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:

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

le mercredi 4 mai 2011

Errata for the Transcript of Hearings on May 4, 2011

Page	Line	Error	Correction
11	27	35	350
44	37	specific sleeper sharks	Pacific sleeper sharks
72	42	angle consumption	annual consumption
89	14	racial predators to prey	ratio of predators to prey
96	10	river mounds	river mouths
99 - 103	top of page	Cross-exam by Mr. TIMBERG (CAN)	Cross-exam by Mr. Leadem (CONSERV)
101	28	Walters 186	Walters 1986

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Mitchell Taylor, Q.C. Charles Fugère Tim Timberg Geneva Grande-McNeil	Government of Canada ("CAN")
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	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")
No Appearance	Area D Salmon Gillnet Association; Area B Harvest Committee (Seine) ("GILLFSC")

APPEARANCES / COMPARUTIONS, cont'd.

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

APPEARANCES / COMPARUTIONS, cont'd.

No appearance	Sto:lo Tribal Council Cheam Indian Band ("STCCIB")
No appearance	Laich-kwil-tach Treaty Society Chief Harold Sewid, Aboriginal Aquaculture Association ("LJHAH")
No appearance	Musgamagw Tsawataineuk Tribal Council ("MTTC")
Lisa Fong	Heiltsuk Tribal Council ("HTC")

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Vancouver, B.C. /Vancouver
(C.-B.)
May 4, 2011/le 4 mai 2011

THE REGISTRAR: Order. The hearing is now resumed.

RANDALL PETERMAN, recalled.

CAROL CROSS, recalled.

GREG SAVARD, recalled.

MS. BAKER: Thank you, Mr. Commissioner. This morning we have counsel for the B.C. Salmon Farmers wants to mark an exhibit that they didn't do during their questioning of the witnesses, and then we'll follow with Ms. Fong for 15 minutes, followed by Canada for 15 minutes, and then we should be ready for Predation.

MR. HOPKINS-UTTER: Thank you, Ms. Baker. I'll try to be quick, Mr. Commissioner. Hopkins-Utter, Shane, for the B.C. Salmon Farmers Association. Mr. Lunn, would you mind pulling -- oh, you actually have it on screen already.

CROSS-EXAMINATION BY MR. HOPKINS-UTTER:

Q I'll just refer to the transcript that we have from the May 2nd hearings. It's at page 60, starting around line 22:

MR. BLAIR: Just a moment, please.

Did Mr. Blair put this document on the screen to you on May 2nd? Sorry, I'm asking the panel. Do you recognize this document from the hearings on May 2nd?

DR. PETERMAN: I'm not sure whether he did. He may have. We had a few dozen documents on the screen.

Q Fair enough. Mr. Lunn -- I apologize for that, Mr. Commissioner. Mr. Lunn, the transcript, please, page 60.

MR. LUNN: It's going to be just a moment if it's Monday's transcript, I'm sorry. You can continue or bear with me until it's up for you.

MR. HOPKINS-UTTER:

Q Okay. For the matter of expediency while he's

looking for that, I'll just read from the transcript.

> We're just going to dig up a document to put up on the screen, but I'll quote it and I will have it up there for you to comment on, and it's a document done by Noakes and others in 2002, and the comment that I'm going to refer and ask for a comment is:

He reads the comment.

> MS. BAKER: Could the article be put up for the witness to look at.
> MR. BLAIR: Yes, we're looking for it. It's the B.C. Farmers' documents at Tab 2, at page 11.
> MS. BAKER: It's on the screen now.

He asked, when he referred to that quote:

> Do you see that, all of you?

This is on page 61 of the transcript.

> DR. PETERMAN: Mm-hmm.

I take that was a "yes" and:

> MS. CROSS: Mm-hmm.

Do you recognize this document?

DR. PETERMAN: Are you asking now, or are you still reading the transcript?

Q Yes, I'm sorry. Dr. Peterman and Ms. Cross, do you recognize this document?

DR. PETERMAN: Well, as I said a minute ago, we looked at lots of documents on Monday, so I don't particularly remember looking at this since he pulled out one paragraph in the middle of it.

Q I apologize, Mr. Commissioner. Page 13, Mr. Lunn, of this document, if you can, near the top. It would be the paragraph starting:

> Straying hatchery fish and salmon egg transfer from other rivers and other parts of the Fraser, in the first half of the 20th

century...

MS. CROSS: Yes, I recognize this.
Q Thank you, Ms. Cross. And do you recognize this document from Monday's hearings?
A Yes, I do.
MR. HOPKINS-UTTER: Okay. Thank you very much. Could we please mark this as the next exhibit.
THE REGISTRAR: Exhibit number 779.

EXHIBIT 779: Noakes et al, On the Decline of Pacific Salmon and Speculative Links to Salmon Farming in British Columbia, 2000

MR. HOPKINS-UTTER: Thank you, Mr. Commissioner.
MS. FONG: Mr. Commissioner, panel, Lisa Fong for Heiltsuk Tribal Council.

CROSS-EXAMINATION BY MS. FONG, continuing:

Q I am continuing my questions regarding the habitat restoration for Ms. Cross and Mr. Savard. And on the screen we have the document we had up when I had last, when I was continuing on Monday, and that's Heiltsuk's application for restoration funding with respect to the stream cleaning activities that DFO had engaged in, in 1985.

Now, on Monday the two of you advised me that you weren't aware of this application or any further applications made by Heiltsuk. So my questions for you are going to be about this type of application. And what I'm interested in understanding is, is this the type of application that the SEP program is aimed at funding so that we can get more of an applied view of what that program does and doesn't do. Okay.

But before I ask that, I just want to know, were either of you aware of the stream cleaning activities that Heiltsuk's talking about, DFO's stream cleaning activities from 1985, removing the large woody debris, which they say damaged the fish habitat? Mr. Savard, perhaps you can answer first.

MR. SAVARD: I'm not aware of the specific project that they might be referring to. I have worked in the Central Coast area, including the area that the Heiltsuk live in, and I am aware that they have

been involved in some of these kinds of activities in previous years. But the particular project that's mentioned that you're asking about, I'm not aware of the details of that one.

Q And just to clarify, when you say "the particular project", you mean DFO's stream cleaning activities in 1985?

MR. SAVARD: No, I'm sorry. I thought you were referring to one from -- a specific project from 1985.

Q Oh, my understanding of the stream cleaning activities is that they occurred between 1985 to 1990 and it was DFO's project of cleaning streams. And what they did was they removed what's called large woody debris from streams and that damaged the habitat.

MR. SAVARD: Yeah, I'm sorry, I'm not familiar with the specific project that you -- or the program that you talk about.

Q Okay. And, Ms. Cross, are you aware of that stream cleaning activity that was engaged in by DFO?

MS. CROSS: No, I was not aware of that.

Q Okay, thank you. Now, we don't have time to go through the details of this application. And, Mr. Lunn, if you could move us forward in the document, past the handwriting section of it, keep going and keep going. Okay, stop right there. And this was the page we were looking at on Monday. And what I'm just going to do is identify for you what -- summarize the sort of key aspects and then just ask you, is this the type of application that the SEP program is aimed at funding.

So under the "Introduction" the salient part really is that the request is being made because DFO engaged in stream cleaning activities which caused various damage to the fish habitat, and the various impacts are set out in paragraph 3 under that numbered "1. Introduction".

And then under numbered paragraph 2, there's a description of what kind of work would be done with the money, and it basically breaks down into fieldwork to assess current fish habitat, and then some removal of obstruction of materials that were created by the stream cleaning. And then if we flip over onto the next page, there's a list of

the streams that are sought to be cleaned. And right under that there's the deliverable. So what would occur at the end is that Heiltsuk would provide a yearend report with maps, photographs, description of surveyed streams and a prescription for restoration.

And then below that under the numbered 3 and the heading "Budget", if you jump all the way down to "Subtotal and Amount of Funding Requested from HRSEP", what they're asking for is $104,100, and right below that where it says "Administration and Overhead @ 10% (In-kind contribution)", I'm told that would be the in-kind contribution that Heiltsuk or other organizations other than DFO would contribute. So the request is for $104,100.

So with that summary of information, and recognizing that, you know, we're not going -- we haven't gone through this application in detail, I appreciate that, is this the kind of application that the SEP Habitat Restoration Fund is intended to fund?

MR. SAVARD: So just generally speaking, and again I think I mentioned on Monday, I mean if the date on this is 2001, I just note that it's kind of an old application. But what I would say about what's described in this work, and I'm not at all familiar about the point that you raised here about the large woody debris project that had occurred earlier, but what I would say about this application is that under our resource restoration element of the Salmon Enhancement Program, projects that talk about improving the habitat capacity or the productivity of streams are the kinds of projects that our Resource Restoration Project would look at. And there's a process on an annual basis where we receive applications and then we prioritize them and make decisions on which ones we would fund. But the nature of this kind of work that's described here, I think this application is dated, but the nature of this kind of work that's described here is the kinds of things that that program would look at.

MS. CROSS: Could I just add something?

Q Yes, please.

MS. CROSS: And I just want to clarify that this particular application was made to HRSEP, which was a short-term or a five-year funding program,

that existed from, I think, about 1999 to about 2004. And under the program there was funds specifically set aside to address this kind of activity, and that's what this application is for. So typically now when we -- we don't have those kinds of funds available. That was a program that was designated to only run for those five years, and we don't have those funds, the funds available. But what this represents is what we talked about on Monday in the way that these restoration programs are done, together with partners to leverage funding, so...

Q Do you know why this program doesn't exist any more?

MS. CROSS: It was a program that was part of a response to conservation concerns around coho. It was part of a restructuring program, and it was designated only to be a five-year program. It was part of a larger package of initiatives.

Q I see. But you would be in agreement with Mr. Savard, though, that conceptually the restoration of manmade damaged fish habitat is what this SEP, the Habitat Restoration, the $3 million would be aimed at addressing?

MS. CROSS: I would agree.

Q Yes, thank you. So coming back to the funding, are there restoration programs which the SEP could support but which are not being funded due only to budgetary restraints?

MR. SAVARD: Yeah, and I would go back to some of the conversation that we had on Monday, and when I think that I was pointing out that on an annual basis we do around 50 to 70 projects in a year, and those projects, how many we actually do, will vary depending on the size and scope of the projects, but also the leverage funding sources. So within the Resource Restoration Unit of the Salmon Enhancement Program, so we talked about on Monday, it's about a $3 million annual budget. We leveraged somewhere between $3 million to $5 million from partners on an annual basis. so, I mean, this is the kind of thing that that project or that program looks at funding.

Q Okay. So just so we understand the leverage funding sources, are you saying that there are projects that are rejected because there are no partners to complement the funding that SEP would

provide?
MR. SAVARD: Well, I guess there's a few elements to it, is that within the Department we have done some work in terms of developing a tool that prioritizes different projects of this nature. So we've done some work, not through the entire coast, but in many parts of the coast where we identify systems that would be priority areas for us to work on, depending on funding level.
Q (Indiscernible - overlapping speakers). Sorry.
MR. SAVARD: Another piece to this though is often the projects that we pursue, proponents come to us and ask to pursue the projects. So it's a combination of us doing this work around prioritizing which watersheds we would work on when we have funding available, but also when proponents come to us and say they'd like to do some work in a particular system and they have funding that they could offer to kind of do that work. So it's kind of two types of projects.
Q Two types of projects. And so you reject projects if there's no additional outside funding.
MR. SAVARD: I guess I wouldn't characterize it as rejecting projects, particularly the ones that the Department has done work on in terms of prioritizing areas that we want to work in. They're always on the books, and it's just a matter of kind of whether or not funding is available.
Q Or you don't fund them. Yeah, okay. Can you give us a sense of the funding shortfall in, for example we're in 2011, like 2010, like what are we talking about? Like projects that stay on the books but don't get done because there's not enough money. Are we talking about something like $10,000 worth of projects, or a million dollars worth of projects or $5 million worth of projects? Like, what kind of dollars are we talking about in terms of funding shortfall?
MR. SAVARD: Yeah, I don't have a -- I couldn't provide a good estimate of those. But I guess I'm not sure that we look at it that way necessarily, because there's a capacity issue. So even if we had more funds, I mean, we couldn't do all projects in a year --
Q Right.
MR. SAVARD: -- because some of them are pretty large.

And, you know, I think the way we approach this is to kind of prioritize them and look for opportunities to move forward on them. And in terms of kind of the number of projects, or what they might be worth in terms of kind of an overall dollar value, I couldn't give you a number now. And we're always adding to this on an annual basis, as well.

Q Right. Do you know how many projects you have on the books? Like, are we talking about one project, or ten projects, or 50 projects that don't get done? I'm trying to get a sense of the size.

MR. SAVARD: Yeah, and I'm sorry, I can't give you an indication of that (indiscernible - overlapping speakers).

Q Okay. And I'm sorry, just because I'm running out of time. Ms. Cross, do you have anything to say about that?

MS. CROSS: No, I can't add anything to that.

Q Okay. Thank you. My next question is from a publication perspective, I haven't seen disclosed in the documents sort of documents that tell us, because I was trying to assess this concept of the funding shortfall, you know, who's applying, who's applying for what, whether they're given funding, and why they're given funding, why they're not given funding on the restoration project so that, you know, the public can sort of assess, well, how much more money, or would it be good money to spend, how much farther would we get with a million dollars, for example. Is that information published, to your knowledge?

MR. SAVARD: In terms of a formal technical document, I'm not aware of anything that's published the way you're speaking of it.

Q Thank you. And, Ms. Cross, are you aware of any document as such?

MS. CROSS: No, I'm not.

Q Okay. My last question is going to be for Dr. Peterman. Dr. Peterman, thank you for coming back.

DR. PETERMAN: Mm-hmm.

Q I was looking at your recommendations, and in reviewing your recommendations in your affidavit, they appear to be aimed at the effects of large-scale hatcheries on wild salmon. Now, coming back

to my conservation hatcheries here. Do you have any recommendations in relation to conservation hatcheries? Like, for example, would you recommend further research into the costs and benefit analysis of funding more conservation hatcheries to improve the overall portfolio of sockeye salmon stocks? What kind of recommendations can you give us about conservation hatcheries?

DR. PETERMAN: Well, I guess the general recommendation would be that they be evaluated, just like any other type of activity. And I'm not aware of how DFO goes about this, but I suspect there's some internal process, just like with these other activities that Mr. Savard just described. That there are some set priorities. They have objectives, and they probably have some evaluation. So that should be done whether it's under the control of DFO or not. I would imagine any group would want to know after some period, has this effort been worth it.

MS. FONG: Okay, thank you. Those are my questions.

MS. BAKER: Do you want to mark that last document?

MR. TAYLOR: If it is, it should be for identification, I think.

MS. FONG: It's fine. I'm not going to, because I'll mark it during Aboriginal Fishing. Thank you.

QUESTIONS BY THE COMMISSIONER:

Q I just wanted to ask one question while you're still on your feet, Ms. Fong. Mr. Savard, in your answers to Ms. Fong in the last few minutes, it wasn't clear to me whether you were telling her that the information she was asking for doesn't exist, or that you just simply don't have it with you today.

MR. SAVARD: Yes, Mr. Commissioner. The prioritization work that I talk about, we have something called a Compass prioritization tool that will identify projects. So there is information around some of the projects that we look at. It's just I don't have it with me here today.

Q And the kind of information she was seeking about the funding aspects of those projects, is it again just a question that you just simply didn't have it with you today?

MR. SAVARD: I didn't have it with me today. One thing that I would say, though, is that a lot of these projects are conceptual in nature, and once a project, we decide to go forward with a project, we do a complete costing of that project. So I'm not sure if cost information is available associated with that prioritized list that I talked about. We would do that as we move forward with projects.
THE COMMISSIONER: Thank you.
MS. FONG: Thank you, Mr. Commissioner.
MR. TAYLOR: I have a question in redirect and then Ms. Baker has allowed me some time to ask questions regarding corrections to the PPR.

CROSS-EXAMINATION BY MR. TAYLOR, continuing:

Q I'll start with Ms. Cross and a question in redirect. Dr. Peterman gave some evidence about concerns if there were to be too many enhanced fish put into the North Pacific, and that was near the end of Monday. Do you recall that line of questioning? I think it was Mr. Rosenbloom, but I could -- or Ms. Gaertner, perhaps. Do you remember that line of questioning?
MS. CROSS: Yes, I do.
Q Now, in the scheme of things, and thinking about the North Pacific as a whole, in the scheme of things are the numbers of enhanced fish that Canada puts out into the North Pacific quite small?
MS. CROSS: Yes.
Q And, Dr. Peterman, you agree with that?
DR. PETERMAN: Yes. As I said on Monday, I think the amount in 2010 was about six percent of the total releases in the North Pacific as a whole, across all three species, pink, chum and sockeye.
Q Is it really countries like Japan and the United States in the form of Alaska that you're concerned about in terms of putting a large number of enhanced fish out into the Pacific?
DR. PETERMAN: Yes, that's right.
Q Now, I have some questions on the PPR that are aimed at seeing if you have evidence that might correct or comment on some of the points there. I'm going to go to question 30 first, or paragraph 30, rather. I think Mr. Lunn is going to bring it

up on the screen. You probably have a paper copy of PPR11 there, as well. Question 30 is speaking to the Salmonid Enhancement Program. My question of Mr. Savard or Ms. Cross is whether -- and I'm particularly focused on the main paragraph in paragraph 30 there, before you get to "a", "b" and "c". Does SEP apply to cutthroat and steelhead trout?

MS. CROSS: Cutthroat and steelhead trout are part of the program in the sense that we have a partnership with British Columbia, but those species are managed by the Province of British Columbia.

Q All right, thank you. And then paragraph 32, which speaks in part about the 350 public involvement projects, I recall some evidence about 360, and it probably doesn't much matter, but do you know the number of public involvement projects which are called PIPs? Is 350 right, or is it a different number?

MS. CROSS: That's the correct -- about the correct number for PIPs, but it doesn't encompass -- that's not the correct number of PIPs that are involved in fish culture activities.

Q Well, that's my question.

MS. CROSS: Yes.

Q Of the 35 then, how many are involved in fish culture?

MS. CROSS: There is about 100 PIPs and about 25 CEDPs.

Q All right.

MS. CROSS: Or, sorry, there's 21 CEDPs.

Q Then if we go to paragraph 60, and particularly the last sentence, is the contribution spoken of there recent, or does it go back a long time? I'm looking at the sentence beginning, "Enhancement is, however," et cetera.

MS. CROSS: The contribution to Cultus is recent. The contribution to Weaver and Gates sockeye is a result of the channel, the channels that are on those sites. and that would be from about five to ten years after the construction of those channels.

Q And that was approximately when?

MS. CROSS: In about by the late '60s.

Q So the contribution then would start in the late '70s for those two.

MS. CROSS: In the early/mid-'70s, yes.

Q And when you say Cultus is recent, can you put an approximate year on that?
MS. CROSS: The captive brood program or the enhancement program began there in 2004, and so it would be the mid-2000s.
Q At paragraph 79, there is a reference there to funding. Does SEP also receive funding from a departmental real property account? Maybe I'll ask Mr. Savard.
MR. SAVARD: Yes, so this paragraph refers to funding to upgrade and work on infrastructure. The particular statement that is there that says $8 million for the SEP program, this was funding that was made available through the Government of Canada's Economic Action Plan, and so that was funding over two years, just the two previous fiscal years, I believe, just finished up.

With respect to kind of longer-term funding, the Salmon Enhancement Program accesses capital funding through a national capital funding pot, which is about $40 million a year. So that is the funding source in terms of doing work on our capital infrastructures, a national funding pot that we access, $40 million a year for the Department of Fisheries across the country.
Q Now, I appreciate that what comes to SEP in any given year is going to vary, but can you say anything about what level of funding has come to SEP from the funds you've just described in recent years per year?
MR. SAVARD: Yeah, typically what happens with this funding is a project will be approved and then we will do -- and it will be approved for funding through this capital funding pot. But the project, most of the major projects don't occur over one year. They will be amortized out over three to five years, because this work takes a lot of time to do. So currently in recent years, a few projects that are underway, is one is the -- we have a complete rebuild that's nearing completion for the Quinsam Hatchery on Vancouver Island, and that was valued at about $14 million, but that $14 million would be spent over about four or five years.
Q And that's coming from the national fund you described.
MR. SAVARD: It's coming from that national fund.

Q All right.
MR. SAVARD: Another -- a few other projects, we've talked about the Economic Action Plan ones. We have something called a concrete package, where we've got capital funding over about, I believe it's three years, where many of the hatchery facilities in the region have a lot of concrete in their construction. So that particular fund, we've accessed money in that fund to upgrade or work on improving or upgrading the quality of that concrete work in a number of facilities across the hatcheries in the Pacific region.

