

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.

Friday, August 26, 2011

Tenue à :

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

le vendredi 26 août 2011

APPEARANCES / COMPARUTIONS

Brock Martland Kathy L. Grant	Associate 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")
No appearance	B.C. Public Service Alliance of Canada Union of Environment Workers B.C. ("BCPSAC")
No appearance	Rio Tinto Alcan Inc. ("RTAI")
Alan Blair Shane Hopkins-Utter	B.C. Salmon Farmers Association ("BCSFA")
No appearance	Seafood Producers Association of B.C. ("SPABC")
Gregory McDade, Q.C.	Aquaculture Coalition: Alexandra Morton; Raincoast Research Society; Pacific Coast Wild Salmon Society ("AQUA")
Tim Leadem, Q.C.	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")
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.

No appearance	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")
No appearance	Heiltsuk Tribal Council ("HTC")

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1 Vancouver, B.C./Vancouver
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4 2011
5

6 THE REGISTRAR: The hearing is now resumed.

7 MR. MARTLAND: Mr. Commissioner, as we resume today,
8 one easy, and one more complicated item of
9 housekeeping, I hope. The easy one should be the
10 PPR, the Policy and Practice Report we've referred
11 to. Yesterday it wasn't available. You'll see
12 before you the Policy and Practice Report on
13 Aquaculture Regulation B.C. I'm going to ask that
14 that please be marked as the PPR in these
15 proceedings.

16 THE REGISTRAR: That'll be PPR number 20.

17
18 PPR 20: Aquaculture Regulation B.C.
19

20 MR. MARTLAND: The second item of housekeeping comes
21 out of the question of the databases, the data,
22 really, that were provided in relation, Mr.
23 Commissioner, to your ruling in December of last
24 year. We've had a series of discussions with
25 counsel with the view of trying to see where --
26 ultimately what people's positions are in terms of
27 Mr. McDade's request that what I'll call very
28 broadly "the data", but what "the data" refers to
29 is really the data that Dr. Korman's report
30 describes and what he used in his report and his
31 analysis is what we're referring to with that for
32 this purpose.

33 Through those discussions - and I welcome
34 counsel to suggest otherwise if they take a
35 different view - but through those discussions, I
36 don't understand document-holders to object, vis-
37 à-vis B.C. Salmon Farmers or Canada, in terms of
38 the data being made an ordinary exhibit, which is
39 to say a public exhibit before you. So I'll be
40 looking to do that in a moment.

41 Indeed, because Mr. McDade has made the
42 request, he has the footing for making the request
43 and asking to have this material put in evidence.
44 Given the support that a number of participants -
45 not all but a number of participants support his
46 position - our view as Commission counsel wishes
47 to facilitate that and have those materials put

1 in.

2 The objection that we did hear through our
3 discussions was made on the part of the Province,
4 and is made in relation to the data that the
5 Province provided to the Commission and that was
6 used in Dr. Korman's report. So with respect only
7 to the Province's materials, as Commission
8 counsel, we're trying to balance the need to keep
9 these hearings on track. We're on the fifth day
10 of disease and aquaculture; we are on track. I
11 don't want to see that fall off the rails. So I
12 do not want to lose an hour or more of time today
13 with objections and skirmishing over this question
14 of the documents.

15 In light of that, given the objection raised,
16 it's important to participants, some participants,
17 that the data from the Province be properly in
18 evidence before you as an exhibit so that they can
19 use it for questions and ultimately can use it in
20 submissions to say what they like about it.

21 Our proposal as Commission counsel is to try
22 and strike a balance between recognizing that
23 there are real objections that the Province makes
24 and, on the other hand, that there's a number of
25 reasons why this ought to be in evidence before
26 you.

27 What we're proposing, Mr. Commissioner, is
28 that the data from the Province be made an exhibit
29 proper, but not made a public exhibit as has been
30 the ordinary course for exhibits through this
31 hearing, but made a non-public exhibit, not
32 permanently so but simply in the short term. What
33 we're proposing is really analogous to what Rule
34 17.2 governs with respect to application materials
35 which is that, in the short term while this
36 question over the objection is under consideration
37 by you, what would happen is that the Province's
38 data would be put into evidence as an exhibit but
39 marked as a non-public exhibit.

40 We would propose a timeline for the exchange
41 of submissions. We'd suggest the Province
42 objection to the data being public would make
43 written submissions by two o'clock on Tuesday,
44 August 29th; that all participants, including
45 Commission counsel, would provide any written
46 response by two o'clock on Thursday, which is
47 September 1st; the Province would be able to reply

1 to those submissions by Friday, two o'clock on the
2 2nd.

3 At this point I haven't seen the -- I haven't
4 read or understood all of the Province's
5 objections. I do expect Commission counsel may
6 well be supporting Mr. McDade and other
7 participants in asking that these materials be
8 made public, but I'll obviously look to read what
9 submissions they have. That's based simply on our
10 discussions to this point.

11 What that would do, Mr. Commissioner, is
12 simply take this question over whether the
13 province's data should be public or private -- it
14 would be an exhibit, it would be in evidence. It
15 would take the question of public or private
16 offstage in terms of the hearing process today.
17 That would allow for that question to be resolved
18 by way of an exchange of written materials. So
19 that will be my proposal.

20 Now, vis-à-vis that proposal, I expect one or
21 more participants may disagree with what I've
22 outlined. I don't want to lose too much time
23 arguing about the process here either, but on the
24 other hand, before you agree to that, I think it's
25 fair that you hear what those concerns are.

26 MR. TAYLOR: If we're going to go in the order that the
27 participants are numbered, I'll go next. Mr.
28 Martland said that we, amongst others, don't
29 object. I just want to make it clear. While I
30 don't have complete clarity what documents we're
31 talking about, although Mr. Martland very kindly
32 last evening sent a note to counsel which has
33 attached to it some lists which is tremendously
34 helpful, so I appreciate that. At the same time,
35 it's a long list and I've only glanced at it.

36 Not objecting is on the basis that, as I
37 understand it, none of the documents in question
38 are sourced from Canada, so it's on that basis
39 that we're not getting involved, if I could put it
40 that way, in a big way. If I'm wrong on that,
41 I'll be sure to want Mr. McDade or Mr. Martland to
42 correct me.

43 Having said that, the normal process is as I
44 outlined it yesterday, and I'm not going to go
45 over that again. I'll just leave it at that.

46 It's our further position, though, that only
47 what went to Dr. Korman should be what's being

1 talked about here, and not everything on Mr.
2 McDade's list went to Dr. Korman. More
3 specifically - and we'll come to this sometime, I
4 guess - numbers 3, 4 and 20 didn't go, I'm told.
5 On the other side of the coin, Mr. McDade hasn't
6 sought to put in everything that went to Dr.
7 Korman. There's other things that went to Dr.
8 Korman too that Mr. McDade is not pursuing, it
9 seems.

10 You'll hear from the Province. They're going
11 to raise a particular concern and I only note that
12 the concern that they raise, which has to do with
13 voluntary disclosure and chilling effect on
14 voluntary disclosure - I'll leave it to them to
15 describe - is a valid concern and certainly the
16 Government of Canada would be concerned about that
17 too. It doesn't apply, as I say, to us in this
18 particular context, but if you are known as a
19 government to give out documents, there can be
20 some trouble that arises when you're trying to get
21 people that you're regulating to give you
22 information. So I only say it that it's a concern
23 even though it doesn't arise with our documents
24 right here, 'cause we're not involved document-
25 wise. Thank you.

26 MR. MARTLAND: I think it may be the first time I've
27 corrected Mr. Taylor, but I think there indeed are
28 two Canada databases that are part of what were
29 described in our letter of last night and propose
30 today. They deal with Atlantic escape records.

31 MR. TAYLOR: All right. Well, that's interesting.
32 I'll have to revisit what I think on those
33 documents then. I don't know what...
34

35 (OFF-THE-RECORD COMMENT BY MR. SPIEGELMAN)
36

37 MR. TAYLOR: We're fine. Not to take away from the
38 general principle, however.

39 MR. MARTLAND: Next time I'm going to call on Mr.
40 Spiegelman to answer.

41 MS. CALLAN: (Microphone not on) Sorry about that, Mr.
42 Commissioner. Callan, C-a-l-l-a-n, initials T.E.,
43 appearing on behalf of Her Majesty the Queen. The
44 Province is in agreement with the proposal put
45 forward by the Commission counsel.

46 Our concerns are twofold: There's an
47 interest of public -- there's a public interest

1 issue that arises with respect to voluntary
2 disclosure, and the Province, in its role as a
3 regulator, regulates a number of other farmed
4 animals including cows and chickens and pigs. In
5 addition, it receives all -- does all of the
6 diagnostic testing still for fish in the Province
7 for DFO.

8 Our concern, and it's raised by page 94 of
9 Dr. Stephen's transcript, is that if the Province
10 is known to give out confidential information and
11 not try to protect it, then voluntary disclosure
12 could stop occurring. This is a concern because
13 there've been outbreaks in the Province before, as
14 avian influenza, and there are a number of
15 diseases that we monitor and track. The Province
16 wants to know and get voluntary disclosure in a
17 timely manner by the farmers that they have a
18 problem, and if their farm source data weren't
19 protected, there's a risk that they'll stop
20 reporting and timely disclosure won't occur.

21 Our public interest grounds is that we really
22 want to make sure that this data is confidential
23 so we can facilitate a good environment to keep
24 the farmers reporting every time there's a problem
25 and this goes to the veterinarians as well.

26 The second issue that arises is Dr. Marty is
27 in the middle of publishing a process paper, so he
28 has created a novel way to coordinate all of the
29 histo-pathology reports, and this is unique to Dr.
30 Marty. One of -- some of the documents that are
31 referred to that went to Dr. Korman employ this
32 method, and it's in the middle of being published.
33 It won't be publishable if it becomes a public
34 document. So the Province is concerned on those
35 grounds.

36 But if it does remain private, it's something
37 that the Province is willing to share with the
38 Commission because they are good-news documents.
39 It's not that these are bad documents that are at
40 all going to be found to show criticism on the
41 Province's behalf. It's that we're really
42 concerned about these two issues, and on those
43 grounds, we're going to be objecting.

44 But we do support the Commission's position
45 and think it's a fair middle ground.

46 MR. BLAIR: Good morning, Mr. Commissioner, Alan Blair
47 appearing for the B.C. Salmon Farmers' Association

1 and with me today is Shane Hopkins-Utter, my
2 associate.

3 On perhaps a lighter note, I will say that on
4 the issue of public and private, the greatest
5 concern I've heard expressed today is that Mr.
6 Martland is now going public, rather than private,
7 with his scorecard by the number of times Mr.
8 Taylor's made an error. I think he's just at one.
9 I would ask Mr. Martland to be private if he has a
10 scorecard on the rest of us.

11 More seriously, B.C. Salmon Farmers'
12 position, Mr. Commissioner, is that the salmon
13 farming documents can be made public and we don't
14 oppose them being marked as a full exhibit.
15 They've been used by the authors of the various
16 reports here today. Dr. Korman and others have
17 looked at them in some detail and we think it's in
18 the public interest that the public has access not
19 just to the reports, but to the underlying
20 documents. We haven't been able to come forward
21 with that position in part because of the issue
22 around public and private, and the various
23 concerns of some of the levels of government has
24 been something that my client has been respectful
25 of, and it seems as though today we may have
26 worked out a procedure to deal with, in
27 particular, the province's concerns which
28 certainly make sense on a chill effect argument,
29 as Mr. Taylor outlined it.

30 So we have no opposition to B.C. Salmon
31 Farmers fish health database becoming a full
32 exhibit. Thank you.

33 THE COMMISSIONER: Thank you.

34 MR. McDADE: Mr. Commissioner, for the Aquaculture
35 Coalition. Our concern here is the public nature
36 of the inquiry. This is a public inquiry. It's
37 been closely followed by a large number of members
38 of the public. They are not all in the gallery
39 here. They look to the Commission website to be
40 able to look at these exhibits and form their own
41 conclusions.

42 The idea of an exhibit that's somehow
43 private, but not for identification, is a novel
44 one to me, and it's a novel one for this hearing.
45 It's simply unacceptable. In my respectful
46 submission, that's not appropriate for a public
47 inquiry, and the idea that we're going to stretch

1 that out in secret or private written submissions,
2 and not know anything for a week or two about
3 where this is going until this panel is gone is,
4 in my submission, unacceptable to us. We need a
5 decision on this now.

6 What I really wanted to say, though, is I
7 don't understand the Province's objections. The
8 documents that we're trying to submit fall into
9 two categories, as I understand it. Category 1,
10 and the primary category that we're seeking, is
11 the audit results. Those are not voluntarily
12 disclosed from the fish farms. They're the
13 provincial audit results. So that whole question
14 about somehow people won't cooperate with us is
15 simply off the table there.

16 The second category of documents that it
17 might apply to are the documents that come from
18 the B.C. Salmon Farmers Association. The B.C.
19 Salmon Farmers Association are standing up
20 staying, "We don't object to them going in."

21 So my friend's objections clearly have some
22 other route to them, or -- simply unacceptable.
23 We're looking at a very significant problem here.
24 These disease records hold the key to it. The
25 derivative - as you've heard already in chief -
26 the derivative reports are not able to tease out
27 on a global level the actual implications. We
28 have to look at these in detail. I cannot, in 75
29 minutes that the Commission has given me to cross-
30 examine, go through those records in an adequate
31 way through these witnesses. The records have to
32 be a primary exhibit, and they have to be one that
33 the public can look at for it to make up their own
34 minds. Thank you.

35 THE COMMISSIONER: Thank you very much, Mr. McDade.

36 Mr. Leadem, do you have something to add?

37 MR. LEADEM: The only part that I wanted to add, other
38 than to support Mr. McDade with respect to his
39 submission, is that I want some clarification from
40 the Province exactly who is asserting his public
41 interest, and I want that on the record, because
42 there are some legalities associated with that.
43 So I want them to stand up and say -- if it's the
44 Province that -- the Province, Her Majesty The
45 Queen in Right of the Province of British
46 Columbia, that is making this assertion, then so
47 be it. But there are some ramifications to that.

1 THE COMMISSIONER: Yes. Thank you. What we're going
2 to do this morning is to follow Commission
3 counsel's proposal, and I want to go back to the
4 commencement of this panel yesterday. There were
5 some exhibits, Mr. Martland, that were marked for
6 identification purposes that I think should now be
7 marked as exhibits. Let's start with the knowns.
8 There was Dr. Korman's report which I think was SS
9 for identification. That will be marked as an
10 exhibit.

11 THE REGISTRAR: That will be marked as Exhibit 1543.

12
13 EXHIBIT 1543: Project 5A June 2011 Salmon
14 Farms Korman - Final, formerly marked SS for
15 identification
16

17 THE COMMISSIONER: TT was the errata sheet, I believe.

18 MR. MARTLAND: TT, I have a note, Mr. Commissioner,
19 that was the Excel spreadsheet that Dr. Korman
20 prepared and relied on for his database.

21 THE COMMISSIONER: All right. Thank you.

22 MR. MARTLAND: For his report.

23 THE COMMISSIONER: That will be marked as the next
24 exhibit, then.

25 THE REGISTRAR: That will be marked as Exhibit 1544.

26
27 EXHIBIT 1544: Spreadsheet prepared by Josh
28 Korman, formerly marked TT for identification
29

30 THE COMMISSIONER: Then - correct me if I'm in error -
31 there were other documents marked. I believe Dr.
32 Connors' report was marked VV for identification.

33 MR. MARTLAND: My note is UU.

34 THE COMMISSIONER: I'm sorry, UU.

35 MR. MARTLAND: Yes.

36 THE REGISTRAR: UU will be marked as 1545.

37
38 EXHIBIT 1545: Technical Report 5B -
39 Examination of relationships between salmon
40 aquaculture and sockeye salmon population
41 dynamics, formerly marked UU for
42 identification
43

44 THE COMMISSIONER: Again, there was a supplemental
45 document marked VV of Dr. Connors.

46 THE REGISTRAR: That will be marked as 1546.

1 EXHIBIT 1546: Errata of technical report 5B,
2 formerly marked as VV for identification
3

4 THE COMMISSIONER: And there was an SS, I believe, for
5 identification.

6 MR. MARTLAND: I think that is now Exhibit 1543, the
7 Korman report.

8 THE REGISTRAR: That's correct.

9 THE COMMISSIONER: I'm sorry, 1...?

10 MR. MARTLAND: I'm sorry, 1543.

11 THE COMMISSIONER: Okay. Does that cover all of the
12 exhibits for identification?

13 MR. MARTLAND: That, I think, addresses all of the ones
14 that we addressed through evidence yesterday, yes.

15 THE COMMISSIONER: All right. Now, to assist the
16 Commission, Mr. Martland, if you could identify
17 the exhibits that are going to be marked this
18 morning, and there are exhibits over which I
19 understand currently Canada and the British
20 Columbia Salmon Farmers Association do not object
21 to be marked as a public exhibit; that is to say,
22 that they will ultimately be posted on the
23 Commission's website. Can you identify which
24 documents will be marked as that exhibit?

25 MR. MARTLAND: Yes. I'll look to do this -- and just
26 by way of our plan - and I have spoken at least
27 only briefly with the Registrar and Mr. Lunn about
28 this procedure - would be that rather than taking
29 you to Exhibit 2000 today, what we would look to
30 do is simply have marked as the exhibit, whatever
31 our next exhibit number would be, assigned to a
32 document which would be the list of all of the
33 series of subdocuments.

34 We would then, in shorthand, be -- and
35 counsel would need to do this for the purpose of
36 their hearing, for example, saying Exhibit 1550,
37 subdocument 7, subdocument 20.

38 THE COMMISSIONER: Oh, I see. All right.

39 MR. MARTLAND: So that I hope that will become clear as
40 we do it. Why don't I start, if I can try and do
41 it this way. This won't be very elegantly done,
42 but I'll do my best. Let's deal with the Canada
43 documents first. There are two different Atlantic
44 salmon escape datasets, and I will be asking Dr.
45 Korman -- but I don't see any concern with us
46 putting these forward and addressing them. And
47 I'll ask a question or two of Dr. Korman to

1 confirm our understanding of this as we do so.
2 So the first, Mr. Lunn, if you can bring up
3 the Atlantic salmon escape data. There's one
4 that's a CAN number which I'll deal with first,
5 285273.
6 MR. LUNN: Was there previous notice given on this
7 document before?
8 MR. MARTLAND: These were only things (sic) last night,
9 I'm afraid.
10 MR. LUNN: I'm afraid I don't have it. I can get it in
11 a few minutes, sorry.
12 MR. MARTLAND: All right. So then I'll leave that down
13 the list. Now, I don't know, Mr. Lunn, if we may
14 fare a little better with respect to what we
15 emailed around. There was a -- secondly a Canada
16 list, I believe, which was an Excel spreadsheet in
17 fact.
18 MR. LUNN: Yes, the lists I have.
19 MR. MARTLAND: So if I could ask if the Canada -- so
20 Canada's the exception to the list. In fact it's
21 -- Ms. Grant just told me it was the stomach
22 contents which sounds ominous. I hope it's not
23 the stomach contents per se, but the data that
24 describes them. But I hope you'll see on screen
25 -- Dr. Korman, it may be hard for you to see, but
26 we had a discussion about this.
27 At a broad level, I'm going to be showing
28 onscreen, sir, some documents and asking if you're
29 in a position to confirm your understanding that
30 what we are presenting here is indeed the data
31 that was provided to you and that went into your
32 analyses performed in the course of your technical
33 report.
34 DR. KORMAN: This file has been sent to me and I've
35 seen it.
36 MR. MARTLAND: All right. And, yes, it does describe
37 what you received from the Commission and relied
38 on in your report?
39 DR. KORMAN: Yes.
40 MR. MARTLAND: All right. Not all of what you relied
41 on but --
42 DR. KORMAN: Right.
43 MR. MARTLAND: -- in part.
44 DR. KORMAN: This is a very tiny subset, of course.
45 MR. MARTLAND: Okay. So in the absence of objection,
46 I'll ask that this please be marked as the next
47 exhibit.

1 MR. TAYLOR: I don't pretend to understand what these
2 documents are, quite frankly, but I'm told this is
3 the document that is the evidence of stomach
4 content of escapees?

5 MR. MARTLAND: That's my understanding.

6 MR. TAYLOR: Okay.

7 MR. MARTLAND: You'll see fish number eight had grey
8 muck for breakfast. So --

9 THE REGISTRAR: That'll be marked as 1547.

10

11 EXHIBIT 1547: Atlantic Salmon Stomach
12 Contents (Excel)

13

14 MR. MARTLAND: With respect to next, the Salmon Farmers
15 Association, I hope this one is a Word document,
16 Mr. Lunn. It would have been part of our emails
17 from last night.

18 Dr. Korman, we provided this to you as well
19 and indeed I understand that you took the step of
20 checking as against the data you received from the
21 Commission to confirm that what we were listing
22 here accurately described the data that were
23 supplied and that you used in your report; is that
24 correct?

25 DR. KORMAN: Correct. What I did was take the original
26 CD that was sent to me from the Commission and
27 then went through and confirmed that the files
28 listed here were actually sent to me, at least in
29 blocks. Given the hundreds or the many files on
30 the list, I wasn't able to like go one by one, but
31 I've looked at sort of chunks and then found them
32 on here which are on my hard disk.

33 MR. MARTLAND: I understand then you compared it with a
34 view to confirming that these were the same
35 documents and indeed confirmed they are the same;
36 is that right?

37 DR. KORMAN: Yes.

38 MR. MARTLAND: I'll ask, then, that this list of --
39 it's a list of databases, Mr. Commissioner, so in
40 this case I'll be asking that the list be given
41 the exhibit number --

42 THE COMMISSIONER: Right.

43 MR. MARTLAND: -- and then in terms of subdocuments, we
44 would then use the list on the left column of that
45 document.

46 THE REGISTRAR: The list will be marked as 1548.

47

1 EXHIBIT 1548: List of BC Salmon Farmers
2 databases provided to Dr. Korman (Excel)
3

4 MR. MARTLAND: I'll advise counsel that because of
5 questions around document preparation and notice,
6 I hope this doesn't create a problem for us but
7 Mr. Lunn simply does not have all of these
8 datasets available for quick production in the
9 course of hearings today, so counsel who look to
10 go to a particular document using that
11 identification system, we'll need to give Mr. Lunn
12 some notice. They could do so at the morning
13 break. It may be it doesn't arise till Monday,
14 but they'll need to coordinate and give notice of
15 a particular document that they want to move to
16 within that dataset if they want to do that.

17 MR. BLAIR: Alan Blair for the B.C. Salmon Farmers.
18 Just for clarification, so that we're all clear,
19 especially since we're coming up upon a weekend, I
20 want to be clear what is public and what is
21 private. I think I know for sure the list is
22 public. I want to be clear that we're all clear
23 on whether the underlying documents are also
24 public over the weekend before we refer to them or
25 not. Our view is we have no objection to them
26 being public, but I want to make sure that
27 everybody's aware of whether they are public or
28 not based on their underlying status under Exhibit
29 1548.

30 MR. MARTLAND: Thank you for that. Mr. Commissioner,
31 our proposal would be -- there's two components.
32 At the principle level, yes, they're public,
33 they're public exhibits. On the practical level,
34 I see it as highly unlikely that our staff are
35 going to be able to have all of this onto a
36 website by end of day on a Friday. So it's not --
37 that's a question of logistics as opposed to a
38 lack of will or intent to do that. We'll look to
39 do that. It's simply not feasible, I expect, to
40 have that done before the end of today.

41 MR. BLAIR: As a very brief follow-up for those of us
42 who might be able to access those databases and
43 wish to make them public for whatever reason,
44 based on the participants' view of this, are the
45 participants free to talk about them or not? Just
46 they won't be --

47 MR. MARTLAND: Mr. Commissioner, unless you have a

1 different view, I don't see any difficulty with
2 that.

3 MR. BLAIR: I just wanted to be certain.

4 THE COMMISSIONER: Thank you.

5 MR. MARTLAND: Thank you. Now, sorry, so just confirm,
6 Mr. Registrar. We've given an exhibit number now
7 to the BCSFA database, or dataset.

8 THE REGISTRAR: Yes, 1548.

9 MR. MARTLAND: We now move to the Province of British
10 Columbia, and if I might just take a moment.

11 So this time, Mr. Lunn, I hope that from the
12 email attachments last night, you'll see an Excel
13 document which itself is a list of different
14 documents, similar to the last one. What we're
15 proposing to do is have this made the exhibit, and
16 then relying on subdocument references to deal
17 with particular doc IDs. We see those in the left
18 column using the ringtail numbering system.

19 Now, this one, Mr. Commissioner, would be
20 given an exhibit number but with a notation that,
21 in the short term, it is a non-public exhibit, and
22 that'll be the subject of written submissions
23 before you.

