way to do this is, using Dr. Korman's report, Exhibit SS. There we are. Using Exhibit SS and in particular if we turn to page 21 of the report and Figure 7B. I don't know what's less cumbersome here in terms of how we do this. But why don't I start with the two on-screen and ask if you could help us to understand. I take it there's a mistake in terms of part of the Figure 7B. If you could explain, please, what that is?

DR. KORMAN: Right. So what that plot says, it's the average number of herring lice or *Caligus* per fish and that average for each year, trying to show the trend in that. The mistake that occurred was what's actually plotted is the average number of herring lice per pen. Typically about 20 fish per pen are sampled. So those numbers are about 20-fold too large. So in fact, that Y axis that you're looking at in 7B, the maximum value should be about 0.3, not 12. But as far as the actual trends or the differences spatially among some of the fish health zones, those patterns are virtually indistinguishable from this version versus the corrected version because, on average, the vast majority of the time the same number of fish are examined per pen and so you wouldn't expect that error to affect the trends.

Q Okay. So the trend would remain the same. But tell me if I'm right. In terms of the number of lice per fish, this would be accurate if it said average number of herring lice per cage, as opposed as per fish?

DR. KORMAN: Per pen, yeah.

Q Per pen.

DR. KORMAN: Per pen would be the proper terminology, not cage.
Q All right. *Caligus* is what is sometimes called, I think your report indeed refers to as "herring lice"?
DR. KORMAN: Correct.
Q The other type of lice is *Lepeophtherius salmonis*, or *Leps*.?
DR. KORMAN: Yes.
Q And that may sometimes be referred to as "salmon lice"?
DR. KORMAN: Yes, and that's what's shown in Figure 7A.
Q And are those figures accurate?
DR. KORMAN: Yes.
Q With respect to the timing of your work, you may have a memory of the timing of this but I'd like to do it by going to page 50 of this report.
MR. MARTLAND: Mr. Lunn, you'll have to do the math, as you so ably do, with the pdf conversion number.
Q But you'll see this is the very last page. Indeed, you included Commissioner Cohen's ruling with respect to the production of fish health and fish farm data in your report; is that right?
DR. KORMAN: Yes.
Q And so we see here that this ruling is issued on December the 8th of 2010. And if we look at paragraph 72, you see reference to documents being produced by January 21 of 2011. I use that to sort of really situate you and ask, is it in late January or afterwards that you received the data that you used in your report?
DR. KORMAN: Yes.
MR. MARTLAND: If I might go to page 1 of the report proper, please? I don't have the right reference in front of me.
Q But let me ask it this way. Could you describe, please, the objective in undertaking this report?
MR. MARTLAND: Now, that I see it, I've made the mistake of putting in number 1, as opposed to Roman numeral i, so this will be about four pages before in the executive summary, page Roman numeral i.
Q And you'll read along there:

> The main objective of this report is to summarize spatial and temporal trends in salmon farm data the Commission compiled for

its evaluation of effects on salmon farms. This includes information on sea lice abundance and the frequency of bacterial and viral diseases.

That was the objective of your research?

DR. KORMAN: Yes.

Q With respect to the sources of data that were used in your report, pages 3 through 5 describe them at a broad level, is it fair to say, that the sources you relied on first were the BCMAL, which is a provincial ministry that you referred to, and, secondly, industry databases from the B.C. Salmon Farmers Association?

DR. KORMAN: Correct.

Q And in general terms, how recent or how long of a time series of data did you have through those two databases that were provided to you?

DR. KORMAN: For the most part, sort of a complete data series was available from about the last quarter of 2003 through 2010. There's small modifications to that depending on whether we're talking about some sea lice data, some of the production data, some of it goes back a little further in time but only for a limited number of farms. So I would say from a complete point of view, 2003 to 2004 through 2010 is the period of record that we have to work with.

Q And I may not be able to put my finger on it but I believe in your report at one point you make reference to having data that goes back some years before that, indeed even to the 1980s?

DR. KORMAN: Right. There's some production data in terms of the massive salmon produced by DFO's statistical area over time that the province provided to Brendan Connors, which was then passed along to me.

Q Okay.

DR. KORMAN: So that would be a third data source, although that wasn't at all the focus of one figure presents that information but I didn't use it beyond that.

Q Maybe I should go there. Page 15, Figure 1, I'll just confirm, is that the figure that you've just referred to?

DR. KORMAN: Yes, that's the production data from the B.C. Ministry of Environment, I believe.

MR. MARTLAND: Now, this report is in evidence. I have no hesitation in expecting my colleagues to rise if they take issue with what I'm proposing to do.

Q But in terms of reviewing some of the findings that you reached in your report, I'd like to lead mildly on some of these points. First of all, there's an average of a 12 percent mortality rate on farms that you find in the data since 2003?

DR. KORMAN: Yes.

Q The reference in the report is to page 7. No. But on page 7, I think you make reference to 20 to 25 percent of the fish that die on farms being something called "fresh silvers". What's a fresh silver?

DR. KORMAN: It's a mortality from a salmon farm that still has a silvery coloration indicating that it's recently died. And the reason the regulators and the farmers are interested in that is those fish have the highest diagnostic value and that if you're trying to look for a disease and you sample live fish, many of those individuals will be healthy and so it's not a very efficient way of doing your sampling. On the other hand, if you take very old fish that have been dead a long time and are decaying and are no longer silver, they could develop secondary infections and, therefore, it would be very confusing to determine how they die. So fresh silvers are what's used as the most diagnostically valuable fish and that's why I've identified that statistic.

Q Reading from what we see on page 7 in the middle of the page, and I'll just read this:

> Across all farms, an average of 130 FHEs, or fish health events, per year were reported by BCFSA. Approximately 35 percent of these events were associated with mandatory lice treatments or use of anaesthetic to handle fish to conduct lice counts. In addition, separate fish health events at a farm were recorded in situations where a disease outbreak where results from treatment were monitored over time.

Any comment on those conclusions that you reached?

DR. KORMAN: With regards to...? I'm not really clear.

Q Well, maybe I can ask this. Obviously, you

reached those conclusions. Could you give us an understanding of how it is that you worked your way through the data to come to those conclusions?

