

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, July 8, 2011

Tenue à :

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

le vendredi 8 juillet 2011

APPEARANCES / COMPARUTIONS

Brian Wallace, Q.C.	Senior Commission Counsel
Wendy Baker, Q.C.	Associate Commission Counsel
Lara Tessaro	Junior Commission Counsel
Maia Tsurumi	Junior Commission Counsel
Tim Timberg	Government of Canada ("CAN")
Geneva Grande-McNeill	
Clifton Prowse, Q.C.	Province of British Columbia ("BCPROV")
Heidi Hughes	
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	B.C. Salmon Farmers Association
Shane Hopkins-Utter	("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")
Don Rosenbloom	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")
Keith Lowes	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 Leah Pence 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")
No appearance	Laich-kwil-tach Treaty Society Chief Harold Sewid, Aboriginal Aquaculture Association ("LJHAH")
No appearance	Musgamagw Tsawataineuk Tribal Council ("MTTC")
No appearance	Heiltsuk Tribal Council ("HTC")

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1
John Davis
In chief by Mr. Wallace

1 Vancouver, B.C./Vancouver
2 (C.-B.)
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4

5 THE REGISTRAR: The hearing is now resumed.
6

7 JOHN DAVIS, recalled.
8

9 MR. WALLACE: Good morning, Commissioner Cohen. For
10 the record, Brian Wallace, Commission Counsel, and
11 Lara Tessaro is with me. This morning first thing
12 we want to just clean up some unfinished business
13 arising from documents that were produced with
14 respect to the Cultus Lake **SARA** list issue late in
15 the day, and we felt it would be unfair to require
16 people to deal with them in the short notice. So
17 we've asked Dr. Davis to return to allow us to
18 introduce five documents and put a very limited
19 number of questions to him.

20 We have an hour for this purpose. I will
21 take, I think, about half that, but perhaps a bit
22 less, I hope, to put the documents to Dr. Davis.
23 And I have had indications from counsel for three
24 participants that they have some questions they
25 wish to ask, as well, and that would be from
26 Canada, the Conservation Coalition and from the
27 First Nations Coalition. I see Mr. McDade is
28 here, as well, and Mr. Blair. I'm not sure if
29 they have -- I see heads shaking. So I think that
30 we're onside for time.
31

32 EXAMINATION IN CHIEF BY MR. WALLACE:
33

34 Q If I may, Dr. Davis, you have been affirmed to
35 tell the truth in this proceeding and that
36 affirmation is still in play, correct?

37 A Thank you, that's correct.

38 Q I would just note for the record that of the five
39 documents that we received and circulated earlier,
40 three have redactions for solicitor-client
41 privilege on them, four have redactions for
42 solicitor-client privilege, and so we circulated
43 yesterday versions of those which note expressly
44 on them that that is the basis for the redactions
45 in them.

46 First, Dr. Davis, if I could ask you to go to
47 Tab 1 of the documents in front of you. This is a

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1 document entitled "March 26, 2005 Deck for
2 Briefing the Minister of the
3 Environment". Can you briefly describe for the
4 Commissioner, please, what this document is?
5 A This document is a compendium of information that
6 came from Pacific Region associated with the
7 emergency listing request for Sakinaw and Cultus
8 Lake sockeye. It would have been compiled in the
9 Region, and then further compiled in Ottawa, and
10 it was a deck that was used by Assistant Deputy
11 Minister David Bevan and myself to brief the
12 Minister of Environment.

13 Q And the two of you had a personal briefing with
14 Minister Anderson on it?

15 A That's correct.

16 MR. WALLACE: Thank you. May I ask, Mr. Registrar,
17 please to have the deck marked as the next
18 exhibit.

19 THE REGISTRAR: That will be Exhibit number 1329.

20
21 EXHIBIT 1329: March 26, 2005 Deck for
22 Briefing the Minister of the Environment,
23 **SARA** Emergency Listing Request: An Approach
24 for the Recovery and Rebuilding of Sakinaw
25 Lake and Cultus Lake Sockeye Salmon, Minister
26 of the Environment, March 25, 2004
27

28 MR. WALLACE: Thank you.

29 Q Just for the record, I think we have the
30 provenance of that document, Mr. Commissioner, so
31 I won't take the witness to the documents that
32 were electronically associated with it. We now
33 know what it was prepared for and how it was
34 introduced and that it was used in the briefing of
35 the Minister.

36 So moving on, if I could take you to page 23,
37 I just have a couple of questions on this
38 document. Page 23 of the exhibit, on the left-
39 hand column under "Options", the base case was
40 compared with three options for achieving
41 harvesting options, I would describe them, with
42 particular results being sought in terms of
43 returning spawners. And Option 2 is to manage the
44 fishery to achieve 250 spawners, that was
45 described as "more restrictive", and with an
46 escapement rate of 10 to 12 percent. And the
47 third option is to manage to achieve a smaller

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John Davis
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1 number:

2
3 ...100 spawners --

4
5 - which is then in parentheses referred to as -

6
7 -- (quasi-extinction) or more, with a high
8 probability.
9

10 And that was described as "restrictive" with an
11 escapement rate of 15 to 20 percent.

12 Can you advise the Commissioner, please, what
13 the expression "quasi-extinction" means and whose
14 advice was that based on?

15 A Just one correction first, Mr. Wallace. It's not
16 escapement rate, it's "exploitation rate".

17 Q I'm sorry.

18 A It's easy to mix those --

19 Q That's a very significant difference.

20 A -- easy to mix those up. Yes.

21 Q Thank you very much.

22 A Yeah, exactly. Right.

23 Q It's the exploitation rate of 10 to 12 percent.

24 A Yeah, in terms of...

25 Q Thank you.

26 A And the quasi-extinction was associated with
27 coming down to a very low number of spawners that
28 the 100 spawners repeated over four years would be
29 close to the level of extinction. You wouldn't
30 want to go below that number of spawners. I've
31 seen sufficient to maintain the population.

32 Q Yeah. And whose advice was that determination?

33 A I couldn't name names specifically, but that, I
34 believe, is coming from the scientists and from
35 the fisheries managers in Pacific Region as part
36 of their assessment work that led to this
37 documentation.

38 Q Thank you. And at page 25 of the document there
39 seems to be a page dealing that's entitled "Timing
40 of Cod". Everything else in the memorandum
41 relates to Pacific salmon. Can you -- and
42 sockeye, in particular. Can you advise why the
43 juxtaposition of a page about cod?

44 A We always dealt with batches of species advice
45 that came forward from COSEWIC. So COSEWIC being
46 the group that provided the assessments that went
47 to government recommending classifications of

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1 listing decisions associated with **SARA** species.
2 So cod was one of the species coming forward
3 through the process. So that's in there just to
4 remind the Minister what's going on with respect
5 to the cod issue, too.
6 Q So this was simply a matter of process, these are
7 other things that you will also be considering?
8 A Correct. And throughout all the different
9 briefings on **SARA**, it was usually batches of
10 species coming forward.
11 Q Thank you. If I may take you now, Dr. Davis,
12 please, to Tab 2 in the book. This is a
13 Memorandum for the Minister dated August the 27th,
14 2004. Have you had an opportunity to review this
15 memorandum?
16 A Yes, I have.
17 Q And you do not appear to be included as having
18 been copied in it. Did you have any involvement
19 in this?
20 A It's curious I'm not on the signoff documentation
21 in this, but I either saw it or would have seen it
22 after the fact, and I'm not unfamiliar with the
23 content. This, it could have been I was away on
24 the day or two when that was prepared, or
25 something like that.
26 Q Yes. Looking at the people at the end of the
27 document indicated as having received copies, we
28 have Dr. Watson-Wright, she was the ADM of
29 Science?
30 A That's correct.
31 Q And Ms. --
32 A Huard.
33 Q -- Huard, who was the ADM of Policy?
34 A Policy, right.
35 Q And Ms. Kirby, ADM of Habitat?
36 A That's correct, and Oceans, Habitat and Oceans.
37 Q Habitat and Oceans.
38 A yes.
39 Q And you at that time were Special Advisor on **SARA**?
40 A I was, and so I was heading up the group that
41 coordinated the process.
42 MR. WALLACE: I wonder, Mr. Registrar, if this could be
43 marked, please, as the next exhibit.
44 THE REGISTRAR: Exhibit 1330.
45
46
47

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1 EXHIBIT 1330: Memorandum for the Minister re
2 **SARA** Legal Listing Decision - Cultus and
3 Sakinaw Lake Sockeye (Information Only) dated
4 August 27, 2004
5

6 MR. WALLACE:

7 Q Now, do you agree with the substance of this
8 Memorandum for the Minister on providing
9 information on the **SARA** listing decision?

10 A It's certainly consistent with the information and
11 the advice that was going forward to the Minister,
12 yes.

13 Q Page 1 of the memo says in the "Summary" box:

14
15 A decision on whether to recommend that
16 Cultus and Sakinaw sockeye should be listed
17 or not listed under the **Species at Risk Act**
18 (**SARA**) must be made over the next two weeks.
19

20 And it goes on to say at the bottom of the box,
21 just below the redaction that:

22
23 A briefing note with the department's
24 recommendations will be provided within the
25 next week.
26

27 Do you know whether such a document was produced?

28 A I think it's the other document that you have in
29 this set that we're looking at.

30 Q Okay. And that will be Tab 4?

31 A Sorry, was that a question?

32 Q Yes.

33 A Oh, yes.

34 MR. WALLACE: Thank you. Perhaps then it would be
35 convenient then to mark Tab 4 as the next exhibit.

36 THE REGISTRAR: Exhibit 1331.
37

38 EXHIBIT 1331: Memorandum for the Minister,
39 **SARA** Legal Listing Decision - Recommendation
40 for Cultus and Sakinaw Lake Sockeye (Decision
41 Sought) dated September 13, 2004
42

43 MR. WALLACE:

44 Q Just for the record, this is described as
45 "Memorandum for the Minister, **SARA** Legal Listing
46 Decision - Recommendation for Cultus and Sakinaw
47 Lake Sockeye" dated September 13, 2004.

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John Davis
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1 A My tabs are different from yours, Mr. Wallace, so
2 that's why I hesitated there, so...

3 Q Oh, I see. Okay. But that is the document to
4 which you were referring?

5 A That's correct.

6 Q Thank you. Going back to the previous exhibit we
7 must marked, Exhibit 1330, I wonder if I could
8 just ask you to address a question on page 4, Dr.
9 Davis. It says just below in the bullet, just
10 below the redacted portion:

11
12 The department is of the view that protection
13 of these small populations under **SARA** is
14 unacceptable both in terms of socio-economic
15 dislocation and the limited genetic impact.
16 This position may raise opposition from
17 Environment Canada and other agencies.
18

19 When you testified in May, on May 30th, you agreed
20 or you testified that DFO agreed with the COSEWIC
21 assessment, which was itself based on advice
22 provided by DFO scientists. Do you recall that?

23 A Yes, I do.

24 Q And yet here DFO officials in Ottawa appear to be
25 giving advice which suggest the opposite, I would
26 say, of the COSEWIC advice, about the limited
27 genetic impact. Can you explain that difference?

28 A I think the portion of the sentence that had the
29 greatest weight in terms of all of the discussion
30 was the socioeconomic side of it. The genetic
31 impact deals with the relatively small
32 populations, relative to all the other salmon
33 biodiversity associated with the Fraser runs.

34 Q And on the socioeconomic part, I'm curious that on
35 page 3 of the Exhibit 1330, just on the first
36 bullet of "Next Steps" it says:

37
38 Further analysis is being finalized on the
39 socioeconomic impacts of listing for both
40 populations.
41

42 Yet in the third bullet of the same set it has the
43 conclusion that protection of the small population
44 is unacceptable. is there -- do you see a
45 contradiction between those two bullets?

46 A I don't see a contradiction, *per se*, but I believe
47 this bullet that you're referring to does inform

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1 the Minister that in fact more work was going on
2 to further develop the socioeconomic impacts, and
3 in fact there are other documents that have been
4 part of the evidence we've looked at that pertain
5 to further work that went on in the fall of 2004
6 on socioeconomic impacts.

7 Q With respect to your comment that the more
8 important piece of this was the socioeconomic,
9 and essentially there was less emphasis put on the
10 biodiversity because of the size of the
11 population, would you agree that that analysis is
12 inconsistent with the way Strategy 4 of the WSP
13 would require such an analysis to be done?

14 A That's a very interesting point, and in fact here
15 we're dealing with advice to a Minister in terms
16 of impacts on a large number of Canadians, and
17 also the other aspect of an important
18 responsibility, a vital responsibility of the
19 Department, which is protection of the resource
20 and biodiversity. And I think that's what the
21 Wild Salmon Policy is all about, and I really do
22 think those are the kinds of decisions that this
23 Commission will have to grapple with, with respect
24 to how you set the bar on implementing WSP. And I
25 would like to address that a bit more later this
26 morning if we have an opportunity.

27 Q We'll come back to that if we may. Let me just
28 get the housekeeping done first.

29 A Right.

30 Q Going then to -- I think I made a mistake a moment
31 ago. I referred to the exhibit we were looking
32 at as Exhibit 1330, and in fact we were at that
33 point looking at --

34 MR. LUNN: I think that's right.

35 MR. WALLACE: It was correct?

36 MR. LUNN: Yes.

37 MR. WALLACE: Thanks.

38 Q In comparing Exhibit 1330 with Exhibit 1331,
39 these are two successive memoranda for the
40 Minister, and the first we were looking at, 1330,
41 the one we've just been discussing, was stated to
42 be for "Information Only". The second one, 1331
43 is described as "Decision Sought". So these two
44 memoranda are of different character. Can you
45 just describe how this -- is this a typical way
46 that decisions are sought from the Minister
47 through a two-step process?

- 1 A This was often the way. In fact, it was a
2 multiple step process on Sakinaw and Cultus
3 sockeye. There were a number of different
4 briefings and discussions with the Minister, and
5 between Ministers, as well, this subject would
6 come up in federal-provincial and inter-
7 ministerial meetings. And you'll see in some of
8 this documentation reference to a meeting in
9 Whitehorse in September that where again this
10 would have been discussed. And the Deputy at the
11 time, did like to give the Minister a heads-up on
12 issues, so for information, the first memo, and
13 then come to the decision later. And I think that
14 allowed the Deputy and the Minister to have their
15 own discussions as well, and for the Minister to
16 take into account and think about and explore
17 various issues. So quite a common practice.
- 18 Q All right. And it's Exhibit 1331 which was the
19 final document put to the Minister, and which he
20 then signed off on as accepting the advice, right?
- 21 A Yes, he did. And you'll notice he signed off
22 quite a bit later, so somehow that was in his in-
23 basket for a while.
- 24 Q Thank you. And at page 5 of Exhibit 1331 there's
25 a reference to the meeting I think you just
26 referred, the meeting in Whitehorse on September
27 16th and 17th. Are you aware of whether this was
28 raised with Minister Dion, the Minister of the
29 Environment at that meeting?
- 30 A I believe so. I have difficulty separating
31 multiple ministerial meetings where we went and we
32 discussed **SARA**, but I suspect it was.
- 33 Q So it wouldn't -- if that was the case, then, it
34 wouldn't have been -- it wasn't signed off by the
35 Minister of Fisheries until after that meeting.
- 36 A Right. Yeah.
- 37 Q Now, consistent with what you said earlier about
38 the relative importance of socioeconomics and the
39 biodiversity issue, in connection with these two
40 subspecies, I notice that the document seeking the
41 advice under the headings, the headings are under
42 "Analysis" and "Comment", "Socioeconomic and
43 Fisheries Impacts of Listing", "Socioeconomic and
44 Fisheries Impacts of Not Listing", "Legal and
45 other Considerations" and "Public Reactions".
46 There is no reference there to biological
47 diversity or the conservation issues, correct?

9
John Davis
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1 A I don't believe so, but that doesn't mean that it
2 was not discussed with the Minister through this
3 process.

4 Q Do you know whether conservation issues were
5 discussed with the Minister?

6 A We would always discuss that in the briefings with
7 the Minister with respect to here's the biological
8 situation, here's the socioeconomic situation,
9 here's the stakeholder and First Nations
10 perspective, that was key.

11 Q Yes. If I could take you now to the document
12 which is a deck with the -- headed "**SARA** and
13 Potential Listing of 16 Aquatic Species including
14 Sakinaw and Cultus Lake Sockeye Stocks,
15 Confidential Draft, 10/09/04". Are you familiar
16 with this document?

17 A Yes, I am.

18 Q Can you tell us the genesis of this document and
19 what your involvement in it was?

20 A This is a draft document that summarizes the
21 information again associated with the listing of
22 Sakinaw and Cultus. It's a fairly detailed
23 document. I'm certainly familiar with the
24 content. I do not know if this exact document
25 that we have before us was the one given to or
26 used in the briefing, but certainly the content of
27 it is familiar and it's likely to be part of the
28 document train that went forward.

29 Q So this is likely to have been, or something
30 similar provided to Minister Regan --

31 A Yes.

32 Q -- in the course of the decision-making?

33 A And it's quite a big document, and typically we
34 wouldn't go through a deck in that detail in a
35 briefing. It would be a combination of oral and
36 portions of a deck. But packages of information
37 went to the Minister, the Minister's staff and the
38 Minister of Environment.

39 MR. WALLACE: Thank you. Mr. Registrar, could this be
40 marked, please, as the next exhibit.

41 THE REGISTRAR: Exhibit number 1332.

42
43 EXHIBIT 1332: **SARA** and Potential Listing of
44 16 Aquatic Species including Sakinaw and
45 Cultus Lake Sockeye Stocks, Confidential
46 Draft, dated September 4, 2010
47

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John Davis
In chief by Mr. Wallace

1 MR. WALLACE: Thank you.

2 Q Finally, if I could ask you, Dr. Davis, to go to
3 the Memorandum addressed to Paul Macgillivray from
4 the Assistant Deputy Minister, Fisheries
5 Management of September 17, 2004. I note that you
6 are copied on this document. You're familiar with
7 it?

8 A Yes, I am.

9 MR. WALLACE: Mr. Registrar, could this be marked as
10 the next exhibit, please.

11 THE REGISTRAR: Exhibit 1333.

12

13 EXHIBIT 1333: Memorandum from D. Bevan, ADM
14 Fisheries Management to P. Macgillivray, RDG
15 Pacific, re Cultus and Sakinaw Sockeye, dated
16 September 17, 2004
17

18 MR. WALLACE: Thank you.

19 Q On this page 1 of the document it starts:

20

21 The departmental recommendation not to list
22 Cultus and Sakinaw sockeye as endangered
23 means that we are charting new waters under
24 **SARA** legislation. These could well be the
25 first endangered species not accepted under
26 **SARA** due to the socio-economic impacts.
27

28 So as at the date of this, September 17th, 2004, I
29 take it the recommendation -- the determination of
30 the recommendation would be made not to list,
31 correct?

32 A Yes, and that timing is consistent with the notes
33 we've just discussed.

34 Q But as we've been discussing, some of the events
35 that went into that final decision occurred after
36 this memorandum, correct?

37 A Right. And this was a recommendation.

38 Q Yes. And further at page -- page 1 in the first
39 paragraph, it goes on to say:

40

41 While the Act allows for only socio-economic
42 impacts to be considered in the listing
43 decision, DFO needs to go well beyond those
44 economic arguments to carry this forward.
45

46 And that's consistent with what you just advised.

47 A Yes. And it also reflects the concern you were

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1 asking about, about effective management,
2 biodiversity and those sorts of things, and the
3 gist of this memo is really the ADM of Fisheries
4 Management encouraging the region to take further
5 steps.

6 Q Looking at those suggested further steps, the memo
7 goes on to make reference to the "Wild Salmon
8 Policy" and to "Mitigation" measures, and a fourth
9 issue, "Legal Risks", which has been redacted.
10 Under the "Fisheries Management" head it says in
11 the second or third sentence:

12
13 When an announcement is made regarding the
14 final **SARA** decision for these two populations
15 (expected by year-end), we will need to set
16 out a plan for the management of Cultus and
17 Sakinaw sockeye that would be in line with an
18 exploitation rate of 10-12%.

19
20 If subsequent years' exploitation rates were
21 higher than that, say, as 20 or 30 percent, what
22 would your reaction be?

23 A I'd be concerned, because this was based on 10 to
24 12 percent, which was being put forward in terms
25 of protecting those stocks.

26 Q And under "Mitigation" on page 2, the memo says:

27
28 With weak stock management, as required by
29 **SARA**, the WSP, and the precautionary
30 approach, it appears there will be ongoing
31 returns of sockeye stocks to the Fraser River
32 that could be harvested in terminal in-river
33 areas. Economic losses in marine fisheries
34 could be offset or mitigated to some extent
35 by the development of in-river fisheries.
36 While this would be highly controversial,
37 there is no biological reason for denying
38 these opportunities. Both the *Review of the*
39 *2002 Fraser River Sockeye Fishery...and*
40 *Socio-Economic Implications of the Species at*
41 *Risk Act...*note that DFO has not evaluated
42 the potential for more in-river fishing. The
43 2002 Review also recommended that there
44 should be consultations leading to a policy
45 decision by 2004 on harvesting in more
46 terminal areas.
47

12

John Davis

In chief by Mr. Wallace

Cross-exam by Mr. Timberg (CAN)

1 Did you ever discuss that mitigation measure with
2 Mr. Bevan?

3 A We did discuss these issues and the fact that the
4 Wild Salmon Policy and dealing with weak stocks
5 was a really important consideration for the
6 region. We were certainly aware that the Wild
7 Salmon Policy document was in preparation, and
8 what we have here is the ADM emphasizing that to
9 the region and saying you need to get on with it,
10 and you need to look into these kinds of more
11 terminal opportunities as part of the approach,
12 recognizing that that is a hugely complex policy
13 shift that affects many people in the industry,
14 First Nations and others all along the B.C. coast.

15 Q Are you aware whether DFO ever did get on with it
16 and conduct the evaluation consultation that would
17 be required to...

18 A I'm not aware of the details, but that is a very
19 good thing to explore.

20 Q So you're not aware of -- are you aware of whether
21 or not any -- any evaluation was done by DFO in
22 more terminal or in-river fisheries?

23 A I had understood that they were doing some of that
24 work, but I don't know the outcome of that.

25 Q And you're not aware of any policy decision made
26 based on that evaluation.

27 A No.

28 MR. WALLACE: Thank you, Dr. Davis. Mr. Commissioner,
29 those are my questions for Dr. Davis. Mr.
30 Timberg.

31 MR. TIMBERG: For the record, Tim Timberg and Geneva
32 Grade McNeill for Canada.

33
34 CROSS-EXAMINATION BY MR. TIMBERG:

35
36 Q Dr. Davis, you just commented that at this time
37 the WSP was being developed. Is it correct that
38 the WSP was finalized in June of 2005?

39 A I believe so.

40 Q And you were just asked a question about follow-up
41 to this memo. When did you retire from the
42 Department of Fisheries and Oceans?

43 A 2007.

44 Q Thank you. And you said earlier to Mr. Wallace
45 that you would like the opportunity to speak about
46 the implementation of Wild Salmon Policy and this
47 Commission's need to grapple with the decision of

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1 how high to set the bar. I wonder if you'd like
2 to comment on that.

3 A Thank you. In my earlier testimony I talked at
4 some length about the situation we find ourselves
5 in now. We are dealing with a changing ocean, a
6 changing world, and considerable variability as
7 evidenced by the purpose that this Commission is
8 addressing, with runs that will fluctuate quite
9 wildly. It suggests to me that you have to have a
10 management process that is flexible and capable of
11 being responsive to changing environmental
12 conditions with really good in-season management
13 information that is used to make these type of
14 decisions. Furthermore, with the implementation
15 of the Wild Salmon Policy, that raises many
16 implications that I'm hoping the Commission will
17 explore.

18 For example, if we set out a whole number of
19 conservation units for small sockeye stocks or
20 other stocks in the fishery, it's going to be
21 quite like the **SARA** situation, where in order to
22 protect, to rebuild and to manage these stocks,
23 the same kinds of decisions will come before the
24 Department and before fisheries managers. And
25 that then has all kinds of implications. And what
26 does that mean from the standpoint of how big a
27 commercial, recreational or First Nations
28 fisheries can be. What are the kinds of in-season
29 decisions that have to be made with respect to
30 protecting weak stocks while allowing economic
31 activity to proceed, and while allowing food,
32 social, ceremonial and other benefits to flow from
33 the resource that people are very much concerned
34 with.

35 So it means to me that one needs to explore
36 this very, very carefully and just where do you
37 set the bar, Mr. Wallace, with respect to
38 protecting weak stocks, and in doing so, what are
39 the implications of that. It could be a very,
40 very different fishery on the West Coast, but one
41 that also has benefits from robust stocks and
42 protecting stocks that are there to provide
43 benefits for the future. And I think it's very
44 much going to boil down to questions about can we
45 get consensus about the tradeoffs that need to be
46 made, can we get the kind of buy-in from the
47 different groups that are involved in the fishery,

14

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Cross-exam by Mr. Timberg (CAN)

Cross-exam by Mr. Leadem (CONSERV)

1 so that a longer-term approach can be taken to
2 planning the strengthening the rebuilding and the
3 augmentation of the stocks in the face of
4 uncertainty, and can we have decision rules that
5 in fact allow for flexibility to deal with the
6 coming impacts of climate change, the ups and
7 downs of the stocks, and have them put in place in
8 such a way that in-season everyone knows what is
9 happening and what needs to be done in order to
10 respond to the conditions that are present in that
11 particular cycle.

12 So I really feel that there's a whole policy
13 context here, and a structural context, and the
14 way the Wild Salmon Policy is going to be
15 implemented, it needs a very thorough look.

16 MR. TIMBERG: Thank you, Dr. Davis. Those are all my
17 questions.

18 MR. WALLACE: Thank you. Mr. Leadem.

19 MR. LEADEM: Leadem, initial T., for the record, Mr.
20 Commissioner.

21
22 CROSS-EXAMINATION BY MR. LEADEM:
23

24 Q Good morning again, Dr. Davis. It's good to see
25 you back again, and thank you for coming back to
26 answer these questions on these documents that
27 were unearthed.

28 A Thank you, sir.

29 Q I'd like to begin by looking at -- I only have
30 five minutes, so I'm going to be very quick, Mr.
31 Commissioner. Document Exhibit 1331, Mr. Lunn, if
32 I could have that pulled up, please, and if we can
33 go to page 4 of that document. I think it's the
34 next page. It's right before the signature block.
35 No, I may have the wrong number, I'm sorry, 1330.

36 This is the passage that Mr. Wallace referred
37 you to. It actually intrigued me, as well, when I
38 read these words in this Memorandum to the
39 Minister that was signed off by the Deputy. And
40 the words that caught me were "limited genetic
41 impact". And obviously there's going to be
42 tradeoffs, as you alluded to in your evidence,
43 between socioeconomics and the value of preserving
44 the species. Do I have that right?

45 A Yes.

46 Q And this is a difficult concept, because in effect
47 what you're doing is effectively putting a price

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- 1 tag on extinction of a species, are you not?
2 A You could look at it that way, and I would explain
3 it by saying, and I've talked about setting the
4 bar in a number of ways, one can devise a
5 management approach that protects the weakest
6 stock, in which case you wouldn't have much or any
7 of the fishery. So those are the kinds of
8 difficult tradeoffs and they're very much the
9 kinds of tradeoffs I just alluded to with respect
10 to how you implement the Wild Salmon Policy.
11 Q And the reason why I focused on the words "limited
12 genetic impact" was precisely because of the
13 reasons that Mr. Wallace pointed out to you, that
14 it seems to run counter to the scientific advice
15 that was being provided to the Department; is that
16 not fair?
17 A It would appear to run counter to it, and it very
18 much relates to the kinds of discussions that were
19 going on about, well, what is the percentage of
20 the overall Pacific sockeye runs associated with
21 Sakinaw and Cultus, they constitute a small
22 percentage, but it very much does point out that
23 here is an issue with respect to biodiversity
24 protection.
25 Q And what it also points out to me, if I can go one
26 step further with you, is that there seems to be a
27 disconnect between the scientific advice that is
28 being provided to the Department and the advice
29 that's being provided to the Minister. Because I
30 can't conceive of a scientist who is well grounded
31 in conservation biology and knows of the concepts
32 of biological diversity who is going to say words
33 such as "limited genetic impact". So to me, the
34 message is not getting through. The scientists,
35 the message from the scientists in DFO is not
36 getting through to the Minister. Would you agree
37 with that concept? Am I reading too much into
38 this?
39 A I think you are in the sense that the Minister was
40 aware that the scientific advice that led to the
41 COSEWIC designation came in fact from departmental
42 scientists in the beginning. They did some of the
43 assessment work that led to the COSEWIC
44 activities. So the Minister is certainly not
45 unaware that there is this advice coming from the
46 Department.
47 Q So somehow or other the people that put together

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Cross-exam by Mr. Leadem (CONSERV)

Cross-exam by Ms. Pence (FNC)

1 the briefing note to the Minister, then, are not
2 making that connection; is that fair?

3 A I'm not sure what was in their heads when they
4 wrote that, but they're certainly pointing out,
5 and they're not hiding the fact that this is part
6 of the overall complexity of this issue.

7 Q All right. And one final question on that same
8 paragraph. It goes on to say:

9

10 This position may raise opposition from
11 Environment Canada and other agencies.

12

13 And so that points out to me that there's some
14 conflict, then, between Departments within Canada.
15 So that Environment Canada might be the promoter,
16 for example, of **SARA** listing, whereas DFO might be
17 saying, well, no, we can't list it. Is that the
18 sort of tradeoffs, or is that the tension that
19 exists between departments in Canada?

20 A Sometimes there's tension between departments. I
21 think what this is alluding to is that the
22 Minister of Environment in fact is the lead
23 minister for **SARA** and consequently would have a
24 position on these sorts of issues.

25 Q Yes.

26 A And he's receiving advice from what is called a
27 "competent minister" under the legislation for
28 aquatic species.

29 Q Who would be DFO Minister.

30 A DFO Minister.

31 Q Right. And the other agencies, do you have any
32 knowledge about the other agencies that are
33 alluded to in that paragraph?

34 A Well, there are other agencies. There was the
35 Parks Canada agency, too, which has an interest in
36 things.

37 MR. LEADEM: All right, thank you.

38 MR. WALLACE: Thank you. Ms. Pence.

39 MS. PENCE: Thank you. Leah Pence for the First
40 Nations Coalition, and with me is Brenda Gaertner.

41

42 CROSS-EXAMINATION BY MS. PENCE:

43

44 Q Good morning, Dr. Davis. Thanks for being here.
45 Mr. Lunn, if you could please pull up Exhibit
46 1332, that's the deck that I understand, the draft
47 deck, the contents of which formed the

1 presentation that was given to the Minister in
2 September of '04. And if you could please go to
3 slide 9, I think it's on page 5 of the document.

