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

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701, rue West Georgia
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APPEARANCES / COMPARUTIONS

Wendy Baker, Q.C. Maia Tsurumi	Associate Commission Counsel Junior Commission Counsel
Mitch Taylor, Q.C. Hugh MacAulay Jonah Spiegelman	Government of Canada
Boris Tyzuk, Q.C.	Province of British Columbia
No appearance	Pacific Salmon Commission
No appearance	B.C. Public Service Alliance of Canada Union of Environment Workers B.C. ("BCPSAC")
No appearance	Rio Tinto Alcan Inc. ("RTAI")
No appearance	B.C. Salmon Farmers Association ("BCSFA")
No appearance	Seafood Producers Association of B.C. ("SPABC")
No appearance	Aquaculture Coalition: Alexandra Morton; Raincoast Research Society; Pacific Coast Wild Salmon Society ("AQUA")
Tim Leadem, Q.C.	Conservation Coalition: Coastal Alliance for Aquaculture Reform Fraser Riverkeeper Society; Georgia Strait Alliance; Raincoast Conservation Foundation; Watershed Watch Salmon Society; Mr. Otto Langer; David Suzuki Foundation ("CONSERV")
Don Rosenbloom	Area D Salmon Gillnet Association; Area B Harvest Committee (Seine) ("GILLFSC")

APPEARANCES / COMPARUTIONS, cont'd.

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

APPEARANCES / COMPARUTIONS, cont'd.

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

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THE REGISTRAR: The hearing is now resumed.
MS. BAKER: Mr. Commissioner, just to outline what our plan is for this morning, we have David Patterson back to complete his evidence on management adjustments, and then we'll be following that with the panel that we had yesterday. I'm wondering if I could propose that we take one break in the morning at about 10:45. We'll just go ahead through to that. Thank you.

So I will continue with Mr. Patterson. Mr. Patterson, you were previously sworn and you remain under oath.

MR. PATTERSON: Yes.

DAVID PATTERSON, recalled.

EXAMINATION IN CHIEF BY MS. BAKER, continuing:

Q The first document I'd like to take you to this morning is at Tab 1 of the binder in front of you, and it's CAN 002886. It's titled "Improvements to Environmental Management Adjustment Models", SEF Final Report.

Now, I understand that this report came out of some recommendations from the Williams review of the 2004 fishery and the standing committee review of the 2004 fishery; is that right?

A Yes. Some of the recommendations came from there.

Q And the recommendations are referred to at paragraph 2 of the Executive Summary which is at page 2 under the ringtail numbers. It just makes reference to the earlier reviews and the recommendation to review management adjustment models. What were the areas for improvement that were identified and which were the subject of this report?

A The main areas were we wanted to look at the actual model inputs, the variables that went into the MA models. We wanted to look at the model structure itself, and also model selection were the three broad areas. We broke that down into five other areas which were basically, sensitivity

of the management adjustment models to temperature, flow, the uncertainty in the environmental forecasts that go with it. I mean they're actually all outlined in the report, but those are the main things, input structure and selection.

Q And this was funded by the Salmon Commission's Southern Boundary Fund; is that right?

A Primarily funded by them and then subsidized by DFO, and then also by NSERC for a graduate student.

Q And was the work contemplated -- let me just back up. This is a final report that was produced once the different studies had been done; is that right?

A That's correct.

Q And what we put into evidence here is an Executive Summary of the different report. The actual SEF report is quite lengthy; is that right?

A Yes.

Q Okay. But the excerpts that we have included here outline the -- summarize the conclusions of the different reports that were done?

A Yes.

Q Okay. And was all the work that was contemplated under this proposal finished, or was there work outstanding?

A We completed all the objectives and delivered on what we said we would do. However, the very last objective is a bit open-ended in terms of the actual development of ecosystem management protocols, so that's ongoing work. And there's continuing ongoing work associated with the other four objectives too. But, for the most part, it was done.

Q The objectives that you're referring to, are those the objectives that are on page 3?

A Yes, the 1 to 5.

MS. BAKER: So if you could turn the page, Mr. Lunn.

Q All right, so these five adjustments. So the final one, number 5, you say is not complete?

A Well, we looked into it, but it's an assimilation of all the information that has been collected and is continuing to be collected, so it's not really something that could be completed, per se. It's never -- this is an iterative process would be a better way of thinking about it.

Q Okay. Are you able to summarize the conclusions of the different studies that were done?
A Yes. If you want to look at the -- basically the main conclusions that are associated with each one of those on the bottom of the page there, from 1 to 7, are the seven main chapters that refer to the first four objectives.

The first paper there dealt with looking at how we could improve getting a heads up at the beginning of the season, before the fishing season started, based on snow pack, air temperature anomalies, and we looked into the efficacy of doing that. It turned out we can within a reasonable amount of uncertainty.

The next one really dealt with how we can improve our temperature forecasting and our monitoring within the system, in the Fraser. That's outlined there. There are some improvements that could be made.

The next one really looked at -- one of the suggestions in the Williams report was to look at different models for accumulated thermal units. We realized that if there's a really good agreement between temperature sites within the Fraser River, then that really wouldn't be necessary and you could use a single surrogate for the entire system, and that turned out okay.

The next one has to do with looking at the uncertainty in the actual model, what other uncertainty goes into the MA models. Not just the inputs, but also how the fish are coming in, the timing of the fish, the shape and profile of the run itself. We realized that it tends to be very sensitive to the actual distribution of the fish coming to the river, the actual MA outputs themselves.

The final -- so is that feedback I'm hearing, you're hearing? Okay.

The evaluation -- the next one has to do with looking at different HE (phonetic) models as well. We accomplished -- we looked at that and to see whether or not it could be feasible. We determined that it wasn't actually a feasible method for the in-season; however, it could be used post-season.

The last two, they're both two primary publications. The one has to do with looking at

model rationale for what we're actually doing in the first place, and whether or not the model structure was sound. It was based on sound biological rationale. The last one has to do with looking at model selection and ways of improving how we choose, how models could be chosen in-season for doing it.

Q All right. Each of these studies discussed improvements that could be made to the models that were being used prior; is that right?

A They looked at improvements to be made and also other ways of looking at the problem. The last thing is a whole list of publications that are in here and subsequent that have to do with the last, which is the assimilation of the ecosystem approach to the management side, which is the actual looking at mortality directly.

Q Were the improvements that were identified in these studies implemented? Have they been implemented since the work was done?

A Certain aspects have been, but not all, no.

MS. BAKER: I'll have this marked, please, as the next exhibit.