DR. KORMAN: Oh, well, the fish health events that are compiled by the salmon farmers include a variety of types of events. I mean it may be worth refreshing us about what a fish health event is. It's either a known disease event on a farm or a suspected disease event that triggers veterinary involvement, a change in husbandry practices, application of medicines, that type of thing. So for example, when one is monitoring for lice and using an anaesthetic, that's like by default a disease, a fish health event, even though it actually isn't indicative of a particular disease outbreak on the farm. So that's why I felt it was important to sort of make that distinction here that not all fish health events are serious disease outbreaks. I think that's all I'm trying to get at here. However, a certain fraction of those include farm-level diseases that were considered high-risk to Fraser sockeye salmon by Kent in one of the Commission's reports. And so I felt it was useful to summarize disease events according to high-risk versus other types of events. And that's what's done here.

Q And so you effectively used Dr. Kent, who testified a few days ago, and described his subjective assignment really of a risk level to different pathogens. Did you simply use his high-risk category in your analysis?

DR. KORMAN: Yes, because I'm not an expert in fish health, while he does have those qualifications. So that was my rationale there.

Q With respect to page 9 of your report. I don't have a particular part of this but with respect to *Caligus*, maybe I can ask the question this way. Can you comment with respect to the *Caligus* infection rates and whether they were found to be higher on average than that for *Leps*.? And if it's of assistance to go back to that Table 7, we can do that.

DR. KORMAN: No, so this is to do with that correction. Basically, as I said, the *Caligus* data have a scaling factor problem of about 20.

Q Right.

DR. KORMAN: So in fact, it's correct to say that

herring lice were much less abundant on salmon farms than salmon lice once you make that correct scaling. However, so all the sort of statistics quoted in this particular paragraph need to be adjusted. And I've done that when I discovered this area.

Q All right.

DR. KORMAN: However, it's worth noting that as far as the correlations in terms of trends through time, which are cited here, those --

Q I'm sorry. And just to be clear, when you say "this paragraph in here", what are you referring to?

DR. KORMAN: Oh, I'm talking about I think page 9, paragraph at the top beginning with "Herring lice were more abundant."

Q Thank you.

DR. KORMAN: And you see there's a few statistics presented at the last two lines at the bottom of the paragraph with respect to the trends in lice abundance over time, over years, while the slope values would change, the same conclusions would be drawn, that there are no significant trends over time in the abundance of herring lice over time. And that conclusion remains the same as what's presented in that paragraph.

Q And if I might go to the bottom of page 9 under the heading "Discussion" about four lines down, you write that:

> The combined government industry monitoring program is impressive in terms of the fraction of farms that are audited, the number of pathogens that are tested for, the intensity of industry-based sampling and reporting, and the annual reporting and comparison of audit and industry-based results by regulators.

Now, the word "impressive" would seem to imply that you were commenting on the sufficiency or how good the overall system is. Is that what you were conveying with the word "impressive" or does that have to do with the quality of data that are generated out of the processes that are in place?

DR. KORMAN: My comment referred to, from my experience, the quality and amount of information

coming out of the particular monitoring program. So what you have is an industry reporting system that's fairly detailed, that's on a monthly basis across all farms, and then an auditing system by provincial regulators which basically provides an independent estimate of sort of disease and lice and other fish farm health factors from a very statistically sound subsample of that population of salmon farms and a fairly large subsample as well, including sort of random testing of individuals for a suite of diseases of concern.

And then the final component of what I consider impressive is that that data is analyzed on an annual basis to check whether the industry results line up with the auditor result. And all that information is presented in a website. And from my experience, I have rarely seen that kind of -- that's impressive. And I guess you say impressive relative to what. So if we would go to a few of the Commission reports, for example, on diseases in the wild or how we monitor diseases in hatcheries, you can just refer to those reports, but there's nowhere near this kind of information. If we were to look at, say, another industry in the province that has a big impact, for example, forest harvesting, at the same time as this system was being developed, we were making major changes to the ***Forest Practices Code*** and the monitoring of that completely essentially a lot of, in people's view, gutting it.

So yeah, from an industry perspective, I think it's an impressive monitoring program. That's not to say it's completely adequate for addressing all the questions before the Commission, of course, and I think we're going to get into that discussion, the main problem being that the information doesn't go back far enough in time. But what they're doing now seems very, very sound, from my view. It just doesn't go back far enough in time for the most part. So does that help?

Q Thank you. Indeed, I'll pick up perhaps on part of your answer. Do you have a view or did you ever form an opinion or a concern about whether the data that you were being given was right or wrong in the sense of you trusting the data or not trusting it? Or is that something you simply

didn't -- is that a question you didn't ask?
DR. KORMAN: Coming into this, given all the controversy about the data in the media, I wasn't really sure what we were going to be getting and I was concerned whether this project would be successful because we wouldn't receive the data or it would be in a very disorganized or piecemeal fashion. In fact, that expectation wasn't met. The data came on the appointed date or close to it and it was, for the most part, very complete and I couldn't find any inconsistencies with it. When I did find things that I couldn't understand, I was able to contact people. Mark Sheppard, in particular, was helpful but we also had discussions with BCFSA and they helped resolve some of the uncertainties in terms of understanding the data. But I didn't come across any inconsistencies. The only other surprise I had was I was expecting to see a much higher frequency in some of the diseases. And so the numbers were, from my expectation, lower than what I was conditioned to expect based on what I had read in the media.
Q With respect to finally your conclusions in this report, and perhaps I'll use page 10 and read much of the paragraph, if the full paragraph. And starting in the middle of page 10, it reads as follows:

> Negative effects of salmon farms on returns of Fraser River sockeye between 2002 and 2010 were not apparent based on a qualitative comparison with salmon farming data provided in this report. Fraser River sockeye returns show a declining trend over this period with exceptionally low and high returns in 2009 and 2010, respectively. The number of mortalities on salmon farms potentially caused by disease has remained relatively constant over the same period with the exception of the higher mortality in 2003.

I'll pause to ask, what does that last point describe, the higher mortality in 2003?
DR. KORMAN: Right. So if you were to look on the figure on total mortalities, which would be Figure 4 on page 18, that's the data from which that's

based. You can see almost a two-to-three-fold, at least a doubling in the number of dead fish in that year, right?

Q Is there an explanation for that year?

DR. KORMAN: Well, you'd have to refer to people in the industry might, as I recall it, IHN-related losses.

Q All right. And Dr. Noakes, I can see you nodding along. I think your report indeed addresses some of that and I certainly invite you to pick up on that in a few minutes. I'll continue reading back from page 10, in the middle of the paragraph.