24 THE COMMISSIONER: So the exhibit number, then, Mr.
25 Giles is...?

26 THE REGISTRAR: For this next document, it'll be 1549.

27 THE COMMISSIONER: Yes.

28

29 EXHIBIT 1549: List of Province of BC
30 databases provided to Dr. Korman
31 (Word) (Private)
32

33 MR. McDADE: Can I just make a short logistic
34 suggestion? As I see it, those numbers are all
35 consecutive. Rather than have to renumber
36 everything to 1549-1, could we have it 1549-2646
37 and beyond? That'll avoid a lot of confusion in
38 the future.

39 MR. MARTLAND: They may not all be consecutive I
40 understand. They go from -- I haven't looked at
41 this myself, but I'm being -- Ms. Callan's
42 indicated that.

43 MR. TAYLOR: Well, to the extent that there's a number
44 with them already, whether they're consecutive or
45 not, Mr. McDade's proposal seems to make sense so
46 we don't --

47 MR. MARTLAND: All right.

1 MR. TAYLOR: -- even get more confused.

2 MR. MARTLAND: That's fine. There's some wisdom to
3 that, so let's do that. In terms of what we're
4 referring to, then, will be subdocuments based on
5 the doc ID, ringtail number, on the B.C.
6 production. I'm sure Mr. Lunn appreciates all
7 this.

8 MR. LUNN: I may have to, just in terms of our own
9 internal database, get back to you on whether
10 that's feasible for exhibit numbers. They may not
11 be.

12 MR. MARTLAND: Maybe, Mr. Commissioner, we can defer
13 the question, and counsel can do their best to
14 refer to either or both of the column number and
15 the doc ID number and we'll try to do that. We
16 can sort through how to identify them as exhibits.

17 I should ask Dr. Korman, with respect to --
18 doing this after the fact, I appreciate -- but
19 with respect to what you see on screen, sir, do
20 you recognize this as being the production
21 received from the Province?

22 DR. KORMAN: Yes, I do, and it's worth noting that
23 there's some duplication in here. Some of these,
24 for example, histo-pathological reports would also
25 be summarized in a larger provincial database
26 which is further down the list in this larger
27 list. So just so you're aware you're looking at
28 various hierarchies of information here.

29 MR. MARTLAND: Thank you. So, Mr. Commissioner, I'll
30 maybe just confer with my colleague to see if I've
31 addressed all these matters.

32 So as an outstanding, I've made a note that
33 we need to return to the escapee Canada ringtail
34 document, and perhaps if counsel don't mind me
35 intervening for that logistical reason after the
36 break, I'll look to just do that briefly at that
37 juncture.

38 I think that concludes our logistical work
39 today. It's used up some time, but we've made it
40 at least that distance down.

41 THE COMMISSIONER: And I just want to make it clear to
42 all counsel and participants in connection with
43 Mr. McDade's remarks earlier, that these documents
44 that have just been marked, in one case using
45 terminology they're not for public but for private
46 until I've received submissions, does not preclude
47 any of the counsel or participants from cross-

1 examining on these documents. They are now in as
2 exhibits with that one exception relating to the
3 Exhibit 1549.

4 MR. MARTLAND: Thank you. That having been done, and
5 mindful of the timing that we're on here, I've
6 effectively covered the ground I wanted to cover
7 through my questions of the panel. Just to
8 narrate the issue as opposed to going through it,
9 Dr. Connors and Dr. Noakes --

10 THE REGISTRAR: Excuse me. Before you get started, Mr.
11 Martland, did you wish to mark the document you
12 were referring to earlier as CAN number 285273?
13 We can do that now if you wish.

14 THE COMMISSIONER: It's 1547, is it not?

15 MR. MARTLAND: I think we're talking about the second
16 Canada database. Mr. Lunn wasn't in a position
17 yet to put that on screen.

18 MR. LUNN: I'm still not, but if you wanted to mark it
19 consecutively --

20 MR. MARTLAND: If there's no objection to doing that, I
21 think it makes sense that we simply go ahead and
22 do that, and if --

23 MR. TAYLOR: Mr. Spiegelman says it's fine.

24 MR. MARTLAND: Oh, good. Well, I'll see what Ms. Grant
25 says.

26 THE REGISTRAR: So that would be marked as Exhibit
27 1550.

28
29 EXHIBIT 1550: Atlantic Salmon Escape Data
30

31 MR. MARTLAND: Thank you, Mr. Registrar, for that
32 point.
33

34 EXAMINATION IN CHIEF BY MR. MARTLAND, continuing:
35

36 Q Dr. Connors and Dr. Noakes -- first of all, Dr.
37 Noakes, in your technical report, sir, would you
38 agree that you, in a sense, went out of your way
39 to analyze and critique Dr. Connors' technical
40 report? Is that a fair way to put it?

41 DR. NOAKES: I wouldn't characterize it like that. I
42 think it's important to note that I raised these
43 issues and concerns at our data meeting on
44 February the 10th, and at least at two other
45 occasions did I raise them. So from what I
46 understand in terms of the statement of work for
47 Dr. Connors, he was to provide that information to

1 both Dr. Dill and I to use. So in that sense, I
2 was responding to it because I was either finding
3 it useful or not useful.

4 So my criticism was basically addressing the
5 issues and concerns that I raised in my evidence.

6 Q All right. And certainly I don't have it in front
7 of us, I don't know that I -- I don't plan to ask
8 a lot of questions, but I think it's page 5 of
9 your report, and for some part of your report you
10 engage in a written critique.

11 In addition to that, one of the documents now
12 in evidence is your response -- or, rather, your
13 -- what happened here is I think I used a tennis
14 analogy. You fronted the first volley over the
15 net which was in your report proper. Dr. Connors
16 responded through a written document, and his
17 response is now Exhibit 1542. In turn, you
18 responded August the 10th with what's Exhibit
19 1538, the document we showed you at the outset.

20 Is that fair to say?

21 DR. NOAKES: Yeah, the timeline is fine.

22 Q Okay.

23 DR. NOAKES: As I say, though, it's not an issue that
24 came up immediately when we saw Dr. Connors'
25 initial draft report.

26 Q Okay.

27 DR. NOAKES: These are issues and problems that I
28 identified very early in the process.

29 Q And, Dr. Connors, for your part, likewise, you did
30 your report, it was circulated. You then, I take
31 it, in terms of the sequence of this, you then
32 read Dr. Noakes' report and saw that he addressed
33 a number of criticisms about your work, and you
34 did a written response to those criticisms.

35 DR. CONNORS: That's correct. That was the first time
36 I'd heard any criticisms of the report from Dr.
37 Noakes when I read his final version of his
38 technical report.

39 Q And your response is Exhibit 1542. That's the
40 document I showed you at the outset of our
41 proceedings.

42 DR. CONNORS: That's correct.

43 Q So it really narrated the debate without engaging
44 in it quite deliberately, and it's simply because
45 I fully expect that other counsel may engage in
46 it. I don't plan to ask you further questions
47 about it. I will give this, if you will, a one or

1 two-minute opportunity if you wanted to make an
2 additional point to what's made in the written
3 exchange of views on this.

4 Dr. Noakes, did you want to do that, sir?

5 DR. NOAKES: Just very briefly highlighting -- I mean
6 the two areas of concern that I have are: one, in
7 terms of using the fish production as a proxy of
8 pathogen exposure, I go through, in terms of my
9 critique, basically showing that it's not a
10 reasonable proxy of pathogen. It's not consistent
11 with the available evidence, fish health evidence
12 or disease evidence that we have from the farm,
13 and it's not consistent in a number of other
14 areas.

15 So on that basis, really, in terms of looking
16 at interactions between farm salmon and sockeye
17 production, the analysis that was presented in Dr.
18 Connors' report is not useful.

19 That said, if you ignore that, then basically
20 if you go onto the modelling, I do have some
21 fairly technical -- I don't want to get into the
22 technical issues here, but there are some fairly
23 technical details in terms of problems that I
24 identified with the modelling process and the
25 modelling outcome itself. I'll just leave it at
26 that. The documents, as I say, are --

27 Q They capture your concern.

28 DR. NOAKES: They capture it and it's -- yeah.

29 Q And with the same constraint, I'm afraid but, Dr.
30 Connors, did you wish to outline in basic, the
31 response that you have to Dr. Noakes' criticisms?

32 DR. CONNORS: I do. And I do want to point out that I
33 was instructed not to submit anything further
34 after seeing Dr. Noakes' --

35 Q Yes.

36 DR. CONNORS: -- response to --

37 Q When you say that, that's the Commission directing
38 that we don't want any more tennis.

39 DR. CONNORS: Correct. And I think we can characterize
40 that we disagree on the usefulness of the number
41 or weight of farm salmon along juvenile salmon
42 migration routes as being useful or not in terms
43 of asking questions about whether or not there are
44 associations between salmon aquaculture and the
45 patterns that we seek to explain in Fraser River
46 sockeye salmon.

47 My position on this is that the number or

1 abundance of farm salmon hosts or hosts in
2 general, and their spatial and temporal
3 distribution, is an important part, a fundamental
4 part of pathogen transmission. As such, I think
5 it is still informative to consider it, and I
6 think we'll have an opportunity to get further
7 into this down the road. I disagree strongly that
8 any inference that's then drawn further on down
9 the line should be categorically dismissed.

10 MR. MARTLAND: I will, on that note, Mr. Commissioner,
11 conclude my questions of this panel. I have next
12 counsel for Canada with an 80, 8-0, minute
13 allocation.
14

15 CROSS-EXAMINATION BY MR. TAYLOR:
16

17 Q I'll start, Dr. Connors, if I may, with where Mr.
18 Martland was. Do you agree that at the heart of
19 the debate that's just been discussed between you
20 and Dr. Noakes is the question of whether
21 production levels on a farm is a key point and
22 driver in determining the pathogen levels?

23 DR. CONNORS: So the question is whether or not I agree
24 that the heart of our disagreement is whether or
25 not the farm salmon production is a key driver of
26 pathogen levels on farms; is that correct?

27 Q And their distribution, if any, or shedding, if
28 you like, of pathogens outwards from the farm?

29 DR. CONNORS: Well, my response to that would be that
30 I'm not making the argument that farm salmon
31 production is a key driver of the abundance of
32 pathogens on farms. The argument that I'm making
33 is that the abundance of farm salmon hosts is
34 likely to play an important role in the overall
35 degree of exposure to pathogens for other salmon
36 that migrate past them.

37 Q And, in that regard, and taking it as you
38 characterize it, do you agree that that's a matter
39 of biology and fish health science?

40 DR. CONNORS: I agree.

41 Q And that's not your expertise.

42 DR. CONNORS: Fair enough.

43 Q Now, I'll begin, if I may, with Dr. Korman and
44 your report, which is 5A, and that is Exhibit
45 1543. If you turn, please, Dr. Korman, to page
46 (i), that is, little (i), in the second paragraph
47 you make reference to -- I'll see if I've got the

1 right paragraph here. There's a paragraph where
2 you refer to B.C. Now conducting 120 -- or, sorry,
3 100 audits a year. I may have noted the wrong
4 paragraph here, but do you recall that in your
5 report?

6 DR. KORMAN: Yes, I say approximately 100, about 100
7 audits in the second paragraph.

8 Q Okay. I understand that in point of fact, that
9 there's about 120 health audits a year or
10 annually, and a further 50 sea lice audits. Do
11 you have knowledge of that?

12 DR. KORMAN: The number per year varies depending on a
13 number of factors, so that's why I used the word
14 "approximately" and used a sort of conservative
15 value rather than -- I wasn't trying to say that
16 was the average number across here, so I agree
17 with what you said, but...

18 Q All right. On page (ii), or two little "i's", the
19 next page there, in the first sentence, you refer
20 to fresh silvers. We've heard of that before.
21 You refer to them as having potentially died of
22 disease. I think I may, like Mr. Martland, have
23 looked at a slightly different printed version
24 when I was making questions than I've got in front
25 of me now, so I regret this, but I may be a little
26 off in my page numbers.

27 But there is a reference in and around that
28 area to fresh silvers and potentially dying of
29 disease, and you spoke of that yesterday and
30 you're familiar with that in your report.

31 DR. KORMAN: Yes.

32 Q Now, in the next paragraph, though, you clarify
33 what I think otherwise might be left as a wrong
34 impression, from what I just said, and you say
35 later - and speak to this - you say that, in
36 effect, in fact -- or let me put this to you. In
37 fact, is it correct that most fresh silver show no
38 sign of disease or infection?

39 DR. KORMAN: Yes.

40 Q And, Dr. Noakes, do you agree with that?

41 DR. NOAKES: Yes.

42 Q And Dr. Dill?

43 DR. DILL: My understanding is that a large percentage
44 of them are not found diagnostically to have an
45 infection.

46 Q Thank you. And, in fact, there's many causes of
47 death other than disease or pathogens, aren't

1 there, Dr. Korman?
2 DR. KORMAN: I'm no veterinarian.
3 Q All right. Well --
4 DR. KORMAN: But, yes, it makes sense to me
5 intuitively.
6 Q Okay. Dr. Noakes and Dill, you agree with that,
7 do you?
8 DR. NOAKES: Again, given the limitation of my
9 expertise, yes, I would agree that there's many
10 causes of death other than disease.
11 Q Dr. Dill?
12 DR. DILL: Yes. Predators, for example, poor water
13 conditions.
14 Q But in terms of fresh silvers, they could have
15 been trapped, they could have suffocated, they
16 could have had metabolic problems and so on?
17 DR. DILL: I'm sure some of them fit that category.
18 Q Now, at page little (v) -- and again, I regret
19 this because -- well, at page little (v) and then
20 page 14, which should have Table 2 on it, this
21 includes -- your lice numbers include herring lice
22 or *Caligus*, doesn't it?
23 DR. KORMAN: That's -- just reading the caption here,
24 sorry. Yes, these are both associated with
25 herring lice, and this is what we discussed
26 yesterday are the numbers which are basically the
27 numbers per -- across the total number of fish
28 examined per pen. In fact, what's in the caption
29 is "per salmon". So these are the numbers that
30 have now been corrected and are 20-fold more than
31 what's presented in this table. Although the
32 patterns across years and across areas and seasons
33 would be the same, the numbers are 20-fold lower
34 than what's presented here.
35 Q Okay. But with that, also, is it the case, to
36 your knowledge, that most fish biologists don't
37 consider *Caligus* or herring lice as particularly
38 significant to farmed or wild salmon in terms of
39 negative impacts?
40 DR. KORMAN: That's my understanding from the
41 literature as far as their sort of parasitic
42 effect. You know, Dr. Dill would be in a better
43 position to speak to the potential as infectors
44 for disease. I think there's also a concern
45 there.
46 Q All right. Well, we'll come to Dr. Dill in time.
47 At page 7 in the first paragraph, and this is

1 under the heading "Trends and Mortality". In
2 Figure 4 on page 18, you refer to three million
3 dead fish a year from farms, and that's about a 12
4 percent mortality rate as I understand it. I
5 think I've got that right so far, don't I?
6 DR. KORMAN: Yes.
7 Q And then you point out that of that three million,
8 about 20 to 25 percent is fresh silver.
9 DR. KORMAN: Correct.
10 Q Now, you seem to take fresh silvers and equate
11 them with death due to disease. Have I got that
12 right as to the premise that you proceed on?
13 DR. KORMAN: No. I think it's fair to say - and I've
14 said this in the text previously - that this is
15 the maximum that potentially died of disease.
16 Q All right.
17 DR. KORMAN: And that's why in that paragraph I say
18 "suspected to have died due to disease or unknown
19 causes." So that's not exactly how you
20 characterized it.
21 Q All right. So then the 600,000 number that's in
22 there, which would be the -- roughly all of the
23 fresh silvers, I guess. That's the absolute
24 highest, then, is it?
25 DR. KORMAN: That's correct.
26 Q Still with that same figure, Figure 4, do you
27 attribute the spike in 2003 to any particular
28 cause?
29 DR. KORMAN: There are higher levels of IHN in the
30 database in 2003 and 2004, actually, than in other
31 years. So that's a strong possibility.
32 However, what I haven't done is gone through
33 and looked at -- to actually confirm what you're
34 saying, one would have to look at the mortalities
35 on the individual farms that had IHN and determine
36 what fraction of that bar was represented by IHN
37 mortality. So I suspect that's the case, but I
38 haven't done that background work to determine
39 that.
40 Q Okay. I understand that this is the first year -
41 2003 that is - is the first year that there was a
42 comprehensive set of data being fed into the
43 province from salmon farms; is that right?
44 DR. KORMAN: Yes.
45 Q Do you have knowledge whether, given that it was
46 the first year, there would have been mistakes in
47 the data coming in and therefore the results that

- 1 you get out are reflective of mistakes going in?
2 DR. KORMAN: I don't have any knowledge of that. I
3 would say that there were a limited number of
4 farms contributing. They had been getting
5 industry reports during the pilot years of the
6 study from smaller numbers of farms, so if there
7 were any bugs in terms of the database structure,
8 I would have thought that they would have been
9 worked out in the earlier years.
- 10 Q Okay. If there was no known significant event in
11 2003, and yet you see the spike that you see, does
12 that make you suspicious of the numbers that
13 you're seeing there? That is, the number for
14 2003, the spike.
- 15 DR. KORMAN: Well, as I said, IHN could be a
16 possibility. I just don't want to swear to it in
17 a court of law that that was in fact the cause.
18 So there is a very likely -- there is a likely
19 cause for that spike and that's why I'm not
20 particularly concerned why it's anomalously higher
21 than in other years.
- 22 Q Okay. And whatever that cause is, then, if it's a
23 health-related cause, that would be for people
24 with expertise other than yourself to speak to,
25 would it?
- 26 DR. KORMAN: Yeah, probably the best person to ask
27 would be the veterinarians working for BCMAL in
28 charge of this database at the time, or perhaps
29 some folks from -- some of the veterinarians from
30 industry would be the ones most qualified to
31 answer you.
- 32 Q All right. And then I want to turn to Figure 1 on
33 page 15, if I may. You point out in that figure
34 that there was a moratorium on tenures from 1995
35 to 2002. So that's a moratorium on new sites, is
36 it, that the province put in place?
- 37 DR. KORMAN: That's my understanding.
- 38 Q And yet during that period of a moratorium, the
39 production levels went up.
- 40 DR. KORMAN: That's what the figure shows.
- 41 Q Do you know why?
- 42 DR. KORMAN: Yeah, I would suspect it was the number of
43 fish produced for tenure increased is the only
44 explanation for that. So farms would have
45 probably expanded their production, individual
46 farms.
- 47 Q And do you know, Doctors (sic) Noake and Dr. Dill,

1 the reason why production would go up with the
2 same footprint in place?

3 DR. DILL: Well, Dr. Korman's explanation is the only
4 one. It's just more fish per farm.

5 Q All right. And did it result, then, from such
6 things as improved husbandry?

7 DR. DILL: I'm not able to answer that question.

8 Q All right. Okay. The only think you know, then,
9 is it went up. All right. Is that the same with
10 you, Dr. Noakes?

11 DR. NOAKES: Yeah, that's true. This is about the time
12 they started to actively vaccinate fish as well,
13 so there were some improvements in husbandry. I
14 mean I was with the Department at that particular
15 time, so I had some personal knowledge of what was
16 happening in the industry. So they did increase
17 volumes and there was improvements in husbandry to
18 accommodate that.

19 Q Which would mean better survival, right?

20 DR. NOAKES: That's correct.

21 Q And do you know whether better feed and better
22 feed conversion was being instituted about that
23 time?

24 DR. NOAKES: I'm aware there were several projects that
25 we did in the Department, and I know that industry
26 was also working on producing better feed in order
27 to improve the feed conversion ratio, but also in
28 particular, at the departmental research what we
29 were trying to do is reduce the waste components,
30 nitrogen and phosphorous that was being produced
31 by fish waste.

32 Q All right. Now, if I may, Dr. Korman, go to page
33 19 and Figure 5. I want to ask about the sea
34 lice. Now, am I right that the death that's being
35 attributed to sea lice in this graph is not death
36 caused by sea lice, but rather death where the
37 fish are killed so they can take the count of sea
38 lice?

39 DR. KORMAN: The fish aren't necessarily killed. So a
40 fish health event, which is what this graph is
41 plotting, is defined as any action that involves
42 veterinary involvement or the use of medication.
43 That would include anaesthetics which are used -
44 I'm not sure in all cases, but in many cases - to
45 handle the fish to do the sea lice monitoring. So
46 some of these sea lice events are strictly -- the
47 events are associated with monitoring the fish --

1 Q So it's --

2 DR. KORMAN: -- and not even to do with the fish that
3 -- in fact probably the majority, if not all of
4 these cases, they're not deaths associated with
5 sea lice, simply sea lice monitoring events that
6 involve the use of an anaesthetic.

7 Q All right. Thank you. Now, Dr. Connors, I'd like
8 to ask you some questions. Your report is now
9 Exhibit 1545, if I have that right. I'd like to
10 go to page 7. There you say at the top of the
11 page:

12
13 I estimated the total number of sea lice (in
14 the millions) on farmed fish in a given month
15 by multiplying the average abundance of [sea]
16 lice on fish examined for lice...

17
18 So you're -- and I think you spoke to this -- you
19 might have spoken to this before. You're
20 including all lice in this calculation, are you?

21 DR. CONNORS: In this calculation for -- if you read
22 further down the paragraph, for four different
23 measures of louse abundance. These include motile
24 salmon lice, gravid female salmon lice, motile
25 herring lice or *Caligus clemensi* and the total
26 abundance of motile lice from both species.

27 Q All right. Dr. Noakes and Dr. Dill, in the case
28 of - and I'm going to say *L. salmonis*, the L-lice,
29 as I would call it 'cause I can't say the other
30 word - is it that the only stages of sea lice that
31 we really want to pay attention to for salmon lice
32 are the adult females and the pre-adult females?
33 They're the only ones that are infectious?

34 DR. DILL: Well, it's the females that are producing
35 the next larval generation, and so that would be a
36 measure of the potential impact of that number of
37 lice on a wild population. The stages which seem
38 to have the most pathogenic effect on individual
39 fish are those sub-adult and adult lice that we
40 call the motiles.

41 Q All right.

42 DR. DILL: By the way, we all have problems pronouncing
43 and so we usually call them *Leps*.

44 Q *Leps*, all right, thank you. I'll try to remember
45 to use that. I appreciate that.

46 DR. NOAKES: I would agree with Dr. Dill and his
47 interpretation.

1 Q All right. So as I understand it, and you're
2 agreeing with me, that it's some of the lice that
3 you really want to pay attention to as a
4 potentially infectious one, and you can put to one
5 side, if you like, other lice in these numbers are
6 being lice, the L-lice or *Leps* that really have
7 any negative impact.

8 DR. DILL: Yes, that's correct.

9 Q Okay.

10 DR. NOAKES: Yes.

11 Q Now, Dr. Connors, the same question that I asked
12 Dr. Korman, are you aware that *Caligus* or herring
13 lice is primarily a non-salmon sea lice?

14 DR. CONNORS: Correct. And, by that, I mean it's
15 commonly found on other hosts besides just
16 salmonids.

17 Q Right. And it's not really a concern for salmon,
18 is it?

19 DR. CONNORS: That's my understanding.

20 Q And I'll ask this of any of you, whoever thinks
21 they're best able to answer, would the number of
22 *Caligus* on a farm be directly related to the
23 number of *Caligus* that's on the non-salmon
24 population in the area where the farm is?

25 DR. DILL: I think that's a very reasonable assumption.
26 Those lice have to get onto the farm from
27 somewhere and the non-salmonid hosts, herring, but
28 other species as well, are probably the major
29 natural source of them.

30 If I could just comment on Dr. Connors'
31 answer to the other question, though, I think
32 while it's true that most of us don't believe that
33 *Caligus* are likely to have a major impact on
34 salmon, no studies have been done, so we're kind
35 of making an assumption. There's just been no
36 experimental work on that.

37 Q All right. Thank you. And in your answer just
38 now, you hit upon something that's important, I
39 think. Can we agree that the fish come into the
40 farms free of lice?

41 DR. DILL: We can.

42 Q And therefore, if they get lice, it's coming from
43 the outside into the farm, right?

44 DR. DILL: That's true, and that's true regardless
45 whether it's *Leps* or *Caligus* that we're talking
46 about.

47 Q Right. Now, Dr. Connors, in your report, you

1 discuss pathogens, but in doing that, you're not
2 offering any opinion about the impact of
3 pathogens, are you?

4 DR. CONNORS: That's correct.

5 Q And you're not offering any opinion on how they
6 function or interact or whether it's negative or
7 positive with the host?

8 DR. CONNORS: That's correct.

9 Q All right. Now, I want to put some things to you,
10 Dr. Connors, and ask if you can agree with me. It
11 has to do with pathogens. I'm informed of these
12 things, and I'm asking you if you can tell me if
13 you had information on the following points and
14 incorporated them in your work. The first is in
15 order to become infected by pathogens, the host
16 must be exposed to a minimum infectious dose.
17 Were you aware of that in doing your work?

18 DR. CONNORS: Related specifically to this report, I
19 make no assumptions about minimum infectious
20 doses.

21 Q Okay.

22 DR. CONNORS: But I do agree with the statement that in
23 order for a pathogen to infect a host, it has to
24 be exposed to that pathogen.