And likewise, we are also getting funding over from that fund for improvements to water distribution systems for a number of sites through the region.

Q And can you put a number, just a number, if you can, approximately per year that is going into what I'm going to describe as the "this and thats" that you've just described, important stuff, but bread and butter kinds of things, if you like. Just is it $1 million, $2 million, what level of dollars are going into that from this national fund?
MR. SAVARD: Based on the projects that I've described, the Economic Action Plan, the Quinsam --
Q Well, we've got the number for the --
MR. SAVARD: Yes.
Q -- Economic Action Plan. It's just the national fund.
MR. SAVARD: But on average I would suggest it's in the $2 million to $5 million range, and I'd have to look at the numbers a bit closer to be more accurate than that.
Q That's good enough. Thank you. If you turn to paragraph 103, it says:

> Lake fertilisation is expensive, costing up to hundreds of thousands of dollars per year per lake.

Am I right that there is lake enrichment going on in recent years in Great Central Lake?
MS. CROSS: Yes, that's correct.
Q And is that the original lake enrichment lake?
MS. CROSS: It is one of them, yes.
Q And is that a highly productive one in terms of

bang for your buck in terms of lake enrichment?
MS. CROSS: Yes. Yes.
Q Do you know the approximate number that's going into that per year?
MS. CROSS: The most recent year I think it was $120,000.
Q If you go to paragraph 116, there is a sentence at the end beginning "The WFSP", I understand WFSP to be Watershed-based Fish Sustainability Plan, which is something that's started to be referred to on the previous page. Is there a correction to the last sentence in paragraph 116, the sentence beginning:

> The WFSP was never a DFO program and thus did not provide...funding...

MS. CROSS: Yes, there is. The WFSP was a partnership program that included DFO and British Columbia, and we do provide, we have provided some funding for communities developing such strategies.
Q And do you know what level of funding on an annual basis, approximately?
MS. CROSS: I don't.
Q Okay, that's fine. If you turn to paragraph 167, it's referring to the Wild Salmon Policy and who has what role. Does SEP have a role in Wild Salmon Policy 5.3? You'll see in that paragraph it says that OHEB, which is the Habitat Management Program, overall has a role, but not SEP it says at the end. Does SEP have a role?
MS. CROSS: I'd actually have to see the action step in front of me, but I believe it's referring to habitat restoration, is that what you're referring to?
Q We can go to that quickly, I think. It's Exhibit 8, as I recall, WSP. I'm not getting a positive sign from Mr. Lunn that we can go to it quickly.
MR. LUNN: Oh, I'm sorry.
MR. TAYLOR: The WSP, I think it's Exhibit 8.
MR. LUNN: I can get that.
MR. TAYLOR: So 5.3, which will be on page, I don't know.
MR. LEADEM: Page 13.
MR. TAYLOR: I should know that Mr. Leadem would know everything about WSP.
MR. LEADEM: Maybe not.

MR. TAYLOR: I'm going to change my mind about Mr. Leadem's knowledge.
MR. LUNN: Page 33 on the hardcopy.
MR. TAYLOR:
Q Does that assist, Ms. Cross?
MS. CROSS: Yes, thank you. So habitat management activities are within the Habitat Management Program, but SEP contributes to a component of that program through our habitat restoration activities.
Q And what is it, briefly in general terms, that you contribute?
MS. CROSS: It's the resource restoration component of the program that we've just been discussing and it's funded for $3 million and is done in partnership with others.
Q All right. Now, at paragraph 173 in the PPR, there is a sentence at the end that is now up on the screen in the bottom half of the screen that's beginning:

> In any event, DFO acknowledges that fish culture is not sustainable over the long-run.

There's a reference to a document. Mr. Rosenbloom asked you about this last time, Ms. Cross, do you remember that?
MS. CROSS: Yes, I do.
Q And you had asked to go and see the document. And there's an exchange between yourself and Mr. Rosenbloom that I can take you to if you want me to. But my question of you is whether you have a comment on that, and I'm thinking, or I have to mind that you were speaking in evidence when Mr. Rosenbloom was asking you about context, and my question is in context what do you say about the statement there about the "long-run" comment as sustainable or not.
MS. CROSS: Yes. So this particular comment came out of a document from the Resource Conservation Council, Pacific Resource Conservation Council, that was referring to the role of public groups in habitat restoration. And I believe the context of the comment was that public groups weren't necessarily able to keep up with the habitat restoration that they perceived as being required, and I believe the point that this particular

statement was trying to make is that we certainly wouldn't want to try to solve all of those problems with fish culture, and from that perspective it's not sustainable over the long run. This particular statement, because it followed on this discussion about Cultus and Upper Adams, is not applicable to that, to what it's following there.

Q All right. A quick question, I think, for a quick answer, and I don't need to take you to it, but at paragraph 138-139 there's reference to the Pacific Salmon Foundation. You're familiar with that organization, both Mr. Savard and Ms. Cross, I believe?

MS. CROSS: Yes.

MR. SAVARD: Yes.

Q Is that arm's length from government?

MS. CROSS: Yes.

MR. SAVARD: Yes.

Q And with regard to conservation stamps, you're familiar with that concept?

MS. CROSS: Yes.

Q Is it a portion of conservation stamp revenue that goes to the Pacific Salmon Foundation as opposed to the whole?

MS. CROSS: That's correct.

Q In paragraph 161, which we can bring up on the screen, there's a reference in the second sentence to an experiment developed in the 1990s. You'll see it there, four lines down. Were UBC scientists involved in that, as well?

MS. CROSS: Yes, they were.

Q And do you know why, it says it wasn't initiated. Do you know why?

MS. CROSS: I wasn't part of the decision-making on that particular experiment.

Q Okay. Do you know anything about that, Mr. Savard?

MR. SAVARD: No, I do not.

Q All right. I'm now at paragraph 54. When Ms. Baker asked you some questions about corrections to the PPR, you added in that it's important to have reference to Hell's Gate, which of course is an extremely important facility in the Fraser River that was built resulting from the slide that happened way back in the first part of the 20th century. I think we have evidence on this. But,

Mr. Savard, Ms. Cross, or Dr. Peterman, do you recall when Hell's Gate was built?
MR. SAVARD: I don't have an exact --
Q Does anyone recall the approximate time?
DR. PETERMAN: Was it in the 1930s?
Q You tell me.
DR. PETERMAN: That's a question.
Q A long time ago, wasn't it.
DR. PETERMAN: That's question.
Q And who manages that now, Mr. Savard, Ms. Cross?
MR. SAVARD: I guess in terms of kind of upgrade, updating and maintenance of it, it's our Real Property Section that manages the --
Q It's DFO though, is it?
MR. SAVARD: That's correct, yes.
Q Okay. And finally, paragraph 27, there's a reference there to the Chehalis First Nation. And specifically that they have an "ESSR Licence", which is Excess Salmon to Spawning Requirements Licence. My question is, is that licence renewable annually?
MS. CROSS: Yes, it is.
MR. TAYLOR: All right, thank you. Those are my questions on this.
MS. BAKER: Thank you, Mr. Commissioner.
THE COMMISSIONER: I wonder, Mr. Lunn, if you could just put back up on the screen paragraph 167. I'm sorry, 173, my apologies. And if you just scroll down to the bottom of page -- the next page, if you just scroll down to footnote 324, I think it is. I just wanted to go back.

Mr. Taylor, I think, just going back up to paragraph 173 and the statement in the last sentence, or second-to-last sentence:

> In any event, DFO acknowledges that fish culture is not sustainable over the long-run.

It gives the footnote there, 324. I believe that document is in evidence, but just that CAN number is just confusing me. So I wonder if you could just clarify for me, is 324, the Ringtail document referred to there, is that already in evidence?
MR. TAYLOR: That question I can't answer. But what it is, is a - is that the letter? - so that document is a letter from a person named Jeff Jung of Fisheries to someone named Mark Angelo, who is

part of a private organization, and he and another person named Marvin Rosenau in 2001 wrote "The Role of Public Groups in Protecting and Restoring Freshwater Habitats in British Columbia, with a Special Emphasis on Urban Streams ". That is a long report. Jeff Jung then in that Ringtail document wrote a letter that he was providing input to Dr. Rosenau and Mark Angelo on their report. Whether it's an exhibit, that Ringtail document, I can't say.

THE COMMISSIONER: All right.

MR. TAYLOR: Under the Rules, of course, you're entitled to look at it.

THE COMMISSIONER: Right.

MR. TAYLOR: But if your practical question is where is it and how can you see it, I'm sure between myself and the Commission counsel we can get a copy available to you.

THE COMMISSIONER: I'm sorry, my apologies. I thought that was already in evidence, but from what you're telling me is it's not.

MS. BAKER: I don't believe it is.

MR. TAYLOR: Well, I don't know.

MS. BAKER: I don't believe it is.

THE COMMISSIONER: Apparently it's not. The other, just one other quick point, Mr. Taylor, I wanted to raise with the panel, is that to the extent that they've been giving you answers estimating figures with respect to DFO's contribution to these programs in terms of dollar figures, and they've been giving you their best estimate, I wouldn't be offended if they wanted to go back and harden up those numbers and give them to you, and then you supply them to Commission counsel. I don't want to have them in the position where they weren't prepared to give a number today, and they're just trying their best to give you a number. But if they want to go back and see if there's more information that might harden up these numbers, that would be fine with me.

MR. TAYLOR: Well, we'd be pleased to do that, Mr. Commissioner, and we'll carry that out and put it back through Ms. Baker.

THE COMMISSIONER: Thank you very much.

MS. BAKER: Mr. Lunn has the letter that was referred to in the footnote on the screen. So if we could have that marked as an exhibit, and then it can be

referred to.
THE COMMISSIONER: Well, I wasn't really wanting to step on counsels' toes in terms of marking things that shouldn't be marked. I just wanted to try to --
MR. TAYLOR: Well, I'm happy to have that marked, if we've now found it. I'm looking at the bottom of it, or I was looking at the bottom of it. I can see from the number that it certainly got itself started into Ringtail. I don't see a CAN number, but Mr. Lunn has found it. Oh, there it is, so, happy to have it marked.
THE COMMISSIONER: All right.
THE REGISTRAR: Exhibit number 780.

EXHIBIT 780: Letter from Jeff Jung to Mark Angelo re "The Role of Public Groups in Protecting and Restoring Freshwater Habitats in British Columbia, with a Special Emphasis on Urban Streams", February 25, 2002

MR. TAYLOR: Thank you.
THE COMMISSIONER: Thank you.
MS. BAKER: It does refer, there is an attachment to that document that is not on the screen, so we'll leave that for now though. The quote I don't think is in this particular page. But in any event, it's been marked and we'll leave it.
That concludes the Enhancement and Restoration Panel.
THE COMMISSIONER: Well, thank you, Ms. Baker and Ms. Tsurumi, for your conduct of the session and to Ms. Cross, Mr. Savard, and once again, Dr. Peterman, for all three of you making yourselves available again this morning, I'm grateful for that. And thank you very much for your willingness to answer these questions. Thank you.
We'll stand down then and regroup.

(PROCEEDINGS ADJOURNED FOR BRIEF RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: Order. The hearing is now resumed.
MR. WALLACE: Good morning, Commissioner Cohen. Brian Wallace, Commission counsel. And Lara Tessaro is with me. We're about to embark on the topic of predation and no hockey jokes are allowed. The

way we're going to organize the next three days, Mr. Commissioner, is, first of all, to introduce you to the authors of our report number 8 on predation, Dr. Trites and Dr. Christensen, who are on the stand at the moment. And once we ask to accept their qualifications and put in some general information on the report, I will conclude their initial examination but not invite participants to examine on the report generally at that point simply because the lines between the general format and what it seeks to achieve and getting into the specifics of predators is impossible to find.

Dr. Trites and Dr. Christensen will both be back on the stand with panels focused on the particular species of potential predators: Dr. Trites on a panel next on marine mammals along with Mr. Olesiuk and Dr. Ford, then following in that panel all participants will have their opportunity to cross-examine. Then tomorrow morning, I anticipate recalling Dr. Christensen along with Mr. Macfarlane and Mr. Hume on a panel that's mostly based on fish predators but also dealing with avian predators as well. And finally, on Friday, we have half a day set aside for Mr. Gillespie to speak on squid. So that's how I see the next two to three days unfolding. Mr. Giles?

THE REGISTRAR: Good morning.

ANDREW TRITES, affirmed.

VILLY CHRISTENSEN, affirmed.

THE REGISTRAR: State your name, please.
DR. TRITES: Dr. Andrew Trites.
THE REGISTRAR: Thank you.
DR. CHRISTENSEN: Villy Christensen.
THE REGISTRAR: Thank you. Counsel?
MR. WALLACE: Thank you, Mr. Giles.

EXAMINATION IN CHIEF ON QUALIFICATIONS BY MR. WALLACE:

Q Dr. Trites, I'll ask Mr. Lunn to put your *curriculum vitae* on the screen. And can you confirm that that is, in fact, your *c.v.*?
DR. TRITES: Yes, that is my *c.v.*

Q Thank you. Just briefly, Professor Trites, you're a full professor at the UBC Fisheries Centre and have been since 2006?
DR. TRITES: Yes.
Q And your professional relationship with that Centre goes back to 1992?
DR. TRITES: That's correct.
Q Okay. You graduated with a Ph.D. in zoology at UBC in 1990?
DR. TRITES: Yes.
Q And you did an NSERC post-doctoral fellowship from 1990 to 1992. What was that area of study?
DR. TRITES: It was focused on predation by seals on salmon.
Q Thank you. And so marine mammals have been of special interest to you and that goes back, I think, to 1980, correct?
DR. TRITES: That's correct. I've been studying marine mammals since 1980.
Q Among your professional affiliations and research affiliations, you've been involved as a member of COSEWIC; is that correct?
DR. TRITES: That's correct. I was a voting member on COSEWIC, as well as co-chair of the Marina Mammal Subcommittee and I continue to serve on that committee now as a member.
Q Thank you. And you've also had professional relationships with UBC, the Vancouver Aquarium and DFO, correct?
DR. TRITES: That's correct.
Q I understand you've published close to 200 scientific papers?
DR. TRITES: Yes, that's right.
Q And that these papers have been cited in total almost 4,000 times?
DR. TRITES: That's correct.
MR. WALLACE: Thank you. Mr. Commissioner, I'd ask that Dr. Trites be qualified in marine mammals and in their conservation status and recovery. I see nobody seeking to speak to that issue.
THE COMMISSIONER: Thank you.
MR. WALLACE:
Q I will move then to Dr. Christensen. Dr. Christensen, you are also a full professor at UBC?
DR. CHRISTENSEN: That's correct.
Q And the associate director of the UBC Fisheries Centre?

DR. CHRISTENSEN: Yes.
Q You became a full professor last year and you'd been an associate professor since 2004.
DR. CHRISTENSEN: That's correct.
Q Your Ph.D. in ecosystem modelling comes from the University of Copenhagen in 1992; is that correct?
DR. CHRISTENSEN: That's correct.
Q And you've worked internationally on food web modelling?
DR. CHRISTENSEN: For more than 20 years, that's correct.
Q Can you just very briefly tell us what food web modelling is?
DR. CHRISTENSEN: It's creating ecosystem models of which the feeding interactions are very important. And in the food web, we describe basically who is who. And how much I should add, by the way.
Q Thank you.
DR. CHRISTENSEN: How much.
Q Thank you. You have had more than 250 publications in scientific journals?
DR. CHRISTENSEN: That's correct.
Q And your publications have been cited more than 5,000 times, correct?
DR. CHRISTENSEN: That's correct.
Q Do you have any experience in salmon research?
DR. CHRISTENSEN: It's not my specialty; food web interactions is. But I have worked a bit on predation on coho salmon smolt and spent about 120 days in the field here in B.C. studying that topic. And working in connection with the supervision of a student working on predation or mortality courses for coho salmon smolt.
MR. WALLACE: Thank you. Mr. Commissioner, I would ask that Dr. Christensen be qualified as an expert in food web modelling and predator-prey relationships. Again, I see nobody leaping to their feet to challenge those credentials and I'd ask if we can move on.
THE COMMISSIONER: Yes, thank you.
MR. WALLACE: Could we mark Dr. Trites' *c.v.*, please, as the next exhibit?
THE REGISTRAR: Exhibit 781.

EXHIBIT 781: *Curriculum Vitae* of Andrew Trites

MR. WALLACE: And if we could put Dr. Christensen's on the screen?
Q Dr. Christensen, can you identify that as your *c.v.*?
DR. CHRISTENSEN: Yes.
MR. WALLACE: And could that then be marked as the next exhibit, Mr. Giles?
THE REGISTRAR: Exhibit Number 782.
MR. WALLACE: Thank you.

EXHIBIT 782: *Curriculum Vitae* of Villy Christensen

MR. WALLACE: Next, Mr. Lunn, if you could put Project 8 on the screen?

EXAMINATION IN CHIEF BY MR. WALLACE:

Q If I may ask you, gentlemen, if you are the authors of the Project 8 report prepared for this Commission? It's entitled Predation on Fraser River Sockeye Salmon.
DR. CHRISTENSEN: Yes.
DR. TRITES: And yes.
Q Thank you. Dr. Christensen, if I could just ask you to go to page 2 of that and the executive summary. There's a point of reference. In the first full paragraph, you describe this as a review of the scientific literature and say it reveals a wide range of species holding the remains of sockeye salmon in their stomachs. Is it fair then to describe this review of qualitative rather than quantitative?
DR. CHRISTENSEN: Yes, that's correct.
Q And can you just help us by telling us the limitations of that in determining your level of confidence in your results?
DR. CHRISTENSEN: We think that it is well-qualified. We brought within the limits that are posed by lack of knowledge and that means there's no very much data, quantitative data on the potential predators of sockeye. So we've had to work within that limitation. Still it's a species that's been studied for a hundred years so there is a considerable amount of information.
Q In your report, you looked at, I gather, a large number of predators and you initially came down to

a list of 26 and then narrowed it further. Can you just describe to the Commissioner, please, how you went about identifying the species that were potential predators and how you then went about narrowing it down to those you thought might have a potential impact that could contribute to the decline.

DR. CHRISTENSEN: We did a very systematic survey of what's available. We started off with freshwater status, moved to the estuarine, to the straits and out to the open ocean. And for each area, we looked at the literature, what information we could find about potential predators and that made a long list. And based on additional information about diets and abundance, we then made a judgment on who might be the potential predators. So it's not a conclusive list that we have produced but it is a fairly comprehensive list and we had a set of criteria that we used for this.

Q And are those the criteria set out at the bottom of page 13?

DR. CHRISTENSEN: Yes, those are the basic criteria we used. And we used them also based on, I would say, 20 years' experience when it comes to evaluating what's important and what's not important. But yes, these are the criteria.

Q Thank you. In the fourth bullet there, I think perhaps there's an error that ought to be corrected where you identify:

> The abundance of the predator must have been decreasing in recent decades...

Am I correct that that should say "increasing"?

DR. CHRISTENSEN: You are correct, yeah. That is an error.

Q Dr. Christensen, in your -- if I may just summarize and in looking at the way you deal with various predators you identify, there seems to be a fair amount of weight put on the fact that there's no evidence of an increase in the abundance of the predator as being one of the facts. Isn't it indeed it's one of the things mentioned in the bullet? And if I may summarize? If you're trying to identify a decline, you want to see if it's turned into something that's increasing the risk, which would be an increase of

the abundance of the predator, correct?
DR. CHRISTENSEN: That's correct, yeah.
Q Is it not also possible, though, that other things besides increasing abundance could increase the risk from a particular predator of sockeye salmon?
DR. CHRISTENSEN: We might have a shift in diets. We know that animals can change preferences, especially at the individual level, that certain animals might specialize on certain prey and that can shift the whole diet compositions. It doesn't happen that often at the population level, though, unless it really is a learned behaviour such as you might see from marine mammals. For fish, that's rarely the case. But we cannot rule it out. We would first look for change in abundance. That's where the best information also is likely to be available. We have less information about diets and how they change. But you are right, that can be a factor, too.
Q Dr. Trites?
DR. TRITES: Yeah, and one other thing perhaps to add to that is, you can also have a shift in distribution so you could have an overlap or increased overlap in where the prey specie is and predators moving in. So that was another criteria we had was distribution overlap.
Q Okay. Thank you. If I may just take you to page 46, I think there's another correction that should be made. This is under the first sentence under the heading "Pacific Cod". There's a reference to the "North Atlantic". Should that be the "North Pacific"?
DR. CHRISTENSEN: It should be, yes.
Q Thank you. If I may take you now to Table 5, which is about page 72, I think, 71. Here's the list of 26 potential predators. Dr. Christensen, you mentioned that the list wasn't exhaustive. It's a qualitative survey. How did you draw the line between the ones you thought could be considered potential and the ones you can dismiss even though there was some evidence of there being among those who love the sockeye?
DR. CHRISTENSEN: That's a difficult question actually because are getting into less and less likely to be of importance. For some where we had no diets, no information about abundance or none of the criteria, but we had expectations or we had

qualitative information that it was rare species, we would exclude it. Or, where there's very little spatial overlap between the potential predator and the sockeye salmon, we, again, wouldn't include it. But this is a long list and you could add to it.