MR. MARTLAND: I'm sorry, Mr. Lunn.

Q

> The frequency of disease events considered to be high-risk for Fraser River sockeye showed a declining trend between 2003 and 2010 based on industry data and no trend based on provincial audit data. The number of salmon lice infecting farmed salmon and spring and throughout the year declined significantly between 2004 and 2010. Salmon lice infection rates in spring 2007 when juvenile sockeye from the Fraser River that formed the poor adult return in 2009 migrated past the farms was 40 percent below the 2004 to 2010 average.

Can you put that last conclusion in layperson's terms, if you will?

DR. KORMAN: Right. So essentially, if we're looking for a reason for why the 2009 adult returns were so low, the majority of those sockeye returning in 2009 left as smolts from the Fraser River and swam past the salmon farms in 2007. So it's reasonable to ask in just a qualitative way, did we see anything exceptionally bad going on in the salmon farms in 2007 that might explain the really poor survival of those 2007 smolts not making it back in 2009 as adults. And that's where I just started looking at these statistics from the salmon farm.

Where the lice in high numbers were, was there a big outbreak of a particular high-risk disease, and this paragraph basically says that, no, in general, there was nothing unusual about 2007. In fact, some of these things of concern

have been going down slightly over time yet sockeye survival rates have been going down. And so what I was saying is there's no obvious, very obvious relationship showing up on this very simple analysis that's presented in this paragraph. And then Dr. Connors, of course, will use lot more sophisticated techniques to do this but I'm just doing this in a very qualitative way.

Q All right. And now obviously the 2010 return was famously big. What about the 2008 fish and what you saw there vis-à-vis information from the fish farm?

DR. KORMAN: Right. So there you see pretty similar conditions in the fish farms, as measured by these various health audits and BCFSA samples, similar conditions to other years yet an exceptional run. Now, if the salmon farms were having a very large, year-by-year effect, then you would have expected maybe to see no disease on those farms or unusually low levels of lice. That's what that would be but that wasn't the case. They were pretty typical.

Q And on the top of page 11 because I think it matters to make this point. You make the point about the inferences from statistical analysis and the limitations because of the number of years of available data. Could you tell us what that note of caution is that you're making there?

DR. KORMAN: Right. So the situation is that to computer a survival rate for sockeye salmon, you need five years to elapse from the time they spawned until the oldest fish from that brood return, right? So basically the last year of ocean entry that we can really look at is 2006. Smolts going out past the farms in 2006 returning as four and five-year-old adults in 2008 and 2009. So basically 2006 is the last year of sockeye survival that we can look at in terms of ocean conditions or fish farm conditions. And yet the salmon farming database really only begins in a robust way in about 2003 to 2004.

So you're only left with about four years of overlap and to correlate conditions on the farms with survival rates of Fraser River sockeye. And in statistics, that's a very, very low sample, which means two things. For one, if there a true relationship, it's going to very difficult to see

it with that small sample size because your statistical power will be very low.

Conversely, it's also possible to, not from a statistical sense, but just by random chance, to see a relationship between those variables just because you've got such a very low sample, that random chance can actually make it such that you'll see a positive correlation when, in fact, none exists. So therefore, there's going to be limited ability to learn something from statistics given our current data availability. Ten years from now, very different story when we'll have 13, 14, 15 years of data. So that was the point I was trying to make there.

Q Thank you. Dr. Connors, I'd like to move to you and ask about your report.

MR. MARTLAND: Exhibit UU, I think, is Dr. Connors' report. And if I could please move to Roman numeral i, page Roman numeral i of that report, and the objective summary. I think it may be the next page.

Q At the start, we read:

> The objective of this technical report is to quantitatively evaluate the relationship between Fraser River sockeye salmon productivity and (a) sea louse (*Lepeophtheirus salmonis* and *Caligus clemensi*) abundance on farmed salmon, (b) disease frequency and occurrence on farmed salmon, (c) mortalities of farmed salmon, and (d) salmon farm production. These analyses are intended to inform the work of other contractors who are preparing comprehensive reports on salmon aquaculture and Fraser River sockeye salmon dynamics for the Cohen Commission.

That was the objective of your report?

DR. CONNORS: That is correct.

Q When you refer to "other contractors", I take it you're referring to the gentleman to your left on the panel right now?

DR. CONNORS: Correct.

Q Drs. Dill and Noakes. What was the data that you relied on? Was it the same, to your understanding, data that Dr. Korman has described

in terms of being these databases from industry in the province?

DR. CONNORS: Correct. So I related the data that Josh compiled to the data that was compiled in, I believe, Technical Report 10, on sockeye population dynamics by Dr. Peterman. In addition to that, I did include two other variables that have been independently identified as possible to likely contributors to declines in Fraser River sockeye. These are measures of oceans conditions, as well as competitors out in the open ocean. These were identified by a Pacific Salmon Commission expert panel in June of 2010. And so those were the sources of data that I considered in my statistical analysis.

Q I'd like to start at the end in a sense by moving to the conclusions that you've reached and I'll use the executive summary as the shorthand way to do this. First of all, is it fair to say your report has two components to it, in a sense?

DR. CONNORS: That is correct.

Q If I deal with the first, please correct me if I have this right or wrong, but you're having a look at the sockeye survival vis-à-vis a number of aquaculture variables?

DR. CONNORS: Correct.

Q If we have a look at the third paragraph, it begins "The first part". This is on page Roman numeral i. And about a third of the way down, you write:

> I related survival anomalies to (a) sea louse abundance on farmed salmon in the spring/summer of the year of sockeye marine entry, (b) the occurrence of high-risk pathogens on farmed salmon in the year sockeye migrate to sea, (c) the proportion of farmed fish that died of disease or unknown causes (“fresh silvers” in industry jargon) in the spring/summer in the year sockeye migrate to sea, and (d) the number of salmon being raised in salmon farms in the spring/summer in the year sockeye migrate to sea.

First, that describes in a very quick way what you were looking at and then by way of conclusion:

My analyses found no statistical support for a relationship between these aquaculture variables and sockeye survival anomalies.

DR. CONNORS: Correct.

Q What conclusion does that lead you to? Did you expect to see something different?

