

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.

Tuesday, September 20, 2011

Tenue à :

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

le mardi 20 septembre 2011

APPEARANCES / COMPARUTIONS

Wendy Baker, Q.C. Maia Tsurumi	Associate Commission Counsel Junior Commission Counsel
Tim Timberg Charles Fugère	Government of Canada ("CAN")
Clifton Prowse, Q.C. Tara Callan	Province of British Columbia ("BCPROV")
No appearance	Pacific Salmon Commission ("PSC")
No appearance	B.C. Public Service Alliance of Canada Union of Environment Workers B.C. ("BCPSAC")
No appearance	Rio Tinto Alcan Inc. ("RTAI")
Shane Hopkins-Utter	B.C. Salmon Farmers Association ("BCSFA")
No appearance	Seafood Producers Association of B.C. ("SPABC")
No appearance	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.

Phil Eidsvik	Southern Area E Gillnetters Assn. B.C. Fisheries Survival Coalition ("SGAHC")
Chris Harvey, Q.C.	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")
John Gailus	Western Central Coast Salish First Nations: Cowichan Tribes and Chemainus First Nation Hwlitsum First Nation and Penelakut Tribe Te'mexw Treaty Association ("WCCSFN")
Brenda Gaertner Crystal Reeves	First Nations Coalition; First Nations Fisheries Council; Aboriginal Caucus of the Fraser River; Aboriginal Fisheries Secretariat; Fraser Valley Aboriginal Fisheries Society; Northern Shuswap Tribal Council; Chehalis Indian Band; Secwepemc Fisheries Commission of the Shuswap Nation Tribal Council; Upper Fraser Fisheries Conservation Alliance; Other Douglas Treaty First Nations who applied together (the Snuneymuxw, Tsartlip and Tsawout); Adams Lake Indian Band; Carrier Sekani Tribal Council; Council of Haida Nation ("FNC")
No appearance	Métis Nation British Columbia ("MNBC")

APPEARANCES / COMPARUTIONS, cont'd.

Tim Dickson	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
David Marmorek
Cross-exam by Mr. Leadem (cont'd) (CONSERV)

1 Vancouver, B.C./Vancouver
2 (C.-B.)
3 September 20, 2011/le 20
4 septembre 2011
5

6 THE REGISTRAR: The hearing is now resumed.
7 THE COMMISSIONER: Good morning, Mr. Leadem.
8 THE REGISTRAR: Order. The hearing is now resumed.
9 THE COMMISSIONER: Good morning, Mr. Leadem.
10 MR. LEADEM: Good morning, Mr. Commissioner. Good
11 morning, Mr. Marmorek.
12 A Good morning.

13
14 DAVID MARMOREK, recalled.
15

16 CROSS-EXAMINATION BY MR. LEADEM, continuing:
17

18 Q We left off yesterday, and we had been discussing
19 the workshop that you had facilitated at the end
20 of November of last year, the two-day workshop
21 where you met with all of the scientists who
22 prepared technical reports for this Commission,
23 and I want to take you to the end of that
24 workshop, because essentially I think there was a
25 breakout session that we discussed last --
26 yesterday, at which you examined the alternative
27 hypotheses that had emerged originally from the
28 PSC workshop in June of 2010. And then, as I
29 understand it, you revisited those alternative
30 hypotheses in the workshop that you facilitated in
31 November of 2010; is that right?

32 A That's correct. We had a brief session where we
33 broke into, I think, four subgroups and each of
34 those subgroups randomly constituted -- made up --
35 looked at the conclusions from the PSC report and
36 then re-evaluated them in light of what they had
37 just heard on the preliminary findings of the
38 workshop.

39 Q All right, thank you. Mr. Lunn, could we please
40 pull up pdf 361 of Exhibit 1896. The first thing
41 I wanted to do was confirm the list of
42 participants, and I see that they are there, and
43 you can confirm that for us, can you?

44 A That is correct.

45 Q And then, if we go back to, I think it's, pdf 35 -
46 just bear with me for a moment - 367, thank you.

47 MR. LUNN: Five seven?

September 20, 2011

1 MR. LEADEM: 367. Oh, sorry, it must be 357; there's
2 no pdf 367. Thank you.

3 Q So in these notes there is the Integrative
4 workshop tasks, and that's the breakout session
5 that you just described; is that right?

6 A That's correct.

7 Q And then after the breakout session, people
8 reassembled, I gather, and going to the next page,
9 under Discussion, there is an ability, then, for a
10 free-ranging discussion on some of the alternative
11 hypotheses, and what had changed, more or less, in
12 people's minds, particularly people who may have
13 participated in the PSC workshop in June, and then
14 what had basically had started to reassemble in
15 their minds as a result of hearing from the
16 scientists who presented it at the workshop that
17 you facilitated in November of 2010; is that a
18 fair statement?

19 A Yes, that's correct. I think there was only maybe
20 - I'd have to check - but maybe five or six people
21 who had been at both workshops.

22 Q Yes. I think Dr. Peterman, for example, was at
23 both workshops and was a primary motivator of the
24 PSC workshop in June of 2010; is that not correct?

25 A Well, he wasn't a motivator of it, he was asked to
26 lead it by the Pacific Salmon Commission.

27 Q Right. So if I can then take you to some of the
28 discussion, and Mr. Commissioner, I'm not going to
29 go through this, but I commend this discussion to
30 you, because it's rather informative in terms of
31 the free-ranging discussion that ensues when
32 scientists are allowed to speak their minds
33 freely. If I could take you to the last -- 360,
34 pdf 360, right before closing comments, right at
35 the top of the page - there it is - Dr. Peterman
36 says:

37

38 We're lacking the big picture because we're
39 not thinking big enough. The proposal for a
40 full-integrated Strait of Georgia study is
41 not thinking big enough - everyone is
42 studying small pieces.

43

44 And then Dr. Skip McKinnell says:

45

46 I think there is an opportunity.

47

1 And then there's some discussion with Dr. Levy,
2 and then Dr. McKinnell says:

3
4 Even something like the old Fisheries
5 Research Board model. Look at what is failing
6 and where advances could be made in a way
7 that is cost effective and that provides new
8 insights.

9
10 And I think I want to come back, then, to the
11 discussion that we left off yesterday, which was
12 trying to find out a mechanism for moving forward
13 in terms of how are we going to address the
14 science that needs to be done in an efficient,
15 cost-effective manner? And one of the proposals
16 I've been advancing is something like the old
17 Fisheries Research Board model, that's quasi-
18 independent of government, but has some reign to
19 sort of -- free reign to sort of focus in upon
20 research questions. I see you're nodding your
21 head, so am I striking a responsive cord there?

22 A Yes, I guess head-nodding doesn't get down in the
23 transcript. So I think that's an interesting
24 proposal, and one other model that might be
25 examined is that of the international joint
26 commission for the Great Lakes --

27 Q Yes.

28 A -- where they drew scientists from different
29 relevant entities, Environmental Protection
30 Agency, Ministry of Environment, but when they
31 went into the International Joint Commission they
32 were forced to sign something. They were taking
33 off their institutional hats. They were just
34 there as independent scientists.

35 That having been said, I think it's also
36 important that a group like that focus their
37 efforts on questions that are really important to
38 people that are making management decisions. You
39 know, it doesn't just become a theoretical
40 academic exercise.

41 Q I now want to not necessarily shift topics, but
42 what I'm struggling with is a framework for
43 decision-making. Given that there seems to be a
44 lack of scientific certainty around what
45 essentially is causing the decline, I mean, we can
46 point to certain factors and say, "Well, this
47 hypothesis is likely," or, "This hypothesis is

1 less likely," but basically are we not in an era
2 where we have scientific uncertainty about what
3 has caused the decline in the Fraser River
4 sockeye?

5 A Certainly that's true, and there are methods for
6 making decisions under uncertainty, which are
7 wholly relevant to the situation.

8 Q Right. And that leads me to discussing with you
9 the precautionary principle and the precautionary
10 approach. And just so that we're clear of what
11 the precautionary principle is, I'm going to read
12 you the Principle 15 from the Rio Declaration and
13 make sure you agree with it. I just want to make
14 sure that we're speaking about the same thing. So
15 that principle says:

16
17 Where there are threats of serious or
18 irreversible damage, lack of full scientific
19 certainty shall not be used as a reason for
20 postponing cost-effective measures to prevent
21 environmental degradation.

22
23 That's the principle that I usually cite. Is that
24 the one that you use as well, or do you use
25 something other than that?

26 A Well, interestingly enough, I checked on this,
27 this morning, and passed onto Ms. Baker, who
28 passed onto Mr. Lunn, the paper that Randall
29 Peterman had given at a salmon summit in, I think
30 I was, 2008, organized by Simon Fraser University,
31 where he talks about the precautionary principle
32 applied to fisheries and the precautionary
33 approach. So actually, I don't know if I could
34 put that up very quickly, just to show you the way
35 I would think about it?

36 Q Well, since you mentioned it, I think that we're
37 obliged to see it.

38 A Okay. It'll just take a moment.

39 MS. BAKER: I do have a paper copy of this that he gave
40 us this morning, so I'll just circulate that
41 around.

42 A Because I do think it's important to understand
43 terms. I think precautionary principle has been
44 applied differently in different contexts, and
45 just so we're talking apples to apples.

46 MR. LEADEM:

47 Q So what you appear to have handed out to everyone

- 1 is Chapter 23, entitled, An Overview of the
2 precautionary approach in fisheries and some
3 suggested extensions, by Dr. Randall Peterman,
4 from Simon Fraser University?
- 5 A Yes. And the simplest summary of this is if you
6 go down to, I think it's page 2, the first figure,
7 I'm not sure, at the bottom.
- 8 Q Page 234 of the extract?
- 9 A Yeah. If you could expand that figure, Mr. Lunn,
10 there. So he described the two things there as --
11 and I don't know if this is the same as your
12 definitions, sir, but essentially the restrictions
13 imposed on human activity, so severe restrictions,
14 what he would refer to as applying the
15 precautionary principle would involve a ban on
16 something. So no longer dumping of waste in
17 oceans, whereas precautionary approach is that you
18 would allow the activity to continue, but use
19 safety margins relevant to that activity. So
20 that's just --
- 21 Q All right. Those safety margins would, in effect,
22 correspond to limit reference points, for example,
23 in harvesting or establishing benchmarks for
24 conservation units --
- 25 A Exactly.
- 26 Q -- something of that nature?
- 27 A Yeah. So that was my understanding. So just I
28 don't know if it's exactly the same as the quote
29 you had from the Rio. A little bit further above
30 is Randall Peterman's definition of a principle on
31 this page. But anyway, that's -- so it sounds
32 similar, but I think the implications here is that
33 if you applied the principle the way he's
34 presented it, then something -- activity doesn't
35 happen at all, whereas with the approach an
36 activity may happen.
- 37 Q All right. So as long as we're not talking
38 semantical differences, I understand that there's
39 probably a spectrum at which you examine cost-
40 effective measures, and if it looks as though
41 something's really going to be disastrous for the
42 environment, you may want to invoke the principle,
43 as Dr. Randall Peterman says here.
- 44 A That's fine.
- 45 Q But in other approaches, you're going to take --
46 or in other situations you're going to adopt an
47 approach as opposed to a principle?

1 A That's correct.

2 Q Okay. So and the fisheries are a really good
3 example of that, in terms of we have a resource
4 that's being utilized by many users, aboriginal
5 users, indigenous peoples have used this for
6 centuries, we have commercial fishing sectors,
7 we've got sport fishing sectors, so everyone is
8 dependent upon that resource, more or less, are
9 they not?

10 A Yes.

11 Q And so in the context, then, where you put
12 conservation of the resource as a primary
13 objective, which we've done through the Wild
14 Salmon Policy, you start up with a concept that
15 you take measures to protect that resource, to
16 protect the salmon, do you not?

17 A So this is where it gets interesting, because
18 there are trade-offs between different objectives.
19 So, for example, if you want to preserve the
20 Cultus Lake sockeye run and have a very high
21 probability of doing that, you would need to
22 curtail harvest by a substantial margin and some
23 of Dr. Peterman's students have done that sort of
24 analysis. So it becomes a societal policy
25 question with respect to what level of certainty
26 you want to have at protecting that species at
27 risk versus what level of harvest you would like
28 to have, because obviously if you eliminated
29 harvest that would have some economic impacts. So
30 I think there's a science aspect to this of
31 evaluating those risks, and then there's a policy
32 aspect of those, which is making the trade-offs
33 between, for example, complete application of the
34 Wild Salmon Policy versus satisfying other
35 societal social and economic needs.

36 Q Right. From a scientific perspective, though, it
37 comes down to, as a scientist, basically if you
38 agree with a concept of biodiversity and
39 biodiversity is to be preserved, when scientists
40 weigh in on that question, they often weigh in on
41 it by saying, "Well, biodiversity is an important
42 factor and we should do what we can in order to
43 preserve it. As a conservation biologist, would
44 you agree with that?"

45 A Well, I think the statement you just made is
46 interesting. I think it was a fairly policy-
47 weighted statement. I mean, I think a lot of

1 scientists who work on environmental things would
2 like to see biodiversity preserved, okay? So as a
3 scientist, I think your job is to, in a completely
4 neutral way, say, "If you would like to preserve
5 biodiversity," if society would like to do this,
6 "here is what you need to do."

7 Q Yes.

8 A Okay? And then it becomes a policy decision of,
9 "Well, yes, we would like to preserve
10 biodiversity, but we also want to preserve these
11 other social and economic goals, and politically
12 we're willing to make some trade-offs." So, for
13 example, when Sakinaw Lake sockeye were petitioned
14 for being listed under the **Species at Risk Act**,
15 the decision was made not to list them, because
16 the implications of doing so would have effects on
17 the fishery, okay? So that was a societal
18 decision between competing objectives, basically.

19 Q Yes. And now, I just want to take it out of the
20 context, because I'm a bit time limited but I want
21 to take it out of the context of harvesting and
22 then move it into another arena where we also seem
23 to have scientific uncertainty, and that's in the
24 arena of fish farming and aquaculture and whether
25 aquaculture is or is not affecting the Fraser
26 River sockeye return.

27 And firstly, would you agree with me that we
28 do have scientific uncertainty in that field?

29 A Yes, I would agree with you.

30 Q And so, then, if we're to apply a precautionary
31 approach as opposed to a principle, where we're
32 not necessarily going to shut down all the salmon
33 farms everywhere along the coast, wouldn't it make
34 sense, as a precautionary approach, to limit the
35 farms that are actually capable of impacting the
36 Fraser River sockeye salmon on their migratory
37 pathway?

38 A So in principle, I think managing those farms to
39 limit impacts is a reasonable principle. The
40 question then becomes -- the devil's in the
41 detail, so how many farms do you allow in which
42 locations, to which degree, and what are those
43 risks? And so because there is substantial
44 uncertainty, and we have two reports which came to
45 some very different conclusions on disease, if you
46 were to try to estimate what that risk is, as a
47 scientist, my response would be, "Well, we need

1 some data," as I said yesterday, on disease in
2 order to make an intelligent estimate of that
3 risk, okay?

4 And then, once you establish that risk and
5 you say, "Well, if you have," and I'll just make a
6 number up, "20 fish farms in this particular
7 region, there's a high likelihood of disease
8 getting transferred, and if you have three there's
9 an extremely low likelihood," you know, just to
10 make some numbers up, then it gives you some
11 ability to make some decisions. In the absence of
12 that information, I think it's very difficult for
13 people trying to do these risk assessments to make
14 those decisions. How are they going to evaluate
15 those risks quantitatively?

16 Q But if I come back to the precautionary approach
17 as opposed to the principle, if we acknowledge
18 that there is scientific uncertainty, and I fully
19 accept that we need more science to be able to
20 answer some of the questions that you're
21 postulating there, but in the absence of that
22 scientific knowledge, then we should be adopting a
23 cautious approach with respect to the location
24 of the fish farms along the migratory pathway of
25 the Fraser River sockeye, should we not?

26 A I think the basic question here is, when you say
27 "apply a precautionary approach," how do you apply
28 that in the absence of accurate information on
29 risk? So to just flip back for a moment to a
30 harvest situation, if you said, "What limit
31 reference point shall we set for this fish
32 population about which we have absolutely no
33 knowledge of its abundance or productivity?" And
34 the answer would be, "We have no idea." And so
35 fishery biologists would go out and say, "Well,
36 let's get some basic information in order to
37 understand something about this population so that
38 we can make those -- set those cut-offs," okay?

39 So if you think about it, you know, the
40 maximum allowable number of fish farms or the type
41 of farms or the amount of activity or something is
42 like a limit reference point, and so you need some
43 basic information that allows you to assess those
44 risks. And I think that's where I would come down
45 on it, because right now we have disease
46 information within the fish farms and that tells
47 us something, but we don't have disease

1 information within the sockeye, so we don't
2 actually know how much exposure there's been.

3 Q If I can come back to that example you gave of
4 limit reference points, and I fully accept that if
5 you're in a fishery situation and you don't know
6 what constitutes a lower reference point, you
7 better find out very quickly. But supposing
8 you're in a situation where you don't know that.
9 Does it make sense to allow fishermen to simply go
10 out and catch as many fish as possible? Doesn't
11 it make more sense to be precautionary and exercise
12 some constraint over that?

13 A Yes, I think it would make sense to exercise some
14 constraint over that. So I guess the question,
15 really, is, "What is the level of risk associated
16 with different levels of fish farm activity?" And
17 I think that we've seen in the two reports from
18 Noakes and Dill very different descriptions of
19 that level of risk. So that doesn't provide a
20 decision-maker with a lot of guidance. You know,
21 it's like coming to a T-junction and being told to
22 turn left or turn right, essentially.

23 So I think in that kind of situation, I've
24 encountered that before, where you have a very
25 wide range of hypotheses about the level of
26 impact, the best way to move forward and actually
27 develop a tangible precautionary approach, is to
28 get the information and use it.

29 Q All right.

30 A So that would -- that, you know, is consistent
31 with what I said yesterday.

32 Q So we should be getting that information quickly,
33 though?

34 A Absolutely. And it should have been quite some
35 time ago.

36 MR. LEADEM: Yes, I agree with that. Thank you, those
37 are my questions, Mr. Commissioner.

38 MS. BAKER: Should we mark this document as an exhibit?

39 MR. LEADEM: Oh sorry. Yes, we should mark that
40 extract from Dr. Peterman, and thank you for
41 bringing it to my attention.

42 THE REGISTRAR: 1906.

43

44 EXHIBIT 1906: Chapter 23, An Overview of the
45 precautionary approach in fisheries and some
46 suggested extensions, by Dr. Randall
47 Peterman, Simon Fraser University

1 MR. HARVEY: Yes, Mr. Commissioner, it's -- and Mr.
2 Marmorek, it's Chris Harvey from the West Coast
3 Trollers Association and the UFAWU.
4

5 CROSS-EXAMINATION BY MR. HARVEY:
6

7 Q And Mr. Marmorek, you've been qualified as an
8 expert in the area of adaptive management, and I
9 think much of what you've been saying comes from
10 that discipline. I must admit that I had to
11 Google it last night to find out exactly what it
12 meant. And what popped up, immediately, was
13 something from the B.C. Forest Service website
14 that defined it, and I'm guessing that maybe you
15 had something to do with that definition that the
16 Forest Services adopted?

17 A Well, there's many definitions. We have done work
18 with the Forest Service on developing a curriculum
19 for teaching about adaptive management.

20 Q Yes.

21 A I think that the specific definition didn't come
22 from us --

23 Q All right.

24 A -- anyway.

25 Q Well, I won't ask you that because I got --
26 something else came up, and that was your own
27 final report to the National Commission on Science
28 and Sustainable Forestry. I think that's a U.S.
29 report.

30 A That's right.

31 Q May 15th, 2006. And it had your name on it as the
32 lead author?

33 A Yes, that's correct.

34 Q Yeah, all right. And it opened with these words,
35 introductory words:
36

37 Adaptive Management (AM) is a rigorous
38 approach for learning through deliberately
39 designing and applying management actions as
40 experiments. It was first developed under
41 the name "Adaptive Environmental Assessment
42 and Management" in the 1970s by Dr. C.S.
43 Holling and Dr. C.J. Walters and associates
44 at the University of British Columbia and the
45 International Institute for Applied Systems
46 Analysis in Vienna.
47

1 Pausing there, is that the same Dr. Walters who
2 gave evidence here in February?

3 A The very same.

4 Q Yes. He seems to pop up everywhere.

5 A He's a busy man.

6 Q So he's one of the leaders in the field of
7 adaptive management?

8 A Yes, he is.

9 Q And then your introductory paragraph continues:

10
11 It has since been applied to a wide range of
12 resource and ecosystem management problems
13 throughout North America and elsewhere... AM
14 is an approach to management that involves
15 synthesizing existing knowledge, exploring
16 alternative actions, making explicit
17 predictions of their outcomes, selecting one
18 or more actions to implement, monitoring to
19 see if the actual outcomes match those
20 predicted, and then using these results to
21 learn and adjust future management plans and
22 [policies]...

23
24 And then you have a diagram outlining the six
25 steps, one of which is evaluate. And then it
26 carries on, in page 2:

27
28 Adaptive management may be essential for
29 achieving sustainable forestry...

30
31 AM is enabled through consideration of the
32 desire for fair and equitable treatment of
33 tenure holders, other resource users, and
34 communities (i.e. trying to ensure the costs
35 and benefits of management experiments are
36 borne equally); creative approaches to
37 sharing the costs and benefits of AM; and
38 compensation programs to mitigate losses
39 associated with decisions based on AM. It
40 can help to compare the real costs and
41 benefits of traditional management (including
42 the costs of litigation) versus the cost and
43 benefits of an AM approach. Finally, there
44 needs to be strong, explicit links between
45 the results of management experiments and the
46 use of those results to modify regulations
47 and future practices—often referred to as

1 "closing the loop."
2
3 So that basically defines the concept, does it?
4 A Yes, I couldn't have said it better if I'd written
5 it myself.
6 Q Which I think you probably did.
7 A At least partially.
8 Q Yes, all right. So you mean by that, do you, that
9 it's critical to the principle of adaptive
10 management that a retro -- well, first of all, a
11 prospective cost benefit analysis is done, and
12 then a retrospective cost benefit is done
13 afterwards, following the management experiment,
14 in order to determine its results?
15 A In the design stage, which is the second step in
16 that diagram that's in that report, the key thing
17 is to simulate through all of the following steps,
18 the implementation of the actions, the monitoring
19 of those actions, the evaluation, and the
20 adjustment phase, if you have different outcomes.
21 And so part of that is looking at costs and
22 benefits for different objectives, such as in case
23 of fisheries conservation or harvest, ecosystem
24 integrity, all of those trade-offs.
25 Q Yes. And that's done on a prospective basis, and
26 then after the experiment it's done on a
27 retrospective basis; is that correct?
28 A Well, I would say during the experiment you're
29 trying to get feedback continually so that you're
30 learning as it goes, and then as it's completed,
31 if it's a finite length experiment, then wrapping
32 that up and saying, "Well, here's what the
33 implications are for what actions we take
34 subsequently."
35 Q Yes. And the point of assessing the implications
36 is not to cast blame on the original decision-
37 makers but to inform future decision-making; is
38 that correct?
39 A That's correct.
40 Q Yeah. Now, many countries have applied the AM
41 process to fisheries management decisions; is that
42 right; principally, Australia and the U.S.?
43 A The number of successful applications is fairly
44 small, but there have been a few.
45 Q Okay. And one other passage in the U.S. Forestry
46 report that I found useful is at page 51 of that
47 report. It deals with how science is conducted.

1 It says:
2

3 Adaptive management combines science and
4 management in order to learn from management
5 experience. To enable adaptive management,
6 both science and management have to combine
7 in a way that transforms both. In doing so,
8 management becomes more scientifically
9 rigorous, and research becomes more policy
10 relevant.

11
12 Without scientific rigor initiatives billed
13 as *adaptive management* may be little more
14 than undisciplined trial and error, a poor
15 paradigm for effective learning.
16

17 So that brings in the role of science and the
18 adaptive management approach; is that correct?

19 A Yes, I think that interaction is extremely
20 important.

21 Q Yeah. Now, just so I fully understand it, in the
22 forestry context, if you're dealing with something
23 like a request to defer cutting of trees in a
24 certain watershed for, say, 20 years, you'd start
25 off by doing a prospective analysis, bringing in
26 the botanists to determine what the growth would
27 be over that period of time, you'd bring an
28 economist to do the cost side of the cost benefit
29 analysis, and then the results of that would go
30 forward to the policy decision that you mentioned
31 a moment ago; is that how it would work?

32 A Well, the description that you just gave could
33 apply to a situation where there wasn't a lot of
34 uncertainty. Adaptive management is only
35 appropriate where there's a lot of uncertainty.
36 So in the example you gave, for you to apply
37 adaptive management there would need to be some
38 uncertainty about whether it was necessary, say,
39 to protect a fish population in the stream near
40 where the cutting was going to occur, whether it
41 was necessary to defer that harvesting or not.

42 Q Yes.

43 A Otherwise, you wouldn't be applying adaptive
44 management, you might apply some other methods.

45 Q Well, you might have uncertainties coming in
46 through global warming changes and that sort of
47 thing, would you not?