Q Thank you. But taking this list you then identified a shorter list of six predators referred to at the top of page 72 and I wonder if you could just take us to that sentence or I can take you to that sentence, Dr. Christensen, if you can just very briefly tell us what attracted you to these six species?

DR. CHRISTENSEN: May I say, first of all, it's six. We could also have made eight or we could have made ten. This is just to make a short list really. It is subjective whether it's four or six or eight. There's no hard criteria for this.

Q But in your judgment, are they listed in order of their likely significance?

DR. CHRISTENSEN: Salmon shark, I would say, is at the top of our list. For the rest, it's difficult to say. They are probably less important. That's what I would say.

Q Okay.

DR. CHRISTENSEN: If I may just comment very briefly on why they're --

Q Very briefly.

DR. CHRISTENSEN: That's what you asked me.

Q We'll get into more detail on this later.

DR. CHRISTENSEN: No, just that we found evidence for all of these six that they might have a quite considerable impact but we also lack data for all of them to make a proper evaluation, a thorough evaluation, like real hard numbers as we love to do. We couldn't do that. The information was not available. But these were the prime candidates.

Q Thank you. Dr. Trites, I notice that on the list of six, none is among your specialty of marine mammals. Can you comment on, just very briefly, the dismissal of marine mammals from that short list?

DR. TRITES: Yeah, maybe we could just go back to the table on page 71. So down at the bottom, we have the marine mammals that are listed. And I think the most striking thing was that while we could find indications that all have eaten some sockeye

salmon, we didn't find an indication that sockeye salmon was an important salmonids in the diets. The only one that we flagged as a possibility was white-sided dolphins and just as a possibility but not up on the high list. And that was really because there's just limited information. And we'll probably discuss this later on --

Q Yes.

DR. TRITES: -- but only a few predation events have been recorded and suggesting that sockeye might be more important. But I think overall, that evidence is relatively weak. So we just didn't find a high indication despite the fact that we've had increases in many of these populations and we've had certainly the chance because there's overlap between where sockeye are and where these marine mammal species are. But overall when we just looked at the big picture, it really came down to one of diet, just not a strong indication that the sockeye was an important salmonids in their diets.

Q Thank you, Dr. Trites. Dr. Trites, you contributed, I believe, to the forum called "Speaking for the Salmon", correct?

DR. TRITES: Yes, that's right.

MR. WALLACE: And if I may ask you, Mr. Lunn, to take us to Exhibit 12?

Q In that contribution, there's a paper which is part of the document commencing at page 27. I won't take you to it but just simply to ask you whether the views you expressed then remain your views?

DR. TRITES: Yes, they are.

MR. WALLACE: Thank you. And if I could ask you, Mr. Lunn, to take us to page 92 of Exhibit 12? This is a wrap-up, I think, by John Reynolds. And at the bottom of page 92 in the last paragraph under "Marine Mammals", in the second line:

> Andrew Trites' presentation was very interesting, especially with respect to the hake story. It is so easy to point at a single predator such as seals and be mad at it.

Can you just tell the Commissioner, please, what the "hake story" is?

DR. TRITES: Yeah, well, the point of this in the presentation was to make people more appreciative of the fact that predation isn't just a two-way relationship. A lot of people think that because a seal eats a salmon and just a very simple thing, removing the seals, would result in more salmon. And so this is pointing out that many of these interactions are three-way, four-way, ten-way, 32 ways. We have to think of this as being food webs so that removing a major predator such as harbour seal would probably, based on the diet data we have from the 1980s, could result in more hake in the system, which could, in turn, result in them eating many other species, possibly salmon. But the point is that we're talking about a predator that's part of a food web, not part of a two-way relationship.

Q Thank you, Dr. Trites. I wonder, gentlemen, if I may take you to your recommendations, which are on page 82 and 83? Starting at the bottom of page 82, and there are five recommendations. Now, as I read the recommendations, they are all designed to teach us more about the role of predators, as a threat to sockeye salmon. My question to you is how do the recommendations go to improving future sustainability of a sockeye salmon fishery? Dr. Trites or Dr. Christensen? Thank you.

DR. CHRISTENSEN: The recommendations follow after a plea for implementation of ecosystem-based management. We have traditionally been managing fisheries resources based on what we call single species management where we mainly consider the impact of the fisheries and tends not to fully include the considerations of the ecosystem, the other parts of the ecosystem and also of the environment. There's a strong scientific almost consensus that, including these additional facts that will minimize the risk of failures. So that's where it comes in that we may see less failures if we understand the ecosystems better.

Q When you speak of failure, do you mean failure of a particular species, in this case, sockeye?

DR. CHRISTENSEN: In this case, sockeye, but this may also have implications for the predators and the preys of sockeye and the competitors. So salmon are part of the ecosystem and that's what we encourage also with these recommendations that

should be considered.
Q Thank you. Then just looking at the five recommendations, I want to just ask some questions about, again, in a general sense, an order of magnitude sense, the cost of the information you suggest we should be seeking and the feasibility of doing some of the work that's recommended. So looking at the first recommendation, to summarize, it's a recommendation of amassing more data on the diet and population trends of the six most significant species you've identified here. Now, how would that data be collected, Dr. Christensen?
DR. CHRISTENSEN: This would call for substantial efforts. We are talking about studies in the open ocean. And the open oceans have with regards to salmon not been started for many, many years. So it's so limited effort that goes into that. This is maybe at the most ambitious recommendation we have. What we're calling for is really an international effort, which would involve the North Pacific countries and it would be a large undertaking. But the methods we have now are so much better than they were in the 1950s to 1970s when the last big research efforts were conducted in the North Pacific. We can easily be talking about ten million dollars or more. But we're also talking about maybe five countries participating.
Q Now, are there examples of this kind of data gathering being done in other parts of the world for other purposes?
DR. CHRISTENSEN: It happens regularly in other places, in the North Atlantic. It also happens regularly when we're talking about there's no oceanographic information and other kinds of information. So what we are asking for is to set up a similar program that looks at the fisheries' ecosystem in the North Pacific.
Q Now, in answering question 1, am I correct you really have also addressed recommendations 2 and 4 as well?
DR. CHRISTENSEN: Yes, with regards to abundance of species and diet studies on fish. And yes, with regards to the part that deals with the open ocean where the sockeye salmon spend two years of their lifetime but not with regards to the coastal and freshwater parts.
Q Right, right. Dr. Trites?

DR. TRITES: The point of our second recommendation was to point out that a lot of the data we were looking at is outdated. And sometimes there's an assumption because an animal ate something in 1980, it's probably still eating that 40 years, 30 years later. So we were trying to point out that you just can't assume because something used to be that way that it's still the same today. And so some attention has to be made to updating outdated information.

Q Yeah. Now, correct me if I'm wrong but I think in the comments I've just heard, we've covered pretty much recommendations 1, 2 and 4, that's determining more data on the six major culprits: updating diet studies and focus those -- that research in the open ocean seems to be the tenor of those three recommendations. So moving on from those, number 3 relates to creating a central diet database. Now, is this something that is done in other parts of the world?

DR. CHRISTENSEN: Yes, and again, if I may refer to the North Atlantic. There is an international effort there in creating diet databases. They go back 1981 and are very comprehensive. If we look at the North Pacific, we do not have any similar. And as part of the move towards ecosystem-based management, which DFO is embracing, this would be an obvious first step, a low apple really.

Q Okay.

DR. CHRISTENSEN: The information is largely there now. There's a lot of information there now. But it is spread out among different researchers, different institutions and having one central repository for it would be an important step for implementation of ecosystem-based management to have access to that information.

Q Now, you're describing this as a low apple. Are you saying this is not an expensive thing to do?

DR. CHRISTENSEN: It is not, no.

Q Yeah. Dr. Trites?

DR. TRITES: Yeah, I just want to echo the same points. One of our biggest challenges was the fact that it was hard to find some of the diet information. We're looking through data reports. Some are in tables. Some of those original records are lost. And it's fundamental, as we look towards doing proper ecosystem-based management, to have this

sort of primary information coordinated, collected, compiled and kept in some central places so that it's available to other researchers. I think it's fundamental for ecosystem-based management to have such a database established.

Q The final recommendation relates to constructing a conceptual ecosystem model to assess the cumulative role of predation on sockeye. Can one of you describe to me in lay language what would be involved in that modelling project?

DR. CHRISTENSEN: First of all, it has to span the whole lifecycle of sockeye salmon. So we're talking about a model that starts in the freshwater and continues out to the straits and encompasses also the North Pacific, the open gyre area up there. This model would describe the environment that the sockeye salmon encounters, the prey and the predators, the competitors, draw information about what we know about these predators and put in some estimates for what's important, what's not important, a bit like we've been trying to do without making the model in our report. To do that really just calls for a person to do it. A post-doctoral fellow could easily do this in a matter of certainly within a year.

MR. WALLACE: I have no further questions for this panel, Mr. Commissioner. So if there are questions arising from that overview, people can put them when each of Dr. Trites and Dr. Christensen come back. It's 11 o'clock. We could go right into the next panel, if you'd like to do that. Thank you. Dr. Christensen, you are temporarily excused.

THE REGISTRAR: Mr. Wallace, did you need to mark that document, Project 8?

MR. WALLACE: Oh, thank you very much. I didn't mark that. I'm sorry. Thank you very much. May I have the report number 8 marked, please?

THE REGISTRAR: Exhibit Number 783.

EXHIBIT 783: Cohen Commission Technical Report 8 - Predation on Fraser River Sockeye Salmon - Feb 2011

MS. TESSARO: Good morning, Mr. Commissioner. As Mr. Wallace explained, we're now going to have Dr.

Trites joined by two DFO witnesses, who are on their way. Perhaps while the witnesses are getting set up, I'll just provide some introductory comments about what we'll be doing with these witnesses today. This panel is what we're referring to as the Marine Mammal Panel. This is something new we're trying today in combining DFO witnesses with our project experts. And the hope, Mr. Commissioner, is that in having people from different perspectives testify together, we're going to aim for a collaborative approach and try and draw out agreements where they exist, and where they do not, to hear evidence of those disagreements. My time estimate is 75 minutes.

THE REGISTRAR: Good morning, sir.

JOHN FORD, affirmed.

THE REGISTRAR: Would you state your name, please?
DR. FORD: John Ford.
THE REGISTRAR: Thank you. Counsel?
MS. TESSARO: Mr. Giles, if we could also have Mr. Olesiuk...?
THE REGISTRAR: Oh, I'm sorry.

PETER OLESIUK, affirmed:

THE REGISTRAR: Would you state your name, please?
MR. OLESIUK: Peter Olesiuk.
THE REGISTRAR: Thank you very much.
MS. TESSARO: And just a reminder that the microphone probably is best to leave it on. I'm not sure if you're name got captured there. Mr. Commissioner, I'm going to seek to qualify Dr. Ford and Mr. Olesiuk as expert witnesses. And in aid of that, if you could pull up Tab 5 of the Commission's list of documents, Mr. Lunn?

EXAMINATION IN CHIEF ON QUALIFICATIONS BY MS. TESSARO:

Q And Dr. Ford, I should just confirm that you've watched the proceedings this morning and you're aware of the lengthy process I'm going to take you through now?
DR. FORD: Yes.
Q Is this your *c.v.*?

DR. FORD: It is.
MS. TESSARO: Could we have this *c.v.* marked as the next exhibit, please?
THE REGISTRAR: Exhibit Number 784.

EXHIBIT 784: *Curriculum Vitae* of John Ford

MS. TESSARO:
Q So Dr. Ford, you are a DFO research scientist and the program head of the Cetacean Research Program at DFO's Pacific Biological Station and have served in that position since 2001, correct?
DR. FORD: That's correct.
Q You're also an adjunct professor in the Department of Zoology and in the Marine Mammal Research Unit at the University of British Columbia?
DR. FORD: That's correct.
Q And in that capacity, you have supervised and advised both Masters and Ph.D. students, including graduate students studying the diets of Pacific white-sided dolphins?
DR. FORD: Yes, that's correct.
Q You received a Ph.D. in zoology from UBC in 1985 for your studies on the behaviour and acoustics of killer whales?
DR. FORD: That's correct.
Q And since that time, you have continuously studied and published papers on marine mammals in B.C. coastal waters and conducted field research into the conservation status, ecology and foraging strategies of endangered and threatened cetaceans, correct?
DR. FORD: That's correct.
Q And you have also provided science advice to DFO managers relevant to fisheries management and to recovery of endangered and threatened cetacean species, correct?
DR. FORD: Yes, that's correct.
Q And finally, are you currently a member of the Marine Mammal Specialist Committee of COSEWIC?
DR. FORD: I am, yes.
Q And how long have you been a member of that committee?
DR. FORD: Five years, I believe.
MS. TESSARO: I would ask that Dr. Ford be qualified as an expert in the conservation, behaviour and ecology of cetaceans in B.C. waters, including

their foraging habits.
THE COMMISSIONER: Yes, thank you.
MS. TESSARO: Mr. Lunn, could I have Tab 6?
Q We're going to proceed through that same exercise, Mr. Olesiuk. Is this your *c.v.*?
MR. OLESIUK: It is.
MS. TESSARO: Could I please have this marked as the next exhibit?
THE REGISTRAR: Exhibit 785.

EXHIBIT 785: *Curriculum Vitae* of Peter Olesiuk

MS. TESSARO:
Q And Mr. Olesiuk, you are a marine mammal biologist at DFO Pacific Biological Station, a position you assumed in 1982?
MR. OLESIUK: Correct.
Q And since 1990, you've also been the head of the Pinniped Research Program at PBS?
MR. OLESIUK: Yes.
Q Since joining DFO in 1982, you have conducted field research and published scientific articles and technical reports on the status, population biology, bioenergetics and feeding habits of seals, sea lions and other marine mammal species in B.C. waters?
MR. OLESIUK: I have.
Q And since joining DFO in 1982, you've also given science advice on the management of pinnipeds?
MR. OLESIUK: I have.
Q You've contributed to the development of pinniped survey and research techniques, including scat analysis and satellite telemetry?
MR. OLESIUK: Correct.
Q I think that's the first time I've said "scat" in a courtroom. And you're also responsible for seal and sea lion surveys and assessments in B.C. and collaborate with marine mammal researchers in Alaska, Washington, Oregon and California on those assessments?
MR. OLESIUK: Yes.
MS. TESSARO: I would ask that Mr. Olesiuk be qualified as an expert in the conservation, biology and ecology of seals and sea lions in B.C. waters, including their prey requirements and diet.
THE COMMISSIONER: Yes, thank you, Ms. Tessaro.

MS. TESSARO: The first topic I'd like to discuss with the panellists today is the Pacific Salmon Commission workshop that occurred in June 2010. And I'll note that this is in pursuit of our terms of reference, which direct the Commissioner to consider previous reports, examinations and inquiries.

EXAMINATION IN CHIEF BY MS. TESSARO:

Q And I'll just ask all three of you to confirm whether you attended the PSC workshop on Fraser River Sockeye Decline in June 2010.
DR. TRITES: I did not.
DR. FORD: I did attend the workshop.
MR. OLESIUK: And prior to the workshop, I worked with John and provided some information on seals and sea lions, which he included in his presentation.
Q And were you at the workshop?
MR. OLESIUK: No.
MS. TESSARO: Thank you. Mr. Lunn, could I ask you to pull up Exhibit 573, please?
Q Mr. Olesiuk, you just referenced a presentation that you assisted Dr. Ford with. Is this the presentation that you're talking about? I'm sorry. We should turn to page 2 of this document.
MR. OLESIUK: Yes, it is.
Q And Dr. Ford, in addition to this five-page summary of your presentation, I understand you also presented a PowerPoint to the PSC conference?
DR. FORD: That's correct.
MS. TESSARO: And if we could just, seeing as it's been mentioned, leave this document aside and quickly pull up that PowerPoint for the purpose of getting it on the record. It's Tab 13 of my list of documents.
Q I'll just ask you to confirm, Dr. Ford, that this is the PowerPoint that you presented to the PSC workshop.
DR. FORD: Yes, it is.
Q You don't need to look at the document any further to confirm that? If you do, there's a binder of documents in front of you.
DR. FORD: The title page is correct so I assume the rest is.
Q Okay, great. Thank you. And so if I understand correctly, you authored this PowerPoint with input

from Mr. Olesiuk?
DR. FORD: That's correct.
MS. TESSARO: So I think we can set that document aside, although I commend it for its amazing photographs and for its content. If we could just quickly turn to page 6 of this document where the conclusion is found and maybe highlight out those first two paragraphs?
Q And my question is for both Dr. Ford and Mr. Olesiuk and, that is, do you still agree almost a year later with the conclusion provided here in the first paragraph of page 6 and, in particular, that:

> Only Steller sea lions and Pacific white-sided dolphins appear to be potentially significant predators of sockeye.

DR. FORD: Yes, I still agree with that.
MR. OLESIUK: Yeah, and I agree with it as well.
MS. TESSARO: If we could turn back to page 5 of this document and go down to the portion on harbour seals?
Q I'm wondering, Mr. Olesiuk, if this still reflects your general views on the potential of harbour seals to have predation impacts on Fraser River sockeye, either in 2009 or in the longer term?
MR. OLESIUK: It does but you need to keep in mind that we are talking here specifically about Fraser River sockeye. I wouldn't dismiss harbour seals as being significant predators on other salmon stocks.
Q Thanks for that clarification. One thing I note in this discussion of harbour seal as a potential predator is that there's no reference in this paragraph to the notion that harbour seals prefer sockeye or have particular preferences for any particular species of salmon. And my question is for all of the panellists to the extent they know. Do harbour seals prefer sockeye? And maybe we'll start with Dr. Trites.
DR. TRITES: Okay. The challenge with determining the diet of harbour seals is that it's relying on identifying hard parts in fecal sample scats. And it's not been possible just from the physical shapes of the bones to know what proportion are sockeye salmon. To get at that now DNA techniques

are available and that work remains to be done and will be done over the coming years. So there's nothing firm in terms of the data outside of we can identify bones as being salmonid.

Whether or not it's important, there's only sort of a few anecdotal observations. One comes from the work of Mr. Olesiuk suggesting that in estuaries that had sockeye salmon there were fewer harbour seals seen on average compared to other estuaries that had other species. And second, there's a report from Alaska where they found that comparing the distance where harbour seals haul out from some of the major rivers that they seem to be furthest away from rivers that had sockeye salmon runs. So they're sort of anecdotal. It doesn't get down to the nuts and bolts. But it's sort of the first I've been suggesting maybe when we do, do the DNA work we're not going to find a high proportion of sockeye.

Q Is there any reason, just to follow up on what you just said, to believe that, in fact, harbour seals are disinclined towards sockeye in contrast to other salmon species?

DR. TRITES: I think I couldn't answer that specific to harbour seals. Certainly, if we're going to speak more generally about other species of marine mammals, sockeye seems to be the least preferred of all the salmon species, at least showing up the least frequently. And that raises questions why.

Q And just turning to the other two witnesses, perhaps Mr. Olesiuk?

MR. OLESIUK: Yeah, if I could just add to what Andrew said. We have gone into some estuaries, not the Fraser River, and done more detailed observational studies where we actually observe seals feeding on salmon, collect scale samples and those can be identified to species. And what we can say about seals is that they are generalists when it comes to preying on salmon. They will take all species that are available depending on their relative accessibility, I think. And getting back to Andrew's point about numbers of seals in estuaries, actually there are significant numbers of seals in the Fraser River estuaries when salmon are returning but the ratio of seals to the large salmon runs that go up the Fraser are lower than we see in some of these smaller estuaries.

Q I don't know if you have anything to add to the other two witnesses' answers?
DR. FORD: No, I have nothing to add to those.
Q While we're at this PSC presentation, I should just confirm, Dr. Trites, have you reviewed this six-page summary?
DR. TRITES: No.
MS. TESSARO: Okay. And now that we've seen the presentation that was made to the PSC and had a glimpse at the PowerPoint, if we could look at the PSC report itself?
Q I'd like to seek your views on some of the comments that are made in the PSC report.
MS. TESSARO: And Mr. Lunn, that's Exhibit 73.
Q And if you could go to what is marked as page 58? And the sentence I'd like to ask Dr. Ford to comment on is the first sentence of the fourth paragraph on page 58, which reads:

> The presentation by John Ford on predation by marine mammals suggested that consumption of sockeye was negligible for most marine mammal species...