DR. CONNORS: I wouldn't say I expected to see something different or not. It's simply these are the relationships or lack thereof from the data that I examined. And so this was meant simply to be an objective examination of the relationships between these variables as per the terms of my contract with the Cohen Commission.

Q In terms of the comment to the effect that there's no statistical support for a relationship or really a finding of no relationship, is there an important distinction here between not finding proof of a relationship and being able to say for sure that there is no relationship?

DR. CONNORS: Of course.

Q Could you explain that?

DR. CONNORS: Yeah, I think Josh did a good job of explaining the limited power that we have to detect a true relationship, should there be one, with these limited time series. And so particularly given that *caveat* and the low statistical power that there was to detect a relationship should it truly exist, I think we need to temper any inference we might draw from this analysis. But that said, we shouldn't also discount the fact that, based on the available evidence from those metrics during that part of the time series, there's no evidence of a statistically significant relationship.

Q Dr. Korman offered some comments with respect to the limitations because of the time, the amount of data you had, the length of data that you had. Could you comment on that limitation? In other words, were the conclusions that you drew or didn't draw, were you limited by the fact that you only had data going back to the early 2000s?

DR. CONNORS: Correct.

Q And how big a limitation was that?

DR. CONNORS: I'm not really, to be totally honest, a hundred percent sure on how to respond to that.

Q It is hard to measure something that you can't

compare to. Was it a big limitation?
DR. CONNORS: I think it was an important limitation that should be considered when one looks at this kind of analysis.
Q I'll still use the executive summary, continuing on, the second part of the analysis that you conducted, the second component of your report in a sense, at the bottom of page Roman i and onto Roman ii, you see reference to, first of all, the limitation and not having a dataset and that begins really until about 2003. But then looking to one place where you do have, and maybe I'll read from the bottom of the first page:

> One dataset that does span the entire sockeye time series is the production of farmed salmon (in metric tonnes)...

What does that describe or record?
DR. CONNORS: My understanding of the dataset is that it recorded the total weight of farmed salmon produced in a given region in a given year.
Q And that data goes back, we see at the top of the next page, until the early 1980s?
DR. CONNORS: Correct. My understanding is that this is a complete time series of the weight of farmed salmon produced in the Province of B.C.
MR. MARTLAND: And now I see something strange on the screen because my page Roman ii has a different page break. So I don't know if there may be an error with the page that's at the bottom. Mr. Lunn, could you zoom out and see if we're on page Roman ii? All right. And it may be that I have a different printout. I'm looking for a passage. Ms. Grant may be able to help me and I'll try my best to carry on if I do have a different version. But I have a printout that says in the second part of this report, this may be simply at the bottom of page i. There we go. So it's just a different page break.
Q At the bottom of page i then and onwards, I'll read this out:

> In the second part of this report I related sockeye productivity...

And then you go on to explain what you're looking

at in terms of sockeye productivity.

> ...to this complete time series of salmon farm production as well as two other factors that have been independently identified as likely contributors to declines in Fraser River sockeye salmon: (1) oceanographic conditions and (2) competition with pink salmon in the North Pacific Ocean. This approach allowed for a quantitative comparison of the strength of the relationship between sockeye dynamics and salmon farm production while explicitly accounting for the influence of oceanographic conditions and the abundance of pink salmon in the North Pacific as well as interactions among these hypothesized drivers.

So this describes in an overview way the second component of your work?

DR. CONNORS: That is correct.

Q And then I take in terms of conclusions, the next paragraph to give us in shorthand your conclusions:

> The results of this analysis suggest that increasing farmed salmon production, SST --

And "SST", is that sea surface temperature?

DR. CONNORS: That's correct.

Q

> -- and pink salmon abundance increases sockeye salmon mortality. In addition, the influence of aquaculture production on sockeye mortality was predicted to be greater when SST anomalies are negative (i.e., cool for British Columbia populations) and when pink salmon abundance in the North Pacific Ocean is high. However, there was large uncertainty around these estimated effects, which precludes drawing strong inference from these results.

DR. CONNORS: Correct.

MR. MARTLAND: Mr. Commissioner, I wonder if I could suggest we go to the break? And I don't know if we're able to do a shorter break or perhaps a

five-minute break?
THE REGISTRAR: The hearing will now recess for five minutes.

(PROCEEDINGS ADJOURNED FOR AFTERNOON RECESS)
(PROCEEDINGS RECONVENED)

MR. MARTLAND: Mr. Commissioner, my --
THE REGISTRAR: Excuse me. We're about to resume, folks. Would you please take your seats. Thank you.
MR. MARTLAND: -- my optimism was a little high in both hoping to resolve the documents issue and asking for a five-minute break. We're not quite there, but I think we may actually be making some progress and I am optimistic. I'll suggest that we simply defer that till tomorrow morning, and that counsel with an interest, Mr. Blair wasn't here for it but I would like him to be part of that discussion. So that at 4:00 if we can take five or ten minutes and see, at least identify positions, and see where we stand.

EXAMINATION IN CHIEF BY MR. MARTLAND, continuing:

Q Dr. Connors, I'd like to go back to asking about the second component of your report, if you will. First of all, if you could explain, and I think you alluded to this, you chose SST, sea surface temperature and pink abundance as being additional factors. Why did you choose those two additional factors?
DR. CONNORS: So I chose those two factors because oceanographic conditions early in marine life and competition with other salmonids, particularly pink salmon, in the open ocean later in marine life, have both been independently identified as possible to likely contributors to the decline of Fraser River sockeye salmon. And that was in the Pacific Salmon Commission workshop in June 2010. That was a workshop where experts on a diversity of hypotheses considered the available evidence for and against different hypothesized drivers, and they came to the conclusion that those were two possibly important factors. And so I wanted to include those to make sure that any relationship that I might observe or may not

observe with salmon aquaculture wasn't confounded by the possible influence of these other known factors.

Q With respect to the use of SST, is that -- was that something you took to be really a proxy for oceanographic conditions generally?

DR. CONNORS: Absolutely. It's considered in the salmon oceanography world as an index of the biological conditions that salmon interact with at a given point in time in the ocean. And it can be a proxy for the abundance of predators, the abundance of important prey, resources. And there's a very well-known and demonstrated break point along the coast whereby populations south of the Skeena River respond in one way to sea surface temperature early in marine life. As sea surface temperature goes up, their productivity goes down. And once you cross that break point, as sea surface temperature goes up, productivity goes up. So that's a well-established relationship that I wanted to make sure I accounted for here in this analysis.