- 1 A Actually, global warming is an example I often use
2 where you can't apply adaptive management because,
3 first of all, there's no possibility of
4 replication, there's only one planet, and it's
5 going to take 50 or 60 years to learn what the
6 consequences of our actions are, globally. So,
7 you know, you could devise an experiment whereby
8 you had some areas of a watershed that were not
9 cut and other areas that were cut and look at that
10 contrast, but both of those are going to be
11 equally exposed to global warming effects.
- 12 Q Yes. But you'd attempt to predict in advance when
13 you're setting up the experiment and then, in the
14 retrospective, years later, you'd look back?
- 15 A That's correct.
- 16 Q Yeah, all right. And you do the same sort of
17 things in the fisheries context, I expect; is that
18 right?
- 19 A When you can, I think there have been
20 opportunities, as you mentioned earlier.
- 21 Q Yes. For example, if someone suggested reducing
22 the harvest rate from 50 to 10 percent in a
23 particular stream, prospectively you'd bring in
24 expert biologists, you'd assess the carrying
25 capacity, you'd assess other things to predict a
26 result, and then you'd bring in an economist to do
27 the simple arithmetic, to do the -- to assess the
28 cost to the economy; is that basically how it
29 would work?
- 30 A I think what you would do, if you were
31 contemplating that experiment, is predict the
32 expected biological outcomes, given the various
33 uncertainties that are there --
- 34 Q Yes.
- 35 A -- the spawner recruit relationship,
36 uncertainties, for example, in what sort of ocean
37 conditions the population might be exposed to, as
38 well as the economic costs you mentioned, so that
39 you would try to work through all of those
40 uncertainties and get a range of possible
41 outcomes.
- 42 Q And then the benefit of it is that with that
43 scientific rigour being applied to all aspects of
44 that, you'd have something to go forward to the
45 policy decision-makers to assist them in decision-
46 making, correct?
- 47 A That's correct. For that sort of experiment it

1 might take you a decade to find out what the
2 consequences were.
3 Q Yes. But after that decade, you certainly want to
4 do the retrospective?
5 A Yes, that's correct.
6 Q Yes. Now, are you aware of what's been referred
7 to, here, as the 1987 Rebuilding Plan for Fraser
8 River Sockeye?
9 A Not in detail, only in general terms.
10 Q All right. In general terms, do you understand it
11 to be a program that was designed on the
12 assumption that if you cut back harvest, increased
13 escapement, you would rebuild the sockeye stocks?
14 A Yes.
15 Q All right. If you had been advising at that time,
16 you would have advised an adaptive management
17 approach, I expect?
18 A Most likely.
19 Q Yes. And including the retrospective?
20 A You're correct.
21 Q And if the government, in its wisdom, had asked a
22 royal commission to do the retrospective, you
23 would have organized that according to adaptive
24 management principles that you just explained; is
25 that correct?
26 A Well, it depends. Just as in the Cohen Commission
27 retrospective ecological risk assessment that
28 we've applied here, you can't apply an adaptive
29 management approach to something which wasn't
30 implemented with an adaptive management approach.
31 So if, for example, you haven't had a rigorous, by
32 design, set of contrasts by which you can evaluate
33 alternative hypotheses, you can't retrospectively
34 apply an adaptive management approach. What you
35 do is you do your best job you can, just as we
36 have in Technical Report 6, to assess alternative
37 hypotheses using whatever contrasts you can find.
38 So it's more opportunistic than deliberate.
39 Q Well, you wouldn't have the benefit of an original
40 cost benefit analysis to compare with the
41 respective cost benefit analysis, but you could
42 still do a retrospective cost benefit analysis,
43 could you not?
44 A Well, you're now using the term "cost benefit
45 analysis" whereas a while ago you were using the
46 term "adaptive management approach", so just to
47 clarify what I mean, so if you -- and I don't, as

- 1 I said, I don't know exactly the details of how
2 that policy were implemented, but it would seem to
3 me that, in 20/20 hindsight, the best way to
4 implement it would be to have some -- if you could
5 manage it, given the mixed stock challenges, if
6 you could manage it to have some stocks where you
7 implemented the new approach and some other ones
8 where you didn't, so you'd have some contrast and
9 be able to compare it, that's not so much a cost
10 benefit application as it is an adaptive
11 management application where you're creating
12 contrast to maximize the amount of learning of
13 your management action. It's like a controlled
14 treatment idea.
- 15 Q But don't we have that in the Columbia, for
16 example, the Canadian policy did not apply, and in
17 Bristol Bay it did not apply?
- 18 A I don't think you can use reference populations
19 that are that far away from the Fraser, because
20 there are too many differences and some of Randall
21 Peterman's work has shown that if you get more
22 than about 500 kilometres away the variation from
23 year to year amongst stocks starts to be very
24 different.
- 25 Q Yes. At any rate, if you were advising on how to
26 do a retrospective analysis, you'd want to do the
27 best you could with respect to drawing in the
28 science, the biologists, the population dynamics,
29 the climate change scientists, and then also an
30 economist to do the arithmetic?
- 31 A That sound reasonable.
- 32 Q All right. When you first learned of the topics
33 chosen by David Levy for the science reports of
34 this Commission, did you have a discussion about
35 the nature of those science reports with him, by
36 any change?
- 37 A They were basically -- we were informed what those
38 topics were, but we didn't discuss whether there
39 was anything missing, for example.
- 40 Q All right.
- 41 A They just seemed pretty comprehensive to me.
- 42 Q All right. Are you aware, by any change, that Dr.
43 Walters made a request to Dr. Levy for a
44 retrospective analysis?
- 45 MS. BAKER: Mr. Commissioner, I'm not sure that this is
46 relevant for the witness to talk about discussions
47 that happened internally at the Commission between

1 other scientists. I would object to this line of
2 questioning.
3 MR. HARVEY: Well, the problem is --
4 A I wasn't aware.
5 Q You weren't? All right, I'll leave it at that.
6 A It was a short discussion.
7 Q Yes, all right. All right, let me return to your
8 report. Your object, if I understand it right,
9 was to determine the possible and likely causal
10 mechanisms for the 20-year decline, correct?
11 A Yes, that's correct.
12 Q And you show that on page 29 of your report, which
13 shows the dropping productivity dropping,
14 actually, below a dashed line representing the
15 level at which the population can replace itself?
16 A That's correct.
17 Q That's a very serious situation, obviously?
18 A Yes, it is.
19 Q Yes. You examined five life history stages,
20 concluded that coastal marine conditions and
21 climate change were the primary likely causes?
22 A That's correct.
23 Q I couldn't help noticing in your report that the
24 stage, I think it's the second stage, which deals
25 with fry in the rearing lakes --
26 A Actually, that's the first stage. The second
27 stage is smolts from the lake down to the estuary.
28 Q But the first stage ends with the fall fry, as far
29 as I could make out. It doesn't include
30 overwintering and it doesn't include the period in
31 the spring when you've got two-year classes
32 occupying the same lake, the same (indiscernible -
33 overlapping speakers) --
34 A Well, it does. There's two different things here.
35 One, is that the way we define the stage, it's up
36 to the point where the smolts leave the lakes.
37 However, in the monitoring that's gone on to date,
38 there are only nine of the 19 monitored stocks,
39 which is only 19 out of 36 conservation units, but
40 there's only nine that have any sort of juvenile
41 monitoring, and seven of those only monitor up to
42 the fall fry, as you've said, and then there's
43 Chilko and Cultus that have the smolt monitoring.
44 Q Which stage does overwintering and the period --
45 the short period in the spring before the
46 migration starts, which stage does that fall
47 under?

- 1 A So that would fall into what we called Stage 1,
2 even though we don't have data on that stage for
3 all but two of the stocks, really.
- 4 Q So you conclude that there's no decline in that
5 stage, but you haven't been able to assess
6 mortality over the winter or in the spring during
7 the migration; is that correct?
- 8 A That's true, and that's a data gap that we point
9 out should be rectified. So if there were impacts
10 that were happening over the winter, they would
11 not show up in seven of those nine juvenile
12 monitoring programs.
- 13 Q With respect to your conclusion about coastal
14 marine conditions and climate change, you'd agree
15 that those are matters that fishery managers can
16 do little or nothing about, I expect?
- 17 A Actually, I don't agree with that. If you look at
18 the paper that was submitted by Kim Hyatt --
19 sorry, I'm not sure who submitted it, but it's one
20 of the 62 documents I got last week, the fisheries
21 management of the Barclay Sound stocks have relied
22 on monitoring of salinity and temperature
23 conditions as those smolts are going out to sea,
24 and then used that to modify expectations of the
25 amount of harvest two years later. So if it's
26 generally warmer waters and El Niño influence,
27 they tend to get like one to two percent marine
28 survival. And if it's fairly cool waters, they
29 tend to have like six or seven percent marine
30 survival. So it's an expectations management
31 thing, which is valuable, I think --
- 32 Q Yes.
- 33 A -- for harvest managers.
- 34 Q Yes, of course. But --
- 35 A You can't change the ocean.
- 36 Q Yeah. And if a decline is caused by that, they
37 can't reverse the decline, because they can't
38 change the ocean.
- 39 A That's correct.
- 40 Q Would you agree with this, that if the coastal
41 marine conditions are more challenging nowadays
42 for Fraser River sockeye, it is very important
43 that the smolts entering the estuary are as well
44 nourished as possible and as strong in terms of
45 size, state of health and energy levels?
- 46 A I think that's one of the things that's important.
47 I think what's also really important, as was shown

- 1 in one of the papers by Dick Beamish and
2 co-authors, is that you need as many -- you need a
3 wide diversity of life history types. So, for
4 example, the Harrison sockeye that apparently are
5 still doing well, and the South Thompson Coho that
6 are still doing reasonably well - I think it was
7 South Thompson --
- 8 MS. TSURUMI: (Inaudible - off microphone).
9 A Chinook. Thanks.
- 10 MR. HARVEY: Yes.
11 A Have later entry time into the Strait of Georgia
12 So I think when you have these highly variable
13 marine conditions both from year to year and
14 spatially, it's extremely important to have a wide
15 diversity of life history types.
- 16 Q Yes. All right. You accept, I think, the basic
17 premises behind the Ricker model, namely that the
18 productive capacity of the freshwater ecosystem
19 limits the number of smolts that can be produced
20 in any particular watershed?
- 21 A Yes, I think the way you said it in words is
22 correct. The Ricker model isn't always the best
23 fit for every population.
- 24 Q And after a certain egg and fry abundance, the
25 Ricker model assumes a limit that is graphically
26 noted as the dome for the Ricker curve?
- 27 A That's correct.
- 28 Q Yes. And that is the point at which something
29 begins to operate to prevent a further increase,
30 and it's that something that is responsible for
31 killing off sockeye at a rate greater than the
32 rate of increase of fry -- of eggs and fry?
- 33 A Yeah, there's a point at which competitive effects
34 of one form or another, either for space or for
35 food, or other effects, like disease, can come to
36 occur if the density is too high.
- 37 Q Yes. Yes. Starvation, pathogens, and predators
38 have all been suggested, and there's some debate
39 about the relative contribution of each, I think.
40 But there's no doubt about the consequence, mainly
41 a die-off greater than the rate of increase after
42 the dome of the Ricker curve; is that basically
43 correct?
- 44 A That's correct. Although, as noted in the paper
45 that I think you submitted from Clark et al, from
46 -- for Alaska sockeye, that's not a sustainable
47 problem because when you have lower production you

1 then flip over to the other side of the curve --
2 Q Yes.
3 A -- lower number of spawners.
4 Q Perhaps we could turn to that. That is, let's
5 see, Mr. Lunn, that's out of the order that I gave
6 you, but it is Exhibit 184. I'd like to start at
7 page 36.
8 A I don't think that's the paper you were looking
9 for.
10 Q This is -- it should be -- oh, I'm sorry.
11 A This is Grant. You want --
12 Q I'm sorry. Exhibit 419, Mr. Lunn. Yes, at page
13 36. Yes. This shows the basic Ricker stock
14 recruitment curve?
15 A That's correct.
16 Q Smax is there at the top of the curve, shows the
17 maximum possible biomass for a given watershed on
18 this model; is that correct?
19 A For given stock, I suspect, yeah.
20 Q Yeah. Seq --
21 A That's the point at which you have one-to-one.
22 Q Yes, one-to-one replacement. And below that you
23 -- this is equivalent to the dotted line in your
24 graph? The population is not replacing itself
25 after you pass that point?
26 A That's correct.
27 Q All right. And Smsy, on the left-hand side of the
28 curve, contains the two biological reference
29 points, the escapement benchmarks marked with the
30 arrows, I think; is that as you understand it?
31 A That seems to be correct.
32 Q Yes. And according to the Alaskan definition,
33 beyond the Smsy point they refer to as
34 overescapement. Now, if you turn to page 5, if we
35 can turn to that, Mr. Lunn, please, this gets to
36 the passage you're referring to. First of all, at
37 the top of the page:
38
39 Any generic theory of salmon production must
40 include the two main ecological processes of
41 an intrinsic rate of increase and a carrying
42 capacity. Similar information can be found
43 in basic texts of fisheries science,
44
45 And Ricker's referred to, Hilbourn and Walters, et
46 cetera. Then dropping down to the fourth
47 paragraph:

1 The intrinsic rate of increase causes a
2 salmon stock to grow indefinitely, but there
3 must be a limit to this growth. The carrying
4 capacity describes the density dependent
5 survival of the salmon stock where the
6 survival stock is directly related to the
7 size of the escapement.
8

9 And finally, at the beginning of the next
10 paragraph:

11 The carrying capacity of a salmon stock is
12 thought to be watershed and stock specific.
13

14 That's the sort of general elementary principle of
15 salmon production; is that correct?
16

17 A Yes.

18 Q If you turn to page 19. I'm sorry, this gets to
19 the point you referred to. Page 19, toward the
20 bottom, the paragraph beginning, "This result,":

21 This result is consistent --
22

23 I'm sorry, "This result" as you refer just to the
24 previous sentence:
25

26 Although some stocks exhibited increases in
27 yield when averaged across these 29 stocks,
28 overescapement resulted in a decrease in
29 yields and an increase in the variability of
30 [risk] (sic).
31

32 This result is consistent with the generic
33 theory of compensatory production, where
34 spawning efficiency decreases with increasing
35 escapement levels and stocks are limited by
36 the carrying capacity of the habitat.
37 Overescapement, in general, is not
38 sustainable as it causes returns and yields
39 to decrease in the next generation, which
40 also result in lower escapements. Lower
41 escapements then result in higher returns and
42 yields in succeeding generations.
43

44 That's what you referred to a moment ago; is that
45 correct?
46

47 A Yes, that's what I referred to a moment ago. Now,

1 a really important caveat here is that all assumes
2 that the stock recruitment curve remains the same
3 over time.
4 Q Yes.
5 A So if you have a major change in ocean conditions,
6 for example, that curve might decrease.
7 Q Yes. But also, does it not assume this, that
8 fisheries managers do not cut off all harvest in
9 the succeeding generations and thereby repeat the
10 overescapement? Because you can repeat
11 overescapement in succeeding generations, of
12 course, simply by cutting off harvest.
13 A Yes, you can. I think it's important in this
14 paper, also, to read the following paragraph, too:
15
16 For the remaining 11 stocks where observed
17 exploitation rate is greater than
18 exploitation rate at [maximum sustainable
19 yield], we found that yields tended to
20 increase as escapements increased, even when
21 overescapement occurred.
22
23 And I believe out of the 40 Alaskan stocks they
24 looked at, they only found evidence of delayed
25 density dependence in five of them.
26 Q Yes.
27 A So I think you have to put it in that larger
28 context.
29 Q But delayed density dependence is the Larkin
30 model. I'm talking, here, about -- we're talking,
31 here, about the Ricker model, are we not?
32 A That's correct. I'm just referring to the
33 conclusions of the study at the beginning of the
34 abstract. So I think -- I just think you need to
35 -- it's easy to zoom in on particular cases where
36 this happened, but it's also important to look at
37 the proportion of cases where it happened.
38 Q Yes. There's something similar to this produced
39 by Kim Hyatt at our document number 5, Mr. Lunn.
40 I don't think it's an exhibit yet. This is Hyatt,
41 Rankin, Sue Grant and others, including Steve Cox,
42 I see, Cox-Rogers.
43 A Yes, that was actually the document I meant
44 earlier.
45 Q Oh, I see. All right. This document, at page 19
46 of 22, has a model. This is a general conceptual
47 model summarizing biophysical mechanism

1 interactions, et cetera. If we stop at the -- if
2 we start at the bottom, left-hand corner, where it
3 says Escapement increases, the arrows bring us to
4 the right, stock fry recruitment increases, and
5 then it goes up, slower fry growth and smaller
6 smolts, and then it goes up and they enter the
7 marine ecosystem. And on the right are certain
8 conditions in the marine, and on the left are
9 certain other conditions. If we go up the right,
10 this is the challenging marine conditions.

11 The next one is early growth of juvenile
12 salmon is slow, then it goes to the right,
13 mortality above average for juvenile salmon, then
14 it goes down, adult returns below the average. And
15 then, if we take the arrow down to the right,
16 escapement decreases, stock fry recruitment
17 decreases, and then we get faster fry growth and
18 larger smolts.

19 That's the concept you're referring to as it
20 being -- as overescapement being not sustainable;
21 is that correct?

22 A That's right.

23 Q But would you agree that if, on the bottom --
24 well, the bottom right says, escapement decreases.
25 If that were adjusted by fishery managers so that
26 we have overescapement again, we'd be back on the
27 left-hand side, where it says, escapement
28 increases, and we'd be going up, up the same cycle
29 again, would we not?

30 A Well, on the left-hand side of the diagram in this
31 paper, he's contrasting State 1, which is La Niña-
32 like conditions, which are more favourable ocean
33 conditions. So the reason for higher escapement
34 on the left-hand side is related to better marine
35 conditions. And the reason for lower escapement
36 on the right-hand side is either poor marine
37 conditions or this oscillating fact that you get,
38 you're sort of flipping back and forth between the
39 peak of that curve that we talked about.

40 Q Yes, well, I'm not disputing that marine
41 conditions can be more challenging at times and
42 less challenging at other times, but that, as you
43 said a moment ago, is something we can't do much
44 about, correct?

45 A Well, as I also said a moment ago, I think you can
46 adjust your habitat and harvest and even hatchery
47 management actions to account for what kind of

1 ocean regime you're in.

2 Q Yes. And you did say, and I think you agree, that
3 you'd want to produce the largest and strongest
4 smolts into a challenging marine environment,
5 obviously?

6 A To the degree that you can.

7 Q Yes. I was struck by something in a document that
8 Mr. Timberg read to you yesterday, and I wonder if
9 we could bring that up again, Exhibit 1903, Mr.
10 Lunn, at page 522. I think it was the top right-
11 hand quadrant. I'm sorry, is this page 522? I'm
12 looking for a passage beginning, "The NPC" --

13 A That's at the top right.

14 Q Oh, top right, "the NPC (sic) noted that" -- oh
15 yes, top right:

16
17 The NPCC noted that while we cannot control
18 the ocean, we can monitor ocean conditions
19 and related salmon survival and take actions
20 to improve the likelihood that Columbia River
21 Basin salmon can survive varying ocean
22 conditions. A better understanding of the
23 ocean conditions that influence salmon
24 survival should provide insight as to which
25 management actions taken inland will provide
26 the greatest restoration benefit.

27
28 And then the next paragraph says:

29
30 Recruitment success in the ocean environment
31 is generally believed to occur largely during
32 the first critical months at sea,
33

34 And then Ricker is cited for that. Now, there are
35 two interesting points there, I think. First of
36 all, that fishery managers should focus on what
37 they can control in order to meet the challenges
38 of what they cannot control. I expect you'd agree
39 with that, would you?

40 A Yes.

41 Q And secondly, that Ricker appears to have
42 recognized that the salmon die-off that occurs at
43 spawner abundance levels beyond the dome of the
44 Ricker curve are experienced largely during the
45 first critical months in the marine environment.
46 I wonder if you have any reason to disagree with
47 that?

- 1 A I think that's, in general, true, although as this
2 paper outlines, the Petrosky and Schaller's paper
3 outlines where you have a lot of dams in the
4 Columbia River you can also have quite a lot of
5 mortality before you get to the estuary.
- 6 Q Yes. But I think it also discusses the delayed
7 effect of that experience, the migration
8 experience, does it not?
- 9 A That's what that paper discusses, yes.
- 10 Q In other words, the mortality often occurs in the
11 early marine stage?
- 12 A That's correct.
- 13 Q All right.
- 14 A There's a considerable amount of debate which has
15 gone over at least a couple of decades as to the
16 proportion of that delayed mortality that is
17 actually delayed mortality because of the dams the
18 fish go through versus simply changes in ocean
19 conditions or some combination thereof.
- 20 Q Yes. But the basic Ricker curve, well, let's put
21 it this way; Ricker, in 1975, in that paper that's
22 noted -- 1976, was not talking about dams, he was
23 just talking about the --
- 24 A That's right.
- 25 Q -- general conceptual model, yes. In other words,
26 the effects of excessive escapement, as the
27 effects causing mortality in the first critical
28 months in the ocean?
- 29 A I think what -- now, it's been a while since I
30 looked at that Ricker 1976 paper, but I believe
31 what he was talking about is that the conditions
32 that fish experience when they first get to sea
33 are very important to determine the level of
34 survival. So it's a combination of how much
35 density-dependent effects occurred from the amount
36 of spawning that was happening in the spawning
37 ground, as well as the conditions that they
38 encounter. The two interact together
39 cumulatively.
- 40 Q Yes. But the Ricker curve is based on -- solely
41 on what happens in the fresh -- the spawner
42 abundance levels in freshwater?
- 43 A Right. But what you have to recognize is that
44 there's really a family of Ricker curves for any
45 given population, so when the ocean conditions get
46 worse, you have a much lower curve; when the ocean
47 conditions get better, you have a higher curve.

1 Q When the ocean conditions are worse, you get a
2 more severe curve, a sharper dome; is that
3 correct?

4 A No, it's just the whole thing drops.

5 Q The whole thing drops? Oh, I see. All right.

6 Now, am I correct that the Ricker model was
7 further developed by Larkin in that Larkin found
8 or hypothesized from stock recruitment data that
9 the effects of excessive spawner abundance crossed
10 cycle lines so that not only one generation was
11 effected, as Ricker found, but one or more
12 successive cycles could also be effected,
13 that's --

14 A That's correct.

15 Q Yeah. Now, the Larkin model is not accepted by
16 everyone as being applicable to Fraser stocks, but
17 everyone who knows anything about fish population
18 dynamics accepts the basic Ricker model; would
19 that be a fair comment?

20 A I don't know about anyone, but let's say those are
21 the two most commonly used models.

22 Q All right. Now, I've referred you to the Alaskan
23 paper. And what I'm going to suggest, with
24 respect to your conclusions, I'm going to suggest
25 to you that the -- what we saw in the Kim Hyatt
26 paper and we discussed a moment ago about
27 overescapement not being sustainable, it can be
28 sustainable if overescapement is repeated by
29 harvest adjustment actions. And I'm going to
30 suggest to you that that's basically what's
31 happened over the course of the years that
32 followed the 1987 building plan, namely,
33 exploitation rates were cut back, increasing the
34 excessive cycles to such an extent that it took
35 until about 2006 for escapement levels to decrease
36 to the left-hand side of the Ricker curve. That's
37 where I'm coming from.

38 And I'm going to further suggest that added
39 to the Ricker density dependence effects are the
40 delayed density dependence effects consistent with
41 the Larkin model in most major runs.

42 Now, you're aware, no doubt, that Dr.

43 Peterman found that the Larkin model fit almost
44 perfectly with the Quesnel run?

45 A So what Dr. Peterman and Dorner found is that the
46 Quesnel stock was the only one of the 19 Fraser
47 stocks for which there was consistent evidence of

1 delayed density dependence --
2 Q Yes.
3 A -- and went through, I believe, three different
4 sets of indicators by which they evaluated the
5 likelihood of delayed density dependence.
6 Q Yes. Now, you consulted Dr. Walters on that, I
7 think, by email, and I'd just like to add to the
8 record the final email that he sent you back last
9 week, and that's --
10 A So could I just clarify something on that?
11 Q Yes.
12 A So what I did in preparing for this week is the
13 previous lawyer talked a lot about the workshop
14 that we had had, November 29th and 30th, and in
15 that document at that time Dr. Peterman said,
16 well, Carl Walters seems to be coming around to
17 the belief that the Quesnel stock is really the
18 only one for which there's any evidence of delayed
19 density dependence. And so I was rereading that
20 and I thought, well, that's interesting. I wonder
21 if Carl still thinks that way.
22 Q Yes.
23 A So I sent him an email and he sent me back an
24 email, actually more than one, and my response to
25 that is that what we have, if you go back, rewind
26 to the June 2010 PSC workshop where Carl Walters
27 presented his hypothesis that there was delayed
28 density dependence in several stocks and he had a
29 five-page handout. So that was a five-page
30 handout, not very detailed on methods, and then
31 Drs. Peterman and Dorner went through their very
32 detailed analysis. And in the correspondence I
33 had with Dr. Walters, and also in the handout that
34 he'd done, it's clear that there's several things
35 which differ between what he's doing and what
36 Randall Peterman and Brigitte Dorner did.
37 So first of all, Dr. Walter is using a
38 different method of fitting the curves, at least
39 he did before, and that he had -- not allowing
40 positive coefficients on those Larkin parameters.
41 Secondly, the different of way of weighting the
42 weak years. Thirdly, they may be using somewhat
43 different datasets, because I know that Drs.
44 Peterman and Dorner fixed up some problems with
45 the dataset since the PSC workshop. And fourthly,
46 they're using somewhat different ways of deciding
47 whether delayed density dependence is happening or

1 not.