4 Because I understand that a risk analysis was
5 carried out on the decision to list these -- or
6 not to list ultimately these two populations under
7 **SARA**; is that right?

8 A Yes.

9 Q And, Mr. Lunn, if you could forward again, because
10 I think that risk analysis is part of this
11 document. So if you could forward on to page 17.
12 Yes, page 17, and scroll down a little bit. So
13 there we go. We have the "Risk Analysis", and if
14 you could scroll onto the next page then, and I'd
15 like to go to the bottom where there's the table.
16 Great. Just hold it there for a moment.

17 So Dr. Davis, you'd agree that fisheries
18 managers were wanting to establish some
19 consistency in the decision-making process, given
20 that this was the first important decision under
21 **SARA** for the Department; is that right?

22 A Yes.

23 Q And part of that internal decision-making process
24 would be establishing the process that DFO would
25 use to assess and weigh risks; is that right?

26 A Yes. What was going on in one of the Ottawa
27 groups, there was a risk analysis documentation
28 being prepared, and I believe this is an excerpt
29 from a longer document that deals with it, and one
30 in fact that I had in my package of materials for
31 my last testimony.

32 Q Okay. And I'd also like if we could pull Exhibit
33 27, because I'm wondering if that risk analysis
34 documentation is also Exhibit 27, which is the
35 Integrated Risk Management Policy. Is that what
36 you referring to, as well?

37 A No, I don't believe it is. The one I was
38 referring to was one that was prepared by Dr. Bill
39 Doubleday's group in Policy Sector. And this, I'm
40 not sure I've ever seen this document, or if I
41 have, I haven't focused much on it. So this one's
42 new and much broader.

43 Q Okay, fair enough.

44 A Yes.

45 Q If I could go to the last page of that Exhibit 27,
46 though, because I think there's some similarities
47 there. Mr. Davis, you'd agree that the table we

- 1 see here that's marked "Risk Tolerance Model" is
2 very similar to the that we see back over on that
3 deck Exhibit 1332 that was used for the Cultus
4 decision.
- 5 A Yes, it's arraying impact on a rising scale, going
6 vertically against likelihood on a rising scale
7 going horizontally.
- 8 Q Thank you. And it uses kind of a stoplight
9 approach of risk, red, yellow, green.
- 10 A Correct.
- 11 Q Thank you. So you'd mentioned Bill Doubleday, but
12 who was involved specifically in completing the
13 risk analysis for the Cultus and Sakinaw
14 decisions?
- 15 A That one I believe was led by a gentleman called
16 John Lark, and if I recall correctly, which I
17 might be fuzzy on, he was working with the
18 Evaluation and Audit Group.
- 19 Q And is that out of the Headquarters Office in
20 Ottawa?
- 21 A Yes.
- 22 Q Okay. And was anyone else involved in that risk
23 analysis? Was Department of Justice involved in
24 that, as well?
- 25 A I don't know. There were probably others, yes.
- 26 Q And what about people from Pacific Region?
- 27 A My assumption is that in compiling it, you have to
28 have data, and you have to have information. So
29 what they would have done is work with regional
30 staff to look at the different aspects of the risk
31 analysis.
- 32 Q Thank you. So we're done with Exhibit 27 now,
33 thank you, Mr. Lunn. If we can go back, then, to
34 the results of the risk assessment, and if you
35 could just scroll up to the previous table,
36 because I just want to make sure I understand what
37 goes into this "Risk analysis process". I'm
38 looking for slide 35. Yes.
- 39 So it's really based on two factors, if I'm
40 understanding it right, the likelihood that the
41 harm will occur and then the impact of the harm;
42 is that right?
- 43 A Correct, of the two axes of the blocks.
- 44 Q Great. And then if we scroll back down - sorry,
45 Mr. Lunn - to slide 36. You were talking about
46 the stoplight approach, and then we've got the
47 numbers, scrolling down, then, the 9, 8, 6 --

- 1 sorry, Mr. Lunn, if we could stop at slide 36.
- 2 A He's very good at this. I'm impressed.
- 3 Q So 9 would be high impact of harm, high likelihood
- 4 that the harm will occur; is that correct?
- 5 A That's correct.
- 6 Q And 5 would be medium impact of harm, medium
- 7 likelihood, and going down.
- 8 A Correct.
- 9 Q And then if we scroll over, and I'll be patient
- 10 here, to get to slide 37, please. And slide 37 is
- 11 where we see the summary of the risk assessment,
- 12 the results, really; is that right?
- 13 A That's correct.
- 14 Q And how -- how do you determine these ratings?
- 15 For example, what gets a 6 versus what gets an 8,
- 16 what gets a 5, what gets a 9. How is that
- 17 decision made?
- 18 A That's a very good question. It's a qualitative
- 19 assessment, as I understand it, and it would be --
- 20 I mean, how do you -- how do you judge federal-
- 21 provincial relationships, whether the province is
- 22 mad at us or not, and it rates a 9 or an 8 or a 7,
- 23 or something like that, that's I would say,
- 24 looking at these, this is useful because it arrays
- 25 all the different considerations. But
- 26 numerically, I'm not sure from a scientific
- 27 perspective how you evaluate those numbers.
- 28 Q Thank you. And who is it that does that numerical
- 29 rating, then, is that, like you said, John Lark
- 30 with the Evaluation Audit Department in Ottawa?
- 31 A I believe that's what was going on.
- 32 Q Okay.
- 33 A But probably in discussion with people to get a
- 34 general sense of the weighting of it.
- 35 Q Thank you. So I'm curious about some of these
- 36 results, and in particular "A", which is
- 37 "Minister's Freedom to Act", "B No Recovery", "C
- 38 Extinction", "D Commercial Fishing", "E" is
- 39 "Aboriginal Food and Social Fishing", "K", like
- 40 you said, we've got "Federal-Provincial"
- 41 relations, "L Relations with Fishing Industry",
- 42 "N" is "Legal" and "P" is "Compensation". And I'm
- 43 wondering, can you tell me why there's a line item
- 44 there for "Compensation", what does that refer to?
- 45 Is it usual for a federal government to offer
- 46 compensation in these situations?
- 47 A No, but there's a very interesting legal issue

- 1 associated with **SARA** as to whether if you
2 infringe, for example, First Nations, there might
3 be some requirement for compensation.
- 4 Q Thank you. And why is there a line item at "D"
5 for "Commercial Fishing" and then another line
6 item at "L" for "Relations with Fishing Industry"?
- 7 A Mm-hmm.
- 8 Q Is that counting fishing interests, commercial
9 fishing interests twice?
- 10 A If you look at how DFO does its work, there's a
11 huge amount of consultation and relationships with
12 different boards, groups, that sorts of thing. So
13 having effective working relationship is an
14 important aspect, and we often think about things
15 in terms of manageability, and fisheries managers
16 had found in some cases when they made a huge and
17 substantive policy shift, people were so upset
18 that they would be almost defiant and not in fact
19 go along with it. So there's manageability
20 aspects to these relationships, too.
- 21 Q Right. Thank you. And why isn't there, then, a
22 line item for relations with First Nations,
23 especially given the constitutional obligations
24 that the Crown has to First Nations. I don't see
25 that there.
- 26 A I'm not sure why they wouldn't put it in. I would
27 think they would see it subsumed under "Aboriginal
28 Food and Social Fishing", but you have a point.
- 29 Q So from the risk assessment summaries, we see that
30 there's high impact, so I'm meaning a "9" under
31 the "List" column for "Minister's Freedom to Act",
32 for "Commercial Fishing", that's at "D", for
33 "Federal-Provincial", that's at "K", for
34 "Relations with Fishing Industry" which we've just
35 discussed, that's "9", and then for the
36 "Compensation" question a "9". And I've actually
37 done a little total, so you'll just have to
38 indulge me here. I've totalled the numbers for
39 the "List" and the "Do Not List" column, and what
40 we get is 110 in the "List" column, for the total
41 risk number, and then 94 in the "Do Not List"
42 column. So the "List" column has a lot more
43 numerical risk, if you were. So from this do we
44 understand that decisions about protecting species
45 is really a numbers game, qualitative numbers
46 game? I don't know how to frame that.
- 47 A I don't think so. I think you're looking at the

- 1 whole issue, and this is one part of the advice
2 that is provided to Ministers. So I wouldn't in
3 any way say "Minister, this was the score, so
4 you've got to do this."
- 5 Q Okay. I'm also curious about how DFO's number one
6 priority, conservation, plays into this. Because
7 I find it puzzling that "No Recovery" and
8 Extinction" have the same ratings, whether you're
9 listing or not, and yet **SARA**, as I understand it,
10 is intended to protect species at risk. So how is
11 it that you have the same ratings in both of those
12 columns?
- 13 A I don't know how they derived those particular
14 ratings, but...
- 15 Q Would you agree with that rating?
- 16 A Well, "No Recovery" is important from the
17 standpoint if you do everything possible to
18 protect the stocks under **SARA**, close down the
19 fisheries, do all these Draconian things and no
20 recovery is possible, there's no way to escape.
21 There's an issue with respect to **SARA** is a very
22 blunt instrument in some ways. It's very unclear
23 about how to delist something.
- 24 Q Mm-hmm.
- 25 A And if stocks continue to decline, you could have
26 all kinds of impacts on people, including First
27 Nations with no ability to turn things around and
28 a very long period of time before something might
29 get off the list. So that's why that's one high.
30 And "Extinction", of course, is important. Here
31 there was a situation at that time where plans
32 were being put in place for Sakinaw and Cultus,
33 quite comprehensive plans costing nearly a million
34 dollars a year in order to try to effect the
35 recovery. So I think that would mitigate the
36 score on the extinction side.
- 37 Q Okay, thank you. I just want to focus finally on
38 "N", which is the "Legal Considerations". And we
39 see that the legal risk is higher if you do not
40 list. It's an "8" there, whereas it's a "6" if
41 you list. Is that because DFO had concluded that
42 there was risk of legal action by environmental
43 groups, First Nations, potentially others, for
44 DFO's failure to meet its conservation mandate, or
45 to fulfill the implementation of **SARA** or its
46 failure to honour obligations to First Nations.
47 Is that what that legal risk refers to?

1 A Perhaps, and perhaps in this case there were
2 discussions with legal counsel. I'm not sure.

3 Q And yet despite that higher risk on the "Do Not
4 List" side, the Minister decided that it wouldn't
5 list. So does that suggest that the Minister was
6 willing to risk lawsuits from First Nations and
7 from others in order to have the freedom to act,
8 and in order to meet some of the interests of the
9 commercial industry?

10 A I'm not sure what the Minister's views were with
11 respect to the legal aspects, but nevertheless we
12 have a piece of legislation that, you know, is
13 designed to do things for conservation purposes
14 and the Minister had to look at that very
15 carefully.

16 MS. PENCE: Thank you. Those are my questions.

17 THE COMMISSIONER: Thank you, Ms. Pence.

18 MR. WALLACE: Thank you, Mr. Commissioner. I have no
19 re-examination, Mr. Timberg has none. I'd like to
20 thank Dr. Davis and all participants for
21 cooperating and allowing us to do this so
22 efficiently.

23 THE COMMISSIONER: Yes. Dr. Davis, I'd like to add my
24 appreciation to you for returning here this
25 morning, and for making yourself available to
26 address questions with respect to these documents.
27 I'm very grateful, sir. Thank you very much.

28 A Thank you, sir, and it's certainly a privilege to
29 be here. And from what I hear, there's all kinds
30 of chinook coming back this year. It's fabulous
31 on the West Coast and up in the Charlottes, so
32 it's not all doom and gloom.

33 THE COMMISSIONER: Did you want to take a short break
34 then, Mr. Wallace, and...

35 MR. WALLACE: Ms. Baker is on her way.

36 THE COMMISSIONER: All right. We'll just stand down
37 briefly.

38 THE REGISTRAR: The hearing is recessed for five
39 minutes.

40
41 (PROCEEDINGS ADJOURNED FOR SHORT RECESS)

42 (PROCEEDINGS RECONVENED)

43
44 THE REGISTRAR: Order. The hearing is now resumed.

45 THE COMMISSIONER: Mr. McDade.

46 MR. McDADE: Thank you, Mr. Commissioner. Continuing
47 on, before we commence, I'd like to be sure to

23
PANEL NO. 51 (cont'd)
Cross-exam by Mr. McDade (AQUA)

1 mark the e-mail that we discussed yesterday, the
2 May 3rd e-mail string with Dr. Thomson. Could I
3 have that marked as an exhibit?

4 THE COMMISSIONER: Yes.

5 THE REGISTRAR: 1334.

6

7 EXHIBIT 1334: E-mail dated May 10, 2010,
8 from Richard Thomson to Richard Beamish,
9 Subject: Sockeye report

10

11 MR. McDADE: And Mr. Commissioner, I have a bit more on
12 cross. I had scheduled 15 minutes for the next
13 panel this afternoon, and I've given that time up
14 to allow myself a little bit extra time this
15 morning.

16

17 RICHARD BEAMISH, Recalled.

18

19 STEWART McKINNELL, Recalled.

20

21 DAVID WELCH, Recalled.

22

23 CROSS-EXAMINATION BY MR. McDADE, continuing:

24

25 Q Dr. Beamish, continuing on where we left off
26 yesterday -- could I have the report that's
27 Aquaculture 6, up on the screen, estimating the
28 abundance of juvenile Coho salmon in the Strait of
29 Georgia by means of surface trawls.

30

31 Dr. Beamish, that's the document you cite in
32 your papers that you've submitted here, today, as
33 the methodology for your trawls?

33

34 DR. BEAMISH: Yes, most likely.

34

35 MR. McDADE: Yes. Could I have that marked as the next
36 exhibit.

36

37 THE REGISTRAR: 1335.

37

38

38 EXHIBIT 1335: Estimating the Abundance of
39 Juvenile Coho Salmon in the Strait of Georgia
40 by Means of Surface Trawls, by Richard
41 Beamish, et al

42

43 MR. McDADE: And Mr. Lunn, could we scroll down, just
44 bellow the abstract, in the second column. Three
45 lines down from the top, Dr. Beamish, there's a
46 sentence that says:

47

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1 We propose that for some salmon species, such
2 as Coho salmon...routine standardized surveys
3 of total juvenile abundance can improve
4 management...
5

6 Let me suggest to you that what you're saying in
7 this document is that the trawl is designed
8 primarily for Coho salmon, not for all -- and it's
9 not appropriate for all species?

10 DR. BEAMISH: Yes, I think that's true.

11 Q So can I suggest to you that the species it's not
12 appropriate for are sockeye and pink?

13 DR. BEAMISH: Well, you know, you'll just have to --
14 what do you mean by "it's not appropriate for"?
15 If you can just give me a little more information,
16 I can answer the question.

17 Q Well, that it's not appropriate to use this trawl
18 and the way it's designed to estimate or compare
19 abundance year over year?

20 DR. BEAMISH: I'm sorry, I know you're in a bit of a
21 hurry and I'll try to answer them quickly, but the
22 -- you can't compare among years. You can't
23 compare the catch per unit of effort. When you're
24 trying to change those catches into an estimate of
25 total abundance where you're putting a number on
26 it, I think you're correct that this is -- that I
27 would agree with you, is a better way of saying
28 it, that making abundance estimates for pink and
29 sockeye are more difficult than making abundance
30 estimates for Coho.

31 MR. McDADE: Can I have the document that's Aquaculture
32 5 up on the screen.

33 Q And this is another paper that you wrote, I
34 believe, Dr. Beamish, An Abrupt Increase in the
35 Abundance of Juvenile Salmon in the Strait of
36 Georgia. You recognize that paper?

37 DR. BEAMISH: Yeah. Again, these are papers that we
38 produce usually each year to inform our colleagues
39 that, in this case, the North Pacific Anadromous
40 Fish Commission, about the work that we have done
41 during that year.

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

44 THE REGISTRAR: 1336.
45
46
47

1 EXHIBIT 1336: An Abrupt Increase in the
2 Abundance of Juvenile Salmon in the Strait of
3 Georgia, by R.J. Beamish, et al, September
4 2000
5

6 MR. McDADE: And could I go to page 4, and scroll to
7 the bottom.

8 Q There's a sentence there that starts four lines
9 from the bottom, Dr. Beamish. It says this -- or
10 let me go to the sentence above it:
11

12 A comparison of pink and sockeye estimates
13 among years was not made because these
14 species tend to be highly migratory with
15 residence times considerably shorter than the
16 other species...
17

18 So there I think it specifically says that you
19 can't -- comparison between years is not
20 appropriate; is that right?

21 DR. BEAMISH: Well, that sentence is a statement made
22 by Dr. Healey, all right? And I realize that we
23 are citing his work, right? It's a statement that
24 he made. And the complication is that at the time
25 when we were writing these reports, I think that
26 the statement that the residence time are
27 considerably shorter than other species is
28 probably okay. I would not use the word
29 "considerably" anymore. So at the time that we
30 wrote the report, going back the way I was
31 thinking when I wrote this, that wouldn't be true
32 at the time. I wouldn't quite -- I wouldn't say
33 that today, no. It would be different today.

34 MR. McDADE: Can I ask that we put up on the screen,
35 again, Exhibit 1303, which is the Anomalous Ocean
36 Conditions by you and Dr. Thomson. And can we go
37 to Table 1 at page 53 again.

38 Q Now, Dr. Beamish, as I understand the paper, in
39 the Strait of Georgia in 2007, you did -- or there
40 was some 74 trawl sets done, and in 2008 some 90
41 trawl sets. As this paper indicates, in Queen
42 Charlotte Sound there were only five sets done,
43 both in 2007 and 2008. Certainly, the -- and what
44 I'm asking you to agree with is the number of sets
45 makes that data far less reliable in terms of
46 comparing abundance and size?

47 DR. BEAMISH: In terms -- I wouldn't use the word

1 "abundance", but in terms of comparing the
2 catches, yes, I agree with you.
3 Q And the Hecate Strait data in your paper, I think,
4 as you note in your paper, the Hecate Strait
5 numbers are actually not supportive of the theory
6 or the conclusions at all; they're an anomaly?
7 DR. BEAMISH: Can you just tell me what you interpret
8 to be the theory?
9 Q Well, the Hecate Strait numbers don't support any
10 difference in catch between 2008 --
11 DR. BEAMISH: Oh yes.
12 Q - and 2007?
13 DR. BEAMISH: Yes, that's true, yeah.
14 Q So can I suggest this, that the trawl survey, as a
15 technique, is at best a snapshot of what you see
16 at the time you do the survey?
17 DR. BEAMISH: Again, if you can just give me a little
18 bit more explanation on what you mean by "what you
19 see"?
20 Q Well, it's not necessarily indicative, for
21 instance, of the conditions of sockeye -- if you
22 take a trawl from July 8th to 15th, it doesn't
23 give you much in the way of indications of what
24 the status of the sockeye were a month or two
25 earlier, when the bulk of the sockeye went through
26 the Strait?
27 DR. BEAMISH: I think that's fair. Scientifically,
28 that's correct, yes.
29 Q And that trawl survey also doesn't tell you --
30 well, you didn't test these fish for disease?
31 DR. BEAMISH: No.
32 Q And if there are any changes in abundance due to
33 disease, you wouldn't -- that would be as
34 consistent with any changes in abundance as it
35 would be problems with prey?
36 DR. BEAMISH: Yes.
37 Q And I think you accept in your paper that if the
38 virus that's been posited by Dr. Miller was a
39 factor in 2007, the ocean conditions in the
40 Georgia Strait would have exacerbated that
41 disease?
42 DR. BEAMISH: Okay, I just want to be careful, but I
43 don't think that -- we didn't refer to the virus,
44 did we, in that paper? I doubt it. Okay, I'm
45 going to assume that we didn't, but I'm going to
46 answer your question by saying that -- just
47 ignoring the reference to the virus, what you said

1 I would agree with.

2 Q And if any smolts were in poor condition in 2007,
3 before they went through the gauntlet of the fish
4 farms up in the Discovery Islands and the
5 Johnstone Strait, that would make them more
6 susceptible to any pathogens they might pick up
7 along the way?

8 DR. BEAMISH: Well, I can't answer that, but I would
9 think that that's possible, yes. I mean, I'm not
10 qualified to answer that, but it does seem to be
11 reasonable.

12 MR. McDADE: Mr. Lunn, could we just call up the data
13 that I refer -- the spreadsheets that Canada's
14 provided in relation to this paper? There are two
15 of them. The smaller one is the one I put up.

16 Q Dr. Beamish, I asked that you provide the raw data
17 that was part of these trawl surveys, and I'm just
18 going to put one up on the screen. As I
19 understand it, you've supplied the data for Hecate
20 Strait and the Queen Charlotte Sound trawls. The
21 Georgia Strait data has not yet been provided?

22 DR. BEAMISH: That's true, yes.

23 MR. McDADE: And apparently will be provided later.
24 And so this is just referring to the Queen
25 Charlotte Sound. If we can just call up -- well,
26 first of all, can I mark this as an exhibit.

27 THE REGISTRAR: 1337.

28

29 EXHIBIT 1337: Juvenile Pink, Chum and
30 Sockeye raw data Excel spreadsheet for the
31 period June 2007 to July 2009
32

33

MR. McDADE:

34 Q If we look at column D and the first 10 rows of
35 column D

36 MR. LUNN: I'm sorry, I can't blow it up the way we can
37 with PDFs.

38 MR. McDADE: Okay.

39 Q Well, in the interest of time, let me suggest to
40 you, Dr. Beamish, that the numbers found in these
41 five sets in the Queen Charlotte Sound in 2007 and
42 2008, were quite diverse. In a couple of sets
43 they found one or no salmon, and in a couple they
44 found a great number.

45 DR. BEAMISH: We're talking about 2007 in Queen
46 Charlotte Sound?

47 Q And 2008.

- 1 DR. BEAMISH: I recall that being correct, yes.
- 2 Q So there's a great variability in these sets?
- 3 DR. BEAMISH: I think so, yes.
- 4 Q Which is another factor of randomness or --
- 5 DR. BEAMISH: Yes.
- 6 Q -- lack of reliability --
- 7 DR. BEAMISH: Yeah.
- 8 Q -- in the data?
- 9 DR. BEAMISH: And it's an indication of a variability,
- 10 yes.
- 11 Q So let me just -- my last questions to you, Dr.
- 12 Beamish, then, if we could go to the Synchronous
- 13 paper, which is Exhibit 1309, I just have a couple
- 14 of other anomalies I'd like to ask you about. The
- 15 table at page 34, Exhibit 1309.
- 16 Now, if we could just -- the first set of
- 17 data is in relation to Coho, and Mr. Lunn, if you
- 18 could just highlight the 2007 and 2008 section.
- 19 Yes. So as I see the Coho data, Dr. Beamish, it
- 20 appears to me that under 2007, 1,233 Coho were
- 21 caught; in 2008, 723.
- 22 DR. BEAMISH: I think that's what that says, yes.
- 23 Q So that actually in your 2007 trawls you got more
- 24 Coho than 2008?
- 25 DR. BEAMISH: According -- well, that -- you'll have to
- 26 look at that in terms of catch per unit of effort,
- 27 and I can't see that from the table, but that
- 28 probably -- it might be true. I don't know for
- 29 sure.
- 30 Q Can we then move down to the Chinook?
- 31 DR. BEAMISH: We're just not comparing catches. You
- 32 have to compare catch per unit effort. Is that
- 33 catch? I can't tell from that table what it is,
- 34 quickly.
- 35 Q Well, it seems to be the number of Coho caught --
- 36 DR. BEAMISH: I know.
- 37 Q -- in the same set of trawls --
- 38 DR. BEAMISH: Yeah, except that it depends on the
- 39 number of sets, all right, and I can't get that
- 40 quickly from the table.
- 41 Q Well, as I understood, there were 74 trawls in
- 42 2007, and 90 in 2008.
- 43 DR. BEAMISH: But that was for sockeye.
- 44 Q Isn't it the same trawls we're dealing with?
- 45 DR. BEAMISH: No, because the sockeye are only the top
- 46 15 metres and Coho are the top 30 metres.
- 47 Q All right. Well, let me move down to Chinook and

1 ask you --
2 DR. BEAMISH: Okay.
3 Q -- about the numbers there. It seems to be a
4 similar indication of Chinook, that there are
5 actually more Chinook caught in 2007 than 2008.
6 DR. BEAMISH: Again, it's the same issue of how many
7 sets we made and what the catch per unit effort
8 is. You can't really, unfortunately, just compare
9 the catches without comparing them to standardize
10 them by the actual number of trawls. And I'm
11 sorry, I can't remember what the catches were,
12 relative to the two years.
13 Q Well, your counsel is going to be providing those
14 data to us in due course.
15 DR. BEAMISH: Yeah.
16 Q All right. And under chum, just one more line
17 down, as I see it, under chum you see the number
18 140.6 compared to 101.8? That's length.
19 DR. BEAMISH: That's true.
20 Q So the chum in 2007 were actually longer than in
21 2008?
22 DR. BEAMISH: That's correct.
23 Q Now, I'll just thank you, Dr. Beamish, for your
24 help. I'll just ask Dr. McKinnell --
25 DR. BEAMISH: Okay.
26 Q -- and Dr. Welch, as I understood your answers to
27 Mr. Blair, there was some reluctance to agree with
28 Dr. Beamish's conclusions. Am I correct that that
29 reluctance has to do with the sufficiency of the
30 samples and the issue with the data that I was
31 cross-examining Dr. Beamish about?
32 DR. WELCH: Who are you asking?
33 Q Each of you.
34 DR. MCKINNELL: I think the issues that I had with
35 these data were that information about growth and
36 information about survival were inferred but not
37 measured. So that would be my main comment.
38 Q And Dr. Welch?
39 DR. WELCH: I would have two general comments. The
40 first, is in July it's the tail end of the sockeye
41 that are mostly migrating through, so any slight
42 variations in either the timing of the fish or the
43 timing of the survey can have large implications
44 for the numbers caught.
45 The second, is a general scientific issue
46 between different investigators. Dr. Beamish has
47 pointed out, in Table 2, that the size of the

1 sockeye in 2007 was smaller than 2008. I did look
2 at that last night. It is statistically
3 significant, but it's almost biologically
4 irrelevant, because it's only a three millimetre
5 difference. And in the same table the weight
6 shows that in 2007 those slightly smaller fish in
7 fact weighed more than the fish in 2008. So it's
8 an interpretational difficulty between scientists
9 as to which of the data you put more weight on.

10 Q And Dr. Welch, are you aware of any other studies
11 that actually show that some species of sockeye
12 were doing well in the Georgia Strait in 2007?

13 DR. WELCH: Well, yes, I think you're referring to the
14 paper I -- that's in press with Dr. Wood as lead
15 author, and myself.

16 Q And what does that say?

17 DR. BEAMISH: In that paper we tagged Sakinaw sockeye
18 and -- actually, I'm not -- I'm not positive it's
19 referring to the 2007 release year. I'd have to
20 go back and check that document. But what we
21 found was that the Sakinaw sockeye that migrated
22 out of the Strait of Georgia never returned. They
23 had tags similar to the Cultus Lake tags. But the
24 Sakinaw salmon that we did not -- that did not --
25 that we did not register leaving the Strait of
26 Georgia actually had three and a half percent, 3.4
27 percent survival, much higher than the marine
28 survival of the wild run as a whole. So it was a
29 very surprising result.

30 Q So it would tend to indicate that sockeye that
31 migrated through Johnston Strait were the ones
32 that had the problem?

33 DR. WELCH: Well, I would actually phrase it as there's
34 a couple of lines of evidence suggesting that
35 animals that stay in the Strait of Georgia have
36 higher survival than animals that migrate out.

37 MR. McDADE: All right. I thank you, gentlemen, for
38 answering these questions.

39 MR. LEADEM: For the record, Leadem, initial T.,
40 appearing as counsel for the Conservation
41 Coalition.

42

43 CROSS-EXAMINATION BY MR. LEADEM:

44

45 Q I want to begin my examination of you gentlemen by
46 focusing upon the technical report, which I
47 believe we've marked as Exhibit 1291. That's your

1 PICES report, Dr. McKinnell, so many of my
2 questions will be to you, initially.

3 Firstly, let me thank you for a well-written
4 report, and I certainly found it enjoyable
5 reading, so much so that I even read the
6 appendices, and that's where I'm going to take
7 you, actually, because the appendices were quite
8 informative. And I want to start by asking you a
9 general question about the report, and perhaps the
10 easiest way to do that is if we can look at page
11 176 together.

12 DR. McKINNELL: Okay.

13 Q Right at the bottom of the page - 194 of your
14 copy, Mr. Lunn, if you're on the PDF - the last
15 paragraph there says:

16
17 Prior to its release, the report was peer-
18 reviewed within PICES by 5 scientists
19

20 And that's the point I want to hit with you,
21 first --

22 DR. McKINNELL: Okay.

23 Q -- that in a question from Canada yesterday, you
24 were asked whether or not you incorporated the
25 views of the reviewers from the Commission, and
26 you said, "No," you did not. Nonetheless, this
27 was peer-reviewed by five scientists; is that
28 correct?

29 DR. McKINNELL: Well, five plus the Commission's
30 reviewers.

31 Q Yes. And this is normal procedure with respect to
32 documents that are coming out from PICES under the
33 authority of PICES; is that fair to say?

34 DR. McKINNELL: It is relatively rare for PICES to be
35 asked to prepare an advisory report, and so common
36 practice, I would suggest, is still being
37 established, but it was set up that there would be
38 a review process.

39 Q And this was the review process that was picked
40 for this particular paper?

41 DR. McKINNELL: The review process was established by
42 the chairman of one of the committees in PICES.

43 Q And there were two external scientists who
44 reviewed it, and they're mentioned there, Dr.
45 Ruggione, from Seattle, and then Dr. Fukuwaka,
46 from Japan; is that right?

47 DR. McKINNELL: That's correct.

1 Q And then when you responded to my learned
2 colleague from Canada, when you said that you did
3 not take into consideration the comments of the
4 reviewers from the Commission, my understanding
5 from reading through, that's a question of timing;
6 you simply did not have enough time to incorporate
7 that and then go back to the board and get
8 approval; is that fair to say?

9 DR. McKINNEL: That's correct.

10 Q The next area I want to take you to is Appendix 4,
11 and these are comments that I found to be quite
12 informative. They're comments on the Pacific
13 Salmon Commission Workshop, beginning at page 168,
14 Mr. Lunn.

15 DR. McKINNEL: Right.

16 Q My understanding is that you were requested,
17 subsequent to the publication of this report, to
18 have an examination of the workshop that was
19 conducted in June of 2010; is that right?