Q Now, at the risk of my either misunderstanding, or at least oversimplifying some of your conclusions, at a very basic level is it right to say that in the second component of your report you find some connections, that you find a connection in terms of when Fraser -- sorry, when fish farm production goes up, when sea surface temperature goes up, and/or when pink salmon abundance goes up, you likewise see sockeye mortality going up; is that the basic, the very basic connections that you're seeing?

DR. CONNORS: Yes, with a couple of caveats. And it might actually be instructive to go to figure -- I believe it's Figure 6.

Q All right.

DR. CONNORS: Which would allow us to better visualize those different components of mortality that are being inferred, based on the relationships from the analysis.

Q That's page 20 of your report.

DR. CONNORS: I believe so, correct.

Q And I'll just simply invite you to explain using this, we have a laser, I'm told the laser pointer, if that's helpful to you.

DR. CONNORS: Okay. I think I'll just try and describe

it here on the screen, and if it gets -- gets hard, then I would be standing up there; is that right?

Q Well, I'm not sure. I haven't used it yet.

DR. CONNORS: Yeah. I'll just describe what's on the screen. So just to be clear, the analysis that I did considered the influence of farm salmon production along migration routes in the year that sockeye enter the marine environment. SST in actually the months preceding marine entry, because that's been shown to actually be a better proxy for the conditions they experience that SST actually when they first enter the marine environment, as well as pink salmon abundance in the entire North Pacific in their final year of marine life.

And I also considered not just each one of those variables independently or in isolation, but I also considered the potential for the influence of one variable to mediate or interact with another one. And that's because again the Pacific Salmon Commission workshop very clearly stated that they thought that it was likely that these different kinds of variables may interact in concert. Their interactions may -- or their effects may be additive, which would mean that, you know, mortality from SST is just added on to mortality from something else, or they may act synergistically, in which case as one thing goes up, the influence of another increases along the way, or antagonistically, where when one variable increases, the influence of another variable on something is diminished. So I also considered these kinds of interactions in the analysis.

And what this plot essentially encapsulates is the results of the analysis that considered not just Fraser River sockeye populations, but also other sockeye populations in British Columbia that are known historically to exhibit spatial co-variation and survival. And so these act as important contrasts or reference populations, if you will, for the different variables we considered.

For example, farm salmon production, as you guys saw in the figure earlier today, it certainly occurs to the greatest extent along the inside of Vancouver Island, but it also occurs on the West

Coast of Vancouver Island, and even to some extent on the Central Coast. And so these spatial contrasts and the degree of exposure to aquaculture are very important for trying to tease out any influence of any association with salmon farm production and these other variables. Because for example, pink salmon abundance is something that all the populations are exposed to for a given cohort.

So with that caveat in mind, we'll come back to this plot.

So this distils those associations from the analysis for Fraser River sockeye populations that migrate up the inside of Vancouver Island. And what I mean by that is we took the observed associations, and we then asked what would their predicted influence be on mortality, and here, this is the percent reduction in the number of recruits. These are the adults that returned to spawn over the spawners. So the percent reduction in recruits per spawner in a given generation.

And what the analysis suggests is that -- and I'm sorry, to back up one more time, these panels, the top two are the influence of the very first one that says "SST", is the predicted influence of sea surface temperature at average pink salmon abundance, and zero farmed salmon production. And what you can see is that it's variable from year to year. Some years there's an influence on mortality, and other years sea surface temperature positively affects the populations.

The next panel is "Farm". That's the predicted influence of or association with farmed salmon production on mortality at average sea surface temperature and average pink salmon abundance. And what you can see is that while there's a slight increase through time, it's highly uncertain, and it has almost symmetrical uncertainty around zero, so not much of an effect at all there or association there.

Likewise for pink salmon, which is the next one down that says "Pink". Again, this is standardized, so this is the influence of pink at average SST and zero farmed salmon production, and from the late '80s forward, you can see there's variable influence on mortality from year to year, and a slight increase through time.

Then the final three panels, which are the "Pink x SST", "Farm x SST", and "Farm x Pink" represent the predicted influence of these interactions in the models that were considered on mortality. And we'll jump to the last two, which are the only two that really show anything striking. The "Pink x SST" does show up in there, but it just bounces around zero.

And what these show is for the "Farm x SST", this suggests that in years when SST goes up, the association between farmed salmon production and mortality goes down. And likewise, the next panel, which says "Farm x Pink" suggests that in years when pink salmon abundance is high, the predicted association between farm salmon production and mortality is much greater.

And I apologize for the longwinded explanation, but that kind of distils the results of the analyses that underpin it.

Q What ultimately does that analysis or those analyses, what do they tell us about fish farms?

DR. CONNORS: Okay. Well, that's -- that's a very good question. And this is all based on associations, in a model that relate one variable to another. And so what these tell us is that there is an association between particularly farmed salmon abundance and the abundance of pink salmon in the North Pacific Ocean and declines in productivity. What it doesn't tell us is that farmed salmon production or pink salmon abundance cause these reductions. These are -- these are simply, you know, statistical associations that then need to be considered in a broader context with other weight of evidence to then try and draw inference from there.

Q I'm going to move on to Drs. Dill and Noakes to ask really the two of you some questions at the same time. So I'll ask the question and ask you both to please answer. First of all, with respect to the statement of work for the work that you did for your technical reports, is it right that the two of you had the exact same statement of work, the same assignment, in other words?

DR. DILL: That's correct.

DR. NOAKES: Yes, that's correct.