THE REGISTRAR: What's the face page of this document?

MS. BAKER: It says "Improvements to Environmental Management Adjustment Models, SEF Final Report." It should be in Tab 1.

THE REGISTRAR: Exhibit 404.

EXHIBIT 404: Document titled "Improvements to Environmental Management Adjustment Models, SEF Final Report"

MS. BAKER:

Q I don't want to spend too much time on this report, but can I just ask you to identify -- if we move through this document, there'll be an Executive Summary for each chapter beginning at page 8. So each of these reports that you just reviewed has been summarized in these different Executive Summaries; is that fair?

A Yes.

Q Okay. Now, I'd like to move to another document which is, I think, referenced in the exhibit that we just reviewed which is a study done by John Cummings from SFU. That is found at Tab 3 of the materials in front of you.

First of all, I'll just ask if you can tell me whether this document, which is a study titled, "The Impact of Different Performance Measures on Model Selection for Fraser River Sockeye Salmon," is that actually one of the reports contemplated by the SEF project?

A Yes. This is the primary publication from number 7 on the previous document.

Q Okay. And you're one of the authors of this report as well?

A Yes.

MS. BAKER: Can I have this marked, please, as the next exhibit?

THE REGISTRAR: Exhibit 405.

EXHIBIT 405: Document titled, "The Impact of Different Performance Measures on Model Selection for FRSS".

MS. BAKER:

Q At page 4 of this document, lines 89 to 96 at the bottom it states that:

> During the fishing season, these --

We're talking about discrepancies. Just a minute, I'll make sure I've got my -- all right. This is just -- I want to pull just some lines out of this summary, so it's a bit -- I don't want to go to the first part of the paragraph, but if we can just pick it up at 89.

> During the fishing season, these discrepancies are incorporated by fisheries managers into estimates of total allowable catch, thus potentially reducing available harvest for regulated fisheries in years when the forecast of loss is high.

And the discrepancies that we're talking about are what are tried to be captured with the management adjustments, I take it.

> Underestimates of in-river loss can lead to conservation concerns with too few fish reaching spawning grounds due to excess catch, whereas overestimates of in-river loss

> can result in foregone catch. Therefore, management of the Fraser River sockeye salmon fishery would benefit from identifying MA models that produce the most precise and unbiased prediction of in-river loss.

So that describes one of the objectives that you were looking to solve, how to find the most precise and unbiased prediction of loss through management adjustment models; is that correct?

A Yes.

Q Okay. And then on page 6 at lines 136 to 138, you'd specified the research objective as being:

> Our research objective was to develop a standardized framework to quantitatively evaluate new and existing MA models and, more generally, to explore how different model performance measures can influence the rank-order of model selection.

So that in fact was the objective that you were dealing with in this project?

A That's the specific one in this paper, yes.

Q And in this research project, you looked at the models for determining management adjustments, and some of those are the ones you talked about last day when you were here, and they included temperature-only models, right?

A Yes.

Q Discharge-only models?

A Yes.

Q Temperature and discharge models?

A Yup.

Q Migration timing models?

A Yes.

Q And average historical escapement discrepancy models; is that right?

A Yeah.

Q And that you assess those models against each other and also against the outcome from applying no management adjustment at all.

A That's right.

Q Okay. And what was the conclusion of your research with respect to using management adjustment models versus not using management adjustment models at all?

A The conclusion was that in three of the four run-timing groups, the worst choice to make would be not to apply one. In the case of the remaining run-timing group, it's the second worst choice of not applying one. So in terms of actual performance, you're better off having an MA model regardless of how precise or biased it may be.

Q So in your view, are management adjustment models then a useful tool for managers to use in managing the fishery?

A Yes.

Q Then moving into some of the choices that must be made in determining what the appropriate management adjustment model is, if you could move to page 17 and line 365. I just wouldn't mind getting a non-technical version of these statements. Three-sixty-five, partway through the line says:

> Model performance measures should not be chosen simply on the basis of statistical tradition, but instead should be consistent with the stated management objectives. For example, use of model rankings based only on AIC_c or R^2 fit to the entire dataset (as is often the case) for management of the Early Summer run would result in the selection of a --

I don't know what this means.

> -- D model (i.e., the historical average discrepancy model). However, for managers who place high priority on objectives that specifically aim to avoid extreme errors in achieving escapement targets, a model that minimizes MAE or RMSE, i.e. the T+Q (temperature and flow) model would be preferred.

So in layman's terms, what are you getting at in those lines? Like what is the dynamic that you're trying to describe?

A I guess when you think about model fit, what happens with these things, like R^2 which is a more traditional way of looking at it, you're looking at a model and you'll see how well they did. He

currently had how well it fits -- if you have a relationship between temperature and in-river loss, you can see how well it does. The problem is if you then -- that's only explaining one aspect of the model itself.

Now, one way, what we did here is we went back and we said, okay, let's start running this model from 1995 and if we had this information in '95 when we apply the model, do we get -- and we keep doing that iteratively, year after year after year. Basically you're looking ahead to see how well it performs in the future. Do you get a -- do these models -- some of these model produce a bias. In other words, they tend to overestimate the number of fish coming back. Even though they may fit the model in terms of after the fact, we may be seeing a bias through time. That's what we're really getting at here.

So if managers, depending on what they want to do, if they want to avoid -- just because of how the models are structured, you have different outcomes will come from them. If you want to avoid extreme errors or if you want to avoid a bias in one direction or the other, you may want to choose to have one model over another.

So I guess it's not an easy thing to actually explain, but there are differences between models and the selection of them, and it's important that we -- it's potentially important, I should say, if managers wanted to do that. It's an area, I guess, that we're looking at exploring and trying to get across.

Q All right. I think that that picks up at page 21 of your report at lines 448 through to 454 where you say:

> Clearly, multiple performance measures need to be considered in fisheries analyses...because of the competing management objectives typically faced by fisheries managers...When clear objectives are combined with appropriate affiliated performance measures, model selection through retrospective analysis can be used to provide scientific advice to managers to help increase the probability of achieving fisheries management objectives.