2 So they're both excellent fisheries
3 scientists. But what we have here is one very
4 detailed report by Peterman and Dorner describing
5 all their methods, on the other hand we have an
6 email with a graph in it. So I think that if
7 you're going to have an apples-to-apples
8 comparison, what you really need is a very
9 detailed description of exactly the methods that
10 Dr. Walters used. Because I found in many
11 previous cases that unless you know exactly what
12 data and methods they're using, it's very hard to
13 compare the conclusions.

14 And one more thing I'd just mention is that
15 Dr. Peterman used the Kalman filter approach, and
16 said that it was unbiased, and Dr. Walters in his
17 email said, well, the Kalman filter approach is
18 biased.

19 So all of this needs to be worked through in
20 a collegial way, probably with a few other
21 independent scientists to examine the data and the
22 methods and the process by which the conclusions
23 are done.

24 Q In order to determine who is right, Dr. Peterman
25 or Dr. Walters; would that be the object?

26 A Yeah, or the relative degree of rightness.

27 MR. HARVEY: Yes, all right. I'd like to mark, if we
28 could -- oh, I'm sorry, I don't think we marked
29 the previous exhibit.

30 THE REGISTRAR: That was Tab 5, Mr. Harvey.

31 MR. HARVEY: Yes.

32 THE REGISTRAR: And you wish that marked?

33 MR. HARVEY: Yes, please.

34 THE REGISTRAR: It will be marked as 1907.

35 THE COMMISSIONER: I'm sorry, what is that, Mr.
36 Registrar?

37 THE REGISTRAR: That's Tab 5 on his list.

38 MR. HARVEY: That's the Hyatt paper, Hyatt et al.

39 THE COMMISSIONER: Yes, thank you.

40

41 EXHIBIT 1907: Hyatt et al, ENSO induced
42 harmonic oscillations of marine survival
43 (HOMS) in Southern British Columbia sockeye
44 salmon populations: Adult sockeye returns
45 "in HOMS way"! July 27, 2010
46

47 MR. HARVEY: Entitled "ENSO induced harmonic

1 oscillations", sorry, that's -- what number did
2 you say that was?

3 THE REGISTRAR: 1907.

4 MR. HARVEY: 1907. And the Carl Walters one at Tab 15,
5 could that be marked as 1908? Perhaps we'll just
6 have the witness identify it.

7 MS. GAERTNER: Mr. Commissioner, it's Brenda Gaertner
8 for the First Nations Coalition. I am objecting
9 to this being marked as an exhibit. As the
10 witness has already clearly said, we have no clear
11 indication of the source of the materials that
12 Carl Walters -- it's not the email so much as the
13 attachments to the emails, which are a series of
14 graphs and materials. We have no clear indication
15 of the source or the methods that Dr. Walters has
16 used. This has neither been peer-reviewed, which
17 has been the test for getting in documents like
18 this from scientists, nor is it the subject of
19 evidence. Dr. Walters is not here and cannot be
20 here to be cross-examined on this. And so in my
21 view, it hasn't met any test, neither the
22 scientific test or the legal test and it should
23 not be admitted.

24 MR. LOWES: Mr. Commissioner, Keith Lowes. I'm
25 supporting marking the document. As I understand
26 the way that the questions went, the document
27 isn't tendered as an expert opinion. It's
28 tendered to show the existence of a controversy
29 between two competent scientists and it goes no
30 further than that. My friend's objections in that
31 sense, with respect to qualifications, I submit,
32 are unfounded, or at least they don't go to the
33 purpose that the document is tendered for.

34 THE COMMISSIONER: Well, once again, I think the
35 appropriate manner, Mr. Harvey, is to mark it for
36 identification purposes for perhaps this main
37 reason, that it cuts across a number of topics
38 that have been addressed at this Commission. Not
39 all counsel are here this morning that were privy
40 to that set of hearings where they did take
41 positions on many of the topics you've raised here
42 this morning. I think it would be prudent to mark
43 it for identification purposes and allow other
44 counsel to weigh in on whether or not they feel it
45 ought to be marked as an exhibit. So I think
46 we'll give it a -- assign it an identification
47 number at this point.

1 MR. HARVEY: And I gather then counsel will be invited
2 to submit --
3 THE COMMISSIONER: Yes, as they have with other
4 exhibits.
5 MR. HARVEY: All right.
6 MS. BAKER: Yes, I was just going to mention that of
7 course that process is out now to you for
8 decision, so we will need to move any objections
9 or comments on this document along very quickly.
10 I would suggest we need to probably have it by
11 Thursday completed because we're going back into
12 hearings again on Thursday and then we're done.
13 THE COMMISSIONER: Well, I'll just leave it at this
14 point as marking it for the next letter for
15 identification, Mr. Giles.
16 THE REGISTRAR: That will be marked as GGG, triple "G".
17 MS. BAKER: And, Mr. Harvey, I believe your time is now
18 over.
19 THE REGISTRAR: I'm sorry, that should be III.
20
21 III FOR IDENTIFICATION: Email from Carl
22 Walters to David Marmorek re "a few more
23 comments about sockeye dynamics", September
24 15, 2011
25
26 MR. HARVEY: I should say I've done some negotiating
27 with time. I understand that Mr. Rosenbloom has
28 agreed, and I have also had discussions with Mr.
29 Eidsvik and Mr. Lowes, I also had discussions with
30 Mr. Leadem, but he didn't leave me any time, but I
31 think I can say that we will finish certainly by
32 -- in time to allow all the remaining people that
33 follow Mr. Lowest the allotted time. So I'm
34 grateful to my friends. If I could just carry on.
35 Q Mr. Marmorek, I'm right, I think, that you didn't
36 have the benefit of Dr. Walters at the workshop
37 you conducted in the fall of 2010?
38 A That's correct, he wasn't there.
39 Q What about Mike Lapointe, Jin Woodey, and Jeremy
40 Hume, were they there?
41 A Mike Lapointe was there.
42 Q Mike Lapointe.
43 A I believe. You can check on the participant list.
44 Q All right. Jim Woodey?
45 A No, Jim Woodey and Jeremy Hume were not there.
46 Q All right. The PSC workshop records a diversity
47 of use ranging from unlikely to likely for density

1 or delayed density dependent effects as the cause
2 of the 20-year decline. I think that's right,
3 isn't it?

4 A I'm just checking. That's from likely to unlikely
5 for the overall declines and very unlikely for the
6 2009 --

7 Q Yes.

8 A -- poor returns.

9 Q Yes. But there's no indication there that I can
10 see where there are those who know most about the
11 subject of population dynamics fell on the likely
12 side or the unlikely side. You haven't done any
13 qualitative separation or analysis; is that right?

14 A I guess what I would say is I don't think it makes
15 a lot of sense to analyze in detail what was a
16 fairly short effort by a panel of scientists after
17 that PSC workshop -- during and after that PSC
18 workshop. I don't think you can compare that
19 effort, which probably amounted to, you know, a
20 week or two of time with the effort that was done
21 by Drs. Peterman and Dorner over several months,
22 over many stocks, to look at things in a lot of
23 detail. Nor do I think you can compare an email
24 that you just discussed with the effort by Drs.
25 Peterman and Dorner. So I think you need to apply
26 some level of weight to these different types of
27 evidence, and I would put, as we did in our
28 technical report, a lot more weight on the very
29 thorough analysis by Peterman and Dorner in their
30 Technical Report 10.

31 Q All right. Dr. Riddell gave evidence here that
32 the -- on this subject, and he said with respect
33 to the delayed density discussion, many people
34 were really encountering that discussion for the
35 first time, and so you have a fairly wide range
36 whether or not it was contributing to the long-
37 term decline. Now -- well, I think I'll leave it
38 at that.

39 The difference of opinion on delayed density
40 dependence was one thing, but I think you've said
41 on density dependence no one is challenging the
42 Ricker model.

43 A Well, as you've already described, sometimes the
44 Larkin model fits better than the Ricker model,
45 but I don't think there's any doubt that density
46 dependence occurs. And in the analyses that we
47 did that I described briefly yesterday there's

1 density dependence for all the stocks, that's
2 correct.

3 Q Yeah. Would it have assisted you in your search
4 for a causal mechanism if an adaptive management
5 process had been followed by DFO with respect to
6 the '87 rebuilding plan, both prospectively and
7 retrospectively?

8 A Well, as I said earlier, I'm only familiar in
9 general with that rebuilding plan, not
10 specifically with the details.

11 Q All right.

12 A But I guess what I would say is for any hypothesis
13 you're trying to analyze, the more contrast you
14 have in your treatments over space or stocks or
15 time the better.

16 Q Yes. There's a note, if we could just turn to it
17 for a moment, at Exhibit 73, which is the PSC
18 document, and at page 51 of that document, the
19 bottom paragraph I think discusses this concept.
20 It says:

21
22 Clearly though, it is not sufficient to
23 merely describe changes in indicators of
24 productivity of Fraser sockeye salmon and
25 attempt to attribute those changes to a cause
26 by merely describing plausible-sounding
27 hypothesized mechanisms. As noted in this
28 report's introduction, statistical analysis
29 of data gathered from carefully designed
30 manipulative experiments is the best way to
31 understand causal mechanisms in ecological
32 systems, but in the case of Fraser River
33 sockeye, such experiments are not practical,
34 except perhaps with changing spawner
35 abundance through altered harvest rates.
36

37 That would seem to refer to what was done
38 following the '87 rebuilding plan, does it not?

39 A I think it was -- Ronald Peterman wrote this
40 paragraph, I think this was just in general, that
41 with respect to the stressors that we were looking
42 at some are more amenable to manipulation than
43 others.

44 Q Yes.

45 A Now, I think it would be fair to say, because I
46 know something about Dr. Peterman's work on this
47 area that were you to explore what you're

1 proposing of changing harvest rates, you would
2 want to do a very careful analysis as you talked
3 about earlier in the adaptive management approach,
4 of what all the uncertainties are, both with
5 respect to stock recruitment relationships,
6 potential marine survival rates, ability to meet
7 target harvest rates, which is sometimes
8 difficult, implications for non-harvested --
9 sorry, implications for co-migrating weaker
10 stocks, implications for the Wild Salmon Policy.
11 So there's a host of tradeoffs you need to examine
12 if you were to explore designing a manipulative
13 experiment to alter harvest rates.

14 Q Yes. And included in the tradeoffs, as you said
15 earlier, is the cost to the --

16 A Yes.

17 Q -- to the economy. All right. Now, with respect
18 to your goal of determining a likely mechanism,
19 you went through four different criterion that you
20 said you'd want to satisfy, causal mechanism,
21 exposure, correlation, and corroborating evidence,
22 heard something about that. That's your basic
23 structure there?

24 A That's correct.

25 Q Yes. Would you also wish to add that the
26 hypothesized causal mechanism should account for
27 both the 2009 disaster and the 2010 bonanza?

28 A Well, our terms of reference were to look
29 primarily at the long-term decline and the poor
30 returns in 2009. That's when we started.

31 Q Yes.

32 A And then the 2010 returns provided some very
33 interesting contrast. So it's very helpful
34 information.

35 Q All right. And also the drop in the early '60s,
36 following the 1958, the large 1958 run in the
37 Adams and the large escapement in 1958. Your
38 model, your hypothesized causal mechanism should
39 take that into account, too, should it not?

40 A So the analyses that we did focused primarily on
41 trends since 1980 which you showed in that earlier
42 graph. We didn't go back to 1958, and the
43 statistical analyses that we did, the earliest we
44 went back was 1969.

45 Q I see.

46 A Now, the work that Peterman and Dorner did, did, I
47 believe, go back all the way to the early '50s,

1 because the time series they were working with
2 goes back that far.

3 Q I'd like to refer you to Exhibit 184 on the basic
4 subject of correlations at page 12. At page 12
5 there are graphs, the bottom line shows the result
6 of what I've called the 1987 rebuilding program,
7 the escapement being run up, and it also shows on
8 the top graph the productivity. Now, that shows
9 in basic, very general terms, a co-variation or a
10 correlation, does it not, I guess you'd call it a
11 negative correlation, escapement increasing and
12 productivity dropping.

13 A It does, however, you have to be very careful in
14 looking at graphs like this to put them in a
15 larger context, and if I could reply with page 33
16 from our document; that's document page, not PDF.
17 So this is the Kalman filter estimates of
18 productivity from Peterman and Dorner's report.
19 So the reason -- I'm sorry, it's one more page.
20 Sorry, next page, pardon me.

21 So here we have a bunch of stocks that are
22 not in the Fraser River, that we're not
23 experiencing the rebuilding experiment, yet also
24 show declining productivity. So I think that's
25 why it's very important to look at a contrasting
26 set of conditions to try to understand causes, and
27 that's essentially what Peterman and Dorner did in
28 their report. So when you look at that graph you
29 just had up earlier, yes, it shows that as
30 spawners go up following that one rebuilding
31 experiment, recruits per spawner go down. But
32 there's also many things going on in many other
33 stocks, where productivity, recruits per spawner
34 was also dropping, and yet there was not
35 rebuilding going on. So I think you have to think
36 about this in a broader context.

37 Q Well, there were other things happening. For
38 example, after the Exxon Valdez there was a few
39 years of no harvesting in that area, increasing
40 escapements and a subsequent decline in
41 productivity. Are you aware of that?

42 A Yes, I am, from that report we discussed earlier.

43 Q All right. And the Columbia and the Bristol Bay
44 show a different sequence, different productivity
45 trend?

46 A That's right.

47 Q If you were to try to do something like this chart

1 here, and instead of the bottom line being
2 effective total spawners, it were environmental
3 changes, you could never draw a line that would
4 correlate with the top line of productivity, could
5 you? You never --

6 A I'm not sure what you're saying. You're saying
7 there's no environmental parameter that would
8 follow that same curve and therefore this is the
9 most likely explanation for the decline; is that
10 where you're going with this? Because I don't
11 agree with that.

12 Q No, never mind where I'm going. And the question
13 is -- the question is you couldn't take your
14 hypothesis of marine conditions and produce a line
15 like the bottom line of this chart?

16 A Well, actually I think you could. And you could
17 look in the report from Dr. McKinnell, if we want
18 to go to it, let's flip to page 136 in the
19 document -- sorry.

20 MS. BAKER: Exhibit 1291.

21 A So this isn't an exactly perfect figure, but it's
22 one interesting example. That's the Word
23 document, not the PDF number. Sorry, it's the --
24 yeah, it's going to further ahead. Page 136,
25 another ten pages and you're there.

26 So this is the graph here, Figure 95, this is
27 Dave Mackas's index of conditions off the coastal
28 water off Vancouver Island. So it doesn't exactly
29 apply because it's not Georgia Strait and Queen
30 Charlotte Sound, but you could also see that there
31 is warmer and unproductive period that starts in
32 about 1991, 1992, and then there's a period around
33 '99 through 2002 where things get better, but then
34 they largely get worse again.

35 So, you know, there are many variables which
36 -- environmental variables which could show a,
37 let's say, increasing level of stress, in addition
38 to the one that you just raised, namely increased
39 spawners and therefore increased density
40 dependence. So I think it comes back to what
41 question we're trying to answer here, and the
42 question we're trying to answer is what are the
43 primary causes for the overall changes in Fraser
44 River sockeye productivity over the last 20 years.
45 And our conclusion was that with the exception of
46 the Quesnel stock, delayed density dependence was
47 unlikely to be a major factor.

1 MR. HARVEY:

2 Q Yes. Well, let me just ask you this. At page 138
3 of your report.

4 A Yes.

5 Q There's a reference to:

6
7 ...the lack of persistence of
8 environment[al]-recruitment correlations.
9

10 A Oh, is this --

11 Q Somewhere at page --

12 A -- Sean Cox's review?

13 Q -- 138 of your report, and it doesn't seem to be
14 disputed by anyone else there. Second paragraph,
15 I'm told:

16
17 The linear, correlative approach taken [by
18 this] report has failed to explain much in
19 the way of salmon population dynamics despite
20 decades of work. In fact, prominent
21 scientists have doubted our ability to
22 recruitment to environmental factors for more
23 than two decades.
24

25 Et cetera.

26 A Yes, and that's correct, and so it is difficult to
27 -- well, I think, Niels Bohr, the physicist, once
28 said "Prediction is very difficult, especially
29 about the future." And so it's easier to go back
30 because there's only one past and try to explain
31 what factors were likely responsible then is to be
32 able to go forward and make projections based on
33 past correlations, which may not be sustained in
34 the future.

35 Q Well, you were doing a past, you were doing a
36 retrospective.

37 A That's correct.

38 Q And somewhere on this page, and I'm sorry, I
39 realized my marked-up copy of the report I left
40 behind, is the statement that there's a lack of
41 persistence of environmental recruitment
42 correlations. I wonder if you agree with that?

43 A I think that's what the evidence shows, that
44 people find certain correlations and then try to
45 apply them in the future and they don't work so
46 well.

47 Q Okay. And the question of correlations, you

1 accept I think, would you, that the Columbia - I
2 note that you've done some work there, as well -
3 had experienced record returns of sockeye in 2008-
4 2009?
5 A Yes, particularly Okanagan sockeye, yeah.
6 Q Yes. And that's an area where the spawner biomass
7 in that system, the Okanagan system, was well
8 below the carrying capacity of the rearing lakes?
9 A I'm not sure about that, I guess you mean prior to
10 -- prior to that return.
11 Q Yes.
12 A I mean, Osoyoos Lake is a pretty tough place for a
13 sockeye smolt. You have a temperature-oxygen
14 squeeze: very high temperatures in the top, very
15 low oxygen down below. So when you talk about the
16 rearing capacity there, there's not a lot of
17 volume for smolts. And so, you know, I'd have to
18 go back to Kim Hyatt and the origin of that stock,
19 going back to I guess it would be the 2005 brood
20 year, and I guess it would be -- they would have
21 been rearing in 2007 to try to -- or, yeah,
22 rearing in 2006 in Osoyoos Lake to try to
23 understand whether or not, you know, what the
24 densities were like. That's a pretty detailed
25 question.
26 Q All right. At any rate, you agree that the trend
27 line for the Columbia is far different than the
28 trend line set out at page 29 of your report for
29 the Fraser?
30 A Fortunately for the Okanagan stock, they appear to
31 have gone around the West Coast of Vancouver
32 Island and encountered much better environmental
33 conditions than the Fraser stocks that went up
34 through Georgia Strait and Queen Charlotte Sound.
35 Q But, Mr. Marmorek, a moment ago you showed us that
36 the Barkley Sound stocks, which are the West Coast
37 of Vancouver Island, had the drop that other
38 Canadian stocks do.
39 A That's correct.
40 Q All right.
41 A So nature giveth and nature taketh away.
42 MR. HARVEY: All right. I'm sorry, I see it's --
43 THE COMMISSIONER: On that note, Mr. Harvey, it might
44 be a good time to take a break.
45 MR. HARVEY: Yes.
46 THE REGISTRAR: The hearing will now recess for 20
47 minutes.

1 (PROCEEDINGS ADJOURNED FOR MORNING RECESS)
2 (PROCEEDINGS RECONVENED)
3

4 THE REGISTRAR: The hearing is now resumed.
5

6 CROSS-EXAMINATION BY MR. HARVEY, continuing:
7

8 Q Mr. Marmorek, I think you and I will have to agree
9 to disagree on the cause of the 20-year decline.
10 But would you agree to this, that if the 20-year
11 decline had been caused by the B.C. harvest
12 management strategy followed since 1987, there
13 would be something seriously wrong with that
14 strategy?

15 A If that strategy -- if that strategy were the
16 primary cause of the decline of the Fraser
17 sockeye, then I would have expected lots of other
18 stocks which did not experience that strategy to
19 have not shown that decline.

20 Q Like the Columbia, for example.

21 A Like the Central Coast, like Southeast Alaska,
22 like the Yakutat.

23 Q All right. As I say, we disagree, but you would
24 agree with me on this, that if that had caused a
25 decline, there would be something seriously wrong
26 with that strategy, correct?

27 A So it's hard for me to disagree that if you could
28 prove something which hasn't been proved, that you
29 would then do something different, which is what
30 you're saying.

31 Q That's right. All right.

32 A So it's a pretty hypothetical question.

33 Q All right. And my second question is this, that
34 if once the runs were restored, as they were in
35 2010, the DFO managers continued to follow that
36 same harvest strategy, they would be making a
37 serious error, correct?

38 A I think that question requires a lot more
39 analysis.

40 Q Yes.

41 A And I think it's going to be interesting to
42 observe what the effects are of the very high
43 escapement returns to the 2014 returns.

44 Q Yes.

45 A But it's a lot more work to be done to assess
46 whether or not that's a big problem or not.

47 Q But surely there are laws in the science of

1 population dynamics, just like there are laws that
2 rocket scientists follow in physics.
3 A Actually, there are not laws, there are theories.
4 There's a difference. I mean, I'd say that
5 there's a law of gravitation, but there isn't a
6 law of stock recruitment. There are various
7 theories of stock recruitment.
8 Q I've heard it described as a theory of
9 gravitation.
10 A Well, it seems to be working pretty well so far.
11 Q All right. Let me ask you to turn to our document
12 number 13. This is something my junior came
13 across quite by accident in the Ringtail
14 disclosures. It's entitled "Are over-escapement
15 and delayed density dependent mortality important
16 contributors to the Fraser sockeye situation?"
17 DFO Science Branch Fraser Sockeye Workshop, April
18 14 -15, 2011, as far as I know, we haven't heard
19 anything about this, Selbie, Hume, Grant and
20 others. You've had a look at this, I guess, in
21 the advance disclosure that you got?
22 A Yes, I did look at it.
23 Q Yes. Did you know anything about this workshop
24 prior to seeing that disclosure?
25 A No.
26 Q Have you investigated since then what this
27 workshop was about and the conclusions that they
28 (indiscernible - overlapping speakers).
29 A No, all I've had a chance to look at is this
30 document, I just got it last week.
31 Q All right. At page 008, there's mention there
32 "Stationary Model Comparisons", these appear to be
33 topics that were discussed:
34
35 • Stationary Mode Residuals: Larkin vs. Ricker
36
37 ■ Larkin fit better than Ricker in 12 of
38 19 Fraser stocks
39
40 You don't know which of the participants concluded
41 that, or whether they all concluded that.
42 A Well, there's several summary statements here of
43 what was in Peterman and Dorner, and I was
44 thinking as I looked through this that what really
45 should be done is to sit down with Randall
46 Peterman and Brigitte Dorner and just confirm that
47 this is exactly what they would have concluded, as

1 well. Because it's a fairly -- you know, this is
2 the problem with PowerPoint, you have a bullet
3 that summarizes a whole lot of information in
4 several pages. So it seems generally consistent
5 with what I had read, but sometimes the devil is
6 in the details.

7 Q Yes. Jeremy Hume is the DFO expert on carrying
8 capacity of the rearing lakes, is he not?

9 A That's what I understand.

10 Q There's a conclusion at page 0011:

11
12 ▪ Conclusion - Where DDD --
13
14 - which I think means delayed density dependence -
15
16 -- exists, it persists across the entire 4
17 year cycle (in agreement with Woodey,
18 Lapointe and Hume); Causal mechanisms of DDD
19 most likely stock-specific
20

21 Do you agree with that conclusion?

22 A Yes, and could you go to the next page, as well.
23 So I just draw your attention to the last bullet
24 there.

25 Q Yes.

26 A
27 ▪ Density dependence] and [delayed density
28 dependence] likely contribute to reduced
29 productivity in a number of stocks, but are
30 unlikely the cause of the widespread declines
31 observed within and beyond the Fraser River
32

33 Which is consistent with the conclusions in our
34 technical report.

35 Q Up at the top it says:

36
37 ▪ Many Fraser stocks are sensitive to simple
38 density-dependence
39

40 Do you see that?

41 A Yes.

42 Q And:

43
44 ▪ Evidence exists of [delayed density
45 dependence] in several stocks, and it is
46 likely an important regulatory mechanism in
47 specific stocks (i.e. Quesnel), in relation

1 to increased spawner abundances.
2
3 A Yes, and that's "i.e.", meaning one.
4 Q Well, it says it exists in several stocks, meaning
5 more than one, correct?
6 A Well, they actually found -- Peterman and Dorner
7 found there were, I think three, Stellako was one,
8 I can't remember the third. But Quesnel was the
9 only one for which they concluded that there was
10 definitely delayed density dependence operating.
11 Q Yes, but the analysis and the work has continued
12 since then and this is a two-day workshop on that
13 entire subject, so you'd expect some development
14 beyond what Peterman and Dorner determined, would
15 you not?
16 A Well, since I wasn't there, I really don't know
17 what they discussed and what evidence they used
18 for that discussion, so it's hard for me to
19 comment on that.
20 Q Do you see at -- turn to page 0014, there are
21 discussion here of "Record Escapements", Quesnel
22 2001 - 2002, and the S_{max} figure is given, the
23 range between 187 up to 334 percent beyond S_{max} .
24 Shuswap 2010, high figure there is 481 percent
25 beyond S_{max} according to the photosynthetic rate
26 model. And Chilko, the highest number there, 547
27 percent beyond S_{max} .
28 A Yes, I see that. I also see on this graph, if you
29 look at the top panel, what struck me about it for
30 the Quesnel stock is despite being way beyond the
31 photosynthetic level and the S_{max} , the fall fry
32 production, when you get up to 1.5 million, was
33 still quite high and in fact didn't follow the
34 Ricker curve. It's actually above the Ricker
35 curve. Now, it could be that those fall fry are
36 small, or, you know, the quality is poor, or, you
37 know, the condition of smolts isn't good. There's
38 a bunch of questions you don't know. So that
39 would be -- and maybe that work's been done. But
40 that would be one of the things I'd be interested
41 in is to learn so what actually happened from that
42 brood year and were there life history bottlenecks
43 and, if so, where did they occur. And it's also
44 going to be interesting to see in, I guess, 2011
45 or 2012 what the -- I guess it would 2012, what
46 the fall fry are like in the Shuswap and the
47 Chilko, both in numbers and quality.