20 DR. McKINNEL: I believe it was part of our statement
21 of work.

22 Q Okay. And your comments with respect to the
23 conclusion, you took some issues with that, and
24 those are summarized in Appendix 4; is that
25 correct?

26 DR. McKINNEL: Correct.

27 Q And if I can summarize, most of your comments
28 dealt with the focus upon the Strait of Georgia;
29 is that right?

30 DR. McKINNEL: That would be because the Salmon
31 Commission's report was focusing on the Strait of
32 Georgia, as I understand -- as I recall.

33 Q Right. And you may recall yesterday that my
34 learned colleague from Canada was asking questions
35 of Dr. Beamish about this same workshop and the
36 conclusions in the workshop?

37 DR. McKINNEL: Yes.

38 Q And so what you have to say about that workshop is
39 found, if we can go to page 169, under the bullet
40 with an underlining, you say:

41
42 There is a positive correlation between the
43 abundance of juvenile sockeye (catch per unit
44 effort) in the Strait of Georgia and log
45 (total Fraser SK production) two years later
46 over 1998-2007...

47

1 I'm not going to pretend I understand R-square
2 values. And then you make a number of comments
3 about that; is that right?
4 DR. MCKINNELL: Yes.
5 Q And I take it that the tenure of those comments is
6 that you take issue with the finding from the
7 Pacific Salmon Workshop; is that fair to say?
8 DR. MCKINNELL: Yeah, that's fair.
9 Q You disagree with them?
10 DR. MCKINNELL: On this point.
11 Q And the reasons why you disagree with them are
12 given in the four bullets that follow; is that
13 right?
14 DR. MCKINNELL: Yes.
15 Q And I won't ask you to repeat them, they're there
16 for our reading pleasure and edification, but I
17 just want to make the point that when the Pacific
18 Salmon Workshop in June 2010 concluded, that a
19 good place to start in terms of looking at
20 contributory factors that led to the 2009 decline,
21 was the Strait of Georgia, you would tend to take
22 issue with that?
23 DR. MCKINNELL: Only after having written our report.
24 Q Yes. And I'm going to turn to you, Dr. Welch.
25 The community around the sockeye and investigation
26 into sockeye, is a relatively small one and tight-
27 knit one. Did you participate in that workshop in
28 June 2010?
29 DR. WELCH: No, I didn't.
30 Q All right. Have you followed any of the thinking
31 from Dr. Randall Peterman since that workshop and
32 what his current views may or may not be with
33 respect to the focus upon the Strait of Georgia?
34 DR. WELCH: We've had a couple of -- we've had
35 professional conversations on things, but I don't
36 think I'd like to characterize what I think I know
37 about Dr. Peterman's --
38 Q Okay. I'll leave it at that. Do you have any
39 views about the conclusions reached from that
40 workshop, that the focus should be on the Strait
41 of Georgia?
42 DR. MCKINNELL: Yes, I do. I think it's too narrowly
43 focused and the problem is that if we focus in on
44 the Strait of Georgia before really establishing
45 that that's the problem, you can spend almost an
46 eternity studying the problem within the Strait of
47 Georgia if it's not there, without recognizing

1 that it's not where the primary determinants are.
2 Q Now, Dr. Welch, you, yourself, are one of the
3 reviewers that the Commission hired to actually
4 examine Dr. -- or the PICES report. I'm going to
5 call it the PICES report, with all due respect to
6 you. I realize that you were the senior author,
7 but it was generally the work of several
8 scientists.
9 DR. WELCH: I would prefer that you call it the PICES
10 report.
11 Q All right. So Dr. Welch, you examined the PICES
12 report --
13 DR. WELCH: Yes, I did.
14 Q -- and made some comments based on your review of
15 that; is that correct?
16 DR. WELCH: Yes, I did.
17 Q Okay. And if we can turn to page - I believe if
18 we look at 185 of the report - this is in Appendix
19 6, The Reviewer's Comments - and I believe Dr.
20 Welch's comments can be found right after Dr.
21 Cooke's. You're faster than I am.
22 Now, there are a couple of things that I
23 found to be intriguing about your comments of the
24 PICES report, Dr. Welch, and under number 2, the
25 bold number 2, you were asked to evaluate the
26 interpretation of the available data. And you
27 pointed out some discrepancies or differences
28 between the McKinnell, et al report, which I take
29 it to be the PICES report, and the Peterman and
30 Dorner reports, which we have already heard from
31 Dr. Peterman, who's presented evidence on his
32 report, and you have a bit of a table there.
33 DR. WELCH: Yes, that's the table in blue.
34 Q And this is something I'm going to come back to
35 you as well, Dr. McKinnell, because the major
36 discrepancy that you point out is that the decline
37 in the PICES report is, according to you, Dr.
38 Welch, a sudden shift occurs in 1992, and then
39 there's a decline as a step-function, whereas
40 Peterman and Dorner seem to describe it more of a
41 gradual or trend to lower productivity is that
42 fair --
43 DR. WELCH: Yes.
44 Q -- is that what you're pointing out there?
45 DR. WELCH: Correct.
46 Q All right. And so back to you, Dr. McKinnell,
47 with respect to the PICES report, you found that

1 there was this sudden decline in 1992, that it was
2 a dramatic shift; is that right?

3 DR. MCKINNELL: I think in the report -- well, first,
4 we noticed that a shift in productivity had not
5 been considered --

6 Q Yes.

7 DR. MCKINNELL: -- by the PSC report, Dr. Peterman's
8 report. We evaluated the recruits per -- log
9 recruits per spawner time series for about 16
10 stocks, and seeking to see whether it was --
11 whether one model, a gradual decline, or a step-
12 shift, fit the data better. And in our, I will
13 say, preliminary evaluation, we found that the
14 simple model fit the step-shift slightly better
15 than the trend model in a number of -- actually, I
16 think, the majority of the stocks. Twelve of 16,
17 thanks, Dave.

18 And so, as I say, this is a preliminary
19 analysis, and I think a useful to do would be to
20 actually do the rigorous statistical analysis on
21 the stocks to determine whether you can
22 distinguish between a step-shift and a trend,
23 given the available data.

24 Q Does it matter much whether we call it a step-
25 shift or a trend?

26 DR. MCKINNELL: Absolutely. Because if you're looking
27 for a cause, if a case was a one-time -- if the
28 response was one-time change in mean productivity,
29 you might look for some very different cause of
30 that change than if you understood it as a general
31 declining trend.

32 Q Right. So in your way of thinking, then, going
33 back to 1992, you would look to see if there was
34 anything dramatic or anything new that was
35 happening at that time to determine why there was
36 this sudden shift?

37 DR. MCKINNELL: Well, that would be my initial
38 exploration.

39 Q Now, the other difference, Dr. Welch, I'm going to
40 flip back to you again, because you were the
41 reviewer, if we can now go to the next page, you
42 say, "Does not identify" -- the one on the left is
43 the PICES report:

44
45 Does not identify Strait of Georgia as the
46 likely geographic site of the productivity
47 problem, and identifies strong correlations

1 with anomalous events in Queen Charlotte
2 Strait (at least for the 2007 out-migration
3 year).
4

5 And then, based upon your -- I believe you were
6 also a reviewer of the Peterman report, were you
7 not, Dr. Welch?

8 DR. WELCH: Yes, I was.

9 Q All right. So then you say, "Ditto," so I take
10 it, by "Ditto," it means that Dr. Peterman also
11 does not identify the Strait of Georgia as the
12 likely geographic site --

13 DR. WELCH: Correct.

14 Q -- of the productivity problem?

15 DR. WELCH: Correct.

16 Q But he goes on to implicate a foreign effect as
17 far north as Southeast Alaska, because he was, as
18 I recollect his report, which seems like eons ago
19 when we actually looked at it, was he looked at
20 the various stocks all the way from Puget Sound
21 and Lake Washington, all the way north up to
22 Bristol Bay; is that right?

23 DR. WELCH: I forget if Bristol Bay was in it, but yes,
24 he looked over a very broad range.

25 Q All right. And he suggested that the problem, "is
26 not confined to Queen Charlotte Sound," but he
27 does not identify a particular cause or issue for
28 the poor 2007 outbound smolt survival?

29 DR. WELCH: Yes, except the wording, "not confined to
30 Queen Charlotte Sound," is my own interpretation
31 of his results. He's identifying some impacts on
32 survival all the way up to sockeye stocks in
33 Southeast Alaska, which was an important finding.

34 Q All right. And would you agree, Dr. McKinnell,
35 that you can't really identify a particular cause
36 or an issue for the poor 2007 decline, can you?

37 DR. MCKINNELL: If you're saying that we have the data
38 to conclude the cause --

39 Q Yes.

40 DR. MCKINNELL: -- I will agree with you.

41 Q And we may never know? We may never know what
42 caused the 2009 decline, the returning decline?

43 DR. MCKINNELL: I think that's a reasonable comment.

44 Q And Dr. Welch, would you agree with me?

45 DR. WELCH: Well, hopefully somebody brighter than us
46 in the next 25 years will answer that question
47 definitively and it will be accepted as that by

1 the scientific community, at least, but I wouldn't
2 categorically rule it out, but certainly at the
3 current time there are multiple explanations still
4 on the table.

5 Q Right. And I've sat through many days of
6 testimony and heard many scientists such as
7 yourself, who have preceded you to the panel, talk
8 about various aspects, various contributory
9 factors and, you know, whether it was
10 contaminants, whether it was something else, there
11 seems to be an array of things that could have
12 caused or could have acted in unison to actually
13 achieve the result of a disastrous return in 2009;
14 is that fair to say?

15 DR. MCKINNELL: To me?

16 Q Yes.

17 DR. MCKINNELL: Yes.

18 Q Dr. Welch, do you agree with that?

19 DR. WELCH: Yes, and the purpose is -- of science and
20 of the inquiry, I think, is to winnow down what
21 are the possibilities.

22 Q Right. And turning, now, to you, Dr. Beamish, I
23 didn't mean to leave you out of the equation.

24 DR. BEAMISH: I appreciate it.

25 Q And I was going to get to you.

26 DR. BEAMISH: Okay.

27 Q Essentially, you take a different view, as I
28 understand it. You say, "Yes, you can, Mr.
29 Commissioner, find a cause for the decline of the
30 2009 return, and that cause is the poor production
31 in the Strait of Georgia when the smolts out-
32 migrated from the Fraser River and they
33 encountered no food"?

34 DR. BEAMISH: Yes, I'll just take a minute just to
35 comment on that just a bit. I agree with you, but
36 I have to qualify just a bit. We don't know for
37 sure whether it was a problem. We did not measure
38 the food. What we do identify in the papers that
39 we submitted was the physical anomalies, which we
40 consider to be very clear and extreme, all right?
41 Unique, almost. And we identify those as most
42 likely contributing to a reduction in prey or
43 food, and then we identify a response, and as I've
44 said, I have never seen anything so clear in all
45 of my career as -- well, that's not quite true.
46 It's one of the things that I've seen that is very
47 clear. And that we saw this synchronous response

1 by all of the fish in the Strait of Georgia that
2 were feeding in the surface waters in the spring
3 of 2007, so I respectfully do not agree with my
4 colleagues. I think that this is a very clear
5 explanation.

6 Q All right. You say that it's likely that due to
7 your observations in the Strait of Georgia for the
8 out-migration of smolt in 2007, and the
9 conditions, the physical conditions, the
10 oceanographic conditions, that those did, in fact
11 cause, or likely caused the decline; that's what
12 you say, unequivocally?

13 DR. BEAMISH: Yeah, contributed. You know, we do also
14 say that the conditions that the fish, after
15 experiencing the poor conditions in the Strait of
16 Georgia, the conditions in the Queen Charlotte
17 Sound and then through into the Gulf of Alaska,
18 would exacerbate what they experienced in the
19 Strait of Georgia.

20 Q So are you saying that it's a contributory factor,
21 or are you saying it is the cause? I want to nail
22 you down on this.

23 DR. BEAMISH: Between those two?

24 Q Yes.

25 DR. BEAMISH: Of course, it's both, but if you only
26 give me two choices, which I would be
27 uncomfortable with, to be honest with you, I would
28 say, because it's a combination, that -- and I'm
29 sorry I can't give you -- I'll answer your
30 question in a minute, but had they experienced
31 very good conditions, say in the Gulf of Alaska or
32 in the first winter, then the conditions in the
33 Strait of Georgia would not have been so severe.
34 So if you only give me two choices, I'd say the
35 cause.

36 Q So you say the cause, rather than --

37 DR. BEAMISH: If you only give me two choices, yes.

38 Q Well, I'm a lawyer, and I get to do that.

39 DR. BEAMISH: That's okay, and I'm a biologist.

40 Q Okay. So I want to now take you -- and you
41 predicate that on a lack of zooplankton data;
42 correct?

43 DR. BEAMISH: Again, you'll have to just give me a
44 little more information about that. What do you
45 mean, "predicate that"?

46 Q Well, if you're going to postulate and form a
47 hypothesis that the salmon, specifically the

1 Fraser River sockeye salmon, are basically not
2 getting enough food in there stomach, then it
3 would be nice to have data that substantiates the
4 zooplankton, what they're normally expected to
5 eat; is that right?

6 DR. BEAMISH: Yeah, that's why I use the term "prey,"
7 but in terms of phrasing the question "as
8 predicated," it's predicated on the synchronous
9 response of all the species. And then it's the
10 inference, if you want, that that synchronous
11 response was a result of a disruption or a -- I'll
12 categorize it as a failure of the prey production
13 during that period.

14 Q Right. And yet there's no zooplankton data
15 available for you to draw that conclusion from?

16 DR. BEAMISH: That's true and, you know, there's been
17 some question about that, but I think that that is
18 true.

19 Q All right. If I could have Conservation document
20 number 7, please? Conservation Coalition
21 document. It's an e-mail exchange. Now,
22 obviously, you did not write this, Dr. Beamish,
23 but I'm hoping it was one of the documents that
24 you may have reviewed prior to coming here. Do
25 you recall reviewing this particular document?
26 It's from Marc Trudel. He's one of your
27 colleagues in DFO, is he not?

28 DR. BEAMISH: Yeah, I probably did read this. Just
29 let me take a quick look at it to make sure I --
30 yes, I think I -- yeah, I remember that.

31 Q Okay.

32 DR. BEAMISH: But it's written January the 29th, right,
33 2010?

34 Q Yes.

35 DR. BEAMISH: Yeah.

36 Q You may not have been back to work by then?

37 DR. BEAMISH: I was out of my coma.

38 MR. LEADEM: Could we have that marked as the next
39 exhibit, please?

40 THE REGISTRAR: 1338.

41
42 EXHIBIT 1338: E-mail dated January 29, 2010,
43 from Marc Trudel to Dave Mackas, Subject:
44 Plankton in the Strait of Georgia
45

46 MR. LEADEM: Now, could we have Conservation Coalition
47 document number 10, please.

1 Q This is an e-mail exchange and, once again, you
2 may not have been privy to this at the time. The
3 main head of the e-mail is from an Ian Perry to a
4 Mr. Robin Brown and to Mr. Mark Saunders.

5 DR. BEAMISH: Yeah.

6 Q Those are colleagues of yours within DFO, are they
7 not?

8 DR. BEAMISH: Yes.

9 Q And that was written on May 19th, 2010, and it's
10 title is, Status of Strait of Georgia zooplankton
11 samples and plans for Beamish samples. And if you
12 scroll through, it's quite a little bit of a
13 lengthy one. If you go to the next page. And
14 there's another e-mail attached there from Dave
15 Mackas. Do you see that one, sent May 19th, 2010,
16 to Mr. Robin Brown and Moira Galbraith?

17 DR. BEAMISH: Well, it's in front of me, yes.

18 Q Okay. And there's a reference to:

19

20 The Strait of Georgia samples we have in the
21 IOS database are summarized in a powerpoint.

22

23 And then the next paragraph says:

24

25 2007 was unfortunately a minimum in DFO and
26 university sampling effort.

27

28 My understanding is that the University of BC was
29 doing a study and that had stopped by that time;
30 is that right?

31 DR. BEAMISH: There's a little bit of plankton data,
32 but there is so little that I think most of us,
33 you know, look at it -- I mean, plankton data,
34 even when you have extensive data, is not always
35 easy to interpret. So there is a little bit of
36 data, yes.

37 Q All right.

38 DR. BEAMISH: Or are a little bit of data, excuse me.
39 I'm also an editor, so I should be careful about
40 my verbs.

41 MR. LEADEM: Okay. Next exhibit, please.

42 THE REGISTRAR: 1339.

43

44

45

46

47

1 EXHIBIT 1339: E-mail dated May 19, 2010,
2 from Ian Perry to Robin Brown and Mark
3 Saunders, Subject: Status of Str of Georgia
4 zooplankton samples and plans for Beamish
5 samples
6

7 MR. LEADEM:

8 Q Now, I want to turn, and I want to do this to be
9 fair to you, Dr. Beamish, because Dr. Dill is
10 going to come and give evidence at these
11 proceedings because of a report that he prepared
12 with respect to aquaculture, and that's coming up.
13 And I want to refer you to one of your
14 publications. It's a publication, Conservation
15 Coalition document number 3, please. It's a
16 document entitled, A proposed Life history
17 strategy for the salmon louse, *Lepeophtheirus*
18 *salmonis* in the subarctic Pacific, and you were
19 the lead author on this publication, were you not?

20 DR. BEAMISH: Yes.

21 MR. LEADEM: Next exhibit, please.

22 THE REGISTRAR: 1340.
23

24 EXHIBIT 1340: *ScienceDirect*, Aquaculture, A
25 proposed Life history strategy for the salmon
26 louse, *Lepeophtheirus salmonis* in the
27 subarctic Pacific, by RJ Beamish, et al, 2006
28

29 MR. LEADEM:

30 Q And this particular paper was the subject of a
31 commentary by Dr. Dill in that same journal, and
32 if I could just ask Mr. Lunn to pull up Coalition
33 Counsel document number 4, I think should be it.
34 There it is. It's a Comment on Beamish, et al
35 (2007), "A proposed Life history strategy for the
36 salmon louse, written by Dr. Dill, amongst others.

37 Were you familiar with the fact that Dr. Dill
38 wrote this commentary, Dr. Beamish?

39 DR. BEAMISH: Yes. It does require a little bit of
40 explanation. Maybe people aren't -- probably
41 wouldn't be ware that, first of all, everyone, I
42 think, is aware that these are -- this issue is a
43 very controversial issue, and the paper that I
44 wrote, the first paper that you exhibited, it
45 requires just a little bit of explanation, because
46 it's important in responding to your comment about
47 Dr. Dill's comment.

1 Q Yes?

2 DR. BEAMISH: And, you know, as we speak here, there
3 are literally millions of pink and sockeye headed
4 towards the Fraser River, you know, coming down
5 the coast, and they're loaded with sea lice. Now,
6 that's an exaggeration, but they are. And a lot
7 of those sea lice are mature, in other words, they
8 are going to release eggs. And our life history
9 strategy was an argument, all animals and plants,
10 all animals evolve to optimize or maximize their
11 reproductive ability.

12 My life history strategy paper, our life
13 history strategy paper, proposed that the reason
14 that the salmon carried large abundances of mature
15 sea lice into the coastal area, because when they
16 eventually go into freshwater the sea lice will
17 die, that the reason for that life history
18 strategy, to bring them back into the coastal
19 area, is that they overlap with the juveniles that
20 are migrating out. And we had evidence for that,
21 and we provided that. And that was how we -- that
22 was one of the mechanisms that we argued that this
23 extremely successful sea lice species is able to
24 maintain its populations, is it has the strategy
25 of bringing -- or of reproducing at the time that
26 juveniles are migrating out.

27 Now, Dr. Dill disagreed with me. It's not
28 uncommon, particularly with the aquaculture and
29 the fish farm -- or the sea lice issue, for people
30 to disagree with each other.

31 The normal way of doing that is to write a
32 rebuttal, and I've written some. And when you
33 write a rebuttal to a journal, the journal, then,
34 if they think there's something in that rebuttal,
35 will then send the rebuttal to the author and the
36 author gets a chance to rebut the rebuttal, and
37 they're all published, so that scientists can make
38 up their own minds.

39 When you write a comment, a comment isn't
40 sent to the author, so the comment appears as you
41 see it. And, in a sense, this is a little bit
42 like a movie critic, okay? So it's legitimate,
43 and the issues are Dr. Dill's opinion, but it was
44 not presented in a way that allowed me to write a
45 rebuttal for it. We have a book coming out, Simon
46 Jones and I, along with other authors, and we have
47 a chapter in that book - the book will be out any

1 day, now - on sea lice, and we then respond a
2 little bit to Dr. Dill's comment in the chapter --
3 in the book that will be out any day now.
4 Q My understanding is that Dr. Simon Jones will be
5 actually coming to testify, so I look forward
6 to --
7 DR. BEAMISH: Yes.
8 Q -- asking him some of these questions.
9 MR. LEADEM: Could I have these, both of these, the
10 original paper by Dr. Beamish, et al, marked as an
11 exhibit, as well as this comment from Dr. Dill --
12 THE COMMISSIONER: I'm sorry, Exhibit 1340 was the
13 article; is that correct?
14 MR. LEADEM: Has it been marked? I'm sorry.
15 MR. LUNN: Tab 3 on the screen is 1340.
16 MR. LEADEM: All right. So this next one needs to be
17 marked, then.
18 THE COMMISSIONER: Thank you.
19 THE REGISTRAR: Exhibit 1341.
20
21 EXHIBIT 1341: *ScienceDirect*, Aquaculture,
22 Comment on Beamish, et al (2007), "A proposed
23 Life history strategy for the salmon louse,
24 *Lepeophtheirus salmonis* in the subarctic
25 Pacific", by LM Dill, et al, 2008
26
27 MR. LEADEM:
28 Q Now, in addition to the debate that was going on
29 between various people, there was also some debate
30 that was going on internally with DFO around the
31 sea lice issue; is that fair to say as well, Dr.
32 Beamish?
33 DR. BEAMISH: Probably, yes.
34 MR. LEADEM: All right. And if I could just ask that
35 Conservation Coalition document, I think it's
36 number 1, be pulled up.
37 Q Now, in preparation before you came here, today,
38 did you have a chance to review this note from
39 Brad Hargreaves?
40 DR. BEAMISH: Well, this was shown to me, and I did
41 take a -- I had never seen this. This is
42 something that was written in November 2003, and I
43 read a few of these things, and I decided it was
44 not heart-smart to spend too much time on this.
45 Q All right.
46 DR. BEAMISH: All right?
47 Q Well, I'm not going to spend a whole lot of time

1 on it, but I am going to suggest to you that you
2 did attend a meeting on November 20th, 2003, with
3 the Province and industry on -- to share
4 preliminary information on sea lice issues; is
5 that right?
6 DR. BEAMISH: Most likely.
7 Q And in the -- I'm still reading from the first
8 paragraph, and at this meeting you announce that
9 Dr. Laura Richards, Regional Director, had
10 recently instructed him to fully integrate his
11 research on sea lice into the broader DFO Pink
12 Salmon Action Plan, PSAP program. So that part is
13 true as well, right?
14 DR. BEAMISH: Well, I, you know, there's no indication
15 of where this came -- it was sent to or anyone.
16 It's just some text. So I have no idea what this
17 is.
18 Q All right.
19 DR. BEAMISH: It's not sent to anyone. There's no date
20 on it. It's nothing. I mean, where did this come
21 from?
22 Q Well, I don't know where it came from, other than
23 the fact that it appeared in ringtail, and so it's
24 not my document, it's not --
25 DR. BEAMISH: That's my point, is that there's just
26 absolutely nothing on here that indicates what
27 this document is all about. It's just some text.
28 MR. LEADEM: Well, it's a document, on its face, Mr.
29 Commissioner, purports to be from Brent
30 Hargreaves, and let me get this fact established:
31 DR. BEAMISH: Brent Hargreaves is a colleague of yours
32 at DFO? He's a fellow DFO scientists, is he not?
33 DR. BEAMISH: Well, I'm not in DFO anymore, but he was
34 when I was there, yes.
35 MR. LEADEM: Yes. I'm going to seek to tender this as
36 an exhibit, based on the fact that it is a
37 ringtail document, it is from Brent Hargreaves, it
38 does make some comments about Dr. Beamish, and I'm
39 going to ask Dr. Beamish if he wants to respond to
40 them, generally, in a moment, and if he declines
41 to do so, then I'll take that as his answer.
42 Q So I assume that you've had an opportunity to read
43 this, from Mr. Hargreaves; is that right?
44 DR. BEAMISH: No, I told you that I looked at it, at
45 first, and I started reading it, and I, you know,
46 unfortunately, things like this, I don't know, I
47 mean, it's too bad that people write this kind of

1 stuff, but obviously he felt -- and again, I don't
2 know what kind of a document it is.

3 Q All right. So you never read it through?

4 DR. BEAMISH: No, I didn't read it through. I told you
5 that I felt that -- I think I said to you I don't
6 think this was a heart-smart thing to do.

7 Q All right. I understand where you're coming from,
8 in that sense. So, in effect, you're declining to
9 respond to it because you're suggesting to me that
10 you did not read it through and --

11 DR. BEAMISH: That's true, yeah.

12 Q All right.

13 THE COMMISSIONER: You haven't marked it, yet, Mr.

14 Leadem, I don't think.

15 MR. LEADEM: Sorry?

16 THE COMMISSIONER: I don't think it's been marked yet.

17 MR. LEADEM: All right. Can we mark that as the next
18 exhibit, then, please. Thank you.

19 THE REGISTRAR: 1342.

20

21 EXHIBIT 1342: Document purporting to be Memo
22 from Brent Hargreaves to Laura, re - Beamish
23 integration into sea lice
24

25

26 MR. LEADEM: Now, I've been advised that my time is up,
27 it's 11:05, and I think we're approaching the
28 magic hour. Those are my questions, Mr.
29 Commissioner.

30

31 QUESTIONS BY THE COMMISSIONER:

32

33 Q Just before you sit down, Mr. Leadem, I just
34 wanted to follow up on, just for my understanding,
35 you had put questions to the panel about step-
36 shift and trending, and I just want to make sure I
37 understood the distinction. And I also wanted to
38 just - I can't use the verbatim, obviously - but
39 my recollection is other DFO witnesses talked
40 about 2009 results as being off the chart. I
41 don't know if they used that term, but I think the
42 evidence was that it was a very extreme result in
43 terms of low abundance. And I just wanted to know
44 if the panel could help me in terms of that
45 context, in other words, step-shift, trending, and
46 then 2009 was, using a DFO witness's terminology,
47 an extreme, in terms of the length of time that
DFO had kept records about these things, that was

1 very extreme year.

2 So extreme, step-shift, trending, what is --
3 and I guess the other thing I would like to ask
4 them, coming out of your questions, was where you
5 have, and you each expressed your views about the
6 different interpretation you've placed on data
7 that has been collected, as between scientists,
8 what is the common ground position on the standard
9 of proof that you would accepting terms of
10 arriving at a conclusion based upon your divergent
11 interpretations data, or is there common ground,
12 that you have more than one standard that you
13 would be looking to, to measure these different
14 interpretations?

15 So first of all, the terminology you've used,
16 and its context, and secondly, where you have a
17 divergence of views in terms of your
18 interpretation, is there common ground, in the
19 biology community, around a standard that you'd be
20 looking to, to help others who are not scientists,
21 understand why you've arrived at a particular
22 conclusion?

23 And I may not have articulated that very
24 well, and if I haven't, I apologize. You can
25 rephrase my question more suitably, if you think
26 you could answer it in a way that would make sense
27 to non-scientists?

28 DR. BEAMISH: Well, maybe we'll all have a shot at
29 trying to answer that.

30 THE COMMISSIONER: Great.

31 DR. BEAMISH: I interpret the question to mean that
32 there was an extreme event in terms of poor return
33 of sockeye in 2009. I'll forget the 2010. And so
34 can the scientific community come together and say
35 that if we had this optimal situation, in terms of
36 we had all of the data that we would like to have,
37 could we come to a consensus and determine -- and
38 come to a conclusion that this was the explanation
39 for the poor return? And my answer to that is,
40 yes, we could do that.

41 Now, knowing my community, we would disagree
42 on a number of things, but if we had the kind of
43 data that we would like, we would be able to come
44 to a conclusion.

45 I think that the workshop that we had,
46 sponsored by the Salmon Commission, was a very
47 good attempt at bringing this community together

1 with imperfect data, and I think that's what
2 you've heard from the three of us, that we have
3 imperfect data, which is why the three of us,
4 which we are friends, even though we disagree,
5 that's why we can't come to a complete agreement
6 on things.

7 The material that we need to come to a better
8 agreement, I think you've heard from us. We
9 haven't heard -- we haven't come to agreement
10 completely on what research is needed, but in my
11 opinion, some simple things, you know, good
12 monitoring, which we have, good monitoring of the
13 juvenile sockeye out of the Fraser, and a good
14 plankton survey in the Strait of Georgia, and
15 good, physical measurements.

16 Now, there are other things that would be
17 nice to know; what happens to stocks as they move
18 up through the -- up into the Gulf of Alaska.
19 Once we have that information, we don't
20 necessarily have to repeat it. Those are smaller
21 pieces of the puzzle that would make it clearer,
22 but there are some fundamental things that are
23 missing that make it a little difficult for the
24 scientific community to come to a consensus, but I
25 think that even though there is some disagreement
26 about that June workshop, that was a good group of
27 scientists that took the issues seriously, using
28 the skills that they had developed throughout
29 their career and the existing data to come to a
30 conclusion.

31 Q Dr. Welch?

32 DR. WELCH: Commissioner Cohen, I'll break my comments
33 into two parts. First, the terminological issue,
34 the issue of whether it's a step-function or a
35 gradual trend to lower survival is important. And
36 here I'm referring to the question of whether
37 there's a step-function change in survival, marine
38 survival, which is a change in the average value
39 of the survival with some variability around it
40 between two periods, which is what we call a step-
41 function or sometimes a regime shift, or a trend
42 to increasingly worse survival over time.

43 Now, that may have still had a regime shift
44 at approximately 1990. That's important,
45 scientifically, because we have two reports in
46 front of you from Dr. Peterman and Dorner, and Dr.
47 McKinnell's group that suggest slightly different

1 things. And based on which of those
2 interpretations of when that change in marine
3 survival happened, whether it was around 1995 or
4 1992, and the nature of the change after that,
5 whether it's just a change in average value or a
6 trend down, is very important, because it allows
7 the scientist to then go back and start hunting
8 for what the problem is.