And Dr. Ford, I'd ask when characterizing consumption of sockeye as "negligible", are you comparing that to other salmon species or are you talking about fish species generally?
DR. FORD: I haven't read this for some time. It would be, I think, overall for marine mammals with the exception of the species that we have highlighted as potentially having a significant -- of sockeye having a significant role in their diet, it would be negligible for the majority of marine mammal species with the *caveat* that for many of these species their diet is relatively poorly known.
Q We've seen that your conclusion in your five-page summary referenced really only two species as potentially significant, the Steller sea lion and the Pacific white-sided dolphin. And here the PSC report, in the middle of this same paragraph, says that:

> However, four other predators - the Steller sea lion, Pacific white-sided dolphin, harbour seal, and humpback whale - were considered to have the greatest potential for

contributing to declines of Fraser sockeye...

Do you agree with that?

DR. FORD: I do not agree with that, no. The two species, Steller sea lion and Pacific white-sided dolphin, I did highlight as being potential sockeye predators that may have potentially had a role in the long-term declines of Fraser River sockeye but harbour seals and humpback whales were not included in that conclusion. And I don't believe that they have a great potential for contributing to declines of Fraser sockeye.

Q And indeed humpback whales weren't noted at all in your presentation?

DR. FORD: That's correct. They did come up in the discussion after my presentation because of new information from studies in southeastern Alaska that had indicated that certain individual humpbacks have been targeting out-migrating or smolts released from hatcheries and may have an impact but there's no evidence that humpbacks naturally feed on any salmonids species.

Q And maybe this is a good opportunity to explain to the Commissioner and the participants the concept of depredation. Is that what is being witnessed by people observing the humpback whales in southeast Alaska?

DR. FORD: Depredation as a process is often used in the context of wildlife taking food from active fishing operations. Depredation by whales can include removing fish from long-line fishing activities and so on. So that would be depredation of an artificially high concentration of smolts presumably coinciding with the release from a hatchery.

Q Okay. I see your hand, Dr. Trites. But Mr. Olesiuk, if you could look at the final paragraph here because there's a sentence I'd like you to comment on. It's the sentence that begins:

> Pacific salmonids (all species) account for a significant portion of the diet of Steller sea lions, exceeding 20% of their diet in summer and fall.

Do you agree with that statement?

MR. OLESIUK: No, I don't. And I think that was a slight misinterpretation from a slide that was

included in John's presentation showing the frequency of occurrence. And that indicated that a greater than 20 percent of Steller sea lions fed on salmon on a regular basis but that doesn't mean that it represented 20 percent of their diet because they were also feeding on other prey at the same time. We did not have actually diet estimates for Steller sea lions at the time this presentation was made and this summary written. We've since got improved estimates that I think are more reliable.

Q And we'll definitely come to those other estimates.

MR. OLESIUK: Yeah. And if I could just go back to the preceding paragraph that reads here:

> ...suggested that consumption of sockeye was negligible for most marine mammals...

I would not characterize that for harbour seals. I think it was insignificant in terms of the overall productivity of sockeye but I wouldn't characterize it as being negligible.

Q Thank you. And Dr. Trites, just before we leave this page, is there anything you'd like to add in particular with respect to whether humpback whales actually eat salmon at all?

DR. TRITES: Yeah, I was just going to say that this is addressed in the predation report that Dr. Christensen and I wrote and we support what Dr. Ford presented. We drew the same conclusion. That's on page 69 of our predation report, the section on humpback whales.

Q That's very helpful. Thank you. I'd just like to, in the same vein, touch on two more points really quickly on the next page at page 59. The first is the first full paragraph and this is a question for you, Dr. Ford. It says that there's an estimated 25,000 Pacific white-sided dolphins occurring in B.C. I'm wondering if that number is subject to some question.

DR. FORD: That number is based on a single survey, vessel survey, over a portion of the British Columbia coast that took place in 2004 and 2005, not by our research group. It has to be put in the context of rather broad confidence intervals around that estimate. So it is the best estimate

but the range could be from roughly half that number to perhaps higher than that number. So there's considerable uncertainty in that estimate but it is the only estimate that we have for a portion of the British Columbia coast.

MS. TESSARO: And if we could finally move to page 96 of this document, which is Table 5.1? And I'm interested in the final right-hand side column. I'm not sure if people can read that. I'm looking, for the witnesses' benefit, to the far right column under the heading, "Plausibility and Realism of Proposed Mechanism". Can people see that?

Q It seems to me, and I'd like Dr. Ford and Mr. Olesiuk's reactions, that this section, there's a number of bullets that are subject to some factual criticism. And one would be, for example:

> There are 60,000 Steller sea lions in B.C. SK are > 20% of their diet...

Is that correct, Mr. Olesiuk?

MR. OLESIUK: No, I think that 60,000 comes from an estimate from B.C. and southeast Alaska combined. We often do our assessments for those areas together because there's a lot of exchange of animals and larger breeding sites near the border. And again, as I said before, sockeye are not greater than 20 percent of the diet in summer. They are about, I believe the figure is about 12 percent during the summer. Ten percent overall of their annual diet is salmon, which a small percentage would be sockeye.

Q And a final question about this document is, it's indicated in red font in this column that:

> Sockeye were less than 5% of diet in a 1980s study...

I'm assuming, Mr. Olesiuk, that this is your study that's being referred to here. Do you know that?

MR. OLESIUK: I actually don't know where that number came from. I don't think it's an accurate figure of our inferred species composition of the salmon consumed by seals based on their distribution relative to different sockeye stocks that were being consumed. So no, I don't know where that 5

percent number comes from.
Q Overall, based on a number of what I'll characterize as errors in this document, would it bring into question for you the PSC author's conclusion that over the long term, and this I should actually flag is at page 61, at the very top of 61, that:

> Marine mammal predation is considered **possible** as an explanation for the long-term decline in productivity of Fraser sockeye.

Do you have any concerns about that conclusion, Dr. Ford or Mr. Olesiuk?
DR. FORD: Yes, I believe that this could be misinterpreted to indicate that the single explanation for the long-term decline could be attributed to marine mammal predation so I don't agree with that statement. What I think would be more reasonable is that marine mammal predation is considered possible as one of the explanations or one of the factors responsible for the long-term decline.
Q I see a head shake from Mr. Olesiuk?
MR. OLESIUK: Yeah, I would have used as possibly contributing to the long-term decline.
Q Dr. Trites, any views on this?
DR. TRITES: Yeah, I would also say certainly predation is a contributing factor.
MS. TESSARO: And I note the time, it's 11:30. It's a convenient time for me to break.
THE COMMISSIONER: Thank you.
THE REGISTRAR: The hearing will now recess for 15 minutes.

(PROCEEDINGS ADJOURNED FOR MORNING RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: Order. The hearing is now resumed.
MS. TESSARO: Mr. Commissioner, my remaining 45 minutes I'm going to basically touch on three topics in 15-minute chunks. We'll go through this at a bit of a galloping pace.
The first topic is going to be a discussion primarily with Dr. Ford about cetaceans, and in that respect it's going to be mostly about killer whales and Pacific white-sided dolphins. Secondly

we're going to have a discussion primarily with Mr. Olesiuk about pinnipeds and that will focus largely on Steller sea lions. And finally we're going to have a few policy questions, policy-oriented questions in the last 15 minutes.

EXAMINATION IN CHIEF BY MS. TESSARO, continuing:

Q So, Dr. Ford, could you briefly describe your general duties and activities as the Head of the Cetacean Research Program?

DR. FORD: My research activities, sorry?

Q Your employment duties, your research activities, the panoply.

DR. FORD: Right. I am Program Head for the Cetacean Research Program and our mandate is to undertake studies on the conservation status of threatened and endangered cetacean, whale, dolphin and porpoise species that are listed under the ***Species at Risk Act***. And this involves a wide range of studies of their distribution, abundance, feeding ecology, and these kinds of questions.

Q So to be clear, the only species that your program is researching are species listed under ***SARA***?

DR. FORD: The great majority of our funding support comes from the ***Species at Risk*** program within Fisheries and Oceans Canada. We have received some funding to address questions on non-listed species, as well, but that's a minor role of our work at present.

Q And which are the species, then, that are the more major focus of your program at present? Can you give us an idea of those ***SARA*** listed species that you most focus on?

DR. FORD: Well, the priority is based on the level of endangerment, really, for each species. And so the endangered species include the large whales, like blue whales, sei whales, North Pacific right whales. Also one of the populations of resident-type killer whales, the southern residents, are also endangered and so they have some priority. But then other species included at the threatened level include the fin whale, humpback whale, and three different populations of killer whale, the northern resident killer whale, the transient killer whale and offshore-type killer whale. These are populations that are considered distinct

by the ***Species at Risk Act*** and by COSEWIC, so they're essentially treated like separate species.

Q And could you just describe those three ecotypes or essentially different species of killer whales that you just mentioned, the transients, the offshores and the residents. Could you in particular describe the prey preferences of each of those three species or populations.

DR. FORD: Fine. The killer whale is an unusual animal. It's the ocean's apex predator, nothing preys on killer whales but it can -- potentially can prey on most organisms in the ocean. And it has an unusual -- it has evolved in an unusual way to be highly specialized on different prey types, even in waters where these different populations, the different specialized groups overlap.

So in this part of the world, in the north-eastern Pacific, we have resident killer whales, which are fish feeding specialists, primarily salmon, but also some groundfish and the occasional squid.

We have in the same waters transient type killer whales. These do not mix with the residents. They're genetically different. They're socially isolated from one another. And this population feeds almost exclusively on marine mammals, that is, seals, sea lions, dolphins, porpoises, occasionally they'll take some sea birds, but they do not feed on fish whatsoever, to our knowledge.

And the third type is a rather poorly known ecotype referred to as offshore killer whales. This is a population that seems to be quite small, perhaps 500 animals, ranges widely up and down the continental shelf. Our knowledge of its diet is rather poor, but we have recently documented them preying on large sharks, specific sleeper sharks, which are a rather deepwater shark. And because of extensive teeth wear in this particular population where the teeth are worn flat, we have hypothesized that they must prey extensively on sharks, perhaps they're shark specialists, because the abrasive nature of the skin of sharks would cause extensive tooth wear, the kind of the wear that we just don't see in the other ecotypes, the resident and transient killer whales.

Q In your opinion, do any of these three ecotypes of

killer whales have the potential to have any marked predation impacts on Fraser River sockeye, and how confident are you of your assessment of each of those three ecotypes?

DR. FORD: Well, I would start with the highest confidence that they're not, and that would be the transient killer whale. Because we have in 30 years of observing predation by this particular type of animal and by examining stomach remains of stranded whales, we have yet to see any predation on any species of fish. So I would be the most confident about that.

Offshore killer whales, we're by far less certain. It is possible they prey on some salmonids, but the extent to which, we don't know. But their distribution pattern does not seem to coincide with the migration timing and location for any salmonid, especially sockeye salmon. So I would be surprised that they feed significantly on any salmonid, in particular on sockeye.

Q Just to be clear, though, you wouldn't be able to with any confidence, quote, "rule them out"?

DR. FORD: No, we would not be able to rule them out as preying to some degree on salmonids, including sockeye.

Q Okay.

DR. FORD: And then for the resident type killer whale, we've been studying them extensively, using a combination of recovery of prey fragments from the site of kills extensively on the coast, including Haida Gwaii and the whole coast of British Columbia from Alaska to Washington State, and over the last 20 years or so we've collected over 800 samples, or samples of scales and bits of tissue from over 800 kills by these whales. And of those, only four have been -- those are salmonids, only four have been sockeye. This discovery was a surprise to us when we realized that sockeye seems to be insignificant in their diet, because the whales' occurrence in these migratory corridors for salmon heading to the Fraser River coincides quite strongly with not just sockeye, but with pink salmon and other very abundant species of salmon.

And so we long assumed that they preyed widely on different species of salmon, but it was only when we started recovering these prey

fragments and actually keying them out by unique features of their scales, which allows species identification, as well as aging, and also using more recently genetic techniques to identify tissue samples, that we realized that they are very much targeting chinook salmon, which represents almost three-quarters of all the kills that we've documented, which was a great surprise, because numerically, chinook salmon are outnumbered by over 500 fish to one in most cases, for example, compared to sockeye or pink salmon.

So we've thought a lot about why this must be so, or why they are so specialized. And it appears that the chinook's life history strategy is such that they are available to these resident killer whales in their range throughout the year, unlike other species like pink and sockeye that spend much of their lifecycle on the high seas and are essentially unavailable to these whales. And also we believe that they target chinook salmon because they're so much larger than the alternative salmonids, ranging up to, you know, 20 kilograms or more, many times the size of a single sockeye, for example. And also that they tend to have the highest fat content or energy content of all the salmonids.

But what is still surprising to us, or was, that much of our sampling and observations of predation by these killer whales takes place at the peak of the sockeye migrations, which in some years can be very extensive, in areas like Johnstone Strait, Juan de Fuca Strait, the sort of migratory corridors. Yet even though we can see sockeye in the water in great numbers schooling, when the whales made kills, invariably they have turned out to be chinook salmon. Secondarily of interest is chum salmon and coho, but pink and sockeye just do not appear to be significant prey.

Q I know you have written numerous articles on this. We're not going to tender all of them as exhibits, but I do have what I understand to be some of the most recent and perhaps most relevant work that we can simply have you identify and mark for the sake of having some documentary -- further documentary support for what you just said. And that if, Mr. Lunn, you could pull up Tab 16. This is actually not what I -- sorry, Tab 15. I apologize.

And, Dr. Ford, this would be a recent technical report or research document that you co-authored?

DR. FORD: That's correct.

Q And you're the lead author?

DR. FORD: Yes.

MS. TESSARO: And perhaps we'll just have this marked as the next exhibit. I do have a question, actually, about this document's origin for you.

THE REGISTRAR: Exhibit 786.

EXHIBIT 786: Ford et al, Chinook salmon predation by resident killer whales: seasonal and regional selectivity, stock identity of prey, and consumption rates, CSAS Research Document 2009/101

MS. TESSARO: Thank you.

Q And I understood this arose out of a request. could you describe for the Commissioner how it came to be that you wrote this paper and what it was in furtherance of.

DR. FORD: Certainly. This report was written for review by the National Marine Mammal Peer Review Committee in the fall of 2009. It was requested -- advice was requested from Fisheries and Aquaculture Management through the Marine Mammal Coordinator, Paul Cottrell, at Fisheries and Oceans. And it was to address the question of the minimum requirements of chinook salmon in order to sustain the current population levels of resident killer whales, and to provide sufficient food for population recovery to levels higher than they are today.

Q Would you -- is it fair to describe this effort as something in the nature of an integrated approach to ecosystem management, or ecosystem-based management?

DR. FORD: Yes, I believe so. The intent was to work towards integrating the requirements of resident killer whales, one of the primary predators of chinook salmon, into the management of fisheries for chinook salmon.

Q And have you seen any comparable efforts to effectively co-manage marine mammals and salmon during your time at DFO?

DR. FORD: I have not, no.

Q Have you seen any efforts to provide marine mammal science advice to sockeye fisheries managers?
DR. FORD: I have not in my ten years with DFO.
Q And have you had any other perhaps less formal interactions with fisheries managers, for example, have you ever been asked to make presentations to fisheries harvest planning committees, or things of that nature?
DR. FORD: Yes. Yes, I've made presentations to the Fisheries and Aquaculture Management Group here in Vancouver on the subject of Salmon Predation by Resident Killer Whales, and also to have had meetings with salmon managers, Jeff Grout, for example, again along with Paul Cottrell, who is our main liaison. He's in Fisheries and Aquaculture Management, but he's our main liaison between Science and Marine Mammal Science and Management.
Q And just two more questions on killer whales. The first is about transients. You've heard this morning evidence about the complexity of food webs, the fact that food webs are not two-way relationships, there's many parties involved. And I'm wondering if it has been hypothesized that transients may be having an indirect effect on Fraser river sockeye.
DR. FORD: The indirect effect of transient killer whales on Fraser River sockeye would be dependent on the extent to which the prey of transient killer whales feed on that particular resource. As we've heard, and I'm sure will in greater detail, there's some question about the extent to which the prey of transient killer whales, specifically Pacific white-sided dolphins, harbour seals, Steller sea lions, the extent to which each of these species preys on Fraser River sockeye. There's a lot of uncertainty in that regard, but indeed there is certainly the possibility for what are called top-down effects on these prey populations, where killer whales, mammal hunting killer whales, could reduce the population abundance of their prey, such as harbour seals and sea lions, et cetera, and thereby indirectly affect, lift predation pressure on the suite of species that those prey animals are indeed themselves preying on.
Q My final question is something that I forgot to do

before, which is refer you to Tab 18 of my list of documents, which is your recent paper on the diets of offshore killer whales. Could you confirm that.

DR. FORD: It is.

MS. TESSARO: And could we mark this as the next exhibit, please.

THE REGISTRAR: Exhibit 787.

EXHIBIT 787: Ford et al, Shark Predation and Tooth Wear in a Population of Northeastern Pacific Killer Whales, January 6, 2011

MS. TESSARO:

Q Just very quickly, Dr. Trites, is there anything that Dr. Ford has said in the last ten minutes that you have cause to disagree with?

DR. TRITES: No. No, I think it's just fascinating the amount of attention that's been paid, and how often -- I think a lesson out of this is that often what we think is going on, once we spend more time looking carefully, is not what's actually happening. So initial reaction might have been they should be eating lots of sockeye, but the research that Dr. Ford has shown is that that was an incorrect assumption, the data show otherwise.

Q And in contrast, and very quickly, Pacific white-sided dolphins, I understand -- is DFO doing research on Pacific white-sided dolphin's abundance, distribution, diet, anything of that nature?

DR. FORD: Our field research is funded almost entirely by the ***Species at Risk Act***, and so ostensibly is targeting these particular species when we undertake field work, either on DFO ships or in our smaller vessels, coast-wide. So we collect information on all the species of cetaceans that we encounter. So one could say these would be opportunistic observations and data collection on Pacific white-sided dolphins.

The only targeted work that we have undertaken is some three years of funding from the Strait of Georgia Ecosystem Research Initiative, which provided funds for us to examine the stomach contents of small cetaceans in the Strait of Georgia region. So this enabled us to look at the

stomach contents from stranded individuals of Dall's porpoise, harbour porpoise and Pacific white-sided dolphins to look at their diet, but that would be the only directed studies on those species.

Q Do you think that the Pacific white-sided dolphin's abundance, distribution and diet should be a priority for DFO research? And in particular with respect to its potential impacts on Fraser River sockeye?

DR. FORD: I think that there certainly is far too little known about the foraging ecology, the diet, the distribution of abundance of Pacific white-sided dolphins, as well as numerous cetaceans on the coast. There's in total 25 different cetaceans known from the waters of British Columbia and some of these are far more poorly known than even the Pacific white-sided dolphin. But they're certainly, given the documented predation on salmonids by Pacific white-sided dolphins and the recent abundance survey that indicated that there are substantial numbers of them on the British Columbia coast, that greater work would be warranted to help fill those gaps.

Q We have your presentation materials to the PSC and we have Dr. Trites' report, and I'm not going to turn to those, but do either of you view the Pacific white-sided dolphin as having a real potential, in contrast to say a hypothetical potential, a real potential to have a significant predation impact on Fraser River sockeye. And in answering that question, I'd ask you to reference what direct evidence exists of dolphin predation on sockeye.

DR. FORD: The evidence for predation on sockeye is primarily from a single study done by a University of British Columbia Masters student, Kathy Heise, from prey fragment sampling in areas on the Central Coast and Northern Vancouver Island, in the 1990s, in the mid-1990s. And she collected samples and was able to identify the prey species in, I believe, 63 incidents of predation and documented predation from these samples on sockeye, coho and pink salmon. And then also there has been -- she looked at stomach contents of some animals that were bycatch in gillnets, incidentally drowned. These had chum salmon in

their stomach. So this is the extent to which we understand really that they do prey on salmonids in addition to many other species of prey.

So they do not appear to be salmonid specialists, like a resident killer whale, for example, but they have the ability to prey on a wide size range of different species, including salmonids, right from first smolts to adult returning fish up to about 60 centimetres, which would include returning adult sockeye.

So again given their widespread occurrence in both inshore waters, offshore waters, and their substantial abundance on the coast, then they could indeed have some -- play some role in the overall cumulative predation impacts on Fraser River sockeye, and other species.

Q I'm going to ask Dr. Trites to answer that same question briefly, but I'm going to ask, Mr. Lunn, if you could pull up Tab 19, which I believe is the Kathy Heise study that the witness was referring to. And while you're doing that, what's your perspective on that question?