And that's kind of what you were just saying, isn't it?
A Yes.
Q So the point I think you're trying to make, and correct me if I'm wrong, is that fisheries managers will have certain objectives whether to avoid not meeting their -- if they want to meet their escapement target. If it's important to ensure that they overestimate to make sure that the escapement targets are met, that could be a management objective, and that objective may help you select a model that will best meet that goal. If the objective is to maximize catch while at the same time attempting to meet the escapement goal, that objective may cause you to use a different model as well. So the model selection could be influenced by the management objective; is that right?
A Yes.
Q Currently have managers been able to communicate their objectives to Science in a way that allows for you to provide advice on the most appropriate model to reflect the management objectives?
A On the one level, yes. I mean, the overarching objective of achieving the spawning escapement target while still providing opportunities to harvest is articulated. The more subtle objectives which are associated with these performance measures have not been. I mean, there are many reasons why. You'd have to ask them I guess. But this process hasn't really had time to, I guess, develop with them, to be honest with you. So it's a yes and no answer.
Q Is that a goal right now, to work with managers to articulate objectives that will assist in providing a proper or a useful model selection for management adjustments?
A Yes. We have presented this work to them and we'll continue to present it, the idea of building a framework for looking at model selection, basically coming up with an agreed-upon set of conditions and taking in mind what the management objectives are so to come up with the best suite of models they can use.
Q Right now, different models can be selected in season for calculating management adjustments; is that correct?

A Different models are presented in season. I'm not sure how they're selected.
Q And, as far as you know, the model selection is not done using this quantitative method that you're trying to develop here. In other words, right now there's not a clear set of objectives that are linked to the models, the model choices that allow them to make a decision on what management adjustment to use.
A I'm not sure what the objectives -- those objectives I've been talking about, as far as I understand, it's the mainly R^2 that's being used as the actual performance measure that's assessed, and without the appropriate p values, I don't know how you can assess what the actual confidence you have in those results are, to be honest.
Q Okay. If the objectives and the performance measures were clearly stated, would that allow for more predictable and transparent assessment of the appropriate management adjustment model to use in-season?
A I think based on the work we've done here, we've demonstrated that by actually having clear performance measures, then you can, in theory, improve the performance management of the system.
Q Thank you. I would like to move to another topic now. At Tab 2 of the binder before you, there's a document titled, "Environmental Watch Program Overview with Specific Reference to Fraser River Sockeye Salmon." That is CAN 05407.
I just wanted to identify this is a summary of the Environmental Watch Program and it outlines the different objectives of that program; is that fair?
A Yes.
MS. BAKER: Okay. I'd like this marked, please, for the record.
THE REGISTRAR: Exhibit 406.

EXHIBIT 406: Document titled "Environmental Watch Program Overview with Specific Reference to FRSS"

MS. BAKER:
Q Getting back to the Environmental Watch Program that you're a part of, does your group do any work on the impacts of temperature and kinds of in-

river fishing? We've heard a little bit in this commission of inquiry about how different kinds of in-river fishing can have certain impacts if temperature of the water is higher than a certain point.

A Yes, we've been indirectly involved, because we've been fishing for the last ten years in different environmental conditions using every gear type imaginable. So we have a baseline record for stress responses from fish caught in different gear types.

But more recently, we've been involved in two NSERC projects that are related directly to the impact of fishing interaction with temperature using different gear types in fresh water.

Q So that work is going to continue being performed; is that --

A There is another two years left on the one project. These are funded out of Carleton University and the University of British Columbia. It's Steve Cooke and Scott Hinch. I believe there's one year left in the UBC one and two years left in the Carleton one.

Q All right. And what will that -- what will the results of that research be used for?

A The idea is to actually basically provide managers with science advice and information on the potential impacts of different gear types, so it's not selecting one over the other. Also, what the impact of those different gear types would be in terms of actual -- at different temperatures as well.

I mean, that particular project, though, is sort of looking straight at the actual catch and typically release as opposed to the other interactions which are getting captured without being brought on board and then incidental capture or even just net avoidance or capture. So there are different levels of interaction, but this is the most primary one where the fish are caught, assessed and then released, looking at post-release survival for the most part.

Q Is your group doing any work that looks at the impacts of future climate change scenarios?

A Yes, we are. We're doing both forecast involved with climate model. There's looking at future conditions in the Fraser River, and also looking

at individual stock specific responses to climate change, either physiologically or behaviourally.

Q What about habitat loss? Has that influence been studied by your group?

A Not habitat loss necessarily. We're more in habitat change, I guess, in regards to temperature itself.

Q So that work is still tied to temperature; is that right?

A Yes, that's correct. We have a pretty broad network of water temperature monitoring stations throughout the Fraser. So we're trying to look now at disentangling climate from habitat alteration.

Q All right. Thank you. Moving to another topic, under the old IPFFC, was temperature data collected by that agency?

A Yes.

Q And did that go back to the 1940s?

A Yes.

Q When certain aspects of the Fraser River sockeye fishery moved to DFO in 1985, did temperature data continue to be collected in the same way as it was done previously by the IPFFC?

A No, there was some changes during the changeover. Some stations were dropped. Methods also changed, switching from older equipment to modern electronic equipment.

Q What temperature data is being collected now?

A Right now, there's two main types. There's real-time water temperature data which is collected on the main tributaries. There's ten real-time sites in the Fraser River. Plus there's a network of just logger stations that you're in there but have to retrieve once a year.

Q If you turn to the exhibit that's on the screen right now, Exhibit 406, if you turn to page CAN number 9. It has a map. Are these sites that are currently being monitored for temperature?

A Those are the sites that are being monitored for water temperature in real time. Actually, it's kind of hard to tell, isn't it?

Q Yeah. That's (indiscernible - overlapping voices).

A Actually, no, these are both. These are real-time and the permanent, the non real-time stations. So we're monitoring in the major migration corridors.

We have some experimental research work in lakes as well, looking at thermal properties and changes.

Q The work that's being done currently by your program and by Water Survey Canada, is that the same level of monitoring that took place from the time DFO took over this in 1985, or was there a period of time where the temperature records are not as good?

A Yeah, the 1980s and the early '90s are particularly poor compared to the '50s and '60s. I think now we're back up to a level that's probably commensurate with what was taking place in the '60s. So, I think, really, I guess in the -- that was really in response to the previous reviews that the temperature monitoring expanded back up after '94.

Q Is the temperature data that's being collected currently representative of the entire river?

A No. The current temperature monitoring, the way it's set up, is designed primarily to provide advice for migratory conditions for adult Fraser sockeye. That's the way it's set up, and that's the main objective for doing it.

Q So the question was whether it's representative of the entire river. How does the answer that you just gave relate to that question, just to be basic with us.

A I guess the first part, when I said "no", I mean insofar as Fraser sockeye are distributed throughout most of the Fraser, it's not set up -- it's not a temperature-monitoring program for the entire Fraser River. It's a temperature-monitoring program for Fraser sockeye migration, and it's earmarked for the 19 major production units. It's not geared to the individual CUs or anything like that.