9 If you think it's just a change in mean
10 value, then you'd say, "Okay, the ecosystem has
11 suddenly changed from a blue state to a red
12 state," and you would categorize those types of
13 changes to identify the suite of things that were
14 associated with the change. If it's a persistent
15 change to lower and lower survival over time, you
16 would look for increasing changes in environmental
17 conditions after the change occurred.

18 So that's an important piece for the
19 scientific community that your Commission will
20 bring out, in that we have two reports that
21 identify a much more broad, geographically-
22 widespread change in time, but we still have some
23 work to do refine some of those details. So
24 that's important for the detectives that are going
25 to go out, now, to look at back in the data to try
26 to better quantify what's going on.

27 That's my preamble to the more philosophical
28 question of what's the sufficient scientific
29 standard. The philosophical answer, in my view,
30 is that we cannot answer these questions. My
31 friend and esteemed colleague to my left -- to my
32 right, has just said, "Yes, we can," and I
33 fundamentally disagree, and I'll articulate that
34 why.

35 The gold standard in science is what's called
36 an experiment, and ideally, in fact, what's called
37 the doubly-blinded experiment, where experimental
38 conditions are changed, one group of patients
39 would be given a blue pill and another group of
40 patients would be given a white pill, but the
41 investigator wouldn't know which pill was a
42 placebo and which was the real drug that was being
43 tested for an effect.

44 That is a very hard standard to reach in
45 marine science. I do think we need to get there.
46 The reason is simply because we get into what's
47 called "observer bias", which is widespread. It's

1 recognized throughout science, that we're humans.
2 And you can see this in terms of the data you've
3 seen presented in the discussion over the last two
4 and a half days. Dr. Beamish has a set of data
5 that he has chosen certain things that he has
6 focused on as he thinks important, such as the
7 difference in size. My colleague, Dr. McKinnell,
8 pointed out in Exhibit 1303, Table 2, that the
9 weight was higher in 2007, for the animals he
10 caught, even though their length was a little
11 lower. That's not necessarily consistent with a
12 feeding response, that they would be fatter.

13 So these are interpretational difficulties.
14 They afflict all of us. And the fundamental issue
15 here is that we have too much data that varies in
16 random ways, and we're looking for patterns. But
17 good investigators, scientific or otherwise, can
18 make multiple patterns out of that data, and the
19 real issue to move beyond that, and I fervently
20 believe this, we have to get to a system where we
21 can do experiments, because in experimental
22 science, when physics change to an experimental
23 science in the 17th Century and chemistry in the
24 18th Century, they made vast strides.

25 We need to get past the natural history
26 observations that we have, simply because we're
27 too slow, as a scientific community, to provide
28 those answers that you're looking for, and it
29 takes a very long time to correct the record. If
30 we make mistakes, it may take decades for views to
31 change. If we can test theories, such as Dr.
32 Beamish's or others, then we can make much more
33 rapid progress than we do right now. It's
34 possible to do that, technically, but it has not
35 been the case in the past.

36 THE COMMISSIONER: Thank you. Dr. McKinnell?

37 DR. MCKINNEL: I'll try and make this brief. I think
38 Dr. Welch has covered the main points, and Dr.
39 Beamish has his views.

40 You know, I like to say, lacking adequate
41 data, imagination is not overly constrained. And
42 as we have said in the PICES report, the
43 observation system that's in place, in our view,
44 was not set up to answer the kinds of questions
45 that are being posed by the Cohen Commission.

46 We also point out that the biggest extreme in
47 2009, was its deviation from the pre-season

1 forecast. We point out in the report that using
2 the data from the Salmon Commission that, in fact,
3 the recruits per spawner, which is kind of a
4 measure of productivity, the median value was
5 lowest for the 2005 brood year, i.e. the 2009 --
6 sorry, the 2003 brood year, the 2007 return. But
7 there is considerable variability in these data,
8 for certain.

9 Dr. Beamish pointed out that the PSC report
10 did a good job, but at the time they hadn't even
11 considered all of the factors that we described
12 for Queen Charlotte Sound. Those were only found
13 as a consequence of the PICES report, and then
14 they came to bear and have a larger role to play.

15 So what the Commission has had to suffer is
16 observing this inner workings of the scientific
17 process, and we apologize for having it bared so
18 openly, but this is an evolution of thrust and
19 parry, and eventually we hope that some good
20 solution will come about.

21 Have we answered your main concerns?

22 THE COMMISSIONER: Yes, for my purposes, but I wanted
23 to give Mr. Leadem an opportunity, if he has
24 something to follow up on.

25 MR. LEADEM: Just a brief follow-up, if I may, Mr.
26 Commissioner.

27
28 CROSS-EXAMINATION BY MR. LEADEM, continuing:
29

30 Q And I was -- one of your remarks hit home to me,
31 which was that there was an expectation generated,
32 because of the forecasting, that the 2009 return
33 would be larger than what, in fact, transpired.
34 And that, in effect, gave rise to this Commission,
35 because the Commission has been called in to
36 investigate that phenomenon. So if we can reduce
37 it to simply a question of, are our forecasts
38 accurate enough? The answer is obviously, "No."
39 And that's an easily answerable question; do you
40 agree with that?

41 DR. MCKINNELL: The Department relies on only one
42 forecast, the Department's forecast, and doesn't
43 yet have a system to entertain forecasts prepared
44 by others.

45 Q Right. Is PICES offering?

46 DR. MCKINNELL: We are in the business of providing

1 advice.

2 MR. LEADEM: All right. Thank you, Mr. Commissioner.

3 THE COMMISSIONER: Thank you, Mr. Leadem. And I'm
4 sure, like all of you, I'm probably in Ms. Baker's
5 bad books right now for having taken her off
6 track. So maybe I can offer this apology as well
7 as suggesting we take a 10-minute break instead of
8 the 15-minute break, and if I've taken up other
9 people's times, if we could, say, stretch out the
10 lunch break to come back at quarter to 2:00
11 instead of two o'clock, if that would assist, I'd
12 be grateful, and I apologize to counsel.

13 THE REGISTRAR: The hearing will take a 10-minute
14 recess.

15
16 (PROCEEDINGS ADJOURNED FOR MORNING RECESS)
17 (PROCEEDINGS RECONVENED)

18
19 THE REGISTRAR: The hearing is now resumed.

20
21 CROSS-EXAMINATION BY MS. GAERTNER:

22
23 MS. GAERTNER: Good morning, Mr. Commissioner. Brenda
24 Gaertner and with me Crystal Reeves for the First
25 Nations Coalition and I appreciate the opportunity
26 to ask questions of the three panellists, these
27 esteemed scientists, but I just wanted to let you
28 know that from the First Nations Coalition's
29 perspective and the organizations that we
30 represent, we're happy to understand what science
31 has to offer, but we don't expect science to have
32 all of the answers. We don't have that
33 requirement of you. And, in fact, what you do is
34 you offer things to the table amongst those that
35 have other things to offer.

36 And the other thing I wanted to state, just
37 so you get a perspective of where we're coming,
38 we're not -- and the Commissioner has heard from
39 First Nations talk about this, representatives
40 here, this is a wild stock. It operates in the
41 wild. We don't manage that stock. We actually
42 manage people's response to that stock. So my
43 questions are going to come from that perspective
44 and not require that science know that stock and
45 experiment with that stock such that we're into
46 managing some -- or changing a wild stock into
47 some kind of domesticated stock.

1 And so I've got -- what I'd like to do,
2 Commissioner, I think I'm going to take about 40
3 minutes of time and I'll adjust my afternoon time
4 accordingly. It may -- and if I take 45, I'll
5 adjust my afternoon time accordingly. I'll do all
6 of that. And what I'd like to do is just at the
7 beginning, clear up a couple of things,
8 particularly from the discussion that just
9 occurred before the break and a couple of details
10 and then I want to take off from where we can go
11 with some of this and what are some of the routes
12 into understanding this a little bit better.

13 Q First of all, I'd like to just pick up on this
14 discussion of trends versus steps and I
15 appreciated the evidence this morning. I had a
16 number of questions around that that I don't have
17 to ask now, which is great, but what I did want to
18 ask you, Dr. Welch, you picked up this issue right
19 in your review of the PICES report and I was
20 grateful for that and you suggested a workshop
21 format to respond to that and I'm just trying to
22 get a sense, is this a lot of discussion between
23 Dr. Peterman and PICES or do we have to do a lot
24 of analysis to understand this a bit better or
25 what kind of work is involved? Can we get that
26 work done in a timely manner so that this can be
27 considered by Commissioner Cohen as he's
28 continuing his work, or what have we got ahead of
29 us to try to solve that distinction?

30 DR. WELCH: Well, I won't speak obviously for the
31 commission. I would guess that it would probably
32 take two or three days of each of the authors of
33 thinking ahead of time, certainly a couple of days
34 at a workshop with some other people that weren't
35 directly involved in the work so that, you know,
36 the narrow focus of each of the authors isn't just
37 there, that people can ask some broader questions.
38 But it's a case of taking the same data and then
39 saying what if we did this instead and then
40 because the two analyses are giving some important
41 but somewhat subtle differences and it would be
42 very interesting to put those together and try to
43 answer those questions. So probably a two- to
44 three-day workshop with scientists beyond just the
45 two groups that develop those reports would do it,
46 so long as the data was ready to go at that time.

47 MS. GAERTNER: So, Mr. Commissioner, I'll leave that

1 for your thinking and also for commission staff to
2 consider that, given the import of these two
3 reports on the marine conditions and what we're
4 looking at more broadly in this inquiry, but it
5 would seem to me anyway that it might be useful to
6 get that work done sooner rather than later.

7 Q And then I wanted to take you, Dr. Welch, again to
8 Tab 2 of my documents, or First Nations Coalition
9 documents. This is an email exchange between
10 yourself and Robin Brown. Do you recall that
11 email exchange?

12 DR. WELCH: Yes, I do.

13 Q And this is particularly on the issue of sockeye
14 mortality in the Strait of Georgia versus
15 mortality outside of the Strait of Georgia and
16 we've heard a number of -- we've heard quite a bit
17 about this issue already. But I want to take you
18 to your comments in this email, 'cause it
19 definitely brought some concerns to my clients.
20 At the bottom of the page, beginning with:

21
22 I suspect that there may be some internal
23 politics afoot to have mainly the
24 departmental staff --
25

26 And I take it you're meaning DFO staff there.

27
28 -- speak on the sockeye issue so that DFO can
29 be seen to be the lead organization, the
30 source of most of the credible information.
31 But it would be a tragedy if this morphed
32 into the department trying to focus on the
33 Strait of Georgia because (a) they have a
34 better handle on how to study it (and can
35 argue for more funding to do what they are
36 already doing) and (b) because it puts the
37 sockeye mortality problem in the Strait of
38 Georgia BEFORE the smolts start migrating
39 past the salmon farms.
40

41 And as we know and we can see from these two days
42 of hearings and as we expect, there is a lot of
43 contention around the implications around
44 aquaculture on Fraser River sockeye.

45 So I'd like you to talk about your concerns
46 here, explain them to us, and what you meant and
47 then put them into the broader context of where

1 should we be looking at early smolt -- marine
2 impacts on early smolt migration and why it is
3 that you're suggesting it happen broader than the
4 Strait of Georgia?

5 DR. WELCH: Yeah. So the obvious point, I think,
6 that's clear is that I was concerned about the
7 view being myopic and too restrictive early in the
8 process. And the reason for that, taking it right
9 back out of this particular issue in front of the
10 commission but a common issue in fisheries is to
11 assume there's a critical period in a certain
12 period of the life history of fish. You will have
13 heard that term used. And then study that to
14 study the, quote/unquote "critical period".

15 In fact, the theory of critical periods for
16 fish has never been actually established as
17 correct. It's often used as a justification for
18 studying something and it's generally the thing
19 that's easy to do. The more expensive hard things
20 to do are essentially left off the table because
21 it's easy for the scientists to move forwards on a
22 piece of work if it's -- for example, in the
23 Strait of Georgia. That's easier than farther
24 away logistically and it's going to be less cost.

25 My concern about that, taking it right back
26 to the general scientific issue is that for a
27 hundred years we've done that on recruitment
28 issues in fish without being successful. And I've
29 said for most of my career that that probably
30 indicates that we're -- the critical period
31 theories aren't necessarily correct so we
32 shouldn't use them as a justification for
33 focusing. We should be testing whether those
34 assumptions of a critical period are, in fact,
35 there. And that's the general point that I'd
36 make.

37 MS. GAERTNER: Thank you. Could I have that marked as
38 the next exhibit?

39 THE REGISTRAR: 1343.

40
41 EXHIBIT 1343: Email correspondence between
42 David Welch, Robin Brown and others

43
44 MS. GAERTNER:

45 Q Now, Dr. Brian Riddell has given evidence, the
46 commissioner has hear him, and in particular in
47 February of this year he also was recommending

1 that we spend some time looking at the Strait of
2 Georgia but he did in his evidence acknowledge
3 that there are others that think that that might
4 be too limited in scope and he acknowledged that
5 he may be wrong on that. But what he did say was
6 that he was -- that he thought there was merit in
7 that kind of study because going to the ocean is
8 extremely -- going to the broader ocean is
9 extremely costly and it's more difficult and you
10 can recognize salmon, Fraser River sockeye, in the
11 Strait of Georgia as you -- whereas it's more
12 difficult to do that in the larger ocean. Do you
13 have any response to that, Dr. Welch?

14 DR. WELCH: Well, I would disagree with that, so first
15 off, there's an opportunity cost associated with
16 spending years studying something if it's not
17 necessarily the correct location for the primary
18 problem, so we -- I mean, the Strait of Georgia
19 has been studied for salmon issues now since the
20 1930s. We're doing a more extensive and more
21 sophisticated job now, but if it's not actually
22 where the problems occur for the, for example, for
23 the mandate of the Cohen Commission, you can do a
24 simple thought experiment and say well, how many
25 years would the Department of Fisheries, would all
26 of the scientists involved, study in the Strait of
27 Georgia before they would conclude that that is
28 not the source of the problem, if in fact it
29 wasn't in the Strait of Georgia? And I think the
30 answer is we would all be dead and gone long
31 before any of the scientists involved would be
32 able to see that.

33 And the reason is that they're too narrowly
34 focused, there are too many variables going on,
35 and there is not an ability to cut to the core
36 issue and say which of these variables affects
37 it? So you need to understand what survives to
38 leave the Strait of Georgia or survives to leave
39 the Queen Charlotte Strait or survives to reach,
40 say Southeast Alaska in order to bound that
41 problem and better focus the work.

42 Historically it was not possible to do those
43 types of tests. The reason that I left and
44 started the company that I did was I did think
45 that it was technologically possible to do this.
46 I think we've established that with the pilot
47 studies that have been done, but the other side of

1 it is people say well, it's very -- both from the
2 United States and Canada, it's very costly. And
3 the difficulty or the point to counter that is
4 that the opportunity costs of studying the wrong
5 problem for many years is an extremely expensive
6 issue for Canada, as well.

7 Q And this is an example, Dr. McKinnell, of making
8 sure that we ask the right questions and be clear
9 about the right questions; is that fair to say?

10 DR. McKINNEL: Yes, you want to ask the right --
11 exactly. I mean, this kind of supports that
12 point. You want to ask the right question and
13 have a mechanism whereby you can reasonably expect
14 to answer it.

15 Q Thank you. Just before we turn to -- looking
16 forward in our research again, Dr. McKinnell,
17 although we can't say the cause of the downturn is
18 either a step or a trend, is it fairly certain
19 that what we're talking about is the effects of
20 the marine environment when we're looking at the
21 trend versus the -- a trend versus a step?

22 DR. McKINNEL: It's the most likely cause.

23 Q Thank you. Now, I'm going to turn to the report
24 and in particular I'm going to go to hard copy
25 page 135 and in this PICES report, Dr. McKinnell,
26 you state that:

27
28 The greatest impediment to demonstrating
29 conclusively whether or not the mortality
30 experienced by the many Fraser River salmon
31 stocks that went to sea in 2000 occurred at
32 sea is the lack of adequate observation.
33

34 And further down in that report you say that:

35
36 The lack of observation of salmon at sea at
37 relevant times and space scales severely
38 limits the ability to draw firm conclusions
39 about their fate.
40

41 I can take you to the pages, but do you agree that
42 that's generally --

43 DR. McKINNEL: Sounds like what we wrote.

44 Q Okay. Thank you. Now, at page 173, and I do want
45 to go to their other --

46 MR. LUNN: Ms. Gaertner, I'm sorry to interrupt. Can
47 you give me exhibit number --

1 MS. GAERTNER: Oh, of the --

2 MR. LUNN: -- (indiscernible).

3 MS. GAERTNER: The project report is Exhibit --

4 MR. LUNN: Oh, thank you. The technical report?

5 MS. GAERTNER: Yes. Sorry. Thank you. I'm sorry. I
6 wasn't meaning to test you in any kind of way.

7 MR. LUNN: And what is the page number?

8 MS. GAERTNER: Page 173 hard copy.

9 Q Again, this was a -- oh, sorry, 173 of the actual
10 document. And I'll just go on. The report states
11 that:

12
13 The current observing system can detect
14 overall productivity changes in many
15 individual populations and on multiple time
16 scales, yet the observation system is not
17 designed to answer why salmon have survived
18 or died at greater than the average rates
19 because it was not designed to do this.

20
21 And Dr. McKinnell, that's, of course, a very broad
22 and important statement and I wondered if you
23 could help us understand that. How has it failed?
24 What do you mean? What do we need to do
25 differently?

26 DR. MCKINNELLS: Well, I think it relates to the point
27 that Dr. Welch just made about making sure that
28 when you're making your observations you allow --
29 you make the observations in a location that
30 allows you to rule out one region as a source of
31 the variation that you ultimately observe as the
32 -- in the returning adults.

33 Q Thank you. Now, I want to go to Tab 1 of our
34 documents which is the 2010 Canadian Marine
35 Ecosystem Status and Trends Report from Department
36 of Fisheries and Oceans. Dr. McKinnell, are you
37 familiar with that document?

38 DR. MCKINNELLS: I mean certainly I am aware of its
39 existence and have probably read parts of it.

40 Q Okay. And I want to go to page 33. In that
41 document there's -- Commissioner, this is a
42 document prepared by Fisheries in Canada about all
43 of Canada's marine environments and speaking to
44 general trends and observations around all of them
45 and at page 33 of that document we talk about
46 climate variability and oceanographic changes and
47 then coastal habitats and in particular they note

1 that:
2

3 Most marine ecosystem time series are
4 relatively short when compared to
5 meteorological forcing time series which are
6 typically long or longer.
7

8 Would you agree that this is a challenge when
9 projecting trends in the marine environment?

10 DR. MCKINNELL: Well, first I should correct myself.
11 I'm not familiar with this document. I thought
12 you were speaking of another one. But in -- but,
13 I mean, this is a true statement that time series
14 in the ocean are generally shorter than time
15 series on land.

16 Q And this is time series as it relates to --

17 DR. MCKINNELL: Of climate --

18 Q -- climate and as it relates to scientific
19 information, the gathering of scientific
20 information by scientists?

21 DR. MCKINNELL: That's probably true.

22 MS. GAERTNER: Okay. Could I have this marked as the
23 next exhibit?

24 THE REGISTRAR: 1344.
25

26 EXHIBIT 1344: 2010 Canadian Marine Ecosystem
27 Status and Trends Report
28

29 MS. GAERTNER:

30 Q Now, as you're familiar, many of my clients and in
31 this case I'm going to speak specifically about
32 the Haida Gwaii and I have of course, been -- have
33 a very long time series relationship to the ocean
34 and at Tab 14 and Tab 7 - and I'd like to bring
35 those up together, there is an example of some
36 work that Haida Gwaii are doing. Just maybe I'll
37 stop. PICES does actually provide advice to other
38 organizations in addition to governments,
39 including, for example, you've been working with
40 First Nations organizations like the Haida Gwaii?

41 DR. MCKINNELL: Not to my knowledge.

42 Q Oh well, that's the information that I have from
43 our clients. But that's okay.

44 Now, this report is a part of a larger marine
45 use planning initiative that the Haida Gwaii and
46 the Coastal First Nations and the Department of
47 Fisheries are doing. Tab 14 is a brochure about

1 the work that's being done and Tab 7 is the
2 accompanying map -- sorry. I did say that wrong.
3 Haida Gwaii is the territory, the Haida are the
4 people. I got that.

5 If you go to the last page on -- last page of
6 Tab 4 there's a discussion of the Haida marine
7 traditional knowledge study launched in 2007 to
8 research and document Haida knowledge about the
9 ocean and it says that 4,000 locations and 150
10 marine species have been recorded with some first-
11 hand observations dating back to the 1920s. And
12 then it talks about the accompanying map.

13 So now I'd like to take you to the map. And
14 if you just scroll down so that you get a sense of
15 the amount of detail that the Haida have been able
16 to, over the last while, map onto and into both
17 the marine and the terrestrial areas of their
18 territory, you can see -- and you can go through
19 it and take you down to the -- yes, let's just
20 keep going to get a sense of the kind of detail
21 that the Haida have been able to provide and if
22 you can go over to the left you'll get a sense of
23 the key. I don't know where the key is in that
24 big --

25 DR. MCKINNELL: Are the bluefin tuna on there?

26 Q It's to the left I think is the key. There it is.
27 You'll see that there's salmon, there's herring,
28 there's abalone, there's sea birds, there's clams,
29 there's fish and there's seaweed. There's a
30 number of different other species that have been
31 mapped throughout their territory.

32 Given the need for more data about the marine
33 environment in a longer time series, would you
34 agree with me that this type of mapping is useful
35 for scientists and this type of working closely
36 with First Nations such as the Haida, the Heiltsuk
37 and Vancouver Island First Nations is a useful way
38 of moving forward when it relates to observations
39 and monitoring of the marine environment?

40 DR. MCKINNELL: I mean, certainly it's part of even the
41 scientific process to understand the distribution
42 and ranges of species found in the area that
43 you're interested in.

44 MS. GAERTNER: Can I have this, both of these, marked
45 as the next exhibit?

46 MR. LUNN: Together?

47 MS. GAERTNER: Yes, I think it's useful to have them

1 marked together.
2 THE REGISTRAR: 1345.

3
4 EXHIBIT 1345: Ocean and Way of Life brochure
5 and map
6

7 MS. GAERTNER:

8 Q Now, in the same breath, Commissioner, you've
9 heard about PNCIMA in the earlier evidence and the
10 work that's being done more broadly, as mentioned
11 one of the things that's happening through PNCIMA
12 in the North Coast is marine use planning and I'd
13 like to go to Tabs 9 and 10. Are you familiar
14 with this work, Dr. McKinnell?

15 DR. MCKINNEL: No.

16 Q Dr. Welch, are you familiar with this work?

17 DR. WELCH: No, I'm not.

18 Q Dr. Beamish, are you familiar with this work?

19 DR. BEAMISH: Can you just go down to the bottom and
20 I'll see who wrote it?

21 Q So this is the Coastal First Nations Turning Point
22 Initiative on Marine Use Planning.

23 DR. BEAMISH: If I just knew the author, I could tell
24 you.

25 Q I don't think there'll be an author on this
26 document. This is the broad --

27 DR. BEAMISH: Then I'm not then. I am familiar with a
28 number of the -- some of the work that's being
29 done up there though.

30 Q I don't think it's contentious about this work.
31 I'd like to have this marked as an exhibit. Let's
32 go back to the question of how to move forward.
33 These types of observations, this type of
34 understand, I appreciate is not the kind of
35 scientific experimental work that you were talking
36 about earlier, but it provides a very, from our
37 client's perspective, a very useful way of
38 understanding the ocean and the ocean's
39 relationship to the land. And I heard Dr. Beamish
40 talking yesterday about the importance of every
41 observation you can make at sea. Will you agree
42 with me, as a panel, that collaboratively working
43 with First Nations using the type of mapping that
44 they're using will be a very useful way of not
45 only determining where it might be useful to do
46 tests, where it might be useful to do
47 observations, but how it is that we're going to

1 look at the implications of those tests and apply
2 them on the ground.
3 Dr. Welch, I'll start with you, since we've
4 just made eye contact.
5 DR. WELCH: I think the map is a very useful inventory
6 of what's present in Haida Gwaii. Where the
7 difficulty in melding the two groups or two
8 approaches comes from is that, for example, under
9 salmon in the key on the map, it indicates salmon
10 but it doesn't indicate which species. So one of
11 the challenges is how do we mesh the traditional
12 ecological knowledge of the First Nations with the
13 very precise data that scientists usually want to
14 work with. So one of our challenges is just to
15 work between two sets of people with different
16 focuses and bring those together.
17 Q Yes, and we're going to get to that in a little
18 bit, but I appreciate there's a different
19 approach, but that bringing them together will
20 provide a better information base; you'd agree
21 with that?
22 DR. WELCH: Yes.
23 Q Dr. McKinnell?
24 DR. MCKINNEL: I can see that there's a utility in
25 sharing knowledge and the reason I asked about the
26 bluefin tuna is because that was a traditional --
27 at least it's been found in middens on Haida
28 Gwaii. But I didn't see it anywhere on the map
29 and so because they're not currently found in that
30 part of the world. So I think there's an
31 opportunity for information exchange.
32 Q And Dr. Beamish, do you have anything to add on
33 that?
34 DR. BEAMISH: You see, I'm a biologist, right? These
35 guys are analysts beside me. I like the species
36 list, I like knowing where animals are and I like
37 having some estimate of how common they are. I
38 use that material and I think in my retirement I
39 think there's a new -- there could be a new
40 species of fish up in Haida Gwaii and I intend to
41 spend some time on it, so my long answer is I use
42 this information and I think it's valuable.
43 Q Thank you. Now, I'm going to go next to our --
44 MS. GAERTNER: Oh, I should mark these as exhibits.
45 THE COMMISSIONER: There were two tabs were there being
46 marked as one; is that...?
47 MS. GAERTNER: Yes, they can be marked as one.

1 THE REGISTRAR: That would be Exhibit 1346.

2
3 EXHIBIT 1346: CFN Into the Deep Blue Report
4 and CFN Sea of Change Report
5

6 MS. GAERTNER:

7 Q I'd like to go to Tab 12 of our documents. Now,
8 we were just talking about how to bring the
9 information together -- sorry, I'll just wait
10 until Tab 12 is there. Now, after reviewing your
11 report -- or the PICES report, Dr. McKinnell, Russ
12 Jones of the Haida Nation brought to our immediate
13 attention this study which is a study of the --
14 it's called the Bering Sea Integrated Ecosystem
15 Program and it's led by the Alaska Fisheries
16 Science which is a subset of NOAA, the National
17 Ocean and Atmospheric Administration. Are you
18 familiar with this study?

19 DR. MCKINNELL: I am.

20 Q And as I read this study and from our client's
21 perspective it reflects a comprehensive strategic
22 plan for conducting and compiling marine ecosystem
23 planning with appropriate oversight by those who
24 are agreeing on questions. They set hypotheses
25 out and then they begin to monitor and integrate
26 the information; is that a fair summary of what
27 they're trying to do here?

28 DR. MCKINNELL: Yes.

29 Q And in your view, would a model similar to this be
30 useful as we begin to approach more
31 comprehensively marine studies in British Columbia
32 along the Northwest Coast?

33 DR. MCKINNELL: That and the funding that went along
34 with this.

35 Q Yes. I appreciate that it is actually a costly
36 study and in the Bering Sea, given the approach of
37 it, and so priorities would have to be set as to
38 how we do that, but it actually provided a
39 comprehensive overview of how the research was
40 going to be done at the start, so instead of
41 saying okay, well, we can only afford this much,
42 let's do this, and we can only afford this much
43 let's do that. That's a bit of a piecemeal
44 approach to doing the work. This is an actual
45 comprehensive view in which people have come
46 together, agreed on the questions and agreed on
47 the approach and you would agree that that might

1 be a useful next step on our coast?

2 DR. MCKINNELL: Having reviewed the initial research
3 plan, I wouldn't characterize it as being so
4 altruistic but I think in the end you get
5 something that seems to have that property.

6 MS. GAERTNER: Excuse me for a moment.

7 Q Sure. And maybe just for our benefits here, if
8 you go to Figure I and the figure in the tables
9 which is at page 27 of this document, you'll see
10 that we've got a fairly complex -- well, we've got
11 five sort of hypotheses, we've got a number of
12 different observational pieces of work and then
13 the various different modelling and approaches
14 that would occur and that's the approach they've
15 used in doing that; is that correct?

16 DR. MCKINNELL: Yes.

17 MS. GAERTNER: All right. Can I have this marked as
18 the next exhibit?

19 THE REGISTRAR: 1347.

20
21 EXHIBIT 1347: Bering Sea Integrated
22 Ecosystem Program Overall Study Plan
23

24 MS. GAERTNER:

25 Q Now, in your view, Dr. Beamish, your counsel
26 through you yesterday put Exhibit 1319 together,
27 which is an article that you wrote with Brian
28 Riddell and I believe the article is fairly
29 recent. It was written in 2009 and at page 591 of
30 that article -- sorry, I don't have the ringtail
31 pages. You set out the scientific group that
32 would -- that you saw as the sort of way going
33 forward into looking at this, and when I reviewed
34 that last night, I was surprised to see that you
35 didn't have a place for First Nations at that
36 table; is that an oversight on your part?

37 DR. BEAMISH: Well, it's an interesting question. It
38 probably is an oversight, but in putting this
39 together this is a -- this is a board that would
40 comment on the key research that is needed and we
41 wanted to keep it small. And that is the issue.
42 It's not any intentional attempt to ignore anyone.
43 It's an attempt to keep it small. And that's why
44 that's -- that's where it is.

45 Would a First Nations representative --
46 should they be on that board? Well, Russ Jones is
47 a good friend of mine. I'd put Russ Jones on

1 there.

2 Q And you agree that if that was the board that was
3 setting the questions and setting the -- trying to
4 determine how to approach the research, given that
5 the outcomes of that research could strongly
6 affect First Nations, it might be useful to have
7 them right from the get-go?

8 DR. BEAMISH: Well, of course that makes sense, but you
9 also -- you also have to have something that's
10 small and that's always difficult because people
11 don't like to be left out when you're making
12 important decisions. But I understand your point
13 and it's a good point and maybe adding one more
14 box might be okay.

15 Q Thank you very much. I can move on now. I
16 appreciate that after all of this work that where
17 we are is that there's a lot of unknowns and
18 Commissioner, your question earlier about the
19 difference between an anomaly and an extreme was
20 very useful for the next place where I'm going is
21 that you also -- we also have a sense that the
22 trend in climate change -- now we're going to go to
23 not productivity, the trend in climate change, in
24 the Pacific Northwest Region may be that there's
25 no trend right now. If that's how I understood
26 your evidence, Mr. McKinnell, that we've got 2005
27 was the hottest since 1972 and 2008 was the
28 coldest since 1972, if I read the report right,
29 and your information we've got 2003 to 2008
30 significantly variable. Have I got that correct?