1 Q Well, since you raised it, with respect to
2 Quesnel, are you not aware that the escapements in
3 '01 and '02 affected juvenile growth and fry adult
4 survival?

5 A I think there actually are some other diagrams in
6 here earlier which looked at those, yes.

7 Q Yes. And just for the record, I point out that
8 Exhibit 562, which is Technical Report 3 at page
9 113, that statement appears, high escapements in
10 '01-'02 affected juvenile growth and fry/adult
11 survival. And in Exhibit 399 at page 10 this
12 statement appears, out-migrating smolts in 2004
13 were the "smallest on record". That would be
14 consistent with density dependence effects, would
15 it not?

16 A Right, that's -- that's interesting.

17 Q All right.

18 A And Quesnel was the one stock that Peterman and
19 Dorner felt they were, there was evidence of both
20 direct and delayed density dependence.

21 Q Now, at page 115, or 0015, I mean, the next page,
22 it refers to "Over-Escapement & Productivity",
23 refers to the Clark paper, that's the Alaska paper
24 that we referred to:

- 25
- 26 ▪ Declines in long-term productivity and
27 increased spawner abundance variability when
28 escapement goals were exceeded
 - 29
 - 30 ▪ Believed to be linked to surpassing nursery
31 ecosystem productive capacity
 - 32

33 And then the next heading is "Delayed Density
34 Dependence", Clark et al:

- 35
- 36 ▪ ...[delayed density dependence] in 5 stocks
37 where over-escapement occurred
 - 38
 - 39 ▪ [Recruits/spawner] fell below replacement for
40 2-5 yr following consecutive over-escapements
 - 41

42 And then the next page --

43 A Sorry, could I just comment on this?

44 Q All right.

45 A Since you raised it. So a couple of things, first
46 of all, I don't think we have to go back to Clark
47 et al, but the first two bullets here is a little

1 bit of the tyranny of PowerPoint here, because
2 they also mentioned that there were several cases
3 where escapement goals were exceeded where it did
4 not result in decreases in productivity, in that
5 we were just looking at that earlier when you went
6 through that report.

7 Q Yes, all right.

8 A And I pointed that out. And also, I think it's
9 also important that it was five out of 40 Alaskan
10 stocks where escapement occurred. Okay? So it
11 wasn't that widespread.

12 Q Mr. Marmorek, would you accept that those
13 attending this workshop had more experience and
14 knowledge in the area of salmon population
15 dynamics than you do?

16 A I don't know everybody who was at that workshop,
17 so I can't comment on that.

18 Q All right.

19 A I think I have a fair amount of experience and I
20 think those people also have a fair amount of
21 experience.

22 Q Population dynamics I don't think is one of your
23 areas of specialty or expertise, is it, fish
24 population dynamics?

25 A I haven't had as much experience as Randall
26 Peterman or Carl Walters, but I have had a lot of
27 experience with fish population dynamics.

28 Q All right. And the next page, page 16, it says:

- 29
- 30 • 2010-2011 in the Fraser: Shuswap and Chilko
 - 31
 - 32 ▪ Potentially severe [density dependence]
33 in 2010
 - 34
 - 35 ▪ Depending on 2011 escapement, possible
36 repeat of the Quesnel/Alaskan examples
 - 37

38 So these, all you know is that these were topics
39 discussed and possibilities expressed by this
40 panel is that correct?

41 A Yes, I think the Quesnel is an interesting case
42 which should be further examined.

43 MR. HARVEY: Do you agree with this, Mr. Marmorek, that
44 -- I'm sorry, could I have this marked as the next
45 exhibit, please.

46 THE REGISTRAR: Exhibit 1908.

47

1 EXHIBIT 1908: Selbie et al, Are over-
2 escapement and delayed density dependent
3 mortality important contributors to the
4 Fraser sockeye situation? DFO Science Branch
5 Fraser Sockeye Workshop, April 14-15, 2011
6

7 MR. HARVEY:

8 Q And do you agree, Mr. Marmorek, that it is
9 important that fishery managers adhere, so far as
10 possible, to scientifically defensible escapement
11 goals?

12 A Yes.

13 Q All right. Now, I've spent some time discussing
14 the first three of your four criteria, plausible
15 mechanism, exposure, spatial correlation, I'd like
16 to turn briefly to --

17 A Sorry, it's not just spatial.

18 Q Okay.

19 A It's either correlation over space and/or time.

20 Q And time, I'm sorry. Now, let's turn to your
21 fourth criteria, where there is corroborating
22 evidence from cause/effect studies. Do you agree
23 that there is empirical proof firstly of a limited
24 carrying capacity in the rearing lakes for the
25 Fraser River sockeye system?

26 A Yes, I think there is a limit of carrying capacity
27 in all sockeye lake rearing systems.

28 Q Yes. And specifically are you aware that in this
29 system in some areas zooplankton counts have been
30 done, fry size analyses have been done, and
31 photosynthetic rate calculations have been done to
32 determine carrying capacity?

33 A I'm familiar with using photosynthetic rate
34 calculations to determine carrying capacity. I'm
35 not as familiar with this specific application of
36 zooplankton biomass estimates. I know there's
37 correlations with carrying capacity, but I haven't
38 seen those --

39 Q All right.

40 A -- applied to the Fraser.

41 Q Do you agree that there is empirical proof of
42 spawner abundance well in excess of the PR,
43 photosynthetic rate, calculated rearing capacity
44 in all or most of the major Fraser runs?

45 A No, I actually don't, and if you want to go to the
46 Selbie et al exhibit, this was in the Appendix C
47 to Peterman et al, there is evidence for some of

1 the Fraser River stocks that one time after 1990
2 the spawning escapements exceeded the
3 photosynthetic rate. So you'd have to open
4 Appendix C --

5 Q My question related to major -- major stocks.

6 A So one of the problems I have with the figure in
7 Selbie et al is -- and if we can find it -- that's
8 great, 573. So it shows the photosynthetic rate
9 calculation, and then it shows the maximum --
10 yeah, we'll just go there. It's easier to
11 describe it once you see it, number 12. It's D12.
12 So if you go down a bit further, this one.

13 So the green represents the maximum observed
14 spawners after the 1990 brood year, and the blue
15 hatched is the photosynthetic model optimum
16 escapement. So you only have the maximum observed
17 spawners. So if you look at the Shuswap, for
18 example, you can see that, yes, there was at least
19 one year in which it was greater than the carrying
20 capacity as estimated by the photosynthetic rate
21 model. But you don't know how many years that
22 was. And so, you know, if you just -- we'll go
23 across there, you see Chilliwack, Lillooet,
24 Shuswap, Chilko, Quesnel and Trembleur had at
25 least one year, but we don't know how many years,
26 where it was greater than the photosynthetic
27 escapement.

28 Q Yes, well, we have had evidence of that and I
29 won't -- of how many years, and I won't go into
30 that with you. Let me simply ask you this. With
31 respect to the Quesnel run, are you aware that it
32 was the Quesnel run that was expected to be the
33 largest run in 2009?

34 A Yes, I am, and that's clear from the figure in our
35 report, page 37.

36 Q Yes. And that it failed.

37 A Right.

38 Q And that according to Peterman and others it
39 failed through density dependent effects?

40 A Well, I'd have to review Peterman and Dorner's
41 report to conclude that it specifically failed for
42 that reason. I don't remember that he discussed
43 that -- I remember that he ascribed that single
44 cause to the failure, because they were also
45 really lousy marine conditions in 2007 when all
46 those stocks went out there. So I don't remember
47 that he actually said that. If you can point me

1 to the section where he actually says that --

2 Q I'm sorry, I'm not --

3 A -- in Technical Report 10, that would be great.

4 Q I didn't mean to suggest it was the only cause.

5 A Yeah, I don't believe that he actually
6 specifically discussed the 2009 returns. If you
7 can find that, that would be great.

8 Q Well, I don't have the time to do that. I just
9 want to do one housekeeping matter before I sit
10 down. At our document 11, there's a basic text
11 here, somewhat simplified text on the "Behaviour
12 and Ecology of Pacific salmon and Trout", Thomas
13 Quinn. You saw this in the disclosures, I expect?

14 A Yes, I did. It was well written.

15 Q Well written, thank you. At page -- and the
16 passage that I have included here shows pictures
17 of all the different food web organisms, among
18 others. At page 176 there's a passage I want to
19 ask you about. Page 176, the paragraph beginning
20 "For anadromous sockeye" the middle of the page:

21
22 For anadromous sockeye, the negative effect
23 of fry density on growth may be offset, to
24 some extent, by the...positive, fertilizing
25 effect of the carcasses of the parents that
26 spawned them...

27
28 Pausing there, there's studies that have been done
29 on that I expect you're aware of, or you'd accept.
30 All right. But this sentence:

31
32 In general, however, large escapements tend
33 to give rise to numerous but slow-growing
34 fry.

35
36 You'd agree with that as a general term, correct?

37 A Yes, I don't -- I don't think we're disagreeing on
38 the fact that density dependence can occur. I
39 think we're disagreeing on the extent to which it
40 was a primary factor causing the declines.

41 MR. HARVEY: Could this be marked, please, as the next
42 exhibit.

43 THE REGISTRAR: Exhibit 1909.

44
45 EXHIBIT 1909: Quinn, The Behaviour and
46 Ecology of Pacific Salmon and Trout,
47 excerpts, 2005

1 MR. HARVEY: Those are my questions. Thank you very
2 much, Mr. Marmorek.

3 A Thank you.

4 MR. ROSENBLOOM: Mr. Marmorek, my name is Don
5 Rosenbloom. I appear on behalf of Area D Gillnet,
6 Area B Seiner.

7

8 CROSS-EXAMINATION BY MR. ROSENBLOOM:

9

10 Q I see you're looking for some paper, are you...

11 A I'm fine. It's okay.

12 Q Thank you. I'll be very brief with you. I didn't
13 have the privilege of hearing your testimony
14 yesterday, but I gather you have said yesterday
15 and you in fact stated in your paper, which is
16 before us, the Technical Report, Exhibit 1896,
17 that you call for more research in the marine
18 environment in terms of both Strait of Georgia,
19 Johnston Strait and up into the Gulf of Alaska,
20 correct?

21 A And including Queen Charlotte Sound, in
22 particular.

23 Q Indeed. My question to you is one of the
24 intriguing stories of this inquiry is how the
25 Harrison stock has had increasing productivity,
26 and as a result, I want to focus very briefly in
27 respect to Harrison. To what extent did you have
28 data in respect to the Harrison migratory history?

29 A So the Harrison stock has a different migratory
30 history, as you know, and in the statistical
31 analyses which we did, which are described --
32 summarized in section 4.7 of our report and
33 described in detail in Appendices 3 and 4, we
34 basically lined up the life histories of all 18
35 stocks that we analyzed. And so the Harrison
36 stock, you know, which leaves early, doesn't spend
37 as long rearing, has a different life history.
38 And so when we lined up the environmental stressor
39 variables, the Harrison stock is exposed to
40 different years than, let's say, an Adams River
41 stock, just because of their life history.

42 Q Were you limited in terms of data information in
43 respect of Harrison in terms of carrying out your
44 -- discharging your responsibilities to this
45 Commission, or your mandate?

46 A Well, certainly there are limitations of data for
47 all the stocks, including very detailed

- 1 assessments of exposure to, for example,
2 zooplankton abundance in the Strait of Georgia and
3 other places. We used the variables that were
4 available in our analyses, but as we've outlined,
5 there are certainly gaps.
- 6 Q Am I right, sir, that there has not been telemetry
7 work done on the Harrison?
- 8 A Not to my knowledge, and I'm not sure how easy
9 that would be to do, given the size they are when
10 they go out. Like, if you're thinking about the
11 POST-style acoustic tags, I don't know if they're
12 big enough to handle those.
- 13 Q I understand. Secondly, in terms of Dr. Kristi
14 Miller's work that is before this inquiry in terms
15 of genomic signatures, and so on, are you aware
16 whether she did any analysis in respect to the
17 Harrison stock in the context of her
18 investigation?
- 19 A No, I'm not.
- 20 Q And you would agree with me, would you not, that
21 if indeed that work was done by her or was to be
22 done in the future, that would be an important
23 component in terms of the puzzle, trying to answer
24 some of these really challenging questions, would
25 you not?
- 26 A I think it would be an important component. I
27 think the paper by Dick Beamish that we mentioned
28 earlier that specifically discusses the Harrison
29 stock and the South Thompson chinook stock, talked
30 about one of the key differences is their later
31 arrival into the Strait of Georgia, and that they
32 may be hitting the second zooplankton bloom and
33 therefore have more food than fish which get out
34 there May-June time period. So I think it's one
35 factor, but it's not the only...
- 36 Q When you have given your plea, if I can describe
37 it that way, for more research in respect to the
38 marine environment, do you include the necessity
39 of doing more work in terms of the Harrison --
- 40 A Absolutely.
- 41 Q -- which of course has a different migratory route
42 altogether.
- 43 A Absolutely. I mean, it's very interesting,
44 because it's done better and you wonder why. So I
45 think it's a very valuable stock to focus on.
- 46 Q Yes. And had there been more information in that
47 regard, it might have enhanced the substance of

David Marmorek

Cross-exam by Mr. Rosenbloom (GILLFSC)

Cross-exam by Mr. Eidsvik (SGAHC)

1 your analysis as provided in your report. You
2 were lacking data?

3 A Well, I would say that we used the data that we
4 had, and certainly the Harrison stock had been
5 examined at the PSC workshop and discussed by Dick
6 Beamish in his presentation there, and I think
7 Mark Trudel also talked about levels of food at
8 different times during the year. So it's not as
9 though we were completely without any information,
10 and it was of particular interest at that PSC
11 workshop.

12 MR. ROSENBLOOM: Yes. I thank you very much. I have
13 no further questions.

14 MR. EIDSVIK: Good morning, Mr. Commissioner, Philip
15 Eidsvik for Area E and the BCFSC.

16
17 CROSS-EXAMINATION BY MR. EIDSVIK:

18
19 Q Good morning.

20 A Good morning.

21 Q It's interesting to listen to the discussion on
22 science and whether there's a delayed density
23 effect or not, and I was interested in your
24 comment, it will be interesting to see what
25 happens in 2014, given the high level of spawners
26 in 2010. As a representative of commercial
27 fishermen, we find that it's a little bit hard to
28 listen to, because really people's lives are being
29 affected, and so what we hear from science a lot
30 of times is more research, more research, more
31 research. In the meantime we have commercial
32 fisheries close, like in 2005, 2002. Doesn't
33 science have a role in -- if we're going to
34 increase escapement, to do it in small steps,
35 rather than take a radical jump from year to year,
36 given that people's lives are being played with?

37 A So there are two different parts to your question.
38 One is how do you implement a management action so
39 that you learn as much as you can about the
40 effectiveness of that action, and I think we had a
41 good discussion earlier with your colleague about
42 adaptive management and designing experiments
43 well. So I think that if you decide either to
44 increase or decrease escapement, that you need to
45 design that as a thorough management experiment,
46 taking into account all the uncertainties.

47 The second part of your question is there are

1 a bunch of different objectives that have to be
2 balanced off in terms of Wild Salmon Policy
3 issues, First Nations concerns, fishermen, fish
4 farmers. So science can help in articulating what
5 the risks are and potential benefits to each of
6 those objectives, but the tradeoffs amongst those,
7 that's a policy or political decision. That's not
8 a science decision.

9 Q Mr. Lunn, could I have exhibit -- or my tab by Mr.
10 Lackey, please. And I'm going to bring up this
11 tab and perhaps we can go to the second page and
12 just the abstract. And could you tell me if you
13 read quickly, do you agree with Mr. Lackey's
14 conclusion that science has to be performed
15 appropriately without a policy bias?

16 A Yes, I do.

17 Q And scientific enterprise has much to lose by
18 doing otherwise?

19 A Yes. And I think that's what I just stated.

20 MR. EIDSVIK: Thank you. Could I enter this as an
21 exhibit, please, Mr. Commissioner.

22 THE REGISTRAR: Exhibit 1910.

23

24 EXHIBIT 1910: Lackey, Is Science Biased
25 Toward Natural? 2009

26

27 MR. EIDSVIK:

28 Q Now, at page 32 of your report, and I don't think
29 we need to go there, you comment that:

30

31 Over the past two decades an increasing
32 amount of en route mortality...

33

34 That:

35

36 This results in reduced harvest, as fishery
37 managers do their best to ensure...
38 spawners...

39

40 That's not -- and I think it's an unintentional
41 thing in your paper, you're not saying that DFO
42 managers did their best?

43 A What I'm saying is that given that en route
44 mortality was occurring, they had to make
45 adjustments for that in the harvest to ensure that
46 they were able to meet the escapement goals that
47 they were trying to meet.

- 1 Q But you really have no idea whether they did their
2 best or not, because there could have been a whole
3 bunch of other factors?
- 4 A Yeah, I see you're focusing on --
- 5 Q The point I'm getting at --
- 6 A -- whether they actually did as well as they could
7 have? Okay, so that's -- maybe a better way to
8 rephrase that sentence is that en route mortality
9 was taken into account in setting harvest rates.
- 10 Q Okay. I just didn't want --
- 11 A I didn't want to take that little phrase out of
12 context and say that, you know, DFO could never do
13 better than they've done. That's not what the
14 intention was of that sentence.
- 15 Q Yeah. Just "best" is bit of an advocacy word, so
16 that's why I wanted to get that off the record.
17 Thank you.
- 18 Your firm does a fair amount of work for
19 government, either directly or by organizations
20 funded by government; is that correct?
- 21 A We've done a lot of work for government,
22 institutions, we've done a lot of work for
23 international institutions, for non-government
24 organizations, Crown corporations like BC Hydro,
25 Bonneville Power Administration that runs dams on
26 the Columbia River. So many of our projects
27 involve actually a mix of clients where we're
28 doing technical analyses and technical
29 facilitation that are attacked by all sides; maybe
30 not unlike here.
- 31 Q Yeah. Your firm in fact is -- has been retained
32 and continues to be retained by a couple of
33 organizations that are still in -- that are
34 parties in this inquiry; is that correct?
- 35 A I don't know which ones you're referring to.
- 36 Q Tsawwassen and Haida.
- 37 A Oh, I think we've done one study for the
38 Tsawwassen First Nation. The Haida? I'm not
39 familiar with work that we've done for -- I think
40 the Tsawwassen First Nation we were critiquing an
41 environmental impact assessment of Delta Coalport
42 expansion, that's my recollection. I wasn't
43 involved on that project specifically. I don't
44 remember a project we did with the Haida, so...
- 45 Q Thank you. If you were working for a party in
46 this Commission, say my organization when you
47 testified before the Commission, there would be

1 concerns about the weight to give to your
2 evidence, given your relationship with a party
3 before the Commission, wouldn't there?
4 A I don't think so, sir. I mean, everything we do,
5 we try to do to the highest possible standards of
6 neutrality, and throughout the 30-year history of
7 our company, we've avoided taking positions to
8 benefit the position of a client, just because
9 they're paying the bill. If that's what your --
10 intent of your question is, I thoroughly reject
11 it.
12 Q So no problem with an appearance of conflict or
13 bias because --
14 A No.
15 Q Thank you. Now, you said that the run in the --
16 that that water in the mid-Pacific was quite cold
17 in 2008, which led to the -- may have led to the
18 big run in 2010 of Fraser sockeye.
19 A That's what Dr. McKinnell had in his report. He
20 said it was the coldest temperatures in 35 years.
21 Q Yes. Now, you're aware that from 1997 (sic) to
22 '98 there was a 21-year warm-water phase with
23 variances that were double in the years preceding
24 2008 in terms of warm water.
25 A I'm sorry, you said in 1997 and 1998?
26 Q 19 -- sorry, 1977 to 1998, that was a 21-year
27 warm-water phase.
28 A Oh, you're talking about the Pacific decadal
29 oscillation --
30 Q Yes.
31 A -- regime shift? Yeah.
32 Q And one of our biggest runs ever was of course in
33 1993, and Fraser sockeye was rebuilt substantially
34 during the '70s and '80s; is that correct?
35 A Right. Well, the thing is the Pacific decadal
36 oscillations are not like an on/off switch in your
37 house. They have oscillations within the
38 oscillations, so it's roughly a 30-year
39 oscillation, like from the mid-'40s to the mid-
40 '70s was generally cooler and wetter, and then
41 from mid-'70s through to the roughly 2000 was
42 generally warmer and drier. But within those time
43 periods there's -- there's La Niña events, like
44 the Hyatt paper talks about. There's various
45 events where things get better. So it's not like
46 -- it's not just all bad and then all good.
47 Q So you don't know that during the 1977 to '94

1 period there was a 21-year warm period. That's
2 your testimony?
3 A Within that time period there were fluctuations,
4 and if you want to go back to the --
5 Q I'll move on, thank you. You said in response to
6 Mr. Harvey --
7 MR. BAKER: Sorry. I would like the witness to be able
8 to complete his answer.
9 A Well, I just wanted to say that the Mackas index
10 that we were looking at earlier, which is affected
11 by both temperature and other indices shows
12 fluctuations of both good and bad during some of
13 that same time period.
14 MR. EIDSVIK:
15 Q Okay. So you don't agree with me then, if I get
16 this right, between 1977 and 1994 there was a
17 warm-water period in the mid-Pacific that had
18 double the variance in warm water, compared to
19 your kind of period prior to -- immediately prior
20 to 2008?
21 A So I don't know what you mean by "double the
22 variance". I don't know exactly what variance
23 you're assuming. What I'm indicating is that I
24 agree that generally the period from the mid-'70s
25 onward was generally warmer and drier, but that
26 within that period there were certainly better and
27 worse years, and there's lots of evidence to show
28 that. It's not like it's all bad every year,
29 that's the point I'm trying to make.
30 Q Now, you said in response to Mr. Harvey's question
31 when he asked you about, you know, why was
32 Columbia and Bristol Bay good, you said because
33 they're not the same stock groups and we really
34 shouldn't go beyond 500 miles in comparison --
35 A Kilometres.
36 Q -- kilometres in comparing stock groups. But I
37 noted at page 34 of your report - and we've gone
38 to it a couple of times this morning - you refer
39 to Barclay Sound, Central Coast, Skeena River,
40 those are more than 500 kilometres, certainly the
41 Skeena is.
42 A So I think you have to remember when Mr. Harvey
43 was asking that question, he was asking it to me
44 in the context of an adapted management experiment
45 where you might want to change harvest policy for
46 one set of stocks and compare it to another set of
47 stocks. What I was saying there is that if you

1 were going to do an adaptive management experiment
2 like that, you would want to choose stocks which
3 were fairly close so that they would have
4 reasonably similar ocean entry timing and
5 reasonably similar migration routes so you could
6 isolate the effects of the harvest.
7 So now what you're talking about are the
8 broad scale patterns that Drs. Peterman and Dorner
9 looked at which are the patterns that we're trying
10 to explain, and that's a different question.
11 Q Well, let's look at Barclay Sound. In the 1990s
12 and early 2000s, we had a tremendous problem with
13 mackerel. They ate a huge amount of smolts; is
14 that correct?
15 A I wasn't familiar with that, but I take --
16 Q Not familiar with that.
17 A -- your word for it.
18 Q And then you cite this Central Coast. In Owikeno
19 Lake, wasn't that one of our first areas where we
20 ran a large escapement program as an experiment?
21 A Yes, and if you could just actually go to --
22 Q Thank you. I don't have time to go to it, so I'm
23 just trying to get my questions out.
24 MS. BAKER: You actually, in my submission --
25 A I just -- I just suggested --
26 MS. BAKER: -- do have to let the witness --
27 A -- he put up page 34 --
28 MS. BAKER: -- answer the question.
29 A -- of my report while you're talking about Owikeno
30 Lake 'cause I think it's important. I won't use
31 any more time other than to have it up there while
32 you're talking about it. Thanks.
33 It's the upper right figure with the blue
34 triangles.
35 MR. EIDSVIK:
36 Q Yeah, and were you aware that fishermen were
37 protesting the spraying of the forests up there
38 with a herbicide to encourage forest growth at the
39 time?
40 A No, I wasn't aware of that.
41 Q Now, you also cite the Skeena River. Wasn't the
42 Skeena River another river where we had massive
43 over-escapement and it resulted in IHN virus
44 viruses on the spawning grounds?
45 A Now, I've heard about that. I don't know much
46 about it in detail.
47 I just wanted to point out that Owikeno Lake