25 Q Are you aware, and did you take account of where
26 you have a single-point source releasing an
27 infectious agent, the further you are away from
28 the point source, the more dispersed the pathogen
29 is going to be?

30 DR. CONNORS: That's a good point. And unfortunately
31 in this analysis, because of the very coarse
32 aggregate level of information that I had, and
33 lack of information on the exact migration routes
34 of the different salmonids, I had to make
35 assumptions about the regions that they pass
36 through. So that's a key uncertainty and I
37 certainly do agree with the statement that the
38 infectiousness of various pathogens is likely to
39 decrease the further away from the point source of
40 infection a susceptible host may be.

41 Q All right. Well, what you just said injects some
42 uncertainty into your conclusions then, doesn't
43 it?

44 DR. CONNORS: You'd have to point that out. You can
45 maybe clearly lay that out. I don't believe it
46 does.

47 Q Well, what I mean by that is you haven't taken

1 account of the distance from the point source to
2 were pathogens might be and their impact because
3 you didn't have data giving you information on
4 that.

5 DR. CONNORS: I don't know if that injects uncertainty
6 into the conclusions that I draw. It's an
7 assumption that has to be made that because we
8 don't have any more finer-scale information that
9 salmonids pass through a given region are coarsely
10 exposed to salmonids there, and I would argue
11 there's a reasonable assumption given the
12 limitations to the data.

13 Q Okay. Is what I said, Doctors Noakes and Dr.
14 Dill, correct that if you have a single point-
15 source releasing an infectious agent, then the
16 number of infectious agents per unit of water will
17 decline as you move out?

18 DR. NOAKES: Yes, that's correct.

19 Q Do you agree, Dr. Dill?

20 DR. DILL: Yeah, that's basic physics, I guess. But,
21 in addition --

22 Q Common sense too, probably.

23 DR. DILL: Yes. But the further they get, the longer
24 it takes them to get there, and there'll be fewer
25 of them that are viable as well. So there's two
26 reasons why that would be.

27 Q All right. And, Dr. Noakes and Dr. Dill, is it
28 correct that different pathogens have different
29 shedding rates and differences in how far they can
30 be spread?

31 DR. NOAKES: Yes, I think that's correct. As Dr. Dill
32 pointed out, even the distance -- some pathogens
33 are particularly sensitive to UV, for instance, so
34 that can affect their viability the further away
35 they get from the farm simply because they're
36 exposed to more UV.

37 Q All right. Now, this is a question of Dr. Dill
38 and Dr. Noakes. If farms were producing large
39 numbers of infectious agents, then would you
40 expect that the fish within the farm would get the
41 highest dose, have the greatest risk, and you
42 would see that manifested on the farms?

43 DR. NOAKES: I would certainly agree with that. It
44 makes perfect sense that the highest concentration
45 would be at the -- if there was a point source of
46 disease, that would be the highest effect.

47 Q And so, in short, if there is a problem posed by

1 pathogens and/or disease emanating from a farm,
2 it'll show up in bright lights, if you like, at
3 the farm itself.

4 DR. NOAKES: Assuming the farm fish are susceptible to
5 that disease, and I think the diseases that were
6 identified as high risk by Dr. Kent, then, yes,
7 you would expect to see that unless...

8 Q Dr. Dill, do you have anything to add?

9 DR. DILL: Yeah, I mean, that is a reasonable
10 assumption or reasonable expectation, but there
11 are two assumptions underlying it. One is that
12 the susceptibility of a farm fish and the wild
13 fish that you're talking about are the same, and
14 we're talking about Atlantic salmon, or in some
15 cases chinook salmon as opposed to sockeye salmon,
16 so we're not always sure of that.

17 The second is that there aren't asymptomatic
18 fish in the pens which are resistant for one
19 reason or another to disease, but are still
20 shedding pathogens that might be affecting wild
21 fish.

22 So subject to those assumptions, what you
23 said is correct.

24 Q All right. Thank you. And, really, what that
25 takes us to, then, doesn't it, in part at least,
26 is good record-keeping and good fish health
27 management on the farms. This is for any panel
28 member. Do you agree with that?

29 DR. NOAKES: Certainly it's a conclusion that I drew in
30 terms of looking at the very low level of
31 mortality that you have on the annual basis. Two
32 percent fresh silvers which could possibly have
33 died of disease, so yeah, so, I mean, they're
34 generally very, very healthy in terms of the fish
35 on the farms.

36 Q What I'm really getting at here, though, is if
37 farms were identified - and I'm not suggesting
38 they are - but if they were identified as a point
39 source, and in many instances at least, or most or
40 all, depending on your view, the problem would
41 then manifest itself on the farm and you would see
42 it in bright lights. The key then becomes record-
43 keeping and fish health management to guard
44 against that, and if it happens, to know it. Do
45 you all -- does anyone disagree with me on that?

46 DR. KORMAN: No, I agree. I mean, they're mandated as
47 a part of the licence requirement to report all

1 fish health events. So if there's a large die off
2 associated with a disease, they're mandated to
3 report it and I would think it would be tricky to
4 hide something like that because they're very
5 likely going to be audited in that quarter or the
6 second quarter.

7 Q All right.

8 DR. KORMAN: And so there's, you know, extra motivation
9 for the industry there, I would think.

10 Q Do the other panel members agree with what Dr.
11 Korman just said?

12 DR. CONNORS: I agree.

13 DR. DILL: I agree with that as well. I mean, it's
14 clearly essential that the farms manage the
15 disease on the farms. I think it's also essential
16 that the sort of audit procedure that the BCMAL
17 was undertaking is continued under the federal
18 government regulations, and even extended. I'd
19 like to see more audits and I'd like to see fish
20 checked for a wider possible panel of disease
21 agents.

22 For example, I don't -- I believe I'm correct
23 in saying that, at the moment, there's no
24 screening for retroviruses, notwithstanding that
25 that's probably quite an extensive undertaking. I
26 would like to see that added to the panel of
27 disease.

28 Q All right. Dr. Noakes, do you have anything to
29 add?

30 DR. NOAKES: No.

31 Q That's a "no". I think your mike was off, but
32 that's a "no" for the record.

33 Just on the move to the federal regime, are
34 the panel members aware of the terms of the
35 licence that are in place now for fin fish
36 aquaculture under the federal regime? I don't
37 mean that you have to cite it chapter and verse,
38 but are you aware generally of the licence
39 conditions and the type of conditions in them?

40 DR. CONNORS: No.

41 Q Any panel member aware?

42 DR. NOAKES: I have some knowledge of it having been
43 involved with this previously and having
44 conversations with Andy Thomson about what
45 conditions would be attached to licences and
46 whatnot.

47 Q All right. And you know Andy Thomson to be the

1 Director of Aquaculture for this region, British
2 Columbia or Pacific Region for Fisheries, do you?
3 DR. NOAKES: I do. Andy used to work for me.
4 Q And are you aware, then, that the terms of licence
5 in the federal licence are very extensive?
6 DR. NOAKES: I am.
7 Q And it includes an awful lot of fish health
8 management and fish health reporting requirements.
9 DR. NOAKES: Yes, I understand that from my
10 conversation with Andrew Thomson.
11 Q All right. Are you aware of that too, Dr. Dill?
12 DR. DILL: No, I'm not. I'm not aware of the
13 regulations.
14 MR. TAYLOR: Thank you. And you'll be hearing more on
15 that on Tuesday, I think it is, Mr. Commissioner.
16 Do you want me to stop now or keep going?
17 THE COMMISSIONER: If it's convenient for you, Mr.
18 Taylor, to stop now, that would be fine.
19 MR. TAYLOR: That's fine. Temporarily stop, that is.
20 THE REGISTRAR: The hearing will now recess for ten
21 minutes.

22
23 (PROCEEDINGS ADJOURNED FOR MORNING RECESS)
24 (PROCEEDINGS RECONVENED)
25

26 THE REGISTRAR: The hearing is now resumed.
27 MR. MARTLAND: Mr. Commissioner, an outstanding
28 housekeeping item which I'm going to simply read
29 into the record rather than anything more formal.
30 Earlier this week, Mr. Leadem asked questions of
31 Dr. Kent in relation to an unpublished manuscript.
32 We'll see that on-screen. That document is now
33 Exhibit 1494 and I'll just simply read into the
34 record. That was published. The reference is to
35 Michael Kent, 1994. The title is "The Impact of
36 Diseases of Pen-Reared Salmonids on Coastal Marine
37 Environments - Proceedings of the Canada/Norway
38 Workshop on Environmental Impacts of Aquaculture,
39 Fisker, F-i-s-k-e-n Og, O-g, Havet, H-a-v-e-t,
40 13:85-96". So that's the formal citation. I
41 think that's an adequate way for us to simply
42 record that indeed that document was ultimately
43 published with that citation. Thank you.
44 Mr. Taylor?

1 CROSS-EXAMINATION BY MR. TAYLOR, continuing:
2

3 Q Dr. Connors, do you agree that the pathogens that
4 you go over are not exclusively pathogens of
5 sockeye salmon?

6 DR. CONNORS: Correct.

7 Q And so any shedding of pathogens from farms should
8 impact or get to other species, such as pink and
9 chum, shouldn't they?

10 DR. CONNORS: All other things being equal, if all
11 those same species were passing, same point source
12 at the same time then, yes, I agree they would be
13 exposed to the same pathogens.

14 Q And of course there's always a temporal element to
15 it, yes. You're aware that pinks are doing quite
16 well these days or these years, aren't you?

17 DR. CONNORS: I am aware of, yes, strong returns to the
18 Fraser in recent years.

19 Q Now, as I understand it, the pink abundances that
20 you used in your report are based on adult pink
21 abundances in the North Pacific; is that right?

22 DR. CONNORS: That's correct. This is the abundance of
23 pink salmon that come back to key watersheds
24 throughout the North Pacific. And I believe it
25 represents about 85 percent approximately of total
26 pink salmon abundance in the North Pacific.

27 Q So you're looking at the adults incoming, of
28 course, and going in the vicinity of the salmon
29 farms in terms of the pinks?

30 DR. CONNORS: No. This is a proxy so --

31 Q Okay.

32 DR. CONNORS: -- the abundance of pink salmon in North
33 Pacific is used as a proxy for potential
34 competitive interactions the year actually
35 preceding in the open ocean between pinks and
36 sockeye.

37 Q Is there a reason why you didn't take a count or
38 include or incorporate juvenile pinks and chums
39 and their abundance in Georgia Strait?

40 DR. CONNORS: Yes, so the reason that I considered the
41 abundance of pink salmon in the North Pacific, as
42 opposed to juvenile abundance or abundances in a
43 suite of other regions is because specifically I
44 was addressing the hypothesis that's been already
45 examined and identified by an independent expert
46 panel that looked at and suggested there's
47 considerable evidence for competition in the open

- 1 ocean with pink salmon across North Pacific.
- 2 Q All right. Dr. Noakes and Dr. Dill, is there
3 competition in Georgia Strait between juveniles,
4 pink and chum and salmon as well?
- 5 DR. NOAKES: I would expect so given the high abundance
6 of all of those species, as well as other species
7 that eat things at the same trophic level as
8 juvenile salmon, such as herring and hake and
9 other species down there.
- 10 Q Dr. Dill, do you have anything to add?
- 11 DR. DILL: I think we need to be a little bit careful
12 in how we're defining competition. To an
13 ecologist, competition means that there's an
14 impact on the thickness of the fish caused by
15 another fish or another species of fish. And just
16 because there's dietary overlap doesn't mean
17 there's competition. To give you an example, if
18 you and I both decide to have a pizza for lunch
19 today, we could walk outside and probably end up
20 in one of any of 50 pizza parlours within a few-
21 block radius of here. We'd have a very high
22 dietary overlap but we wouldn't be competing for
23 anything because there's an excess of pizza.
- 24 Q Yes, but you've hit on the point. It's dependent
25 upon the food abundance in a given year, isn't it?
- 26 DR. DILL: That's correct.
- 27 Q So if there were low food abundance in Georgia
28 Strait, that would present a problem and one
29 should take into account the pinks and the chums
30 and what their competing for food might do to
31 sockeye, shouldn't you?
- 32 DR. DILL: It would certainly increase the likelihood
33 of competition if there were low food abundance.
34 But again, we'd have to know exactly what the
35 dietary overlap was between them. They don't eat
36 exactly the same things. There's some
37 differentiation in their diets. But again, you
38 know, this is somewhat irrelevant to Dr. Connors'
39 analysis because he was just testing these
40 hypotheses that have been put forward by others.
- 41 Q Yes, we moved off his report a little bit here for
42 a moment. But just on this, all of the salmon
43 feed on plankton-like food, don't they?
- 44 DR. DILL: Yes, but different species, different size
45 classes.
- 46 Q All right. Back to you, Dr. Connors. And I just
47 want to sum up on this, if I may, and see if I've

- 1 got it right. We've established, I think, that
2 you used all developmental stages of lice in your
3 study, correct?
- 4 DR. CONNORS: That's not correct.
- 5 Q Okay.
- 6 DR. CONNORS: If we go back to the paragraph on sea
7 lice that I considered, I believe it's on page 7,
8 at least in the report that I'm looking at.
- 9 Q Yes?
- 10 DR. CONNORS: The four different measures that I
11 considered starting with number 1 are motile *Leps*,
12 right? So this includes pre-adult one, pre-adult
13 two and adult developmental stages. That does not
14 include any of the developmental stages preceding
15 that. I also considered just gravid adult females
16 and that alludes to the conversation earlier about
17 them likely being the best proxy for the number of
18 infectious or copepods and not that are being
19 released from the farm. The third is motile
20 *Caligus clemensi* so this doesn't include the
21 earlier developmental stages of *Caligus*. And the
22 fourth is total abundance of motile so it's just
23 the sum of those three previous different
24 variables.
- 25 Q All right. Thank you for that clarification. You
26 used both species of lice, though, didn't you?
- 27 DR. CONNORS: Yeah, I considered both of them in
28 combination and independently, yes.
- 29 Q And as well as I understand it, and I think you've
30 said this already, you used all cases of fresh
31 silver mortality in your estimations?
- 32 DR. CONNORS: Correct. If we go to farm salmon
33 mortalities, yes, I took the estimates of fresh
34 silver mortalities, as defined in the database.
- 35 Q So when you were then using what we've just gone
36 over to then deal with pathogens and disease and
37 numbers and impacts and so forth, you were
38 presenting high numbers, or you used high numbers
39 to then come up with your conclusions, did you?
- 40 DR. CONNORS: Depends what you mean by "high numbers".
41 If you're asking if the fresh silver mortalities
42 is the upper bound of the estimate of mortalities
43 due to disease or unknown causes, as the
44 definition that I used here, then, yes, that would
45 be the upper bound for that metric.
- 46 Q Right. And so you may not have used the worst-
47 case scenario but you've certainly used a high-

1 impact scenario?

2 DR. CONNORS: I've certainly used, yes, an upper bound
3 for that metric, yes.

4 Q And even with that you didn't find a problem? You
5 found no evidence of a problem?

6 DR. CONNORS: No. So to be clear, I didn't find a
7 statistically significant relationship between the
8 proportion of fresh silver mortalities in the
9 months that juvenile salmon migrate past those
10 farms and their productivity in that analysis
11 which covered about, I believe, in that analysis
12 four years of information in terms recruits-per-
13 spawner.

14 Q Okay. And just one final question, at least for
15 now, Dr. Connors of you, and this comes from
16 something that one of the reviewers of your report
17 was saying, and it's at page 62, if you want to go
18 to it. But am I correct that you did not include
19 the 2010 returns in your study?

20 DR. CONNORS: That is correct. I included all the
21 information that was available at the time of
22 writing the report. That did not include the 2006
23 brood year for which the majority of fish that
24 returned would have returned in 2010.

25 Q And are you in a position to say what change there
26 would have been to the results if you had had that
27 data and had included them?

28 DR. CONNORS: I am not in a position to say how these
29 conclusions would be influenced by updating that
30 information, which is why I stress the importance
31 of revisiting this analysis once that data becomes
32 available.

33 Q Okay. Dr. Dill, I wanted to ask you some
34 questions about you report. And I'll start, if I
35 may, at page 9 of your report. And this is
36 Exhibit 1540. There's a sentence in the middle of
37 the second paragraph where you say:

38
39 There is no evidence to suggest that the
40 sockeye enter the Broughton archipelago and
41 pass by the many farms there...

42
43 And therefore, do I take it that you're saying
44 that there would be no direct impact on sockeye
45 from farms?

46 DR. DILL: That statement is based on my understanding
47 from people who have done sampling in the

1 Broughton. They very, very rarely find sockeye
2 salmon. When they do, they're probably from local
3 area streams. And as a result, the Fraser fish
4 are probably migrating past the mouth of the
5 Broughton, not turning in there and being directly
6 impacted by the farms there. But they may be
7 indirectly impacted, as I've said, by interacting
8 with pink and chum coming out of there.

9 Q All right. At page 12 at the top, there is a
10 sentence in the third line, if the print you have
11 is the same as mine. It is, thank you. Where you
12 say:
13

14 On balance, I believe the science strongly
15 supports the conclusion that pink salmon in
16 the Broughton Archipelago, and perhaps other
17 salmon species there as well, have been
18 negatively impacted by lice from fish farms.
19

20 Now, that's speculative, isn't it?

21 DR. DILL: No, I wouldn't characterize it as
22 speculative. I'd characterize it as my opinion
23 based on the science that I have read and also the
24 science that my students and I have done and
25 participated in and published.

26 Q Isn't the word "strongly" in that sentence itself
27 too strong?

28 DR. DILL: I don't believe so based on my
29 understanding.

30 Q Dr. Noakes?

31 DR. NOAKES: Yeah, I wouldn't have made that statement.
32 As I say in my report, I think there is some
33 serious flaws in many of those investigations.
34 And certainly the only one that has been
35 published, there's one come out recently and again
36 there's some problems with that, but the only one
37 that was available to us at that time was the one
38 by Marty *et al* that used farm salmon data. And it
39 had an opposite conclusion.

40 Q So you disagree with Dr. Dill's statement?

41 DR. NOAKES: I disagree with that statement.

42 Q Then at page 17, Dr. Dill, you're dealing with the
43 benthic impacts here. And at the bottom of that
44 first large paragraph, there's the sentence that
45 begins:
46

47 However, it seems highly unlikely that such

1 local effects could impact Fraser sockeye
2 survival...

3

4 Do you agree with me that the period should be
5 right where I've put it, after "survival" and not
6 carry on the way you have?

7 DR. DILL: No.

8 Q What do you mean by "to any great extent"?

9 DR. DILL: Well, I mean that individual fish that
10 might, for one reason or another, hang out locally
11 or on the farms might be impacted but that it's
12 unlikely it's going to have a major impact on the
13 population as a whole.

14 Q So there's no population, in fact?

15 DR. DILL: I think it's highly unlikely.

16 Q Page 19, you're dealing with SLICE there. And I
17 believe this is what you're saying but I want to
18 be clear. Do you agree that SLICE is not a factor
19 in the decline of sockeye?

20 DR. DILL: My understanding of the sort of dynamics of
21 SLICE in the marine environment is that it, again,
22 is very unlikely to be a factor in the decline of
23 Fraser sockeye.

24 MR. TAYLOR: At page 25, in the first paragraph, 25, it
25 starts just at the bottom of the previous page, if
26 you want to maybe, Mr. Lunn, just go to the
27 previous page so they can see the study. Thanks.

28 Q So you're speaking of ISA here. And you then
29 speak about what Dr. Sheppard and Dr. Marty are
30 having to say. Was that in conversations with
31 them that you're getting the information that
32 you're postulating there, or in documents
33 themselves?

34 DR. DILL: With respect to Mr. Sheppard, that was a
35 phone conversation that all of us had with him in
36 the Commission offices. The information about the
37 classic symptoms of ISA is from the document
38 quoted in there.

39 Q All right. And what about with Dr. Marty?

40 DR. DILL: That's what I meant, with Dr. Marty. The
41 classic symptoms of ISA quote is from BCP002864.

42 Q Did you have a conversation with Dr. Marty then?

43 DR. DILL: Not directly.

44 Q Do you have notes of the conversation with Dr.
45 Sheppard?

46 DR. DILL: Yes.

47 Q Can you produce those?

1 DR. DILL: I think I have already have.

2 MR. TAYLOR: Mr. Martland?

3 MR. MARTLAND: I think he already has and I think that
4 in the course of production by the Commission of
5 the working files of these experts that ought to
6 have been included. I can't say firsthand whether
7 it is but I expect that would have been part of
8 that production.

9 MR. TAYLOR: All right. Well, I'll check that some
10 more but I'll leave it there at this point then.

11 Q Now, in the section following that where we just
12 were, Dr. Dill, you deal with what you
13 characterize as "The so-called 'Miller virus'".
14 And you're referring to Dr. Miller there, are you?

15 DR. DILL: Yes, Dr. Kristi Miller, who testified
16 yesterday and the day before.

17 Q All right. And were you here for her evidence?

18 DR. DILL: I was not here for the first day; I was here
19 yesterday morning.

20 Q You say in your first sentence:

21

22 A recent paper by Miller et al. (2011)...

23

24 Just pausing there. That's the paper that was
25 produced in January of 2011, is it?

26 DR. DILL: In the journal, *Science*, that's correct.

27 MR. TAYLOR: Yes. And that's, if I've got my numbers
28 right, Exhibit 558, I think. The Commission seems
29 to magically come up with numbers all the time so
30 they may confirm or correct me but I think that's
31 the exhibit number.

32 Q You say there that:

33

34 A recent paper by Miller et al. (2011)
35 provided evidence for a virus-like particle
36 associated with early freshwater entry (by
37 returning adults)...

38

39 I want to suggest to you that she did not provide
40 evidence; she has a hypothesis that is being
41 worked on and they're trying to work this through,
42 as scientists. Is that a fair characterization?

43 DR. DILL: Yeah, what she provided evidence for was a
44 genomic signature that was associated with early
45 freshwater entry and high PSM. And she suggested
46 that this genomic signature looked like something
47 that might be produced by a virus and so she

1 hypothesized that it was a virus. So that would
2 have been a better way for me to write that
3 sentence.
4 Q All right. And you, of course, defer to Dr.
5 Miller in terms of getting an accurate
6 characterization of her work, do you?
7 DR. DILL: Absolutely. And I met with her at DFO and
8 heard her speak yesterday and it's my
9 understanding that the hypothesis, some of its
10 predictions are being met and it appears that
11 there is, in fact, a virus involved which
12 yesterday I heard her call a parvovirus.
13 Q Now, at pages 26 and 27 you go on to speak about
14 transmission or possible transmission. I think
15 we've clarified this but just to be sure. You're
16 not an expert in disease, are you?
17 DR. DILL: No, I'm not.
18 Q And you're not an expert in transmission of
19 pathogens either, are you?
20 DR. DILL: No, I'm not.
21 Q And you're not an expert on the impacts of
22 pathogens?
23 DR. DILL: I am an expert on the impact of sea lice but
24 not of other pathogens.
25 Q And your expertise in that regard is as an
26 ecologist?
27 DR. DILL: It's as a behavioural ecologist and author
28 of several studies.
29 Q And your opinion on sea lice is they are not
30 causing a problem or they're not part of the
31 reason for the decline.
32 DR. DILL: My opinion is that sea lice directly are not
33 a cause of the problem but I don't believe the
34 numbers of sea lice that we're talking about,
35 given the size of the host that we're talking
36 about, are likely to be directly causative of any
37 declines in Fraser sockeye but I do caution that
38 they could be acting as vectors for disease and
39 they could also, if you read the last section of
40 my report -- I've forgotten what it's called --
41 the futility of looking for the cause they may be
42 interacting with other factors. So directly, no,
43 they're not the smoking gun that we're looking
44 for.
45 Q All right. At page 27, there is, in the second
46 paragraph in the second sentence, these words, and
47 this is dealing with IHN and whether it may spread

1 from farm-to-farm in the water and you've referred
2 to Dr. Saksida's paper of 2006. You then say:

3
4 If so, there is no reason it could not be
5 spread to passing sockeye.

6
7 That statement is speculative?

8 DR. DILL: Yes.

9 Q Just going back for a moment to what you were
10 saying two minutes ago, you're not an expert in
11 vectoring, are you?

12 DR. DILL: No, I'm not.

13 Q We then turn, if we may, to page 34 where you have
14 a section entitled "Summary". And you start there
15 by saying:

16
17 The relationship between farm production and
18 Fraser sockeye survival in the long-term data
19 set suggests that the farms are having some
20 sort of negative impact on wild salmon
21 productivity, most likely in concert with
22 other factors in the marine environment.

23
24 Now, first, given what you say there, I take it
25 you'll agree with me that whatever be the cause or
26 causes of any decline, it's multi-factorial, is
27 it?

28 DR. DILL: That's what is suggested by the Connors
29 analysis that surface temperature, which is an
30 index of food availability for the fish when they
31 first enter the ocean and pink salmon among them.
32 Those are the factors that I'm talking about
33 there. I also suspect that in the more general
34 use of that term there are probably a lot of
35 interacting factors that have affected Fraser
36 sockeye. So yes, I agree with you.