I mean if you were to look at the future down the road, if you want to look at climate change impacts, then you'd probably remodel, tweak some of the stations around. If you wanted to look at CUs for the WSB as a habitat indicator, then you'd have to modify the existing program.

Q Is the data that you are able to obtain through these sites adequate for the management adjustment models that are used in managing?

A They're adequate for the current management

adjustment models, yes. I think that one multi-site correlation paper that was referred to earlier, and one of the SCF project reports, summarizes how confident we are, I guess, in the current coverage.

Now, that's just for the current system. If the management changes or the fisheries are redistributed or any sort of change, then we'd have to adjust accordingly. I mean, that's not to say improvements couldn't be made, but in the big scheme of things where we have other uncertainties that go into the management adjustments, we're comfortable with water temperature is not playing -- is not a limiting problem in this case.

Q In your view, is it important to maintain that full dataset of environmental conditions in the river?

A Yeah, absolutely. I mean, although most of the scrutiny is associated with the in-season management and Fraser sockeye for temperature monitoring, the real benefit of this temperature monitoring has actually probably come from a lot of the other research and spin-off work that we've done, such as assessing climate change. You don't have that information unless you have long-term records of water temperature monitoring. We can now look at individual -- we can reconstruct thermal exposures for different populations. We're doing it now for downstream smolts.

Q Do you think that the Department of Fisheries and Oceans is the right department to be responsible for monitoring temperature in the river?

A I don't think I'm the right person to ask in the sense it's not -- I'm not going to comment on what our mandate is. We have a use for it, we have a need for it, and therefore we do it.

Q Well, I guess the question is should this be a responsibility of Environment Canada? Are they already monitoring things, water temperature and other temperature sites?

A I mean Environment Canada does do some water temperature monitoring. They give (sic) mandate to monitor water quality, and in my personal opinion, water quality -- water temperature is probably the main attribute for analyzing water quality, so insofar as that, I think that they could be doing more, to be honest.

Q My final questions relate to some recommendations made by Williams. If you could go to Exhibit 14 which is in front of you there, and if we can have Exhibit 14 come up, Mr. Lunn? Exhibit 14, page 263. Recommendation 19 states that:

> Given the challenge posed to fisheries management by high water temperature and associated impacts on fish mortality, more systematic collection of data on the number of fish observed floating in the river or dead on the banks downstream of the spawning grounds would prove useful for comparative purposes.

So, first of all, did the Department assess the relationship between loss and salmon carcasses in response to this recommendation?

A Well, we initiated the work prior to this actual recommendation, in terms of we're looking at the relationship between carcass visibility, or the ability to detect carcasses within the Fraser River itself.

Q And were you able to establish that there's a relationship between salmon carcasses and best estimates of loss?

A We never directly compared salmon carcasses and best estimates of loss because I think at the time, because of what's construed within the -- the difference between estimates on the uncertainty associated with them, we decided instead to look at the direct relationship between the number of carcasses and high -- and water temperature itself. We did find the relationship between -- those years that had high water temperature also had higher number of carcasses relative to the abundance of fish in the river.

Q And have other studies been done or experiments been done to try and figure out what happens to all the fish that die in the river?

A Yeah, we conducted a study where we actually looked at the relationship between water temperature, anywhere from 5 to 20 degrees, and the time it takes the fish to surface. From that, we deduced that even at 20 degrees, it takes one to two days for a fish to resurface. At 5 degrees, it's up to 12 days. So it's highly

unlikely that you're not going to see lots of fish floating in the river at any point -- and fish are negatively buoyant, in which case, unless -- the only way they can float is with gas build-up, so if their body is perforated in any way or scavenged even partially, then they're not going to resurface.

Also the water conditions, the clarity, how fast the Fraser River moves, it takes a few days for water to get from the Thompson to the mouth of the river, so there's a whole bunch of reasons why we found it highly unlikely that you actually seize large numbers of fish in the river, carcasses.

MS. BAKER: Mr. Commissioner, those are my questions for Mr. Patterson. I know that Canada has some questions for him, but I'm not sure how many other participants do.

THE COMMISSIONER: Could I, Ms. Baker, just try to clear a question mark in my head on the modelling side if I could, and that is, is there any relationship whatsoever between the models that you have discussed in these reports and given evidence upon, and FRSSI?

A There is. I believe that those guys associated with FRSSI -- Michael, who's going to come talk later, if you want more details on it. There is a connection, and Michael talks -- he's probably the best one to know exactly how it's incorporated into the model itself.

THE COMMISSIONER: But from your perspective, what is your understanding of --

A Oh, how it's actually --

THE COMMISSIONER: Right.

A Well, I guess the simplest one -- well, in the FRSSI model, you have the TAM rules, the Total Allowable Mortality. Within there, if you -- say, for example, TAM rule will be 60 percent. Most of that, in a high temperature year, most of that 60 percent allowable mortality will be taken out by the predicted MA, management adjustment model. So, in that sense, the MAs are directly associated with the TAM rules.

And then the other place where Michael talked about -- or Gottfried, I guess, were talking about how it's being incorporated was in the long-term future planning where you can provide long-term

estimates of discrepancy, so they can be incorporated into the long-term escapement planning. So, in other words, if we're thinking 10, 20, 30 years down the road, our environmental conditions are going to get worse, therefore it's expected that you're going to have higher frequency of in-river mortality, therefore you should adjust your spawning escapements accordingly down the road.

That's another place I potentially see it being incorporated into FRSSI. I don't know exactly specifically how it has, but that's the sort of advice we've provided to them in the past on this. So if that makes sense.

THE COMMISSIONER: As I understand the evidence, your adjustments are made annually in season; is that correct?

A Yes. The ones I was talking about today, yes.

THE COMMISSIONER: To the extent that in-season total mortality is being used to develop a total allowable catch, what I need to understand is whether there is already built in to the TAM an adjustment for the factors that you take into account in your adjustment model?

A The factors that are taken into account, they are one of the -- it's either the catch or it's the MA, from the MA model. Those are the two that go into the TAM, so the answer is yes. That's how it's being incorporated into the TAM rules.

In some cases, the predicted mortality will be greater than the 60 percent, in which case there will be no TAC available at all. So it can easily overcome the total allowable mortality. I mean, it's allowable from a management perspective, but obviously nature doesn't -- you can get 80, 90 percent mortality overall. So that's how it's being incorporated right now.

MS. BAKER: Mr. Commissioner, perhaps just to assist.

Q If we turn to Exhibit 317, which is the IFMP for 2009, and we go to page 67 of that document, you can see this is the fisheries plan for sockeye and you'll see a column, Mr. Patterson, a second column from the right. It says "Management Adjustments" and those numbers are the result of the running of the different models we've talked about today; is that right?