1 is one of several stocks in the Central Coast and
2 in southeast Alaska who have shown similar timing
3 - and the Yakutat - of decline, so it wasn't
4 unique. So the fact that there was increased
5 escapement on there is not sufficient explanation
6 for why -- on Owikeno Lake, sufficient explanation
7 for why the other stocks would decline.
8 Q If there was a reduction of fishing effort on
9 Owikeno, those other stocks fished -- are
10 basically run together up to that area, don't
11 they?
12 A Some of them -- you're saying that all of these
13 stocks including southeast Alaska --
14 Q I think the --
15 A -- and the Yakutat would have all increased --
16 Q No, no.
17 A -- in escapement because of reduction in harvest
18 on Owikeno Lake? I don't think so, sir.
19 Q Given my limited time, I'll move on, thank you.
20 Now, if ocean conditions -- and I want to
21 separate - and I think it's helpful for the
22 Commissioner to separate - our mid-Pacific Ocean
23 conditions from the estuary and Johnstone Strait
24 area and Queen Charlotte Sound. Would you agree
25 with that?
26 A Yes.
27 Q Okay. So that might -- I mean, we had really good
28 pink salmon runs in the Fraser.
29 A I'm sorry, when?
30 Q We've had very good pink salmon runs.
31 A Oh, recently, yes.
32 Q Okay. That's a contrast to what's happened on
33 Fraser sockeye?
34 A Yes.
35 Q Decent chum runs in the Fraser, past decade or so?
36 A So I understand. I don't know the details of
37 that.
38 Q High Alaskan and Russian sockeye runs, last decade
39 or so?
40 A In general over the last few decades, they've been
41 going up.
42 Q Large chum runs in Hokkaido?
43 A I didn't know about that, but I take your word for
44 it.
45 Q And then Mr. Harvey and you talked earlier about
46 Harrison stock. And of course this year we have a
47 very large successful sockeye run in the Harrison

- 1 Lake -- sorry, Somass River; is that correct?
2 A Sorry, I don't know the details of this year's run
3 in the Somass River.
4 Q No. Now, in terms of the Pacific Ocean, one of
5 the big factors is when the wind blows from the
6 north, it's cold, and that affects the temperature
7 of the Pacific; is that correct?
8 A The wind patterns and temperature patterns are
9 pretty complicated as described in Skip
10 McKinnell's report, so I wouldn't want to make
11 just one generalization about wind patterns.
12 Oceanographers have lots of discussion about these
13 things.
14 Q In any event, the Minister can't change which way
15 the wind blows, much as he'd like to.
16 A Yes, I wouldn't disagree with you on that.
17 Q So in terms of fishery management, let's say that
18 you're correct that ocean conditions in the mid-
19 Pacific affect what's come back in the last few
20 years. You couldn't --
21 A Sorry, I just to clarify. It's not so much "mid-
22 Pacific". It's the coastal migration that we're
23 talking about.
24 Q So you're saying coastal migration?
25 A That's the life history stage that we've been
26 talking about, not the mid-Pacific, as the primary
27 cause of the decline. So it's Georgia Strait and
28 Queen Charlotte Sound that we're talking, not the
29 mid-Pacific.
30 Q That's quite helpful. Now, at page 48 of your
31 report, amongst all the factors that science has
32 looked at in this Commission, you conclude that
33 climate change is really the only possible factor.
34 A No, that's not correct. On page 48, we -- oh, I'm
35 sorry, you're at 48. Okay, I thought you were
36 talking about the overall -- this is for one life
37 history stage only. So this is just for the
38 Fraser sockeye salmon as they're going -- this is
39 eggs, alevins, fry and parr, so this is just the
40 egg to parr life history stage.
41 Q So, at that point, the only factor is climate
42 change?
43 A Right, and it's -- and you'll notice it's rated as
44 a possible factor. The correlation and
45 consistency was fairly weak evidence there, so
46 it's not a very strong case, not as compared to
47 the main factors that we talk about in the coast

- 1 migration stage, which would be life stage 3.
- 2 Q Right.
- 3 A Where we say that marine conditions and climate
4 change are the likely primary drivers of the long-
5 term pattern.
- 6 Q Now, I note on the ESSA website that you advertise
7 climate change adaption and carbon accounting as
8 two significant parts of ESSA's business.
- 9 A Adaptation, yes.
- 10 Q Now, I don't see any mention of that in this
11 technical report.
- 12 A No, because it isn't relevant.
- 13 Q Isn't one of the ways -- I mean, as a layman, and
14 I'm not a lawyer and perhaps there's rules here I
15 don't understand, but as layman, isn't one of the
16 ways to deal with where somebody would say you
17 have a conflict would be to declare it and get it
18 right up front. or a bias?
- 19 A Pardon me? What's the conflict? I don't
20 understand what the conflict is.
- 21 Q Well, if there's -- if somebody -- if you're
22 making -- well, let's put it this way: If the
23 Commission finds that climate change is to blame
24 for the problems in Fraser sockeye, your firm
25 would undoubtedly be bidding on jobs and earning
26 revenues from helping fishery managers accommodate
27 and adapt to climate change.
- 28 A So this is sort of akin to saying that if I were a
29 carpenter and I put my foot through somebody's
30 stairs because there was some rotten wood and I
31 pointed that out to him, that I was really just
32 trying to generate business? Is that your
33 argument?
- 34 Q No. I'm just pointing out that in terms of
35 science and the key role that science has in
36 forming political decision-makers and the really
37 important necessity to separate advice and
38 revenues or possible benefits. Do you understand
39 that at all? Not a concern?
- 40 A The reports we write, sir, are reviewed by many
41 different entities and because of the kinds of
42 work that we do, those entities often are
43 adversaries around particular issues. So we work
44 to the highest possible scientific standards.
45 Most of the -- you'll see in my c.v. that I've
46 published many peer-reviewed articles. So the
47 fact that we mention climate change as a possible

1 factor, and the fact that we also do work on
2 climate change adaptation, is completely
3 irrelevant. The two things are completely
4 disconnected.

5 Q So in your view, but to a fisherman on the dock,
6 it might not be.

7 A Well, I can't claim to explain the reasoning by --

8 Q That's fair enough.

9 A -- which you're linking these two things.

10 Q Thank you. Now, I want to go back, because if we
11 look at 1992, we saw the decline in productivity.
12 We saw some management changes and I kind of want
13 to focus on the things that have changed.

14 A Sorry, I just want to point out that the decline
15 in productivity happened a lot earlier than 1999.
16 It actually started --

17 Q 1992.

18 A Yeah, and some of the stocks -- I won't show the
19 diagram, but as we talked about in section 4.1,
20 some of the declines started even earlier than
21 that for some of the stocks.

22 Q Okay. So let's talk about changes that happened
23 since 1992 that we can put a finger on, and that
24 the managers have some control over. So in '92,
25 we had the introduction of a very large, new
26 commercial fishery in-river. That's one aspect of
27 change, correct?

28 A I don't know the full history of all the changes
29 in fisheries over this whole period of time.
30 We're looking at the pattern recruits per spawner
31 and trying to explain that. The recruits include
32 escapements, harvest and en-route mortality, so
33 the fact is that even after you've added in
34 harvest and en-route mortality, there's been a
35 decline in productivity and that's what we're
36 trying to explain.

37 The actual amount of harvest doesn't really
38 affect the estimate of recruitment. It just gets
39 -- I mean, it does affect the total recruitment,
40 but it doesn't help to explain the pattern of
41 decline in recruits-per-spawner because it's
42 already considered in recruitment.

43 Q Yeah, I understand that, but I'm trying to focus
44 on issues that have changed since 1992, 'cause it
45 seems to me when I read through all the science
46 reports, we don't have a lot of conclusive
47 answers; is that fair to say?

- 1 A I think there's disagreement on various issues and
2 I actually think there's a fair agreement on a lot
3 of issues. For example, if you look at the
4 overall conclusions of our report in terms of
5 which factors are unlikely to have been
6 responsible, I haven't heard from many other
7 people much disagreement about those. So we are
8 able to make some useful conclusions --
- 9 Q Yeah, I'm almost --
- 10 A -- despite the lack of evidence.
- 11 Q I'm almost done my time. Let's just go quickly
12 through the other factors. Fish farms are pretty
13 big development since '92?
- 14 A Yeah, and earlier.
- 15 Q Very large escapements on the Fraser sockeye since
16 '92?
- 17 A Yes.
- 18 Q Large pink abundance since '92, possible predator
19 effects?
- 20 A With oscillations.
- 21 Q Warm water in the Fraser in some years?
- 22 A Increasingly so. You're talking about the returns
23 now, the en-route mortality, or...?
- 24 Q No, I'm just talking about things that have
25 changed, and if I was trying to --
- 26 A To a degree change, I think, over the last 40
27 years, I believe, maybe 50 years.
- 28 Q And of course we have 15 million sockeye lost
29 between the spawning grounds and the mouth of the
30 river during this period. So if you were --
- 31 A Do you mean it the other way around?
- 32 Q Well, from the spawning grounds -- sorry, from the
33 river to the spawning grounds.
- 34 A Sorry, are you adding the number up over many
35 years, or what are you --
- 36 Q I'm adding the number up since that's in evidence.
- 37 A Yeah, I'm sorry, I haven't seen that --
- 38 Q Okay.
- 39 A -- evidence so I don't know what that is.
- 40 Q So now my final question is: If you're a
41 fisheries manager, you can't control which way the
42 wind blows, but you can control to some extent
43 poaching in the Fraser, over-escapement, the
44 amount of fish you put on the spawning grounds.
45 Isn't that what you should focus on as a fishery
46 manager?
- 47 A I think as a fishery manager you have a really

1 tough job, because you have to balance many
2 different objectives, including the Wild Salmon
3 Policy. You're trying to also meet harvest
4 objectives. You've got en-route mortality
5 happening. You've got a difficulty of meeting
6 harvest targets. So I think as a harvest manager,
7 the best thing you can do is if you're
8 contemplating alternative harvest approaches is
9 that you systematically do a decision analysis of
10 the possible outcomes of those different actions
11 for all those different objectives, given all
12 those different uncertainties, including the
13 marine conditions.

14 I think that's the approach that modern-day
15 risk assessment fish biologists and population
16 dynamics experts would recommend.

17 Q So you've done a cumulative effect analysis of
18 science issues. Can you tell me why there hasn't
19 been a cumulative effect analysis of the
20 management decisions? Wouldn't that give us more
21 light in what's happened to Fraser sockeye?

22 A Well, I think the report by Karl English - I can't
23 remember the number - for the Cohen Commission
24 looks at some of those management questions and
25 the ability to meet escapement targets, the
26 ability to meet harvest targets. If that's what
27 you're referring to, I think there has been a fair
28 amount of work done. I wasn't at the hearings
29 where Karl testified, so I don't know.

30 MR. EIDSVIK: My time is done, Mr. Commissioner.

31 There's one other issue that I quickly wanted
32 to raise. Commission counsel and ourselves have
33 been disputing whether a document from testimony
34 before the Standing Committee on Fisheries and
35 Oceans concerning set-net dropout rates should be
36 admitted to the Commission. We haven't agreed on
37 it, but I didn't want to take up a bunch of time
38 today.

39 I wonder if you had a process in mind,
40 because I think the document is quite important.

41 MS. BAKER: Well, it's inadmissible for parliamentary
42 privilege reasons, and Parliament hasn't waived
43 privilege over that document, so it's not
44 admissible which is the point I've made to Mr.
45 Eidsvik. So I am certainly not going to agree or
46 recommend that there's a process in place to admit
47 that document.

1 MR. EIDSVIK: And there's a serious dispute on whether
2 the privilege belongs to the person who testified
3 or Parliament, and the law is not clear on that at
4 all.

5 MS. CALLAN: Callan, C-a-1 --

6 THE COMMISSIONER: I'm sorry. Mr. Eidsvik, I'm sorry,
7 obviously I can't respond to you because I'm
8 unaware of this contest between you and Commission
9 counsel.

10 MR. EIDSVIK: Yes.

11 THE COMMISSIONER: But obviously if you have positions
12 to express, I assume you've either expressed them
13 to Commission counsel or you will express them so,
14 at some point, this issue that you've raised can
15 be resolved one way or the other.

16 MR. EIDSVIK: I have a feeling we've been going back
17 and forth for several months on it and I think, in
18 the end, you're going to have to decide, Mr.
19 Commissioner.

20 THE COMMISSIONER: Well, I'm pleased to hear that, Mr.
21 Eidsvik.

22 MR. EIDSVIK: Thank you.

23 MS. BAKER: Mr. Commissioner, in any event, the
24 document hasn't been put to any witness, so
25 there's this initial hurdle that needs to be dealt
26 with in that there's been no witness here to speak
27 about this document in the first place. In second
28 place, there is a privilege that attaches to that
29 document that's not been waived. So there's a
30 couple of hurdles.

31 I don't know what point there is in carrying
32 on this dispute. There's no mechanism right now
33 to get this document before the Commissioner.

34 MR. EIDSVIK: Mr. Commissioner, I didn't put the
35 document before the Commission this morning. I
36 could see my friends were up and ready to go, and
37 I know Canada will disagree, but it deals with the
38 question of how many fish are dropping out of set-
39 nets and if the evidence was right by that
40 biologist, it's a major factor in what's going on
41 in the disappearance of Fraser River sockeye.

42 THE COMMISSIONER: I think, Mr. Eidsvik, with respect,
43 the issue that Commission counsel has raised
44 initially is a key issue; that is to say, the
45 privilege issue. So obviously that's not going to
46 be resolved at this moment in time.

47 MR. EIDSVIK: Yes, I agree.

David Marmorek

Cross-exam by Mr. Eidsvik (SGAHC)

Cross-exam by Mr. Lowes (WFFDF)

1 THE COMMISSIONER: Thank you.

2 MR. EIDSVIK: Thank you.

3 MS. BAKER: Sorry to keep delaying on this, but in the
4 interests of time and efficiency, even if we said
5 that there was no privilege attached to this
6 document, there's nobody here to talk about what
7 is in that document, to identify it or to speak to
8 it. The weight that would be attached to that
9 document is non-existent. So I don't know why
10 we're going to continue to take up time on this
11 particular issue. Thank you.

12 THE COMMISSIONER: Thank you, Ms. Baker.

13 MS. GAERTNER: Just for the record, Karl English's
14 technical report was Technical Report number 7,
15 Exhibit 718 which the witness just referred to.

16 THE COMMISSIONER: Thank you, Ms. Gaertner
17 Ms. Callan?

18 MS. CALLAN: I just wanted to put on the record that
19 the Province of British Columbia supports the
20 Commission counsel's position.

21 MR. TIMBERG: And, just for the record, so does the
22 Government of Canada support the Commission's
23 position.

24 THE COMMISSIONER: Mr. Lowes, are you up next? Thank
25 you.

26 MR. LOWES: J.K. Lowes for the B.C. Wildlife Federation
27 and the B.C. Federation of Drift Fishers
28

29 CROSS-EXAMINATION BY MR. LOWES:
30

31 Q You've been examined fairly closely on some fairly
32 detailed issues this morning, Mr. Marmorek. You
33 can relax. I'm going to give you an opportunity
34 to exercise your pedagogical skills and talk about
35 your report and particularly the notion of
36 evidence. Like Mr. Leadem, I compliment you on
37 the clarity of the report. Even I could
38 understand it, I think.

39 You used some terminology with respect to
40 evidence that I'd like you to open up a little bit
41 on for the assistance of not only me, but
42 especially the Commission. You use the terms "the
43 breadth of evidence", "the depth of evidence", and
44 the "weight of evidence". I'd like you to, if you
45 would, expand a little bit upon those concepts
46 and, in particular, on how they apply to the way
47 you put together your report, and in particular,

1 the limitations that result, the kinds of
2 limitations that result in your report on those
3 areas.

4 A Okay, thank you for that interesting question. So
5 maybe I could just go to page 24 of our report,
6 because it'll help me to answer your question as I
7 go through it. So if you could expand that
8 figure, Mr. Lunn.

9 This is the decision tree that we used to
10 decide on the relative likelihood that different
11 factors were responsible for observed declines in
12 sockeye productivity, so these are the different
13 categories of evidence. Is there evidence of
14 plausible mechanism, is there evidence of exposure
15 to a stressor, is there evidence of
16 correlation/consistency between the stressor and
17 productivity, and then is there other evidence
18 such as laboratory experiments, thresholds and the
19 like.

20 So when it comes to the breadth of evidence,
21 I think there we're talking about the breadth of
22 evidence across different stressors that are
23 affecting different life history stages. So for
24 the freshwater habitat we have logging, mining,
25 small scale hydro, large scale hydro,
26 urbanization, agriculture, so that's kind of a
27 breadth issue.

28 And then depth of evidence relates to how
29 good is the evidence for each of those stressors.
30 And so, as we talked about several times, for
31 exposure, let's say we had very poor data for
32 disease, so no conclusion was possible. And then
33 on the other hand, for some water quality
34 contaminants we had quite good data; not all of
35 the water quality data. So there we have deeper
36 evidence over space and time. In fact, we're able
37 to examine the correlation of changes in
38 contaminants with changes in productivity, and it
39 turned out for the things that have been measured
40 anyway, there wasn't a good correlation. There
41 was evidence against the idea that water quality
42 contaminants were causing sockeye declines.

43 And then the weight of evidence, the last
44 part is really looking at the relative degree of
45 evidence across all these different stressors
46 using this decision tree to try to pull out, at
47 the bottom of the tree really -- well, which

1 things fall out as being unlikely for one or more
2 reasons. There's five different ways to get to
3 the unlikely side, unlikely conclusion, or
4 possible or likely or very likely. So we're
5 basically weighing all of the evidence together
6 for the different stressors to try to come to our
7 conclusions.

8 Q And do I read your report right when I get the
9 impression that you see the strength of your
10 analysis in the breadth of the evidence relative
11 to the other two?

12 A Well, I think the strength of the analysis is that
13 we went through a very systematic approach to all
14 of the evidence that was there, so I would call
15 that the third, the weight of evidence. For the
16 evidence that we had, we looked at in a very
17 systematic way. Where we didn't have evidence, we
18 indicated what those limitations were, like I just
19 mentioned, for disease.

20 In some cases, the depth of evidence is
21 really great, like for example, en-route
22 mortality. I mean, the story is sad, mortality is
23 going up, but the evidence as to why it's
24 happening and that it is happening is very strong.

25 Q Well, the thrust of my question was what you're
26 looking for is an explanation of an overall trend
27 as distinct from stock-specific issues.

28 A Yes, that's correct.

29 Q Right. And the strength of the analysis of an
30 overall trend is, of course, the breadth of the
31 evidence, the number of factors that it considers;
32 is that --

33 A That's correct.

34 Q -- a fair way of putting it?

35 A And I think the breadth is both the number of
36 factors that are considered and also the very
37 helpful contrast that you get by looking across
38 both Fraser stocks and non-Fraser stocks.

39 Q Right. And of course the depth and the weighing
40 of the evidence depends upon the strength of the
41 individual reports that comprised the subject
42 matter of your synthesis.

43 A That's correct.

44 Q You would agree with me, would you, that in a
45 perfect world, you would want to be, as a
46 scientist, a perfect scientific world, you would
47 want to be concerned with both the overall trend

65
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1 and stock-specific issues?

2 A Absolutely.

3 Q And particularly with respect to important stocks,
4 stocks which are significant for one reason or
5 another, especially significant.

6 A I think it's important to look at the major stocks
7 which comprise the fishery as well as the other
8 stocks.

9 MR. LOWES: Thank you. Those are my questions.

10

11 QUESTIONS BY THE COMMISSIONER:

12

13 THE COMMISSIONER: I wonder if I could just - if Ms.
14 Baker will permit me, and if somebody will give me
15 a minute of their time - I think this is -- it's
16 not directly dealing with -- excuse me for this
17 microphone awkwardness -- not dealing directly
18 with Mr. Lowes' question, but I just wonder if Mr.
19 Marmorek could just go to, just to explain to me
20 and just clarify, in the Executive Summary, it may
21 be the best place, Mr. Marmorek, to let me ask you
22 my question and I'm going to be brief. I just
23 need clarification.

24 I don't think there's a page number, but it's
25 just where you deal with -- I'm going to call it
26 page 2. It starts off, "Based on the available
27 evidence...".

28 A Yeah.

29 THE COMMISSIONER: "...we then came to a conclusion
30 whether the factor was *unlikely*...", et cetera.

31 Just adding on to Mr. Lowe's question and
32 your answers, you give there the possible, likely,
33 or very likely, representing the highest level of
34 confidence, to have been the primary driving
35 factor. Then you deal with, I believe, unlikely
36 and so on. I just want to make sure I understand
37 where that terminology comes from and just the
38 weighting that you've ascribed. The word
39 "probable" doesn't appear there, and lawyers and
40 judges are often more comfortable with concepts
41 like "balance of probabilities" that you've heard
42 frequently, I'm sure, and that kind of thing.

43 I just want to make sure my head's in the
44 right space from your perspective when you set
45 this terminology.

46 A Right. So that first sentence there is we came to
47 the conclusion whether the factor was unlikely,

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1 representing the lowest level of confidence. So
2 that's basically -- if you think of the lowest
3 level of probability that the factor was a primary
4 driver of the overall declines, whereas at the
5 other extreme, very likely representing the
6 highest level of confidence or highest level of
7 probability. But it's all relative probabilities.
8 It's not like we can say .93 or .02.

9 So we're making an ultimately qualitative
10 judgment based on all of the evidence for each of
11 those factors on the relative likelihood that they
12 were a primary factor driving the overall declines
13 in productivity.

14 THE COMMISSIONER: And the word "possible" in the
15 context of likely or very likely, how does that
16 fit together?

17 A So it fits within the decision tree that we were
18 just putting up there in the sense that if, for
19 example -- if we could just go to page 24, I think
20 it'll be easier for me to answer that question
21 'cause there's a variety of ways by which we come
22 to that conclusion.

23 So, for example, as you come down this
24 decision tree and, let's say, you have some data
25 on the exposure of sockeye to a given stressor so,
26 for example, predators, we have some data that say
27 Steller sea lions have changed this much, harbour
28 seals have gone up. We have some data that way,
29 so the answer to that exposure question is yes.
30 It's possible some predators have gone up.

31 Then you come down to the correlation
32 consistency box. Well, for predators, there were
33 no analyses done, until we did our own, as to
34 whether or not predators went up at the same time
35 as sockeye productivity went down. So you drop
36 down to where the left side of that diagram has
37 other evidence, and then it says, "No data." Then
38 you conclude "Possible."

39 So essentially it's following our decision
40 tree where if, on the other hand, we had found
41 evidence that was saying, yes, there is a
42 correlation that predators went up and sockeye
43 went down and it looks like these particular
44 predators could well have been responsible, and
45 there was other evidence as well, like we found
46 sockeye in those predators' stomachs, we might
47 well have ended up at the bottom right there with

1 likely or very likely. But we didn't have that
2 evidence.

3 THE COMMISSIONER: That's very helpful. Thank you very
4 much.

5 A Thank you.

6 MS. GAERTNER: Mr. Commissioner, it's Brenda Gaertner,
7 and with me, Crystal Reeves. for the First Nations
8 Coalition. I am not going to try to be a rocket
9 scientist today or any day, and I'm going to use a
10 different metaphor that, I'm sorry, Mr.
11 Commissioner, you've heard a couple of times, but
12 at this point in this inquiry, I find it a little
13 inspiring. I have been using the migratory route
14 of the salmon and where we are in this inquiry,
15 and I feel like the cumulative impacts of this
16 inquiry have resulted in many multiple stressors,
17 that I'm working very hard to avoid en-route
18 mortality, and I can smell my natal stream and I'm
19 keeping my focus and looking forward to getting
20 home.

21 A So that will reduce the temperature here?

22 MS. GAERTNER: That would be helpful some days, that's
23 for sure. But that's the metaphor I'm sticking
24 with and that's where we are.

25
26 CROSS-EXAMINATION BY MS. GAERTNER:

27
28 Q Mr. Marmorek, before I start my questions of you
29 today, I just want to observe on the evidence,
30 we've never worked together before. I met you for
31 the first time yesterday, and I'm just very
32 grateful for the amount of work that you've done
33 to prepare to come here. I'm grateful that you've
34 read all the documents in the short period of time
35 that you have, and that you have a substantive
36 answer for many of the hard questions, and I want
37 to express the gratitude of my client for the work
38 that you've done.

39 A Thank you.

40 Q Now, just to let you know, I've got about 45
41 minutes of my own time, and I understand from some
42 of my friends that if I'm doing well and being
43 useful, they'll give me a bit more of their time,
44 so I may have a little bit more time after lunch.
45 But we're going to start with that.

46 I've got a couple of themes that I'm going to
47 let you know that I'm going to cover so you get a

1 sense of where I'm going to go. I want to talk
2 about specific questions, both the specific
3 questions that you were asked and the questions
4 that weren't asked. I need to touch a little bit
5 on biodiversity within the Fraser River sockeye
6 salmon and the importance of scale going forward.
7 I want to talk a little bit about cumulative
8 impacts and climate change, and then primarily, at
9 the end of it, I want to go into your
10 recommendations at the end of your paper and
11 unlock some of them, because on the face of it,
12 I'm a little bit worried that we might get
13 confused in applying them, and I want to give you
14 an opportunity to help us as we go forward.

15 So let's start with specific questions. I'm
16 going to ask an obvious one first just to lead up
17 to my more difficult question, I think. You'll
18 agree with me that the question, "What happened in
19 2009", is a bit of a different question than
20 "What's the explanation for the long-term
21 declining trends?" You agree with me on that?