31 DR. MCKINNEL: Yes.

32 Q And so right now at any rate in our oceans, it's
33 perhaps difficult to identify a trend and the
34 effect of climate change?

35 DR. MCKINNEL: The variability is certainly what we're
36 seeing rather than the trend right now.

37 Q And so the variability might be the trend?

38 DR. MCKINNEL: It might well.

39 Q Right. And so when we've got a variability as a
40 possible trend, we've got the absolute need to be
41 very precautionary; would you agree with me as it
42 relates to decisions around the productivity of
43 salmon in the marine, that if we've got a
44 continual variation and we don't have a trend,
45 that we've got to be even more precautionous about
46 our forecasts and even about how we interpret
47 those forecasts and the returns?

1 DR. McKINNEL: Well, I think this relates to a point
2 that Dr. Beamish relayed yesterday on Bill Ricker,
3 he said -- I believe he said expect surprises.

4 DR. BEAMISH: Expect the unexpected.

5 DR. McKINNEL: Expect the unexpected. And so I think
6 that's wise advice.

7 Q All right. I'd like to go to -- I have marked all
8 my exhibits so far, First Nations Coalition Tab
9 13. This is a relatively recent document. I'm
10 not sure, Dr. McKinnell, if you've had an
11 opportunity to read the outcome of this workshop
12 that occurred in June of 2011 by IPSO and the
13 World Commission on Protected Areas. Have you
14 seen this document?

15 DR. McKINNEL: No. Well, I've seen the cover.

16 Q All right. So I want to take you to page 7 and 8
17 of this document. Perhaps Mr. Commissioner, this
18 is a document that's come out of a conference that
19 was held in April of this year at the University
20 of Oxford by -- the event was led by the
21 International Program on the State of the Ocean
22 and it had some outcomes and recommendations and
23 gentlemen, it's -- it's difficult, I suppose, in
24 these circumstances given that we will never be
25 able to be absolutely precise in the immediate -
26 it may take 20 or 25 years, as I've heard earlier,
27 and so we need to know what to do in the meantime
28 while science and First Nations and different
29 perspectives continue. And so I want to take you
30 to page 8 of this and obviously as it relates to
31 climate change we can all recognize the importance
32 of the immediate reduction in CO2 emissions, but
33 the next two are interesting:
34

35 Urgent actions to restore the structure and
36 function of marine ecosystems...

37
38 And the necessity to identify as they say
39 protected areas and approaches there.

40 Do you have any response to that as an
41 immediate response to what we do in the interim
42 before we figure all of these things out? And
43 I'll start with you, Dr. McKinnell.

44 DR. McKINNEL: You've put a page up. Could you ask me
45 a more specific question than the one you just
46 did?

47 Q Sure. On the second -- beginning of page 8, the

1 first recommendation -- I can take you to page 7,
2 which is the recommendations from the workshop, so
3 that's what we're looking at.

4 DR. McKINNELL: Yes.

5 Q All right? So they're looking at technical means
6 to achieve the solutions to many of the problems
7 that already exist.

8 DR. McKINNELL: Yes.

9 Q And they turn over to the next page and they say:

10
11 Immediate reductions on CO2 emissions...

12
13 We don't need to take time to talk about that
14 here. But then more relative to our marine
15 environment they say:

16
17 Urgent actions to restore the structure and
18 function of marine ecosystems...

19
20 And they list a number of steps that could be
21 taken to do that. Perhaps take a moment and
22 review that list. And I appreciate this is
23 interplay between science and policy, but these
24 are extremely important matters in the middle of
25 this commission, and so I'd like from your
26 expertise whether or not looking closely at some
27 of those steps to restore the structure and
28 function of marine ecosystems is a useful step in
29 British Columbia right now as it relates to Fraser
30 River sockeye salmon.

31 DR. McKINNELL: I don't think I can do that in the time
32 we have available. And in part -- I mean, the
33 first bullet is:

34
35 - reduce fishing effort to levels
36 commensurate with long-term sustainability of
37 fisheries and the marine environment;

38
39 Do you mean for Cultus Lake sockeye or for Sakinaw
40 sockeye or general? You know, is it -- are you
41 looking for a general response that fishing
42 responsibly is a good idea? I mean, fishing
43 responsibly seems like a good idea to me.

44 Q Well, one of the things that's spoken about in
45 this document and in the document that commission
46 counsel talked about is making sure at times of
47 uncertainty that we ensure that our fishing takes

1 into consideration the variabilities that were
2 operating and the absolute importance of making
3 sure that fish get to the spawning grounds.
4 That's a good precautionary step at this stage,
5 given the variabilities in the marine; would you
6 agree with that?

7 DR. McKINNEL: Well, if I come back to the
8 observations of the years that we've had our
9 greatest focus on, the 2007, '08 and '09, it seems
10 to -- you know, if we look at the observation
11 system we have in place and the decisions that
12 were made on the basis of that observation system,
13 that we ended up reducing fishing when there were
14 no fish or risk to fish and allowing fisheries
15 when there was an abundance. So -- so the -- I
16 mean, it seemed to me that at least at the levels
17 of variability that we were seeing, the right
18 decisions seemed to be made as a -- I'm not an
19 expert on this, but it seemed like they were
20 reasonable decisions for an outside observer.

21 Q In the interests of time, I'm not going to be able
22 to take you through that whole list. And so I
23 want to take you to the next one.

24 We've heard generally and understand the
25 department's views on the precautionary principle,
26 but here I thought was an interesting:

27
28 Proper and universal implementation of the
29 precautionary principle by reversing the
30 burden of proof so activities proceed only if
31 they are shown not to harm the ocean singly
32 or in combination with other activities.
33

34 What do you think about that approach?

35 DR. McKINNEL: Well, that, in fact, has been used, the
36 precautionary principle was used once.

37 Q Well, the precautionary principle, as I understand
38 it generally, in DFO's principles is that you
39 don't make decisions unless you have the
40 appropriate data and if you don't have the
41 appropriate data, you approach it carefully.
42 That's very different than saying we won't proceed
43 to impact the environment unless we prove that it
44 doesn't have an effect on the ocean.

45 DR. McKINNEL: The principle is -- as I recall the
46 evolution of precautionary approach and
47 precautionary principles as they were established,

1 I probably first saw them in the early 1990s, and
2 they came to bear on the squid and high seas
3 driftnet fisheries that I was involved with at the
4 time. And ultimately the decision on -- the
5 United Nations General Assembly became a fisheries
6 management organization and of all the possible
7 options for that fishery, they chose the most
8 extreme option, which was to close down the
9 fishery on the basis of the information that we
10 had been collecting, which more or less fit with
11 the idea of the precautionary principle, not the
12 precautionary approach.

13 Q I wonder if any of the other panel members want to
14 weigh in on either of these two topics. If not,
15 we can move on. You're not being required --
16 you're not forced to, but if you have a comment on
17 this...

18 DR. BEAMISH: We don't want to because these are nice
19 things to say and do but in a management agency
20 where we fish and where we log and where we build
21 houses and things, these are difficult issues.
22 And so if you reversed the burden of proof which
23 would be nice to do, there are a number of things
24 that simply wouldn't happen. So it's not an easy
25 thing to deal with. In an ideal world, of course,
26 you'd be able to do that, but, you know, I live in
27 a house and someone cut down some trees for me to
28 live there and so these are tough things to deal
29 with when you have to manage an ecosystem
30 essentially.

31 Q All right. Let's go to Exhibit 1320 which brings
32 this home a little bit more. This is a document
33 that the Provincial Crown placed before you
34 yesterday, an article by Michael Healey and I
35 appreciate, Dr. McKinnell, that you had some
36 disagreement with some of his data and the
37 observations, but at page -- well, it's Table 1
38 beginning at page -- I can't see the page numbers
39 on this document. One, two, three, four -- there
40 it is. And if you go over -- go to the
41 implications associated with climate change on --
42 that's what he's looking at there, and he's taking
43 it at various different stages and Stage 6, 7 and
44 8, I believe are the marine environments and he
45 says:

46
47 From a management perspective, ensure minimum

1 anthropogenic stressors during ocean entry
2 phase.

3
4 And then:

5
6 Ensure remaining high sea habitats are
7 protected from fishing.

8
9 And then over onto the next page from a returning
10 adult's perspective:

11
12 In the short term, rates of return, growth,
13 et cetera, will be highly uncertain. Manager
14 will need to reduce interception fisheries to
15 ensure sufficient salmon reach spawning
16 grounds. Commercial fisheries will need to
17 be greatly reduced in capacity and perhaps
18 limited altogether at some point.

19
20 I'll start with you, Dr. Beamish. When responding
21 to the nature of the uncertainties and when
22 responding to the nature of climate change, do you
23 agree that these are reasonable approaches?

24 DR. BEAMISH: You know, I did read the paper, but for
25 some reason I didn't read this part of it. I
26 don't know why. I'm going to generalize and say
27 that, you know, Dr. Healey is a pretty good
28 scientist and as I read through these, of course
29 they make sense. But again, they're more of what
30 targets than they are maybe rules. I'm just
31 reading as I'm talking and I'm sensitive to your
32 time, so in general, probably they're useful,
33 but...

34 Q Dr. Welch?

35 DR. WELCH: They're generally correct that I'd agree
36 with them, that they do indicate that we're going
37 to have troubles in the future, increasing
38 troubles because of the likely direction of
39 climate change. The broader issue though is that
40 taken more broadly is that these need to be put
41 within a political context of people that rely on
42 the fisheries for many purposes, commercial,
43 sports and so on, and it ultimately becomes a
44 political decision as to how you're going to
45 manage these -- those demands relative to the
46 demand to protect the species. It's going to be a
47 very tough issue to deal with.

1 Q Do you have anything to add, Dr. McKinnell?

2 DR. MCKINNEL: Just a comment that -- I read the rest
3 of the paper later and I think there's very
4 sensible things that he's saying in this document.
5 But I think it's also preliminary. It's a
6 conceptual view of things and as an analyst and
7 recognizing that the climate and ocean
8 interactions are not simple "X" causes "Y", there
9 are complexities in how they interact and how they
10 will affect salmon. I note that he said in here
11 there is a project going on led by Professor
12 Mantua at University of Washington to look at this
13 more analytically.

14 Q Thank you. I just have one further question which
15 is that -- well, it's a two-part question. Is
16 there an existing organization that any of you
17 could recommend or would like to recommend as a
18 way of focusing Canada's research efforts for
19 international work regarding Fraser River sockeye
20 salmon in the Gulf of Alaska and in the Bering Sea
21 and then perhaps just to do it as two part, is
22 there an existing organization that you recommend
23 could begin to do the kind of planning for the
24 ecosystem kind of studies that were -- that we
25 talked about earlier as it relates to the Pacific
26 Northwest Coast? Existing organizations that we
27 can look to to try to provide this type of work
28 going forward in a comprehensive way?

29 DR. MCKINNEL: I mean, I think there are existing
30 organizations that could fill the role. This -- I
31 think that you cannot understand Fraser sockeye
32 without cooperating with the United States, simply
33 because they migrate and co-migrate with American
34 stocks through U.S. waters and so I think it's
35 essential that at least there be some opportunity
36 for the U.S. and Canada to be involved in joint
37 research and planning.

38 If you want to go into the Bering Sea, then
39 you start talking -- you could get -- you know, I
40 would say initially just the Americans but it
41 allows the opportunity for interactions with
42 Russian species of Pacific salmon and then the
43 NPAFC could do that, as well.

44 As for how you might implement it, PICES is
45 also -- has an agreement with NPAFC to do
46 cooperative work on Pacific salmon and so the
47 organization that I'm from, NPAFC, or the PSC are

1 all potential organizations.

2 Q Dr. Beamish?

3 DR. BEAMISH: NPAFC can do it and Dr. McKinnell
4 mentions that it does have an agreement with PICES
5 and Russ Jones used to be a commissioner for NPAFC
6 and in that long-term research and monitoring plan
7 which I think was submitted as a document here, in
8 there we propose an International Year of the
9 Salmon and I'm going to put some time into trying
10 to get this established. And this is a focus on
11 understanding what's regulating salmon abundances
12 and population dynamics but in the ocean. And I
13 know that countries will cooperate and I suspect
14 that many organizations would sponsor it and I've
15 already proposed to DFO that they step up and lead
16 the parade and I think that that would be a nice
17 way of bringing everyone together that will deal
18 with this. Even though you asked us specifically
19 for sockeye, it would fit perfectly. So yes,
20 NPAFC is the organization that can do this.
21 Within NPAFC we can have a focus which I'm calling
22 an International Year of the Salmon and I think
23 that would highlight the needs that we need to do
24 and I still say to really come to an understanding
25 of the fundamental processes that regulate salmon
26 abundances, even though my colleagues don't think
27 it can be done, I do think it can be done.

28 Q Dr. Welch?

29 DR. WELCH: I would agree with the general comments.
30 I'd put more of an emphasis strategically on PICES
31 because it has a broader focus than just on the
32 fish. It's the environment that the fish are in
33 that's equally important and I think as a general
34 comment that there's better science that comes out
35 of the PICES side when those things are brought in
36 than if it's solely within NPAFC, but both of
37 those organizations are there and I echo what Dr.
38 Beamish says about the general thrust. It would
39 be --

40 Q Sorry --

41 DR. WELCH: -- tactical differences.

42 Q Sorry I interrupted, but if you were assuming to
43 us an ecosystem-based approach, I should have said
44 that, but if you're -- in trying to do a broader
45 ecosystem holistic approach, then the PICES from
46 your perspective?

47 DR. WELCH: Well, you definitely need the environment

1 in there and within NPAFC it's what we refer to in
2 the business as the fish heads are meeting. It's
3 the people with the salmon biology focus. What
4 they are -- what's lacking within that venue is
5 the oceanographic or environmental understanding
6 on a broader note, so that's the strength of
7 PICES. So the two organizations together can
8 provide much of a...

9 MS. GAERTNER: Thank you. Mr. Commissioner, those are
10 my questions.

11 THE COMMISSIONER: Thank you, Ms. Gaertner. Oh, I'm
12 sorry, that document, I may have missed the
13 exhibit number but the international workshop
14 document?

15 MS. GAERTNER: Oh, I don't think I actually -- I didn't
16 mark that actually. Thank you. Could I have that
17 marked as the next exhibit?

18 THE REGISTRAR: 1348.

19
20 EXHIBIT 1348: IPSO Ocean Stresses and
21 Impacts Summary Report
22

23 THE COMMISSIONER: Mr. Lunn, do you know which
24 document?

25 MR. LUNN: Yes, that was Tab 17 of --

26 THE COMMISSIONER: Of the -- right, thank you.

27 MS. BAKER: Thank you, Mr. Commissioner, next would be
28 any re-examination from Canada. I am hoping that
29 we can start the next panel before the lunch
30 break, so I'm hoping any re-examination will be
31 brief.

32 MR. TIMBERG: Yes, Mr. Commissioner, I have two
33 questions.
34

35 CROSS-EXAMINATION BY MR. TIMBERG, continuing:
36

37 Q And they're both for yourself, Dr. Beamish. In
38 cross-examination Tim Leadem, counsel for the
39 Conservation Coalition, asked you a question where
40 he hemmed you in, he said what is the cause of the
41 decline, it was at either -- at either Queen
42 Charlotte Sound or Georgia Strait. How would you
43 answer that question if you had more than the two
44 options provided?

45 DR. BEAMISH: Well, of course, it's both. All right?
46 The process started in the Strait of Georgia. Our
47 work and my interpretation is that there was --

1 let me say it differently. It makes no sense to
2 think that all of the species in the Strait of
3 Georgia except sockeye salmon were extremely
4 stressed and there's clear evidence for that, and
5 that somehow sockeye managed to avoid that
6 stressor, swim through the Strait of Georgia
7 either in the time that Dr. Welch mentioned or the
8 time that we wrote about in our paper, and then
9 somehow managed to make it to Queen Charlotte
10 Sound and experienced similar stresses that is
11 presented in Dr. McKinnell's report and then
12 somehow mysteriously all got zapped in that period
13 of time. I think that makes no sense
14 scientifically.

15 So our explanation is that in 2007 there was
16 extremely anomalous physical conditions that
17 clearly resulted in something that's highly
18 unusual with a synchronous response of all of the
19 -- sorry, all of the fish in the surface waters to
20 whatever the stressor was, our interpretation of
21 the stressor is that it had to be associated with
22 prey. And so it's a combination.

23 Q Thank you. And then Mr. Lunn, if we could go to
24 Exhibit 1294. My second question for you, Dr.
25 Beamish, is again Mr. Leadem brought up Exhibit
26 1339 which was an email from Dave Mackas which
27 referenced some Georgia Strait plankton data and
28 you said that there's a little bit of plankton
29 data there. So I would like to go to page --
30 Slide 23, I think it is, and I note this at the
31 bottom says source, D. Mackas. Is this an example
32 of some of the Mackas data that he mentioned?

33 DR. BEAMISH: I -- probably, yes.

34 MR. LEADEM: All right. Thank you. Those are all my
35 questions.

36 MS. BAKER: Thank you. And I have one issue to raise
37 on re-examination with Dr. Welch.

38
39 RE-EXAMINATION BY MS. BAKER:

40
41 Q Dr. Welch, when Canada was asking you questions
42 about the document which has now been marked as
43 Exhibit 1314, this is the paper you wrote in 2009.
44 I had understood Canada was going to give you an
45 opportunity to actually speak to this document
46 rather than just marking it, so I wanted to give
47 you that opportunity and Canada took Dr. Beamish

1 to the line in the abstract which noted the
2 average exit time from the Fraser River was four
3 to 5.6 days after release and average residence
4 time within the Strait of Georgia was 25.6 to 34.1
5 days. I wanted to just turn into the body of the
6 document to page 746. So under the heading Travel
7 Rate and Swimming Speeds you'll see that reference
8 again. It says, the first paragraph in the last
9 line of that paragraph says:

10
11 There was no clear pattern with release date
12 and time taken to exit the Strait of Georgia
13 across the QCS --

14
15 Which I understand to be Queen Charlotte Strait --
16
17 -- line --

18
19 And you can correct me if I'm wrong on that.

20
21 Average times from release to reaching the
22 QCS line range from 25.6 to 34.1 days.

23
24 And then, of course, you've got a map setting out
25 your array on page 738 of this article, as well,
26 which shows your two array lines, one at the
27 Northern Strait of Georgia and one at Queen
28 Charlotte Strait.

29 So can you just explain why -- if there's a
30 misunderstanding in the abstract and as then
31 incorporated into the paper Dr. Beamish was
32 referred to.

33 DR. WELCH: Yes, well there's a lexical or
34 terminological difference that in May 2009 when we
35 published the paper, we didn't know that the focus
36 on the Strait of Georgia as -- or the definition
37 if it was going to be as important as it is now,
38 so we were using the term more loosely to include
39 up to Queen Charlotte Strait and the broader
40 reason for that is that there's multiple papers
41 that show Queen Charlotte Strait stocks of salmon
42 as well as the Strait of Georgia stocks of salmon
43 have had very poor marine survival since about
44 1990. So -- and that's different from the West
45 Coast of Vancouver Island. So it's -- I've used
46 the term loosely here because that whole area
47 including Queen Charlotte Strait has had very poor

1 marine survival, so it's not just as we're
2 currently defining it, the Strait of Georgia, that
3 does have it.

4 And finally, if the commission's -- or if
5 people are interested in looking at the rates of
6 travel, Figure 8 on page 747 shows the estimated
7 or the measured rates of travel through the
8 different sections of the system that we could
9 measure, so the Lower Fraser River to Northern
10 Strait of Georgia in that Figure 8 shows it as 170
11 to 200 kilometres at the bottom, gives the numbers
12 there and the average rate of movement is 15 to 20
13 kilometres, so that would be about ten days from
14 the Fraser River mouth to Northern Strait of
15 Georgia and then at the far right Northern Strait
16 of Georgia to Queen Charlotte Strait 240
17 kilometres and the fish are going about 25
18 kilometres a day most years and that would again
19 be another ten days out. So, now, these are fish
20 that are about 170 millimetres long, 17
21 centimetres. The wild fish would be ten, 11
22 centimetres, so they would -- but we know in terms
23 of speeds and scaled by body size that they're
24 equivalent, so you would double those. So instead
25 of ten days for each of those two areas, you would
26 probably double that and take it as 20 days for
27 wild smolts that we have not yet tagged.

28 Q All right. So if you'll recall in Exhibit 1305
29 and the paragraph is bounded by the lines 344 to
30 352, this is where Dr. Beamish --

31 DR. WELCH: Sorry, what's Exhibit 1305?

32 Q 1305 is the -- it's called the Residence Time of
33 Juvenile Fraser Sockeye Salmon. It's done by
34 Preikshot and Beamish.

35 DR. WELCH: Right.

36 Q So page 13 lines 344 to 352 is where there's this
37 reference to your paper and it says that --
38 confirming, I guess, the conclusion in your paper
39 as they read it that the tagged fish in your study
40 were 26 to 34 days, only slightly shorter than
41 their estimate for the average residence time, 35
42 days; was that a correct reading of your report?

43 DR. WELCH: It's a misinterpretation, because of my
44 loose terminology, so I had used Strait of Georgia
45 but was thinking of it as up to Queen Charlotte
46 Strait. The Preikshot report is calculating to
47 the end of the Strait of Georgia, so about half

1 c.v., Dr. Parsons, is in Tab 11 of the
2 commission's documents and that'll be up on the
3 screen for you to have a look at in a minute. Do
4 you recognize that?

5 DR. PARSONS: Yes.

6 MS. BAKER: All right. I'll have that marked, please.

7 THE REGISTRAR: 1349.

8

9 EXHIBIT 1349: *Curriculum vitae* of Dr.
10 Timothy Parsons

11

12 MS. BAKER:

13 Q Thank you. And Dr. Parsons, you are -- have been
14 a fisheries biologist for many years, you're a --
15 you also have expertise in oceanography; is that
16 right?

17 DR. PARSONS: I'd put it the other way around. I've
18 been an oceanographer many years and am very
19 interested in fisheries.

20 Q All right. You have a degree, a Ph.D. from McGill
21 going back to 1958?

22 DR. PARSONS: That's correct.

23 Q All right. And you are a professor emeritus with
24 the Department of Earth and Ocean Sciences at UBC
25 presently?

26 DR. PARSONS: Correct.

27 Q Okay. You were the president of the American
28 Society of Limnology and Oceanography from '69 to
29 '70?

30 DR. PARSONS: Correct.

31 Q And you received the Order of Canada in 2006?

32 DR. PARSONS: Yes. I'm sorry.

33 Q That's fine. And there's actually a medal named
34 after you with Fisheries and Oceans Canada?

35 DR. PARSONS: Yes.

36 Q Which you received?

37 DR. PARSONS: Convenient. Yes.

38 Q And you have honorary doctorate degrees from a
39 number of different universities including the
40 University of Victoria, UBC, Tsukuba University in
41 Japan and Hokkaido in Japan?

42 DR. PARSONS: Correct.

43 MS. BAKER: Mr. Commissioner, I -- Mr. -- Dr. Parsons'
44 c.v. is set out here and I wonder if I could just
45 ask that he be qualified as an expert in
46 biological oceanography with particular expertise
47 in marine food webs and fisheries oceanography

1 without taking the time to go through all of his
2 publications which are set out.
3 DR. PARSONS: Yes, we've written two textbooks which
4 are still selling on the subjects which you
5 mention.
6 THE COMMISSIONER: Thank you.
7 MS. BAKER: Okay. Thank you.
8 Q And Dr. Irvine, your c.v. has already been marked
9 as an exhibit in these proceedings as Exhibit 177?
10 DR. IRVINE: I don't see it in front of me, but --
11 Q I know.
12 DR. IRVINE: -- I'm sure that's correct.
13 Q It's coming.
14 MR. LUNN: Just working on it.
15 DR. IRVINE: It's a very brief c.v.
16 MS. BAKER:
17 Q Okay. In light of that, let me see if we can
18 briefly go through your qualifications. You also
19 have a Ph.D. In zoology?
20 DR. IRVINE: Yes, that's correct.
21 Q And you have been a fisheries biologist with a
22 focus on salmon and ecology throughout your
23 career?
24 DR. IRVINE: That's correct.
25 MR. TIMBERG: I hesitate to interrupt, but Dr. Irvine's
26 c.v. was entered earlier in December as Exhibit
27 177.
28 MS. BAKER: I did identify that.
29 MR. TIMBERG: Oh, okay.
30 MS. BAKER: As that. Thank you. But you'll see that's
31 the exhibit on the screen.
32 Q The c.v. that you presented earlier has just got a
33 selected listing of publications that relate
34 directly to -- at that time it was Wild Salmon
35 Policy but also Fraser River sockeye. It's on the
36 second page. But you have authored many more
37 publications than that with respect to salmon and
38 freshwater and marine ecology; is that right?
39 DR. IRVINE: Yes, that's correct.
40 MS. BAKER: And I'd like to have Dr. Irvine qualified
41 as a fish biologist with a focus on salmon and
42 salmon ecology in both the freshwater and the
43 marine environment.
44 THE COMMISSIONER: Yes. Thank you.
45 MS. BAKER: All right.
46 Q And just a -- just to follow up on that, your
47 career has looked -- over your -- in your career,

1 over the first part of your career, you looked at
2 primarily the freshwater ecosystem and then in the
3 latter half of your career, you focused more on
4 the marine ecosystem; is that right?

5 DR. IRVINE: Yes, that's true. I suppose where my
6 background is a little bit unusual is that I did
7 spend probably the first half of my career dealing
8 with freshwater ecosystem issues, primarily with
9 focus on salmonids and then about a dozen years
10 ago, I suppose, I saw the light, shall we say, or
11 wanted a change and so I made a conscious shift to
12 focus increasingly on the marine environment and
13 I've done that. As I think you're aware, I co-
14 chair the Fishery Oceanography Working Group
15 within DFO, I've had long involvement with the
16 Wild Salmon Policy, so I have quite a broad
17 background.

18 MS. BAKER: All right. Thank you for indulging me and
19 getting this done before the break.

20 THE COMMISSIONER: No, that's fine. No.

21 MS. BAKER: So are we coming back at quarter to? Is
22 that what you had said?

23 THE COMMISSIONER: Yes. We'll attempt to get back
24 by --

25 MS. BAKER: Thank you.

26 THE COMMISSIONER: -- quarter to 2:00. Thank you.
27 We'll just take the lunch break. Thank you, Dr.
28 Parsons and Dr. Irvine.

29
30 (PROCEEDINGS ADJOURNED FOR NOON RECESS)

31 (PROCEEDINGS RECONVENED)

32
33 THE REGISTRAR: The hearing is now resumed.

34 MS. BAKER: Thank you. I'm going to start my questions
35 up with Dr. Parsons.

36
37 EXAMINATION IN CHIEF BY MS. BAKER:

38
39 Q Dr. Parsons, you have a lot of experience in
40 phytoplankton and community structures in the
41 ocean, so I'm going to ask if you could tell us a
42 little bit about what phytoplankton are and how
43 they work within the ocean in supporting sockeye
44 salmon.

45 DR. PARSONS: The phytoplankton themselves are the only
46 photosynthetic organisms in the ocean that supply

1 virtually all the energy for the creatures of the
2 ocean. They're all microscopic single-celled
3 organisms and they come in about 12 or 15 classes
4 of organisms.

5 They range in size from one micron to 1000
6 microns linear dimensions. That means they change
7 in size from nine orders of magnitude. What else
8 in this planet changes by nine orders of magnitude
9 in the biological world? From a blade of grass
10 and a giant sequoia are different in size by nine
11 orders of magnitude.

12 The ecology of grass is a lot of animals
13 graze it and a lot of wild beasts living (sic).
14 The ecology of giant sequoias is that a couple of
15 squirrels might be found in one tree. So what I'm
16 saying here is this enormous range of size of the
17 photosynthetic organisms in the sea is paralleled
18 by a very large range in size of the terrestrial
19 plants.

20 The dominant class very often in many waters
21 are the flagellates. Now, we refer to flagellates
22 as being the smallest of the algae. The largest
23 of them are called the diatoms, so they range 100
24 microns and more, the flagellates ten microns and
25 less. What I shall concentrate on is the
26 different ecologies of these.

27 Q All right. You made a public submission, which we
28 have on the screen here, for the Commission and
29 you state that:

30
31 Food availability for zooplankton and
32 eventually sockeye is not just dependent on
33 the amount of phytoplankton, but on the kinds
34 of phytoplankton in the ocean.
35

36 Can you explain that?

37 DR. PARSONS: Yes. We're back elaborating now on this
38 tremendous size difference. What I'm giving you,
39 Mr. Commissioner, is a trophodynamic concept of
40 the ocean; that is, the feeding of phytoplankton
41 to zooplankton to fish. There are certain areas
42 of the ocean which are the upwelling areas,
43 Benguela Current, the Canary Current and so on,
44 where there is a total dominance of diatoms, of
45 large phytoplankton. These areas are also known
46 as places which produce most of the fish in the
47 world.

1 There are also areas where you get no
2 fisheries such as the Great Barrier Reef, the
3 Caribbean, the Indonesian Islands. In these
4 waters, the dominant phytoplankton are
5 flagellates.

6 So if I could give you an analogy as to what
7 the difference is between having those small
8 phytoplankton that feed into coral reefs and
9 having very large phytoplankton that feed into
10 some of the major fisheries: if I was to bring a
11 loaf of bread to my neighbour and he ate it every
12 day, he would have enough calories for the day.
13 If I went to the other neighbour and took him the
14 same amount of bread, but I broke it all up into
15 breadcrumbs and threw it around the house, it
16 would be very difficult for my neighbour to get
17 his loaf of bread. The ecology of his house would
18 be turned over to mice.

19 So this is the sort of thing that is going on
20 in the ocean. We have the Great Barrier Reef, the
21 Caribbean, dominated by small flagellates, and we
22 have these enormous fishing areas dominated by the
23 diatoms which are a 100 microns in size.

24 I must make it clear, however, when I talk
25 about coral reefs, I'm talking about an animal
26 which is known as the Cnidarian, which is the same
27 animal as jellyfish. It has two stages: It can
28 either be a coral reef or it can be a jellyfish.
29 So we, in our environment, are much more familiar
30 with jellyfish blooms than we are with coral
31 reefs. So the small flagellates develop ecologies
32 which can give rise to jellyfish populations, the
33 large diatoms give rise to fisheries. These,
34 then, are the two extremes which I want to
35 consider further, depending on the question.