37 Q Now, it seems to me, and I put it to you as a
38 suggestion, Dr. Dill, that what you say in that
39 sentence, namely, that farms are having some sort
40 of negative impact on wild salmon productivity is
41 unsubstantiated.

42 DR. DILL: I disagree with you. I believe it's
43 substantiated by the results of the Connors
44 analysis which others may disagree with. But that
45 is the information I take as given in writing my
46 report.

47 Q All right. Dr. Noakes, do you have something to

1 say on that?

2 DR. NOAKES: No, I had spent a fair amount of time
3 looking at the Connors analysis and, in my
4 opinion, it's flawed on several levels. So in
5 terms of that, I would agree that it's highly
6 speculative that there is an impact from farms.
7 But I'd also like to go back to the point that
8 you've just made in terms of multi-factorial. I
9 mean we've had 11 other reports in terms of
10 particular causes that might have contributed to
11 the decline of sockeye and there's lots and lots
12 of those.

13 So to try and isolate this farm salmon or any
14 particular other variable in this kind of
15 analysis, again, it was done very quickly, this
16 analysis, but it's a much more complex problem
17 than that. And I know even in our first data
18 meeting when we were talking about one of the
19 things we went through was trying to generate
20 hypotheses about what we would check. And some of
21 the things that came up were actually looking at
22 things like abundance of herring in the Strait of
23 Georgia and hake and other kinds of variables that
24 we might look at. So I think, as I say, the time
25 restrictions limited the kind of analysis that
26 could be done but this is far too restrictive and
27 I think it's not really a supportable statement.

28 Q All right. Thank you. Just by the way, I'm
29 asking questions on Dr. Dill's report so I've been
30 turning to him but of course, Dr. Noakes, if you
31 have at any time anything you want to say, just
32 jump in or shout and we'd be pleased to hear from
33 you even if I haven't specifically gone to you.
34 So thank you for interjecting on that and adding
35 your point.

36 Dr. Dill, is it the case that going into the
37 work that you did for the Commission, that you
38 presumed there was a problem or impact of farms on
39 the wild stocks?

40 DR. DILL: I would have to say that based on my
41 experience in the Broughton and the pink salmon
42 situation there, I probably went in with a slight
43 expectation in that direction but essentially I
44 went in with an open mind and looked at what the
45 data had to say.

46 Q And on page 1 of your report, you say, and I take
47 this to be your working hypothesis:

1
2 The hypothesis that there is an effect of
3 farms on sockeye survival was tested by
4 examining the support for its predictions
5 that there would be negative relationships
6 between fish farm production levels...and
7 Fraser sockeye survival.
8

9 That's the hypothesis and the line of thinking
10 that you went into this report with, is it?

11 DR. DILL: That's correct. And what I'm reporting
12 there, by the way, is the first part of the
13 Connors analysis.

14 Q All right. And then, having done the study,
15 relying on the information you did rely on, it
16 seems that you found nothing to support that
17 hypothesis or conclusion and you refer that, as I
18 read it, at page 2 in the second paragraph there,
19 the paragraph beginning "Despite". Do you agree
20 with me that you found nothing to support the
21 hypothesis that you set out on page 1 in terms of
22 causation?

23 DR. DILL: No, I disagree. I believe that the Connors
24 analysis provides some support. It's weak support
25 because, as Dr. Connors himself has indicated,
26 there is quite a bit of uncertainty around his
27 results and you can't draw very strong inferences
28 from it but nevertheless, I believe there is some
29 support for, in effect.

30 Q Well, page 2 in that paragraph, beginning
31 "Despite", you say "there's only correlation".

32 DR. DILL: That's often all we have. We haven't been
33 able to experimentally manipulate the farms to see
34 whether or not it has any effect on Fraser sockeye
35 so we're always going to be stuck with
36 correlations.

37 Q Is it fair to say then that the furthest, or the
38 most you can take it is correlation?

39 DR. DILL: That, in addition with what I try to do in
40 my report, which is to look at what we know about
41 the various mechanisms and see what each ones, if
42 any, might be involved.

43 Q Yesterday, Mr. Martland used a criminal law
44 analogy in the difference between not proven and
45 shown to be innocent or something to that effect.
46 If we back out of criminal law and come back to
47 fish and science. Thank you, Ms. Gaertner. I

1 understand the fundamental difference between the
2 two of you, Dr. Noakes and Dr. Dill, is that Dr.
3 Noakes has looked at material and I'll ask you one
4 at a time. Dr. Noakes, you've looked at material
5 and found that there is no evidence to support any
6 causal or connection between farms and the
7 survival of Fraser sockeye; is that right? Or put
8 it in your own words.

9 DR. NOAKES: Yeah, that's basically correct. What I
10 did was I tried to focus on the evidence and
11 minimize any speculation and basically using sound
12 scientific principles and analyses come to the
13 conclusion, and looking at, as I say, the level of
14 impact whether it be in escape farm fish, sea lice
15 or disease and looking at all of the information
16 as a whole, I didn't see any evidence. I would be
17 leaning towards acquittal rather than just a
18 finding of not guilty.

19 Q Dr. Dill, for you part, I understand the situation
20 to be that you, too, didn't find any evidence to
21 show a connection but nonetheless you still think
22 or say there could be a problem?

23 DR. DILL: No, I wouldn't characterize it that way.
24 The statement I made is that in the short-term
25 analyses, we cannot find statistically significant
26 relationships between sockeye productivity and the
27 various metrics that Dr. Connors looked at. In
28 the longer-term analysis, I believe there is a
29 signal there that tells us that there is a
30 relationship between farm salmon production and
31 health of wild sockeye. And despite the fact that
32 there is some uncertainty about that, that's what
33 the analysis tells us. Now, Dr. Noakes may
34 disagree with that analysis. I know, in fact,
35 that he does and he's said that very clearly. But
36 that's an issue for statisticians to decide. But
37 I take it as a given that there is this
38 relationship that Dr. Connors has shown and I
39 reported as such.

40 And I really want to make sure that there's
41 no misunderstanding here. I hope that Dr. Noakes
42 was not implying that he uses proper scientific
43 methodology and I rely on speculation. I think I
44 also used scientific methodology. But the facts
45 that I choose to base my inferences on may be
46 different from his. I'm not simply looking at the
47 numbers of things reported in the database but

1 also looking and using my knowledge of general
2 ecology and fisheries biology in trying to put
3 this together into perhaps a more sort of higher
4 level examination of the situation rather than
5 just looking at what diseases were on what farms
6 in what year.

7 Q All right. I should give Dr. Noakes a chance to
8 speak.

9 DR. NOAKES: I wasn't implying that you didn't use
10 proper, but what I was implying was that, in terms
11 of my scientific expertise, in terms of statistics
12 in time series analysis that we did different
13 kinds of analysis and came to different
14 conclusions. And again, the evidence sort of
15 speaks for my report and my rebuttal so to speak
16 to the deficiencies I see in the Connors one. But
17 getting back to the short-term one, one of the
18 problems with short-term data is you often end up
19 with the data points being around the mean. What
20 we have in this particular case is we also have
21 them at the extreme.

22 We have in 2009 the lowest returns on record
23 or very near the lowest returns on record. And in
24 2010, although we may not know the exact number,
25 they're certainly one of the highest on record.
26 So we have a unique situation here. Even though
27 it's a short one, you have a bit more power in
28 terms of an ability to look at the relationship
29 simply because we're looking at the extremes, at
30 both the high and the low. So if we're going to
31 see some sort of a signal associated with
32 aquaculture or something else, then you should be
33 able to see it when you're looking at those
34 extremes because, as I say, most of the time when
35 you're limited with a short-term time series,
36 you're dealing with things right around the mean
37 and you don't have a lot of ability to try and see
38 those signals. But if there was something that
39 caused the huge decline in 2009, it should jump
40 out at you.

41 And the same thing would happen in 2010 in
42 terms of a large return. Even though we don't
43 know exactly what the number is, we know it was
44 very large. So again, what changed to give us
45 that kind of high contrast that we see in the two
46 returns from those two years? It's a unique
47 situation. As I say, most of the time when you

1 only have three or four years of data, the data
2 points are typically closer to the mean and you
3 don't have that kind of high contrast to actually
4 look and see what the signal might be. So it's
5 very powerful and it's very unique and it gives us
6 a lot more information simply because we've got
7 that huge range.

8 Q And do you also agree that the juxtapositioning is
9 important as to 2007 and 2008, the outgoing years,
10 and in terms of whether anything drastically
11 different was happening in each of those two
12 years, one to the other?

13 DR. NOAKES: Yeah, the unique part of it is not only
14 it's the highest and lowest but they're back-to-
15 back so it's not as if they were 20 years apart
16 and you can argue that, well, things changed in 20
17 years. We're dealing with something that happened
18 over a two-year period. So if you're looking for
19 something, the smoking gun, then you should be
20 able to see something in terms of what caused the
21 dramatic decline in 2009 returns and what changed
22 in order for the 2010 returns to go so high. And
23 as I say, it's multi-factorial. I'm sure there's
24 lots of issues that govern the survival. But if
25 you're looking at particular ones, you should be
26 able to see something in that signal. What
27 changed in, say, aquaculture or salmon farms that
28 would cause that kind of dramatic change?

29 Q Dr. Dill, I think you want to get in on this.

30 DR. DILL: I just wondered if I could refer you to the
31 next sentence in that paragraph.

32 Q Sorry. You're the next sentence beyond the --

33 DR. DILL:

34
35 Despite the a priori predictions...However,
36 the fact that the 2006 brood year interacted
37 with half as many pink salmon as the 2005
38 brood year, and that the corresponding 2010
39 returns were much greater than those in
40 2009 --

41
42 And that would be predicted by the Connors model.

43
44 -- suggests that the Connors statistical
45 model may be capturing some underlying causal
46 relationships, and thus motivates the search
47 for what these might be.

1 Q I see. And pinks are high numbers in odd years,
2 are they?

3 DR. DILL: There's so much variation up and down the
4 coast in what's and even years that that's not a
5 particularly accurate statement. But perhaps Dr.
6 Connors would be better placed to respond to that.

7 DR. NOAKES: Yeah, just to add onto that, though, as I
8 say on one of my responses, if you were seeing a
9 high impact from pink salmon, and of course my
10 suggestion is you have to look at all of those
11 species because it's like feeding teenagers. If
12 you've got two teenaged boys, they're going to eat
13 a lot, versus two teenaged girls. So if you're
14 looking at an impact on your grocery bill, you'd
15 like to know sort of a biomass or what kind of
16 people you're feeding. But if you are seeing, in
17 terms of pink salmon and if they are having this
18 high and low in terms of the numbers, you should
19 be seeing some sort of a two-year cycle, or a two-
20 year signal in the survival for Fraser sockeye and
21 you just don't see that. So what it implies to
22 me, and again I've looked at a lot of salmon data,
23 is that if there is an interaction out there it's
24 with more than pink; it's with the whole sort of
25 ecosystem in the North Pacific in terms of the
26 interactions in terms of all of those salmon
27 species because you have sockeye, pink and chum,
28 that are eating at least at the same trophic
29 level, and there may be other things out there as
30 well. So as I say, if it is only pink, you should
31 be seeing a stronger two-year signal in the
32 survival and you just don't see that in the data.

33 Q Right. Dr. Connors?

34 DR. CONNORS: If I might add, we do find support for an
35 influence of pink salmon and not just in my
36 analysis and other analyses, which is why it was
37 considered as one of the hypothesized contributors
38 to the decline. And in regards to whether or not
39 pink salmon are always stronger odd year/even
40 year, it does vary up and down the coast depending
41 on the region. But as across the entire North
42 Pacific, particularly in recent years, there was
43 very strong year/even year patterns. I could
44 refer you to a figure in my report that plots out
45 the abundance of pink salmon across the North
46 Pacific across the entire time series that
47 consider.

1 Q Dr. Dill referred to 50 percent pink in '06, I
2 guess it is, versus '05, sorry '08 versus '07.
3 There was still, even at the 50 percent level, an
4 awful lot of pink, wasn't there?

5 DR. CONNORS: Yeah, if we could maybe pull up that
6 figure?

7 Q Which one are you thinking of?

8 DR. CONNORS: Just give me one second and I'll find it
9 here. Figure 5, page 12, I think is the one I was
10 thinking. Now, with the caveat here. We're
11 looking at the top right panel. With the caveat
12 this has been standardized across the means so
13 zero is the long-term average for the variable.
14 The final data point would be the pink salmon that
15 the 2010 returning salmon the majority of them
16 interacted with whereas the data point preceding
17 that which is the highest in the time series would
18 be the data point that the 2009 returns interacted
19 with. And so yes, there are still pink salmon in
20 the North Pacific and a number of them, in the
21 millions. I'd have to back out to get exactly
22 where that turns out to.

23 But I think the point that Larry was making,
24 and an interesting point about the analyses, is
25 that you get a very strong contrast between these
26 years, particularly towards the end of the time
27 series. And that appears to be driving the
28 interaction and the statistical support that we
29 see for this interaction in the analyses. So it
30 would qualitatively fit with an idea of good
31 returns and bad returns. But I really caution (a)
32 extrapolating this beyond the data that's been
33 considered here and I again strongly advocate for
34 re-examining this once we have that 2010 data.
35 The argument that we don't qualitatively see a
36 two-year pattern and time series of sockeye salmon
37 productivity in the Fraser, in my opinion, is a
38 weak argument. One needs to quantitatively
39 examine the relationship between the two before
40 one makes a statement like that.

41 Q All right.

42 DR. NOAKES: Actually, if I could respond to that. In
43 fact, if you actually look in my report, when I
44 look at the -- it would be in the appendix, one of
45 the figures. When I pre-whiten, when I'm looking
46 at whether there's a causal link correlation
47 between, say, farm salmon production and the

1 returns-per-spawner, when I go into Appendix 2, I
2 believe it is, where I actually look at pre-
3 whitening that, one of the things I do is actually
4 calculate the autocorrelation for that time
5 series. And if there was a two-year cycle, you
6 would see that in that autocorrelation plot. And
7 so you don't see that.

8 What you will see is, if you look at the
9 autocorrelation plot for that, you will see that
10 it's decaying and then if you look at the partial
11 autocorrelation function you will look at -- and
12 again, I apologize for the technical aspects of
13 this but if you look at that then you will see a
14 spike at Lag 1, which means that there is a
15 correlation one year but not at two years. So as
16 I say, if there was a strong signal with relation
17 to the number of pink salmon in there, you would
18 see a two-year cycle coming through and you just
19 don't see it. There's no significant correlation
20 at Lag 2 and I apologize for that.

21 Q All right. That's fine. Dr. Connors?

22 DR. CONNORS: I'll just make one last comment.

23 Q Mr. Martland spoke of tennis earlier.

24 DR. CONNORS: Yeah, I just want to make one last
25 comment on this. I'm of the opinion that the most
26 rigorous analysis to consider the hypothesis for
27 pink salmon abundance would be considering not
28 just 20 years of information on the Fraser, but
29 considering all the available information we have
30 across both the individual stocks in the Fraser,
31 as well as other sockeye salmon populations in
32 B.C. and elsewhere. And so I maintain that that's
33 a more rigorous examination of the relationship or
34 the support for that hypothesis. And I also want
35 to reiterate that this is not just a hypothesis
36 that I have put forward. I'm simply considering
37 this because it's been independently identified by
38 experts in that field as being a likely to
39 possible contributor to declines in Fraser
40 sockeye.

41 Q All right. Well, we'll leave that point there
42 with that, I think. At page 34 of your report,
43 Dr. Dill, there is a paragraph there where you
44 call for a consolidated database. Now, I know you
45 said earlier that you're not familiar with the
46 conditions of licence and reporting and so forth.
47 Dr. Noakes said he is. Under the federal regime

1 that's now in place for the last nine or ten
2 months now and going forward, that's exactly what
3 DFO is doing, isn't it, Dr. Noakes, creating a
4 means to have a comprehensive long-term database
5 of information?

6 DR. NOAKES: That was my understanding with my
7 conversation with Andy but I don't know the
8 details of it.

9 Q All right.

10 DR. NOAKES: Andy Thompson, that is.

11 Q Now, I want to ask Dr. Noakes and Dill about the
12 material that Dr. Dill used and referred to and
13 relied upon in terms of reference to articles and
14 so forth. I suggest to you, Dr. Dill, that you
15 use literature in your report and to support the
16 propositions in your report, that is literature
17 that tends to be against aquaculture. Is that a
18 fair assessment?

19 DR. DILL: No.

20 Q All right. Do you consider the literature you
21 used to be a balanced set of literature?

22 DR. DILL: I believe I mentioned the controversy in the
23 Broughton, if that's the area you're speaking of
24 specifically. I think that's the only place where
25 there might be any concern.

26 Q Well, certainly there's mention of controversy.
27 But in terms of reliance, is it literature that
28 tends to be against aquaculture that you relied
29 on?

30 DR. DILL: I relied on what I considered to be the best
31 science.

32 Q All right. Dr. Noakes, do you have a comment on
33 this, and that is, whether the literature that is
34 relied on in Dr. Dill's report, represents a
35 balanced approach to literature or whether it's
36 not?

37 DR. NOAKES: I don't have a comment with that respect.
38 I mean I respect Dr. Dill. We approached the same
39 problem from different aspects and our backgrounds
40 dictated sort of what we looked at. So I'm not in
41 a position to say whether it's balanced or not
42 because obviously he has different expertise and a
43 different insight into the issue. And it was
44 certainly different than my literature review
45 which again reflects the approach that I took. So
46 I don't really have a comment on whether it's
47 balanced or unbalanced. I'm assuming that it

1 reflects his understanding and his background in
2 expertise in the way he approached the problem.

3 Q All right.

4 DR. NOAKES: I don't want to put words in his mouth.

5 Q Okay. Thank you. I'm almost at my time now.

6 I've probably got about four minutes so I'll just
7 have a couple of final questions. I just want to
8 be clear on one point. It may be there in the
9 evidence but I'm not sure. Dr. Dill, Dr. Connors
10 is a recently-completed PhD student of yours,
11 isn't he?

12 DR. DILL: That's correct.

13 Q And you agree with that, I take it, Dr. Connors?

14 DR. CONNORS: I do indeed.

15 Q So you have a long-term association,
16 professionally, in your work, the two of you?

17 DR. DILL: We do.

18 DR. CONNORS: That's correct.

19 Q How long have you worked together?

20 DR. CONNORS: I started my PhD with Larry in the fall
21 of 2005. And I believe we probably met six months
22 to three-quarters of a year before that.

23 MR. TAYLOR: All right. Thank you. Those are my
24 questions.

25 MR. MARTLAND: Mr. Commissioner, counsel for the
26 Province with 60 minutes.

27 MS. CALLAN: Mr. Commissioner, Callan, C-a-l-l-a-n,
28 initials T.E., appearing on behalf of Her Majesty
29 the Queen in Right of the Province of British
30 Columbia.

31

32 CROSS-EXAMINATION BY MS. CALLAN:

33

34 Q Dr. Noakes, you analyzed where disease has been
35 reported in relation to sockeye salmon migrations
36 route. Since 2003, there have been 38 cases
37 reported of furunculosis and 29 of the 38 occurred
38 on the west coast of British Columbia?

39 DR. NOAKES: I believe that's correct.

40 Q And specifically, Vancouver Island's west coast?

41 DR. NOAKES: Yes.

42 Q There are no reported instances of IHN since 2003?

43 DR. NOAKES: That's correct, based on the data.

44 Q Since 2003, there's also been a significant
45 decline in BKD, or bacterial kidney disease,
46 within the main migration route of sockeye salmon
47 on the Fraser River?

1 DR. NOAKES: That's correct.

2 Q And only one farm around the Fraser River sockeye
3 salmon's migration route reported BKD in 2007 and,
4 specifically, that was at Bennett Point?

5 DR. NOAKES: I believe so. There's a figure in my
6 report and I can't recall the figure number that I
7 identify for each year where the BKD outbreaks
8 were. Most of them were in salmon in Sechelt and
9 Jervis Inlet in the last few years. And for each
10 of the last three years, there was one farm. One
11 I think actually was in the Broughton.

12 Q Have you reviewed the paper entitled "The Abuse of
13 Power: The Pervasive Fallacy of Power Calculations
14 for Data Analysis"? And it's at Provincial Tab 3.

15 DR. NOAKES: Yes, I'm aware of that. I think John
16 Hoenig sent it to me right after it came out.

17 Q Could you summarize this report in a few words
18 that a non-statistician could understand?

19 DR. NOAKES: Okay. Basically, what it's saying is that
20 there's people who are doing statistical analysis,
21 and this is a point that's maybe missed in terms
22 of the title, but the emphasis should be on
23 generating an appropriate hypothesis rather than
24 looking at doing post hoc power analysis. So what
25 you want to do is when you're looking at how you
26 want to analyze data and test hypothesis is pay a
27 lot more attention to what you want to test, make
28 sure that it's worded properly and also you want
29 to set the level in terms of how much evidence you
30 need to, say, prove or at least reject the known
31 hypothesis. Usually, the known hypothesis is that
32 there's no effect. So you normally wouldn't say
33 I'm assuming that there's an effect and then you
34 want to test for that.

35 So normally you say there's no effect and
36 then what you're looking at is, do the data
37 provide evidence of an effect? And if they don't
38 at a particular level, so it's, say, the burden of
39 proof, if they don't then you simply can't reject
40 the known hypothesis. So you can't prove that
41 there's no effect. All you can say is the data do
42 not provide sufficient evidence for an effect.
43 What often happens, and I teach my students not to
44 do this, is what will happen is once you've done
45 your analysis and found that there is no effect,
46 or at least a particular significant level, then
47 you go back and do what's called a post hoc, in

1 other words, after-the-fact power analysis to say,
2 well, I had too few data and if I'd had more I
3 could have detected that.

4 It really doesn't give you any more
5 information than what you're already done if
6 you've properly identified what your hypothesis is
7 and set the bar in terms of evidence. So for
8 instance, to use a judicial example, there's a
9 certain level of proof that's required to convict
10 somebody. And it would be as if after the trial
11 you suddenly decide, well, you know, maybe we'll
12 just lower that a bit because I think he's guilty
13 or we'll raise it a bit because he seems like a
14 nice guy. What you want to do is, the statistics,
15 set this all ahead of time. And the reason you do
16 that is you want to avoid either inadvertently or
17 purposely putting in your own bias into how you're
18 going to analyze that.

19 So you identify those ahead of time so that
20 you don't have to go back and then make an
21 adjustment which can introduce bias into your
22 conclusions and your inference. So what he's
23 doing here basically he's doing in a very
24 mathematical and technical point, is showing that
25 in terms of doing these analysis, what will happen
26 is you can often find after the fact low power.
27 But that really doesn't give you any more
28 information than you already had if you properly
29 actually identify what your hypothesis and set
30 your bar. As I say, it voids the problem of after
31 the fact saying if you didn't get the result you
32 want, saying, well, if only I had more data or if
33 I'd lowered the bar instead of, for instance, the
34 normal burden of proof is, say, significant levels
35 of 5 percent.

36 So in other words, what you're looking at is
37 these data wouldn't have been -- there's only a
38 one-in-20 chance that you would have observed this
39 extreme a result or more extreme in terms of
40 looking at your data. So what it avoids is
41 saying, well, I'll accept a one-in-ten chance
42 rather than the one-in-20. So it's a way of just
43 making sure that everything's done up front rather
44 than, as I say, inadvertently introducing bias
45 into the conclusions at the end.

46 Q And this is a paper you agree with?

47 DR. NOAKES: Oh, yes. I mean, John's a first-rate

1 statistician. I have known him for many years.

2 MS. CALLAN: Can we mark this paper as the next
3 exhibit?

4 THE REGISTRAR: Exhibit 1551.

5

6 EXHIBIT 1551: The Abuse of Power: The
7 Pervasive Fallacy of Power Calculations for
8 Data Analysis

9

10 THE COMMISSIONER: Ms. Callan, I wonder if I could just
11 ask the witness a question?

12 DR. NOAKES: Sure.

13 THE COMMISSIONER: On this page on the screen, and I
14 don't know how to -- I'm looking at the right
15 column on the screen and the paragraph starts, "It
16 is important to understand." I hope everybody is
17 with me on which column I'm looking at. About
18 five sentences down, it says:

19

20 However, there is increasing recognition that
21 a reversal of the usual scientific burden of
22 proof...

23

24 I want to try and move away from analogies to the
25 legal burden of proof because it's well-
26 established in both civil and criminal law so it
27 doesn't change from case-to-case. It's always the
28 same. Are you telling the court that there is not
29 the usual burden of proof or that there could be a
30 different burden of proof for each different
31 hypothesis?

32 DR. NOAKES: There can be. And it really depends on,
33 as I say, if you get back to looking at what your
34 hypothesis is and the level of proof or the
35 significant levels you're willing to accept,
36 basically can be done on a case-by-case basis but
37 it should be done before you do your analysis. So
38 for instance, the normal level of proof is a one-
39 in-20 or a P level of .05. In scientific papers,
40 that's in the normal level of proof. If it was a
41 particularly important problem that you were
42 looking at, say, for instance, for human health or
43 whatnot, you might want to put a higher level
44 burden of proof there so you might be .01.