22 A Yes, I would.

23 Q Now, apparently in your terms of reference, the
24 only question you were asked for the paper was
25 whether cumulative impact assessments could help
26 understand the pattern of change and productivity
27 in Fraser River sockeye salmon over the past
28 several decades, correct?

29 A Well, actually, if we were to look at that
30 precisely, we'd have to look at the terms of
31 reference for our study which are in one of the
32 appendices, but it's a little broader than that.

33 Q But when I looked at your framework, you're
34 primarily approaching the question of how
35 cumulative impacts can assess (sic) understanding
36 the long-term patterns of change, correct?

37 A We were looking at long-term patterns of change in
38 both productivity, but also as you'll note in some
39 of the footnotes to that final conclusions table
40 in section 4.7, we also considered effects on
41 escapement and effects on harvest as well.

42 Q All right. It was broader than --

43 A Because the terms of reference of the Cohen
44 Commission are also the fishery, not just
45 productivity.

46 Q Right. Okay, so point well taken, thank you.

47 MS. GAERTNER: But I want to ask another important

1 question of this inquiry and one that, Mr.
2 Commissioner, our clients made submissions right
3 at the beginning, which was when we asked to look
4 at the broad questions you were going to be asked.
5 We said right at the beginning that, in our view,
6 cumulative impacts was an important component of
7 explaining 2009.

8 Q I want to turn now to you to ask you, based on the
9 work that you've done, all the reports that you've
10 read, all the work that you've done in your
11 career, is it reasonable to conclude that the
12 cumulative of exposure of Fraser River sockeye
13 salmon to multiple stressors caused or
14 significantly contributed to the unexpected low
15 returns in 2009?

16 A So that question was addressed in both the PSC
17 workshop report and actually they spent more time
18 talking about 2009 specifically than we did in our
19 report. But our conclusion was - and it's in
20 section 4.4 - that the marine conditions were the
21 most likely primary factor causing the declines,
22 the poor return in 2009, both the conditions -- in
23 2007, the conditions in the Strait of Georgia and
24 Queen Charlotte Sound. It's near the end of that
25 section.

26 And that these other factors certainly could
27 have contributed to that.

28 Q And so if --

29 A But those are the primary factors.

30 Q So for the 2009 return, cumulative or multiple
31 stressors, most likely in the marine environment,
32 were the primary causes.

33 A That's what we concluded.

34 Q Thank you. I want to make that clear on the
35 evidence.

36 Now, is it also reasonable to conclude that
37 the cumulative exposure of Fraser River sockeye
38 salmon to multiple stressors is contributing to
39 the long-term decline and productivity we are
40 observing since at least the 1990s, if not earlier
41 in some stocks.

42 A So this is where it gets tricky, because we don't
43 have a cumulative stress meter that we can stick
44 into sockeye and determine how that overall stress
45 is going up, or what the contributors are to that
46 overall stress. So it's reasonable to assume that
47 there are interacting factors that affected those

1 trends, and what we tried to do in this report is
2 to look at the best evidence we can of the
3 relative likelihood and so, you know, I think if
4 you look at -- I think it's probably fair to look
5 at the table in section 4.7 because it's kind of
6 an integrative result of all our conclusions, page
7 90 in the document. It's updated with aquaculture
8 in the addendum, but this is fine for now.

9 This is our summation, really, of what we
10 think the relative likelihoods are of these
11 different factors. Those that are listed as being
12 unlikely, it doesn't mean that they couldn't have
13 contributed, but we don't think that they were the
14 primary drivers.

15 Q Right. So there is quite a bit of difference,
16 because they could, in any one given year, have a
17 particular effect on a particular stock, but that
18 all of them together could easily have a
19 contributing effect to the long-term decline.

20 As scientists, you're looking for a primary
21 driver at a mathematical level or otherwise, but
22 from an aboriginal way of being, or a holistic
23 perspective, the cumulative impacts are a valuable
24 unique look at what might be driving the
25 vulnerability of sockeye salmon.

26 A I think it's important to consider the cumulative
27 impacts, and I think it's also important to try to
28 hone in, as much as you can, on the major factors
29 as opposed to the minor factors, and that's what
30 we tried to do through all of these analyses.

31 Q In order to help make us, as managers, better
32 decision-makers, right? I mean, that's the
33 purpose --

34 A Right. And so, for example, I don't think that
35 adding more logs into streams that sockeye might
36 spawn in is going to make much difference to the
37 overall lifecycle productivity.

38 Q Gotcha. I understand that. Okay, now, would you
39 agree that given the complexity -- and I very much
40 enjoyed studying the diagram that you have of the
41 lifecycles and all the interactions that are
42 possible in any one year, or a cycle for a salmon,
43 would you agree that this complexity, and the
44 unique combinations that are possible and the
45 unique multiple stressors in any given one year,
46 gives us cause to be very humble about what we
47 think we know, and how we act when harvesting

1 sockeye.

2 A Yes, I think humility is wise, and data can help
3 to diminish humility.

4 Q But you also agree, and I've read this in many
5 critiques of scientific thought, that we have to
6 be careful about what we think we know, what we
7 know we don't know, and what we don't know we
8 don't know.

9 A Yes, I believe that was a former Department of
10 Defence, Donald Rumsfeld, so I don't like quoting
11 that for various other reasons.

12 Q I didn't quote him either, I just -- I didn't
13 quote him either. But it's an important component
14 of the complexities we're dealing with.

15 A No, absolutely. I mean that was one of the things
16 he got right.

17 Q All right. Thank you very much for those
18 beginning questions.

19 Now I want to go to biodiversity within the
20 Fraser River sockeye salmon, and I could take you
21 to Exhibit 1855 if you want. This is a more
22 recent study on the effects of river temperature
23 and migratory Fraser River sockeye. You're aware
24 of this study?

25 A Yes.

26 Q And you agree that this study highlights how
27 climate change is impacting on sockeye in the
28 Fraser River currently, and how it's expected to
29 do so going forward. It has some analysis on a
30 stock-specific level, correct?

31 A Yes, it's a good paper.

32 Q All right. Would you agree that the type of
33 research and data we are going to need going
34 forward to study the interactions of multiple
35 stressors, including the variety of possible
36 climate change stressors on stock health, is at a
37 conservation unit specific level.

38 A So there's 36 conservation units in the Fraser,
39 and I think there are tough decisions to be made
40 as to how you choose which of those you want to
41 study really intensively. It's a breadth versus
42 depth question, and what we recommended is that
43 you choose a representative cross-section for
44 detailed studies rather than trying to cover all
45 36.

46 Q Yeah, and I'm going to get to that because I'm
47 going to take you right to your recommendation.

- 1 A Sure.
- 2 Q But you'll agree that we need to take care on
3 that, because there might be quite a different
4 question as to what effect does climate change
5 have on early or late summer Fraser River sockeye.
6 Then a question that says how can my priority to
7 fish for food, social and ceremonial purposes, be
8 met on the Early Stuart runs. Those are very
9 different questions, isn't it?
- 10 A Absolutely and you have to look at multiple
11 objectives.
- 12 Q Do you agree that research and management
13 decisions and conclusions regarding climate change
14 and multiple stressors on Fraser River sockeye
15 salmon could be more helpful if nested within an
16 adaptive management strategy going forward?
- 17 A Yes.
- 18 Q Now, yesterday you spoke about a number of
19 comparison to the non-Fraser River stocks and
20 there was some discussion on the Harrison. We
21 pick this up a little bit, but I want to make sure
22 the evidence is clear. When you were talking
23 about the chinooks, you were talking about the
24 Shuswap-South Thompson stocks of chinook; is that
25 correct?
- 26 A Yes, I think it's in one of the papers by Beamish
27 that's included in the 62 documents. There's
28 actually a map there. I don't remember the
29 number. I could dig it out. So if that's an
30 important detail, we can find it.
- 31 Q What's important, as I understand it, is that both
32 that stock and the Harrison stock are flourishing
33 somewhat over the last two or three cycles and
34 they have similar migration patterns from the
35 fresh water; is that correct?
- 36 A Yes, I think the key point of that paper was that
37 they arrive late in the Strait of Georgia.
- 38 Q All right. So now let's move to climate change.
39 Do you agree that baseline data regarding sea
40 surface temperature is critical to maintain and,
41 if so, are there other data sources, baseline data
42 sources regarding climate change that you would
43 recommend for the purposes of management of Fraser
44 River sockeye salmon?
- 45 A So, yes, I would agree that sea surface
46 temperatures are very important. Salinity is also
47 important. Within the freshwater cycle, I think

1 it's very important to understand temperatures
2 within rearing lakes and streams and how they may
3 be changing. That data aren't too expensive to
4 acquire.

5 Also the timing of smolt emigration towards
6 the estuary, actually, and arrival in the Strait
7 of Georgia, relative to the timing of zooplankton
8 blooms, which are important for food.

9 Q Thank you. That's very helpful. Would you agree
10 that setting management targets for Fraser River
11 sockeye salmon on the principle of maximum
12 sustainable yield historically assumed or depended
13 on a constant and predictable ecosystem?

14 A Yes, there is a paper by Peter Larkin called, "An
15 Epitaph for the Concept of Maximum Sustainable
16 Yield," so I think there has been an increasing
17 recognition that stock recruitment relations vary
18 over different periods and that fisheries
19 management needs to adapt accordingly.

20 Q Would you also agree that the MSY calculations,
21 they're only potentially relevant for predictably
22 strong stocks in a predictable ecosystem?

23 A I think theoretically maximum sustainable yield
24 could apply to any stock provided that you have
25 reasonable data on that stock recruitment
26 relationship, not only strong stock. I mean,
27 there is the challenge of mixed-stock fisheries
28 and how you can allow harvest on a very strong
29 stock while at the same time maintaining the
30 weaker stocks. That's an implementation challenge
31 for sure.

32 Q Now, you spoke briefly this morning about the
33 precautionary approach and the precautionary
34 principle. Before I get to your recommendations,
35 which I promise I'll take you to, I want to take
36 you to our Tab 7. Are you familiar with this
37 article?

38 A Oh, yes, that was one that you passed around,
39 yeah.

40 Q And you'll agree that this is a study that's been
41 done out at UBC Fisheries Centre on cumulative
42 impact mapping; is that correct?

43 A Yes.

44 Q Given our time allocations today, I regret I
45 probably shouldn't take you to the whole article,
46 but I'll take you to pdf page 8 which is page 883
47 of the actual article. In it, the author states

1 that:
2

3 In the absence of absolute field
4 measurements, relative modeled measures can
5 still be used to direct future management and
6 field research actions.
7

8 Would you agree with that?

9 A Yes, I would. I think the limitation of this
10 paper really is that you have a whole lot of
11 different cumulative impact scores for one point
12 in time. You don't have any data over time. So
13 for the purpose of what we're trying to work at
14 here, it's difficult - as it was also in the
15 freshwater report, Technical Report 3 - if you
16 just have a snapshot, to be able to say, well, how
17 has this changed over the last 20 years, and to
18 what extent could that possibly explain the
19 patterns that occur.

20 Q So more for the methodology than the conclusions,
21 but rather what the author there is saying that if
22 we don't have absolute field measurements ,
23 relative modelled measures can still be used to
24 direct future management.

25 A Yeah, I think in general, that's true. When I
26 looked at this paper, I wasn't sure how you would
27 use these maps to direct management. It wasn't
28 clear to me.

29 MS. GAERTNER: So I'm going to take you to -- maybe
30 before I do that, may I have this marked as the
31 next exhibit?

32 THE REGISTRAR: Exhibit 1911.
33

34 EXHIBIT 1911: Ban et al, Cumulative Impact
35 Mapping: Advances, Relevance and Limitations
36 to Marine Mgmt and Conservation, using
37 Canada's Pacific Waters as a Case Study, 2010
38 [Marine Policy]
39

40 MS. GAERTNER:

41 Q Let's go to our Tab 6, which is Exhibit 1345 which
42 is the Haida map that I'm not sure you had an
43 opportunity to review.

44 A Mm-hmm, yeah, I looked at this. It's a nice --

45 Q The Commissioner has seen this map on a number of
46 occasions.

47 MS. GAERTNER: Maybe I'll just -- if you keep going,

1 sorry. Go right to the map.

2 A I think it's the last page, isn't it?

3 MS. GAERTNER: That's right. There it is.

4 Q Now, what I'm going to suggest to you, and we're
5 going to get to this more in your recommendations,
6 but if you don't have all the particular
7 causation, the data to prove causation in a
8 scientific or a legal perspective, but you have a
9 map in which you have clearly set out areas of
10 importance, areas of potential sensitivities, and
11 the potential stressors, that that might be a
12 useful way of streamlining data and making
13 management decisions in the absence of evidence.

14 A Okay. So, yes, so for example, for protecting
15 critical areas, yeah, I think that's a reasonable
16 approach. You look at what are the special areas
17 you need to protect and what's the total
18 cumulative stress on those areas. That's a
19 logical thing to do.

20 Q And potentially quicker than long-term data and
21 scientific analysis.

22 A I think it depends on what question you're trying
23 to address. If you're trying to address, say,
24 land-use planning or marine planning, question as
25 to where you should allow certain kinds of
26 developments, just like as in the Fraser River
27 Estuary Management Program, they have certain red
28 areas that have zero development, no development.
29 There's certain green areas which are already
30 highly developed where they allow more development
31 to occur, so you're trying to focus the
32 development in that way. So I think from a land
33 or marine use planning point of view that's
34 useful.

35 As I said earlier, I think it's tough to use
36 this kind of snapshot information for the kinds of
37 questions that we were addressing retrospectively.

38 Q No, absolutely. What I'm looking for is helpful
39 ways in which we could do adaptive management in
40 the future, given all the unknowables. So we can
41 take step 1 and say, okay, we're just going to
42 rely on the scientific method and we'll wait for
43 five or 10 or 15 years when we have the confidence
44 in the experiments and the confidence in the
45 outcomes. Or we can, at the same time, be mapping
46 sensitive areas so we're very clear where we
47 shouldn't be taking risks.

- 1 A Right. I would call that prudent management
2 rather than adaptive management. Adaptive
3 management's sort of become a plastic word where
4 it means almost anything these days. So I think
5 of adaptive management as being rigorous
6 implementation of management using experimental
7 principles so you learn from them. So it's just a
8 qualification there.
- 9 Q I'll be happy with prudent management in this
10 case, that's for sure.
- 11 A Okay.
- 12 Q All right. Now, before turning to the science
13 management interplay, I want to pick up on an
14 example of what -- so far, I've identified as an
15 uncertainty in your report, and I just want to see
16 whether my read of this -- now, if you note your
17 figure, 3.3-1, which is --
- 18 A Page 24?
- 19 Q -- the figure that has all of the different
20 interplays and I note that pathogens and disease
21 is a potential stressor in every life stage of the
22 Fraser River sockeye salmon, you'll agree with me
23 on that?
- 24 MS. GAERTNER: The one just before that.
- 25 A I think I'm a little too far.
- 26 MR. LUNN: You don't by chance have a page number?
- 27 MS. GAERTNER: Sorry. For some reason right across
28 that reference, I don't, Mr. Lunn, I apologize.
- 29 A I'll find it in a second.
- 30 MS. GAERTNER: There it is, just right next to it.
- 31 A Yeah, the document page 18.
- 32 MS. GAERTNER: There it is.
- 33 A This one, yeah.
- 34 MS. GAERTNER: Sorry, Mr. Lunn.
- 35 Q So I just note that pathogens and disease are
36 identified as potential stressors for every single
37 lifecycle of this Fraser River sockeye; is that
38 correct?
- 39 A Yes, potential stressors for which we have no
40 exposure data.
- 41 Q It's clear that one form of the evidence that you
42 relied upon in making your assessments of this
43 information are the technical reports, and I want
44 to go to Technical Report 12, which I believe is
45 Exhibit 735. Now, that's the technical report
46 done by Dr. Johannes; is that correct?
- 47 A Yes, that's right.

1 Q And you would agree that he may have discounted
2 various factors as stressors prematurely or
3 without the appropriate amount of data?

4 A I read some of that in the transcript. I think
5 it's important to recognize that when we were
6 looking at the freshwater habitat factors for this
7 cumulative impact assessment, we relied mostly on
8 Technical Report 3, because that was Nelitz et
9 all, because that covered all of the 36
10 conservation units and looked in detail at
11 correlation evidence for, I think, the 18 or 19
12 stocks.

13 So because we're looking at the whole Fraser
14 as opposed to just the lower Fraser, we relied
15 more on Technical Report 3 than we did on
16 Technical Report 12 for our conclusions.

17 Q Is that because you weren't comfortable with
18 relying on Technical Report 12?

19 A No, it was just because of the spatial extent of
20 the two studies. Basically Technical Report 3 was
21 looking at all the stocks over all of the Fraser
22 River and looking at contrast. They also had a
23 cumulative stress estimate.

24 So as I was asked about earlier, there was a
25 greater breadth and depth of evidence in Technical
26 Report 3 for the retrospective ecological risk
27 assessment that we were doing.

28 Q Did you, when you were reviewing this report, also
29 review the additional appendices provided by Dr.
30 Rosenau?

31 A Oh, the reviews?

32 Q The reviews and --

33 A That's one of the --

34 Q -- he actually, in addition to his review,
35 provided specific appendices. I can bring those
36 forward to you. They're --

37 A No, I did not review those.

38 Q Okay. In the time remaining, I think I'll pick up
39 on my questions on the recommendations. Before
40 that, I just want to put before you our Tab 8, and
41 I appreciate it's a basic -- I might call it
42 science 101 and bear with us on that. But did you
43 have any chance to look at this?

44 A Oh, I've known this paper for a long time.

45 Q Oh, great, that's even better. Do you agree that
46 it's a good summary of the interactions of risks
47 and uncertainties with cumulative impacts?

1 A Yes, I do.

2 MS. GAERTNER: Could I have that marked as the next
3 exhibit?

4 THE REGISTRAR: Exhibit 1912.

5

6 EXHIBIT 1912: Suter et al, Treatment of Risk
7 in Environmental Impact Assessment, 1987
8 [Environmental Mgmt]

9

10 MS. GAERTNER: Thank you very much.

11 Q And I wanted to clear up something that I've heard
12 a couple of times in your evidence, and I just
13 want to make sure that I've heard this correctly,
14 which is, a number of times you've talked about
15 how scientists can help the risk analysis. Would
16 you agree that it's not just scientists that need
17 to do the risk analysis, that -- I mean, you've
18 quite quickly put trade-offs as policy decisions,
19 but I want to suggest to you that how people
20 measure risk and how comfortable they are with
21 risks and the impacts of those risks can be quite
22 different, depending on the nature of the rights
23 and interests that they're concerned with?

24 A Oh, absolutely. That's part of the process of
25 discussion.

26 Q So the risk analysis that you're talking about is
27 not just a scientific inquiry. It requires a
28 broader breadth of perspectives involved.

29 A That's right, and understanding of the willingness
30 to accept different levels of risk by different
31 groups.

32 Q And so yesterday when you were talking about your
33 suggestions as it relates to page 104, which is
34 the setting of the research agendas, and then the
35 questions that you have specifically set out on
36 page 107 of your report, those are both decision
37 trees and analysis that require participation by
38 First Nations in the context of their rights; is
39 that correct?

40 A As well as other groups, yes.

41 Q But you'll agree that First Nations must be at the
42 table, that this is not a scientific-alone
43 discussion.

44 A Oh, I think the things that are listed at the
45 bottom of page 107 require dialogue amongst all of
46 the interested parties, and I guess what I would
47 suggest is that just as in, for example, the

1 water-use planning process where there's a variety
2 of stakeholder groups represented, as well as
3 technical analyses that fed those discussions,
4 that something roughly analogous would be helpful
5 for doing this prioritization.

6 Q And also because in cumulative impact assessments,
7 or multiple stressor situations like Fraser River
8 sockeye salmon, the work of researchers needs to
9 be very tightly interactive with the work of
10 decision-makers; is that correct? And so you need
11 an interplay between the science and the
12 management that's quite consistent and iterative
13 (sic).

14 A Yes, I agree with that.

15 Q Okay. In the time that I have, I'm going to start
16 with my questions on the recommendations, then.
17 If we can go to your Table 5.2-1. I've just got
18 to ask a couple of preliminary questions 'cause I
19 heard how you described it yesterday, and your
20 charts include explanatory importance and, as I
21 understand it, to overall trends. Then you have a
22 column called "Relevance to Management Actions".
23 It's going to be that one that I'm going to spend
24 a little bit of time with, with you.

25 But I just want to get how did you come to
26 your conclusions in that one? I mean, you're a
27 group of scientists working on your own here, and
28 given our dialogue just now, I'm a little curious
29 on how you were able to manage to weight relevance
30 to management actions.

31 A So we were building on the Pacific Salmon
32 Commission Table 5-3, and you don't have to get it
33 up right now, but essentially these column
34 headings are similar to those, so there's a bit of
35 an ancestral aspect to where these things came
36 from. If you go up to the caption here -- if you
37 could just go up, Mr. Lunn, a bit.

38 So it says:

39
40 "Relevance to Management Actions", i.e., the
41 value that such knowledge has for informing
42 potential management actions.

43
44 So there we're talking about things that
45 managers could potentially change in, let's say,
46 harvest or habitat or hatcheries, hydro in the
47 case that there are some - there aren't that many

1 in the Fraser - as opposed to explanatory
2 importance which are things that help you to
3 understand what's going on, why trends are
4 happening, which is relevant to management as
5 well, but is a bigger question.

6 Q And you'll agree with me, given the preliminary
7 discussions we've had, that how people weight that
8 might be quite different depending on their
9 interests and concerns.

10 A I think that's true.

11 Q All right. So I think we don't have to then
12 battle about which one's right, but I'll just try
13 to get a sense of what your thinking was when you
14 gave your thoughts on that.

15 So let's start with parental spawning success
16 and incubation. Now, it's likely/unlikely (sic)
17 to be the root of observed productivity declines,
18 however highly relevant to management I would
19 suggest, since spawning success and egg survival
20 directly affect the development of spawning
21 escapement goals and the conduct of fisheries.

22 Would you agree with me on that?

23 A So parental spawning success and incubation, I
24 mean, what's usually done to try to establish
25 escapement goals as we talked about in quite a bit
26 of detail earlier with Mr. Harvey was using
27 spawner recruit data to try to understand that.
28 Now, there's also some of the detailed information
29 on, for example, condition and numbers of fry that
30 can help to inform discussions about density
31 dependence and so on.

32 If you go down a little bit in this table
33 here so we can just see that whole row, if we're
34 going to talk about that row. So it says, number
35 1 is:

36
37 Better estimates of both watershed conditions
38 over time...to better understand current
39 status, causative mechanisms and risk
40 thresholds.

41
42 So that's important.

43 Q
44 Better understanding of the status of smaller
45 conservation units, consistent with
46 implementation of the Wild Salmon Policy.
47

1 Like those are three very important components to
2 management and to how we're moving forward.
3 A Right.
4 Q And so just so that we can be clear, we had
5 difficulty with your relevance to management
6 actions being low. We actually think the
7 relevance to management actions of those steps is
8 quite high, and the choices that we have to make
9 around that quite high. So I'm just wondering if
10 you might give us your thoughts on that.
11 A So I could understand that interpretation. I
12 guess the question is really the extent to which
13 -- the way we're thinking about this is how can
14 you -- what management actions might be needed to
15 change in order to improve the current situation
16 so we get better productivity?
17 Q Just --
18 A I'm sorry, so that was affecting us -- and when I
19 say "us", I include the Pacific Salmon Commission
20 Science Panel who also gave this low. Basically
21 what they're saying is, well, it didn't look like
22 habitat was a likely explanation of the patterns,
23 and so if you then -- and we certainly want to
24 maintain habitat as much as possible. We don't
25 want to ratchet back protection of habitat, for
26 example.
27 But it's not as though -- if you suddenly had
28 a lot more information about those early life
29 history stages that you would then implement a
30 bunch of actions which would recover those stocks,
31 that's kind of why the --
32 Q I just --
33 A -- implication was that it's not as though there
34 are management actions you can do that are really
35 going to turn that around.
36 Q So I guess maybe we'll take that. I mean, I did
37 go back to look at the PSC report on this, and
38 they also gave parental spawning success and
39 incubation low, but they didn't place into that
40 comments and issues for recommended research, all
41 of the things that you have.
42 A Mm-hmm.
43 Q They weren't placing the implementation of the
44 Wild Salmon Policy into that.
45 A Right.
46 Q And so I think that's where the potential mix-up
47 has happened.

1 A Yeah.

2 Q And I really want to clear this up.

3 A No, I think that's a good point, in that we
4 expanded the recommended research and monitoring
5 activities based on all the technical reports. So
6 from the point of view of implementation of the
7 Wild Salmon Policy and understanding the status of
8 those, I think it's fair to say that it would be
9 appropriate to raise the relevance for that
10 particular recommendation.

11 In looking at this table now, you know, it
12 would probably be better to actually go through
13 each of the recommendations and have an
14 explanatory importance/relevance to management
15 actions like within each row. In other words,
16 you'd split this thing and have three sub-rows
17 within it. We didn't have time for doing that.

18 You know, I just want to say about these
19 things is that this is a long list. There's like
20 20-something, 23 things, and it would be a lot of
21 money to do all these things, right?