DR. TRITES: I agree with the comments made about diets. I think the one interesting thing with the Pacific white-sided dolphins is how their distribution appears to have shifted over the past 20 years. They were, if you look at probably -- about the only data we have available from the cetacean sightings, not sure if it's called network or database, maintained at the Vancouver Aquarium, and those are reports that mariners have given of when they've seen different species. And looking prior to, what, about 2000, they were commonly found on the offshore waters, and the first time, for example, in the Strait of Georgia, the first report in that database is 1994, and then later 1999. but in the last ten years they've been seen every single year, and they started first more in seasonal, spring and fall, then filling in the summer and over the past 12 months we now find them here year around.

And so that's been a big change in the distribution, and it seems to be coast-wide that they're now more in the inside waters. Whether that has an impact on salmonids, I think time will tell.

Q And, Dr. Ford, is the article that's -- or the

publication that's on the screen the Heise study that you were referring to?

DR. FORD: Yes, it is.

MS. TESSARO: Could I have that marked as the next exhibit, please.

THE REGISTRAR: Exhibit 788.

EXHIBIT 788: Heise, Diet and Feeding Behaviour of Pacific White-Sided Dolphins (*Lagenorhynchus obliquidens*) as Revealed Through the Collection of Prey Fragments and Stomach Content Analyses, 1997

MS. TESSARO:

Q And if we could just quickly turn to page 3 of this paper -- or, sorry, PDF page 3, and in the top corner there's a table. Tell me if I've interpreted this right, Dr. Ford. When I look at sockeye salmon, I see four samples. And you've told us already that resident killer whales, you found only four samples of sockeye in their diet. I'm wondering if I've understood this correctly, why only four instances of sockeye found as Pacific white-sided dolphin prey would be translated into an assessment that they may have potentially significant predation impacts.

DR. FORD: Well, in the case of the four samples from resident killer whales, this was in a much larger sample of over 800 kills collected extensively on the coast. I think what makes this more compelling is that it's a small sample size of only 63 kills, if you total up that column with a number there, and so the four of 63 is significant, I believe. And also you can see there's greater number of pink salmon which are 11 in this case, 11 of 63 samples, several of those fish were rather large. They were adult size, and would put them in the same sort of range of potential prey as sockeye salmon.

So I think what's important to keep in mind, looking at the diet of these animals, is they're very likely opportunistic predators, unlike the resident killer whale, which seemed to be highly specialized and ignore alternative prey species, even when they're in great abundance like sockeye salmon.

Far more likely is that Pacific white-sided

dolphins prey opportunistically on whatever species is the highest availability and is most profitable for them at the time and location that they are found, or that they're present. And so potentially, during the migratory phase, the great pulsive abundance of sockeye salmon when they're moving through the habitat of these dolphins, I would imagine that they're very likely that the sockeye would play a much more important role in their diet at that time and location, so...

Q And one very narrow question for you, Dr. Trites, unless there's something --

DR. TRITES: Can I just comment on that. I think it's important to keep in mind that not all species of salmon are likely to be equally accessible or vulnerable. The species have evolved different strategies to avoid being preyed upon. Some are tight schools and faster, some may be more loose, some like chinook may be more single, and it probably takes a different strategy to capture the different species. So we shouldn't just assume that they're all equally vulnerable.

Q I'm wondering if your current graduate students have found any sockeye salmon in their recent fieldwork.

DR. TRITES: No.

Q Thanks. One very quick question about the Dall's porpoise for the two of you before we turn to pinnipeds. And the question is, given their comparable abundance to Pacific white-sided dolphins numerically, and given the very small sample size of only 13 stomachs, why is it that - tell me if I'm wrong again - you would rule out Dall's porpoise while not ruling out Pacific white-sided dolphin.

DR. TRITES: The abundance, the only abundance estimate that we have is from that same study that I referred to earlier that led to the abundance estimate for Pacific white-sided dolphin of 25,000, and I believe that their estimate for Dall's porpoise was substantially smaller, perhaps around 5,000 animals coast-wide, and they are distributed widely and in small groups. And in Georgia Strait we've long wondered whether they may target out-migrating smolts, for example, because the kind of prey that Dall's porpoise focus on are small fish. There's no evidence that

they take any fish as large as a returning adult. So for Dall's porpoise it would really be predation on the smolt phase, out-migrating smolts that could be of any potential significance. However, based on the records in the cetacean sightings network and our own observations, we do not see any influx of Dall's porpoise into areas to coincide with the out-migration of sockeye smolts from the Fraser River. There doesn't seem to be any seasonal increase that would lead to any significant mortality. And the stomach samples that we've been able to examine from stranded animals in the Strait of Georgia area have failed to reveal any salmonids. Their prey is dominated by herring and other small schooling fish, but not salmonids.

Q And that's 13 samples.

DR. FORD: Pardon me?

Q How many samples of --

DR. FORD: Yeah, I believe it was 13. It's not a large dataset, but it's what we have to work with.

Q Right. I'm sorry to rush along. I'm going to rush along here. Final question on whales is, Dr. Ford, did you have any substantive disagreements with the Project 8 report submitted by Dr. Trites and Dr. Christensen?

DR. FORD: My only substantive comment would be that I think that the Pacific white-sided dolphin perhaps potentially has a larger role in the suite of predators that may have over the last 20 years been impacting Fraser River sockeye and other sockeye runs. So and that because of that potential, I think that further research should -- on this particular species, diet, distribution, abundance, should be included in the list of recommendations from that (indiscernible - overlapping speakers).

Q Thanks. You've been waiting very patiently, Mr. Olesiuk. I'll ask you the same question. Do you have any substantive disagreements with the Project 8 report?

MR. OLESIUK: I agreed with the authors that pinnipeds and marine mammals were very unlikely to be responsible for, or played a significant role in the anomalously low returns in 2009. As for the general decline in productivity of Fraser River sockeye, I thought that Steller sea lions should

have been on their list as a species that warrants more attention.

Q I understand that you have also provided a table where you've identified what you would characterize as some data errors, is that...

MR. OLESIUK: Yeah, in going through the report, I paid particular attention to the pinniped section. That's my specialty, and there were quite a few inaccuracies and omissions, and I felt compelled to flag those just to set the record straight. I provided a table, and I hope that by doing so, we can move onto the more substantive issues dealt with in that report.

MS. TESSARO: Let's do that, but let's mark that as the next exhibit. That would be Tab 7 of the Commission's list.

THE REGISTRAR: Exhibit 789.

EXHIBIT 789: Olesiuk, Comments on Pinniped Information in Cohen Predator Report

MS. TESSARO:

Q Before we move on, this is a question for both Dr. Trites and Mr. Olesiuk. For both of you, do any of these proposed data corrections in Exhibit 789 have the effect of changing the report's overall assessment of the potential impacts of individual marine mammal species on Fraser River sockeye? Are these corrections, or do they amend potentially the report's conclusions?

MR. OLESIUK: No, they're corrections for the most part. The only again substantive conclusion that I didn't see eye to eye with were the Steller sea lions and their potential role in the long-term decline in productivity of sockeye. And in fairness to the authors of the report, we recently completed a study, and there's new information that's available on the importance of salmon and sockeye in the diet of Steller sea lions that wasn't available when the authors wrote the report.

Q Was that a frustration in writing the report of the availability of information on pinnipeds?

DR. TRITES: It is, and we were aware of it because I'm also a co-author on that report. But at the same time it wasn't yet in a form that could be cited. So there were certainly some documents that became

official, and we did not have access to it at the time.

Q And happily we do have them now, and I'm going to ask a couple of questions about seals and then turn to that Steller sea lion issue. One important question I think is in terms of abundance. Can you explain to the Commissioner the population trends in harbour seals over the last 25 years.

MR. OLESIUK: Okay. Well, over the last -- actually starting in about 1970 when seals were protected, we saw quite a dramatic increase of populations were growing at 12 percent, at which rate they double in size every six or seven years, and that growth continued to the '70s, '80s, and into the early '90s, resulting in a tenfold increase in harbour seal abundance. Since the mid/late-1990s the population appears to have stabilized.

Now, you need to put that in perspective of the longer-term historic trends. Harbour seals were depleted by commercial harvest and predator control programs, from the late 1800s all the way through to the mid-1960s, and what we saw in the '70s and '80s, those dramatic increases were really the recovery of populations, and now the population appears to have stabilized at is roughly the same levels that we saw in the late 1800s before there were any large scale kills.

Q Moving from abundance to diet studies, we've already heard that you did a number of diet studies in the Strait of Georgia in the 1980s. I'm wondering if you could please indicate the results of those studies with respect to salmon, percentage of salmon in harbour seals' diets, the percentage of sockeye to the extent that's known, and also the age of salmon that appear to be eaten by harbour seals.

MR. OLESIUK: Yeah. The diet study indicated that the main prey of harbour seals were hake and herring. Salmon constituted a small part of the overall diet, about four percent. Seals mainly consumed adult-size fish, and predation was concentrated in estuaries and river mouths in the lower parts of rivers where seals congregated when salmon were returning to spawn. And in those areas, salmon could be a very important part of the diet. But since there's relatively a small proportion of the

overall population in those estuaries and river mouths, and they are only there for a portion of the year, when you average it out, that's why salmon are overall a small part of the diet.

As for species composition, this was based on scat analysis, at that time we had no means of accurately determining species of salmon. The genetic techniques had not yet been developed. So we were unable to directly assess species composition. However, if you look at where and when seals were preying on salmon, relative to what the availability of various species of salmon would have been in those areas and at those times, they're feeding on all five species of Pacific salmon, and I imagine that sockeye is a relatively large fraction of what they take, especially in areas like the Fraser River.

Q But you don't have data, that's a speculation on that last point, that Fraser River -- that sockeye you think may be a large portion, that work hasn't been done to assess that. You don't have that data.

MR. OLESIUK: No, we don't have that data, and I don't think it actually will affect our general conclusion that harbour seals were not a significant factor. Even if they were feeding on mainly sockeye, they still would not have consumed enough to have a significant impact.

Q That's helpful clarification. The diet research that you did is from the, as I understand it, mid-1980s. It's for the Strait of Georgia. What updates do you need on that research, both temporally and geographically. What should be done to update it?

MR. OLESIUK: Well, you have to understand that scat analysis, especially for species like harbour seal, is a fairly crude tool. I think it's useful for looking at broad scale patterns and identifying key prey species. But it lacks, it's difficult to collect large numbers of seal scats, unlike sea lion scats, and even if you were to apply genetic analysis I think it would just give you a general crude overview of the diet.

What we have done after that general diet studies in the '90s, we spent considerable effort in particular estuaries where we had identified salmon to be a major part of the diet, going in

there, doing vary detailed observations, tagging animals and tracking their movements, doing surface observations, looking at where and when they were feeding on salmon, collecting scales to identify species composition. So that is a more, I think, useful tool once you identify sort of areas that you want to focus detailed studies.

Q Has there been a detailed study in the Fraser River estuary?

MR. OLESIUK: No.

MS. TESSARO: I apologize, Mr. Commissioner, I'm about 15 minutes behind my estimate, so we'll just make use of the next six minutes and hopefully I can wrap up after the break.

Q In the same vein of looking at abundance and diet, and turning to Steller sea lions, what's your best abundance estimate, Mr. Olesiuk, for Steller sea lions currently in British Columbian waters?

MR. OLESIUK: It varies from about 32,000 during the summer breeding season, to 48,000 during the winter non-breeding season.

Q And are you able to -- I'll move on from that question, actually, your answer is really clear. You have recently, with your co-author, and other co-authors released an in-press on Stellar sea lion diet.

MR. OLESIUK: Correct.

Q And I believe that's at Tab 21 of our materials. Is this the report that you've been working on recently?

MR. OLESIUK: It is.

Q And is it finalized? Will it go through any more substantive changes?

MR. OLESIUK: It has gone through our internal peer review process, and there were some minor revisions will be made and have been made, none of which will affect the substantive conclusions.

MS. TESSARO: Could we please have this marked as the next exhibit.

THE REGISTRAR: Exhibit number 790.

EXHIBIT 790: Olesiuk et al, Prey requirements and salmon consumption by Steller Sea Lions (*Eumetopias jubatus*) in southern British Columbia and Washington State, CSAS Research Document, Draft

MS. TESSARO:
Q Perhaps, Mr. Olesiuk, rather than go through the report page-by-page, I know this is a significant amount of work that you've put into this, and I don't want to diminish that, but perhaps you could just give us an overall description of the approach you took on the report and the main components of the study, the things that you looked at. What does this study look at?
MR. OLESIUK: Okay. Well, this was really the first major study to look at the importance of salmon in the diet of Steller sea lions. The study or the project was funded by the Pacific Salmon Commission through their Southern Endowment Fund.
Our study area was southern B.C., and Washington State, so from Cape Caution on the Central Coast to the Columbia River. And what we did is we integrated information on our abundance estimates for Steller sea lions, their seasonal distribution, their activity patterns, based on satellite telemetry, and diet analysis based on scat collections and DNA analysis of the species of salmon, and integrated all that into coming up with estimates of the importance of salmon in the overall diet.
Q And what is that estimate, what were your results?
MR. OLESIUK: It's just under 11 percent of the overall diet is made up of salmon.
Q And how confident are you in those results. Is that with absolute certainty, is that a...
MR. OLESIUK: It's a scientifically defensible estimate. There are fairly wide CVs, coefficients of variation, associated with the estimate, probably on the order of about 35 percent. But considering all of the components that go into that estimate and the sources, cumulative sources of variability, it is, I think, a relatively defensible estimate.
Q And what is the estimate of the amount of sockeye within that 11 percent?
MR. OLESIUK: Well, we've only been able to so far analyze one-third of the scat samples that contain salmon. And so based on those preliminary results, again Steller sea lions are generalists. They feed on all five species of Pacific salmon, as well as steelhead, and sockeye made up at least five percent of the salmon that have been

identified so far. And there were another, some of the samples were ambiguous. We can only, based on the DNA results to date, narrow it down to one of two species of salmon, and a lot of those could have been either pink or sockeye. And so there was another 15 percent that were either pink or sockeye.

So until we resolve those ambiguities, and I think that we will with further testing, but right now it's five to 20 percent potentially of the salmon identified were sockeye.

Q And why were you only able to analyze one-third of the samples?

MR. OLESIUK: Just due to the amount of funding that was available. We actually, for this study, obtained far more scat samples that we had originally planned. All kinds of other researchers, including Andrew Trites, contributed samples that they had collected. That was great and provided bigger sample sizes, but we only had the funding to do a third of the DNA analysis.

Q And have you submitted any application to DFO requesting funding to assess the remaining two-thirds of those samples?

MR. OLESIUK: I have.

Q And what's been the result of that funding application?

MR. OLESIUK: The proposal has been well-received, but so far we haven't identified a source of funding. This year, we're just entering a new fiscal year, there's some uncertainty with the political situation, but our request for funding will be considered amongst division priorities and fiscal restraint.

THE COMMISSIONER: Ms. Tessaro, I note the time.

MS. TESSARO: Yes. And thanks to Mr. Olesiuk's succinctness, I will be able to finish in 15 minutes.

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

(PROCEEDINGS ADJOURNED FOR NOON RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: The hearing is now resumed.

EXAMINATION IN CHIEF BY MS. TESSARO, continuing:

Q Panellists, I just have a few more fairly scattergun questions around a variety of what I'll characterize as management issues for you. The first question is for Mr. Olesiuk. We heard this morning about resident killer whales and chinook interactions increasingly being managed in this more integrated way and I'm wondering if there are any comparable examples of that for that more integrated management for pinnipeds and salmon?

MR. OLESIUK: Well, I think, in general, that pinniped populations have recovered and their consumption of salmon has increased and especially for a species like Steller sea lion, who is now taking as much salmon as a commercial fishery, that they need to be factored into these management plans. I don't think it's exactly the same as killer whales. Killer whales are different in that salmon are the mainstay, the principal prey. There's an indication that their productivity is directly correlated with salmon abundance.

For pinnipeds, their diets tend to be more diverse. Salmon tends to be a relatively small part of their diet, and I don't think salmon are what dictate pinniped population levels.

Q Just to follow up on the one thing you just said, you said that Steller sea lions are taking the equivalent of the commercial fishery. Could you be a little bit more specific in which commercial fishery you're talking about and --

MR. OLESIUK: Yeah, that was based on the study that we were discussing this morning, and we estimated total consumption of salmon by Steller sea lions in our study area, from Cape Caution to Columbia River, was about 17,000 tonnes and the commercial fishery in that same area, the total salmon commercial fishery takes about 18,000 tonnes a year.

Q Thanks for that. Turning to fisheries management for a moment, and I'll ask you this, as well, Mr. Olesiuk, are you aware of harbour seals having any adverse impact on Fraser River sockeye test fisheries?

MR. OLESIUK: They're certainly a nuisance. They remove sockeye from the test gillnets. It's a problem we've seen in other systems, like the

Skeena River, and I think it interferes with their ability to enumerate the number of salmon that are moving upriver, but it's sort of a -- it's interference and nuisance, rather than sort of a conservation concern.

Q And I'll ask Dr. Trites this and then you, what's the solution? Do you, as a marine mammal scientist, have any insight into potential mitigation measures or solutions to help mitigate the impact on Fraser River test fisheries of depredation by seals?

DR. TRITES: Well, the depredation problem has been an issue because, you know, the problem comes down to that if a seal is removing fish out of the nets and it's not documented, you're assuming, therefore, there was fewer fish coming back into the river. And so that has a bearing in terms of setting quotas and catch levels.

I think different people try different things trying to reduce that effect, and the most recent one that I'm aware of was trying to electrify part of the netting. And the authors of a paper which was published a couple of years, of that electrifying that portion of the net had a big effect and they concluded from that that the seals had been removing a lot of fish from the test fishery nets. So I guess, you know, long-term, it's going to be a question of trying to calibrate that and maybe make some corrections for it, but I'm not aware that that mind of research is continuing, but I know it's been an issue for the test fisheries and probably will be for a long time to come.

Q Mr. Olesiuk, are you aware if those efforts with the electrified net are ongoing or --

MR. OLESIUK: Yeah, and I think that they were pleased with the effect of the electrifying net and they had moved to sort of implementation as a routine part of their test fishery. And they have applied for licences to continue that work, and I think those licences have been issued.

Q Are there any concerns, conservation concerns for species other than the seals from using electrified nets? From the perspective of thinking through Fraser River sockeye sustainability, are there concerns about using electrified fishing equipment in the Fraser River?

MR. OLESIUK: Well, not in the way it's being used. The way these electrical fields work is they dissipate very rapidly from the source, and that's actually what limits their effectiveness. So they may be effective for, you know, protecting a point source like a gillnet, but when we experimented with electrified barriers in rivers to prevent seals from moving upriver, they were not effective just because the electrical gradient dissipated so rapidly that it was so strong that at the bottom, where the electrodes were, it would prevent the passage of fish, and so near the surface of the seals' pass, unaffected.

Q And maybe this is a good segue into other mitigation measures. It's a bit of a euphemism, perhaps, but Dr. Ford, could you comment on whether predator control programs for marine mammals are an effective and appropriate tool for promoting salmon sustainability?

DR. FORD: That was certainly in the history of our society's management of marine mammals. This included culling programs in the past. These ended about 40 years ago on this coast and as a result, marine mammal populations have come back. I think now we're just in the process, as these populations are re-establishing their historical abundance, of evaluating the role of marine mammals and their predation in the management of fisheries. I believe that as we move more and more towards ecosystem-based management, those kinds of historical techniques for management are becoming less and less appropriate.

Q Does anyone have a different view than that on this panel?

DR. TRITES: Maybe only to point out that, you know, culling has been attempted not just in British Columbia, in Alaska, it's been used in the Baltic Sea, in the Adriatic Sea, in South Africa, and one of the problems is people have a simple perception, thinking that, again, it's just this two-way relationship, remove that predator and the prey will respond. But I'm not aware of any that have tried to evaluate that at the same time. When people looked at it retrospectively, you know, for example, if you look at River's Inlet where two sea lion rookeries were wiped out, they're extinct, and that was to ensure greater

catches of sockeye salmon at River's Inlet. To my knowledge, those catches never increased and the sockeye are severely low now. So any case I know of where culling was attempted, there's no evidence that it ever had the desired effect.

Q Mr. Olesiuk, you heard this morning about the theory that seals might have a "net positive impact" on sockeye salmon, and my question is if seals are removed, could one potentially increase predation on sockeye by fish like hake? What do you think of that theory?

MR. OLESIUK: I think that I agree with the concept that these are complex food webs and that removing one predator may have unpredictable effects. As part of the Strait of Georgia Ecosystem Research Initiative, we've been looking at those effects in the Strait of Georgia and how the recovery of seals has interplayed with the hake and herring, they were two principal prey. And it appears that seals have displaced hake now as a major fish predator in the Strait of Georgia and we see less predation by hake on small, juvenile herring, and even juvenile hake, but I don't think that hake in the Strait of Georgia are main predators on the salmon or sockeye.