45 So for instance, if I'm testing a vaccine and
46 I want to make sure that that the effect I'm
47 seeing is positive, then you might put a higher

1 burden of proof on that. But it always should be
2 done ahead of doing the analysis because one of
3 the voids is then going back if I didn't reach
4 that burden of proof then I'll simply reduce the
5 significant levels because you just want to avoid
6 even accidentally including some bias into the
7 results and interpretation.

8 THE COMMISSIONER: So may I just ask then, if you and
9 Dr. Dill were given the identical terms of
10 reference around a research project, is it
11 possible that in engaging your research you would
12 each have in your premise a different burden of
13 proof that you wished to establish?

14 DR. NOAKES: That's certainly possible. And as I say,
15 when you do statistical analysis, the usual or the
16 normal and accepted burden of proof is an alpha or
17 a P level of .05. But there are possibilities
18 where you could adopt a different burden of proof.
19 The key is that you set that level before you do
20 your analysis and you don't adjust it afterwards.

21 THE COMMISSIONER: Dr. Dill?

22 DR. DILL: In truth, you should set that level before
23 you even collect the data but that wasn't an
24 option that was given to us. The data was
25 collected for other reasons and provided to us to
26 do the best that we could with it. I just do want
27 to clarify one thing, though, and that is that the
28 type of analysis, the long-term analysis, is not
29 based on what's commonly called "frequentist
30 statistics", it's based on a different kind of
31 statistical analysis in which we look at the
32 degree of uncertainty around alternative
33 hypotheses rather than looking at a simple null
34 versus a research hypothesis.

35 DR. NOAKES: That's actually not quite correct. I mean
36 the models are based on frequencies. And I
37 apologize for the technical term. They're
38 basically statistical models, which are dealt with
39 in the normal fashion that you would deal with the
40 model. The difference is that they're using a
41 criterion actually to select the best model and
42 that's a slightly different mechanism that they're
43 using. But the models themselves are frequent in
44 the sense that they're using the data. They're
45 assuming a probability distribution and an error
46 distribution and then estimating the parameters
47 from those particular models. And it's only after

1 the fact that they're using some criterion to say
2 this model is better than that model. So it is a
3 frequentist in terms of looking at estimating the
4 models. And again, I'm sorry for the technical.
5 DR. DILL: But it's not in terms of setting a P value
6 or a confidence interval in the same way.
7 DR. NOAKES: Oh, absolutely. When you're looking at
8 these models the P values in terms of looking at
9 the parameter estimates to see whether they're
10 significant, looking at the significance of the
11 model, you are using that P value exactly as I
12 described in terms of here's the level of proof
13 that I'm looking for in those particular models.
14 It's only after you've estimated the models that
15 you then go back and use the results of that
16 analysis to actually determine, is there a model
17 or a set of models which are better than the
18 others?
19 THE COMMISSIONER: Ms. Callan, I think I've taken us to
20 the lunch break. I apologize for using up a
21 little bit of your time.
22 MS. CALLAN: That's all right. Your questions are
23 always the most important ones.
24 DR. KORMAN: Can I clarify one issue with relation to
25 this paper? I'm not exactly sure why you're
26 bringing this here but if we're talking about the
27 issue of whether there's enough salmon, from the
28 salmon farming database, if there's enough
29 information to establish a correlation with Fraser
30 sockeye survival. If that's the context you're
31 bringing this up in, then this paper does --
32 basically when you have a sample size of three or
33 four years, you are going to have very low power
34 to detect an effect of salmon farms on Fraser
35 survival. And this paper does not in any way
36 counter what I just said.
37 MS. CALLAN: Oh, I'm not going there.
38 DR. KORMAN: Okay.
39 MS. CALLAN: I have a specific reason that I'll bring
40 up later in my cross-examination.
41 DR. KORMAN: Okay. I just wanted to make that point.
42 MS. CALLAN: So tune in at two o'clock to find out what
43 that is.
44 THE REGISTRAR: The hearing is now adjourned till 2:00
45 p.m.
46
47 (PROCEEDINGS ADJOURNED FOR NOON RECESS)

(PROCEEDINGS RECONVENED)

THE REGISTRAR: Hearing is resumed.

CROSS-EXAMINATION BY MS. CALLAN, continuing:

Q Dr. Korman, you tracked a number of diseases that Dr. Kent identified as high risk.

DR. KORMAN: Yes.

Q And specifically furunculosis, IHN, BKD, and vibrio or VHSV?

DR. KORMAN: Yes, those four.

Q Now, you identified a statistically significant declining trend towards the number of high-risk diseases reported by salmon farmers between 2003 and 2010?

DR. KORMAN: Yes.

Q This comprised of 496 groups of between five to eight fish?

DR. KORMAN: Let's -- can we go to the page there, because I'm... I think the correlation you're referring to is from the B.C. Salmon Farmers' Fish Health Event data file, but let's just go check that if we can. If you can tell me --

Q It should be page 7.

DR. KORMAN: Page 7. Yeah, that's right. So it's not -- so it's not associated with that 496 fish, so that that is is, you know, salmon farmers have to report on all fish health events, right, and that goes into a database. I then classify those high-risk ones and correlated those over time so the 496 fish, I believe, would be an example of the number of fish sampled during the audits in any one year randomly. So I don't think that applies to that, if I'm understanding correctly.

Q Okay. And the 496 is identified on page 8 paragraph 1.

DR. KORMAN: Right. So that refers to the audit data where they randomly pick fresh silver fish and sample them for a series of viruses and bacteria but that is not the same data that's supplied by the salmon farmers. Just to clarify.

Q Would you agree with the statement that the audit and surveillancing data was quite encouraging?

DR. KORMAN: It shows, you know, fairly low frequency of disease in these -- of the diseases that are monitored in these fresh silvers, yeah, very low

1 frequency.
2 Q And specifically, a low number of positive
3 findings for VHSV?
4 DR. KORMAN: Is -- are you referring to --
5 Q Vibrio.
6 DR. KORMAN: -- vibrio? Yeah, and that's summarized in
7 -- we have -- there's a table that will document
8 that. Just find that very quickly, so I make sure
9 it's accurate. Oh, no, it's in a Figure actually.
10 Yeah, Figure 5 on page 19 is -- yeah, that purple
11 is undetectable in that figure or very hard to
12 see, so that indicates very low frequency of that.
13 Q There were no reports of ISAV?
14 DR. KORMAN: No, that's one of the -- that's one of the
15 viruses that's tested for in this random screening
16 and there's been no positive occurrences of the
17 virus from that testing.
18 Q And you would agree with your statement at
19 paragraph -- at page 10 that negative effects of
20 salmon farms on returns of Fraser River sockeye
21 between 2002 and 2010 were not apparent based on a
22 qualitative comparison with salmon farming data?
23 DR. KORMAN: Yes, I wrote that and I agree with it.
24 Q My next set of questions are for Dr. Connors.
25 Your statistical analysis based on B.C. MAL's
26 record showed no statistical support for a
27 relationship between Fraser River sockeye returns
28 and sea louse abundance on farmed salmon in the
29 Spring or summer of marine entry, the occurrence
30 of high-risk pathogens on farmed salmon in the
31 year sockeye migrate to sea and the proportion of
32 farmed fish fresh silvers -- it's a bit of a
33 tongue-twister.
34 DR. CONNORS: I agree with that statement except for
35 the very beginning where you say returns. So I
36 just want to be, you know, for the record
37 completely clear that what I related there are
38 what I termed survival anomalies which we can go
39 into if we want, but not specifically relating the
40 number of fish that returned and spawned in the
41 river.
42 Q Now, for the second part of your analysis you
43 analyzed fish farm production numbers, winter sea
44 surface temperatures and pink salmon return
45 numbers. However, your results had a high
46 uncertainty that was associated with the
47 calculation such that taking anything from it

- 1 would be speculative.
- 2 DR. CONNORS: I wouldn't say that taking any -- I mean,
3 that's a very broad statement, taking anything
4 from it would be speculative. I think that given
5 the uncertainty around some of these estimated
6 effects, the inference that we draw from it should
7 be done with caution and should be balanced given
8 the weight of other evidence that you guys are
9 considering.
- 10 Q Now, including the three variables as you did, it
11 makes it impossible to figure out if the ocean
12 conditions alone or pink salmon alone were
13 positive?
- 14 DR. CONNORS: Not a hundred percent sure what you mean
15 by that, but what I can say is the approach that I
16 took considered a suite of different working
17 hypothesized -- different hypotheses for the
18 decline. Those hypotheses included just the
19 influence of sea surface temperatures, just the
20 influence of pink salmon abundance, just the
21 influence of farmed salmon production, as well as
22 combinations of those. And so in that sense, I
23 did consider the hypothesis that just sea surface
24 temperatures alone had the greatest support given
25 the data and the analysis certainly suggests
26 otherwise.
- 27 Q Now, I understand that you did an analysis
28 excluding the pink salmon abundance and the
29 surface temperature. So specifically, you were
30 doing farmed salmon numbers versus sockeye
31 returns?
- 32 DR. CONNORS: Yes. One of the analyses looked -- the
33 hypothesis just considered farmed salmon
34 production along early marine migration routes.
- 35 Q And I understand that no correlation was found
36 between sockeye returns and farmed salmon
37 production numbers?
- 38 DR. CONNORS: Okay. So I should just clarify it. I
39 think I was interpreting your initial question as
40 referring to the longer-term analysis that I did,
41 but I believe you're referring to what I call the
42 first component to my analysis that looked at the
43 number of salmon during the shorter time series
44 that we had; is that correct?
- 45 DR. CONNORS: No. I'm talking about the second series.
- 46 Q Okay. So then can you restate what the
47 conclusions were from it? I apologize. I just

1 want to be clear which analysis we're talking
2 about.

3 Q Okay. No specific statistically significant
4 correlation was found between sockeye returns and
5 farmed salmon production.

6 DR. CONNORS: Okay. So I do not report the results of
7 a correlation test between just farmed salmon
8 production and sockeye salmon productivity. If we
9 go to Table 5 in my report on page 19, this table
10 illustrates the different hypotheses that I
11 considered and on them, the two that would most --
12 would refer to the question you asked would be
13 number 19, which is no, which is not the
14 consideration of any of these variables, and
15 number 17 would be farm which is the consideration
16 of just farmed salmon production with the
17 exclusion of or not considered in sea surface
18 temperature or pink salmon abundance. So the
19 question is whether or not based on that, I found
20 a statistically significant correlation between
21 farmed salmon production and sockeye productivity,
22 although I don't report as such in the report, nor
23 do I couch it in a statistically significant
24 framework, if we look at the support for those
25 different models, particularly the column that
26 says "Delta AICC", we see that the difference
27 roughly is about seven or a little less than seven
28 between number 19 and number 17, and so that's
29 fairly strong support for the inclusion of a term
30 for farmed salmon production. But as this -- I
31 believe this analysis illustrates, it would be
32 unwise to just consider -- I mean, given the suite
33 of different hypothesized drivers and candidate
34 models I considered, that's a very, very unlikely
35 model relative to the ones at the top of the list.

36 Q Dr. Noakes, do you have anything to add?

37 DR. NOAKES: In my -- in the first part of my analysis
38 in my report, I actually looked at the correlation
39 between farmed salmon production and log recruit
40 per spawner which is an index of sockeye
41 productivity, and in my analysis I didn't find any
42 significant correlation between the two.

43 DR. CONNORS: So if I could just add a comment there
44 then. Comparing the two analyses is really
45 difficult. Dr. Noakes' analysis considered a
46 portion of the sockeye Fraser time series in
47 aggregate related to farmed salmon production on

1 the East Coast of Vancouver Island. This analysis
2 is based on sockeye salmon populations both from
3 the Fraser, as well as elsewhere, so it includes
4 spatial contrasts and the exposure to farmed
5 salmon production, as well as these other
6 variables, across the entire time series for which
7 we have available information.

8 Q If the commission could turn to provincial Tab 1,
9 I'll put this to the group generally. Would you
10 agree that if a correlation had been found, it
11 doesn't mean causation? For example, in this
12 figure, it's fair to say that fish farm production
13 has been going up in a similar fashion to the
14 population of British Columbia?

15 DR. CONNORS: I guess -- can I start? So of course, as
16 is clearly stated in my report, correlation does
17 not equal causation. And we can get into a
18 discussion about correlation versus causation.
19 This is an interesting graph. It shows that over
20 a time period from 1985 to almost 2010 the human
21 population in B.C. has been increasing and during
22 that same period the human population in -- sorry,
23 the production of farmed salmon has also been
24 increasing along the inside of Vancouver Island.

25 I want to be clear that we want to be
26 cautious comparing this to what I've done. What
27 I've done would be more analogous to considering
28 the human population across all these populations
29 across the entire time series. And so I just
30 wanted to be clear that we're not directly
31 comparing the two kinds of analysis.

32 Q Now, would it be reasonable to assume that
33 increases in B.C. human population might be
34 associated with decreased sockeye salmon returns?

35 DR. CONNORS: Yeah. That's an absolutely legitimate
36 hypothesis but again, I'll direct you to the
37 Pacific Salmon Commission expert workshop that
38 considered a whole suite of different hypothesized
39 drivers to the decline of sockeye salmon and of
40 those, they considered four that were possible-to-
41 likely and those are the ones that are included in
42 my report.

43 MS. CALLAN: If we could mark this as the next exhibit
44 and to give a bit of credit for the document, this
45 is a graph that was created by Dr. Marty.

46 THE REGISTRAR: Exhibit number 1552.

47

1 EXHIBIT 1552: Table showing correlation
2 between B.C. population and farm fish
3 production
4

5 MR. MARTLAND: This one at least, if I might, Mr.
6 Commissioner, pause to observe because I think
7 whatever the approach is with respect to documents
8 created for the purpose of questions on other
9 occasions there have been objections to those, in
10 other cases counsel who made objections are trying
11 to lead the documents. I don't know where that
12 takes us. I don't hear any other objections. We
13 don't raise an objection if that's what it is. I
14 suppose Dr. Marty is here and could be asked about
15 it. I do simply want to make that observation
16 though.

17 MS. CALLAN:

18 Q And this is another question for the panel
19 generally, so whoever feels most qualified to
20 answer it can jump in. What is pseudoreplication?
21 Dr. Connors, feel free to answer if you want.

22 DR. CONNORS: Okay. So pseudoreplication would be the
23 inclusion of a suite of observations that you
24 treat as being independent observations when they
25 aren't. By treating them as independent
26 observations, you increase the likelihood that you
27 might find a statistically significant
28 relationship when in fact a given observation
29 isn't truly independent of another one.

30 Q Now, pseudoreplication is -- in mathematical
31 modelling should be avoided?

32 DR. CONNORS: Absolutely.

33 Q Dr. Noakes?

34 DR. NOAKES: Yes, that's correct.

35 Q Now, Dr. Connors, Dr. McAllister reviewed your
36 report and stated at page 72, seven lines down:

37
38 It appears that all of the statistical tests
39 reported are invalid due to pseudo-
40 replication within each year.
41

42 Can you explain the basis of this comment and what
43 you did in response?

44 DR. CONNORS: Yes, absolutely. That's a very fair
45 point to bring up. So in the analysis that I did,
46 I considered the suite of different sockeye salmon
47 populations. And in a given year, for example,

1 for Fraser stocks that migrate up the inside of
2 Vancouver Island we only have a single estimate of
3 farmed salmon production along that migration
4 route. As a result, if we considered each
5 individual population as an independent
6 observation of the relationship between
7 productivity and farmed salmon production, we
8 would be committing the error of
9 pseudoreplication.

10 Now, in the draft report that I wrote for
11 this technical report I didn't discuss that
12 element of the analysis and though I attempted to
13 account for it, he very correctly pointed out that
14 the way that I structured my models did not. As a
15 result, I changed the way that I structured my
16 models such that correlations in observations
17 within a given year at the unit with which things
18 are measured, so for example, farmed salmon
19 production and the stocks that are all exposed to
20 a single value, are appropriately accounted for in
21 terms of the fact that they're not independent
22 observations but are, instead, correlated.

23 Q So this analysis for your report after the changes
24 were made made it more defensible?

25 DR. CONNORS: This analysis after the changes were made
26 accounted for concerns with regards to
27 pseudoreplication.

28 Q Now, pseudoreplication could be used to increase
29 the apparent power of a statistical test, but it
30 would not increase the true power of the
31 statistical test? And anyone can jump in if they
32 want on this question.

33 DR. NOAKES: Yeah, that's true, because when you have
34 pseudoreplication you assume that you have more
35 degrees of freedom than you actually do and that
36 affects the -- that negatively affects your
37 ability to detect a significant -- you over-
38 estimate the response or statistical significance
39 of the test.

40 DR. KORMAN: If I could jump in here, the modification
41 that Brendan Connors made with respect to the
42 issue of pseudoreplication is in his equation 4 of
43 his report page 14 and I've looked at those
44 comments and the work you've done and I feel that
45 the inclusion -- the modification of his model to
46 account for the correlation in survival rates
47 among stocks within a region basically deals with

1 the pseudoreplication issue, thus, you know, the
2 extent -- thus I think is estimate of what is
3 significant or not then, based on a reasonable
4 model and therefore, probably reasonable estimates
5 of significance.

6 Q Now, in the last ten years, Fraser River pink
7 sockeye salmon have been having some extraordinary
8 returns; would you agree?

9 DR. CONNORS: Is this directed at me?

10 Q Yes.

11 DR. CONNORS: Yeah. I would agree qualitatively that
12 my understanding is that they've had very strong
13 productivity over the past while, but I wouldn't
14 say that I'm, you know, expertly qualified to
15 attest to those patterns.

16 Q Since pink salmon have had a number of extremely
17 good runs since 2000, would you assume that farm
18 production numbers improved the chances of pink
19 salmon survival?

20 DR. CONNORS: Well, that's a good question. I haven't
21 done the analysis that looks at all the available
22 information to ask whether or not there's a
23 positive, negative or no relationship between the
24 productivity of pink salmon populations across a
25 given area and farmed salmon production. But I
26 will point out, I mean, this is an important
27 point. How do we rectify these apparently very
28 contradictory observations? Pink salmon are doing
29 great, sockeye aren't doing well. There's this
30 interesting observation that Harrison River
31 sockeye salmon that have a life history that's
32 more closely to pink salmon, are also doing well,
33 and I don't have any, you know, magic answer for
34 that but I think one interesting piece of
35 information that comes from my analysis is that it
36 does suggest that the species identity does
37 matter. And we know that there are -- there is
38 strong evidence for competition between pink
39 salmon and the open ocean and sockeye salmon and
40 it may be, and my analysis certainly suggests that
41 that's a very important determinate of any
42 influence or association with salmon aquaculture.

43 Q Okay. I'm going to move topics a little bit now,
44 so my next series of questions are for Dr. Dill,
45 but if anyone has anything they want to add with
46 respect to it, feel free to jump in.

47 In what years do you think sea lice from fish

- 1 farms started to infest sockeye salmon?
2 DR. DILL: I actually haven't any idea.
3 Q Would you agree that the first time sea lice were
4 reported in a journal to infect juvenile sockeye
5 salmon was in 2005 in Morton's journal entitled
6 "Sea Louse Infestation in Wild Juvenile Salmon and
7 Pacific Herring" which is Provincial Tab 4?
8 DR. DILL: I actually can't remember if sockeye salmon
9 were in there or if that was pink salmon. Could
10 you put it up? It is? Yeah. Yeah, I'm not aware
11 of any earlier work than that.
12 Q Now, are sockeye infested with sea lice difficult
13 to diagnose?
14 DR. DILL: It's sometimes difficult to diagnose the
15 species of sea louse when they're in the juvenile
16 stage and often they have to be brought into the
17 laboratory to distinguish between the two.
18 Q Would you agree though that juvenile sockeye
19 salmon were probably infested with sea lice before
20 Morton observed it in her 2005 paper?
21 DR. DILL: If they were on the farms, I think it's
22 probably a good bet.
23 Q Would you agree that sea louse infestation is
24 probably -- oh, you actually just answered the
25 question, that it's been going on as long as farms
26 have reared Atlantic salmon.
27 DR. DILL: Sea lice infestation of Pacific salmon has
28 been going on a lot longer than that. This is a
29 natural host parasite system. The issue is at
30 what stage they get onto wild salmon.
31 MS. CALLAN: I think this document is already marked,
32 Morton's paper. Can you just confirm for me?
33 MR. MARTLAND: I'm going to suggest, Mr. Commissioner,
34 that we mark this as an exhibit. If during the
35 break it turns out that -- perhaps we should defer
36 that till after the break and we can see if we're
37 able to learn whether this has already been put
38 in.
39 MS. CALLAN: If we could now turn to Provincial Tab 6.
40 Q Now, I understand Dr. Dill and Dr. Connors were
41 both authors in this paper?
42 DR. DILL: That's correct.
43 DR. CONNORS: Correct.
44 Q If you look at this paper, it describes the years
45 preceding salmon louse infestations as 1975 to
46 2000 and then 2001 to 2002, 2004 and 2006 as
47 during recurrent salmon louse infestations?

1 DR. CONNORS: During recurrent documented salmon louse
2 infestations on juvenile pink and chum salmon,
3 yes.
4 Q Would you agree that this paper says that in 2000
5 that year pre-dates louse infestations?
6 DR. CONNORS: At the time, we did not have any evidence
7 of infestations on those juvenile salmonids prior
8 to that.
9 Q So for the purposes of your paper you assumed then
10 that there were zero lice on the farms?
11 DR. CONNORS: We made the assumption in this analysis
12 that infestations on juvenile pink and chum
13 salmon, yes, were zero during those time periods.
14 Q When writing this paper, did you have access to
15 farmed sea lice counts?
16 DR. DILL: No.
17 DR. CONNORS: No.
18 Q Did you examine any wild coho salmon in 2000 to
19 confirm they had no louse infestations?
20 DR. CONNORS: No. An important point here is that
21 there's only two years of data. It's a proceeding
22 paper that this cites for which we had comparable
23 observations of sea louse infestations on coho
24 versus pinks and chums. So we were making the
25 assumption in here that during those years where
26 there are infestations on pinks, there was
27 coincident infestations on coho salmon.
28 Q And Dr. Noakes, do you have anything to add to
29 this point?
30 DR. NOAKES: I don't have anything specific to this
31 study, but I think it's pretty reasonable to
32 assume that there were sea lice on juvenile salmon
33 for a very long time before salmon farms were
34 here. They're naturally occurring, as Dr. Dill
35 points out. They're naturally occurring parasite
36 and you would expect to find them on juvenile
37 salmon of all species from -- for however long
38 salmon has been around.
39 DR. CONNORS: Nor do I disagree.
40 DR. DILL: Yeah, I disagree completely because studies
41 that have been done in parts of the coast where
42 there aren't salmon farms have found either no
43 lice on juvenile salmon or very low levels
44 compared to those that were found in the Broughton
45 Archipelago in the years of this study. So they
46 are natural parasites, but on much larger fish.
47 DR. NOAKES: Well, I think common sense would suggest

1 that if they're on adult salmon that they're also
2 on juvenile salmon. The first documentation, I
3 mean, and there's back to 1964 I think there was a
4 paper by Parker documenting sea lice and those
5 sorts of things, and I think there's -- I mean,
6 it's -- I think it's common sense and logical to
7 -- and reasonable to assume that there were sea
8 lice on juvenile salmon well before salmon farms
9 were here.

10 DR. DILL: Well, you may say it's common sense and
11 logical, but I would contrast that with a number
12 of studies done on the north coast and in Alaska
13 in which it's simply not the case. They were not
14 found on juvenile fish. And when I'm talking
15 juvenile fish, I'm talking the size that they're
16 parasitizing in the Broughton Archipelago. They
17 simply were not found or found in very low levels
18 until they got further out into the marine
19 environment where they could interact with larger
20 salmonids, either feeding in that area or coming
21 back to spawn. But in the shallow near-shore
22 environment there's almost no evidence with the
23 exception of that Parker paper, which I believe
24 was *Caligus*.

25 Q Now, Dr. Marty published a paper in the
26 proceedings of the *National Academy of Science* in
27 2010 --

28 MS. CALLAN: Oh, sorry. We'll mark this as the next
29 exhibit, Provincial Tab 6, before I move on.

30 THE REGISTRAR: Ms. Callan, we can mark Tab 4 if you
31 wish. We've found that it has not been marked.

32 MS. CALLAN: Okay.

33 THE REGISTRAR: So that will be 1553, that will be for
34 Tab 4. And Tab 6 will be marked as 1554.

35
36 EXHIBIT 1553: Sea Louse Infestation in Wild
37 Juvenile Salmon and Pacific Herring
38 Associated with Fish Farms off the East-
39 Central Coast of Vancouver Island, British
40 Columbia - Morton et al

41
42 EXHIBIT 1554: Coho salmon productivity in
43 relation to salmon lice from infected prey
44 and salmon farms - Connors et al

45
46 MS. CALLAN: And while we're in the marking mood, if
47 you could turn to Provincial Tab 7. If we could

1 mark this as the next exhibit.