A Yes. I mean, we do the -- most of the -- we talk

about the in-season MA models, but MA models are also developed pre-season to look at what's happening and then they can be simulated to see what happens. This is where these ones would have come from. This is the best guess before they even -- environmental conditions have been assessed, is find out what we're going to expect.

The same thing you can do is we - and we have - we can look at 5, 10, 30 years down the road. We can generate management adjustments as well for planning purposes. So you have to ask the other FRSSI people what exactly they do, how it's incorporated, or if it is right now. But it can be done. In some where climate change where it's -- that's exactly what we're looking at. We're looking at long-term patterns and mortality and how you can adjust for the -- and the tricky part is it's easy to make guesses on what's going to happen in the future for the fish, but it's harder in terms of how that impacts on the fishery itself. That's a different set of questions.

Q And if we could also just go to Exhibit 330. So what we've just looked at, Mr. Patterson, was the pre-season plan, and now I'm going to ask you just to quickly look at one of the in-season decision-making documents. If you can go to page 130? I'm not sure if that's the CAN number, but try 130 and see where that gets us. Four more. Okay, stop there.

You see this is a calculation sheet from an in-season week, and it shows, underneath the in-season run size estimate, it has the escapement target set out and then it shows the management adjustments that need to be made for the different stocks. Again, that management adjustment number is what's created through the use of the models that we've been talking about; is that right?

A Yes.

MS. BAKER: Thank you. Mr. Commissioner, are there more questions or shall I open it up for Canada?

MR. SPIEGELMAN: Thank you. For the record, my name is Jonah Spiegelman representing the Government of Canada.

CROSS-EXAMINATION BY MR. SPIEGELMAN:

Q I just have a very few questions for you today,

Mr. Patterson. The first area that I want to ask you about is following on the selection of models, questions that you were asked previously, and I just wanted to clarify there are a number of different models that your group has developed, and Ms. Baker took you through them. One is the temperature only, and one is the discharge only, then there's the combined of the two. So you have a whole bunch of different models that use data from different environmental factors; is that correct?

A Yes, correct.

Q And you have developed these models in your capacity as a research scientist with DFO, and you've handed them over to the Fraser Panel for use in in-season management?

A The models were developed -- I was one of the people involved in the model development along with, actually, people from the Pacific Salmon Commission as well. But, yes, the development phase, and now the models themselves have been used by the Salmon Commission.

Q Okay. And as part of your work, you've evaluated, as we went through, and Exhibit 405 is an example of your evaluation of the performance of different models using historical data among various performance measures; is that fair?

A Yes.

Q And so in season, when these models are going to be run for the generation of an actual management adjustment, does Pacific Salmon Commission or the in-season managers, they come to you and ask periodically for advice about model selection; is that correct?

A More so in the past than recently, but it does happen, yeah.

Q Okay. And if you were to be asked that advice, what factors might you consider when providing that advice?

A I guess when we're -- the ones that I use -- my background is migration biology, so one of the things that if you're going to be relying on the MA insofar as it explains in-river mortality, I'd want to make sure that any model you're choosing was grounded in biological basis as much as possible.

The other thing is in model selection. Be

careful of, I guess, selecting -- leaving data in or taking out just because you may have a hunch or an idea of why one model is better than another. There's some pretty good reasons for switching between models, but I am pretty -- maybe I'm more conservative but I think these things should be worked out ahead of time for the most part.

And on top of the actual model performance criteria outlined clearly in these papers, there's a very good statistical basis for why you want to choose one model or the other, but the other part that isn't outlined there is the biological rationale for it.

Q Would the sort of real-time and in-season environmental data that you're providing lead you or them towards choosing one model over another? For example, let's say this week's data show that it's a high temperature period. Would that tend to be factored in?

A Only if it was going into territory they'd never seen before. Pre-season, we give them an idea of what sort of conditions to expect, so unless there's confidence in the actual temperature or discharge forecast itself, if there's a serious problem or this is identified, then there's a legitimate reason to switching over.

But unless you're going into temperatures or discharges haven't been experienced before, I'd be highly -- I'm not sure about actually switching unless those sort of decision rules were agreed upon ahead of time.

Q And you said that, as one of the hypotheses that you tested in this study, Exhibit 405, was comparing the different models versus applying no MA at all.

A Yes.

Q And you indicated that it was consistently the worst or among the worst options.

A Yes, that's correct.

Q I just want to turn very briefly to the climate change work that you've done. Can you comment on how different climate change scenarios may impact the survival of migrating salmon in a general way?

A I think in terms of, more generally, in terms of Fraser sockeye, it's been identified that the actual upstream out-migration is probably going to be one of the more sensitive or bottlenecks to --

in the future in terms of under climate scenarios. One of the things in terms of looking at it, looking at it on a stock-specific level or population-specific level, they do respond to temperature differently. So it's not necessarily that easy to predict. You can't make general statements regarding the long-term persistence of the population.

More importantly, when it comes to things like behaviour or physiological adaptation, we don't know which direction they'll go. Some populations may decide to come in earlier, some might come in later within the group. So the basis and the ability to adapt is going to come from their genetic diversity that exists within the populations themselves. So that's the modelling stuff we've done and looked at now.

Q So following from that, then, in an uncertain future where climate change may have an impact on the environment through which salmon are migrating, maintaining that broad base of genetic diversity would be helpful for future survival and adaptation; is that fair?

A Based on the modelling stuff we've done and the other work we've read, yes.

MR. SPIEGELMAN: Those are my questions, Mr. Commissioner.

MS. BAKER: Thank you. From talking to counsel yesterday, I think the only other counsel that has questions for Mr. Patterson is -- oh, Mr. Leadem has one or two, and then I think Ms. Gaertner. I think that that's it unless somebody else wants to jump up.

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

CROSS-EXAMINATION BY MR. LEADEM:

Q Mr. Patterson, you'll have to forgive my line of questions because I'm not a modeller and not a scientist, so some of the questions may come from a period of ignorance on my part.

I'm concerned about the communication of what you're doing to the people that are going to be affected by the management adjustments. Do you know, for example, whether you or any other

scientist conduct workshops with fishers, the commercial fishing industry, with First Nations groups or with conservation groups to explain what you're doing in terms of all of these modelling exercises?

A The way it works is we provide our science advice to fisheries management directly, and typically the resource management are involved in the consultation aspect of it. I can't speak for my other colleagues.