Q And I think we're going to hear more about that topic in tomorrow's panel so I'm going to move along. A few questions on funding to conclude.

MS. TESSARO: If I could ask that Tab 22 of our documents be pulled up?

Q We've already heard from Dr. Ford about your source of funding primarily through the SARA program. Mr. Olesiuk, I'm wondering how many staff are covered, permanent staff are covered by your budget?

MR. OLESIUK: That would be one, myself.

Q And that would be you. So how many staff work in DFO Pacific Region on pinnipeds?

MR. OLESIUK: Specifically, on pinnipeds, would be myself, in Science. We have a marine mammal coordinator who is a pinniped expert that works on management issues.

Q Right. I'm going to turn to your budget in one moment, but I have a document here on the screen, I'm just going to ask you, Dr. Ford, to identify what this is.

DR. FORD: This is a summary of the annual budgets in my group's -- the Cetaceans Research Program, which includes sea otters, but not pinnipeds, over the last six years.
MS. TESSARO: Could I have this be marked as the next exhibit, please?
THE REGISTRAR: Exhibit 791.

EXHIBIT 791: Funding Summary - ***SARA*** Cetacean Program

MS. TESSARO: And Mr. Lunn, if we could turn to the second part of Tab 22?
Q Likewise, Mr. Olesiuk, are you able to identify this document?
MR. OLESIUK: I am.
Q And could you describe what it is?
MR. OLESIUK: Well, this is part of a spreadsheet that I've provided outlining the pinniped funding to my program over the last five years.
Q And the second page, is that the rest of the spreadsheet?
MR. OLESIUK: Yes, I presume so. I haven't seen the second page.
MS. TESSARO: If we could just turn to page 2?
Q Is that --
MR. OLESIUK: Yes.
Q That's the remainder of the spreadsheet?
MR. OLESIUK: Yes.
Q And just so we're clear, this budget reflects only the work of one pinniped scientist?
MR. OLESIUK: Correct.
Q I'd like to get one more document on the record regarding the cost of pinniped research, and that is Tab 23.
MS. TESSARO: Oh, I'm sorry, I should mark this document as the next exhibit.
THE REGISTRAR: Exhibit 792.

EXHIBIT 792: Five-year funding summary for pinniped research at DFO Pacific

MS. TESSARO:
Q Mr. Olesiuk, this appears to be an email that you sent to a DFO official. Can you describe what this email addresses?
MR. OLESIUK: This was an email that we were asked, in

conjunction with sort of the Cohen Inquiry, to put together proposals, sort of a low level, moderate level and high level of funding that could address some of the hypotheses and one of them being predators, and this addresses pinniped predation on Fraser River sockeye and the types of research that we would propose to do.

Q And that type of research, is that what is found at page 2 of this documents and onwards?

MR. OLESIUK: Yes.

Q So this was a document you authored?

MR. OLESIUK: Yes.

Q And you're providing it to DFO managers as an estimate of the cost of the research that would be required to test those Fraser River sockeye hypotheses?

MR. OLESIUK: Correct. It was prepared for Science managers.

Q Thanks.

MS. TESSARO: Could we please mark this as the next exhibit?

THE REGISTRAR: Exhibit 793.

EXHIBIT 793: Fraser River Sockeye Proposal - Pinniped Predation

MS. TESSARO:

Q And my final question is for both Mr. Olesiuk and Dr. Ford, and we've heard from both of you about the need to study two particular species if the concern is Fraser River sockeye. From Mr. Olesiuk, we heard about the importance of Steller sea lions, and from Dr. Ford, I believe you indicated the need to study Pacific white-sided dolphins. My question is is your recommendation to study those species, does that potentially, from your perspective as marine mammal scientists at DFO, does that potentially detract from more pressing marine mammal research priorities? Is that objectively a priority or is it only a priority in the context of Fraser River sockeye sustainability? Does that question make sense?

DR. FORD: In terms of the main mandate of our group, which is to better understand and promote the recovery of species listed under the ***Species At Risk Act***, those studies would not be deemed a priority, however, in terms of the role of Pacific

white-sided dolphins in the coastal marine ecosystem and their role, their abundance, their predation pressure on not just Fraser River sockeye, but other species, I would place them at a high priority in terms of the need to improve our understanding of that particular species.

Q Thank you. And Mr. Olesiuk?

MR. OLESIUK: As I mentioned, there are actually several levels of research. For seals, here, the minimum research effort is very focussed specifically on looking at seal predation on Fraser River sockeye, and we would obtain information on that and basically that and nothing else. If you look, though, at some of the moderate and the extensive research efforts, they would actually provide broader information on overall diets of seals, in addition to information on Fraser River sockeye.

MS. TESSARO: I have stretched my 15 minutes to 18 minutes and so I'll leave for Canada to ask the key questions of you that I have undoubtedly missed, but thank you very much for your testimony. That's all my questions.

MR. TIMBERG: For the record, Tim Timberg for Canada, and with me is my colleague, Geneva Grande-McNeil. I've estimated, approximately, one hour, Mr. Commissioner, and I've got a series of questions for the panel, and I'll identify you as I go through. The first question is a housekeeping matter, Mr. Registrar, and I'm wondering if you could pull up from Canada's list of documents, Tab 2?

CROSS-EXAMINATION BY MR. TIMBERG:

Q And this document is a collection from the Pacific Salmon Commission meeting workshop last June 2010, and this is an appendix that forms part of the record.

MR. TIMBERG: And so I've spoken to Commission counsel and we're suggesting that this be marked as Exhibit 573A so that it will be linked to the other document, 573.

Q And I'd just ask, perhaps, Dr. Ford, if he could identify this document for us.

DR. FORD: This would be an appendix of the report that resulted from the Pacific Salmon Commission-

sponsored workshop from June 2010, Peterman et al.
Q Okay. Thank you.
THE REGISTRAR: So it will be so marked as Exhibit 573A.
MR. TIMBERG: Thank you.

EXHIBIT 573A: Appendix C of Pacific Salmon Commission workshop report June 2010, Peterman et al

MR. TIMBERG: And if we could have Exhibit 73 brought up, please?
Q And Dr. Ford, this morning in examination from Commission counsel, you were brought to a section of this report and you were asked some questions about the content of that report. So my question is did you have an opportunity to review this report before it was finalized?
DR. FORD: No, I did not.
Q And who are the authors of this report?
DR. FORD: I believe the authors were a panel of experts that is listed on the title page, here, but specifically what each person's role was in the production of the report, I don't know, but I believe this was the group that synthesized the various presentations at this workshop over the three days and resulted in the conclusions that were discussed this morning.
MR. TIMBERG: Okay. Thank you. And Mr. Registrar, if we could then have Canada's list of documents at Tab 13? Oh, it's Commission's list of documents, Tab 13. I apologize.
Q And so Dr. Ford, this is the paper that you presented at the Pacific Salmon Commission workshop in 2010?
DR. FORD: It is.
MR. TIMBERG: And if this could be marked as the next exhibit.
THE REGISTRAR: Exhibit --
MS. TESSARO: I believe it's been marked as an exhibit already. No?
MR. TIMBERG: No. Was it? You raised it, but you didn't get it marked this morning.
THE REGISTRAR: It will be Exhibit 794.

EXHIBIT 794: Hypothesis: Predation by marine mammals is an important contributor to the Fraser Sockeye situation (presented at Pacific Salmon Commission workshop 2010)

MR. TIMBERG:
Q So for the assistance of the Commissioner, could you perhaps just provide a bit of an overview of your understanding of why that 2010 workshop on the causes of decline of Fraser River sockeye salmon was held?
DR. FORD: It was a workshop which brought together experts, technical specialists in various different fields to explore and evaluate the various different potential factors that could be implicated in causing or contributing to the decline of Fraser River sockeye, both in the long term and in the event in the 2009. And there were a number of hypotheses that were addressed, including such things as oceanographic conditions and their influence, contaminant levels, pathogens, harmful algal toxic blooms and predation was one of these hypotheses.
Q All right. And so this is your paper, here. And I understand that when you made your presentation, you discussed seven marine mammals of 31 species that are known to exist in British Columbia; is that a fair summary?
DR. FORD: Correct.
Q And can you explain for the Commissioner why you focussed on seven marine mammals?
DR. FORD: Well, these seven species of marine mammals are those that are either known to prey on salmon or could be considered to be potentially significant salmon predators based on their spatial distribution, their relative abundance and it does not include many species of cetaceans, for example, that live in deep water oceanic habitats that feed exclusively on squid and these kinds of things. So it's really just narrowed down to the species that were known or suspected, with good reason, to potentially prey on sockeye salmon.
Q And I'm not sure if you need this exhibit to assist you, but what are the seven species that you focussed on?
DR. FORD: Well, the cetaceans were killer whales, Dall's porpoise, Pacific white-sided dolphins, and

then there were pinnipeds, the Steller sea lion, California sea lion, harbour seal and Northern fur seal. I believe those were the seven.

Q Okay. Thank you.

MR. TIMBERG: And perhaps we could just turn to page 43 of this document, here, "Conclusion."

Q And so this overall conclusion is consistent, I think, with what you commented on this morning. And perhaps you can just talk about the concerns about lack of data, and then over the page, you have a recommendation for further research needs. So this summarizes what you think would be of benefit to pursue the studies to understand these issues better?

DR. FORD: Yes. Well, the overall conclusion from a citation perspective was that the Pacific white-sided dolphin is poorly known in terms of its overall abundance, its seasonal distribution, its seasonal diet, and it was impossible to really assess its potential role in sockeye predation generally, and so that was a recommendation that should be a data gap that would warrant some attention.

And then for the Steller sea lions, certainly, it's the species, this already has been discussed --

Q Right.

DR. FORD: -- that was of the highest concern in terms of its potential role in salmonoid predation.

Q All right. Thank you. And then I understand there's been subsequent follow-up to this meeting from June of 2010 at a DFO workshop held April 14th and 15th.

MR. TIMBERG: If we could have from Canada's list of documents Tab 46, please, Mr. Registrar?

Q And Mr. Olesiuk, were you at this workshop, DFO synthesis workshop on the decline of Fraser River sockeye?

MR. OLESIUK: Yes.

Q And this is the outline?

MR. OLESIUK: Correct.

MR. TIMBERG: If we could have this marked as the next exhibit, please.

THE REGISTRAR: Exhibit 795.

EXHIBIT 795: DFO Synthesis workshop on the decline of the Fraser River Sockeye

MR. TIMBERG:
Q And just generally, can you comment on your understanding of why this workshop was held on April 14th, 15th?
MR. OLESIUK: This was the -- there had been a series of meetings and workshops and this one was to bring the people that had been considering these various hypotheses together to begin to synthesize the results.
Q All right. And was that primarily a DFO Science meeting?
MR. OLESIUK: Yes.
Q Okay.
MR. TIMBERG: And then if we could have Canada's list of document, Tab 24? And Mr. Commissioner, as an aside, we're working to get all of the materials from that workshop prepared to be brought before you at some point.
THE COMMISSIONER: Are you marking this last one?
MR. TIMBERG: Yes, I think I've marked the last agenda, but there are supportive materials --
THE COMMISSIONER: Oh, I see.
MR. TIMBERG: -- that we are seeking to bring forward.
THE COMMISSIONER: Thank you.
MR. TIMBERG:
Q And Mr. Olesiuk, could you please identify this document?
MR. OLESIUK: So this was an abbreviated version of the presentation that John had given to the PSC workshop that I gave to this April Science workshop.
MR. TIMBERG: All right. And so if we could have this marked as the next exhibit, please?
THE REGISTRAR: 796.

EXHIBIT 796: Abbreviated version of Exhibit 794

MR. TIMBERG:
Q And did this presentation analyze the same seven species as the Pacific Salmon Workshop in 2010?
MR. OLESIUK: No, it considered only four species, sort of the killer whales and harbour seals.
Q Mm-hmm?
MR. OLESIUK: And the reason we included those is that they are widely perceived to be important salmon predators and we wanted to explain why we didn't

think that they were playing a significant role in the decline of Fraser River sockeye. And then the other two were the Pacific white-sided dolphin and Steller sea lions, which we do think warrant further consideration.

Q All right. And I think we've covered that sufficiently already so I won't belabour that point.

MR. TIMBERG: If we could perhaps move to slide 27 of this document? Okay. I'm looking for slide 27.

Q Yeah, so this sheet, does that tell us what proportion of salmon that is eaten are sockeye? Is that what this tells us?

MR. OLESIUK: What it tells us is what proportion of the samples that have been analyzed to date have been identified as either being various species of salmon. And in red, there, I've indicated the ones that are sockeye or the ambiguous samples that could have been sockeye or pink.

Q Right, and this is going back to the Steller sea lions, that's correct?

MR. OLESIUK: Correct.

MR. TIMBERG: Okay. Thank you. And if we could move to slide 29.

Q And this is your conclusion with respect to the impact of Steller sea lions with respect to sockeye salmon returns?

MR. OLESIUK: Yes.

Q And if we could look at the next slide, 30, and what does this chart tell us with respect to sockeye salmon predation by marine mammals in British Columbia?

MR. OLESIUK: Well, this was a preliminary attempt to try to put things in perspective as to the relative significance and importance of various salmon predators, specifically, the four that had been addressed in this presentation. And so I have summarized the best abundance estimates we have, what the trend in abundance has been, what the approximate daily prey requirements would be, and then based on the abundance and daily prey requirements, what the total angle consumption of all prey would be by these species, and then based on the diet studies that had been done, some of them are outdated, some of them are in local areas, but what percentage of salmon were found in those studies, and then just a comment on whether

of those salmon, whether they include sockeye.
Q All right. Thank you. Now, I'd like to move onto a new theme of questioning with respect to predator culls and listed marine mammals and so Mr. Olesiuk, can you advise us whether Steller sea lions are listed under the ***Species at Risk Act***?
MR. OLESIUK: They're listed as a species of special concern.
Q And what does a species of special concern mean?
MS. TESSARO: I'm just going to observe that that is a defined term in the statute so perhaps Mr. Timberg could be clear as to whether he's eliciting that the statutory definition of species of special concern, or some kind of interpretation of that?
MR. TIMBERG:
Q No, well, the question is what does it mean for a species to be of special concern? What does it mean for it to have that status?
MR. OLESIUK: Well, okay. Well, the implications of it being listed are that we are required to develop a management plan.
Q Okay. And do you know why they've been listed?
MR. OLESIUK: Well, the general concept, and this, I think, fits pretty closely with the definition, is that a species of special concern is a species because of a combination of its biological characteristics and identified threats, is a species that could become threatened or endangered.
Q Okay. And when was the Stellers listed?
MR. OLESIUK: In 2003.
Q All right.
MR. TIMBERG: And if we could then, Mr. Registrar, have from Canada's list of documents, Tab 56?
Q And I understand this is the Steller Sea Lion Management Plan. Can you identify this?
MR. OLESIUK: This is the management plan that has recently been finalized.
Q And when was that finalized?
MR. OLESIUK: In January of 2011.
Q Okay.
MR. TIMBERG: If that could be marked as the next exhibit, please.
THE REGISTRAR: Exhibit 797.

EXHIBIT 797: ***Species at Risk Act*** - Management Plan Series - Management Plan for the Steller Sea Lion

MS. GAERTNER: Mr. Commissioner, this exhibit, I'm not going to object to it going in, but I do want to put on the record that we were provided this exhibit last night. It's about 80 pages long. I have not had a chance to review it and I am going to try to do that this evening, if there's any questions of this panel. If we're finished with this panel, I may have some follow-up in writing, but I'm not quite sure why we got this so late, since this is a January document of the Department's.

MR. TIMBERG: I'll proceed, Mr. Commissioner, with using this document. I'm not certain why we have the late notice. I apologize for that.

Q Can you tell us, Mr. Olesiuk, does the plan conclude that availability of prey species will be an issue for Stellers going forward?

MR. OLESIUK: It recognizes it as, I think, a moderate threat, potentially high.

Q All right. And perhaps we could turn to page 28 of the pdf, or page 17 of the document. And is this the table, here, that refers to that?

MR. OLESIUK: Correct.

Q So this is the top table. If you could just explain how we're to understand this table, Mr. Olesiuk?

MR. OLESIUK: Well, this went through in trying to identify what the threats are to Steller sea lions that might cause them to decline to the point where they would be considered threatened or endangered. And so for each, we had a workshop where we invited sea lion experts from various groups and countries and identified what we thought were the threats, which age classes of animals would be potentially affected, what would be affected, what the actual threat would be, the severity of the potential population impact, how certain we were about the threat, and the current level of concern. In some cases, there had been historic threats that had been since mitigated, and then the potential for mitigating of these various threats.

Q Okay. And does that plan consider harvest

management of fish species that Stellers rely upon?
MR. OLESIUK: It recognizes that there is a significant overlap in their diet and that fish abundance is likely to be a limiting factor and potential threat for Steller sea lions and that anything that affects fish abundance could affect Steller sea lions.
Q All right.
MR. TIMBERG: And if we could turn to page 36 of the document, or 47 of the pdf?
Q And item section 2.3.2. Is this the section, then, that speaks to the management of fish resources and fisheries that overlap with the diet of Steller sea lions?
MR. OLESIUK: Yes. Now, this section of the document summarizes the various actions by Science, by Management, so forth, that would be taken to either research or mitigate these threats. And the first one under "Management" is to continue to manage fishery resources and fisheries where they overlap a Steller sea lion diet.
Q Okay.
MR. OLESIUK: And they consider the dietary needs when changes are made to the fishery's management regimes.
Q Okay. So this is similar to some of the work that was raised earlier this morning about the management of killer whales and their dietary needs for chinook salmon?
MR. OLESIUK: Yes.
MR. TIMBERG: If we could then turn to page 37 of the document at page 48 of the pdf.
Q So does the plan consider future research requirements?
MR. OLESIUK: It does.
Q And that's the section there, 2.3.3?
MR. OLESIUK: Yes.
Q And perhaps you could summarize what the future research requirements are.
MR. OLESIUK: Well, there's a whole series of them. I think the one that's probably most relevant to the discussion here today is the need to obtain better information on the diet of Steller sea lions, particularly outside the breeding season, during the winter, fall, spring.
Q All right. And are there harvest controls on

Stellers in place?
MR. OLESIUK: Yes.
Q And can you explain for the Commissioner what a nuisance licence is?
MR. OLESIUK: It's a licence that's issued under the ***Marine Mammal Regulations***, or now the ***Agriculture Regulations*** that allows for the removal of nuisance seals. There's two categories, one are seals that are deemed to be a conservation threat to anadromous fish like salmon along their migration route through rivers and estuaries, and the second category are seals that are interfering with fishing operations. Fishing operations include gillnets, hatcheries, test fisheries, counting fences, so forth.
Q All right. And does a nuisance licence allow you to kill Steller sea lions?
MR. OLESIUK: No. Well, with the listing in 2003, Steller sea lions were removed so now the nuisance seal licence only covered California sea lions and harbour seals.
Q Okay. Thank you.
MR. TIMBERG: If we could then move to Exhibit 445, please. That's Canada's list of documents, Tab 17. And if we could then move to the bottom of page 20. And first, just for the assistance of the Commissioner, this is the last year's IFMP for the southern salmon area.
Q And at the bottom of page 20 of last year's IFMP, it reads that:

> DFO is currently developing ***SARA*** management plans for four marine mammals listed as special concern, offshore killer whale, harbour porpoise, grey whale and Steller sea lion. These plans, which will be posted on the ***SARA*** registry for public comment in 2010, describe species, biology, distribution and threats, as well as recommending potential actions to protect these species and mitigate impacts from key threats. Several key threats to these species include oil spills, chemical pollution, acute noise, stress, reduced prey availability, habitat degradation and fishing gear entanglement.

So my question for Mr. Olesiuk is who at DFO can

speak to whether or how the Steller sea lion management plan objectives will be taken into account in the salmon IFMP moving forward?

MR. OLESIUK: Now, that question would need to be directed to Management. We have a marine mammal coordinator, Paul Cottrell. He used to also look after ***SARA*** issues. I'm not sure what the division of those responsibilities are, but I would refer that question to managers.

Q All right. And perhaps on that note, you could just clarify your business relations between Science and Fisheries Management.

MR. OLESIUK: Well, I'm in Science Branch and our role is to give science-based advice to managers and to ensure that Science decisions are made on sound factual information. And that advice is hopefully considered by managers, along with social, political and economic factors in, ultimately, making management decisions.

Q All right. And what's the general route of how you communicate with the managers? What's the general line of communication?

MR. OLESIUK: Well, it's evolved and it varies, and, in reality, it's sort of a two-way street in that sometimes being marine mammal specialists, we may have an understanding and see a looming issue that should be addressed before the managers are aware of it. For example, the growing Steller sea lion population, we thought that, you know, we should know something about their feeding habits so we could kind of flag the issue for managers.