2 THE REGISTRAR: 1555.

3

4 EXHIBIT 1555: Relationship of farm salmon,
5 sea lice, and wild salmon populations - Marty
6 et al
7

8 MS. CALLAN: So Provincial Tab 7 is Dr. Marty's 2010
9 PNAS paper.

10 Q Now, Dr. Marty had access to the farm lice counts
11 and estimated the number of adult female sea lice
12 on farms in March 2000 as 9.1 million, which was
13 slightly greater than the amount in March 2001 of
14 7.5 million; would you agree with that?

15 DR. CONNORS: So we're referring to Figure 1?

16 Q That looks like it.

17 DR. CONNORS: Okay. I agree. I can't remember the
18 exact numbers you said, but I certainly agree that
19 there were lice documented on farmed salmon right
20 up to the 2000s, absolutely.

21 Q Okay. Now, this seems to be one of the big areas
22 of disagreement between yourself and this --
23 between Provincial Tab 6 or Exhibit 1554 and
24 Exhibit 1555 and your new paper; is that correct?

25 DR. CONNORS: Not quite. I would agree that the data
26 that was then made available upon the publication
27 of Tab 7 here, the Gary Marty paper, certainly
28 provided more information that needs to be
29 evaluated relative to the dynamics of adjacent
30 wild salmon populations. It also points out that
31 the assumption that juvenile salmon were -- or,
32 sorry, the assumption that farmed salmon had no
33 lice on them prior to 2001 is, you know, an
34 incorrect assumption. And so I think we're going
35 in this direction, but as a result we've taken
36 this information that's been -- that was released
37 as part of this, it's the first time that we had
38 access to the number of sea lice on farmed salmon
39 and related -- and re-examined those relationships
40 in those two data sets and that's, I believe,
41 probably one of the next tabs that you're going to
42 come to.

43 Q Does anyone else want to add any comments to that
44 question?

45 DR. KORMAN: Well, I mean, just in a larger context,
46 the debate about these papers, the controversy in
47 terms of Noakes' interpretation versus others and

1 all the rebuttal papers has largely been around
2 the fact that we don't have a long-term reliable
3 index of sea lice abundance and so various authors
4 have had to, you know, make guesses as to when --
5 the extent of infection and sea lice abundance
6 prior to dates when that information was routinely
7 collected. And that's led to a lot of the debate
8 among the validity of the conclusions from these
9 papers. So I just thought I'd provide maybe that
10 helpful overview.

11 DR. NOAKES: There's also another point too is that
12 even though we don't know the number of lice
13 before 2000, but you need to consider that in the
14 ten or 20 years leading up to that, particularly
15 in the Broughton, there was a large increase in
16 the number of pink salmon returning, so there's an
17 inconsistency in terms of sort of ignoring the
18 fact that you had this large increase while farmed
19 salmon was actually increasing, as well. And the
20 other thing that -- one of the problems here and
21 also in the coming -- in the paper that has just
22 come out, is that everything is being referenced
23 with respect to the highest returns of pink salmon
24 in that area that we've basically gone on record.
25 So essentially, you're reviewing things from the
26 top. So when you look at it in terms of what
27 direction they're going, you're exaggerating the
28 decline because your reference point is not the
29 mean, it's not the lowest one. It's certainly the
30 highest one. So I think that that's a real
31 problem in addition to just assuming that the lice
32 were zero before then. You have to take into
33 account the salmon production that was happening
34 in that area before and you also have to take into
35 account where you're viewing all of this from, so
36 you're viewing it from the top and as I say, that
37 tends to exaggerate any relationship or any
38 perceived relationship that you might have. It's
39 the same problem in the paper that just came out.

40 Q Go ahead, Dr. Connors.

41 DR. CONNORS: So just to be clear, I mean, I think we
42 can certainly probably all agree that an
43 understanding of what was going on during this
44 black box period of about I believe it's ten years
45 prior to the early 2000 during which there was an
46 escalation of the number of farmed salmon in the
47 Broughton but for which we don't have information

1 on the number of lice on farmed fish or
2 information on the number of lice on juvenile fish
3 is an area of considerable uncertainty.

4 The approach that we took in our most recent
5 publication is we treated that as missing
6 information in our analysis. We otherwise
7 included information during this time period that
8 you're looking on the figure, as well as adjacent
9 reference populations and periods preceding
10 aquaculture's presence at all during which it's
11 not possible for there to be lice from salmon
12 farms being transmitted.

13 Q Okay. So for a bit of housekeeping, is Provincial
14 Tab 9 your paper that you just published a couple
15 of days ago in the proceedings of the National
16 Academy of Science?

17 DR. CONNORS: Yes.

18 MS. CALLAN: If we could --

19 DR. DILL: Could I just make a comment before we move
20 on?

21 MS. CALLAN: Oh, I'm not moving on, but if I could mark
22 this first and then --

23 DR. DILL: Oh, sure. Yeah.

24 MS. CALLAN: Okay. If I could mark this as the next
25 exhibit?

26 THE REGISTRAR: 1556.

27
28 EXHIBIT 1556: Effects of parasites from
29 salmon farms on productivity of wild salmon -
30 Krkosek et al
31

32 MS. CALLAN:

33 Q Now you can go on, Dr. Dill.

34 DR. DILL: Thank you. I just wanted to say that I
35 think this controversy or this contrast between
36 these two papers illustrates something really good
37 about science, and that is that science builds
38 incrementally on other knowledge. And there are
39 two really good things about the Marty, Gary Marty
40 et al paper. Quite apart from the fact that I
41 disagree with the analysis and I think our
42 analysis is an improvement, but one of them is
43 that the data is available to us now. When
44 someone publishes a paper and they have access to
45 data that no one else does, then it behoves them
46 to make that data available to everyone and it was
47 the fact that they published their paper at all

1 that made us -- made it possible for us to do this
2 kind of analysis and so I think that's great.

3 The other thing is that there was one finding
4 in this paper that - I'm talking about the Marty
5 et al paper - the finding that the number of lice
6 on juvenile pink salmon was closely related to the
7 number of lice on the farm. That pretty much
8 nails now that relationship to the lice on the
9 wild fish are coming from the farm. This is
10 something that the fish farm has denied for many
11 years but I now think that it's incontrovertible.

12 Q Now, I'm going to -- oh, go on, Dr. Noakes.

13 DR. NOAKES: It's okay. It's a criticism I have of the
14 Marty paper, as well, is I think they could have
15 -- there are other papers that came out after the
16 Marty paper or at least about the same time in
17 terms of other hosts for *Lep s.* in terms of three-
18 spine sticklebacks and those sorts of things. So
19 as Marty correctly points out and as Terry Quinn,
20 who's a very competent stock assessment person,
21 there is a good predictor in terms of the number
22 of lice on returning salmon in the Fall is a good
23 predictor of the number of lice that you're going
24 to see on farms in the previous year.

25 But it ignores the fact that there are other
26 -- there are other syncs or at least hosts of lice
27 that are from those fish that are returning in the
28 Fall, and again, I don't think there's any
29 question that some of those lice are coming from
30 the farms and onto pink salmon, but there are
31 other hosts there, as well, that probably could
32 have been mentioned in the Marty et al paper.

33 Q And what do you think those hosts are?

34 DR. NOAKES: Well, as I say, in Jones and Prosperi-
35 Porta, and I don't know if that paper's been
36 entered into evidence or not --

37 Q I don't think it has.

38 DR. NOAKES: Okay. There is another paper out there
39 that talks about high level -- it was -- I
40 referenced it in mine and I don't know if you did
41 in yours, but there's -- but there are other --
42 there's another paper out there that references
43 high levels and high prevalence of sea lice,
44 salmon lice, on three-spine stickleback, which is
45 another tongue-twister.

46 DR. DILL: But, correct me if I'm wrong. There have
47 been only a very few adult lice and absolutely no

1 gravid female lice ever found on a three-spine
2 stickleback, so they cannot be the source of lice
3 to farm fish.

4 DR. NOAKES: Yeah. I mean, it's a limited study and
5 it's true that I don't think there has been adult
6 lice found there, but that doesn't mean that they
7 aren't competent for infecting other fish, in
8 terms of having motile lice.

9 Q So my next set of questions will be to try to
10 parse out some of the differences between your
11 paper and Dr. Marty's paper. So you've reviewed
12 Dr. Marty's PNAS paper on sea lice where they
13 reported no relationship between lice levels on
14 farmed fish and -- in the Broughton and pink
15 salmon survival levels. Now, I understand that in
16 at least Dr. Dill's opinion in his report at page
17 11 at paragraph 2, that the analysis had a very
18 small probability of being able to detect such
19 effect. It had what statisticians call low power;
20 is that correct?

21 DR. DILL: So where (indiscernible - microphone off)?
22 Q It's page 11, para 2.

23 MR. LUNN: (Indiscernible - microphone off).

24 Q I'm referring to Dr. Dill's technical report. So
25 5D.

26 DR. DILL: Yes, I believe that's correct.

27 Q Okay. Now, I put it to you that this is the type
28 of analysis of low statistical power that was
29 criticized in Hoenig's paper?

30 DR. DILL: It is that sort of post hoc analysis.

31 Q Dr. Noakes, did you want to add anything?

32 DR. NOAKES: That's correct, it is the same analysis
33 that was criticized by Dr. Hoenig.

34 Q And I won't get into the debate we had before
35 lunch, but I take it that amongst the panel
36 there's differences of opinion between whether or
37 not that type of analysis is correct?

38 DR. CONNORS: I certainly don't disagree with the paper
39 that Hoenig wrote. I mean, I haven't gone through
40 it in detail, but I think the general criticisms
41 of post hoc power analysis where you use an
42 observed effect and ask whether or not it matters,
43 I believe, you know, believe in general with that
44 statement, yeah.

45 DR. NOAKES: Yeah, I would -- I think -- there are many
46 -- certainly there are many people that don't
47 believe in doing post hoc analysis, power

1 analysis. The power analysis should be done when
2 you're planning an experiment, rather than after
3 the fact. You deal with that in terms of
4 significance and testing and creating an
5 appropriate hypothesis to test.

6 Q Dr. Dill, did you have anything to add?

7 DR. DILL: (No audible response).

8 Q Okay. Now, at page 2 of Dr. Hoenig's paper he
9 says [as read]:

10
11 Because of the one-to-one relationship
12 between P values and observed power, non-
13 significant P values always correspond to low
14 observed powers.

15
16 Do you agree with this statement and anyone can
17 jump in and feel free to comment on that.

18 DR. NOAKES: I certainly agree with that statement.

19 Q And I take it from your nodding, Dr. Korman, that
20 you do?

21 DR. KORMAN: Yes, it's common result.

22 Q And Dr. Connors also nodding?

23 DR. CONNORS: Yes, correct.

24 Q Okay. And Dr. Dill is also nodding.

25 Now, in your paper which is Provincial Tab 9
26 and Exhibit 1556, the missing data was just
27 ignored for the purposes of it and wasn't counted
28 in the conclusion. I put it to you that that's a
29 key assumption and without this assumption, you
30 wouldn't have reached the same conclusion. And
31 specifically to help you, I've just got a quote
32 from page 3 of your study which says:

33
34 If lice were present but at a regionally
35 negligible abundance before 2000, then there
36 would likely be little change to the results.
37 However, if lice were in fact abundant and
38 infestations of wild juvenile salmon occurred
39 in the 1990s, the estimated effect of lice on
40 wild salmon survival would likely be
41 diminished due to high salmon returns in
42 those years.

43
44 Do you agree with that statement?

45 DR. CONNORS: Yes, I agree with that statement. I
46 think the important thing to note here is that
47 that doesn't say that if we had information that

- 1 went back then that these results wouldn't hold,
2 or these patterns wouldn't hold. We have to make
3 an assumption or in this case we have to, you
4 know, leave that data out because we don't have
5 that data for this analysis. Now, we go on to
6 detail a possibility or a plausible scenario which
7 has been demonstrated elsewhere whereby a regional
8 host threshold might be passed, but again, that's
9 simply some speculation given some of the
10 available information and so we felt the most
11 rigorous way to do this was to treat that as
12 missing data and use those reference populations,
13 as well as information back through time, to
14 better estimate all the other aspects of our model
15 and better isolate any potential influence or
16 correlation with sea lice on farmed salmon.
- 17 DR. NOAKES: I think you're correct though in the sense
18 that by setting those to zero, you're not
19 significantly different than the analysis that you
20 had in the first Krkosek paper and where they
21 explicitly assumed that it was. I mean,
22 essentially setting them to zero is implicitly
23 having that assumption that lice were a problem
24 before that time.
- 25 DR. CONNORS: That's a really important point. We did
26 not set it to zero. That would be assuming that
27 there were no lice on farmed salmon during that
28 time. We simply omitted that data from the
29 analysis, which is different than setting farmed
30 -- the number of lice on farmed salmon - our
31 covariate - to zero during that time period.
- 32 Q And that was a change in assumptions from Exhibit
33 1554 to 1556, so that's your first paper on coho
34 salmon productivity and your latest paper.
- 35 DR. CONNORS: That's correct, a change in assumptions
36 as to whether or not regional infestations of lice
37 on juvenile salmon occurred during that period,
38 correct.
- 39 DR. NOAKES: I don't see a big difference between
40 omitting it and setting it to zero. I mean, you
41 know, if you omit it, by default it's zero. So...
- 42 DR. CONNORS: But by setting it to zero, you are
43 including information on the dynamics of those
44 populations during that time period. Right. And
45 so -- and that's certainly not what we did in this
46 case. And so I just want to be clear on that
47 distinction. It's not that we treated louse

- 1 abundance on farmed salmon as being non-existent
2 and then interpreted our relationships including
3 information on pink and coho populations during
4 that time period. We removed that entire time
5 period from the analysis.
- 6 DR. NOAKES: I just don't see the difference. Sorry.
7 Q That's fair enough. And that's the beauty of the
8 panel, I think, is that you get everyone's opinion
9 in real time and don't have to go through the same
10 questions four times.
- 11 DR. KORMAN: But if you just -- in that particular
12 example it's actually -- it's non-debatable. I
13 mean, Don. If you're -- think of a simple
14 regression of one variable on another and there's
15 a certain number of observations that have, let's
16 say, zero for the "X" value, right? So in one
17 case you're going to estimate the regression and
18 include those zeros as part of the estimation.
19 That's going to give you a different answer than
20 if you drop those zero values. Then they won't
21 even be shown on the graph and you'll come up with
22 a different estimate, which is what Dr. Connors is
23 saying, so that you will get different results
24 dropping numbers versus including them in the
25 analysis as zeros. That's -- just like it's not
26 debatable.
- 27 DR. NOAKES: No, no, no, I'm not debating that. What
28 I'm saying is with respect to the inference you're
29 drawing with respect to the impact of lice from
30 the farms on the pink salmon there's no difference
31 in that particular -- your case, whether you admit
32 them or assume that they're not there. I mean,
33 you're basically just using the data from that
34 2000 point on and, as I say, whether you admit
35 them or whether you set them to zero, that will
36 cause a difference, but, I mean, realistically in
37 the grand scheme of things you're doing exactly
38 the same thing as you did in the first paper.
- 39 Q Now, would you agree that in 1999 the brood year
40 that returned returned in record high numbers?
- 41 DR. NOAKES: This is for Fraser River sockeye,
42 you're...?
- 43 Q That's right. No, actually, I think it would
44 be --
- 45 DR. NOAKES: No.
- 46 Q -- for pinks, sorry.
- 47 DR. NOAKES: I haven't seen any data presented and I

1 don't have it in front of me on pink salmon
2 returning to the Fraser in 2009. But I do believe
3 that they were -- there was a considerable return.
4 Q Now, another question that I have with respect to
5 your models is that I understand that in your
6 paper and specifically the Exhibit 1556 that your
7 model had all stocks of fish in a given year going
8 by the same number of lice. Would you agree that
9 this is a form of pseudoreplication?

10 DR. CONNORS: I would agree that if it's not
11 appropriately accounted for then it is a form of
12 pseudoreplication. It gets right back to the
13 heart of the discussion we had at the beginning of
14 these discussions after lunch about how to
15 appropriately account for the non-independence of
16 observations across populations being related to a
17 single regional variable in a given year. And so
18 this exact same approach that I took in my
19 technical report for the Cohen Commission is the
20 same formulation that we took in this analysis.

21 MS. CALLAN: And I'm coming quick to the end of my time
22 so I was just wondering if the salmon farmers
23 would give me a couple minutes? Fifteen? Thanks.

24 Q Now, I also understand in contrast to Dr. Marty's
25 paper, your paper addressed pink salmon numbers,
26 as well as coho salmon?

27 DR. CONNORS: Correct.

28 Q Okay. And I understand that Ms. Morton also
29 published a paper in October which is Provincial
30 Tab 13 and if we could mark this as the next
31 exhibit.

32 THE REGISTRAR: Exhibit number 1557.

33
34 EXHIBIT 1557: Sea lice dispersion and salmon
35 survival in relation to salmon farm activity
36 in the Broughton Archipelago - Morton et al
37

38 MS. CALLAN:

39 Q And on this paper at page 155 she stated:

40
41 Based on the escapement data, there were no
42 significant differences in survival that
43 corresponded to sea-louse abundance and
44 juvenile salmon mortality on the migration
45 route containing active farms relative to
46 unexposed populations north of the Broughton
47 Archipelago.

1 Do you agree with the conclusions of the study?
2 DR. CONNORS: Is that directed at any one person?
3 Q If you'd like to answer it?
4 DR. CONNORS: Yeah, I have not read in detail through
5 the entire paper, but my -- but I do in my coarse
6 reading of it last night, after I did see that it
7 was going to be entered into evidence, I agree
8 with the results of that analysis.
9 Q Okay. And it looks like Dr. Dill wants to jump
10 in, as well.
11 DR. DILL: Only to say that I received this paper at
12 about seven o'clock yesterday morning and haven't
13 had a chance to look at it.
14 Q Okay. So I take it that's the reason why it wasn't
15 cited in your PNAS paper, because you haven't seen
16 it prior to the Cohen Commission?
17 DR. DILL: I had not seen it until yesterday morning.
18 Q Now, on -- or on Tuesday Dr. Johnson testified
19 regarding coho susceptibility to sea lice. He
20 said at page 13 lines 5 to 21 - and if we can just
21 put that up --
22 MR. LUNN: Sorry, Doctor...?
23 MS. CALLAN: Dr. Johnson on Tuesday, page 13 and lines
24 5 to 21.
25 MR. LUNN: This is from the transcript?
26 MS. CALLAN: That's correct.
27 Q And it says:
28
29 Q And my last question is are you aware of any
30 controlled laboratory studies with sea lice
31 and coho salmon?
32
33 Dr. Johnson answered:
34
35 As part of my Ph.D. thesis, I did conduct
36 some studies with sea lice and coho salmon,
37 looking at susceptibility of coho salmon to
38 infection in comparison to Atlantic and
39 chinook salmon as well as looking at the role
40 of processes such as inflammation and the
41 ability of coho salmon to remove sea lice.
42 Q And what were your findings?
43
44 And then Dr. Johnson answered:
45
46 It was found that coho salmon, of all the
47 salmon species that we've examined, are very

1 resistant to infection, and this is a single
2 pulse infection within the laboratory when
3 compared to Atlantic or chinook salmon.
4

5 Do you agree with that statement?

6 DR. CONNORS: Yeah. I mean I agree with the paper that
7 he published on that work that showed that when
8 you exposed the three species, it's my
9 recollection of the paper when you expose the
10 three species to a single pulse infection of "X"
11 number of sea lice, coho end up with the least
12 number of sea lice on them at different given
13 points in time afterwards.

14 Q And, as well, if we could turn to Provincial Tab
15 12.

16 DR. DILL: May I just comment on that, as well?

17 Q Absolutely.

18 DR. DILL: As I understand and remember Dr. Johnson's
19 Ph.D. thesis, this was done like a lot of the
20 similar kinds of studies, with sea lice
21 copepodids, so juvenile stage lice in a single
22 pulse. If you remember or if you've read our
23 other paper on coho salmon, the one that was co-
24 authored by Drs. Jones and Hargreaves, we believe
25 a lot of the lice that are getting onto the coho
26 salmon are actually getting onto them as motile
27 pre-adult and adult lice. And so the situation
28 may not be directly comparable because these
29 different life stage may be having a very
30 different effect.

31 Q Okay. So if we could turn over then to Provincial
32 Tab 12. This is another paper by Dr. Johnson and
33 he came to similar conclusions as what he wrote --
34 or what he testified. And specifically at page
35 188 on the last line he says:

36
37 And specifically said coho salmon appear to
38 be the most resistant species having
39 significantly fewer copepods than both
40 chinook or Atlantic salmon at 15 and 20 post
41 days infection.
42

43 Now, I understand, Dr. Dill, that you did have
44 some concerns. Is this something -- this
45 statement that you agree with or do your earlier
46 concerns raised that you just said apply to this
47 paper?

1 DR. DILL: I don't have any concerns with the paper and
2 I agree with the statement. It's copepodids, by
3 the way, not copepods. They're all copepods. But
4 I was just simply pointing out that it's the same
5 caveat would apply here that we're not for the
6 most part probably talking about lice that get on
7 at that early stage of their existence.

8 Q And you didn't cite this in your PNAS paper last
9 week?

10 DR. CONNORS: No, this paper was cited in the preceding
11 papers that looked specifically at the
12 interactions between pink salmon and coho salmon
13 and drew some inference on whether or not there
14 were detectable -- likely impacts from louse
15 infection, et cetera. I don't believe this is
16 said in the PNAS paper.

17 MS. CALLAN: Okay. If we could just turn subjects
18 quickly. Oh, could we mark this document as the
19 next exhibit?

20 THE REGISTRAR: Exhibit 1558.

21
22 EXHIBIT 1558: Comparative susceptibility and
23 histopathology of the response of native
24 Atlantic, chinook and coho salmon to
25 experimental infection with *Lepeophtheirus*
26 *salmonis* (Copepoda: Caligidae) - Johnson et
27 al
28

29 MS. CALLAN:

30 Q Dr. Dill, at page 3 of your report you stated that
31 infectious salmon anaemia has not been confirmed
32 on B.C. fish farms but several of the veterinarian
33 records refer to symptoms that are highly
34 suggestive. Can you identify for me the symptoms
35 that are highly suggestive?

36 DR. DILL: As you were quick to point out yesterday, I
37 am not a veterinarian or a fish diagnostician, so
38 I am going from the report cited in my report, my
39 technical report and that's Dr. Marty's statements
40 that the fish had ISA-like symptoms.

41 Q But you'd have to defer to Dr. Marty or to Dr.
42 Kent with respect to their conclusions that they
43 reached with respect to whether the symptoms were
44 causative of ISA or another disorder?

45 DR. DILL: Well, one of the things I've heard is that
46 the same symptoms may be characteristic of other
47 diseases and so we can't take too much from the

1 statement that they are ISA-like. But it strikes
2 me as rather curious that the pathologist would
3 write ISA-like instead of BKD-like or IHN-like or
4 whatever else these diseases are. It's also my
5 understanding that when those ISA-like symptoms
6 appear, there is some process that's supposed to
7 kick in to do more detailed analyses, diagnostic
8 work, and it's supposed to be reported to the
9 world food agencies and so forth.

10 Q But, again, you're not an expert so...

11 DR. DILL: I'm not claiming to be an expert. I'm not
12 claiming to know that this was ISA, I'm not
13 claiming to know it isn't ISA.

14 Q Okay. Now, as well, another question for you, Dr.
15 Dill. You've cited Johnson's 1996 paper for the
16 proposition that adult sockeye can be killed by
17 lice in sufficient numbers and under adversarial
18 environmental conditions. However, you would
19 agree that the measure number of *L. salmonis* in
20 the paper was 300 lice per fish and the range
21 observed was 49 to 1,372 lice per fish?

22 DR. DILL: Well, I don't have those numbers in front of
23 me, but yeah, it was a very unusual event. It was
24 an event with very high temperatures in Alberni
25 Inlet and the fish weren't able to get up the
26 river and they were milling around in there and
27 they basically had their skin almost eaten off by
28 high levels of these lice. It was a very unusual
29 circumstance.

30 Q Okay. And is Provincial Tab 2 the paper that I'm
31 -- the Johnson paper?

32 DR. DILL: I -- could you pop it up? Yes, that's the
33 paper.

34 MS. CALLAN: Okay. If we can mark that as the next
35 exhibit?

36 THE REGISTRAR: 1559.

37
38 EXHIBIT 1559: Disease induced by the sea
39 louse (*Lepeophtheirus salmonis*) (Copepoda:
40 Caligidae) in wild sockeye salmon
41 (*Oncorhynchus nerka*) stocks of Alberni
42 Inlet, British Columbia - Johnson et al
43

44 MS. CALLAN:

45 Q Dr. Dill, now I understand that you are of the
46 opinion that you need more data. How many more
47 years of data would you require to come to the

1 conclusion that there is no correlation between
2 salmon and sockeye returns, and specifically,
3 farmed Atlantic salmon?