Q Okay. Do you occasionally make guest appearances to the Fraser River panel, either their Technical Committee or the decision-making committee of the Fraser River Panel?

A Yes.

Q And at that time when you attend, do you explain the structure of the models and what they're used for and how they're applied, and which model would be better under certain circumstances? Is that the nature of the kind of advice you're giving to them?

A Not in those cases. Some cases yes, but there's other reasons for appearing at the Technical Committee beyond the MA model world.

Q All right. So I take it from your answer, then, that you don't, strictly speaking, attend at those meetings for the purposes of advising on the management adjustment models and which one would be the best selection under certain circumstances.

A That's correct.

Q I want to examine, just very briefly, Exhibit 406 with you. This is the Environmental Watch Program Overview. If we can turn to page 8 of that document under the heading "Climate Change and Migratory Success", I find these words:

> Warming temperature conditions have already been documented in the Fraser River...and have been associated with increased frequency of high in-river losses of sockeye salmon.

There's a reference then to a paper that's *in press* apparently at the time of this publication. Then it goes on to say:

> Increasing temperature trends, in combination with shifting hydrological regimes, are

expected to continue under climate change scenarios for the Fraser Basin.

Are you in agreement with those two sentences I just read to you?

A Yes.

Q And then if we can flip back to page 6 of that document under the heading "Temperature Impacts on Salmon During Spawning Migration", I find this sentence:

> It has been well-recognized that sockeye salmon in the Fraser River are vulnerable to high river temperatures during their once-in-a-lifetime upstream adult migration.

Once again, there's a reference to a paper by Macdonald. Are you in agreement with that sentence as well?

A Yes.

Q Later on in that same heading, there's a reference, you drop down a sentence. It says:

> Extreme high temperatures for short periods can lead to thermal shock and mortality --

There's a reference to a 1977 journal article, and it goes on to say:

> -- while continued exposure to high temperatures over extended periods can elicit a variety of stress responses leading to chronic sub-lethal impacts such as disease progression, changes in migration behaviour, decreased swim performance and altered reproductive success.

There's a reference then to that paper by Macdonald that's apparently *in press*. Is that -- well, firstly, let me ask you are you in agreement with that sentence?

A Yes.

Q The paper by Macdonald, has it now been published to your knowledge?

A Yes.

Q And I'm not familiar with -- is Macdonald a DFO scientist or do you know where he researches or

where she researches?
A Yeah, he's a DFO scientist.
Q At Pacific Biological Station in Nanaimo?
A No, at the West Van lab.
Q Now, earlier, we heard some testimony earlier, I think a few weeks ago, from Mr. Lapointe, who talked about temperature. Then when Sue Grant from DFO attended to give her evidence with respect to forecasting, I asked her a question about being able to forecast water temperature in the Fraser as a forecasting measure on a pre-season type basis. She said that I would better ask that question of you.
So now I'm going to pose it to you. So is it possible that, as a pre-season predictive tool, that you could actually make a forecast of what the water temperature is likely to be in the Fraser River?
A Yes, and we do, but we also provide the uncertainty associated with those forecasts.
Q Right. And I understand that management adjustments are then used in season. To a certain extent, is that predictive effect of water temperature pre-season, is that used to factor into some management decisions to your knowledge in terms of selection probabilities for the harvesting?
A My understanding is that the temperature forecast that we provide pre-season in June are then used to generate the management adjustments that are what I consider place-holders. In other words, you can go into the season with no MA and then wait for the first forecasts, and then have to make big adjustments or you can come into the season with an MA that we think is going to be reflective of the conditions you're going to experience and therefore have less probability of having to make a major change one way or the other.
MR. LEADEM: All right. Thank you, Mr. Patterson.
MS. GAERTNER: Thank you, Mr. Commissioner. Brenda Gaertner, and with me, Leah Pence, for the First Nations Coalition.

CROSS-EXAMINATION BY MS. GAERTNER:

Q Good morning, Mr. Patterson. I'm wondering if we

could go to Exhibit 317 we've already looked at earlier today with you, and I want to go again back to the Table B, page 66 of 150. Mr. Patterson, you just previously spoke about where the management adjustment is shown in this chart. I wonder if we could go one step further.

When looking at that management adjustment in preparation for my opportunity to speak with you today, I was not surprised but at least curious about the difference between a management adjustment in one season of zero for the Birkenhead and Birkenhead-type Lates, and then we go to 59 percent for the Early Stuart, and all the way up to 604 percent for the true Lates. I see that's a fairly large difference in numbers of the management adjustment, and I'm assuming that's different models.

But I'm wondering if you could bring that home for Mr. Commissioner and myself as to what do we take from such differences in numbers when it's -- if the management adjustments are primarily addressing temperature and sort of known quantities. I'm very curious about those differences and I wonder if you could help us understand that.

A On this particular case, I'm not really the best person to ask. I mean, I can talk about why there's run time specific differences in the management adjustments or, more specifically, the difference between the estimates. However, seeing 604 percent for the Lates, that's an artifact of the management and what they're being -- their spawning escapement targets, and what you'd actually have to achieve mathematically in terms of management adjustment to still allow for -- it's not a -- I'm not really the best one to ask about this, 'cause this really is the use of management adjustments in the management context itself after we've passed along the development aspect.

Q Mr. Patterson, I'm going to ask you to work a little harder on that, because if I was thinking of my clients who are looking at this chart, and I was thinking about the expert that's here to talk about management adjustments, and they just asked this question, Mr. Patterson, why are you making an adjustment of 604 percent on the Birkenhead

Lates, and only an adjustment of seven on the Summer and 59 on the Early Stuart, when what we're trying to do is make adjustments for environmental conditions. I agree that the salmon, the Early Stuarts come up earlier and so if that's what the adjustment is, please just tell us that. Just explain it to us.

A I'm not sure I understand where -- I'm not the one who's generating the 604 percent here, I guess is probably the better way of saying it. If you want to know why Early Stuarts have a higher management adjustment, or why we have historically seen a higher discrepancy between them -- is that the question you want to get at?

Q Sure. And just is it the Early Stuarts are more sensitive to temperature and therefore they're 59 percent, or -- just it's really important that we be able to understand these charts, and so I'm just asking you to explain it.

A With regards to the Early Stuarts, they do come in at the highest flow conditions and moderate to warm temperatures, especially in the upper part. So historically they've experienced some pretty adverse conditions and they tend to be -- and through the past, they've lost -- had high loss estimates. The 40 percent for Early Summers, same thing. They're coming through at the high temperatures. Sometimes they get hit by high flows. The Summers, historically, they're coming in high temperatures with a declining (sic) -- and the flow conditions are moderate.