22 Q Yes, we're going to get to that actually, also.

23 A And we don't think it's necessarily going to have
24 that much money.

25 Q Exactly.

26 A We also didn't think it was our call to start
27 narrowing down the list, funnelling it down for
28 the reasons you've just stated.

29 Q No, and I appreciate all that, and I appreciated
30 you saying that that's for a broader group of
31 people to do.

32 A Mm-hmm.

33 Q I just want to be very careful because this could
34 influence that broader group and definitely could
35 influence the Commissioner.

36 A Right.

37 Q And so what I've heard you say is that having had
38 this dialogue, you would change the relevance to
39 management actions given that you've put the Wild
40 Salmon Policy and the conservation units into
41 this, and give it a higher score.

42 A Right. I think for the implementation of the Wild
43 Salmon Policy, having a better understanding of
44 the status of smaller conservation units has a
45 high amount of relevance to implementing the Wild
46 Salmon Policy.

47 MS. GAERTNER: Thank you. Given the time, Mr.

1 Commissioner, thank you.
2 THE COMMISSIONER: Thank you.
3 THE REGISTRAR: The hearing is now adjourned till 2:00
4 p.m.
5

6 (PROCEEDINGS ADJOURNED FOR NOON RECESS)
7 (PROCEEDINGS RECONVENED)
8

9 THE REGISTRAR: Hearing is now resumed.

10 MS. GAERTNER: Thank you, Mr. Commissioner. Within my
11 own time allotment I have 15 minutes and I
12 understand my friends will grace me with five more
13 if I need it, but I'm hoping to finish within my
14 own time.
15

16 CROSS-EXAMINATION BY MS. GAERTNER, continuing:
17

18 Q So carrying on, Mr. Marmorek, with Table 5.2-1,
19 I'm just about finished with the first box there,
20 but there's something that you pick up in both the
21 first box and the next box that I have to say had
22 many of my clients and their technical advisors
23 scratching their heads a little, and it's this
24 concern. As you know, that -- or probably are
25 familiar, the debate going into the Wild Salmon
26 Policy had the government and stakeholders having
27 a lot of discussions about on what level and scale
28 management should be occurring, and the Wild
29 Salmon Policy came down to conservation units and
30 the work associated with conservation units.
31 You're selecting -- you're suggesting something a
32 little different in this -- you might be. I'm not
33 sure. This strategically selected cross-section
34 of stocks. You use those words. You don't
35 describe them in your report as to what you're
36 after, and so I'm curious, is this a budgetary
37 concern? Is this a management concern? Where are
38 you going and what were you intending with that?
39 Because we're hoping not to continue a historical
40 debate about the importance of biodiversity.

41 A So the question comes back to the breadth versus
42 depth of evidence that one is able to have, and
43 so, you know, for example, you could get a great
44 breadth of evidence for all 36 conservation units
45 with a very shallow depth or at the other extreme,
46 you know, you could have five stocks that you
47 studied very intensively. Okay? And so what we

1 were saying here is strategically selected cross-
2 section of stocks with varying conditions and
3 migration distance levels and types of watershed
4 disturbance, so essentially you try to take a
5 sample, and this would include a range of sizes of
6 stocks and a range of strengths of stocks, like
7 not just the big ones, so that you're able to have
8 some depth of evidence for that subset, rather
9 than spreading yourself too thin. So if you had
10 an infinite amount of money, yeah, you could have
11 all the information on all the conservation units.
12 But you're not going to -- I don't think it's very
13 likely you're going to have that.

14 Q Let's assume we won't.

15 A I think that's a safe assumption.

16 Q That's a good one, I think.

17 A So that's the rationale.

18 Q All right. And so it's fair to say that if we --
19 if we wanted to make sure this research was as
20 useful as possible the selection of the
21 strategically selected cross-section of stocks
22 would need to be done by a broad spectrum of
23 managers and stakeholders; is that correct?

24 A Yes, looking at a wide variety of objectives.

25 Q Okay. All right. Then with those two questions,
26 I think I can now move down to the section on
27 downstream migration to the estuary, and here I'm
28 just more curious about helping to understand your
29 relevance to management actions on -- as high, I
30 appreciate that understanding the survival rate of
31 smolts during the downstream migration could be
32 quite useful for explaining the overall trends and
33 where we have -- and perhaps even the reduction in
34 overall productivity, so I was curious that you
35 thought it was only medium, because it might be a
36 bottleneck. But as it relates to relevance to
37 management actions, is your conclusion that it's
38 high based on the assumption that if we did learn
39 that it was a bottleneck that there would be
40 active steps to minimize pollution or other
41 habitat issues during this component of the life
42 cycle?

43 A Yes. That's correct. Or it can -- like you say,
44 pollution issues or perhaps disease issues. So,
45 for example, at the Mission trap, smolt trap, you
46 could collect a bunch of smolts, analyze their
47 contaminant body burdens, analyze them for

- 1 disease, do genetic stock identification. That
2 might be a good sort of screening kind of approach
3 to detect problems, particularly, say, as
4 temperatures go up or if there are certain stocks
5 that do have delay density dependent effects, you
6 might be able to detect that earlier.
- 7 Q All right. And then the question would be what
8 could we do about them? That's the relevance to
9 management. But again, you're dealing there with
10 what we could do with it there as a habitat
11 protection issue.
- 12 A It -- for the case of contaminants, it would be a
13 habitat protection issue. In the case of disease,
14 it would depend on what the causes of that were,
15 so if you found out that diseased fish were more
16 likely to come from fish that -- from stocks where
17 they greatly exceeded their escapement, that would
18 suggest one direction. You could go look more
19 closely at those stocks to try to understand them
20 better. You could also help to eliminate that
21 hypothesis, as well.
- 22 Q Okay.
- 23 A So I think it just is a screening tool for a
24 variety of potential actions.
- 25 Q Right. That's helpful to understand. Let's move
26 on then to the coastal migration, which you've
27 rated as high for explanatory importance and high
28 for management activities. And I just want to
29 unlock some of the 9 to 13, for example. And
30 let's just start with some of the easier
31 components. Number 10 and number 13 seem
32 identical to me with the exception that you've put
33 -- you've mentioned Harrison Lake in 13. But
34 otherwise, what we're talking about is really
35 trying to get the residency and migratory path of
36 the Fraser River sockeye post-smolts, including
37 Harrison Lake; is that correct?
- 38 A Yes, that's right.
- 39 Q All right. And then as it relates to number 9,
40 you know, one of our observations is this would be
41 a wonderful study, but it might take all of DFO's
42 budget for research for the next little while to
43 complete number 9. Am I correct that the number 9
44 is a potentially expensive approach to management?
45 Maybe I'm not seeing it right or...?
- 46 A Well, I think this comes back to - and we don't
47 have to flip back there, because we've already

1 talked about it earlier, but some of the questions
2 -- or let's say the process by which we would
3 prioritize and further characterize exactly what
4 you would do here, which is outlined on page 107.
5 And so the first question there is how exactly
6 will the information be used. Okay? So number 9,
7 if you were to try to get at a complete
8 fundamental understanding of everything that's
9 happening in all of those places, could be a lot
10 of dollars. If your intent was to say let's try
11 to understand well what the potential effects are
12 on returns two years hence, and say whether things
13 are likely to be lower than expected, higher than
14 expected, based on the number of spawners in the
15 parent generation, that defines a different level
16 of information which perhaps wouldn't cost as much
17 money.

18 So being an applied ecologist, rather than an
19 academic one --

20 Q Yes.

21 A -- my approach is to outline, so how will the
22 information be used and what's the intended uses,
23 and then think about what's the level of
24 resolution that's appropriate, right? So I'd
25 often use the term bicycle, Volkswagen or
26 Cadillac --

27 Q Yeah.

28 A -- and maybe Cadillacs are extinct now, so -- but
29 what level is required --

30 Q Right. Okay.

31 A -- to answer the question.

32 Q So, in fact, paragraph 9 really needs that
33 qualification, when you say a fully-integrated
34 oceanographic and ecological investigation - and
35 don't get me wrong, my clients would love that,
36 but we're a little bit worried about whether we'll
37 be able to fund it. But the -- what you want to
38 do is make sure that number 9 is very keyed to the
39 research question that's being asked.

40 A Actually, that's true for all --

41 Q All of them.

42 A -- of these recommendations.

43 Q Yeah. All right. Would you agree, and we had
44 this dialogue earlier, that a companion to number
45 9 is the marine use planning that I referenced you
46 to, because if we're really going to get down to
47 understanding this, once we learn this we're going

1 to have to figure out what we can do about it and
2 where the sensitive areas are and any of those.
3 So I agreed that the relevance to management
4 actions is high, but the management actions we
5 have in the marine are pretty well habitat
6 protection; would you agree with me on that?
7 A No, I think -- I think that's a reasonable
8 inference, as you find out more about where the
9 stressors are and look at what you can do about
10 them, then the logical sequence is to manage your
11 activities accordingly, assuming that you can.
12 Q Right. And so we would need to know where the, as
13 you call them, bottlenecks or stressors are and
14 determine what we can do about that. And so it
15 might be useful to make sure we're doing that at
16 the same time as any of the larger studies.
17 A No. That's reasonable.
18 Q Thank you. Then let's --
19 A Or, yes, that's reasonable.
20 Q Okay. Let's go on to growth in the North Pacific
21 and return to Fraser. You've put that as relevant
22 to -- the explanation -- explanatory is medium and
23 the relevant to management actions is low, and I
24 just -- when I was reading that, I was hearkening
25 back to listening to Randall Peterman and his
26 evidence and particularly the interaction -- the
27 potential interaction that he saw in his
28 population dynamic work between international
29 production of pinks and fish farms and climate
30 change and the interaction between those three.
31 And so given that from his work that was his
32 caution and that concern to the group of us that
33 are helping the commissioner wade through all of
34 this, would you agree that relevance to management
35 actions may not be low? It may actually be
36 necessary to take some fairly strong management
37 actions as it relates to international work?
38 A Well, I think -- it's a little tricky to follow
39 that I don't disagree with the points you just
40 raise with respect to factors that may be
41 important, like variation in pinks and potentially
42 fish farms. With respect to fish farms, as we
43 talked about earlier, I think the main focus is on
44 the coastal migration stage and trying to get
45 specifically recommendation 11 dealt with. With
46 respect to competition from pinks and hatchery
47 pinks, the work that Greg Ruggerone and others

1 have done, I mean, you can get at those questions
2 based on spawner recruit analyses. You don't need
3 to go out and do open ocean research to get at
4 those questions. The only part -- I mean, at
5 least in terms of effects on recruitment.

6 He has done work in the Gulf of Alaska on
7 effects of pinks on growth of salmon at sea, so in
8 years -- it's odd, even years. I can't remember
9 which way the story goes. But in the years where
10 you get more pinks, you end up having less growth
11 of Bristol Bay sockeye and that was, you know,
12 getting information at sea.

13 So I think you can draw inferences based on
14 returns rather than having to do detailed studies
15 out in the North Pacific.

16 Q Yes, the concern more is that you rated it low and
17 given the goal -- the low to management actions,
18 and --

19 A But I'm rating low open ocean research. I think
20 the --

21 Q Oh, I see.

22 A What may have been misleading here is that - and I
23 can understand why you would draw this conclusion.
24 I think you can improve your understanding of
25 competition of some pink sockeye interactions
26 without actually having to do work in the North
27 Pacific. There's other pink sockeye interactions
28 like growth, maturity and overwintering survival,
29 which would require going out there. So it's a
30 question again of is this a Volkswagen or a
31 Cadillac that you need in order to address the
32 question.

33 Q All right. But the management action --

34 A It's probably not going to be a bicycle.

35 Q The management actions could be quite relevant,
36 the management --

37 A Yes, that's true. The management actions could be
38 quite relevant, so that's fair that the ultimate
39 response that information could be medium or, yes,
40 depending how you argue it. That's fair.

41 Q Okay. Thank you. Let's go to the last one then,
42 migration back to spawn. You'll agree, of course,
43 that the assessment of high to relevance to
44 management action is one of our strongest
45 management actions is to decide when and where
46 we're going to fish, correct?

47 A Yes. Can we just move to the next page? Sorry.

1 Thanks, Mr. Lunn.

2 Q Now, I'm curious about number 19 and I'm just
3 wondering, 20 wasn't given a bold, and it seems to
4 me that management strategies to maximize the
5 potential for persistence under stress from
6 climate change is going to be very interactive
7 with any kind of modelling on climate change;
8 would you agree with that?

9 A Well, I think the -- you know, one of the problems
10 with this table, I think it's been interpreted to
11 mean that the bold ones are the only ones we're
12 recommending. That's not the intent of the table.
13 The intent of the table is to say the bold ones
14 we'd like to make sure definitely get attention
15 and the other ones should also get attention, so
16 it's not as though they're -- climate change
17 modelling is still important. Somewhere along the
18 line you're going to have to make some choices and
19 different groups would probably bold different
20 parts of this table. So this is our first
21 recommendation at it, but we suspect that if you
22 went through that process you were describing
23 earlier, that might come out differently.

24 You know, for example, that paper that you
25 referenced earlier by Martins et al did some
26 climate change modelling. The -- I think the
27 thing there is that we know something about what
28 kind of temperature changes might occur. Doing a
29 lot more climate change modelling isn't going to
30 gain us a lot more inferences on that. What's
31 probably more challenging and what's the greater
32 uncertainty is so what can you do about these
33 temperature increases? Can you create cool water
34 refugia? You know, what other things -- which
35 stocks are most critical to preserve? And so I
36 think that's a greater level of uncertainty, so
37 that's why we bolded that one.

38 Q Okay. So there's two things that follow up on that
39 what can we do question. The first one that I
40 wanted to pursue with you is that given all of the
41 work that you've done in summarizing these
42 multiple stressors and given that climate change
43 is neither predictable in terms of our coast, as
44 Skip McKinnell was very good to remind us, or even
45 Dr. Beamish when he said we have to expect the
46 unexpected as it relates to that, would you agree
47 that the opening and closing and placement of

- 1 fisheries in response to a returning stock is
2 going to ever-increasingly need to be
3 precautionary?
- 4 A I would agree with that.
- 5 Q And that we will need to take very -- additional
6 care in trying to understand exactly the strength
7 of the run within a mixed stock fishery?
- 8 A Yes, of the multiple stocks that are co-migrating.
- 9 Q Thank you. And I just need to take a couple of
10 minutes to talk about migration back to spawn and
11 particularly your comments on en route mortality
12 and pre-spawn mortality. Hoping I can do this
13 without taking you back to your report, but I
14 don't have any difficulty with that. When
15 describing the declining trend, you were careful
16 in your analysis to say we don't have to examine
17 the correlations between en route mortality and
18 life cycle or post-juvenile productivity because
19 that's already included in the management. But
20 you'll agree with me that en route mortality and
21 the relationship between disease or other
22 stressors and en route mortality could very much
23 be direct causative?
- 24 A Of what?
- 25 Q En route mortality may be caused by --
- 26 A Direct cause of what?
- 27 Q By multiple stressors or the exposure to disease.
- 28 A So en route mortality appears to be caused from
29 the work that Tony Farrell and others have done
30 most particularly by the higher temperatures and
31 the stress that that causes to various stocks and
32 associated with higher temperatures are also
33 various diseases and the work that Kristi Miller
34 has done has shown some correlation between those
35 fish that have genomic signal and those that die
36 during en route mortality, although as you've
37 discussed already in other hearings, exact disease
38 isn't known. But I think the big issue is the
39 change in temperatures. That's the driving --
40 that's the key driving factor, the change in
41 temperatures in the Fraser River as those fish are
42 moving up.
- 43 Q Fair to say it's one of the most overt things that
44 we can see is the driving temperatures. We know
45 sockeye is very sensitive to temperature, so we
46 can see that it's an overt measurement that we
47 have. But we don't know the subtle interplays.

1 A No, we don't know the subtle interplays and it's
2 complex at the PSC workshop which was in 2010, Dr.
3 Miller presented evidence saying that the outgoing
4 smolts in 2008 had a high proportion of them also
5 showed that genomic signal, and yet we had really
6 good marine survival. So the fact that you have
7 genomic signal, it may be that that's just a
8 weaker portion of the population. If they hit a
9 good ocean, they do fine; if they hit a lousy
10 ocean, they die. Or --
11 Q I'm going to -- sorry.
12 A Or en route mortality.
13 Q I'm sorry. I'm getting the nod, so I have to -- I
14 think I can sneak in two quick questions. I guess
15 just on that en route mortality, it's clear to you
16 that we need to keep making that adjustment, that
17 management adjustment, and we need to be very
18 careful and keen to observe how much more of that
19 adjustment we may need in the future, given
20 climate change?
21 A I agree with that.
22 Q All right. And then finally, I just need to --
23 oh, I've just been given five more minutes. I
24 just need to understand one more thing about how
25 you've integrated your recommendations, and
26 particularly I'm concerned with some of the
27 recommendations that we had an opportunity to
28 discuss with Karl English, and the sort of
29 management recommendations that came out of his
30 work and others. Was it your intention to try to
31 summarize all of those into these recommendations
32 or were you more intending to summarize the work
33 that needs to get on to really understand the
34 long-term trend issue?
35 A The latter.
36 Q Thank you. And so the development of
37 methodologies to design and evaluate stock health
38 and production frameworks and fisheries deployment
39 work that needs to get done isn't so critical for
40 understanding the long-term trend, but may be very
41 critical for the sustainability of the sockeye
42 salmon; you'd agree with that?
43 A Yes, I'd agree with that.
44 MS. GAERTNER: I think that concludes my question, Mr.
45 Commissioner.
46 THE COMMISSIONER: Thank you, Ms. Gaertner.
47 MR. GAILUS: Mr. Commissioner, John Gailus for Western

1 Central Coast Salish First Nations.
2

3 CROSS-EXAMINATION BY MR. GAILUS:
4

5 Q Mr. Marmorek, just by way of background, I'll try
6 and explain to you who the Western Central Coast
7 Salish First Nations are. They're a group of
8 First Nations mostly located on the East Coast of
9 Vancouver Island, sort of central down to Victoria
10 area. But it's also a First Nation with the
11 community in Ladner that's part of that group, as
12 well. Their traditional territories, fishing
13 areas, are in the Strait of Juan de Fuca, Strait
14 of Georgia and the mouth of the Fraser River.

15 Mr. Commissioner, I've given up some of my
16 time to Ms. Gaertner, and I expect that she's done
17 actually a very good job of laying the groundwork
18 for my cross-examination, so I think I will
19 probably only be about 20 minutes and possibly
20 less than that.

21 Mr. Marmorek, I'm going to apologize ahead of
22 time, because some of the questions that I'm going
23 to ask you may seem a little bit redundant. We've
24 covered some of these areas before, but I just
25 want to lay out some context and we can have some
26 discussion around that. I'm mostly interested in
27 your recommendations, but I want to go back to
28 some key principles, if I can. I'm only going to
29 be referring to your report, so if we could go to
30 page 6, Mr. Lunn.

31 And just under 2.2 and I must apologize for
32 this, but I want to look at this definition,
33 because I'm going to go back to it later, and it's
34 the definition of cumulative effects assessment.
35 And it:

36
37 ... specifically refers to the process in
38 which the effects of a proposed project are
39 assessed together with the effects of other
40 past, present or future projects to determine
41 the overall cumulative effects on Valued
42 Ecosystem Components (VECs).
43

44 Now, I know earlier that I think it was my friend,
45 Mr. Prowse, took you to another definition of
46 that, but -- and we've been throwing this phrase
47 around quite a bit, but you'd agree that your

1 technical report, and I think you used the term
2 retrospective cumulative effects analysis. That
3 would more accurately describe what your report
4 is?

5 A That's one term, and the other was retrospective
6 ecological risk assessment.

7 Q Okay. Thank you. Now, if we just go back to page
8 5 right at the bottom.

9 A Sorry, could I just make a comment on what you
10 were just pointing to, if you don't mind?

11 Q Sure.

12 A Just 'cause it's fairly important clarification
13 here. So if we just go back to the section you
14 were looking to, the first paragraph describes how
15 cumulative effects assessment is generally done in
16 Canada and the second paragraph points out that
17 there are problems with the way that's done.

18 Q Okay. Thanks. And let's take a look at the
19 things that come before that when we're talking
20 about cumulative effects and ways of looking at
21 cumulative effects. So at the bottom of page 5,
22 you talk about -- there's sort of two kinds of
23 analysis. I want to look at -- if we go over to
24 the next page, I want to talk a little bit about
25 the second kind of analysis, so if we could just
26 go there. So it's the first full paragraph on
27 page 6.

28 Now:

29
30 The second kind of analysis looks at how
31 multiple effects might combine (i.e., how
32 multiple stressors might interact to produce
33 a combined impact different (in form or
34 magnitude) from each stressor acting
35 independently). For example, how might
36 increasing ocean temperatures have affected
37 predators, diseases and parasites in a way
38 that changes their overall impact? There are
39 many ways in which individual effects might
40 combine to form types of "cumulative
41 effects".
42

43 Now, I want to explore that with you a little bit,
44 that sort of analysis. And in cross-examination
45 with Ms. Gaertner, and I appreciate her setting
46 the table for me on this, you agreed that although
47 marine conditions and climate change were the

1 primary drivers, that other factors may have been
2 at play. And I want to delve into this a little
3 bit deeper, a little bit deeper with you.

4 A That's fine.

5 Q Okay. So yesterday in evidence you referred to
6 marine conditions impacting on other factors and I
7 think you made a reference to low food abundance
8 being one of those factors.

9 A Yes, that's right. Low food abundance is
10 generally considered more of a problem as sea
11 surface temperatures go up for Fraser sockeye.

12 Q Yes. And also I think there was a reference to
13 possibly predators, as well?

14 A Right, some of the things that are mentioned here.
15 That's right. They also change at the same --
16 likely to change at the same time, as temperatures
17 get warmer, fish that are normally found off the
18 coast of California are more commonly found up in
19 B.C.

20 Q Okay. And there was quite a bit of discussion
21 we've had around climate change or global warming
22 or global weirdness I think is what a lot of the
23 scientists are calling it now. And one of those
24 impacts from climate change would be changes in
25 ocean temperature; is that correct?

26 A Yes, that's right.

27 Q Okay. And possibly salinity, as well?

28 A Mixing, salinity, pH, a bunch of things.

29 Q Okay. Now, I want to suggest, and please correct
30 me if I'm wrong in this, that perhaps we can view
31 climate change as a catalyst for among other
32 things changes in ocean conditions.

33 A I don't know if catalyst is the term. I mean, I
34 think a key driver.

35 Q Okay.

36 A It's basically the same concept, yeah.

37 Q So it's a key driver and major contributing
38 factor, you would agree?

39 A Yes.

40 Q Okay. And now, just sort of going down that road,
41 changes in marine conditions could also act as a
42 key driver as opposed to a catalyst for other
43 factors; is that correct?

44 A Yes, that's correct. And the two -- sorry, the
45 marine conditions and then climate change are
46 interactive, as we talked about previously with
47 Ms. Baker. They overlap.

- 1 Q So we talked about low food abundance would be one
2 of those factors that may occur as the ocean gets
3 warmer?
- 4 A Right. Both gradually over time and also
5 episodically with an El Niño or year-to-year
6 fluctuations.
- 7 Q Right. And then also increases in predators or
8 new predators coming --
- 9 A Yeah, it could be increases or decreases. It
10 could be changes in competitors, as well as
11 changes in prey.
- 12 Q Okay.
- 13 A All of the above.
- 14 Q Colonization by invasive species perhaps?
- 15 A Also possible.
- 16 Q And also harmful algae blooms?
- 17 A Yes.
- 18 Q How about development of pathogens?
- 19 A So Dr. Kent in his report pointed out that
20 pathogens are likely to become more common as
21 temperatures increase, so I think it's reasonable
22 to assume that in the areas where temperatures go
23 up, it may be expected to see more pathogens.
- 24 Q Okay. Thank you. So when we're -- when we're
25 looking at designing a science project, would you
26 agree that all of these factors need to sort of go
27 into that basket, you know, given your findings
28 that climate change is its major driver, these are
29 the types of factors we should be looking at?
- 30 A Right. And that's, as I was just discussing
31 previously, with your colleague, that's why
32 recommendation number 9 talked about fully
33 integrated oceanographic and ecological
34 investigation on page 109.
- 35 Q Well, you're jumping ahead, but -- so I might as
36 well ask you that question now anyway. So would
37 you agree that as part of that project, that
38 cumulative effects assessment would be one of the
39 key, I guess, terms of reference or one of the key
40 approaches that one would have to take to complete
41 that study?
- 42 A Okay. So when you ask that question, cumulative
43 effects assessment as outlined by the Canadian
44 Environmental Assessment Association or Agency
45 rather, is not necessarily what we would recommend
46 because it's project-focused rather than focused
47 on the value of the existing component, in this

1 case sockeye. So we would rather recommend that
2 you were looking at cumulative impacts on the
3 different life history stages of the valued
4 ecosystem component, so what we call VEC-focused,
5 rather than project-focused.

6 Q So I think we've still got it up there. Would it
7 be -- would the second kind of analysis more
8 accurately characterize the --

9 A Right, the paragraph below --

10 Q -- approach?

11 A -- the one that's under -- beginning of s. 2.2, so
12 the second paragraph. Mr. Lunn, if you could just
13 go down a little bit there. Actually, I think it
14 was a little earlier. If you go down further -- a
15 little later, rather. So here we go:

16
17 CEA should be focused on VECs rather than
18 projects because ultimately the cumulative
19 effects on VEC sustainability are the effect
20 of greatest concern.