4 DR. DILL: Well, that's where we could do, I think, the
5 kind of power analysis that probably would agree
6 is valuable. It's the sort of situation where you
7 can look at your estimated effect size and predict
8 how many data points you would need to reject a
9 null hypothesis. I can only guess at that. I
10 would, you know, say perhaps eight to ten years
11 might be sufficient. Four or five, which is what
12 we have now, is certainly not.

13 Q Now, in your view, what was the most limiting
14 factor in your ability to perform a rigorous
15 analysis capable of answering these questions with
16 certainty? Would it be a lack of sockeye salmon
17 disease data or a lack of farm disease salmon
18 data?

19 DR. DILL: It's a lack of -- I won't say disease farm
20 -- pathogen data. It's the very short nature of
21 the time series. That is the most limiting factor
22 I think we faced.

23 Q So you'd specifically disagree that it's a lack of
24 wild sockeye salmon disease data?

25 DR. DILL: I think that's important but in terms of
26 testing the hypothesis that we're examining, the
27 wild sockeye data is not useful for testing a
28 hypothesis. It would test some predictions of the
29 hypothesis that would follow if you were rejecting
30 the null hypothesis.

31 Q Dr. Noakes, do you have anything to add?

32 DR. NOAKES: I don't think I'd agree with that. I
33 mean, if you're trying to look at causation and
34 you're trying to evaluate whether, for instance,
35 in this case farmed salmon has an effect, you
36 really do need the data from the wild salmon to
37 actually make some sense of what's going on.
38 Because if you don't even know if they have a
39 disease, how can you suggest that a disease on a
40 farm is causing (a) a disease and then (b)
41 mortality in sockeye salmon? You really do need
42 to know what's going on in the wild salmon. I
43 mean, if they have -- if there's no IHN on farms,
44 but they have IHN on wild salmon, then that tells
45 you something in terms of what's going on. So
46 there's no way you can look at causality without
47 having those kind of data there.

1 Q And I think --

2 DR. DILL: Just to be clear, I don't disagree with
3 that. I was answering in the context of the way
4 that I understood you to phrase the question.

5 DR. NOAKES: Right. And, I mean, to be clear, I
6 thought the question was how much more data do you
7 need to establish a correlation between disease on
8 farmed salmon and the dynamics of Fraser sockeye.
9 And I also agree that information on the diseases
10 present, their distribution and abundance on wild
11 fish is absolutely important to establish any
12 causality or establishing the legitimacy behind
13 any correlation you find. I just wanted to
14 clarify the question.

15 Q And my last question is for Dr. Noakes. Can you
16 tell me what you meant by your comment at page 7
17 paragraph 3 and specifically [as read]:
18

19 Not surprisingly, Connors' 2011 found that
20 the data from the 2005 brood year, the 2009
21 returns, exerted a high degree of leverage
22 that observation significantly influenced the
23 results and would by itself tend to
24 exaggerate any negative association. Also,
25 Connors' 2011 elected to not include data
26 from the record 2010 returns of Fraser River
27 sockeye salmon in his analysis for a variety
28 of reasons. Like 2009, I would fully expect
29 the 2010 return data would exert significant
30 positive leverage that would tend to reduce
31 the association between and among the various
32 factors?
33

34 DR. NOAKES: Yes, first of all, in terms of not
35 including the 2010, there are reasons why that
36 wasn't done. We don't have the five-year-olds and
37 we don't have an exact number. We know it was
38 very large. So not including that particular data
39 point is understandable, as I say, for a variety
40 of reasons.

41 But the reason I say the 2005 and talk about
42 the leverage on the 2010 is it goes back to a
43 point where I made before where we may have a
44 short time series, but we have a time series which
45 includes the highest and the lowest values that
46 we've ever seen in terms of returns to the Fraser
47 in terms of sockeye. So what happens is when you

1 have a data point which is far away from the mean,
2 it's like a lever on a wheelbarrow. The further
3 away you get from the wheel, the easier it is to
4 lift it up. So when you have data points that are
5 far away from the mean, they exert high -- it's
6 called high leverage on the relationship. So a
7 data point that's particularly low will tend to
8 pull the relationship towards that point, the way
9 the statistical estimation procedure works. So a
10 data -- for instance, the 2009 would tend to
11 exaggerate a negative effect whereas the 2010,
12 because you've got an exceptionally high, it would
13 counter-balance that. Essentially what it would
14 do is it would tend to pull the relationship in
15 the other direction because it's exerting high
16 positive leverage in terms of that. So as I say,
17 it's quite powerful to have those two points
18 there, even though they only have a few years of
19 data. It gives us extremely high contrast.

20 Q And Dr. Connors?

21 DR. CONNORS: Just to follow up on that, and I don't
22 disagree with Dr. Noakes' characterization of
23 that. I do want it just clear for the record that
24 there was no election to not include any data in
25 this analysis. I used all the available
26 information that was there for me. And when it
27 comes to the statement that I would fully expect
28 the 2010 return data to significantly -- exert
29 significant positive leverage that would tend to
30 reduce the association between and among the
31 various factors, I think Don would maybe agree
32 with me that that's speculation. And it may be,
33 given this very, you know, the support for this
34 odd year/even year pink salmon influence on farmed
35 salmon production, that including 2010 data may
36 strengthen that relationship. We don't know until
37 we include that data in the analysis. But I just
38 want to make that point clear.

39 DR. NOAKES: I don't think there's a lot of question of
40 whether including something that's the maximum.
41 You just need to look at what the residual would
42 be from that. We have what the value of the mean
43 -- we can calculate the mean and it's pretty easy
44 to see the 30 million is well above the mean. So
45 you're going to have, whether it's a 25 million in
46 terms of the residual or it's a 20 million, it's a
47 very high leverage point. I don't think there's

1 any question that it would exert high positive
2 leverage.

3 MS. CALLAN: And those are my questions. I want to
4 thank you for making a lot of difficult math
5 concepts easy to understand. Thank you.

6 MR. MARTLAND: Mr. Commissioner, I have counsel for the
7 B.C. Salmon Farmers' Association remaining with
8 just under 60 minutes on his time.

9 THE COMMISSIONER: Would it be convenient to take a
10 ten-minute break now?

11 MR. BLAIR: As you wish. I'm happy to get started.
12 I'm also happy to take a break now. Your choice
13 always.

14 THE COMMISSIONER: We'll take the break -- well, not
15 always.

16 MR. BLAIR: Thank you.

17 THE COMMISSIONER: We'll take a ten-minute break.
18 Thank you for your cooperation.

19 MR. BLAIR: Thank you.

20 THE REGISTRAR: Hearing will now recess for ten
21 minutes.

22

23 (PROCEEDINGS ADJOURNED FOR AFTERNOON RECESS)

24 (PROCEEDINGS RECONVENED)

25

26 MR. BLAIR: It's Alan Blair, appearing for the B.C.
27 Salmon Farmers Association, and with me is my
28 associate, Shane Hopkins-Utter.

29

30 CROSS-EXAMINATION BY MR. BLAIR:

31

32 Q Gentlemen of the panel, I'd like to start where
33 the Province left off, but I'm not sure that I
34 totally understand where that is. So I'll ask a
35 more general question, rather than the somewhat
36 specific questions around statistics that we've
37 been listening to for most of the day. It does
38 touch on the statistics, and also a little bit on
39 biology. And I'm thinking of the comments we've
40 heard from Dr. Noakes earlier, when he was
41 referring, as you all have, to the relative short
42 time series of data from the B.C. Salmon Farmers
43 fish health database, and also the audit numbers
44 that we have in the provincial database.

45 And Dr. Noakes made an important point, or it
46 seemed important to me, with respect to the
47 significance of the very low returns in 2009 and

1 the very high returns in 2010. And I think -- I
2 think, subject to the information that's in the
3 databases and the length of the time series, I
4 think those of you can give an opinion on this
5 will be of one mind, that there's no, in quotes,
6 "strong signal". Dr. Noakes is looking for a
7 strong signal in the data if one existed. And I
8 think I -- I think you're all in agreement that in
9 the data that you looked at, there was no strong
10 signal which would have predicted, statistically
11 at least, to a low '09 or a high 2010 return.

12 So we go left to right.

13 DR. KORMAN: Yes. I said something very much along
14 those lines in one of the final paragraphs of my
15 report, and it's not really -- one doesn't have to
16 use a statistical comparison to make that
17 inference. So, I mean, it's just a standard
18 observation that if you have, you know, very low
19 and strong survival, very contrasting values, and
20 very similar values in an independent variable,
21 like the number of fish farms, or the amount of
22 disease, then your qualitative assessment of that
23 is that there's not that much of a linkage based
24 on that very limited sample. So you can make that
25 inference without it invoking statistics at all.
26 In fact, the sample size is so low there's really
27 not much point in invoking statistics.

28 Q So I just want to summarize. You're in agreement
29 that the B.C. Salmon Farmers fish health database
30 and the provincial audit database on fish health
31 audits doesn't show any signal which is predictive
32 of the low returns in '09, but the high returns in
33 2010.

34 DR. KORMAN: Absolutely.

35 Q Yes. Dr. Connors.

36 DR. CONNORS: And I agree, as well. But I just want to
37 be clear, I did not do any analysis that included
38 the 2010 returns; just so that's clear for the
39 record.

40 Q I'll put another note in the column next to your
41 name on that point, then. I have three. Dr.
42 Noakes.

43 DR. NOAKES: Yeah. No, I would agree with that.

44 DR. DILL: As would I.

45 Q Thank you. Now, picking up on the strong signal
46 but moving from the database entirely, but looking
47 for a strong signal in some other evidence than

1 those two databases that I've just referred to.
2 And specifically I want to direct the four of you
3 to ocean conditions, and specifically ocean
4 conditions relative to the out-migrating Fraser
5 River sockeye notably in 2007 and 2008 for the
6 returns in 2009 and 2010.

7 We've heard evidence of a one-two punch, or a
8 one-two-three punch, and in the -- in the order
9 that the out-migrating salmon might have seen
10 them, we heard evidence in 2007 of a one-two-three
11 punch, and I'll summarize those for you. And my
12 question so you can be thinking about it is, is
13 there anything similar that would have affected
14 the out-migrating salmon in 2008, positive or
15 negative, that you're aware of.

16 But I'll give you the 2007, what I'm calling
17 the one-two-three punch.

18 One, there was a *Heterosigma* bloom in the
19 Strait of Georgia. We heard that, Mr.
20 Commissioner heard that from Dr. Rensel when he
21 gave his evidence. He also demonstrated the very
22 strong correlation between *Heterosigma* bloom and
23 sockeye returns.

24 Number two was the low feed availability,
25 that you probably all know was Dr. Beamish's
26 evidence before this Commission. His evidence, in
27 summary form, was that the fish weren't eating.
28 There wasn't much in their stomachs as they were
29 moving through the Strait of Georgia.

30 And three was the evidence we heard from Dr.
31 McKinnell. And his evidence in part was dealing
32 with the ocean conditions that the fish would have
33 encountered as they were migrating up towards the
34 Gulf of Alaska. And you may or may not know, but
35 the Commission heard that there were three
36 particular data points clustered together at the
37 very northern tip of Vancouver Island to the north
38 end of Johnstone Strait. He described for all of
39 us that there's a grid and devices in the ocean
40 which measure temperatures. And so we had up on
41 the screen three bright red spots, which was
42 basically - you may not know this evidence, but
43 I'm summarizing it for you, and if you do know it,
44 you can tell me when you answer the question -
45 that the migrating salmon heading north at the
46 north end of Johnstone Strait near the northern
47 tip of Vancouver Island would have encountered

1 abnormally hot water, warm water, warmer than
2 average, and certainly warmer than any other point
3 of the Gulf of Alaska at that time period, and at
4 the time period it was right for the out-migrating
5 salmon.

6 So one-two-three punch is what we heard from
7 various witnesses; the Commissioner has that
8 evidence.

9 Firstly I'd ask you individually, perhaps
10 left to right again, if you're familiar with that
11 evidence. And by that I don't mean personally,
12 but that the Commission has heard that evidence.
13 Dr. Korman?

14 DR. KORMAN: Yes, I've heard this story for 2007.

15 Q Dr. Connors?

16 DR. CONNORS: As have I.

17 Q Dr. Noakes?

18 DR. NOAKES: Yes, and I've read those papers.

19 Q And, Dr. Dill.

20 DR. DILL: I was not aware of the *Heterosigma* work
21 until just recently. But my understanding was
22 that much of the testimony of Dr. Beamish was
23 called into question, that his data didn't
24 actually support that. Nevertheless, I think it
25 was very good evidence that 2007 was a
26 particularly bad year for ocean conditions.

27 But I also want to take this opportunity to
28 point out something that's been sort of nagging at
29 me throughout all of the proceedings here today,
30 and that's that people seem to insist on taking
31 things one factor at a time. And I'm really glad
32 that where you seem to be going is looking at
33 interactions of factors. So there are a variety
34 of different oceanic and other conditions that
35 might affect the fish simultaneously,
36 synergistically, antagonistically, with farms.
37 And it would be a mistake to look at factors one
38 at a time, like how much IHN was there in a
39 particular year, or how much BKD was there in a
40 particular year, what was the sea surface
41 temperature in a particular year. It's these
42 factors interacting with one another which are
43 determining the dynamics of fish populations,
44 whether they're sockeye salmon or any other
45 species.

46 Q Thanks for that clarification for all of us, Dr.
47 Dill. So left to right again, and again I'll

1 phrase the question in summary form. I'm
2 suggesting that 2007 from an out-migrating sockeye
3 salmon, Fraser River sockeye salmon, dealing with
4 ocean conditions only and not many of the other
5 factors or variables which may have been in place,
6 amounted really to a very, very tough year for
7 those out-migrating salmon in the one-two-three
8 punch I've described?
9 DR. KORMAN: Yes.
10 Q And, Dr. Korman, as it relates to out-migrating
11 ocean conditions, you're unaware of any similar
12 one-two punch, one-two-three punch in the out-
13 migrating 2008 as it relates to ocean conditions?
14 DR. KORMAN: Right. It's not really something I track
15 as part of my regular job.
16 Q So your answer to that part would be "I just don't
17 know"?
18 DR. KORMAN: I just don't know.
19 Q Fine. And, Dr. Connors?
20 DR. CONNORS: I'd have to defer to the same statement
21 in the sense that I don't have a really intimate
22 understanding of all the different processes
23 across those two years.
24 Q And so you're not able to answer either '07 or
25 '08, out-migrating, you just don't know?
26 DR. CONNORS: Correct.
27 Q Correct. Thank you. Dr. Noakes?
28 DR. NOAKES: Yeah. I'm certainly familiar with the
29 '07. The '08 I can't recall a McKinnell issue in
30 terms of the temperature up there, but --
31 Q And the water was also '07 in terms of the high
32 temperatures. Those were all in '07.
33 DR. NOAKES: Yes. No, as I say, I don't know -- I'm
34 aware that -- I've read the Rensel paper in terms
35 of the *Heterosigma*, and I'm aware of Beamish's
36 work with respect to food availability in the
37 Strait for juvenile salmon, but I don't know if --
38 I can't recall whether McKinnell had any data for
39 2008 for --
40 Q I'll take you to that. I'll take you to that in a
41 moment. But do you agree that it was a one-two-
42 three, meaning a strong signal as it relates to
43 ocean conditions in 2007?
44 DR. NOAKES: Yes, I agree.
45 Q And, Dr. Dill?
46 DR. DILL: 2007 was definitely a worse year than usual.
47 Anecdotally I've heard that 2008 was very much

1 better.

2 Q Thank you. Mr. Lunn, could you go to Salmon
3 Farmers Tab 3, please. On the screen, gentlemen,
4 is a document prepared by Dr. Rick Beamish,
5 Richard Beamish, on July 2011, and the title is
6 somewhat self-evident, "Assessing the Impact of
7 Salmon Farming on Pacific Salmon at Population
8 Level in British Columbia." My questions are for
9 Dr. Noakes, but as earlier questioners have
10 encouraged, I'll also encourage anybody who has a
11 viewpoint on these questions to jump in when
12 appropriate.

13 Firstly, Dr. Noakes, are you familiar with
14 this work?

15 DR. NOAKES: Yes, I read this paper.

16 Q And can you indicate what conclusions Dr. Beamish
17 comes to in this paper? Would it assist you to go
18 to page 7?

19 DR. NOAKES: Page 7.

20 Q And in particular where he's making references to
21 the distinctions between --

22 DR. NOAKES: Yeah.

23 Q -- two different works.

24 DR. NOAKES: Yeah. As I say, it's been a week or two
25 since I read -- or whenever you sent out this
26 document. I guess it's been a week since I read
27 it. And he's contrasting the work of Marty et al
28 and Krkosek and Ford and Myers. And essentially
29 there's the issue with Krkosek, 2007, and Krkosek
30 and Hilborn in 2011. And it's an issue that I had
31 pointed out before in the sense of they're
32 assuming that there wasn't an issue with sea lice,
33 for instance before 2001. And it's the same issue
34 in each of those papers.

35 In the Ford and Myers, what the Ford and
36 Myers paper did was they -- and I don't know if
37 it's exactly on this page, but there's a
38 difference in -- if I recall this, there's a
39 difference in what's said in the abstract and a
40 difference which is said in the paper. In the
41 abstract, I think he makes references to three
42 species of salmon being impacted by aquaculture,
43 and in the body of the paper, he only refers to, I
44 believe, pink salmon. And I stand to be
45 corrected, but I think that's what I recall.

46 And I think Beamish's concern was that most
47 people will just read the abstract and they won't

1 go into the report. So they'll be left with the
2 impression that three species of salmon have been
3 shown to be impacted, or at least a particular
4 study suggested that three species of salmon have
5 been impacted by sea lice. Where in fact it was
6 only one, and that there was this inconsistency in
7 the reports.

8 Q And, Dr. Noakes, does it further refresh your
9 memory of this paper if I suggest to you that what
10 Dr. Beamish notes was that there were different
11 conclusions reached by the Krkosek and Hilborn
12 2011 study, and the Marty et al 2010 study, and
13 this was apparently due to the fact that the
14 former inferred sea lice abundance on farms and
15 assumed the infection began in 2001, whereas Marty
16 et al in 2010 used actual data from the salmon
17 farms.

18 DR. NOAKES: Yeah, and that was a big difference, and I
19 think that's been alluded to in the discussion
20 here by everyone in terms of it really
21 demonstrates the importance of needing the data
22 from the farm to actually make some assessment in
23 terms of whether there is any -- any significant
24 relationship or causal relationship between it.
25 And Marty, as I say, it was a good paper in the
26 sense that it combined experts in fish health and
27 also Terry Quinn, who is a very well respected
28 analyst and stock assessment person. It combined
29 those skills to look at the data in a
30 comprehensive way and came up with a different
31 conclusion than the other two authors.

32 Q Thank you, Dr. Noakes. I see Dr. Dill signalling.

33 DR. DILL: I just wanted to comment that Ran Myers and
34 Ray Hilborn, co-authors on those papers, are also
35 well-known experts in analysis of fish
36 populations. But when I read this, one thing that
37 I was a little bit confused about is where was
38 this published? I didn't see that on the
39 information.

40 Q To my knowledge it's not published. It's a new
41 document just completed by Dr. Beamish.

42 DR. DILL: Ah, right.

43 Q The purpose of my question is to have witnesses
44 before the Commissioner comment on the works, and
45 you both have. Do you have any further comments,
46 Dr. Dill?

47 DR. DILL: No, not at this time.

1 MR. BLAIR: Thank you. I wonder if this could be
2 marked as the next exhibit.

3 THE REGISTRAR: Exhibit 1560.

4 MR. BLAIR: Thank you.

5 MR. LEADEM: Before it gets marked -- sorry, for the
6 record, Leadem, initial T. Before it gets marked
7 as an exhibit, I think that this fits the category
8 of documents that are prepared expressly for
9 evidence tendering into the Commission. It's not
10 a peer-reviewed journal. It's essentially written
11 by Dr. Beamish, who has come and testified already
12 at these proceedings, albeit on another point, and
13 tendering it in this fashion, I would submit, is
14 akin to someone just being able to take any
15 dataset, any evidence that we've heard so far and
16 comment on it, and then proffer their testimony in
17 that fashion. As such, I would suggest, with all
18 due respect, that this not be tendered and
19 accepted at this stage.

20 MR. BLAIR: Mr. Commissioner, I'm happy to respond to
21 that. We just moments ago had Dr. Marty's paper
22 which was prepared in much the same light and
23 tendered by the Province entered as an exhibit.
24 The scope of Project 5 mandated more broadly than
25 any other project reviewers that, as it turns out,
26 the Drs. Dill and Noakes were to look at all
27 literature available. They were to talk to
28 anybody they wanted to. They could look at grey
29 literature, peer-reviewed journals, anything.
30 This certainly is something. This is from a
31 leading expert who this Commissioner has heard
32 from. I don't think it matters whether it was
33 prepared in July 2011 or July 2010. In fact, it
34 ought to matter more perhaps that it was prepared
35 this year, because we have a Commission that is
36 stressed to get all the work done in a limited
37 time period.

38 And we covered this when we raised issues
39 last week, or perhaps it was earlier this week.
40 We can't call every witness. This is a summary
41 that we hope to have marked in evidence and, Mr.
42 Commissioner, you can look at this like all of the
43 other reports. We have entered 1,500, closing in
44 on 1,600 reports, and many of them are from far
45 less well-known scientists than Dr. Beamish, and
46 to think that this would not be relevant and
47 useful, would not fall within the scope of the

1 literature which they were mandated to look at by
2 the project, would be a great stretch to exclude
3 it, in my respectful submission.

4 MS. GAERTNER: Sorry, Mr. Commissioner, but having been
5 through this many of these days of this inquiry,
6 this has obviously been produced after Dr. Beamish
7 was a witness, after these reports have been
8 tendered. I'd like to know if was produced for
9 the sole purpose of being put to these witnesses
10 during this evidence. I mean, I don't know why he
11 produced this document at this time, or one that
12 hasn't been peer reviewed, which is generally the
13 basic requirement that we've used in this inquiry
14 to get documents in.

15 THE COMMISSIONER: I don't know if you know the answer
16 to that query, Mr. Blair.

17 MR. BLAIR: I do. Dr. Beamish -- this goes back to the
18 limited number of spots there are in those coveted
19 four seats over there. Commission counsel has to
20 decide, really, which witnesses you'll hear.
21 We're invited to make recommendations of who might
22 be on the various panels, and we have, as I'm sure
23 other parties have, as well. We obviously can't
24 get everybody on a panel. We can't get Dr.
25 Beamish in here to opine on this. He's well-known
26 to this Commission now, and this is another way of
27 getting his opinion in, we can ask these four.
28 But why wouldn't we ask these four. We're going
29 to hear from Dr. Marty later and his report was
30 just entered as an exhibit. Why don't we enter
31 this. Why is this in some special class because
32 it was prepared for this Commission. And indeed,
33 it was prepared so that the Commissioner could
34 have the benefit of that knowledge, and the
35 evidence which would be the viva voce evidence of
36 the two doctors you've just heard from.

37 THE COMMISSIONER: Well, I don't know what the answer
38 of the Province is with respect to your comments
39 re Dr. Marty, but I think just in the interests of
40 time, Mr. Blair, we'll mark this for
41 identification purposes. It certainly is on the
42 record, and that's not to say it won't be marked
43 as an exhibit. I just wish to at least have an
44 opportunity to know more about this assertion by
45 Mr. Leadem and your response, and from any other
46 of the participants' counsel who may want to weigh
47 in on this at some point, if it becomes relevant.

1 So I'll mark it at this for identification
2 purposes.

3 THE REGISTRAR: The document called as Exhibit 1560
4 will be withdrawn and that will be marked for
5 identification as WW.

6
7 WW FOR IDENTIFICATION: Beamish, Assessing
8 the Impact of Salmon Farming on Pacific
9 Salmon at Population Level in British
10 Columbia, July 2011

11
12 THE COMMISSIONER: Thank you.

13 MR. BLAIR: Thank you, Mr. Registrar. And, Mr.
14 Commissioner, and for the benefit of participants'
15 counsel, I know none of us wish to take up
16 valuable time. I'm sure we'll be revisiting this
17 very issue again. And as for a date and place, I
18 can indicate that the first B.C. Salmon Farmers'
19 witness, Dr. Peter McKenzie, will be on next week
20 with a panel. I intend, and I'll just give notice
21 to my colleagues, I intend as the client, as the
22 person who commissioned these reports, or at least
23 one of the member companies and a fish
24 veterinarian, to put through him the c.v.s of all
25 of these people who have prepared reports. And I
26 will again be seeking to tender them as expert
27 reports with requisite c.v.s. Dr. Beamish's c.v.
28 won't be necessary, but others will be provided
29 and have been provided recently to my friends.

30 Thank you for that. I just wanted to give
31 that explanation in terms of the timeline. Mr.
32 Martland and I can work on that if we need to, to
33 keep precious court time, hearing time free.