But there are obviously -- these are average. The actual values themselves -- this is a pre-season forecast, right? So you just go on historical values, what's going on.

With regards to the Late run, the reason why it's 604 is a function of the rules. The TAM rules are set, but we have seen high losses in terms of Late runs since 1995.

Q So it's an example of -- given the --

A I can't comment on the Birkenhead 'cause it's nothing --

Q There's nothing there.

A They don't go through the Hell's Gate, so therefore I think that's the reason for exempting them from the management adjustments insofar as they're related to environmental conditions.

Q Okay. Thank you for that. I don't need the exhibit any further.

I've just got a few questions around -- I wasn't sure I quite understood your information earlier. I take it from the chart, the temperature and flow data that we're using is primarily in-river and is primarily being used in relation to returning adults. Do we need more temperature and water conditions for juveniles going into the marine environment, and have we begun to identify where we might be able to identify the environmental conditions that are affecting out-migration?

A I guess in the last ten years, we've run the stations -- you're trying to run them year-round now for that very reason, so we can document the out-migration conditions for smolts, but also for conditions for other Pacific salmon migrating upstream or downstream. So more the habitat monitoring research as opposed to just sockeye-centric.

Q And that data is getting into your models at this point in time, or...?

A Well, there's no end-use for those models right now.

Q Yeah, gotcha, okay. You don't use those models to adjust in-season forecasts, and so you're not -- they wouldn't be relevant to the in-season forecasting. Have I understood you correctly?

A Well, in terms of relating to juveniles?

Q Yeah.

A Yeah, as far as I understand, there's no application of data for looking at juvenile survival or subsequent returns, no.

Q Not yet. Okay. One more question around that, which is, is there data that's presently being gathered regarding the state of the Strait of Georgia and what's happening there regarding climate change? Have we begun to look at temperature changes in the mouth? What, to your knowledge, is happening there, and what might be helpful?

A There is work being done in the Strait of Georgia. I'm not the person to ask. I feel like I'm playing the Billy Goat Gruff game here, but I -- freshwater biologist, habitat biologist, so --

Q Who would be doing that work?

A At PBS, there's a scientist at PBS -- I'll give you a name, Dick Beamish, you probably know, who is -- if he's not involved in it, someone else will be. But there is work going on there. There's work from UBC, from IOS in the Strait of Georgia. I'm not up to speed on what -- there's an ecosystem initiative, but you'll have to ask someone else in terms of getting the straight answers on who the best person to talk to is.

Q Okay. Thanks very much on that. What indicia are being used in-season in the river? You spoke briefly about the report you're doing on gear types. What are you learning? What are the indicia on health of the salmon as they migrate through, and are we looking at developing models that are actually looking at the health of the salmon as distinct from the climate around the salmon?

A I mentioned earlier we have sort of the indirect assessments of gear type was based on the years of catching fish at different locations in the river using different types. Part of that was we do physiological assessments where we're actually looking at not just the acute stress associated with capture, but also chronic stress to see what kind of condition the fish are in, in terms of energetic condition, if they have sufficient fat stores.

Some of the information is then fed into use for other health assessments. Information can be provided. We look at autoregulatory stress, so I guess the answer is yes. We don't have predictive models associated for it, but it takes time because you need a variety of conditions, annual variability to be able to interpret what you're actually seeing, if that makes sense.

Q Yeah, I think I followed you. I'm just going to make sure I understand that you are looking at some of the health indicators and it's something you're beginning to collect data, but these are not being put into the models at this point in time. Did I understand that correctly?

A Yes. No, the models are based strictly on environmental conditions, but biological rationale is consistent with the information we are collecting, biological research we're doing on energy and migratory energetics and disease

progression.
Q Water temperature seems to trigger those vulnerabilities; is that correct?
A Yes.
Q I'm just wondering is there a way of running the models to increase the indicia, to begin to address that which I'm going to generally call cumulative impacts. As you know, there are a lot of things that are occurring. You're comfortable using water temperature. Are there any other indicia that we should be looking at more closely in order to begin to collect the data?
A Maybe I'll back up a bit. Your first part of the question was to the actual model. I think I'd be careful in terms of using additional information in the current model structure. I'd be even more comfortable saying we can start to use those things you're talking about in coming up with independent assessments of in-river mortality based on cumulative impacts and the stress but outside of, necessarily, the MA model paradigm. We can still provide advice, but it would be an estimate of the actual, say, mortality that's associated just with the in-river mortality, not associated with the other issues with DBEs.
Q I'd like to think of that - and bear with me -- I sound a bit more -- the difference is that you can provide advice to the managers and those -- you can help them make informed decisions, but not necessarily numbers.
A Well, I don't know if it's the best process for getting those numbers across is using the management adjustment model structure as it currently exists, because of the ability to be -- 'cause you need forecasting and predictability for them to work, right? It's pretty hard to forecast some of these other issues when the fish are already in the river.
Although, thinking about it, you can use the post-season to evaluate what we think happened and then provide a best estimate for -- it can be a number. I'm not sort of loathe to provide it, a point estimate, but you can provide a range of numbers saying, look, mortality can be 10 to 20 percent. It's the regional estimate for in-river mortality. Then you could use that to evaluate your post-season estimate, which is important for

the DBEs for generating run sizes, so for production --

Q Don't get me wrong. I wasn't actually suggesting or creating a criticism that you couldn't provide the numbers. In fact, it's a compliment of the work that you do is you can provide numbers on some things 'cause I heard your opening remarks on what you provide. You also provide advice, general advice on the balancing that needs to occur or the considerations that need to occur given the multitude of matters that can come into the conversation of environmental conditions and their effect on salmon.

A Yes.

Q And that advice presently that you're providing is generally through DFO Science to DFO managers?

A And to the general science community. We are in the field all the time too, so we do talk to stakeholders and the public all the time, right, on an informal basis.

Q Okay. Just two more brief questions. One is I wasn't clear, do your MAs make adjustments to uncertainties that are -- increasing uncertainties that are being developed around run timings and run shapes and run profiles? Do you make an adjustment within the MA for that?

A We looked at how sensitive the MA models are to changes and run timing and run shape. In the case of the pre-season, we generate -- because the run timing is a critical one, we generate forecasts on a daily basis so that managers can see what the actual impact of the MA would be by changes in the actual run timing itself. So that's how the uncertainty is incorporated and produced.

In the case of the run shape, we still -- this is a 19-day mean average, so there is no shape associated with that.