Q Right.

MR. OLESIUK: And then once managers began to appreciate that they are an important predator, they start asking us for science advice on more specific topics, and presumably, how the information can be incorporated into their management plans and decisions.

Q Okay. Thank you. And in your opinion, should allowances for Steller prey requirements be made in the IFMP?

MR. OLESIUK: I certainly think Steller sea lions should be included in the management plans. I'm not sure that we should be setting a quota or making allowance specifically for sea lions. Like I mentioned this morning, unlike killer whales, Steller sea lion populations, right now, are not

being -- they're not being limited by anything, they're growing exponentially.
Q Right.
MR. OLESIUK: That growth can't continue indefinitely. When they do ultimately become limited, it's likely to be prey resources, but it's unlikely to be salmon. Salmon only make up a little over 10 percent of the diet. 90 percent are other fish species and so we need a more general inclusion of sea lion factors in management plans, not the specific quota of chinook, like killer whales.
Q All right. And has predator control of marine mammals taken place in recent years?
MR. OLESIUK: The most recent control was in the Puntledge River in the late 1990s, where we removed about 45 nuisance seals.
Q Okay. So that was an isolated incident in time and place?
MR. OLESIUK: Yes.
Q What process is utilized to determine whether or not a cull should be utilized as a tool?
MR. OLESIUK: Well, in the case of the Puntledge, we had established a working group to examine factors that were impeding the recovery of summer chinook, which there was a serious conservation concern for, and we had Habitat people and Enhancement people, and chinook Managers, Enforcement people, and I was on the working group as a pinniped specialist and we collectively tried first to mitigate the impacts on pinnipeds on chinook using non-lethal measures, and ultimately, when those failed, proceeded with a cull.
Q Okay. Thank you. All right.
MR. TIMBERG: If we could turn to page 19 of the IFMP. And then here, if we could -- the paragraph in the middle of the page. Right there, yeah.
Q So in the middle of this paragraph, it states:

> Recent indicates that chinook salmon represents about 90 percent of the resident killer whale diet in the ***SARA*** ...

And I won't read the rest of this, but for Dr. Ford, then, this inclusion in the IFMP, where it talks about the northern resident, southern resident, offshore and transient killer whale populations, you'll agree that they're all listed

under ***SARA***? Or let me get that question right. I've read the wrong question, I apologize. Does this paragraph in the IFMP refer to your diet work on killer whales?

DR. FORD: Yes, it does.

Q And did you work with resource managers in the course of your killer whale diet work?

DR. FORD: Not in the course of our collection of data and analysis of the data to do with killer whale diet, but in developing Science advice for management, yes.

Q All right. And then who at DFO could elaborate on what Management actions are taken with respect "ensuring an adequate supply of prey for resident killer whales"?

DR. FORD: Being that our work has shown a strong relationship between resident killer whale survival and chinook salmon, it would be the individual responsible for management of chinook salmon, Jeff Grout, at present.

Q All right. And are there other marine mammals that should receive the same consideration in salmon planning as resident killer whales? I'd ask that question of yourself and of Mr. Olesiuk.

DR. FORD: Well, from a citation standpoint, no. I don't believe there is another species that relies to anywhere near the extent that resident killer whales do on salmon. Again, the Pacific white-sided dolphin is an animal that potentially could play a role in salmon predation and potentially, salmon declines, and also may, at certain times of the year, in certain areas, be reliant on salmon, but we don't have enough information to assess that as yet.

Q All right. And Mr. Olesiuk, are there other marine mammals that should receive the same consideration and salmon planning as resident killer whales?

MR. OLESIUK: Well, we do have issues with harbour seals and impacting some of the small depressed salmon stocks, and I think that needs to be considered in the management plan. There's a proposal to undertake a science assessment this year, and I believe that advice has been asked so that it can be incorporated into the management plan.

Q All right. Thank you. I'll move on to a new

theme, then, of science advice to fisheries managers. I think I've covered this. You've spoken generally about resource managers requesting science advice. I'm wondering if you could each give an example from your own work on such a request for science advice.

MR. FORD: Certainly. In our work on cetaceans, the best example is the request to provide estimates of the number of chinook salmon that might be needed to support the existing population abundance of resident killer whales and also as required under the ***Species at Risk Act***, to allow for recovery of the population into the future. And so this was a formal request for Science advice to provide this information. That then led to a special analysis, the report that has been marked previously.

Q Right.

MR. FORD: Which updated our understanding, and based on our field work, of the diet of resident killer whales and also described new techniques, genetic techniques that were applied to better understand which stocks the resident killer whales prey on in different areas, and at different times of the year, and also included estimates of chinook consumption rates, based on bioenergetic models. So these were put together into a report that was reviewed by DFO's National Marine Mammal Review Committee, which is primarily marine mammal specialists, an annual meeting in the fall of 2009.

Q All right. So there's an example, and Mr. Olesiuk, do you have any other examples with respect to requests for Science advice?

MR. OLESIUK: Well, our salmon consumption estimates for Steller sea lions were requested by Science, that they be peer reviewed and we did that.

Q Okay. Thank you.

MR. TIMBERG: If we could now have expert report number 8, which I guess is Exhibit 783, and if we could turn to page 13.

Q And Dr. Ford, do you agree with the criteria for determining which are important predators that's listed at the bottom of page 13, under the paragraph, "Significance of Predation"? Do you agree with that way of understanding and selecting potential predators?

DR. FORD: Yes. Yeah, those criteria seem to be the most important ones.
Q All right. And does a predator have to be increasing in abundance to have a predation effect on sockeye?
DR. FORD: Not necessarily. It could involve a shift in the prey that that species, that predator is targeting. I think that was raised this morning, as well.
Q All right. Okay. And can there be cumulative predator effects on Fraser River sockeye salmon?
DR. FORD: I would expect that there would be because there's multiple potential different predatory species on Fraser River sockeye at various stages of their lifecycle so yes, those would be cumulative.
Q All right. And Dr. Trites, does your report consider the cumulative effects of predation on Fraser River sockeye salmon?
DR. TRITES: We haven't looked at it specifically in terms of cumulative. Doing so would probably require putting together an ecosystem model, which is one of our recommendations. And only that way do we think we could truly evaluate the cumulative and indirect effects.
Q Okay. So right now, we just have the individual effects in your report?
DR. TRITES: We have the individual effects and then in our assessment, we're looking at all four combined.
Q All right.
DR. TRITES: So it isn't just relying on one. This first list, here, helps us to identify the key ones we need to look into further, but in the end, it's assessing all four together.
Q Okay.
MR. TIMBERG: If we could turn to page 67, and the second paragraph there on killer whales states:

> Chinook salmon appear to be less frequently eaten by resident-type killer whales in Alaska. Sockeye salmon have been estimated to form 12.5 percent of the overall killer whale diet in the Central Aleutians. 6.4 percent in the Eastern Aleutians and 10 percent in the Gulf of Alaska.

Q And Dr. Ford, do you agree with that assessment?
DR. FORD: Not in all respects. There is work that colleagues have been undertaking using conventional prey fragment sampling, as we have done in observations of predation that have shown that the specialization of the resident-type killer whales in Southern Alaska, so that would include the areas of Prince William Sound, Kenai Fjords and so on, where most of this work has taken place is actually very similar in that chinook are the preferred species and subsequently, you know -- or other species are less so. Their samples are fewer in number. They have about 160 predation events that they've quantified and there was only one sockeye in those samples.

The study by Worthy that's referred to there, I don't believe that that's accepted in that it uses chemical tracers taken from the skin and blubber of stranded or biopsy-sampled killer whales and uses very statistical techniques to infer diet from those samples. It uses a technique that I don't believe is widely accepted, it's not been peer-reviewed. At least that report was not peer reviewed. And others that have undertaken similar work with larger samples have shown conflicting results. And I think the key thing that's, I think, not generally accepted in the use of this technique is that it enables that level of resolution to be able to distinguish predation levels on different salmon species, for example.

Q All right. And so to summarize that, then, how would you summarize your observation with respect to chinook salmon and killer whales' diet up in the North Pacific?
DR. FORD: I would say that the evidence suggests that the population that's been studied in the Eastern part of Southern Alaska is very typical of what we see in this population here. As one goes west towards the Aleutians, there is evidence that there's a shift in the diet of fish-feeding killer whales in that region, but there's no evidence that they feed to any significant degree on sockeye salmon.
Q Okay.
MR. TIMBERG: If we could turn to page 68 of the

report? The first paragraph on white-sided dolphin reads:

> A small population of dolphins, numbering about 100 individuals took up year-round residency in the Strait of Georgia over the past 10 years, but nothing is yet known about their movements or diets.

Q Again, Dr. Ford, do you agree with that statement?

DR. FORD: I think that may overstate the degree to which we understand the abundance and site fidelity of dolphins in Georgia Strait. As Dr. Trites explained this morning, there has been a shift in distribution. Dolphins became frequently sighted in Georgia Strait in the 1990s, but there's really no evidence that -- well, there's no information on the overall abundance of these animals or whether they are actually resident in Georgia Strait throughout the year. Part of the problem in tracking this kind of information with the sightings network is over the last decade, in particular, that the sightings network has been promoted. More and more sightings have been submitted to the network and so there's a potential shift in the effort in collecting these sightings. So what may appear to be more frequently sighted dolphins may be, at least in part, attributable to an increase in sighting effort. Nonetheless, I think it's clear that white-sided dolphins are regularly found throughout the year now in Georgia Strait, and their numbers are probably in the low 100s.

MR. TIMBERG: Thank you. If we could then turn to page 71 of the report, Table 5.

Q And Dr. Trites, could you explain how you arrived at the 26 species?

DR. TRITES: Well, initially, in our original scoping, you already touched on the four criteria.

Q Right.

DR. TRITES: I think that was on page 17.

Q Yeah.

DR. TRITES: We then searched through the literature to see which of the many species that are in our ecosystems would fit these criteria and then shortened it down to those where a red flag came up, either because of a diet abundance, overlap or

some change in the specie numbers.
For many species, we don't have good estimates in terms of, you know, quantitative estimates for diet, sometimes not for abundance. In other cases, some species, particularly for marine mammals, some of them, we have much better information. So we've shaded things in here based on how strong or weak we felt the evidence was for each of these categories.
We were looking in terms of abundance since the 1980s --

Q Mm-hmm?

DR. TRITES: And out of that, we end up with, essentially, a scoring sheet here.

Q Right.

DR. TRITES: Which we then use to evaluate which ones we feel were the most important.

Q And then when you get to the final six, are you looking at all of those categories, the five columns, or are you looking at just diet?

DR. TRITES: We're trying to synthesize, in this case, all, what, four columns together.

Q All right.

DR. TRITES: So it is trying to come up with an overall qualitative assessment.

Q And having heard from Dr. Ford and Mr. Olesiuk, would you agree that their suggestion that white-sided dolphin should perhaps be included, and also their assessment with respect to Steller sea lions?

DR. TRITES: In terms of white-sided dolphin, we're still down to essentially that one sample where we found -- through the work from Kathy Heise for sockeye salmon. And so that's why we've shaded him with a grey colour, is that there's some evidence that there could be. We know that salmon does make up part of the white-sided dolphin's diet, but beyond that, I think I'd be hesitant to wave too strong a flag saying that white-sided dolphins were a significant predator of sockeye salmon. Nevertheless, it is something that needs to be filled in with more confidence. I think more puzzling, perhaps, is this arrival of the white-sided dolphins from the outer waters coming into the inside waters over the past decade. And from this sightings network, and Dr. Ford touched on some of the weaknesses of relying on citizen

scientists to provide information, but one of the interesting things in looking at the data is that the main group sciences, over the past decade, have been increasing. So just that numbers indeed have been increasing in the inside water. So that's the main number of dolphins being sighted by the individual mariners.

And the other interesting thing is that they're now here 12 months of the year, and that wasn't the case at the beginning of the decade. So there is reason to look more carefully, but keep in mind, that's just 10 years, and we're talking about a trend with sockeye salmon that goes back more than just 10 years. And there's nothing unusual in the sightings for the 2009 year return. So I think it is one to put on the watch list, but in our opinion, it did not merit as high a consideration as the other six species, although, as Dr. Christensen mentioned this morning, you know, six was not a magic number, we could have put seven or eight and made the list longer, then the white-sided dolphins would have come up on it.

Q Okay.

DR. TRITES: You had asked about Steller sea lions. I don't know if you want to go into that, or not?

Q My colleague, here, has got me a question. No. And so before we move on to Steller sea lions, I'm just wondering, Dr. Ford, if you agree with that statement?

DR. FORD: Yes, I don't disagree substantively with what Dr. Trite's explained for white-sided dolphins.

Q Okay. And then if perhaps you could just -- then your comments on Steller sea lions, whether that should be included.

DR. TRITES: Yeah, the -- I guess the big issue, the big question here is just how important is sockeye salmon in the sea lion diet. And I'm just wondering if we could go back to one of the figures that was shown earlier, and it was based on the DNA work done on Steller sea lion scats, and I've got it as document 21, and I'm not sure which binder this is, predation documents 5-23, the Marine Mammal Panel. I'm looking at page 94, figure 36.

MR. TIMBERG: Mr. Commissioner, I'm wondering if this

is an appropriate time for the afternoon break?
THE COMMISSIONER: Certainly.
MR. TIMBERG: Yeah.
THE REGISTRAR: The hearing will now recess for 15 minutes.

(PROCEEDINGS ADJOURNED FOR AFTERNOON RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: Order. The hearing is now resumed.

CROSS-EXAMINATION BY MR. TIMBERG, continuing:

Q Dr. Trites, before the break I was asking you to comment on your response to whether we should put greater emphasis on Steller sea lions with respect to Table 5. Figure 36, page 94, Table 5.
DR. TRITES: Yeah, and I think a lot of the question originally comes down to diet, how much sockeye salmon's in their diet. So I'd like to go to that figure 36 on page 94 of Tab 21. So this is the work that Mr. Olesiuk has been leading, and it's the DNA results that were shown earlier in a slightly different format, but to me what's so intriguing on here is as we go across you see that of the salmon species that were identified positively you've got sockeye there just over five percent, the least of all the species, followed there by pink, coho, chum and Chinook.
Q Isn't sockeye at 15 percent?
DR. TRITES: Sorry, the second bar is sockeye salmon?
Q Oh, I'm looking at the bar, sockeye or pink, at the --
DR. TRITES: Yeah, so I'll take you --
Q -- far right.
DR. TRITES: -- across to there, but if we just start with the ones that we know for sure what they are, you can see that sockeye is not very, what, frequently occurring --
Q Right.
DR. TRITES: -- compared to the rest. The issue comes down to this one about sockeye or pink, the ones that can't be categorized yet. More analysis, it wouldn't take very long to do, could tell us for sure, are those mostly sockeye or mostly pink. So if you deal with the positive ID, you'll see sockeye is the least preferred, which is

consistent with what you're seeing for Northern fur seals, consistent with killer whales, for example, but -- and so until we get that one bar resolved, there'll be some disagreement, perhaps, about how important they are.

If you look at off the Washington where you have the Columbia River, it's interesting that sockeye and pink occur in very low abundance. Now, there's not many pink in the Columbia to begin with, but there are a lot of sockeye, and you would think if sockeye were important to Steller sea lions, we'd be finding sockeye salmon there showing up. But it's a, what, relatively infrequent, the occurring prey specie there.

So I think that when this analysis is done we're probably going to find something consistent with the Columbia River, which would be that sockeye are not that important. If you look at overall the diet is estimated to be about just over 10 percent is salmon for Steller sea lions. If you break that down to five percent of the 10 percent it gets down to a very small percentage.

Q All right. Thank you. And Mr. Olesiuk, do you have any comment?

MR. OLESIUK: Yeah, I'm not ready to hang my hat on these particular data, yet. As Dr. Trites has pointed out, these samples need to be analyzed to sort out the ambiguities, but I think even more importantly, we need to run the other two-thirds of the samples that have been collected but not genetically analyzed at all, and we need to expand these studies. We've only looked at Steller predation in the southern part of B.C., which represents roughly half of the population. We need to extrapolate the -- extend those studies to the other, northern part of the province.

But in terms of the importance of sockeye predation, I think it's a matter of what the total consumption is and also what apportion of that total consumption is sockeye. In the case of Steller sea lions I think we have a very high consumption figure and a low proportion of sockeye, which could still result in a significant amount of sockeye being consumed.

Q Right. So the question, then, is: What does this five percent translate to in volume?

MR. OLESIUK: Okay, well, the total salmon consumption

in our study area was about 17,000 tons, which is 17 million kilograms a year. About 14, just over 14 million of those kilograms occurred in B.C. That's sort of half the Steller sea lion population in B.C. And even if five or 10 percent of 14 million kilograms of sockeye, that represents a lot of sockeye.

Q All right. Thank you. Mr. Olesiuk, can you explain what is a depensatory effect?

MR. OLESIUK: Well, generally, predation tends to be compensatory, the opposite of depensatory, and what that means is that these predators, most of them are not specialists but opportunists that will feed on whatever is locally and seasonally abundant. And so what happens if it's a good year and lots of the, you know, salmon eggs hatch and fry are abundant, predators will take a larger fraction than if, in a poor year, where there's few fry. And if the predators in the lake and river where these eggs are hatching take lots, there's left (sic) for, you know, for the predators out in the estuary. But if the predators in the lake take less, there's more left for predators in the estuary, so they tend to compensate one another and basically buffer the system.

Depensatory mortality is the opposite, and this is where you get the sort of artificial situations where there is -- the balance between predator and prey is disrupted, and most of the seal problems, the conservation issues we're dealing with are because of this imbalance, things like Puntledge River Chinook, they've been depressed to very low levels. But, in that same system, there are still healthy, large returns of pink salmon and chum salmon that attract lots of predators, and these large numbers of predators congregate in the area and remain in that area between the pink and the chum runs and feed on these low, depressed --

Q Right.

MR. OLESIUK: -- Chinook stocks, and that's where you get an artificially high level of predation. And these predators aren't -- their numbers aren't dictated by the number of Chinook returning; they're dictated by these larger run that attract them to that area. And so you get into a

situation where prey populations, the more depressed they become the higher the predation rate, and those are the situations we're dealing with, with seals.

So if this investigation were a -- commission were into some of the smaller steelhead and coho runs that are going up the Fraser with these still relatively large sockeye, I would have more concern over the impact of seals.

Q Right. So depensatory effect is there's a greater predator impact with the same number of predators if there's fewer prey; is that --

MR. OLESIUK: Yeah, it could be even fewer predators, but it's the racial predators to prey.

Q Right.

MR. OLESIUK: So you could have even moderate level predators, but with very low prey abundance you get a depensatory effect.

Q Okay. And so I think -- so you've given -- so some examples of depressed prey stocks, what are some examples, then, of depressed prey stocks impacting on predation?

MR. OLESIUK: Well, I've already mentioned Chinook in the Puntledge River. We've got, in the Strait of Georgia we've got healthy seal populations with depressed rockfish stocks, depressed lingcod stocks. On the east coast they've got increasing large grey seal populations, they've got depressed Atlantic cod stocks. And in all of these situations I don't think anybody thinks the pinnipeds are the factor that drove these prey stocks to low levels, whether it's natural, catastrophic events or habitat disease or overfishing, but once these prey populations are reduced, that's -- and you have healthy pinniped populations maintained by other prey, that's where you get these large impacts.

Q Okay. Thank you. If we could turn to page 81 of the report, it says, in the middle paragraph there:

> ...it has been postulated that harbour seals in British Columbia might have a net positive effect on the return of adult salmon by consuming species of fish that prey heavily on salmon smolts...

And Mr. Olesiuk, do you agree with that comment?
MR. OLESIUK: No. As I mentioned earlier, I think that pinnipeds do prey on other fish predators, but I'm not aware of any of the species that we've identified in seal diets in British Columbia being heavy salmon predators.
Q Okay. Thank you. If we could then turn to Canada's list of documents, Tab 23A, there's a number of web-paged documents here that we've included.
And so Dr. Ford, could you please explain what the Strait of Georgia Ecosystem Research Initiative is, and in answering that question, could you explain what this document is, also?
DR. FORD: The Strait of Georgia Ecosystem Research Initiative is one of a number of ecosystem research initiatives that were undertaken by DFO in the various different regions of the country, so these initiatives were meant to implement steps towards ecosystem-based management that was mandated by the ***Oceans Act***. And so to help that process get underway, these ecosystem research initiatives were meant to choose kind of an model study ecosystem in each of the regions and then to examine them in great detail. For Pacific Region, the Strait of Georgia was selected as the area to focus on.
Q All right. And this document, where does this document come from?
DR. FORD: That particular document's on the DFO website.
MR. TIMBERG: All right. And if we could have that marked as the next exhibit, please?
THE REGISTRAR: Exhibit 798.