Q With respect to the database, the fish health and fish production data, were you provided access to

the same data, to your knowledge?
DR. NOAKES: To my knowledge, yes.
DR. DILL: Yes.
Q You both, each of you worked separately in the sense that you did not read or review the other person's report until it was finalized; is that correct?
DR. DILL: That's absolutely correct. There was no contact at all except for a couple of meetings with staff in the office, but we didn't talk about our reports during those meetings.
DR. NOAKES: That is correct.
Q Dr. Dill, I'd like to move through some points, and because the report's in evidence, I will not be looking to try and comprehensively cover it. The report obviously speaks for itself. I'll preface my questions of you by stating and confirming with you, obviously the premise for this report and the basis for this report is a look at connections or interactions between fish farms, or aquaculture, and Fraser River sockeye. And of course, that's a more narrow question than a more broad question about wild fish or wild salmon, or indeed other species of salmon.
DR. DILL: That's correct, and that's why I was asked to bring into the -- into consideration literature and studies on other salmon species in other areas that might inform this analysis.
Q At the outset, I covered off some questions in terms of a host of specific impacts. As I heard you, you by and large were expressing some agreement at a high level. And when I put it to you as a proposition that there was insufficient evidence to form a connection between fish farms and the population level decline over time of Fraser sockeye, you agreed with me when I'm putting it that way in terms of insufficient evidence. Let me spend a little bit of time now on some of those specific points and invite you to offer any further comments.
Dr. Dill, on the benthic and pelagic impacts, which is to say mainly the waste impacts from the operation of a fish farm on the B.C. coast, what was your conclusion vis-à-vis Fraser sockeye?
DR. DILL: My conclusion was that these impacts, though they do exist locally, are probably not sufficient in geographic scale or impact to have been drivers

of Fraser River sockeye declines, or nor is there any reason to expect that differences in outputs between years could explain the difference in returns in 2009 and 2010.

Q Dr. Noakes, did you agree with the conclusion as just stated?

DR. NOAKES: Yes, I do. There was just, as I say, there was the impacts are certainly local to the farms and there was no evidence that it was -- or link, plausible link that would suggest that it's impacting the productivity of Fraser River sockeye.

DR. DILL: The only caveat that I might add to that is that although the impacts of any one farm are local, in the Discovery Island areas there are a large number of farms that the fish have to pass sequentially during their migration, and there simply have not been any studies on what the consequences of that might be.

Q So as I take you, but tell me if I have this right, when you make that point, you're describing that whereas there may not be a measureable impact from a migrating sockeye passing a fish farm, there may be a different picture when one takes into effect the combined effect of migrating past a whole number of farms?

DR. DILL: There may be. That's a comment I would make in relationship to a number of the different factors. I think it's unlikely to be that important when we're talking about benthic and pelagic impacts, though.

Q Okay. With respect to chemical impacts, Dr. Dill, in your report you addressed chemical inputs, SLICE, which is used to treat sea lice on fish farms, chemotherapeutants, antibiotics, antifoulants, disinfectants, what conclusion did you reach with respect to those?

DR. DILL: Well, again, and these may have some negative impacts, but they'd be very local to the farms and very unlikely to have any impacts on the population dynamics of Fraser sockeye.

Q And you also commented in your report about "Structural and operational impacts" of fish farms. That's set out in your report around page 20 and 21. But I take it that talks about things like the interference with the tides and the lights from the farm, and the sort of physical

positioning of the farm facilities?
DR. DILL: Yeah, in particular I was concerned there with the possible impact of lights, which are often left on all night long to increase feeding rates of the fish. And those lights can attract other fish to the farms, including potentially wild sockeye, and if there is - and I'm not saying at this point that there is or isn't - but if there were pathogens being transmitted, this could increase the transmission rate by bringing them into closer proximity.
Q And if I could go in Dr. Dill's report to the top of page 21, please, Exhibit 1540, at the top of page 21, in connection with this discussion about structural and operational impacts, you write:

> For sockeye, this could mean an increased risk of infection by sea lice, bacteria and viruses, and perhaps increased mortality due to predation. Only the transfer of pathogens is likely to be important but there is no direct evidence of this.

DR. DILL: That's correct.
Q Dr. Noakes, with respect both to chemical inputs and the structural and operational impacts of fish farms, do you agree or disagree, or have any comment on what Dr. Dill has just outlined?
DR. NOAKES: Yeah, I would agree that the impacts are likely very local and are not likely to affect the population dynamics or survival of Fraser sockeye.
Q And with respect to Atlantic escapes or escapees, again I take from my initial question that both of you reach a conclusion that there's insufficient evidence to draw that link. Any additional comment on those?
DR. DILL: I would agree with that, but I think in this case I'd go even further than saying there's insufficient evidence. I'd say it's very, very unlikely because of the fact that they are not spawning in the streams that Fraser sockeye occupy. They aren't apparently competing with Fraser sockeye for food. There's very little likelihood that escapees are having much of an impact on Fraser sockeye, if any at all.
DR. NOAKES: Yeah, I would agree with that. The data, there are very, very few Atlantic salmon been

found in Area 29, which is the lower Strait of Georgia, Fraser River. So and again the main impact from escaped Atlantics would be in terms of interaction. I think there's, in terms of disease, farms are a more credible source if there is transfer of disease from farms to -- from farmed fish to sockeye. So I think that concentrating the analysis on that, rather than looking at Atlantics. I think there's -- it's a very, very small likelihood of any negative impact from escaped Atlantics.

Q Let me turn to the topic of sea lice by using, Dr. Noakes, your report, Exhibit 1536, and in particular I'll go to page 16, please. So we read at the top of that page, you write:

> Sea lice have been a significant ongoing problem for farmed and wild Atlantic salmon in Norway, Scotland, and the east coast of North America...

No issue with that, and Dr. Dill would you -- you wrote it, so I presume you don't disagree with it. Dr. Dill, do you agree with that point?

DR. DILL: The first sentence, yes.

Q Yes. Also, elsewhere in your report, Dr. Noakes, I won't take you to it, although I can, you acknowledge that sea lice have the potential to serve as vectors for other pathogens, indeed, you give the example with respect to BKD or IHN; is that right?

DR. NOAKES: Could you repeat that question, sorry?

Q Sure. It probably wasn't very clear. Page 20 of the report may situate that discussion within the same report.

DR. NOAKES: This doesn't look like...

Q So you'll read the paragraph near the top, "There is also the potential", you write:

> There is also the potential for sea lice to act as vectors as for other pathogens (for instance, BKD or IHN) that may cause disease in sockeye salmon.

DR. NOAKES: Yeah, that's correct. There's two ways that that could happen, and it comes from conversations with fish health experts. One is

that they are physically attached to the outside of the lice, and the possibility is that they are somehow -- they have contracted or consumed or have the pathogen inside them and then transfer.

Q Okay. Dr. Dill, do you have any comment on that?

DR. DILL: I think I summarized it -- I know I summarized in my report a number of studies which have shown at least the potential for sea lice to act as vectors of various kinds of viruses and bacteria. I'm not sure that Dr. Noakes wants to suggest that the disease agents involved a vector or vectoring as a means of transmission. I think it's probably just an accidental consequence of their being either present on the surfaces of the lice or in their bloodstream. The potential is there. No one has demonstrated that it has a major impact.