36 Q All right. In the Gulf of Alaska, what kind of
37 phytoplankton dominates that community?

38 DR. PARSONS: Yes, good question. I've been across the
39 Gulf of Alaska many times and I've measured the
40 phytoplankton. They are nearly all -- they are
41 all small except during the spring bloom which
42 lasts about a month. So you have an enormous body
43 of water that is dominated by very small
44 flagellates with the exception that the whole of
45 the coastline - that is, the continental shelf of
46 the Gulf of Alaska - is dominated by diatoms.
47 It's a very rich body of water, but it's very

1 small. But a lot of the young salmonids and many
2 other fish live in that coastal zone, and that is
3 where you have very high predation.

4 Now, there is an interesting point here that
5 if I say that the biggest area, the Gulf of
6 Alaska, is dominated by small flagellates, does it
7 then have lots of jellyfish? We can compare the
8 Eastern Gyre, which is the Gulf of Alaska, with
9 the Western Gyre which is off the coast of Japan.
10 In the Western Gyre, there is a system from the
11 Okhotsk Sea which pumps iron in the Western Gyre,
12 and the diatoms require iron, and in the Western
13 Gyre, you have very few jellyfish and much bigger,
14 much larger population of fish, commercial fish,
15 than you have in the Gulf of Alaska.

16 We find that in the Western Gyre, you have
17 diatoms where, as I've already said, in the Gulf
18 of Alaska, you have flagellates.

19 So what do we find when we go to the Gulf of
20 Alaska? We find a big population of aglantha.
21 It's too deep to have coral reefs, it's too cold
22 mostly to have coral reefs, but we find the other
23 form of the Cnidarian. We find large populations
24 of jellyfish.

25 So generally I'm giving a picture which looks
26 very sterile as far as being a good place for
27 salmon to feed, but a good place for jellyfish.

28 Q And is it always the case -- in the Gulf of Alaska
29 in the community structure you've just described,
30 is that a consistent pattern?

31 DR. PARSONS: No.

32 Q Can it change?

33 DR. PARSONS: This is where the whole business of
34 variations in returns of salmon come in. Every
35 now and again this very sterile environment is
36 penetrated by upwelling water, by a thrust of cold
37 water, currents being carried across the Pacific.
38 Every now and again eddies - and eddies are
39 spinning water masses that come off the coast -
40 spin right out into the Gulf of Alaska. And very
41 occasionally we have a volcano which dumps a whole
42 lot of iron into the sea, and I believe - and
43 we'll talk about later - also sets off a change,
44 and sometimes Gobi dust.

45 So there are three or four different ways in
46 which this rather sterile environment can be
47 enriched by the addition of iron. So there is the

1 potential always for change.

2 When I wrote this submission in '04, I wrote
3 it four months before the volcano went up and
4 produced this enormous diatom population. Whether
5 or not there's a connection between that diatom
6 population and the return of the 34 million fish
7 needs to be discussed separately. But, in
8 general, the concept is undeniable that the iron
9 enriched the ocean produced diatoms and
10 traditionally, from what we now about the rest of
11 the world's oceans, anything that produces large
12 numbers of diatoms is going to be very beneficial
13 for fisheries. Hence you have a mechanism here
14 from a sterile environment that's not producing
15 any salmon to the sudden thrust of cold water,
16 putting iron into the environment, and making the
17 whole scene favourable for salmon survival.

18 Then the next year, this may not happen, so
19 it can drop off again. So hence I think there is
20 a reasonable argument in the size concept of the
21 phytoplankton to say that this could be a
22 mechanism, a trophodynamic mechanism governed by a
23 bottom-up mechanism.

24 Q Are you aware of any studies that link
25 phytoplankton communities to sockeye production?

26 DR. PARSONS: Not in terms of the open ocean. It
27 simply has not been studied, but I have two pieces
28 of experience with which I can reinforce my
29 opinions.

30 In the 1960s I organized experiments on
31 fertilizing Great Central Lake. We did the same
32 thing as may happen in the ocean. We added tonnes
33 of fertilizer to Great Central Lake per week for a
34 period of about three months. Great Central Lake
35 has its own little population of sockeye salmon,
36 so we weren't dealing with the adults. We were
37 dealing with the young parr. Those fish grew 35
38 percent bigger, and those fish returned in a
39 seven-fold abundance as a result of this
40 fertilization. The phytoplankton produced in that
41 lake, there were lots of diatoms. So, on a mini-
42 scale, this was an experiment in which we could
43 say that it can be used to verify the concept.

44 In a second set of experiments we conducted
45 here in Canada under an international program, we
46 had things called mesocosms which are giant test
47 tubes. They are between 100 and 1000 tonnes of

1 seawater. Within these giant test tubes which
2 were located in Saanich Inlet, we could have
3 everything from phytoplankton to fish.

4 Now, we could control the environment in
5 these test tubes. They were called mesocosms,
6 really. Within these mesocosms we could produce
7 diatoms or we could produce flagellates by
8 governing the amount of nutrients and governing
9 the light intensity.

10 Where we did that, we found that young salmon
11 -- the salmon were not the same. We were using
12 chum salmon in these experiments. The salmon
13 would grow very well as long as we produced a
14 diatom ecology in these mesocosms. If we produced
15 a flagellate ecology in these mesocosms, nothing
16 but small phytoplankton. We got lots of
17 jellyfish. So it was a very clear experiment. It
18 was the kind of thing I like because you can put
19 your hands on it and there is no correlation at
20 the end to try and r-square of .5 or something.
21 You've got a real result. To me, a real result is
22 what counts.

23 Q Okay, thank you. Dr. Irvine, I wanted to move
24 over to you now and ask are you aware of any
25 estimations of phytoplankton biomass that can be
26 done using satellites?

27 DR. IRVINE: Yes, Mr. Commissioner. Satellite imagery
28 is being used increasingly to estimate
29 phytoplankton biomass, but I just want to point
30 out that really what the satellite imagery is
31 doing is simply recording the colour of the
32 surface water. Based on the colour of the water,
33 you can develop estimates of phytoplankton.

34 I'll just give an analogy from my flight over
35 from Nanaimo this morning. When my flight left
36 Nanaimo Harbour, I was looking into Departure Bay
37 and it's quite brown. That is probably
38 heterosigma. When you get out in the middle, it
39 seems to be fairly unproductive. You get closer
40 to the Fraser, what you're looking at is the
41 turbidity from the Fraser.

42 So with satellite imagery what you're doing
43 is essentially quantifying the colour. Then
44 there's been quite a bit of field work done to
45 relate the different colour measurements to
46 phytoplankton.

47 Q And how does chlorophyll relate to this

- 1 discussion, because we hear people talking about
2 chlorophyll in the water.
- 3 DR. IRVINE: Okay, yes. So chlorophyll is the pigment
4 that's produced by most plants and it's what tends
5 to give them the colour. So with satellite
6 imagery, you're measuring the chlorophyll-a.
7 There's at least a couple of types of chlorophyll
8 in plants, but it's actually measuring the
9 chlorophyll-a production.
- 10 Q And, Dr. Parsons, did you have anything to add
11 about the use of satellite imagery?
- 12 DR. PARSONS: Yes. Because I've just been talking
13 about --
- 14 Q Could you put your mike on?
- 15 DR. PARSONS: Oh, I'm sorry.
- 16 Q That's okay, thank you.
- 17 DR. PARSONS: I'm old; I forget. I've just been
18 talking about diatoms, and what has come up now,
19 to me, most interestingly, is a paper that not
20 only can detect chlorophyll from satellites, but
21 here's the title: "Discrimination of Diatoms from
22 Other Phytoplankton Using Ocean Colour Data". In
23 other words, what we can now do is scan the whole
24 of the Gulf of Alaska, not just for chlorophyll -
25 which is important - but also for the proportion
26 of diatoms. This work was done on the east coast
27 of Canada.
- 28 Q Dr. Irvine, have you done some work looking at
29 chlorophyll peaks in Queen Charlotte Sound and the
30 smolt-to-adult survival of Chilko sockeye?
- 31 DR. IRVINE: Yes, I have. Because the real beauty of
32 satellite imagery is that it's relatively cheap.
33 The satellites are flying over, circling the globe
34 frequently, and so you're actually able to get
35 measurements from the satellites relatively
36 inexpensively. You don't have to go in the field.
37 So working with ASL Borstad, I've been doing
38 quite a bit of work with them over the last
39 several years, and they have a lot of expertise in
40 the interpretation of satellite imagery results.
41 So we were trying to look and see if there were
42 links between the information that could be
43 gathered from satellite imagery and sockeye
44 survival for example.
- 45 Q Right. And there was a paper in one of the "State
46 of the Ocean" science documents that I think has
47 some of this work in it, which I'd like to take

1 you to.

2 MS. BAKER: Has it been marked? Exhibit 1327, so this
3 is the CSAS document 2010/053 and it contains, at
4 page 132 -- once that gets put up on the screen
5 here.

6 Q This document is a compilation of various
7 articles, and there's one at page 132 which is one
8 by you which looks at marine conditions in Queen
9 Charlotte Sound and whether it limits the marine
10 survival of Chilko sockeye salmon; is that right?

11 DR. IRVINE: Sure. And I could quickly just walk you
12 through this if you like.

13 So if we look at the plot, what we have is on
14 the vertical axis we've got what I labelled
15 "marine survival" but it's actually the smolt-to-
16 adult survival, so it does include the freshwater
17 migration. On the horizontal axis is an estimate
18 of the chlorophyll-a production within Queen
19 Charlotte Sound during approximately the first
20 three weeks of April.

21 The numbers on this plot refer to the ocean
22 entry years, and what we noticed was that in years
23 when there was a relatively high production of
24 chlorophyll in early April, that the survival of
25 the out-migrating smolts was relatively high. So,
26 for example, the three points on the upper right
27 part of the graph, which are '01, '98 and '04 -
28 those being ocean entry years - those three years
29 had relatively high levels of chlorophyll and
30 correspondingly high levels of survival.

31 So what we did is we just did a simple
32 correlation, so this is not cause and effect.
33 This is simply a correlation. I thought it would
34 be interesting to see how well it worked in a
35 predictive sense. So the red line in the middle
36 is the linear relationship, so that's the line of
37 best fit. If you look at -- there's two dotted
38 lines, and then there's two outside lines that are
39 solid blue. Those are just measures of the
40 deviation around the prediction, if you like, so
41 that the two dotted lines, what they are saying is
42 that there's a 95 percent probability that the
43 actual line fits somewhere between those two
44 dotted lines, and the two solid lines are saying
45 that there's a 95 percent probability that the
46 individual measurements would fit within those two
47 outside lines.

1 So the two points I should point out are
2 labelled '08 and '09, and those are in red. So
3 those were predictions for the smolt-to-adult
4 survival based on the chlorophyll conditions in
5 those years.

6 So the '08 ocean entry year is the 2010
7 return year. So what I was predicting here was
8 approximately a 4.2 percent survival. Now, we now
9 know the measurement, the actual survival, and
10 it's in the order of about 5.8 percent. So this
11 was an underestimate, but the 5.8 was within the
12 confidence limits. So if this relationship holds,
13 and if you read the text, you'll see that I'm very
14 careful to indicate that this is a correlation.
15 This would indicate a relatively low survival of
16 sockeye returning this year.

17 Now, the reason that we sort of felt that
18 this was worthy of putting in the State of the
19 Ocean report is that there is -- it's not just
20 strictly -- it's a correlation, but there's a
21 plausible mechanism behind it. What we've looked
22 at is if you look at the chlorophyll
23 concentration, which is an index of the
24 phytoplankton, if you look at it earlier than the
25 first three weeks in April or, indeed, if you look
26 at the chlorophyll concentration later than the
27 first three weeks of April, there's no strong
28 correlation.

29 So the theory is that you have a high
30 phytoplankton production in early April. This, as
31 Dr. Parsons has indicated, results in benefits to
32 the zooplankton community. Sockeye, by the time
33 that they arrive in this area are probably feeding
34 on relatively larger zooplankton so it could
35 actually go through a couple of iterations, so
36 that the time lag between the phytoplankton bloom
37 in April, it would be reasonable to expect that
38 this would result in suitable food organisms for
39 the out-migrating smolts in June.

40 Q And then the 2007 ocean entry year also shows on
41 your graph or your table that we're looking at
42 here as a very poor return in fact.

43 DR. IRVINE: That's right. And so that was an actual
44 measurement, so that wasn't a prediction. So the
45 only predictions from this relationship are the
46 '08 and the '09 ocean entry years.

47 Unfortunately, there are satellite data from

1 earlier years, but it was a different satellite
2 with different equipment so we weren't able to
3 develop the -- basically to use a longer time
4 series.

5 Q Do you think, then, that the chlorophyll-a
6 measurements in the peak in April are helpful in
7 allowing us to predict Fraser returns?

8 DR. IRVINE: Well, I guess the jury is out on that. If
9 we have really poor returns in '09, I'll probably
10 get some sort of medal, but I'm very careful to
11 indicate that this is a correlation which does
12 appear to have a mechanistic relationship, but I
13 wouldn't -- correlations like this have a tendency
14 to break down, and in fact this r-squared of .87
15 means that we explained 87 percent of the
16 variability around the survival data based on
17 this, and this is statistically implausible to
18 have a correlation this high. It's just that it's
19 such a high correlation and the mechanism seems to
20 be reasonable that I felt it was worth writing up
21 and then making the prediction.

22 Q All right. Thank you. Over the last three days
23 we've been listening to three of your colleagues
24 talk about the Strait of Georgia and Queen
25 Charlotte Sound and the Alaska coast and also the
26 Gulf of Alaska. We heard people talk about the
27 importance of the marine phase in the Strait of
28 Georgia. In particular, Dr. Beamish testified
29 that, in his view, the early marine phase is
30 critical to the survival of Fraser River sockeye
31 and he tended to focus that discussion on the
32 Strait of Georgia, although he didn't rule out the
33 importance of Queen Charlotte Sound.

34 Could I ask you, Dr. Parsons, do you have any
35 views on that?

36 DR. PARSONS: Yes. I don't know if you reproduced the
37 little graph that I drew, probably not.

38 Q Oh, I think it's in the submission that we just
39 had up on the screen, isn't it?

40 DR. PARSONS: No, I haven't seen it. All right, let me
41 answer the question, then. All animals go through
42 -- no, it's not that one.

43 Q Not the page 2?

44 DR. PARSONS: I sent it to you by email.

45 Q Oh, number 36.

46 DR. PARSONS: All animals go --

47 Q 36.

1 DR. PARSONS: What?

2 Q 36.

3 MR. LUNN: Of this?

4 MS. TSURUMI: Tab 36 of our...

5 MR. LUNN: Thank you.

6 DR. PARSONS: Okay. All animals go through -- yes, if
7 you get it the right way around. Sorry.

8 MS. BAKER:

9 Q We don't make people read things sideways.

10 DR. PARSONS: All right. This is a general growth
11 curve for all animals. There are three stages,
12 and it applies just as much to sockeye salmon.
13 There's an immature stage, there is a juvenile
14 stage and a mature stage.

15 The immature stage is subject to a great deal
16 of predation. When those fish enter the ocean,
17 they are subject to many birds of prey. They are
18 subject to dogfish and a huge number of other
19 things. So, during that phase, mortality is the
20 big problem.

21 Then they move offshore and they enter a
22 rapid phase of growth. The curve goes steep.
23 They are adolescent fish. Now it becomes a matter
24 of diet. Can they get enough of the right food to
25 grow fast enough, and that is the period which
26 I've been talking about in the Gulf of Alaska.
27 That is the period which simply has not been
28 covered to any great extent in the documents that
29 I have seen. If they don't get the right food,
30 they're going to fall off that growth curve and be
31 subject to further predation. But if they can
32 stay on that steep curve, you're going to get a
33 good harvest.

34 Finally, in the mature stage, well, they're
35 coming in towards the coast, and of course they're
36 subject then to the fisheries.

37 So it's that ocean juvenile stage, Gulf of
38 Alaska, which I think is the one in which we don't
39 really have very much data.

40 Q Is there much literature on the trophodynamics of
41 salmon in the sea to explain that period of time?

42 DR. PARSONS: No. That is the problem, because it's
43 expensive to go out and study salmon once they're
44 widely distributed. It can be done much easier in
45 a place like the Strait of Georgia. But once they
46 get out into the ocean, there are no studies,
47 basically, on this. But I think using an

1 increased number of automated techniques including
2 satellites and so on, that we can probably start
3 to come to grips with that phase later.

4 Q And Dr. Irvine?

5 DR. IRVINE: Well, this is something I'd like to speak
6 to maybe later in greater depth, but I mean Dr.
7 Parsons is right. Essentially it's a process that
8 begins in the lake. We have huge mortalities
9 right within the lake from the time the eggs are
10 deposited. So you start with 4000 eggs and then
11 you end up with three or four adults on average
12 returning. So there's mortality at each life
13 history phase.

14 I do have a slide that I hope I can speak to
15 later that kind of talks about this process right
16 through the life cycle, and in my view, each of
17 these life history stages are important in
18 determining the total returns. So I'd like to
19 return to that at some point.

20 Q Yeah, I'm just wondering if I should take you to
21 that now or if I should come back to that. Why
22 don't I go there now. I think I know what you're
23 referring to.

24 MS. BAKER: Could you bring Tab 32 up on the screen?

25 MS. TSURUMI: Of Canada's documents.

26 MS. BAKER: Of Canada's documents, sorry, and in there,
27 there was another document that was produced by
28 Canada. It should be the very last one, Tab 48.
29 I don't know if you want -- if those are related
30 or if you wanted to deal with them both at the
31 same time.

32 Q Is this the document that you wanted to go to?

33 DR. IRVINE: Yeah, so the two I'm thinking of is this
34 one, but also the PowerPoint, this one. I don't
35 know if you can do a split screen. Maybe we can
36 just start with this one slide, because I think
37 this is important, because I wasn't here
38 yesterday, but I listened to the discussion this
39 morning and on Wednesday.

40 What I'd really like to do is just very
41 quickly walk through the salmon life cycle and
42 show not only the mortality that occurs at
43 different stages of the life cycle, but also the
44 variability among years in terms of the survival.

45 So this is a figure that I put together and
46 it essentially relates to the Chilko sockeye, so
47 I've been spending quite a bit of effort over the

1 last year working with Scott Aikenhead who is a
2 modeller and I'm more of a biologist. So we
3 basically are working on a couple of manuscripts
4 where we're pulling all this together.

5 But what we see here is the life cycle of
6 Chilko sockeye. The estimates are the mean
7 estimates between 1958 and 2009 with the ranges.
8 So I'm very quickly going to go through this
9 because I think it is instructive. So on the
10 left-hand side of this figure is the ocean. On
11 the right-hand side is freshwater.

12 So if we start up at the top, you see a
13 picture of two -- a spawning pair of sockeye
14 salmon. On average over this 60-year time series,
15 we have .2 million effective female spawners.
16 Effective female spawners are the number of female
17 spawners that actually spawn. So .2 million, but
18 the range - and these are measured - is between
19 .02 to .6. So a huge range.

20 Now, we don't actually have estimates that we
21 can rely on for the number of eggs or the number
22 of fry, so I've just applied literature values.
23 So on average you'd expect about 800 million eggs
24 to be deposited on an annual basis for this one
25 population of Chilko sockeye, and an average
26 survival to the fry stage is about 20 percent. So
27 you'd expect to see about 160 million fry. So
28 we've already gone through an 80 percent reduction
29 in survival. If you have conditions which are not
30 conducive to egg-to-fry survival, you'll have much
31 higher mortality, or alternatively, you can have a
32 good year with good survival.

33 So then the average survival from fry to
34 smolt is about 12-and-a-half percent. So we're
35 now at the smolt stage, so this is where the fish
36 are on their way to the ocean and we're down to 20
37 million on average. But again, it's varied
38 between .16 and 77 million. So we've gone from
39 800 million down to 20 million and these fish
40 haven't entered the ocean yet.

41 So then the next measurement that we have is
42 to the returns. So, again, the mean return
43 estimate which is the returns are -- a lot of
44 people get confused with the terminology. So the
45 returns are the number of salmon that survive to
46 be adults before any fishery. So we have about
47 1.5 million returns, but again, the range is

1 between .07 to five million. And then about 13-
2 and-a-third percent of those, on average, survive
3 to become female spawners if you like.

4 So the point I want to make is that there's
5 mortality that occurs at each life history stage,
6 and it's not constant through time.

7 So if you could flip to the other, this one
8 here, yeah. I don't know if you can do a split
9 screen, but ideally, if you could have the second
10 page of the Powerpoint presentation on one half --
11 we'll see how good this fellow is.

12 MS. BAKER: John is --

13 DR. IRVINE: Ah, he's great. So get to the second page
14 there, and then what I'd like to do is very
15 quickly walk you through some of these results,
16 because I think they're quite instructive. What
17 I'd like to do is start with Figure 1-D. Now,
18 what that shows, Mr. Commissioner, is the
19 freshwater survival. So this is for Chilko
20 sockeye salmon. This is the survival in fresh
21 water, and I have it arranged by ocean entry year.

22 What I'd like to point out is that from about
23 1965 through to about the early 2000s, we have
24 basically a lot of variability, but a negative, a
25 decline in the freshwater survivals. So this is
26 all natural.

27 Then something happened after about 2005.
28 This is really quite fascinating because suddenly
29 this lake, the freshwater survival is much higher
30 than it has ever been, even during a period of
31 lake fertilization. Now, the two high points, I
32 just want to point out on that graph are the two
33 years that we are the most interested in, so this
34 is the '07 ocean entry year, and the '08 ocean
35 entry year. So those are the two points right up
36 at the very top.

37 Now, if you would please look at Figure 1-E,
38 and if you could blow that up, please? Now this
39 looks complicated but it isn't. So this is a
40 graph. We could call this a stock-recruit
41 relationship. But what we show on the horizontal
42 axis is the number of spawners, and on the
43 vertical axis is the number of smolts. If you
44 ignore those two triangles, what you see is a
45 relationship that basically asymptotes at about 40
46 million.

47 So what this is saying, Mr. Commissioner, if

1 I'm making myself clear, is that regardless of the
2 number of spawners that were going into this lake,
3 the maximum smolt production, until 2007 and 2008,
4 was about 40 million fish. But suddenly in 2007
5 and 2008 ocean entry years, we have these two high
6 values. So basically this lake has suddenly
7 shifted in terms of its productivity, and I could
8 talk at length about why I think this has
9 happened, and it's similar to the volcano
10 hypothesis, but I won't. Suffice it to say that
11 we have these two years with very high production.

12 Now if you would just indulge me and go to
13 Figure 1-F, which is just to the right of this,
14 what we have here is the same kind of graph, but
15 this is for the ocean. So we have the spawners on
16 the horizontal axis and the returns on the
17 vertical axis. So this is simply measuring what
18 was going on in the ocean, whereas the two
19 previous graphs were measuring what was going on
20 in fresh water.

21 What you see - and again, just ignore the two
22 triangles for the moment - what you see is a lot
23 of variability but no evidence of the plot
24 plateauing, so no evidence of density dependence.
25 But the upward triangle - and I want to make sure
26 I get this right - but the upward triangle is
27 ocean entry year 2008, so that was the year when
28 we had really good returns. The downward triangle
29 is ocean entry year 2007.

30 So what's happened here is that the ocean
31 survival of the 2007 ocean entry year fish was
32 abysmal, even though the freshwater survival was
33 incredible. So we had huge freshwater survivals
34 for both of these years, but only in the one case
35 did they survive well in the ocean.

36 Now, if you don't mind, just quickly look at
37 Figure 1-C. The reason I want to point this out
38 is I know there was discussion this morning about
39 whether the '07 ocean entry year was anomalously
40 low. So what we've done here is basically
41 computed the smolt-to-adult survival for two
42 different age groups of salmon, and they're
43 represented by the solid circles and the empty
44 circles. This is a log plot. Basically what's
45 happening here is that we've had increasing marine
46 survival, or smolt-to-adult survival for Chilko
47 sockeye right through until about 1989, 1990, and

1 this was a recognized regime shift in the North
2 Pacific at that point, and then we've had a fairly
3 consistent period of decline. But again, if you
4 look at that lower triangle, the downward facing
5 triangle, that is the '07 ocean entry year. So it
6 is clearly an outlier. So it is not explained by
7 any of these data, whereas I think all of the
8 other estimates are sort of within reason.

9 So, Mr. Commissioner, I know this is quite a
10 bit of detail. What I encourage you and your
11 staff to do over the next few weeks or months is
12 to look at these data in more detail, because I
13 think there is a lot of information here that I
14 think helps to understand what's going on with
15 Fraser sockeye.

16 Maybe if we could just quickly go to the
17 final page of the PowerPoint. So, in my view,
18 Chilko sockeye returns are influenced by factors
19 affecting survival at multiple life history
20 stages. We've been focusing this week, or you've
21 been focusing this week on the ocean, but let's
22 not forget the fresh water, because the fresh
23 water is really the main reason why the Chilko
24 sockeye returned in huge numbers in 2010. So I
25 have to differ with Dr. Parsons a little bit on
26 that one.

27 So anyway, in summary, the low returns for
28 Chilko in 2009 occurred despite huge freshwater
29 survivals, and they were caused by anomalously low
30 ocean survivals, or at least smolt-to-adult
31 survivals, and the good returns in 2010 were the
32 result of high freshwater survivals. The ocean
33 survivals were in fact just average.

34 Q Are you able to locate where in the marine
35 environment the mortalities were occurring at such
36 a high level for the 2007 ocean entry year?

37 DR. IRVINE: Well, what I would say, it would be -- I
38 think they got like a triple whammy. There is not
39 a specific environment. This is something that,
40 in my opinion, the -- to have really anomalously
41 low survivals as we did for the 2007 ocean entry
42 year fish, it would have to be some sort of major
43 catastrophe occurring at some specific location,
44 and there's no evidence of that. So my
45 presumption would be that it would be a cumulative
46 effect of subnormal conditions at multiple life
47 history phases of the fish, and it's a real

1 anomaly.

2 It's exactly the sort of thing that you
3 expect to see occasionally in times of climate
4 change.

5 MS. BAKER: I neglected to mark as an exhibit the graph
6 that Dr. Parsons used to illustrate his answer,
7 and then I would also like to mark these two that
8 are on the screen that Dr. Irvine just reviewed,
9 so perhaps we should do them in order and start
10 with Dr. Parsons' graph or table, figure. It was
11 Tab 36 of the Commission's documents. That's it.

12 THE REGISTRAR: Exhibit number 1350.

13
14 EXHIBIT 1350: Chart titled "Food Chains of
15 the Oceans - Trophodynamics"
16

17 MS. BAKER: Thank you. And then we'll mark the two
18 documents that Dr. Irvine just referred to.

19 MR. LUNN: Do you want to mark those together?

20 MR. BAKER: No, as separate documents.

21 THE REGISTRAR: Exhibit 1351.

22 MS. BAKER: Which one are you marking?

23 THE REGISTRAR: And 1352.

24 MR. LUNN: So we just made this (indiscernible - not at
25 microphone). Tab 32 is 1351 and Tab 48 of Canada
26 is Exhibit 1352.

27
28 EXHIBIT 1351: Submission 0179 by Dr. Parsons
29

30 EXHIBIT 1352: Chilko Sockeye Mortality
31 Patterns by Dr. Irvine, June 30, 2011-07-10
32

33 MS. BAKER: Thank you.

34 Q I'd like to move over to what's been referred to
35 as the volcano theory. So these questions are for
36 you, Dr. Parsons, and if I could just ask you to
37 turn your mike on?

38 We've heard about a theory based on food
39 availability in the Gulf of Alaska regarding the
40 volcano that occurred in 2008 and how that may
41 have contributed to large returns of sockeye in
42 2010. Can you explain that for us?

43 DR. PARSONS: We have submitted - and I don't know if
44 you've included in your submissions - a new paper
45 on this subject authored by myself and Frank
46 Whitney.

47 MS. BAKER: It's Tab 19 in the Commission's documents,

1 so that could get pulled up.

2 DR. PARSONS: So just to run over the events, there's
3 no doubt in the paper by Hamme that iron entered
4 the Gulf of Alaska from the volcano. There's no
5 doubt that an enormous diatom bloom was generated,
6 and further, the zooplankton increased somewhat by
7 a factor of three, a three-fold increase, although
8 the interpretation of that differs depending who
9 you talk to. I connect it myself with the diatom
10 bloom.

11 This has happened before. It happened in
12 1956. Two years later in 1958 there were 20
13 million salmon returning when a volcano erupted in
14 Kamchatka in 1956. So it's not a unique event
15 although it's somewhat a singular event.

16 In our paper, we do not deny that there can
17 be other events, and I've discussed these already,
18 that you have, for example, a rather sterile water
19 mass which has nothing but flagellates in it. It
20 can be suddenly penetrated by water with a lot of
21 iron in it. That will also produce a result
22 similar to the volcano although I still hold that
23 the volcano was responsible for the massive
24 return.

25 One question which has come up - and it sort
26 of comes up in what Jim was just talking about -
27 why, when you had both the 2008 salmon and the
28 2009 salmon in the water at the same time, why did
29 this only affect the younger fish, the 2008
30 salmon? Our take on that is that what you have
31 taking place is a massive bloom of diatoms which
32 are absorbed very quickly by the zooplankton. The
33 zooplankton will be rather small zooplankton and
34 they will be consumed much more easily by the
35 younger adolescent salmon than the larger 2009
36 salmon which are still waiting for something big
37 to come along. They've already gone through the
38 stage where they were eating small prey. They're
39 a year older.

40 Well, the volcano probably did not have time
41 to produce larger zooplankton, euphausiids, a
42 whole host of smaller fishes and so on that they
43 could have fed on. So it doesn't disturb me that
44 the 2008 sockeye, being very young, could respond
45 very quickly to a fall bloom. These blooms can
46 occur for other reasons. They usually extend as
47 far as October so that from August to October,

1 it's my hypothesis that a massive bloom was
2 generated both of phytoplankton and zooplankton.
3 We know the zooplankton increased by a factor of
4 three, but in the time scales we're dealing with,
5 it would only be the smaller zooplankton that had
6 time to generate. The larger ones would not
7 generate as quickly.

8 So I can accept there is this division
9 between the 2008 and 2009 events.

10 Q Sir, when you refer to the 2009 fish, you're
11 talking about the fish that came back in 2009, a
12 very low return.

13 DR. PARSONS: Yes, I'm sorry. That's the way I'm
14 talking, yes.

15 Q And were all coastal sockeye stocks that would be
16 up in the Gulf of Alaska able to benefit from this
17 bloom?

18 DR. PARSONS: This is a question which is, to me, a
19 very large question as to exactly where the salmon
20 were at that time. My take on this one is that if
21 an event occurs out in the ocean that is very
22 favourable towards young salmon, they may probably
23 move out to take advantage of that.