21
22 Q Okay. Now, I want to talk a little bit about
23 unknowns, unknowables, knowledge gaps and data
24 limitations. And I know that Ms. Gaertner stole
25 my thunder. I was going to reference this as a
26 Rumsfeldian statement that you came up -- and
27 let's go to that. It's on page 14 of your report.

28 Now, you've -- actually, let's go over to
29 page 15, please. Now, you've identified three
30 challenges under this section and the first was
31 data limitations and I think we've beaten that
32 horse to death, so I don't want to ask you about
33 that one. And then there's the two others: the
34 gaps in basic knowledge or understanding; and what
35 you've termed as unknowables. The third
36 challenge:

37
38 We cannot know --

39
40 That's the next page over.

41
42 We cannot know the explanatory influence of a
43 factor that has not been monitored in a given
44 year or location. When there are no data, one
45 cannot make any inferences either in favour
46 or opposed to a given hypothesis.

47

1 Now, you're -- you referred to that as an
2 unknowable and I suppose if we're doing a
3 retrospective analysis we could use that term, but
4 I guess if we're looking forward, that those sort
5 of factors may become knowable?

6 A If you have anticipated, for example, that some
7 exotic species should suddenly appear and that you
8 have a monitoring program which could detect that,
9 then that becomes a knowable. If you didn't have
10 a monitoring program which was capable of
11 detecting that exotic species - and that's just
12 one example - and it suddenly appeared but you had
13 no data around it to explain that, then you
14 wouldn't know that it was there. So you couldn't
15 use it as an explanatory variable in your analyses
16 to explain why something was happening.

17 So anyway, that -- it's just kind of by
18 definition. If you don't have any knowledge of
19 something you can't know what its explanatory
20 importance is.

21 Q Okay. Now, the recommendations that you have in
22 your report and I think I'd like to go to page
23 109. I want to really focus on the marine
24 conditions, given the interests of the folks that
25 I represent. I want to ask you a little bit about
26 whether -- well, I'll just ask you the question,
27 whether or not these recommendations that you've
28 set out here address some of the challenges, those
29 being numbers 2 and 3, and to what extent.

30 A Actually, if you could stay down where you were,
31 Mr. Lunn, that's great, on the coastal migration
32 stage, because I think that's the key one there.
33 So the intent of number 9 is to get a good
34 understanding both in terms of breadth and depth
35 of the oceanographic conditions in the key
36 environments along the coastal migration - so
37 Strait of Georgia, Strait of Juan de Fuca,
38 Johnstone Strait, Queen Charlotte Sound.

39 So the reason for that is that over time,
40 just as has been done motivated by the Cohen
41 Commission, looking back to 2007 and what occurred
42 that was anomalous, unusual in those years in
43 those locations, as we acquire more of that
44 information we'll be able to better understand, I
45 think, or provide explanations for what causes
46 better years or poorer years, just as Kim Hyatt
47 had in the paper that we were talking about

1 earlier. So I think that covers -- fills some of
2 the data gaps so that I guess it would be the
3 first and second of the two types of challenges.
4 It's hard to describe what you would -- which of
5 the unknowables you would monitor, almost by
6 definition.

7 Q And that's, you know, that's fair comment. I
8 think you already answered this question, but
9 would you agree that a cumulative impacts paradigm
10 - and I'm not talking about the **CEAA, Canadian**
11 **Environmental Assessment Act** paradigm, should play
12 or guide a role in these research projects that
13 we've set out here, the 23 recommendations?

14 A Yes, very much so.

15 Q Okay. Now, your report obviously identifies a
16 number of gaps in science. And I know that you're
17 -- you or your firm has worked a lot with First
18 Nations and First Nations organizations. Do you
19 -- is it your opinion that there's a role for
20 traditional and local ecological knowledge and if
21 so -- actually maybe I'll ask you that first
22 question and then...

23 A Yes. I believe there is a role.

24 Q Okay. So how do you see TLEK or TEK being
25 integrated into the scientific research projects
26 you've identified as priorities?

27 A Well, I think it's a very important form of
28 knowledge, in particular because of the time span
29 both in duration and also in terms of resolution,
30 namely that people, First Nations, have been in
31 particular locations for a very long period of
32 time, have seen many fluctuations in resources,
33 have amazing memories about -- well, hopefully
34 recorded from elders and the like about what's
35 changed, but also because they're there all the
36 time during a given year. So if something really
37 unusual happens, oh, we had these really weird
38 algal blooms in May before any of you scientists
39 got up there with your sampling gear, they're
40 there. And so I think that -- and in other work
41 that we've done in the north and elsewhere, for
42 example, in Tuktoyaktuk Inuit noticed that the
43 broad whitefish tasted funny long before anybody
44 detected that there were some petrochemicals in
45 them.

46 Q Mm-hmm.

47 A So there are many examples like that. We did a

- 1 report, actually, for the Pacific Fisheries
2 Resource Conservation Council on traditional
3 ecological knowledge, some of my colleagues did.
- 4 Q Yes, I think we might be discussing that in our
5 next panel. Finally, well, actually not finally,
6 just taking off on that point, would you agree
7 that given the conclusion around the ocean
8 environment being a primary factor that there is a
9 role beyond TEK for First Nations to play in the
10 science, so in the data collection, as well?
- 11 A Yes. I do agree with that.
- 12 Q Thank you. One last question for you, and we
13 heard yesterday and looking at your c.v. you've
14 had a lot of experience on the Columbia River.
15 Perhaps in the brief time that we've got, maybe
16 you could summarize the -- what we might be able
17 to learn from what's occurred on the Columbia
18 River and should we be cautious in adopting the
19 Columbia River approach?
- 20 A Well, I guess one recommendation I'd have, which
21 isn't new because the Fisheries Research Board
22 back in the early '60s wrote a report which said
23 it's probably not a good idea to build big dams on
24 the Fraser 'cause they did that on the Columbia
25 and they're having trouble. So I think that's
26 pretty evident. There's obviously trade-offs
27 there. I think one of the ironic benefits of
28 those dams is that they now have hit tag detectors
29 which can detect fish going over spill -- well,
30 not going over spillways but going through bypass
31 facilities and so they have very detailed
32 information on life stage specific survival. So
33 from spawners to smolts before they get to the
34 first dam at Lower Granite and then from Lower
35 Granite to the last -- or eighth dam at Bonneville
36 and then back and that information has proven very
37 valuable for disentangling freshwater versus
38 marine versus combined versus delayed mortality
39 effects.
- 40 It's a lot of money and in fact the power
41 production generates the money that funds the fish
42 and wildlife studies, so there's a real trade-off
43 there. However, I guess what I would point out is
44 that you can learn a lot without spending quite so
45 much money, like the kinds of life stage specific
46 survival studies that are in Dr. Hyatt's report,
47 so I think we can learn a lot from those -- that

1 kind of work that tries to identify where the
2 bottlenecks are for different stocks in different
3 locations. That's something that's been valuable
4 learning from the Columbia.

5 MR. GAILUS: Thank you. Those are my questions.

6 MR. DICKSON: For the record it's Tim Dickson for the
7 Sto:lo Tribal Council and Cheam Indian Band

8

9 CROSS-EXAMINATION BY MR. DICKSON:

10

11 Q Mr. Marmorek, Ms. Gaertner and Mr. Gailus just
12 before me have covered a lot of territory, some of
13 which I wanted to ask you about, so my questions
14 are going to be brief. I just want to focus on
15 one broad management implication of your report
16 that I see and that's how we respond to climate
17 change. Because when we look at the stressors
18 that you cover in your report some of them we have
19 quite a lot of control over, if we chose to
20 exercise it and an example being, say, salmon
21 farming. Others we have little control over. We
22 might have some control over some kinds of marine
23 conditions, but very little control over other
24 kinds of marine conditions; is that fair?

25 A Yes, that's fair. I think one of the
26 implications, and perhaps we don't discuss it
27 directly, is that even though you don't have any
28 control over marine conditions, the fact that
29 there can be a lot of variability in marine
30 survival has implications for how you make other
31 decisions, like for example for the Barkley Sound
32 stocks, harvest decisions are anticipated two
33 years before based on conditions for outgoing
34 smolts. So you can learn things that help you
35 subsequently.

36 Q Yes. And you're going to have to respond to those
37 marine conditions through such decisions as
38 harvest management, that's exactly the point.
39 Climate change, more broadly, is again a pattern
40 over which we as a nation have extremely little
41 control; that's fair, right?

42 A Yes, I think that's true, though I like Al Gore's
43 comment that political will is also a renewable
44 resource.

45 Q Yes. Yes. I agree. And so a troubling
46 conclusion of your report is that the kinds of
47 changes over which we have relatively little

1 control appear to be relatively responsible for
2 the decline in productivity.
3 A Sorry? Could you repeat that?
4 Q Sure. The kinds of stressors over which we have
5 relatively little control are relatively central
6 to the decline in productivity and I mean marine
7 conditions --
8 A So it's --
9 Q -- and climate change.
10 A Right. Marine conditions and climate change we
11 have relatively little control over and they
12 appear to have had a major effect, that's correct,
13 yeah.
14 Q All right. And so the point I want to focus on is
15 that if we cannot prevent climate change, we
16 cannot prevent some adverse changes in marine
17 conditions and it becomes crucial that we protect
18 the ability of sockeye to adapt to these changes;
19 would you agree with that?
20 A Yes, I think that's correct and to the degree that
21 you can maintain diverse life histories and
22 diverse habitats that potentially create across
23 all the stock conflicts greater resilience to
24 those varying conditions caused by climate change
25 and perhaps other actions. In the paper by Mike
26 Healey he lists a bunch. I think that paper has
27 been circulated before.
28 Q Yes, I think so. And that is the point that I
29 want to drive to, that in the face of such things
30 as climate change, we -- it becomes more and more
31 important to protect biodiversity. Diversity,
32 genetically and of life histories and habitat,
33 broad portfolio of stocks; do you agree with that?
34 A Yes, I agree with it and so do lots of others.
35 There's a whole session on that at the American
36 Fisheries Society conference earlier this month
37 and that was one of the key recommendations.
38 Q And just for the commissioner, although I'm sure
39 he has the point, if I can just bring up Exhibit
40 553. This is Project 9, Mr. Marmorek, Hinch and
41 Martin's paper and if you can go, Mr. Lunn, to PDF
42 page 35, and here Hinch and Martins are speaking
43 to adaptation of Pacific salmon to climate change
44 and in the first full paragraph there, they cite:
45
46 ...one of the best examples of phenological
47 changes presumably arising through evolution

1 in response to warming comes from the
2 Columbia River, where sockeye salmon have
3 started their spawning migration ... earlier.

4
5 And that's an example of a kind of response to
6 climate change that is a successful adaptation,
7 successful to a point anyway. Is that fair? I
8 know it goes on to say --

9 A It goes both ways though --

10 Q -- about not being enough --

11 A It goes both ways though because some of the, you
12 know, earlier return behaviour of some of the late
13 runs in the Fraser may well have been triggered by
14 unusual conditions, as well, which is not an
15 evolutionarily wise behaviour right now, coming
16 back earlier when the temperatures are hottest in
17 the summertime. So it can go both ways in the
18 sense that some of the responses may end up being
19 evolutionarily advantageous but it could go in
20 either direction.

21 Q Absolutely. That's how natural selection works;
22 isn't that right? I mean, there's broad
23 variability and then --

24 A And I think there's -- sorry.

25 Q -- and then it selects for the successful.

26 A Yes. And there's -- I think there's a limit to
27 adaptation, as well, given that sockeye are near
28 the southern end of their range.

29 Q Yes. And that's discussed a little bit in Hinch
30 and Martin's but I want to take you to just one of
31 their conclusions on page 33, just the -- I think
32 the next page, Mr. Lunn. And just at the bottom
33 of that paragraph they're describing management
34 responses that could be adopted to better cope
35 with climate change. And in the last few lines
36 they say:

37
38 ... adjust fisheries management practices so
39 as to ensure the achievement of escapement
40 goals and thereby the conservation of genetic
41 diversity across stocks (e.g. shift the focus
42 from dominant to smaller stocks when
43 adjusting escapement targets).

44
45 And I take it you would agree with that as a
46 prudent management response?

47 A Well, that's an example. I think, as I said

- 1 earlier in response to a different set of
2 questions, I think if you're going to consider
3 what are the best harvest management strategies
4 for giving sockeye the best possible chance to
5 adapt to climate change, you have to do some
6 pretty thorough analysis of that. Like I wouldn't
7 want to just put out a general principle without
8 actually working that through for each of the
9 stocks and the various life history timings and
10 the expected direction of changes in temperatures
11 and a bunch of other things like that. Some of
12 these other reports that are mentioned here talk
13 about other strategies, as well, like a little bit
14 higher, yeah.
- 15 Q Right. And protecting biodiversity is one of the
16 core objectives of the Wild Salmon Policy?
- 17 A That's correct.
- 18 Q And it does that be defining conservation units
19 according to genetic uniqueness and then setting
20 benchmarks and then managing in response to those
21 benchmarks --
- 22 A Yes, that's right.
- 23 Q -- is that a fair summary? And in broad terms, in
24 your opinion, is managing according to CUs defined
25 in that way as opposed to managing according to
26 larger aggregates, is that a prudent and sensible
27 framework in light of climate change?
- 28 A So there's two parts to this and I think it's
29 really important to tease apart those two
30 components. So one is if you would like Fraser
31 sockeye to be the most resilient with respect to
32 climate change, what is it you would like to do?
33 And then the second part is if you would like to
34 maintain the objective of allowing harvest to
35 various groups, commercial, recreational, First
36 Nations, what is it you would want to do? And
37 there are going to be trade-offs amongst those
38 objectives with different policies. So the
39 societal resolution of what's an adequate trade-
40 off isn't a science question. It's a policy
41 question.
- 42 Q Absolutely. And just going back on the first of
43 those prongs, which is what I'm focusing on, if
44 your concern is resilience in the face of climate
45 change, your aim is going to protect biodiversity
46 in the range of conservation units; is that fair?
- 47 A I think, as I said earlier, you would really need

1 to work this through carefully based on what
2 appear to be the relative sensitivity of different
3 stocks. So if, for example, it turned out that
4 the Chilko stock - I'm just saying this because I
5 don't know if it's true - were far less sensitive
6 to temperatures than let's say Stellako -- or the
7 Early Stuart or something, then you might -- those
8 -- there might be a win/win there in terms of --

9 Q Yes.

10 A -- your adaptation to climate change and your
11 ability to meet the harvest objectives. On the
12 other hand, if it turned out that most of the
13 major stocks were much more vulnerable to climate
14 change and some of the weaker stocks had a lot
15 greater ability, then that would -- that may
16 suggest that maximizing your diversity is the
17 best. So I think it's combining some of the work
18 that Scott Hinch and Tony Farrell and others have
19 done with things like the stock management harvest
20 models and putting them together and seeing what
21 the combined implications are is what you really
22 need to do to explore what are the most robust
23 strategies to all those uncertainties.

24 Q Right. And part of that is gathering more
25 information about all the individual CUs?

26 A Yes, I think that's right.

27 Q You know, and taking into account available
28 resources and I heard your evidence on
29 strategically choosing CUs to focus on, but
30 certainly we want to gather information at the CU
31 level.

32 A Right.

33 MR. DICKSON: Thank you. Those are my questions.

34 MS. BAKER: Thank you, Mr. Commissioner. I just have a
35 couple of re-examination questions.

36

37 RE-EXAMINATION BY MS. BAKER:

38

39 Q The first one was when Mr. Timberg for Canada was
40 asking you about comparing the Pacific Salmon
41 Commission 2010 report with your report he asked
42 you if you agreed that the PSC report and your
43 report came to similar conclusions, and you talked
44 about a distinction that you would make based on
45 more information that was available to you in
46 doing your report. And I just wanted to clarify
47 that there was another distinction, was there not,

1 in that the hypotheses that were looked at by the
2 salmon commission workshop were actually -- while
3 they overlapped with what was looked at in your
4 reports, they were slightly different, so there
5 was some difference in hypotheses in the two
6 projects; is that right?

7 A Yes, that's correct. For example, the harmful
8 algal blooms was not looked at in our report but
9 was examined in the PSC report.

10 Q And then -- thank you. And then when Mr. Eidsvik,
11 you remember, asked you a bunch of questions about
12 changes, significant changes that had happened
13 since 1992, and you ran through a list and one of
14 the changes he asked you about was whether there
15 were large escapements with respect to Fraser
16 River sockeye and you agreed with that. Were all
17 the stocks on the Fraser River system experiencing
18 larger escapements in the 1990s or since 1992?

19 A So to look at that what I'd really want to do, and
20 I don't think you have time to do it, is to
21 actually dig into the appendices of Peterman and
22 Dorner's report number 10 and I think there was
23 quite a bit of variation amongst the stocks in
24 terms of what the escapements were, but I'd really
25 have to look at that to answer that question well.

26 Q So you wouldn't agree that it's true that all
27 stocks have large escapements. You'd need to go
28 and look at the data?

29 A I'd agree that I'd need to look at the appendix to
30 answer the question in detail.

31 Q Okay. All right. And then when Mr. Prowse was
32 asking you some questions about looking at
33 different stressors in different areas and you
34 answered a question and you said you can look at
35 contaminants and you can say well, in certain
36 pristine areas there were no contaminants noted,
37 so we can kind of maybe rule out contaminants as
38 being a big driver of declines in productivity
39 because you can compare a more polluted area like
40 the Fraser with areas that are further up the
41 coast which are more pristine. And I just wanted
42 to clarify, when you're talking about contaminants
43 in that context, you're talking about, I guess,
44 contaminants that are generated at ground level.
45 You're not really talking about atmospheric
46 deposition of contaminants; is that right?
47 Because that would affect those pristine areas, as

1 well.

2 A No, that's correct, and they have found
3 atmospherically deposited contaminants, you know,
4 way up in remote Alaska areas and so on. I think
5 the point here is the fact that declines have
6 occurred in areas which we suspect have very low
7 levels of contamination, we don't actually have
8 the data that -- we didn't have the data for the
9 non-Fraser stocks, suggests that things other than
10 contaminants are likely to be responsible for
11 declines in productivity in those non-Fraser
12 stocks. But that's not to say that contaminants,
13 particularly those for which we don't have data,
14 like the endocrine disruptors, had zero effect in
15 the Fraser. You could have both things going on.

16 MS. BAKER: Thank you. Mr. Commissioner, those are all
17 the questions I have for Mr. Marmorek. I had a
18 couple of housekeeping matters I wanted to cover
19 over with you and counsel, which we don't need to
20 have Mr. Marmorek stay for, so...

21 THE COMMISSIONER: Well, I'm sure he'd be delighted to
22 leave, so Mr. Marmorek, thank you very much for
23 your attendance yesterday and today, for answering
24 the questions of counsel and myself and for your
25 assistance to this commission. Thank you very
26 much.

27 A Well, thank you very much for the opportunity.

28 THE COMMISSIONER: And so Mr. Marmorek can be excused.
29 And you wanted to take care of a couple of
30 housekeeping matters?

31 MS. BAKER: I did. Thank you very much, Mr. Marmorek.

32
33 (WITNESS EXCUSED)

34
35 MS. BAKER: Just a couple of points. I know I'm
36 risking your irritation with this, but we have two
37 matters that are outstanding from today. One of
38 them is a document that was marked for
39 identification and I'm wondering if we need to put
40 some more structure around how we're going to deal
41 with that because we have such limited time.
42 Looking at how that document was treated, it
43 wouldn't be going in for the truth of the
44 document. It goes in simply as a foundation to
45 questions that were asked and it's really the
46 evidence that came from Mr. Marmorek which is the
47 evidence that is relevant and can have some weight

1 attached to it. Given that it was, although Mr.
2 Harvey didn't directly put it to him when he was
3 answering his questions, it was clear that it was
4 the document that was being referenced and the
5 answers.

6 I would suggest that that should be marked as
7 a full exhibit and given how close we are to the
8 end of hearings, I'm concerned about adding more
9 time to the process in moving that forward. I
10 know that you had indicated there may be other
11 parties that would like to comment on that, but
12 again, at the risk of it being extremely
13 irritating, I would say that those parties who
14 haven't shown up to the hearings, I'm not sure
15 that we should be waiting on the process for them
16 to weigh in on that issue. They were not here to
17 weigh in on any other marking of exhibits when
18 they're not in the room. So I would suggest we
19 deal with that one first today. That would be my
20 first point, which we could deal with, and then I
21 have one other point.

22 MR. TIMBERG: Mr. Commissioner, I spoke to my client
23 about this at the coffee break this morning and
24 said that this issue would be coming up and I'd
25 need to get instructions. I do not have any
26 instructions with respect to that document, so I'm
27 not in a position to take a position right now.

28 THE COMMISSIONER: Which document are we speaking of?

29 MS. BAKER: This was an email from Carl Walters to Mr.
30 Marmorek.

31 THE COMMISSIONER: Oh, yes. I'm sorry.

32 MS. BAKER: You recall it. Yes.

33 THE COMMISSIONER: I think what we could do, Ms. Baker,
34 is Mr. Lunn will be sending out his usual reminder
35 about the hearing on Thursday and I would suggest
36 that he could include in that notice mention of
37 this document and the fact that for one thing Mr.
38 Timberg does not have instructions at this point,
39 but that we will deal with it on Thursday, pending
40 any matter or submission that a party wishes to
41 make with respect to the document. And so we
42 could cover it off in his notice to make sure
43 people know that we're going to deal with it on
44 Thursday.

45 MS. BAKER: Thank you. And then the last point is the
46 document which was talked to -- which Mr. Eidsvik
47 talked to you about which is the document which we

1 say is privileged. And I have some concerns about
2 how we proceed with this document. At the moment
3 it is a document that hasn't been put to any
4 witness. The author of the document has not been
5 called. I cannot imagine what evidentiary weight
6 could attach to this. It's not going to be able
7 to be used for the truth of the document. It
8 really has no evidentiary value at all and I'm
9 wondering if we really need to go through the
10 process of submissions on the weight to be given
11 to this document, its admissibility and everything
12 else, given our very limited time and given the
13 fact that I don't see in my submission how any
14 weight can attach to this document in any event.

15 THE COMMISSIONER: Ms. Baker, I don't think I disagree
16 with your position on the privilege matter that
17 you've raised with respect to its admissibility.
18 I think in fairness to Mr. Eidsvik, I can recall
19 him, suggesting that he had some position to take
20 on the matter of privilege. He hasn't expressed
21 that position to me, nor -- I have not seen any
22 submission in writing from him. So at this point
23 in time, I don't think there's any need for me to
24 deal with it. If Mr. Eidsvik wishes to raise the
25 matter with some position or submission that I
26 ought to address, then I will address it, but at
27 the moment I don't intend to deal with it until he
28 takes some action with regard to expressing a
29 submission or position on whether or not it ought
30 to be admitted.

31 I understand your position. He seems to
32 suggest, at least he did today, that there was
33 some answer to that position, but he hasn't
34 expressed it. So at this point in time, it's not
35 going to be marked, but I'm content that if he
36 wants to raise it again, I'll see what he has to
37 say.

38 MS. BAKER: Thank you. And then the last one,
39 hopefully won't irritate you, which is simply
40 about Thursday morning. There's apparently a fire
41 drill in the building that day and we can't start
42 until, I think, 10:45 people are going to be
43 hopefully able to be back in the room with a
44 hopeful start time of 11:00, I think is my -- the
45 message I'm supposed to communicate to the room.

46 THE COMMISSIONER: Yes. I think I was forewarned about
47 the fire drill. I'm not sure why it takes an

1 hour, but apparently it does. It's the federal
2 government. They take longer than the provincial
3 government to organize fire drills, so I
4 understand we're starting at 11:00, I believe, on
5 Thursday morning and we may sit a bit later that
6 day to try to make up for lost time. I think
7 that's Mr. Wallace's intention.

8 Mr. Rosenbloom seems to know something.

9 MR. ROSENBLOOM: No, I don't know anything. In fact,
10 this is the first I've heard of it. Why don't we
11 start early that morning and then take our coffee
12 break during this one-hour fire drill?

13 MS. BAKER: I don't know the details, except I know
14 that they've been negotiating extensively with the
15 building on this is this was where they landed.

16 MR. ROSENBLOOM: Thank you.

17 MS. BAKER: So, sorry.

18 MR. HARVEY: Just wanted to know, for Mr. Lunn's
19 benefit, will his notice with respect to the
20 exhibit refer to written submissions or oral
21 submissions?

22 THE COMMISSIONER: I would prefer written submissions
23 by Thursday then Mr. Harvey, if anybody has one,
24 they might wish to submit. We'll have, I think, a
25 full day on Thursday without this matter. So
26 we'll leave it at counsel coming at 10:45 on
27 Thursday morning so we can get underway as close
28 to 11:00 as possible. Thank you all very much.
29 Appreciate it.

30 THE REGISTRAR: Hearing is now adjourned until Thursday
31 at 11:00 a.m.

32
33 (PROCEEDINGS ADJOURNED TO SEPTEMBER 22, 2011
34 AT 11:00 A.M.)
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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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9

10 _____
11 Karen Hefferland
12

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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22 _____
23 Pat Neumann
24

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

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