However, I would say that since the lice are actively looking for a host, it could be a very effective means of transmission, because they're looking for another salmon, and so it's a more directed and less kind of a random process.

DR. NOAKES: I think the point I'm making in my report is that it's certainly possible that the pathogens have developed by themselves very effective means of infecting fish. So, for instance, they don't need lice to actually do the transmission. And there's some evidence, for instance, in the Great Lakes where sea lamprey have transferred disease to fish, as well. So I mean, there's always a possibility of a number of organisms in the ocean transferring disease. But I think primarily the diseases themselves have come up with pretty effective ways of transmission.

I wasn't here for the disease panel, but certainly with my conversations with Dr. Garver and others that, for instance, IHN is very effectively transferred through water. So it wouldn't rely, and it probably wouldn't be a significant contribution at the population level for sea lice to be transferring IHN to fish. It's very effective in terms of transmitting through the water.

Q On that note, let's move to the topic of disease. And, Dr. Dill, I'd invite you to describe your view about, or concerns you may have about the role of fish farms and the spread of disease, in

particular in relation to Fraser sockeye.

DR. DILL: Well, my concern is that although my colleague, Dr. Korman, described the -- the BCMAL process and the reporting of fish health events and the data that came from that as being impressive, there may be a number of significant gaps in those data. For example, only 20 to 25 percent of the mortalities, and we heard that's about 12 percent of the caged fish per year, only 20 to 25 percent of those are fresh silvers, which are analyzed. So some large percentage of the mortalities are not being analyzed for disease at all. Many of those may have died from causes that are not related to disease whatsoever. They may be predation events or low oxygen levels, or something. But undoubtedly some of them did die, they're lying on the bottom of the cage and rotting and they could be releasing pathogens of one sort or another.

In addition, even though fresh silvers, which are analyzed by BCMAL veterinarian pathologists, some fairly high percentage of those, I think 60 to 70 percent, there's no cause of death identified, which suggests that there may be something killing these fish that is not actually being screened for. So I think there's the potential for some things to be missed. If new diseases evolved or new strains, mutant strains of diseases evolved, they may evolve more rapidly than diagnostic technique would allow us to detect them. So my concern is partly that.

It's also partly the possibility that some of the fish in the cage, the pens, that appear to be totally healthy, may be asymptomatic for disease, but may still be shedding bacteria and viruses, and I don't know whether that was discussed by the disease agents, but I know there are papers to that effect for some of the diseases that we're concerned with.

And even the vaccinations that we have for some of the high risk diseases, they're not 100 percent effective. I think I've seen numbers like 80 percent or 90 percent. So there is some percentage of fish that may be carrying disease, may be releasing pathogen progeny, and we're not detecting that.

So I take kind of a cautious position on what

may or may not be coming from the farm, but admit that at this stage of our knowledge we don't know, we don't know enough, I don't think, about disease in the farm, and we certainly don't know enough about diseases in wild fish.

Q Dr. Noakes.

DR. NOAKES: Yeah, and in terms of the disease, I mean, I relied on the data that was provided, so, you know, there are all sorts of possibilities, but I tried to really minimize the speculation that I did. And I approached it slightly different than Drs. Connor and Korman. Although I do reference their correlations to sort of declining trends in fish health events and lice, and those sorts of things.

In terms of the data, I actually repeated all the correlation analysis that Dr. Korman presented in his results. So I typically, when I'm working with new data, I don't rely on the analysis of somebody else. I like to get a feel for the data. So I actually went through and calculated those correlations. And they're in agreement certainly with Dr. Korman's analysis.

In terms of the fish health, again I'm of the opinion of Dr. Korman that this is a pretty impressive system of monitoring that they've set up for farmed salmon. The farmed salmon, or salmon farmers themselves do a good job in terms of monitoring and reporting on a regular basis. And in addition, the independent auditing, I didn't -- like Dr. Korman, I didn't see any obvious gross differences in terms of what was being reported by the salmon farmers, and also what was being dealt with in terms of -- or reported through the audits.

Rather than simply look at in gross -- at the gross level in terms of fish health events, and looking at the correlation, I took a little different approach to it, in the sense that I went through the data, and again regenerated all of the tables that were presented in the Korman report. I redid all of the pivot tables to make sure that the numbers in terms of IHN diseases for a particular year matched up. And the reason I did that is when I went through the analysis, what I was looking for was I was trying to find at the farm level what disease at what level, or at what

-- in what year that disease occurred. So what I was wanting to find out was, okay, for IHN, if I had 15 events, which individual farms were experiencing those, and then what I was doing was cross-checking with Josh's table to make sure that in fact I got 15 farms, or at least in some cases these fish health events are documentation of ongoing problems.

So for instance, with BKD, which is the bacterial kidney disease, there were a number of farms in the Salmon, Sechelt, Jervis Inlet area, where they had a number of fish health events for BKD over the years. So they'd have two or three per year. So essentially what that was, is it was follow-up visits. They identified the initial disease, and then there was a check later on, or there was additional treatment to go on.

So these were identified and we confirmed this with Dr. Mark Sheppard, they're identified as individual fish health disease, or fish health events. They had the same case number, but again, they're identified as individual fish health events. So what I did for that was I went through and identified what farm was experiencing which specific disease outbreak and whether it was a recurring problem, or whether it was a single event, which was dealt with in terms of treatment or whatever action was required.

And I did this for each of the four high-risk diseases, which were identified by Mike Kent. So that would be IHN, BKD, vibriosis, and furunculosis. Okay. And the reason I did that is I wanted to see exactly where those are. Because it's important, not only, as you probably heard from the disease experts, it's important to see where the diseases are occurring and where the fish are migrating by, in terms of the sockeye, because if they're not migrating by the farm, then certainly the risk association with that disease outbreak is significantly reduced in terms of the impact on Fraser sockeye.

And so what I found for some of the diseases that a number of the fish health events that were reported by Korman, the number was accurate, but a lot of those were actually occurring on the West Coast of the Island, which were not impacting the main runs of the Fraser River sockeye, which go up

through between Mainland B.C. and Vancouver Island. And then for some of the others, for BKD, for instance, I found a lot of them were in Jervis Inlet and Sechelt, so pretty tangential to the analysis.