24 On the other hand, if there are no events in
25 the Gulf, then they may be better to stay near
26 shore because productivity near shore is much
27 greater. On the other hand, predation is much
28 greater near shore, so it's a win or lose
29 situation for a young salmon. If it stays near
30 shore, it gets more food, but it gets eaten more.
31 If it moves offshore, the predators such as the
32 birds and dogfish are much less, and if the food
33 conditions are very good, then it can prosper.

34 But these are really quite hypothetical
35 answers to a question which we have said is
36 somewhat speculative, but worth recording as a
37 possible mechanism for the 34 million salmon.

38 MS. BAKER: Thank you. Could I have that marked, the
39 paper that's on the screen marked as the next
40 exhibit?

41 THE REGISTRAR: Exhibit 1353.

42 MS. BAKER: Thank you.

43
44 EXHIBIT 1353: Parsons and Whitney 2011
45 manuscript re volcanic ash
46
47

1 MS. BAKER:

2 Q We've reviewed, over the last few days with Dr.
3 McKinnell the technical report that PICES did for
4 the Commission, and there's some discussion about
5 this theory in that paper. I'd like to just give
6 you an opportunity to respond to some of the
7 comments made at page 126 of Exhibit 1291, which
8 is the technical report.

9 DR. PARSONS: Me?

10 Q For you, yes.

11 DR. PARSONS: Sorry.

12 Q That's okay.

13 DR. PARSONS: All right. I have several objections to
14 comments that have been made here. I have an
15 objection right at the top about the --

16 MR. LUNN: One-two-six, right?

17 DR. PARSONS: -- volcano.

18

19 The enhanced productivity of chlorophyll in
20 mid to late August likely provided little
21 immediate benefit to immature sockeye...as
22 they do not eat diatoms.

23

24 Nobody ever said they ate diatoms. That's like
25 saying lions don't eat grass, all right? So
26 nobody made that connection, so why is he denying
27 the connection as being made? I'm sorry, but I
28 don't follow that.

29 I also don't follow on page 125. Listen to
30 the following:

31

32 Assuming that the immature sockeye salmon
33 distributions in the Gulf of Alaska in
34 2008...what they were in the 1960s, immature
35 fish would be feeding in the deep water
36 regions of the Gulf of Alaska that summer.

37

38 Okay. If they're feeding in the deepwater region,
39 it means they've passed out of the coastal region.
40 They're off the continental shelf. But then
41 further down, only a sentence later, he says:

42

43 Based on current knowledge, the abundant 2008
44 smolt year would have been migrating along
45 the continental shelf.

46

47 Well, which was it? Were they out on deep water

1 or were they migrating along the continental
2 shelf?

3 I have some other smaller objections about
4 how he believes, towards the end of that
5 paragraph, that somehow the volcano food had to be
6 stored over winter. There are no haystacks in the
7 ocean. Food isn't stored that way.

8 I go back -- no, I think those are the main
9 comments I have.

10 Q Thank you. And just above the graph, the figure
11 that's on the screen right now, there's a sentence
12 that says:

13
14 The dominant copepods --

15
16 This follows up on one of the lines that you did
17 read. He says:

18
19 The dominant copepods with an ability to
20 sequester the enhanced production as stored
21 lipids, would have entered diapause at depth
22 by mid-August.
23

24 Was that something you considered?

25 DR. PARSONS: The major spring bloom starts in May and
26 continues through to June, July and then falls
27 off. That doesn't mean to say there are not lots
28 of organisms for salmon to eat in the Gulf of
29 Alaska. Amphipods, euphausiids, pteropods, all
30 these animals can bloom later in the year and some
31 take advantage of the fall bloom. What he's
32 referring to is the enormous effect of the spring
33 bloom which only lasts for about three months at
34 the most, early from May, June, July. Following
35 that, there's lots of food available from other
36 sources.

37 Q All right, thank you. Dr. Irvine, do you have any
38 observations or comments on the potential impact
39 of a volcanic eruption in 2008 on the 2010
40 returns?

41 DR. IRVINE: Yes, no, I'd like to make a couple of
42 comments. The first is I look forward to reading
43 the manuscript by Drs. Parsons and Whitney 'cause
44 I have a lot of respect for each of those two
45 scientists and I haven't read their paper, and I
46 haven't looked closely at the PICES comments on
47 this issue.

1 But I have no doubt that, based on what Dr.
2 Parsons has said, that the eruption resulted in an
3 increase in the productivity in that part of the
4 Gulf of Alaska. But when I look at the salmon
5 results - and I'm more of a fish person than an
6 oceanographer - it doesn't quite line up. Dr.
7 Parsons indicated why the '09 returning fish would
8 not likely have benefited from this, but I would
9 like to just point out that when the salmon are in
10 their final year of maturation in the ocean,
11 nutrient sources are extremely important to them
12 because they're essentially getting ready to not
13 only migrate all the way back to the river mouth,
14 but then all the way up the river. So they
15 accumulate a lot of mass, they accumulate -- their
16 lipid concentrations go up. They're also putting
17 a lot of energy towards reproductive product. So
18 I guess I would have expected some sort of
19 residual -- some sort of effect for the '09
20 returns. But perhaps that's not fair.

21 But when you look at the actual salmon
22 results, we know that the 2010 sockeye returns to
23 Alaska and to Northern British Columbia, in
24 particular the Skeena and the Nass, were all well
25 below average, the returns to the central coast,
26 in particular Rivers Inlet and the west coast of
27 Vancouver Island, which is Barclay Sound, and the
28 Fraser, as well as the Columbia, were all either
29 high or higher than expected.

30 But these salmon all went to sea in '08, or
31 most of them went to sea in '08 which was a very
32 strong *La Niña*, which was cold water, and so one
33 would anticipate that the survivals of fish going
34 to sea in a *La Niña* would be reasonable. And in
35 fact Dr. Hyatt, in his annual reports to the
36 "State of the Ocean", forecasted higher survivals
37 based on that particular parameter.

38 But then the real issue is -- it's very
39 confusing. People talk about returns, people talk
40 about escapements. Well, returns is just sort of
41 one year to the next. We had low returns in '09
42 and high returns in 2010. Well, those are
43 different groups of fish. There's very little
44 exchange between those two. So really what you
45 want to be looking at is the survival in the
46 ocean.

47 Now, the figures that I just bored you with

1 in my previous discussion, we're talking
2 specifically about the smolt-to-adult survival, so
3 the survival from the lake. Certainly for Chilko
4 sockeye, what we saw was that although the returns
5 in 2010 were really, really high, that was not the
6 result of what went on in the ocean. It was what
7 happened in freshwater. The ocean survivals were
8 higher than they had been in relatively recent
9 years, but they were not different than the long-
10 term average. So --

11 Q It's just like looking at the productivity, for
12 the recruits-per-spawner kind of productivity
13 index?

14 DR. IRVINE: No, I'm looking at the survival. See,
15 recruits per spawner is different. This is what
16 Peterman does, right, he looks at recruits per
17 spawner. But that doesn't differentiate between
18 the fresh water and the marine. So what I'm
19 talking about with the Chilko, which is one of the
20 rare instances where we can actually separate the
21 mortality in the lake from the mortality that
22 occurs downstream from the lake, and for the 2010
23 high returns, the reason the returns were so high
24 was largely a result of an unusually high survival
25 in the lake environment combined with reasonable
26 survival in the ocean.

27 So I guess when I look at it, it's a very
28 sexy -- it's really cool. But I guess I'm a
29 little bit sceptical that it is actually a real
30 reason for sockeye survival in this instance.

31 Q Thank you. Is there anything you wanted to add in
32 response, Dr. Parson, before I move to a new
33 topic?

34 DR. PARSONS: Well, I think what we're getting into,
35 from what I gather from Jim, it really depends
36 where the different stocks of salmon are located
37 in the Gulf of Alaska. We don't have a lot of
38 information on this, but Blackbourn published a
39 paper in the late '80s. Welch and myself
40 published a paper more recently. In both those
41 papers, we indicate that different stocks of
42 salmon go to very specific locations in the Gulf
43 of Alaska. They don't swim around taking
44 advantage of whatever they find.

45 Now, I contacted someone on other animal
46 migrations, birds and reindeer and things, and I
47 said, "Do birds always go from point A to point

1 B?" "Yes, except for five percent which are
2 wanderers." Now, the point of this is do sockeye
3 from the Chilko go out and mix with all the other
4 salmon, or do sockeye from the Chilko go out to a
5 specific location?

6 The two papers I've referred to, first by
7 Blackburn and the second by Welch and myself
8 using radio isotopes, indicate in a cursory manner
9 that sockeye go from one stock location in the
10 rivers and lakes to another stock location. If
11 they do that, then you can expect to have high
12 seas variation.

13 A recent publication from the United Kingdom
14 shows - and this is very recent - that salmon in
15 the Atlantic do exactly that. They go from one
16 location to another specific location in the
17 ocean. In other words, the ocean isn't just a
18 mixture of all these different stocks. So long as
19 the stocks are going to different locations, it
20 means you're going to have a mechanism which will
21 say this year the Chilko Lake salmon did really
22 well, but the Harrison Lake salmon didn't do at
23 all well. Well, they ended up in different
24 locations where maybe there was a physical
25 difference in the water mass and, going back to my
26 theory, that the diatoms were very rich in that
27 region but 500 miles away where the other stock
28 was located, they didn't get the same effect.

29 We don't have that information. We need that
30 information.

31 Q All right. Thank you. I have two questions that
32 I'd like to ask both of you in sequence and
33 they're related. The first question is whether
34 you think that further high seas research needs to
35 be done in the Gulf of Alaska, and if you do think
36 so, how can that work be done? I'll start with
37 you, Dr. Parsons.

38 DR. PARSONS: What we need is real-time data
39 collections. Look, if you go into a physician's
40 office, he doesn't say I've got a model of you,
41 I'll tell you what's wrong with you. He takes
42 your temperature, he counts your red blood cells
43 and assigns you to a certain treatment.

44 I grew up in the biology of agriculture and I
45 took a degree in the biology of medicine. In both
46 those fields of biology, there is an analytical
47 approach to the problem. What we need to have is

1 real-time data on the ocean to be able to form a
2 conclusion the same way as a physician forms a
3 conclusion about you.

4 How are you going to get it? There are new
5 instruments, gliders, that go 1000 miles into the
6 ocean and come back with all kinds of data. We've
7 talked about satellites. There's electronic
8 tagging, the Argo Float Program, and best of all
9 for me would be a satellite that could measure the
10 amount of diatoms in the sea. If we have those
11 data coming in, we can make a diagnosis that the
12 ocean really does look good for salmon this year.
13 There's too much of a time lag in the kinds of
14 data that we're getting at the moment. We want
15 hands-on data.

16 And I want to follow this by saying those
17 data should not be put into a model. Physicians
18 don't make a model out of you. There's a tendency
19 now to make ecosystem models which are not
20 predictive. They're very helpful in understanding
21 mechanisms, but understanding mechanisms, that's
22 quite different from being predictive. We need to
23 be predictive on the basis of the most recent data
24 available.

25 Q And do you see a role for non-scientists in
26 assisting in gathering any of this data?

27 DR. PARSONS: Yes, I do. I think -- and I've been
28 talking -- I play tennis with a couple of
29 fishermen. They've been out to sea in the Gulf of
30 Alaska and they said if they had a boat that was
31 big enough, 120 feet - not your normal type of
32 fishing boat on the coast - they could probably go
33 out --

34 MS. BAKER: Sorry.

35 DR. PARSONS: Oh, I'm sorry. Excuse me.

36 MS. BAKER: Not allowed to lean back here.

37 DR. PARSONS: They could probably go out and collect
38 data. What we need from someone is to be able to
39 go out without the expense of a research vessel,
40 which is incredibly expensive, collect salmon, get
41 the exact position of those salmon from PDS
42 system, bring it back and have the salmon
43 identified by genetic analysis, that the salmon
44 they caught at such-and-such a location was a
45 Chilko salmon. This is the way things are leading
46 up in the Atlantic and, as I said, at least two
47 papers in the Pacific.

1 But I think the fishermen might be willing to
2 do this for a price, but that price would be a lot
3 less than building a lot of research vessels. But
4 it's a very tedious thing to go out and catch
5 salmon in the Gulf of Alaska and find out exactly
6 where they're located.

7 MS. BAKER:

8 Q Thank you. And Dr. Irvine?

9 DR. IRVINE: Well, you know, it's a big question and I
10 think the most important thing, before designing
11 or thinking about any new program, is to be very
12 specific as to the questions you're trying to
13 answer. So are we just trying to figure out what
14 happened with Fraser sockeye? Are we trying to
15 understand the entire ecosystem? Are we trying to
16 predict what's likely going to return? Are we
17 trying to understand the mechanisms?

18 I agree totally with Dr. Parsons. We do need
19 real-time data, but I think -- I'm sure you've
20 heard over the last several days lots of ideas on
21 projects that should be undertaken, but again, it
22 comes back to what is it we're trying -- what are
23 the questions we're trying to answer?

24 Partially, I've got some strong views on some
25 of the types of research that I think are
26 appropriate that are much less expensive that
27 would enable us to understand what's going on in
28 the ecosystem. So I'd like to be able to talk
29 about that.

30 The one really interesting thing with Fraser
31 sockeye is that we've been studying these fish
32 since before I was born, maybe even before Dr.
33 Parsons was born, but I'm not sure about that, but
34 for quite a long time. Despite what you may have
35 sort of gathered over the last few months, our
36 understanding of Fraser sockeye is far better than
37 almost any other salmon species or group of
38 species in the North Pacific. So certainly within
39 Canada, Fraser sockeye is where we've got the most
40 knowledge. But what we haven't done in my view is
41 utilize the information that's been gathered.

42 One of the projects that I'm really keen on
43 is basically a retrospective examination of scale-
44 growth patterns. So I think probably, Mr.
45 Commissioner, you understand that the scales of a
46 fish are like the growth rings on a tree. So we
47 have scale samples going back over 60 years, and

1 each of these scales provides an estimate or a
2 measure of the growth between each of the years of
3 that fish. So you've got the freshwater growth,
4 you've got the first marine growth where these
5 fish are relatively coastal and southern, the
6 second marine growth period where they're perhaps
7 largely confined to the continental shelf, and
8 then the final period when they're on their way
9 back. So we have a huge source of information
10 that would enable us to look at things like
11 density-dependent effects in the marine
12 environment over the last 60 years, as well as to
13 be able to look at, for example, if there was a
14 volcano in 1962, we can look at the growth
15 patterns of the fish that were in the ocean in
16 1962 and we can see whether there was in fact a
17 response. We could do this with the fish that
18 we've been talking about right now simply by
19 looking at the growth patterns.

20 So, to me, the biggest issue with Fraser
21 sockeye, with the possible exception of climate
22 change, is enhancement in Asia. It's the
23 production of pink salmon from the Soviet Union.
24 This is a huge -- I've been there and I've seen
25 the incredible, the exponential increases in the
26 numbers of pink salmon that are being released
27 into the marine environment.

28 So if we can go back in time and look at
29 density-dependent effects in the marine
30 environment, we should be able to anticipate more
31 accurately what's going to happen in the future
32 with respect to things like Asian pink production,
33 or climate change, warming. So I'm a strong
34 believer in sort of making better use of the
35 information that we have, because to do that,
36 you're talking about relatively small amounts of
37 money.

38 I was thinking this morning of some examples,
39 and that was the primary one I thought of. But
40 there's also things like, for instance, we
41 enumerate the smolts that are leaving -- I'm
42 trying to think of things that people haven't
43 talked about probably, so at Chilko Lake there's a
44 video enumeration program of the out-migrating
45 smolts. And what they do is they sample these
46 video images. We have this going back many years,
47 this videotape.

1 Now, we have the technology now to digitize
2 those images and basically not only estimate the
3 numbers of smolts, but the sizes of the smolts
4 that have been leaving over the last multiple
5 years. So again, that's something that's
6 relatively cheap.

7 One of the things I'm very interested in is
8 quantifying the variance associated with the
9 survival time series, and that's the plots I was
10 showing with the two different age classes. To do
11 that requires somebody spending probably several
12 months going through filing cabinets of the Salmon
13 Commission to basically get the old data sheets to
14 find out what the actual sample sizes were. I
15 mean, this is not high-tech stuff, but it would
16 enable us to basically understand how accurate our
17 estimates of survival over the time series have
18 been which, to me, is one of the things we're
19 really interested in.

20 Satellite imagery, we have -- the change in
21 Chilko Lake that I alluded to is perhaps a result
22 of the receding glaciers, and you've got the
23 terminal moraine at the outlet of the glacier that
24 perhaps is providing iron or some other nutrient
25 which is fertilizing the lake which has caused
26 this increase in freshwater survival. So
27 satellite imagery is something that, again, can be
28 better utilized.

29 Dr. Parsons talked about how satellite
30 imagery now can differentiate between the
31 different types of phytoplankton, basically the
32 good planktors and the bad planktors, the diatoms
33 and the flagellates and things like heterosigma
34 which can be a concern out here.

35 So I guess my plug would be that we need to
36 think carefully about the questions we're trying
37 to answer, but let's not forget about these huge
38 stores of data that haven't been properly analyzed
39 and samples as in the scales that haven't been
40 properly examined.

41 Q Is the research on the marine area being well
42 coordinated right now in your view?

43 DR. IRVINE: Research on what?

44 Q All of the different marine areas that you've
45 talked about and what could be done. Is there a
46 coordinated plan that is being implemented?

47 DR. IRVINE: Well, I'm quite involved with NPSC as you

1 probably know, so Dick Beamish and I have been
2 sort of -- he's been the lead, but I've been the
3 second for quite a few years with some sort of
4 variation. So I've been quite involved NPFC and
5 with PICES. Both of those organizations serve to
6 coordinate research.

7 You heard this morning sort of the discussion
8 of the pros and cons of NPFC versus PICES, and
9 NPFC tends to be more the fish people, and the
10 PICES are more the researchers, if you like. But
11 the two need to come together. There's
12 opportunities for improvement in terms of
13 coordination. We definitely do have to interact
14 with scientists from other countries. We are
15 doing that. But I really think what we need are
16 clearer objectives on what it is we're trying to
17 achieve and a reasonable understanding of the
18 likelihood of achieving those objectives.

19 THE COMMISSIONER: Ms. Baker, I think we'll take the
20 break.

21 MS. BAKER: Okay.

22 THE COMMISSIONER: And then we'll adjourn at 4:00. I
23 don't know what...

24 MS. BAKER: I'll talk to my friends over the break
25 about how we're going to deal with the time this
26 afternoon. I have about one question left for
27 these fellows and then I'll be done.

28 THE COMMISSIONER: All right.

29
30 (PROCEEDINGS ADJOURNED FOR AFTERNOON RECESS)
31 (PROCEEDINGS RECONVENED)
32

33 THE REGISTRAR: The hearing is now resumed.

34
35 EXAMINATION IN CHIEF BY MS. BAKER, continuing:
36

37 Q Thank you. I only have two -- well, two-and-a-
38 half questions left. So the first question I want
39 to ask both of you is we've heard about research
40 priorities in different geographic areas already
41 in this -- in the previous few days, and looking
42 at Strait of Georgia, Queen Charlotte Sound,
43 Hecate Strait, south-eastern Alaska or Gulf of
44 Alaska, looking at those geographic areas, where
45 would you prioritize research needs right now?
46 And I'll ask you to start, Dr. Parsons, and we're
47 just looking at those geographic areas, is what

1 I'm asking about.

2 DR. PARSONS: Well, I think where we're missing most
3 data, because it's hard to get to it and it's
4 expensive to operate, is in the Gulf of Alaska.
5 So I would favour some works and programs being
6 started out on the Gulf of Alaska, where I've
7 indicated what we need is real-time data.

8 Q Okay, thank you. And, Dr. Irvine?

9 DR. IRVINE: Well, what I think is most important is to
10 be able to continue to partition the lifecycle
11 into different stages and look at the survival.
12 And so clearly we need -- we need a program or
13 should have a program in the Lower Fraser River as
14 other people have talked about, and it's not a
15 difficult -- well, it's not impossible to do. So
16 we have a multi -- basically, you're estimating
17 the portions of the different populations near the
18 mouth, determining the populations based on the
19 DNA, and then what's really important is to have
20 estimates of survival and abundance at at least
21 one site upstream, for example, the Chilko. But
22 that similar project could also be implemented in
23 areas such as Johnston Strait or Discovery
24 Passage. So somewhere in that area, so that you
25 can basically partition the mortality further
26 along in the time series.

27 Certainly we need work in Queen Charlotte
28 Sound and Gulf of Alaska. There's quite a bit of
29 work already going on in the Gulf of Alaska and
30 also the Bering Sea, so I think the important
31 thing there is to try to collaborate with other
32 researchers and basically piggyback with their
33 programs. I think there's ways that we could
34 expand the focus of existing studies and obtain
35 useful information.

36 Q And then my last question is for you, Dr. Irvine.
37 You've got the unique experience of having done
38 many years of work in the freshwater, and then
39 again many years in the marine environment. Do
40 you think that we need to add additional resources
41 to the freshwater analysis so fry assessments and
42 that kind of thing in the freshwater environment,
43 or is it time to move more to the marine, which is
44 what we've been hearing a bit recently?

45 DR. IRVINE: Well, I mean, I tried to demonstrate in my
46 presentation that we don't want to forget about
47 the lakes, because there's a lot of mortality that

1 occurs in the lakes. Now, I don't know if anybody
2 has spoken to this Commission on all the
3 hydroacoustic estimates of sockeye.

4 Q They have.

5 DR. IRVINE: Has that been done?

6 Q Yes.

7 DR. IRVINE: Okay. So that, you know, that is
8 something that should continue, but it needs
9 additional verification. I think that we have to
10 be focusing more at the conservation unit level.
11 And so we're still continuing to talk about
12 stocks, we're talking about groups of populations
13 with very different life histories, so that even
14 within Chilko Lake there are two conservation
15 units. These are distinct groups of fish with
16 different life histories. You know, so that I
17 think we have to understand the variability within
18 a taxonomic species, and to do that requires
19 additional work in freshwater.

20 MS. BAKER: Okay, thank you. Those are my questions.
21 Now, Canada, my friends have been very cooperative
22 with me in giving me time estimates that should
23 allow us to complete today, so Canada is first and
24 he's estimated 15 minutes.

25 MR. TIMBERG: Yes, and for the record Tim Timberg and
26 Geneva Grande-McNeill for Canada.

27

28 CROSS-EXAMINATION BY MR. TIMBERG:

29

30 Q A series of questions for you, Dr. Irvine. What's
31 your present involvement in the Wild Salmon
32 Policy, Dr. Irvine?

33 DR. IRVINE: Well, as you know, I was very involved
34 right through the development of the Policy, but
35 my main role right now is I co-lead Strategy 3
36 with Dr. Kim Hyatt, and so this is essentially the
37 ecosystem component of the Wild Salmon Policy.

38 Q Thank you. And is the State of Ocean report
39 linked to the Wild Salmon Policy?

40 DR. IRVINE: Yes, it is, and I guess my main interest,
41 my main -- one of my main research interests is
42 trying to do a better job of linking what goes on
43 in the ocean in terms of the physical and chemical
44 aspects with fish production. And so this is
45 essentially an aspect of the Wild Salmon Policy is
46 trying to understand better the factors in the
47 ocean that are controlling salmon survival and

1 production. So that's kind of my, I guess, the
2 official justification for me, co-chairing the
3 Fishery and Oceanography Working Group.
4 Q Thank you. And, Mr. Lunn, I thought we could put
5 into evidence three more State of the Oceans. If
6 we could go to Canada's Tab 27, and can you
7 identify this 2006 state of the ocean document,
8 Dr. Irvine?
9 DR. IRVINE: Yes. This is the Science Advisory Report
10 for --
11 Q So this is the somewhat -- the shorter form of it?
12 DR. IRVINE: That's right. So right now each year we
13 produce two different documents for the State of
14 the Ocean. We produce -- let me just back up a
15 little bit. So the State of the Ocean is a
16 meeting of scientists that occur annually. It's
17 largely made up of scientists and biologists
18 within Fisheries and Oceans Canada, but also
19 includes university people, provincial people,
20 NGOs and some American researchers. But the
21 intent is basically to bring together the
22 oceanographers, you know people like Dr. Parsons,
23 with the fish types, so people like myself, so we
24 can get together and talk and find out what each
25 other are doing. So we have a workshop, the
26 various researchers make presentations, then these
27 are summarized in what we call a research
28 document.
29 Q And that's what this is.
30 DR. IRVINE: No, this is an advisory report.
31 Q Okay. So I'm just cognizant I only have 15
32 minutes, Dr. Irvine, so...
33 DR. IRVINE: Okay.
34 Q So this is the summary document.
35 DR. IRVINE: This is the summary document. This one is
36 peer reviewed.
37 Q Okay.
38 DR. IRVINE: The other document is not.
39 MR. TIMBERG: Okay, thank you. If that could be marked
40 as the next exhibit.
41 THE REGISTRAR: Exhibit 1354.
42
43 EXHIBIT 1354: State of the Pacific Ocean
44 2006, CSAS Science Advisory Report 2007/019
45
46 MR. TIMBERG:
47 Q Okay. And if we could then go to Canada's Tab 29.

1 And, Dr. Irvine, could you identify this document,
2 the 2007 State of the Pacific Ocean?

3 DR. IRVINE: Yes, I do.

4 MR. TIMBERG: Okay. If that could be marked as the
5 next exhibit, please.

6 THE REGISTRAR: Exhibit 1355.

7

8 EXHIBIT 1355: State of the Pacific Ocean
9 2007, CSAS Science Advisory Report 2008/028

10

11 MR. TIMBERG:

12 Q And then if we could go to Canada's Tab 30,
13 please. And could you identify this document, the
14 2008 State of the Pacific Ocean document.

15 DR. IRVINE: Yes, this is the next in the series. Yes.

16 MR. TIMBERG: And if that could be marked.

17 THE REGISTRAR: Exhibit 1356.

18

19 EXHIBIT 1356: State of the Pacific Ocean
20 2008, CSAS Science Advisory Report 2009/030

21

22 MR. TIMBERG:

23 Q So, Dr. Irvine, I'm wondering if you could provide
24 us with an update on the current various status
25 assessments that are being done on sockeye salmon,
26 and to assist you perhaps we could pull up
27 Canada's Tab 28.

28 DR. IRVINE: Okay. So I think what I'd like to point
29 out is that --

30 Q Perhaps before you start you could give us an
31 overview of what assessments are being done and
32 then maybe we'll go to the specific document so we
33 can understand the various --

34 DR. IRVINE: Okay.

35 Q -- assessments that are out there.

36 DR. IRVINE: All right, thank you. So there are status
37 assessments done on sockeye salmon and other
38 species at different levels. And so the document
39 that's on display right now is produced by the
40 IUCN, which is an international conservation body,
41 and I'm a member of the Salmonid Species
42 Specialist Group within this committee. So this
43 committee, actually they do things like they
44 assess the status of panda bears and polar bears
45 and hundreds of species, but they do it at a
46 worldwide level.

47 So we, I was on the committee that actually

1 assessed the status of sockeye salmon through this
2 process, and I think there's a couple of documents
3 that refer to that.

4 MR. TIMBERG: All right. If this could be marked as
5 the next exhibit.

6 THE REGISTRAR: Exhibit 1357.

7

8 EXHIBIT 1357: IUCN Red List - Categories and
9 Criteria (version 3.1)

10

11 MR. TIMBERG:

12 Q And if we could perhaps then go to Canada's Tab
13 33. And Dr. Irvine, can you identify this
14 document titled "Sockeye Salmon" and it has a logo
15 "Red List" in the top left-hand corner.

16 DR. IRVINE: Yes, I can. This was the background
17 documentation for the IUCN listing of sockeye
18 salmon internationally.

19 Q And if we could go to page 12. Could you describe
20 for the assistance of the Commissioner how this
21 document is relevant to Fraser River sockeye
22 salmon?

23 DR. IRVINE: Certainly. So the IUCN is, as I
24 mentioned, this is the international group that
25 assesses the status of all sorts of different
26 species. And I don't quite remember the year this
27 was done, but probably five or seven years ago
28 there was an assessment done on sockeye salmon in
29 the world. And so essentially what you're looking
30 at here are what they call subpopulations of
31 sockeye salmon in the south-eastern range of their
32 distribution. And I think the point I'd like to
33 make is this includes the Fraser, but it also
34 includes sockeye subpopulations right down into --
35 into the Columbia, and then up into Southeast
36 Alaska.

37 And the point I think I should make here is
38 that there's a lot of variability in the status of
39 populations of sockeye salmon. And but this is
40 done at a relatively large geographical area, so
41 for instance unit 68 is -- comprises about
42 approximately maybe 40 percent of the Fraser River
43 watershed. So there's a number of different
44 populations that are contained within -- within
45 that group.

46 So when the IUCN looks at status, it's
47 relatively new that they're looking at it within a

1 taxonomic species. So traditionally when IUCN has
2 looked at the status, they would look at the
3 taxonomic species. So they'd look at the status
4 of polar bears.

5 Q Right.

6 DR. IRVINE: Salmon, of course, are different with all
7 these different populations. So this is one
8 level.

9 Now, the criteria that the IUCN uses are
10 essentially the same as we use in Canada for
11 COSEWIC and the **Species at Risk** designations. And
12 so you've probably heard that there was a COSEWIC
13 report down on Cultus sockeye. There's another
14 one that is being -- that's in preparation for
15 Fraser sockeye, and that will be completed within
16 the next eight to ten months. And that's looking
17 at a much finer geographic unit, in fact, it's
18 looking at it from a conservation unit basis. And
19 I'm sure what will be determined is that within
20 the Fraser there are conservation units that are
21 relatively healthy, and there are conservation
22 units that are unhealthy and that a bunch -- a
23 bunch in between.

24 Q And who's doing the work on this present COSEWIC
25 assessment?

26 DR. IRVINE: Well, Dr. Blair Holtby has a contract to
27 do this, and I believe he's working with Dr. Chris
28 Wood. Dr. Holtby presented a sort of preliminary
29 version of the methodology underlying his status
30 designation approach last week at the Biological
31 Station.

32 So I think the point is that there's -- you
33 can assess status using different metrics, and you
34 can assess it at different levels. So you can use
35 the taxonomic species, you can use subpopulations,
36 you can use conservation units. And so there's
37 this continuum of different biological groupings
38 that you can assess the status of.

39 Q And can you give an update for the assistance of
40 the Commissioner on Sue Grant's work on
41 conservation unit assessments?