34 Could we please, Mr. Lunn, go to Exhibit
35 1540, which is Dr. Dill's report.

36 Q Dr. Dill, I'd like to direct you just to the
37 bottom of page 1, to the bottom of the Executive
38 Summary, and starting with "Unfortunately, it
39 turned out" -- yes, that's the paragraph. Just at
40 the top of the screen there to make it a little
41 larger. You note here, Dr. Dill, that -- I'll
42 just read it into the record:

43
44 Unfortunately, it turned out that the data
45 provided by Provincial government (BCMAL) and
46 the BC Salmon Farmers Association (BCSFA)
47 were insufficient in both quantity and

1 quality to allow a rigorous analyses capable
2 of answering these questions with certainty.
3

4 Do you still stand by that, that statement, sir?
5 DR. DILL: Yeah, I don't mean to imply that that was
6 any fault of the B.C. Government, or the Salmon
7 Farmers Association. That was just the cards we
8 were allowed to play with.

9 Q And I want to turn to Dr. Korman, if I may,
10 because Dr. Korman opined that he was -- it was an
11 impressive array of data, and we've heard all of
12 you describe the limited time series. But in
13 terms of the quality of data, I gather, Dr.
14 Korman, you might disagree and you might say that
15 there was excellent quality.

16 DR. KORMAN: Right. So I think we're both in agreement
17 here that the real issue here is the short time
18 series that's available, because the program only
19 began in full swing in 2003. So there's no
20 conflict there.

21 I'm not exactly sure what Larry Dill means in
22 terms of the quality. I'm guessing perhaps
23 testing for more pathogens than is currently done.
24 You know, from my view, as a non-veterinarian, the
25 amount of testing that's done, and I guess my
26 perspective is also I'm thinking about other
27 monitoring programs that looked impressive.
28 Whether or not it -- it's certainly not
29 exhaustive, and so I think you'd have to ask Dr.
30 Dill what he means by the quality. To me it seems
31 generally pretty high quality for the data,
32 monitoring datasets that I've seen, but...

33 Q Thank you. I just wanted to confirm that with the
34 ability to look at that executive summary, you
35 could --

36 DR. KORMAN: I agree with his statement on quantity.
37 I'm a little less -- I'm unsure of what he means
38 by the problem with the quality.

39 DR. DILL: You characterized it correctly. It's the
40 fact that there are a large number of these events
41 and audits that identify mortality, but without a
42 diagnosis present.

43 Q In fact, in terms of the number of audits, there
44 were about 800 audits that you looked at from the
45 B.C. Province, is that correct?

46 DR. KORMAN: Let's see, that would be pulling up a
47 hundred and -- just roughly 100 to 120 a year

1 times -- for seven or eight years, so, yeah that
2 would, you know, it may be more. So lots of
3 audits. I guess the question that's nagging Larry
4 Dill, and that seems that maybe would be a
5 veterinarian would have to answer this, is why are
6 there so many fresh silver mortalities and with no
7 sign of disease. And therefore he's using that to
8 say, well, I'm not convinced that this dataset is
9 -- that this program is fully rigorous. I mean,
10 am I capturing -- and I'm not qualified to respond
11 to that.

12 Q We're going to go to fresh silvers soon.

13 DR. KORMAN: Okay.

14 Q Before we do, Mr. Lunn, could we go to pages 15
15 and 16 of the same report. And if you can split
16 it, or just the bottom of 15 and the top of 16.
17 Just while he's finding it. This is, Dr. Dill,
18 your report, a summary of Connors' analysis. It's
19 starting "It is important to bear in mind" -- yes,
20 and then the next paragraph as well. Can you
21 possibly put both that paragraph and the paragraph
22 below it. Okay, harder to read, but, thank you.

23 So I want to direct everyone's attention to
24 the last several lines at the bottom, starting "In
25 addition, the dataset". So right down four or
26 five lines from the bottom, Mr. Lunn. In addition
27 at the right-hand margin at the bottom of the
28 page. Thank you. So these are Dr. Dill's words
29 describing the dataset generally, and I'll just
30 read it into the record:

31
32 In addition the dataset did not allow for a
33 closer look at the effect of individual farms
34 (data were aggregated across fish health
35 zones), or for a breakdown according to
36 proximity of the farms to the presumed
37 migration route of the majority of juvenile
38 Fraser sockeye.

39
40 So looking at that statement just by itself, it's
41 my understanding that that statement is not
42 correct. Is that -- do you agree with that --
43 with my summary, Dr. Korman?

44 DR. KORMAN: Yeah, the data was provided -- and maybe
45 probably just a clarification here. The data was
46 provided on a farm-by-farm basis, all of it. And
47 if an analyst wanted to use that at a farm level,

1 it was possible to do so. In my report, for
2 brevity, I summarized it as fish health subzones.
3 So, yeah, but the other uncertainty, of course, is
4 without knowing the details of the migratory
5 pathways, it might be difficult to use all the
6 site-by-site, the farm-specific information. So
7 Dr. Dill may be referring to that. But we do have
8 farm-specific location information for all the
9 data.

10 Q And, Dr. Connors, you agree.

11 DR. CONNORS: I do agree, and I was the one that then
12 aggregated these at levels for exactly the reason
13 that Josh pointed -- Dr. Korman pointed out, and
14 the fact that I felt like I would be criticized if
15 I assumed migration routes, or if I didn't assume
16 migration routes. And so given those assumptions,
17 I had to aggregate them at the...

18 Q And, Dr. Noakes, you agree that the statement is
19 wrong, and in fact there were individual farm data
20 available?

21 DR. NOAKES: That's correct. And, in fact, I actually
22 looked down to the farm level because I wanted to
23 see what particular disease was occurring on what
24 farm in exactly what geographic area so that I
25 could determine whether in fact there was a risk
26 of pathogen transfer from that farm to Fraser
27 River sockeye.

28 So, for instance, in the -- with respect to
29 BKD in recent years, many of the farms are in
30 Salmon and Sechelt and Jervis Inlet, which are not
31 on the migration route. So say five out of the
32 six -- five or six of the farms that are
33 experiencing BKD outbreaks are not -- the Fraser
34 River sockeye are not being exposed to the
35 pathogen, BKD pathogens from those particular
36 farms.

37 So, yes, I did go down to the -- so this
38 doesn't -- this isn't consistent with the dataset,
39 that information.

40 Q Yes, I really hate to rush any of you, but we're
41 under such time constraints, and Dr. Dill's
42 itching to go.

43 DR. DILL: Yeah, I just want to put this in context.
44 This is the last paragraph in a section that's
45 describing the Connors' analyses, and so I'm
46 referring there to the aggregation that was done
47 on the Connors' analyses, not the fact that the

1 raw data were not available on a farm-by-farm
2 basis.

3 Q Yes. So to be clear, then, Dr. Noakes was in the
4 position, because of his statistical background,
5 to take the individual farm point data and work
6 with it yourself professionally. Dr. Dill, your
7 skill sets are different and you didn't do that.
8 You relied on Drs. Korman and Connors to do that
9 and aggregating the data, and that's what you're
10 referring to here?

11 DR. DILL: That's right. But it's not because of my
12 skill set, it's because I chose to do it that way.

13 Q Oh, I'm sorry. I'm sorry, I didn't mean to offend
14 you. I thought that statistical magic we've heard
15 from the other three rested with them entirely,
16 but perhaps you can give me a lesson in statistics
17 later, after Monday.

18 DR. CONNORS: To be clear, there was no analysis that
19 related data from the individual farms to
20 productivity of sockeye in any of the reports.

21 Q Well, this is a perfect lead-in to what I'm afraid
22 I'm going to get back into the ping-pong match, or
23 the tennis match once again, and I'm going to
24 frame my question this way. These are questions,
25 Mr. Commissioner, on the Connors and Noakes
26 disagreement, or disagreement on conclusions. And
27 I'm going to centre my question on this as a
28 matter of biology as opposed to pure statistics,
29 because we've been hearing all of the statistical
30 models, and I'm lost. And I think Mr. McDade
31 threatened to walk out if I raised any questions
32 on statistics, and I said I'd be out the door
33 before he would be. And so you're losing us in
34 the statistics.

35 So I want to take it to the biology. I
36 understand that the major distinction between the
37 Connors' assessment of the data and the Noakes'
38 assessment of the data, and I'll let you both
39 answer, is that I understand, Dr. Noakes, you took
40 the individual farm-by-farm and said, "We don't
41 have just one common aggregation of farms and
42 applying it across the board and saying the
43 disease happens uniformly," you looked, Dr.
44 Noakes, at the individual farms and said, "So we
45 found some diseases in these subsets, and I looked
46 at where they were, and predominantly they're not
47 on the migration pathway, the presumed migration

1 pathway for out-migrating Fraser River sockeye
2 salmon, and therefore you can't assume that they
3 were."

4 And I believe Dr. Connors, because you didn't
5 want to presume the out-migrating pathway, assumed
6 it would be better to look at all the data as one
7 set, and therefore didn't take the step of
8 excluding those farm sites in years where there
9 were disease recorded and excluding them from the
10 impact on the out-migrating Fraser River sockeye.

11 So that's my general question. Who would
12 like to go first?

13 DR. NOAKES: Commenting on what I did, yes, that's
14 correct. I mean, I looked at the disease and
15 specific farm in relationship to the presumed
16 migration route for Fraser River sockeye. And
17 what I was looking for was what is the potential
18 for pathogen exposure to those fish swimming by.
19 And as I say, as I said in my report, it's quite
20 important to figure out where those farms are,
21 because if they're -- if they're tangential, such
22 as being in Salmon and Sechelt and Jervis Inlet,
23 then even though there's a disease outbreak there,
24 they really don't contribute, or at least they --
25 there is very unlikely to contribute any exposure
26 to pathogens in migrating --

27 Q And I don't mean to cut you off, but while --

28 DR. NOAKES: Yes.

29 Q -- you're speaking to this, I do want to have Mr.
30 Lunn put up Exhibit 1536, the Noakes report.

31 DR. NOAKES: Yes.

32 Q We'll give you to agree at the end of the day.
33 And small "ii", it's the "Key Findings", paragraph
34 5, next page. And there having interrupted you,
35 Dr. Noakes, this paragraph summarizes what you
36 were describing in terms of the work you did to
37 break out where the diseases were?

38 DR. NOAKES: That's correct. And there's one figure
39 with respect to BKD in there, showing which farms
40 in three years that they were on. But that's what
41 I did. I basically looked at the -- separated the
42 ones on the West Coast from those within the main
43 migration path, and then within those, identified
44 how many farms and specifically for BKD exactly
45 where they were.

46 Q And so --

47 DR. NOAKES: Because BKD represented 74 percent of the

1 high risk diseases, so...

2 Q So sticking with you just for a second, and then
3 we'll get to Dr. Connors, you're saying that using
4 farm production numbers, increasing farm
5 production numbers can't be looked at without --
6 in terms of a proxy. or some -- some determinant
7 for disease, for disease potential, transfer. You
8 can't look at that generally when you can
9 specifically take the actual diseases out of the
10 migration pathway. So, Dr. Noakes, you took them
11 out of the migration pathway, which is why you say
12 farm production can't just be looked at as a -- as
13 a straight line.

14 DR. NOAKES: That's certainly one reason. There are a
15 lot of other reasons why you can't use it as a
16 proxy. And I don't know how much time you want me
17 to spend on this.

18 Q Go ahead.

19 DR. NOAKES: Okay. So, for instance, let's use an
20 example of a consumer price index. When you're
21 using a proxy, there are certain things that you
22 need to look at in terms of the properties of that
23 proxy and what you're using. It has to basically
24 be representative of the time series, or the -- or
25 what you're trying to represent. So there's been
26 a lot of work go into identifying what products
27 they'll put in to calculate a consumer product
28 index.

29 Well, the same thing in terms of the Connors'
30 analysis, in terms of using farmed salmon
31 production as a proxy in disease. First of all,
32 it has to match up with the disease evidence,
33 because we do have some disease evidence. There's
34 a certain number of years that we have, and at
35 least if you're going to use it as a proxy, it has
36 to match up with the evidence that you do have.
37 The other thing that it should do, is it should be
38 in the way that this model is being formulated, it
39 should be proportional to. So, for instance,
40 whatever proxy you're using should be proportional
41 to the disease or the pathogen exposure, as Dr.
42 Connors puts it. So that proxy should be
43 proportional to that value. And the last thing
44 is, it needs to be consistent over time, because
45 there's no sense using a proxy that's only good
46 for five years and then it changes.

47 So I go through in my comments to Dr.

1 Connors, basically I go through the four high-risk
2 diseases that Mike Kent provided, and the sea
3 lice, and what I do is I demonstrate how they're
4 simply not proportional.

5 So, for instance, we have the IHN, and if you
6 go to the B.C. Government site you'll see on there
7 they document outbreaks of IHN. And they're
8 sporadic over time and they have occurred over --
9 since the 1990s. But one of the things we see is
10 that there's been no IHN detected on farms since
11 2003. So using farm salmon production for IHN
12 isn't consistent in terms of over time, because
13 you have the sporadic nature and, of course,
14 there's no IHN since 2003.

15 For BKD, BKD is primarily a disease which
16 impacts Pacific salmon, chinook and coho. And if
17 you look at the production numbers, that there's a
18 graph in Connors' -- or, sorry, Korman's, Dr.
19 Korman's report, breaking down the percentage of
20 Atlantic and Pacific salmon that are farmed. It
21 varies widely over time, and since about the last
22 several years, it's gone from about 30 percent
23 down to about 10 percent. So there's not a
24 consistency, and it's certainly not proportional
25 to overall farmed salmon production.

26 The other thing, of course, is because it
27 only affects a small portion of the farmed salmon
28 production, it's not reasonable to use it as a
29 proxy for the total salmon production in terms of
30 Atlantic salmon.

31 For the other two diseases, the high-risk
32 diseases, vibriosis and furunculosis, there's been
33 vaccines for those two diseases since about the
34 mid-1990s. That's the information I received from
35 the vets on the farm.

36 So what you have in those cases, and also
37 with IHN, because there's a vaccine there, is you
38 have a discontinuity in the time series. So you
39 don't have a consistency in the pattern of
40 diseases which is proportional to the farmed
41 salmon production.

42 For sea lice, since 2003 -- presumably there
43 were sea lice on the farms before, but certainly
44 since 2003 there's been mandatory treating of sea
45 lice. And there's a trigger of three lice per
46 fish, and once that trigger is reached, or once
47 that level is reached, then there's automatic

1 treatment. So again you don't have consistency
2 over time in terms of the lice production, because
3 it's being artificially held low, because there's
4 treatment at three lice per fish.

5 So overall, for the four high-risk diseases
6 and the sea lice, farmed salmon -- using farmed
7 salmon production is not consistent with the
8 observed disease evidence we have from the farm.
9 It's not proportional, and there's inconsistencies
10 over time, simply because the use of vaccines has
11 reduced substantially the amount of disease that
12 we found on there.

13 Now, the effectiveness of the vaccine varies
14 by disease. But it's certainly not zero, and for
15 IHN, it's in the high 90 percent.

16 So, for instance if you used a human example
17 in terms of measles, before 1964, when a measles
18 vaccine - I Googled this when I was doing the
19 report - if you looked before 1964, there was an
20 average of around 500,000 measles cases per year
21 in the United States. And once they started using
22 vaccine, you can see that it went down -- went
23 down to essentially zero, very few cases of
24 measles. There's certainly some, but they're
25 certainly not in the hundreds of thousands.

26 So that's the kind of structural change you
27 see in the time series and the disease time
28 series, and you're going to see exactly the same
29 thing in -- in the farmed salmon pathogen output,
30 as well.

31 So there's a real problem. Using farmed
32 salmon production as a proxy is not a good
33 approximation. So essentially what -- in terms of
34 the analysis, if it doesn't approximate disease,
35 or it doesn't approximate pathogen exposure, then
36 for the purposes of basically looking at a
37 relationship between farmed salmon production and
38 sockeye productivity, it is not a useful analysis.
39 And that's (indiscernible - overlapping speakers).

40 Q Thanks very much, Dr. Noakes. Dr. Connors.

41 DR. CONNORS: So my interpretation of this is that the
42 comparisons that Don just made are not the most
43 rigorous, you know, examinations that can be made
44 between farmed salmon production, and in this case
45 the number of farms that test positive for a
46 disease or a vaccine. So fish health events are
47 at the level of a farm. Audits are at the level

1 of a farm. Sea lice are -- you can scale up and
2 ask how many sea lice are on a farm.

3 At the most basic level, the abundance of
4 hosts is a fundamental component of pathogen
5 transmission. And all other things being equal,
6 the abundance of infected hosts is, you know, a
7 fundamental component to the exposure that other
8 hosts may have to a pathogen.

9 Now, a perfect example is that if you have no
10 farmed salmon on a migration route, you cannot
11 have pathogens from farmed salmon being
12 transmitted. If you have many, many farmed salmon
13 on a migration route and they have pathogens in
14 them, or there are pathogens present, then you can
15 have more pathogens transmitted.

16 I agree that the shape of that relationship
17 may take various different forms. It may be
18 influenced by vaccines. It may be influenced by
19 the application of SLICE, environmental
20 conditions, et cetera, but it doesn't negate that
21 fundamental relationship. And so as a result, I
22 would argue that it can still be considered as a
23 proxy for these processes, albeit it has to be
24 considered, you know, within the light of the fact
25 that it's a coarse approximation

26 We use proxies all the time for a number of
27 different things, including sea surface
28 temperature and its relationship with the dynamics
29 of wild salmon population. The fact that sea
30 surface temperature is a very coarse and poorly
31 understood proxy for the biological conditions
32 that salmon experience when they enter the marine
33 environment, or when they're in the marine
34 environment, hasn't precluded much progress being
35 made in the salmon world, much progress from being
36 made. And so that's my interpretation, you know,
37 of the argument.

38 Q Yes, and, Dr. Connors, I don't want to cut you off
39 before I cut Dr. Noakes off, but the clock's going
40 to cut us both off. So I'm going to come back to
41 you, Dr. Connors, with another follow-up question,
42 and that is that I'm right to characterize it that
43 when Dr. Noakes was doing his assessment of your
44 assessment, he took the high-risk disease fish
45 that he found in the individual farms in
46 individual months, and placed them geographically,
47 based on the coordinates, and found that an

1 overwhelming number of the high risk diseases were
2 off what would be considered -- or what the
3 Commissioner may consider to be the evidence of a
4 traditional migration pathway. He did that step,
5 you didn't, correct? Is that yes or no, he did
6 that, you didn't?

7 DR. CONNORS: I have to qualify the answer.

8 Q Sure.

9 DR. CONNORS: He did a qualitative examination of the
10 distribution of pathogens on farms.

11 Q I thought when I read his report and I heard him
12 say "I found five BKD fish in the Sechelt Inlet,
13 and that's not the migration path." That's not
14 qualitative, isn't that quantitative?

15 DR. CONNORS: Well, in regards to the productivity of
16 Fraser River sockeye salmon. All right? And so I
17 absolutely agree that if -- if one wanted to make
18 assumptions about migration routes that they
19 follow, one could have a more refined measure of
20 diseases along migration routes. And I think that
21 that is, you know, a good idea to do.

22 But the important -- the important point to
23 make is that in the case of contrasting the two,
24 there was no analysis between productivity and
25 diseases on farms at a finer spatial scale.

26 Q Let me put it to you this way, Dr. Connors. I
27 think what we're doing here, all of us, is we're
28 in a mystery novel. We're trying to figure out
29 what happened to the declining sockeye, and in
30 particular, 2009 became the, you know, the
31 exclamation point on that. And so we are making
32 assumptions about migration paths. I hear you
33 saying it's okay to use the whole model because
34 it's -- just let me finish the question and then
35 you'll understand where I'm going. I hear you
36 saying statistically it's okay to use the whole
37 model. But if this is a mystery novel, and most
38 of the fish are going one way, and we're looking
39 specifically at risks and high-risk diseases, and
40 one of the statisticians takes all of the high-
41 risk diseases and puts them because the data shows
42 them to be off the migration path, and another
43 statistician doesn't do that, isn't it fair to
44 acknowledge that you're going to get different
45 results for that reason alone?

46 DR. CONNORS: But we didn't get different results.

47 DR. NOAKES: I think we did.

1 Q In terms of farm production and the relationship
2 to the declining sockeye.

3 DR. NOAKES: Yeah. No, I think we did. And you can't,
4 I mean, you can assume, if you want to speculate
5 and assume that farm production is proportional to
6 pathogen outlay, the only way you can do that is
7 if you dismiss the disease evidence on the farm.
8 I mean, that's -- that's fundamental when you're
9 using an index, it has to be represented by the
10 data that you have. I mean, any proxy that you're
11 using has to at least be consistent with whatever
12 data you have, and there's all sorts of other
13 assumptions.

14 Now, you can't say that, I mean, that the
15 whole issue about identifying a particular farm
16 and a disease on there is you can't say that
17 there's a disease on the farm if there's no
18 disease evidence, or there's no evidence of that
19 disease. And that's why I went to that point.

20 Q And your -- and your point was you looked where
21 the disease was and you found overwhelmingly the
22 high-risk diseases, as described before this
23 Commission, overwhelmingly by number, numerically
24 they were off of the presumed migration path. Is
25 that the quick summary, Dr. Noakes?

26 DR. NOAKES: That's the quick summary basically.

27 Q And now, Dr. Dill is going to get the last word
28 before Mr. Commissioner sends us all away for the
29 weekend, correct?

30 DR. DILL: Yeah, I didn't want to wait till Monday, so
31 if I could just quickly add two points to this.

32 Q Carry on.

33 DR. DILL: You said all high-risk diseases. All high-
34 risk diseases that we know about, which are those
35 four.

36 Q Yes.

37 DR. DILL: We don't know that there might not be some
38 other pathogen on the farms. The Kristi Miller
39 testimony makes us worry that there might be.

40 Secondly, there may be other mechanisms,
41 other than disease, which might relate production
42 to salmon productivity. Now, I know in his report
43 the implication was that it was a good proxy of
44 disease transference. But it's also possible that
45 it could be a proxy of anything else. It could be
46 chemicals, you know, chemical therapeutants,
47 whatever. So we needn't get too tied up in the

1 disease issue, I don't think.

2 MR. BLAIR: Thank you. Mr. Commissioner, we're at the
3 stroke of 4:00. I'm worried that I'll be taking
4 your time on the weekend. I worry about that more
5 than Mr. Martland's time through the day.

6 MR. MARTLAND: I won't comment. Mr. Commissioner, I
7 think we can now adjourn. I will canvass, though,
8 we're on schedule, but we have some time pressures
9 on this panel. This is an important panel, I want
10 to make sure I'm not in the position of
11 unilaterally cutting time allocations. So I would
12 ask that we convene at 9:30 on Monday, rather than
13 10:00, if that's agreeable. Because that will
14 allow us to conclude this panel's evidence on
15 Monday within the usual timeframe otherwise. That
16 would be my request.

17 The other points, if I might just canvass a
18 few points briefly. First, I wanted to express my
19 gratitude to all counsel in the room for their
20 significant cooperation. It's been exceedingly
21 helpful. It has allowed us to stay on schedule in
22 a very dense week of hearings to this point.

23 The second point is just to narrate again and
24 make it clear that in relation to the process vis-
25 à-vis Exhibit 1549, which is the Province's
26 dataset, which is now a non-public exhibit in
27 these proceedings, the timelines that we'd
28 outlined were to have the Province's submissions
29 by two o'clock on August the 3rd, participants'
30 submissions - I'm sorry, let me try that again -
31 August 30, I think I've missed a decimal there,
32 two o'clock on Tuesday, August 30, other
33 participants by two o'clock on September the 1st,
34 which is the Thursday, the Province responding by
35 2:00 on September 2nd. I'll ask those materials
36 be provided by email to Natasha Tam, as well as
37 myself and Ms. Grant, please, so that we're clear
38 where they're going.

39 Those would be my final points, Mr.
40 Commissioner. Thank you.

41 MR. BLAIR: And just to be clear, do I still have 15
42 minutes?

43 MR. MARTLAND: Yes.

44 MR. BLAIR: Thank you.

45 THE REGISTRAR: The hearing is now adjourned to 9:30
46 Monday morning.

47

1 (PROCEEDINGS ADJOURNED TO AUGUST 29, 2011 AT
2 9:30 A.M.)
3

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

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13 _____
14 Diane Rochfort

15 I HEREBY CERTIFY the foregoing to be a
16 true and accurate transcript of the
17 evidence recorded on a sound recording
18 apparatus, transcribed to the best of my
19 skill and ability, and in accordance
20 with applicable standards.
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25 Karen Acaster

26 I HEREBY CERTIFY the foregoing to be a
27 true and accurate transcript of the
28 evidence recorded on a sound recording
29 apparatus, transcribed to the best of my
30 skill and ability, and in accordance
31 with applicable standards.
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36 Susan Osborne

37 I HEREBY CERTIFY the foregoing to be a
38 true and accurate transcript of the
39 evidence recorded on a sound recording
40 apparatus, transcribed to the best of my
41 skill and ability, and in accordance
42 with applicable standards.
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46 _____
47 Pat Neumann