So, as I say, I didn't look at the -- although I acknowledge and make reference to the Korman and the Connors statistical analysis of these trends in fish health events, I went down right to the farm level to make sure I understood exactly what was happening. So, and as I say, I redid -- not that I didn't trust Dr. Korman, but I redid it as a crosscheck to make sure that we were getting exactly the same numbers, so that when I was listing the farms, I could say, yeah, there was 15 in Josh's table and there are 15 farms that are listed, some repeated times.

So that was sort of a long explanation. But by and large I think I'm quite confident, having looked at that level of detail in terms of the fish health events that are reported, and also the fish health audits, which I also looked at, that it's -- that I was not as surprised as Josh to see the limited number of fish health events, but certainly it gave me good confidence that the disease is not having a major impact, or is not likely to have a major impact on the survival of Fraser sockeye.

Q Dr. Dill, you had a comment?

DR. DILL: Well, I think Dr. Noakes has done a very good job of presenting and re-analyzing the data that do exist on diseases that have been identified. But I want to reiterate that if we're not looking for something, we're not going to find it in the dataset, and we can't do anything about it. And I'm thinking now of Dr. Miller's parvovirus, or any other number of diseases that might be out there that we're not looking for.

Q With respect to, Dr. Noakes, in your last answer, you talked really about engaging yourself in the very dataset -- the same dataset that you were -- that Dr. Korman's report is based on. I take it, it was useful to you to have access and to be able to engage directly in that data, to make use of it for your report and analysis?

DR. NOAKES: Yeah, absolutely. I mean, as I say, it's not just -- and when we were talking with Dr.

Sheppard, and it was a very valuable conversation to actually understand what the data were actually telling us in terms of what is a fish health event. And one of the questions we had is when we had that conversation, I had identified that, yeah, we had fish health events, but they all had the same case number, and what -- what did the data in the spreadsheet mean with respect to that. So it was very important to understand that.

But again, I couldn't have done the kind of, you know, farm level analysis in terms of the disease without having access to that. And, you know, it's just something that the way I approach the data analysis. It's always good to do some of that analysis so you get a feel for what's going on.

It gives you -- it often will identify, because these datasets are very large, you can identify, for instance, you know, if there's a decimal place wrong or something, because when you plot something you might get a point that's way out. So it's always nice to run some of these just gross kind of analyses just to show that.

But getting back to what Dr. Dill was saying in terms of, yeah, I mean, you can always speculate about the possibility of other diseases. But when I look at the data, and again, as I say, I wasn't as surprised as Dr. Korman was, I mean, the farm fish are pretty healthy. If you look at the number of fresh silvers, it's about two percent per year. So if there was some sort of other disease there, you would expect to see that go up, again recognizing that the different diseases impact different species differently. But if there was something there, you would expect to see some sort of a blip.

Such as in 2003, for instance, you were looking at Dr. -- you were asking Dr. Korman about that one. Yeah, you could go back and it's actually in his tables, it actually identifies the number of fish health events for IHN, spiked then because there was a big outbreak there, so that's what I end up with.

Q We're almost at the end, and perhaps if I might just ask one last question, appreciating we only have one or two minutes to get your quick view on this. I may have a further few questions tomorrow

morning. But the question is this, and I welcome you to disagree with it. Is it fair to say that as between Dr. Noakes, you, and Dr. Gill, to some extent you're -- if I can use a criminal law analogy, is the difference between not proving a case and actually declaring the person to be innocent. In other words, you may have a situation where the evidence doesn't quite take you to the point of establishing or attributing a cause or attributing responsibility, but you may still be suspicious, as opposed to the evidence taking you to the point of feeling confident that the person is innocent. The analogy isn't exact. But I wonder, because I read that sort of tenor to the two of your conclusions, that if, Dr. Dill, if this were a criminal trial, would you acquit with reservations, and, Dr. Noakes, would you go further and make a declaration of innocence?

DR. DILL: Well, what that argument seems to ignore is the results of the Connors analysis, which I know we're probably going to get into a discussion of it, because Dr. Noakes doesn't agree with them. But I started from the basis that there is some evidence of an impact of salmon farms, and was looking for what the causative mechanism might be underlying that. So I would not at this point be able to come down on the side of innocence.

DR. NOAKES: Yeah, I guess I approached from an evidence base, I mean, I really tried to limit the speculation in terms of this could happen, or this could happen. What I really looked at was what data, what evidence do we have. And so for instance, if you're looking at escaped Atlantic salmon, if you look and see how many Atlantic salmon we've seen in the last ten years in Area 29, I think there was -- I'd have to refresh myself, in terms -- I think there was only two fish in the last ten years. So, I mean, to me, that's more than just not proving guilt. I think that that's pretty good evidence that in terms of that, there's a -- you would declare that person innocent, or whatever.

And again, you just go back down through in terms of not only looking at the actual data themselves, but some of the trends. I mean, when you see, for instance, the salmon lice numbers going down, and then you could almost calculate a

positive correlation between salmon lice counts on farms and farm survival. So it's not just the data themselves, it's the trends and it's the whole body of evidence when you look at it, that it's pretty convincing in terms of I don't think it's just that we didn't prove that he was guilty, I think it's leaning quite heavily towards innocence.

But again, it's again, it's a question of how much speculation you want to bring in this. If you're sort of black and white and want to look at the evidence, then that's what it's telling me, rather than woulda, coulda, shoulda.

MR. MARTLAND: I'm going to suggest, Mr. Commissioner, we break till 10:00 a.m. tomorrow.

THE REGISTRAR: The hearing is now adjourned for the day and will resume at ten o'clock tomorrow morning.

(PROCEEDINGS ADJOURNED TO AUGUST 26, 2011 AT 10:00 A.M.)

I HEREBY CERTIFY the foregoing to be a true and accurate transcript of the evidence recorded on a sound recording apparatus, transcribed to the best of my skill and ability, and in accordance with applicable standards.

Pat Neumann

I HEREBY CERTIFY the foregoing to be a true and accurate transcript of the evidence recorded on a sound recording apparatus, transcribed to the best of my skill and ability, and in accordance with applicable standards.

Diane Rochfort

I HEREBY CERTIFY the foregoing to be a true and accurate transcript of the evidence recorded on a sound recording apparatus, transcribed to the best of my skill and ability, and in accordance with applicable standards.

Karen Acaster