42 DR. IRVINE: Yes. So my --

43 MS. BAKER: Sorry, if I could just interrupt for a
44 moment. Mr. Commissioner, I have some difficulty
45 with this. This panel is to deal with marine
46 habitat and I'm not discounting any of this
47 evidence that Dr. Irvine is giving, which I'm sure

1 is important and relevant. However, we're dealing
2 with the marine theme today and all of our
3 colleagues today will be prepared for the marine
4 theme, not dealing with COSEWIC or **SARA** listings
5 or updating on CU status. And I'm not -- I don't
6 know how far along we can go. He's only got 15
7 minutes. He's got five minutes left and I am
8 concerned that it's not really fair to the other
9 participants to have a bunch of new evidence come
10 in on topics which nobody's prepared to deal with
11 today.

12 So I don't know what we can do with this.
13 There's only a limited amount of time here today,
14 so it's a very superficial, you know, content that
15 can be given on these topics, which is entirely
16 out of context for what we're dealing with today.
17 So I do have a concern with this examination
18 continuing in this way.

19 MR. TIMBERG: I'm prepared to move on. Dr. Irvine was
20 a member, and it seemed certainly relevant to the
21 terms of reference.

22 This morning Justice Cohen -- oh, if I could
23 have that marked as an exhibit, please.

24 THE REGISTRAR: Exhibit 1358.

25
26 EXHIBIT 1358: IUCN - Sockeye Salmon
27 (*Oncorhynchus nerka*) Supporting documentation
28 and summary for Red List assessments at
29 species and subpopulation levels
30

31 MR. TIMBERG:

32 Q Dr. Irvine, this morning the Commissioner asked a
33 question with respect to what's the best way to
34 resolve scientific disagreement amongst
35 scientists. Do you have a brief comment on that?

36 DR. IRVINE: Well, first of all, you know, with respect
37 to my colleagues, scientific disagreement is
38 common and healthy, and that's how science moves
39 forward. You have to have disagreements. But the
40 way to resolve these issues is essentially through
41 the peer review process. So we've seen a number
42 of documents presented this week that are peer
43 reviewed, and some that are not. You know, I tend
44 to place a lot more influence or weight on those
45 that have gone through a proper thorough peer
46 review process.

47 Q And what is a proper peer review process?

1 DR. IRVINE: Well, you know, there's all sorts of
2 levels of peer review, and there's sometimes
3 you'll have review by your peers, and that's not a
4 peer review process. I mean, normally, a good
5 peer review process should have some anonymity,
6 and the better journals will have relatively high
7 rejection rates because it's difficult to get a
8 paper published in a really good journal. So that
9 it's reasonable to expect that, you know, that not
10 everything is worthy of publishing in the primary
11 literature.

12 Q Do you have a recommendation with respect to the
13 use of peer review and the papers that have been
14 filed before this Commission?

15 DR. IRVINE: Well, certainly, you know, articles that
16 have gone through a formal peer review process
17 should be given more weight than articles that
18 have not. That doesn't mean that the information
19 in un-reviewed articles is not valid, but it
20 hasn't been proven.

21 MR. TIMBERG: Thank you. Those are all my questions.

22 THE COMMISSIONER: Thank you, Mr. Timberg.

23 MS. BAKER: The next questioner would be Mr. Alan
24 Blair.

25 MR. BLAIR: Mr. Commissioner, for the record, Alan
26 Blair with Shane Hopkins-Utter appearing for the
27 B.C. Salmon Farmers Association. I have four
28 topics in ten minutes.

29 Mr. Lunn, could we see Exhibit 1227, please.
30 There's a graph on PDF 144.

31
32 CROSS-EXAMINATION BY MR. BLAIR:
33

34 Q Dr. Irvine, these questions are for you. The
35 document that we've brought up and the graph in
36 the upper left corner on the screen refers to the
37 increasing of contaminant concentrations in the
38 Strait of Georgia. You're familiar with this
39 graph, of course?

40 DR. IRVINE: I am familiar with it. I'd like to know
41 which document this is from, though, if I could.

42 Q Sure. We can go back a bit to the -- can you go
43 back to the --

44 DR. IRVINE: The first page.

45 Q -- cover page, Mr. Lunn.

46 DR. IRVINE: Okay, thank you.

47 Q Thank you. And my questions relate primarily to

1 the impact of these increasing concentrations of
2 contaminants in the Strait of Georgia. And in the
3 margin of the -- of the graph, there's a reference
4 to pharmaceuticals and PBDEs, and PBDEs are
5 sometimes referred to as endocrine disruptors; is
6 that correct?

7 DR. IRVINE: That is correct, but this is out of my
8 area of expertise, and this is a document that
9 was, I believe, 160 pages in length, so I won't be
10 able to speak authoritatively on this particular
11 figure.

12 Q All right. You were listed as one of the authors,
13 I'm correct?

14 DR. IRVINE: I'm listed as one of the editors, that's
15 correct.

16 Q I'm sorry, editors.

17 DR. IRVINE: Yes. So the authorship is up top.

18 Q Are you able to comment generally, then, or
19 perhaps not, on whether or not pharmaceuticals
20 that are intended to have biological effects on
21 people can also have biological effects on
22 organisms when they're flushed into the marine
23 environment?

24 DR. IRVINE: I would rather not. This is out of my
25 area of expertise.

26 Q I appreciate that.

27 DR. IRVINE: Thank you.

28 Q Can we -- it's already marked as an exhibit. Can
29 we go to B.C. Tab number 11, Mr. Lunn. And, Dr.
30 Irvine, the document that is being pulled up is
31 titled the "Fraser river sockeye salmon marine
32 survival decline and harmful blooms of
33 *Heterosigma*" algae bloom.

34 DR. IRVINE: Yes.

35 Q We're getting closer to your comfort level?

36 DR. IRVINE: Closer, yes. No, I've reviewed this
37 paper.

38 Q Thank you. This paper refers to the fact that
39 *Heterosigma* has been detected in B.C. coastal
40 waters for about 50 years; is that correct?

41 DR. IRVINE: I believe so, yes.

42 Q And are you able to indicate whether you're
43 familiar with any linkage of the *Heterosigma* bloom
44 to returning numbers of salmon? Is there a
45 relationship?

46 DR. IRVINE: Yes, there's -- as presented in this
47 paper, there is a correlation between the

1 *Heterosigma* blooms and the survival of Fraser
2 sockeye salmon.

3 Q And that's fairly set out in a very brief way in
4 the abstract, which is on the screen now?

5 DR. IRVINE: Yes, this reflects the information in the
6 manuscript, in the paper, yes.

7 MR. BLAIR: Thank you. Might this be marked as the
8 next exhibit.

9 THE REGISTRAR: Exhibit 1359.

10

11 EXHIBIT 1359: Rensel et al, Fraser river
12 sockeye salmon marine survival decline and
13 harmful blooms of *Heterosigma akashiwo*, 2010
14

15

15 MR. BLAIR: Thank you.

16

16 Q Mr. Lunn, Salmon Farmers Tab 10, please. And Dr.
17 Irvine, you're an editor of this document, as
18 well.

19

19 DR. IRVINE: That's correct.

20

20 Q I wonder if, Mr. Lunn, you could go to page 16 and
21 17. It's the PDF -- I'm sorry, the PDF pages.
22 And could you split the screen, please, and also
23 bring up Exhibit 1326 - it's like a quiz - and go
24 to PDF page 14. Take a moment, Dr. Irvine.
25 You're familiar with both of these documents?

26

26 DR. IRVINE: Yes, I am.

27

27 Q My questions relate to the -- if you can look to
28 the left page, left side of the page, the red and
29 the blue in the graph on the left side of the
30 screen. This refers to water temperatures.

31

31 DR. IRVINE: Yes. This is a work that was by Dr.
32 Holmes, where he's looking at correlations between
33 sea surface temperature anomalies and albacore
34 tuna abundance.

35

35 Q And these water temperatures are on the west side
36 of Vancouver Island?

37

37 DR. IRVINE: Well, I'm just reading the text, and it
38 says "Amphitrite Point".

39

39 Q Figure 9, it says the southwest coast of Vancouver
40 Island.

41

41 DR. IRVINE: Yes, I guess that's correct. Yes.

42

42 Q We saw this graph in the last panel, and there
43 were some discussions about water temperatures
44 generally. And so the blue, I understand,
45 indicates colder than normal waters, and red
46 indicates warmer than normal waters for that
47 location? You're familiar with that?

1 DR. IRVINE: Yes, that's correct.

2 Q And if you can then look to the other side of the
3 screen, to the other article that I have on the
4 viewer. I understand from -- if you could take a
5 moment to peruse the bottom of PDF page 16, and
6 the top of page -- the next page, there's a
7 reference to catch-per-unit-efforts for juvenile
8 salmon.

9 DR. IRVINE: Yes, that's right.

10 Q And as I understand it, when you read those two
11 references together and link them back to the
12 graph on the other side of the split screen, there
13 seems to be a correlation, and that may not be the
14 right word, but I'll start with that, showing that
15 you have higher than normal catches when the
16 water's cold on the West Coast, and lower than
17 normal catches when the water is warm on the West
18 Coast of Vancouver Island. Do you see those
19 references on those documents and do you draw the
20 same conclusions?

21 DR. IRVINE: Well, actually, the figure on the right is
22 talking about salmon survival.

23 Q Yes.

24 DR. IRVINE: And the figure on the left is talking
25 about tuna catch.

26 Q Yes. But it refers to water temperatures, so the
27 figure on the --

28 DR. IRVINE: That's correct.

29 Q -- the figure on the left is reference for water
30 temperature. I appreciate it's albacore, but it's
31 reference for the water temperature.

32 DR. IRVINE: Yeah. That's correct.

33 Q So where the water is cold on the West Coast, left
34 side of your screen.

35 DR. IRVINE: Yeah.

36 Q You have a high incidence of catch for salmon,
37 right side of your screen, correct?

38 DR. IRVINE: Well, not catch, survival.

39 Q I'm sorry survival. And likewise when it's -- the
40 water's warm, the survival is lower?

41 DR. IRVINE: The water tends to be -- the survival
42 tends to get lower, that's correct. Yes.

43 Q Would you call that correlation?

44 DR. IRVINE: Well, this is -- it's a principal
45 component analysis, so it's a different
46 statistical approach. But there is a correlation
47 between -- what we found on the West Coast of

1 Vancouver Island, and this is work of Dr. Trudel
2 and Dr. Dave Mackas primarily, is that in years
3 that are relatively -- where the sea surface
4 temperature is relative cool, you tend to have a
5 copepod community that's dominated by lipid-rich
6 individuals that tends to favour the early marine
7 growth, survival of the -- of coho salmon and
8 chinook salmon.

9 Q So these two documents read together, one could
10 conclude that, for example, salmon stocks that
11 migrate up the West Coast of Vancouver Island,
12 perhaps Fraser River, Fraser -- I'm sorry,
13 Harrison Lake sockeye, perhaps some of the
14 Columbia River fish have a higher survival rate in
15 cooler water, in cooler water years than in warmer
16 water, warmer water years?

17 DR. IRVINE: Well, my recollection is that this figure
18 on the right is, if you scrolled up a little bit,
19 that I think it's --

20 Q I've scrolled -- I've scrolled already --

21 DR. IRVINE: It's not --

22 Q (Indiscernible - overlapping speakers).

23 DR. IRVINE: I don't think it's sockeye. I think it's
24 chinook and coho, so it's different. All right?

25 Q Yes. But does the principle that the salmon will
26 do better in colder water than in warmer water
27 hold true?

28 DR. IRVINE: That's generally true, yes.

29 Q Yes. So one would expect the higher survival in
30 the cold water years on the West Coast and less
31 survival on the warm water years?

32 DR. IRVINE: In general, yeah, and you can see '08 was
33 anomalously cool, and those were the fish for
34 sockeye that generally returned in 2010 at high
35 abundance.

36 MR. BLAIR: Thank you for your time.

37 MS. BAKER: Thank you. And the next -- did you want to
38 mark one of those documents, Mr. Blair?

39 MR. BLAIR: I'm sorry, yes, please. Thank you.

40 MS. BAKER: So the next questioner will be Mr. Leadem.

41 THE COMMISSIONER: Just before that, is Tab 10 the one
42 you want to mark, Mr. Blair?

43 MS. BAKER: Is it Tab 10 you want marked?

44 MR. BLAIR: I'll say yes more closely.

45 THE REGISTRAR: Exhibit number 1360.

46
47

1 EXHIBIT 1360: Crawford and Irvine, State of
2 physical, biological, and selected fishery
3 resources of Pacific Canadian marine
4 ecosystems CSAS Research Document 2009/022
5

6 MR. LEADEM: For the record, Leadem, initial T.,
7 appearing for the Conservation Coalition. Could I
8 have Exhibit 1358, please, Mr. Lunn, it's the IUCN
9 document.

10
11 CROSS-EXAMINATION BY MR. LEADEM:
12

13 Q I can't resist asking you a question about this,
14 Dr. Irvine, now that it's entered as an exhibit
15 and I've had a chance to quickly scan it, because
16 I like what I see. Page 2 of the document I find
17 -- and this is an international group that is
18 providing advice for the conservation of
19 endangered wildlife, and the focus here is Fraser
20 River sockeye specifically. At the bottom of the
21 page I see the key threats to the species
22 identified by the SSG, which is the group that you
23 are a member of; is that right?

24 DR. IRVINE: That's correct, but I would like to
25 emphasize that the focus is not Fraser River
26 sockeye. The focus is sockeye salmon in the
27 world.

28 Q Yes.

29 DR. IRVINE: So this includes right from the Soviet
30 Union through to California.

31 Q But it did show that Canada, it says that:

32
33 While all of the countries listed above
34 contain threatened subpopulations, the
35 greatest number and concentration of
36 threatened subpopulations were located in the
37 Province of British Columbia, Canada.
38

39 And then your counsel took you to the map and that
40 map showed that some endangered sockeye were
41 located actually in the Fraser River, correct?

42 DR. IRVINE: That's correct.

43 Q And what I found to be instructive is actually at
44 the bottom of the page there's some advice being
45 proffered by this organization to DFO, so I would
46 imagine that you would be wearing your IUCN hat
47 and then saying to yourself as DFO, for example:

- 1 • Emphasize the pivotal role that Fisheries and
2 Oceans Canada play in protecting sockeye
3 salmon, and encourage them to fully implement
4 their Wild Salmon Policy...

5
6 So basically you're saying with your IUCN hat on,
7 let's implement this Wild Salmon Policy quickly;
8 is that right?

9 DR. IRVINE: That's correct, yes.

10 Q And the second one is also instructive:

- 11
12 • Shift fishing pressure from coastal and lower
13 river locations to more terminal, upriver
14 locations...

15
16 Once again that's advice coming from this
17 international group; is that right?

18 DR. IRVINE: That's correct. Now, that's not specific
19 to Fraser sockeye, of course.

20 Q No, of course not, but it's to help the endangered
21 species of sockeye that are listed there in --

22 DR. IRVINE: Well, yeah, there's, I think, an
23 increasing tendency internationally to shift
24 towards more terminal fisheries.

25 Q Okay. And then my final question to you, Dr.
26 Parsons, and I hope that hopefully we can be
27 brief, is that I like your idea of forecasting,
28 not by modelling but by observational data. And
29 so the question is, is do you think that we could
30 do that with some degree of precision, as well as
31 some degree of cost effectiveness by focusing upon
32 food sources in the Gulf of Alaska, by focusing
33 upon the phytoplankton or the zooplankton in the
34 Gulf of Alaska?

35 DR. PARSONS: Yes. It has to be done, however, without
36 burdening us with research vessels.

37 Q Yes.

38 DR. PARSONS: So that if possible we've got to find
39 ways of using instruments which give us a lot of
40 data relatively cheaply.

41 Q Right. But you would eliminate the reliance upon
42 modelling, which has forecasting and sometimes,
43 most of the time, off, as we heard evidence of
44 earlier in the year, and you would substitute that
45 kind of a forecast for actual observational data
46 that you can obtain?

47 DR. PARSONS: Absolutely. You've said it better than I

1 could say it. We've had too much of modelling
2 which does not predict the next six months of this
3 year. It does help us understand the mechanism,
4 and that is very important. But to predict the
5 next six months of what's going to happen, we need
6 this real time data, the same as the two other
7 professions of biology, agriculture and medicine,
8 use real time data, and we have not seemed to have
9 evolved that in fisheries biology.

10 MR. LEADEM: Thank you, Dr. Parsons. Those are my
11 questions.

12 MS. BAKER: Thank you, Mr. Rosenbloom.

13 MR. ROSENBLOOM: Thank you very much. Gentlemen, my
14 name is Don Rosenbloom. I appear on behalf of
15 Area B Seiner, Area D Gillnet. I have a series of
16 brief questions.

17

18 CROSS-EXAMINATION BY MR. ROSENBLOOM:

19

20 Q Dr. Parsons, firstly this particular volcanic
21 eruption that has been the focus of your
22 discussion today that took place in 2008, I gather
23 was in the Aleutian Chain; is that correct?

24 DR. PARSONS: Yes, it was.

25 Q And are you able to tell us the plume that
26 developed as a result in terms of the drop of
27 volcanic ash, how extensive was that plume? Did
28 that plume spread out throughout the Gulf of
29 Alaska right to the Continental Shelf of the
30 coast, or what?

31 DR. PARSONS: Well, the best answer to that is in the
32 satellite imagery of the chlorophyll. And the
33 chlorophyll does seem to be distributed throughout
34 the Gulf of Alaska, which doesn't mean that it was
35 necessarily evenly distributed, but it seems that
36 the ash covered pretty well the whole of the Gulf
37 of Alaska.

38 Q Right. And that being the case, would you not
39 imagine that all stock, all fish stock that
40 mingled in the Gulf of Alaska would benefit from
41 this phenomenon, at least certainly the stock that
42 would be returning in 2010?

43 DR. PARSONS: Not necessarily. Because as I've
44 mentioned in connection with that, first of all,
45 although the chlorophyll appears from the
46 satellite to be even, it may not have been evenly
47 distributed. And secondly, there's strong

1 evidence now that different stocks go to different
2 parts --

3 Q Yes.

4 DR. PARSONS: -- of the Gulf. And I had contacted a
5 lady salmon biologist in Alaska, and she said, of
6 course, we had no effect from the ash. Well, they
7 already have a lot of diatom growth all along the
8 coast of Alaska. They have different problems.
9 It's not a problem of iron shortage.

10 Q Right.

11 DR. PARSONS: So it could have been, for example,
12 spinning gyres out in the Gulf that already had
13 iron. And so it's not a quite a uniform picture
14 as perhaps you're suggesting (indiscernible -
15 overlapping speakers).

16 Q So to explain away evidence we've heard previously
17 and certainly heard today, that the returns to the
18 Nass and Skeena systems were disappointing in
19 2010, as opposed to what happened south of,
20 whatever, Rivers Inlet. Would you partly explain
21 that on the assumption that the stock from these
22 various watersheds on the West Coast are
23 congregating within communities within the Gulf.
24 In other words, applying what you know from the
25 Atlantic Ocean experience, and that you have to
26 assume that that's going on in the Pacific and
27 that the Skeena and Nass stock were not benefiting
28 in the same way that the Fraser stock were. Is
29 that your theory?

30 DR. PARSONS: Yes.

31 Q Yes.

32 DR. PARSONS: I would suggest what you're saying is
33 correct, but it is speculation --

34 Q Yes.

35 DR. PARSONS: -- until we get some data on that.

36 Q Yes. Because you don't know as yet, we don't know
37 as yet whether the various watershed stocks are
38 indeed sitting as in community -- as communities.

39 DR. PARSONS: Yes.

40 Q My next question to you is obviously the Aleutian
41 Chain is active in terms of volcanic eruptions
42 from time to them. Have you, sir, had the
43 opportunity to determine whether previous
44 significant eruptions, volcanic eruptions within
45 Alaska, have led to some correlation of stock
46 abundance of salmon on our coast.

47 DR. PARSONS: There is only the one that I mentioned

1 from Kamchatka.

2 Q Yes.

3 DR. PARSONS: And that was in 1956. And again it was a
4 two-year period, and the ash apparently came right
5 across the Gulf of Alaska and the returns in 1958
6 were 20 million salmon, which sticks out like a
7 sore thumb in the lower levels pre-1958. That's
8 the only other one, other than suggestions that
9 Gobi dust does the same thing.

10 Q All right. And my last series of questions relate
11 to this very issue of correlation of volcanic
12 activity with stock abundance. Obviously there
13 are other regions of the world where there's
14 active volcanic activity, Japan, in particular,
15 the southern island of Kyushu is an example, other
16 volcanic activity in Southeast Asia, we know of it
17 obviously in Iceland with recent events. My
18 question to you is this, sir. As a scientist, has
19 your community that's focusing in this area done
20 any studies that correlate volcanic activities in
21 these other regions of the world with stock
22 abundance?

23 DR. PARSONS: We have mentioned one which occurred in
24 the tropics, which greatly increased productivity,
25 and it wasn't connected with salmon. If you go to
26 the Atlantic, the Atlantic is not short of iron.
27 So when the Icelandic volcanoes go up, you don't
28 get any effect of increased Atlantic salmon
29 productivity. So it depends not only on the -- it
30 depends on the location and the timing, because if
31 this happens in the middle of winter, it's pretty
32 hard to get enough light to grow anything. So the
33 volcanic dust coming down, shall we say from a
34 volcano in December, wouldn't have the same effect
35 as a volcano that exploded in June or July, or
36 something.

37 Q Well, let's take the Asian experience. Is there an
38 iron deficiency in those waters, marine waters?

39 DR. PARSONS: There is much less iron deficiency in the
40 Western Gyre, which is very similar to the Eastern
41 Gyre. The Eastern Gyre is the Gulf of Alaska.
42 Off the coast of Japan, where they also experience
43 volcanoes, the Sea of Okhotsk entrains a lot of
44 iron into the system. We have no equivalent
45 system. So it would tend to have a much greater
46 effect on the Gulf of Alaska than on the Western
47 Gyre.

125

PANEL NO. 52

Cross-exam by Mr. Rosenbloom (GILLFSC)

Cross-exam by Ms. Gaertner (FNC)

1 Q Well, my precious time is up, but you can't point
2 to experiences in other regions of the world where
3 they had determined a correlation between volcanic
4 eruption and stock abundance; is that fair to say?

5 DR. PARSONS: It's fair. I couldn't write any papers
6 about other regions, really.

7 Q Yes.

8 DR. PARSONS: But I suspect there is probably rather
9 undocumented evidence that that is true.

10 MR. ROSENBLOOM: I thank you very much.

11 THE COMMISSIONER: Ms. Gaertner, I don't mind you
12 starting if you can finish at 4:00.

13 MS. GAERTNER: I'll finish at 4:00.

14 THE COMMISSIONER: All right, thank you.

15 MS. GAERTNER: It's Brenda Gaertner for the First
16 Nations Coalition and with me, Crystal Reeves. In
17 fact, Ms. Baker has asked me to finish at half a
18 minute before 4:00 so she could do one thing. So
19 I've got two very quick things.

20

21 CROSS-EXAMINATION BY MS. GAERTNER:

22

23 Q Dr. Parsons, you mentioned two papers, one by, I
24 heard you say, Blackbourn, and one by Welch and
25 Parsons, that you've reviewed that deal with
26 different stocks going to very specific locations
27 in the Gulf of Alaska; is that correct?

28 DR. PARSONS: Yes.

29 Q And you agree that those papers are reliable, at
30 least to begin to confirm that proposition?

31 DR. PARSONS: Yes, they want to be confirmed, but I
32 think there was an excellent suggestion.

33 Blackbourn was a complete pioneer in his early
34 papers in the late '80s.

35 Q Mr. Commissioner, we don't have those documents
36 before us, but they do contradict, or at least
37 balance some of the evidence we heard from Dr.
38 Beamish. I would like those tendered, and I
39 wonder if, Dr. Parsons, you could get those to us,
40 so we could have those tendered into evidence.
41 Would you be willing to do that?

42 DR. PARSONS: Yes, I'll do that.

43 Q Thank you. Dr. Irvine, I just have two quick
44 questions of you. One is, I might have missed
45 something in this hearing, it's quite possible,
46 but this is the first time I've heard that Blair
47 Holtby and Chris Wood are doing COSEWIC and **SARA**

July 8, 2011

1 reviews on the Fraser salmon; is that new?

2 DR. IRVINE: My understanding is that they -- they were
3 awarded a contract to undertake that work over the
4 upcoming months.

5 Q And that's just very recent. And how far is that
6 work, and when do we expect it completed?

7 DR. IRVINE: I think it's at a very preliminary stage
8 right now.

9 Q All right. I wonder if -- I guess through your
10 counsel we'll continue to get updated on the work
11 that the Department is doing. And then I was very
12 curious when you said that -- I thought it was
13 very, I guess, helpful that we get practical
14 suggestions on things that can move forward, and
15 this retrospective analysis of scale growth
16 patterns, that's information we already have, why
17 is that information -- why is that work not done?

18 DR. IRVINE: Resources, or lack of resources.

19 Q When is the most recent time that you've sought to
20 do this?

21 DR. IRVINE: Well, I was part of the group that
22 included Dr. Trudel over there that submitted a
23 proposal to do this type of work. And it's kind
24 of interesting, Mr. Commissioner, because the
25 official reason we heard that it wasn't considered
26 was because they're waiting for the Cohen
27 Commission to tell them what to do. So we have
28 actually --

29 Q But --

30 DR. IRVINE: Just to elaborate a little bit, we have
31 actually initiated this work this summer with a
32 co-op student. But we're starting with chum
33 salmon. But there's all sorts of -- yeah, so
34 anyway, it would be a project that would likely
35 take -- it would be suited for, say, a post-doc to
36 work on for a couple of years. It's that sort of
37 level of effort that would be required.

38 Q So for some reason that was refused, but the Blair
39 Holtby and Chris Wood has been accepted?

40 DR. IRVINE: Well, no, it's totally different funding
41 sources. So I'm not really privy to the decisions
42 as far as COSEWIC funding, but my understanding is
43 that they were awarded a small contract to do an
44 assessment of Fraser sockeye salmon.

45 MS. GAERTNER: Don't get me wrong. I'm glad the
46 assessments are going done, I'm just curious about
47 how it is. Those are my questions at this time,

1 Mr. Commissioner.
2 THE COMMISSIONER: Thank you very much, Ms. Gaertner.
3 MS. BAKER: Thank you very much, and thank you to the
4 witnesses for coming today. I have one
5 housekeeping matter, which is PPR number 15 has an
6 appendix now prepared, which simply puts together
7 all the cited sources in a big list, and so the
8 list of documents on the website are cited, and
9 there's another list of acronyms. So those need
10 to get added to PPR number 15, just as PPR15A, I
11 think. So those have been circulated already to
12 all the participants' counsel, but they just as a
13 housekeeping matter need to be marked.
14 THE COMMISSIONER: Thank you very much.
15 MR. LUNN: Maybe I can just assist with this part. So
16 that will be -- those two documents will be marked
17 as PPR15A.
18 MS. BAKER: Yes, thank you.
19
20 PPR15A: Appendices B and C to PPR15
21
22 THE COMMISSIONER: Thank you.
23 MS. BAKER: Okay. so we are --
24 THE COMMISSIONER: Yes, thank you to Dr. Irvine and Dr.
25 Parsons very much for your attendance and for
26 answering questions of counsel. Dr. Parsons, if
27 you could deliver -- if you have those documents
28 and they're available, you could deliver them to
29 Ms. Baker. That would be very kind of you. Thank
30 you.
31 DR. PARSONS: To who?
32 MS. BAKER: To me.
33 THE COMMISSIONER: To Ms. Baker, or Ms. Tsurumi, either
34 one.
35 MS. BAKER: Okay. Well, thank you very much to
36 everybody, and enjoy the five weeks off from this.
37 THE COMMISSIONER: Well, I'm not sure people are going
38 to be enjoying the five weeks. But I, too, wanted
39 to thank first of all, Commission counsel for the
40 preparation for this hearing, and to participants'
41 counsel very much, not everyone is here today -
42 I'm sorry, I'm often accused of not speaking into
43 this apparatus, but it never really wants to
44 cooperate - not everyone is here today, but those
45 who are here today will know how grateful I am for
46 the cooperation you've shown, essentially from day
47 one, at least in this hearing room.

1 It's often said judges shouldn't be thanking
2 lawyers for being courteous and respectful and
3 cooperative in the courtroom, but I am of the
4 school that believes it's always good to thank
5 lawyers for being so highly professional in all
6 that you do in this room, and for the degree to
7 which you assist me. It's of immeasurable
8 assistance to me when you show that kind of
9 courtesy and respect and cooperation. I know it's
10 part of your DNA as lawyers, but it's not always
11 shown in the courtroom, from my experience over
12 the course of many years, and it has been in this
13 hearing room and I'm very grateful for that. And
14 I know it will continue as we move towards the
15 closure of our hearings, which get underway on
16 August 18th, according to the cue card here, and
17 end sometime in September. I can't remember when.

18 So I wanted to thank you for that. I wanted
19 to wish you a healthy and happy break, and hope
20 you don't forget about this Commission and that
21 you'll be thinking about your submissions, and
22 working on those to the extent that you're able
23 to.

24 And I wanted to particularly thank our crew
25 here. Mr. Registrar, who filled in this week for
26 Mr. Giles, thank you very much for your assistance
27 in doing that; Mr. Lunn, who is on top of his game
28 every day and does a superb job; and to Madam
29 Registrar, who -- Madam Recorder, I should say, I
30 apologize, who also does a superb job for us. All
31 of these people make it possible for us to get
32 through this very heavy and daunting task. So
33 thank you all very much and I'll see you on August
34 the 18th. Thank you.

35 THE REGISTRAR: This hearing is now adjourned and will
36 reconvene again on August 18, 2011.

37
38 (PROCEEDINGS ADJOURNED TO AUGUST 18, 2011 AT
39 10:00 A.M.)
40
41
42
43
44
45
46
47

1 I HEREBY CERTIFY the foregoing to be a
2 true and accurate transcript of the
3 evidence recorded on a sound recording
4 apparatus, transcribed to the best of my
5 skill and ability, and in accordance
6 with applicable standards.
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10 _____
11 Pat Neumann
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13 I HEREBY CERTIFY the foregoing to be a
14 true and accurate transcript of the
15 evidence recorded on a sound recording
16 apparatus, transcribed to the best of my
17 skill and ability, and in accordance
18 with applicable standards.
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23 Karen Hefferland
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26 true and accurate transcript of the
27 evidence recorded on a sound recording
28 apparatus, transcribed to the best of my
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35 Susan Osborne
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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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47 Diane Rochfort