EXHIBIT 798: DFO website snapshot, titled, The Strait of Georgia Ecosystem Research Initiative

MR. TIMBERG: And Mr. Registrar, if we could then turn to the next document at the same tab?
MR. LUNN: Letter B?
MR. TIMBERG: Letter B, yes. And so actually, if you could go to the next tab, D, sorry, key outcomes, yes.
Q So again, Dr. Ford, could you provide for us an overview of what some of the key outcomes were and

perhaps just a bit of the chronology of where we're at with this initiative?

DR. FORD: Okay, the initiative began in January of 2008. It involved a wide range of studies looking at different components of the Strait of Georgia ecosystem. These are just a few outlined here and key outcomes, a few of the anticipated outcomes when the project started and included development of tools for ecosystem-based management. Those would be primarily ecosystem models that can be used to better understand and predict how the ecosystem functions. And there were problems, initially, that wanted to be -- that warranted being addressed and those were specifically with coho and Chinook. This project began in 2008, it's a three-year project with one additional year of analysis and synthesis that is underway this fiscal year. But at the time that the ERI began, the sockeye situation hadn't developed to the point it did in 2009.

Q Okay.

DR. FORD: And then the third outcome was anticipated to be a better understanding of the role of apex predators, like harbour seals in food webs of Georgia Strait.

Q All right. And is there --

MS. TESSARO: I'm sorry, Mr. Timberg, to interrupt you. Without in any way intending to rush you, I just would note that we're at the 60 minutes of your estimate right now, and if you have a revised estimate that would be fine.

MR. TIMBERG: Yes, thank you. I've cut back significantly. I would like to get through this research initiative, because I think it's relevant for the ecopath modelling and the ecosystem management, that this was basically a pilot, I understand. And then I have a series of questions with respect to whether or not we need to look at the location of mortality in analyzing and understanding predator-prey relations, and then I think I would be completed. So I'm hoping to be finished in the next 10 minutes. Is that -- well, I'll do my best.

MS. TESSARO: I can't disagree with that.

MR. TIMBERG: Okay, thank you.

Q And is there a modelling component to this ERI program?

DR. FORD: Yes, there is. There's four different models that have been examined and developed as part of the ERI. One is an ocean and atmospheric forcing model, another model looking at low trophic level effects in the ecosystem, and then two models that have involved higher trophic level interactions, and one of those is Ecopath with Ecosim-type model, and another is one called Osmose that is a slightly different approach, but again looking at connections between upper trophic levels.

Q And who, at DFO, is best placed to speak to this modelling component?

DR. FORD: Probably Caihong Fu, who developed the Osmose model with other co-authors, or Ian Perry, both in science.

Q And who is Ian Perry? Okay. And if we could then move to Tab F of the same...This is a list of ongoing research projects. And did you participate, yourself, in any of this ERI-related work?

DR. FORD: Yes, I did. I was involved in two projects. One is shown here on this page, about the fifth down, diet and distribution of porpoise in the Strait of Georgia, I referred to that study earlier, looking at stomach contents to gain insight into the diet of these animals in the Strait of Georgia ecosystem. And another project that looked at the relationship between changes and abundance and habitat use patterns of mammal-hunting killer whales coinciding with the increase in harbour seal abundance in Georgia Strait over the last 30 years or so.

Q All right. And I'm going to move on, but I'm just wondering, for the assistance of the Commissioner, if you could just provide an overview of what was the intent of this ERI project and what you know -- obviously what you know about what's going to happen in the future?

DR. FORD: Well, I think it was really to get a more complete understanding of how the ecosystem works, temporal variability in the ecosystem, spatial variability, and how energy flows between trophic levels in the food web. Those were some of the key goals. Also to better understand resilience of the ecosystem, how it's vulnerable to perturbations through fisheries or other factors

and how resilient the ecosystem is.

And then, again, to specifically develop models that can be used as tools down the road to actually better put the Strait of Georgia into an ecosystem management context and to apply those tools to management of other parts of the ecosystem outside of the Georgia Strait.

MR. TIMBERG: All right. Thank you. And just for clarity, I'm going to suggest that that exhibit we just entered would be for all of the tabs, because that, as I understand it, the first page is from the website and then the documents that follow are the links that if you clicked on it you would go to that. So I'm wondering if that's permissible?

MS. TESSARO: Barring any objections from participants, we don't have a concern with that approach.

THE COMMISSIONER: So which one are you marking, then, sorry?

MR. TIMBERG: Ms. Gaertner has suggested that they perhaps be marked subcategory A, B, C, D, for clarity. So I'm certainly agreeable to do that, and then we would just need to, Mr. Registrar, just perhaps go through this tab so we can all get our A, B, C's correct.

THE REGISTRAR: You've already marked 798.

MR. TIMBERG: So the first page, perhaps, will be 798, and then the second page will be 798A.

THE REGISTRAR: We have documents here that are A to F; is that correct?

MR. TIMBERG: That's correct.

THE COMMISSIONER: Mr. Registrar, what was Exhibit 798 again, I'm sorry?

THE REGISTRAR: 798 was the Strait of Georgia Ecosystem Research Initiative.

THE COMMISSIONER: And what was 797?

THE REGISTRAR: 797 was the ***Species at Risk Act*** Management Plan Series, Management Plan for the Steller Sea Lion in Canada.

THE COMMISSIONER: Okay, thank you.

THE REGISTRAR: Now, if you want these marked 798 A through F, I notice you've already got them marked A to F there.

MR. TIMBERG: Mm-hmm.

THE REGISTRAR: If I mark them 798 starting at A --

MR. TIMBERG: So it'll go A to --

THE REGISTRAR: -- we'll be missing 798.

MR. TIMBERG: Okay, so --

THE REGISTRAR: It comes out of sequence.
MR. TIMBERG: So we'll just knock one off at the end.
THE REGISTRAR: Yes, so you'll have 798, 798A -- actually, do to it properly, in terms of sequencing the exhibits, 798 will be A --
MR. TIMBERG: Yeah.
THE REGISTRAR: -- will be Item A, the Strait of Georgia Ecosystem Research, that'll be 798.
MR. TIMBERG: Okay.
THE REGISTRAR: 798A will be Strait of Georgia Ecosystem, which is shown as B here.
MR. TIMBERG: Okay, thank you.
THE REGISTRAR: Okay? So that will be A.

EXHIBIT 798A: Strait of Georgia Ecosystem Initiative, an Overview

THE REGISTRAR: 798B will be Ecosystem Research Initiative (ERI) Pacific Region.

EXHIBIT 798B: Ecosystem Research Initiative (ERI) Pacific Region - "The Strait of Georgia in 2030", Research Plan

THE REGISTRAR: 798C will be the Strait of Georgia Ecosystem Research Initiative.

EXHIBIT 798C: Strait of Georgia Ecosystem Research Initiative - Key Outcomes

THE REGISTRAR: 798D will be Strait of Georgia Ecosystem Research Initiative, Modelling Component.

EXHIBIT 798D: Strait of Georgia Ecosystem Research Initiative, Modelling Component

THE REGISTRAR: And E will be the Strait of Georgia Ecosystem Research Initiative - Ongoing Research Projects

EXHIBIT 798E: Strait of Georgia Ecosystem Research Initiative - Ongoing Research

MR. TIMBERG: Thank you. And then, Mr. Registrar, if we could go back to expert report number 8, if we could turn to page 13?

THE COMMISSIONER: The towel brigade.
MR. TIMBERG: I'm making very efficient use of my 10 minutes.
THE COMMISSIONER: And we're being entertained.
MR. TIMBERG: That's good enough, thank you.
UNKNOWN SPEAKER: Time's up.
MR. TIMBERG: I know. I've got four minutes.
Q So at the bottom of page 13 we have the test or the analysis for what is a significant predation. And for the panel, or Dr. Trites, would you agree that the location of any Fraser River sockeye mortality is also a consideration in assessing possible predator impacts?
DR. TRITES: Yes, I would agree.
Q So that would be --
DR. TRITES: So that's our first criteria on there, that the prey and predator must overlap in time and space.
Q So my colleague's saying it's the location of increasing mortality is another consideration that would be helpful?
DR. TRITES: So I guess what you're getting at is, are you asking, does it matter if the amount of prey consumed is high? Is that what you're touching on? Because the reality is that, depending on the species, if the sheer numbers are high they could eat a low amount and that could, in turn, have an effect.
Q But would you agree that most Fraser River sockeye die as a result of predation?
DR. TRITES: We don't have any evidence of that. They could be dying of a number of different things.
Q Okay.
DR. TRITES: But I think it's fair to assume if they don't get back they have died.
Q There we go. All right. And I guess my point is, the issue of where the mortality occurs is -- does it happen in the Georgia Strait; or does it happen in the open ocean; does it happen in the river, is a relevant factor that we should be looking at?
DR. TRITES: You know, in our assessment, and here I'll go just beyond marine mammals, including, also, birds and fish, there is evidence that predation occurs throughout the life history of salmon.
Q Right. And so where that mortality happens is a helpful consideration?
DR. TRITES: Definitely.

Q And then whether a particular predator is feeding on a fry or a smolt or a juvenile salmon or an adult salmon is another relevant consideration?
DR. TRITES: That's correct.
Q Okay. And so do we know whether -- or do you know whether Fraser River sockeye mortality in freshwater has been increasing?
DR. TRITES: In terms of marine mammals, there's no evidence that they are -- I mean, some are in river mounds, for example, some freshwater areas. But when you look at predation that's been recorded by harbour seals on smolts coming out of rivers, there's only two spots in British Columbia that's been identified: one, is the Puntledge River; the other is in Port Moody. Both are associated with hatcheries. Both are associated with rivers where there's been changes: dredging; bridges; lights from the towns and cities. And so it's not clear whether or not this is a normal predation occurrence or just an artefact of how the environment has been changed and the mammals have taken advantage of it.
Q Right.
DR. TRITES: One thing that is interesting is that in none of these two cases is there any predation on sockeye.
Q Okay. And if we could turn to page 83 of your report, the fourth paragraph there, the first sentence, you say that:

> Indications are that the problem --

DR. TRITES: Just wait one second till I see where you are.
Q So the fourth paragraph there:

> Indications are that the problem of low survival may be explained by conditions encountered at sea.

DR. TRITES: Okay, the point here is that most of what we know about salmon, it would appear, is from the freshwater systems. Once they get into the near shore coastal waters, you know, it's slightly less, and it seems that once they get out into the open ocean we know even less about them. So that's the point of this, is that we essentially

don't know, and so, therefore, it raises a fairly big question because it's part of the lifecycle that we don't have good data for.

Q So when you say "encountered at sea", does that include knowledge of the Georgia Strait, or are you combining Georgia Strait and the open ocean?

DR. TRITES: With this statement here we're being very general in applying both areas.

Q All right. And if we go to page 29, the third paragraph, so here you state that:

> The mortality of salmonids in the ocean can be substantial, and indications are that the early mortality is substantial (2-4% per day for the first 40 days) but also that there is substantial mortality afterwards...(0.4% - 0.8% per day for the 410 next days...

DR. TRITES: Mm-hmm.

Q And so my question is, then: Fraser River sockeye salmon, would you agree they spend their first 40 days primarily in the Strait of Georgia?

DR. TRITES: All they can do, here, is just refer to the work of Beamish and Neville and the work that they've cited. And so, to my knowledge here, we've cited the work as it has been published and we're drawing estimates that they've made; we've not made these estimates.

Q Okay. Do you have any knowledge, yourself, as to where Fraser River sockeye spend -- where they're located in their first 40 days in the ocean?

DR. TRITES: I don't, and when I've asked, trying to understand more about the behaviour of sockeye, for example, you know, we puzzled over why do sockeye seem to be the least frequently occurring salmon in the diets of marine mammals? And to answer that I think we have to find people who understand the behaviour of salmon. How do they school; what are their anti-predator techniques? And it seems that that's an aspect of the life history that very few people know.

Q Okay.

DR. TRITES: And it's one of the big question marks we have.

Q But you'll agree, then, that of the six predators you've selected for further research, only two of them occur in the Strait of Georgia; that's the

common murre and the River Lamprey, that the other four don't occur in the Strait of Georgia?
DR. TRITES: That's correct.
Q All right. And then how do you reconcile that, then, with Dr. Beamish's observation that early mortality within the first 40 days is quite significant? I'm curious that you're not focusing on predation in the Strait of Georgia.
DR. TRITES: Well, we have tried to focus on predation throughout the entire system, entire life history. I think you're going to get more into this when Dr. Christensen is here, as he speaks specifically to the fish aspect, predation by other fish, and that's essentially, I think, what this mortality estimate is here. This does not refer to predation by marine mammals --
Q Right.
DR. TRITES: -- but is touching on predation by fish that should be the subject of the next panel, I believe.
Q So your work, then, is primarily in the open ocean and not in the Strait of Georgia?
DR. TRITES: No, my work has been with marine mammals --
Q Right.
DR. TRITES: -- and predation by marine mammals.
Q Okay.
DR. TRITES: And these comments here are, I believe, are attributed to predation by fish --
Q All right.
DR. TRITES: -- as opposed to predation by marine mammals.
Q Okay, that's fair enough.
DR. TRITES: Perhaps that should have been clarified when we stated the estimates.
MR. TIMBERG: All right. And my time is up. Thank you very much.
MS. TESSARO: Mr. Commissioner, Tim Leadem, for the Conservation Coalition, is going to use the next 10 minutes.
MR. LEADEM: For the record, Leadem, initial T., appearing as counsel for the Conservation Coalition.

CROSS-EXAMINATION BY MR. LEADEM:

Q Good afternoon, gentlemen. We're at the end of a

rather long day for some of you. And I want to start off with a general question of you, Dr. Trites, that your report is entitled, Predation Upon Salmon, and you would -- you've left out of the predation equation, obviously because of your terms of reference, the biggest predator, I would suggest, of sockeye salmon is the human species; is that correct?

DR. TRITES: That's correct, and you're also correct that we were -- we had our terms of reference, and the effects of fishing was not considered to be predation, per se.

Q But if I can look at this holistically and maybe even from an ecosystem conceptually, if we put the human factor back into the equation, if we're saying, for example, that we're going to allow or call other predators to make more fish for humans, how is that an ecosystem -- how does that balance out in terms of an ecosystem approach?

DR. TRITES: You know, I can't speak specifically to sockeye salmon in this case, but I know in other ecosystems, for example, the Bering Sea, where I have worked in constructing ecosystem models, that we can show the effects of humans and how removing one specie can have cascading effects throughout an entire ecosystem. A human is definitely, you know, are major factors in ecosystems. Removing any one specie can have cascading effects and indirect effects that we don't think of beforehand, but often when we follow through the mathematics and the numbers we can reason out why we get these predictions from the models.

Q And I suppose from the aspect of my clients, there's been predation, human predation, upon sockeye salmon for centuries. And then we get to commercial harvesting of salmon, and my clients' approach are from the perspective that when there was human predation upon sockeye up until the time that commercial harvesting began, there seems to be healthy populations of sockeye. So perhaps there's a right way to catch fish and maybe a wrong way to catch fish?

DR. TRITES: Yeah, and I think perhaps the other aspect is, you know, your question, I think, is we're just catching sockeye salmon?

Q Yes.

DR. TRITES: But, of course, fisheries are taking other

species as well: cod; pollock; flatfish, and fisheries that are removing other species of fish can also have indirect effects. What happens when the major prey of perhaps a marine mammal are moved? What are they going to switch to, to compensate for it? That's why, in our recommendations, our final one, was the need to essentially model with mathematics the whole flow of the lifecycle of the salmon to figure out just those sorts of things and issues you're raising, to see if there's other weak links in here that could explain more than what our simple overview of predation has been.

Q Right. And that was, looking at your report, that was your last recommendation, number 5, I think, or the --

DR. TRITES: That's right.

Q -- last paragraph?

DR. TRITES: Mm-hmm.

Q And I wanted to talk to Dr. Ford and Mr. Olesiuk, too, about the recommendations contained in Project 8, and to see if you had any comments, particularly with respect to this modelling that's being proposed here by Dr. Trites and Dr. Christensen.

DR. FORD: I don't have any specific comments on that particular section of the report. I think ecosystem modelling can be a very valuable tool. There's various models being developed, both within DFO as a result of the Ecosystem Research Initiative I just mentioned, and elsewhere. So I think it is an important role -- there is an important role for predictive models in ecosystem-based management.

Q Right. So you don't take issue with that particular recommendation, do you?

DR. FORD: I'd have to see if there's specifics that --

Q Page 83, please.

DR. FORD: In general, I agree with the importance of ecosystem modelling.

Q We're now looking at Project 8, and just to draw your reference, Dr. Ford, to page 83, it's the last paragraph on that page.

DR. FORD: I agree, in principle, with that recommendation.

Q Right. And Mr. Olesiuk, would you also agree, in principle, with that recommendation?

MR. OLESIUK: I also agree that ecosystem modelling is a valuable tool, but I would caution that these models are only as good as the data that go into them. And I think that, as we've heard today, our understanding of food habits of these predators is insufficient right now to construct models that are actually going to give us predictive capabilities.

Q If I can just go back to Project 8, to one page, to page 80, or a couple of pages, to page 80, there's a heading, Ecosystem manipulation: a scary concept. And then I want to actually get Dr. Ford's and Mr. Olesiuk's comments on the last paragraph under that heading, which is found on page 81, and the paragraph begins:

> The first step to moving beyond *ad hoc* experimentation with ecosystem manipulation is through analyzing the effects at the ecosystem level, be it through conceptual or quantified ecosystem modeling. It must further be recognized that there are limits to current empirical knowledge and modeling capabilities. Thus, experimental protocols need to be carefully developed as part of adaptive management schemes,

And there's a reference, then, to Walters, 186. That would be Dr. Carl Walters, would it, Dr. Trites?

DR. TRITES: Yes, it is.

Q All right. Could I get Dr. Ford's and Mr. Olesiuk's reaction to that? Are you in agreement, basically, with what's being propounded there?

DR. FORD: I have to confess, I haven't thought extensively about that recommendation, but it appears to be reasonable to me.

Q And Mr. Olesiuk, do you have any comments on that?

MR. OLESIUK: Yeah, I wasn't expecting this question, but I do think that we need to learn from the way we've managed in the past and in the present, and I'm just not sure whether -- to what extent management should be conducted as an experiment.

Q Right.

MR. OLESIUK: But monitoring might be more of what I would -- sort of the philosophy I have.

Q But you would agree that there has to be a high

degree of caution applied if we're going to be dealing with ecosystem manipulation?

MR. OLESIUK: Oh yeah. Yes, I agree.

Q Now, the other aspect of the report that is absent, well, not totally absent, because there's reference to it throughout, Dr. Trites, and that is the sockeye, themselves, are predators, and so, I think as you've put it in the report, it's the law of the sea, at least from a fish's perspective, is to eat or be eaten. And so I want to throw this question back at you. If you look at what seems to be driving the decline in sockeye, it's either the fish are not getting enough food to eat or they're being eaten by something that's bigger than them, at least from an ecosystem approach.

So can you hypothesize what it is, in your knowledge? Is it that they're being eaten or that they're not eating?

DR. TRITES: No, I don't have a good answer for you on that. You know, perhaps one of the sort of interesting observations is no matter how well our marine mammals have been doing in British Columbia where, for example, sea lions are increasing, whereas you go to Alaska and they're on the endangered specie list, compared to how poor our salmon have done, whereas in Alaska they've done extremely well.

And so conditions in the ocean have changed. Something major happened in the mid to late '70s, the ecosystem seemed to have flipped, and so it would appear to be much more bigger than just a simple predator-prey relationship. There's something in the physical oceanography that's also influenced in the dynamics that probably ties to food, distribution, water temperatures. It's a much bigger story than just simply a predator-prey relationship.

Q All right. So you would then, if you were asked to quantify what's causing the decline in the sockeye for the last decade or so, you would say that the predation aspect might be a contributing factor but it's certainly not the sole factor?

DR. TRITES: We could certainly find no smoking gun, in the sense of saying, yes, predation was the driving factor. We recognize that it is a contributing factor, but it would appear, at least

when we sit back and look at the whole North Pacific, what's going on, that there's a much bigger force at play.

MR. LEADEM: Mr. Commissioner, I have 20 minutes allotted to me, and it looks like it's the magic hour, and I'll come back with my last 10 minutes tomorrow morning, if that suits you?

THE COMMISSIONER: Thank you very much, Mr. Leadem.

THE REGISTRAR: The hearing is now adjourned until ten o'clock tomorrow morning.

(PROCEEDINGS ADJOURNED TO THURSDAY, MAY 5, 2011, AT 10:00 A.M.)

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

_____
Pat Neumann

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

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Karen Acaster

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

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Irene Lim

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

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Karen Hefferland