Q Okay. One final question. We've heard a couple of times about - and haven't heard much detail at all - about some work that Kristi Miller is doing. I understand it's what's generally called genomics, and I wonder if you could just briefly describe to Mr. Commissioner what genomics are and what value they may provide in better assessing environmental impacts on salmon.

A I will be brief because I think Kristi Miller or someone else would be better to actually address

this. But in this case, the genomics, we're looking at -- we normally do, or historically have done, is looked at sort of the physiology of the fish. We look at its blood, we look at hormone levels, we look at stress levels. But we can only do limited -- maybe 20 parameters.

What the genomics allows us to do is look at 16 or 30,000 genes that are being turned on or off, so it's looking at a holistic organismal response, so you can actually look at the condition of the fish, take a snapshot of what it's actually doing, how it is, and if you take a biopsy of the fish and then release it and track it through radio tracking or acoustic tagging, you can trace its fate in terms of survival. So you can see whether or not the condition of the fish at the time of capture, and how it's doing, its overall health state, by looking at all these different genes that are turned on or off, or being expressed or not expressed, and see whether or not -- probably a survival. That's the work that's being referred to here.

Q And that work actually, as it develops, would it help us assist in assessing more precisely conservation units; is that correct?

A From a conservation unit perspective?

Q So if we know the gene -- through the genes work already, you know what conservation unit it is, so if you were assessing the conservation unit through the genes, you're also then doing the kind of health of the salmon approach that genomics does. I'm just wondering, that might be --

A Yes.

Q -- a positive thing; is that correct?

A In terms of this application, you know the actual conservation unit the fish belongs to. You'll know its actual health condition at the time, and then you can trace its fate. You can see whether or not some populations may be more vulnerable than others to environmental conditions or other insults that are thrown at it.

Q So it will help us become more precise. How would that work help your work in setting management adjustments?

A How would it help? Well, right now we're in discussions and trying to -- exactly how you could incorporate these biomarkers or bioinformatics

information into the management itself.
Yeah, I can envision in some cases how it would work. This is sort of a work in progress, I guess, that needs to be filled out. This is part of a three-year project that's ending this year, so we are involved in the post-doc right now to look at some of how this stuff could be incorporated. It does have promise, but it takes time to develop.

Q I guess one of the reasons why I, as a layperson as we called ourselves, became instantly interested in is that it's difficult to do cumulative impact assessments because there are so many different variables. It would be difficult to get measurements of all those variables.
But from a genomics perspective, you're letting go of measuring all the different external variables and you're trying to more concretely understand the salmon's response to those variables and you can actually do that at a conservation unit. So it seems like a -- I know it may be cutting edge, but it seemed very useful in the challenges associated with cumulative impacts.

A Yeah, and conceptually it's a bit of a shift, because we're now using the fish as an indicator of the environment and that habitat, as opposed to the other way around in the past. So we've done this successfully in other cases, looking at individual aspects of fish physiology and survival, so in this case we have a much broader ability to look at the whole organism response. It does show promise, although it takes a long time to go from that to actually being implemented as a management adjustment process.
I've seen this many time and time again. It's difficult to go down that road. I'm not saying -- it will require work to get there.

MS. GAERTNER: Those are my questions, Mr. Commissioner.

MS. BAKER: Thank you. Mr. Commissioner, I just have one quick re-exam question.

RE-EXAMINATION BY MS. BAKER:

Q Mr. Leadem asked you, Mr. Patterson, if you used the pre-season forecast of temperature in-season,

and you said that you used a pre-season forecast to create a place-holder for management adjustment in season. I just wanted to clarify that in season, for management adjustments, there are ongoing forecasts done of temperature. There's not a reliance on pre-season where they forecast in season.

A As soon as the in-season forecasts become available, then the MA models themselves will be updated.

MS. BAKER: Thank you. Those are all my questions, Mr. Commissioner. Thank you, Mr. Patterson, you can step down.

Our next witnesses will be the panel from yesterday.

AL CASS, recalled.

ROB MORLEY, recalled.

MICHAEL STALEY, recalled.

KEN WILSON, recalled.

MR. TAYLOR: Mitchell Taylor, Mr. Commissioner. With me is Hugh MacAulay. I'll continue with my questioning of this panel from yesterday.

CROSS-EXAMINATION BY MR. TAYLOR, continuing:

Q First, and with some measure of risk to me, I'm going to pick up on something that Mr. Patterson was testifying to and have the panel clarify or see if you agree that I've got things right here.

The Commissioner had asked Mr. Patterson about the connection or link between management adjustments and FRSSI in terms of the modelling exercises. Now, am I right - and I'll ask any panel member of this, whoever wants to answer - that, as a starting point, you can use FRSSI to determine the TAM and the escapement number? Am I right so far? Mr. Cass, perhaps?

MR. CASS: Mr. Commissioner, yes, that's correct. FRSSI is all about the TAM rule.

Q And then am I further correct that you use the management adjustment to apply to and incorporate that into the TAM or the MA is applied to and

incorporated in TAM?
MR. CASS: That's correct. I invite others to respond.
Q So, at bottom, TAM is made up of the harvest rate or harvest number plus the management adjustment?
MR. CASS: Yes.
Q Then if you look at matters for the other end, so to speak, the harvest number is TAM minus the management adjustment.
MR. CASS: Correct.
MR. TAYLOR: Now, this is a question of Mr. Cass. I wonder if you could turn, Mr. Lunn, to CAN 252068, which is in Canada's binder at Tab 2.
Q Mr. Cass, do you recognize that document? I know you can only see the cover of it at the moment. We can turn up more if you need it.
MR. CASS: Yes, I recognize that document.
Q Can you say what is it and who prepared it? I don't mean the person, but what organization?
MR. CASS: If it's possible, Mr. Commissioner, to scroll down to -- I think there might be an abstract or Executive Summary. That's correct, okay.

This is a summary document that's produced annually in preparation for pre-season planning activities. That's my recollection. So this one would be for 2010.

Q All right. And is that prepared by the Fisheries Department?
MR. CASS: Yes.
MR. TAYLOR: Could that be marked as an exhibit, please?
THE REGISTRAR: Exhibit number 407.
THE COMMISSIONER: Is this document in the binder?
MR. TAYLOR: It's in what's called Canada's list of exhibits, and I'm not sure whether that gets to you, Mr. Commissioner, or not. I'm getting an indication not.
THE COMMISSIONER: And the exhibit number, I'm sorry, Mr. Taylor, is...?
MR. TAYLOR: It's 409, I believe, Mr. Registrar?
THE REGISTRAR: It's 407.
MR. TAYLOR: All right, sorry, 407.

EXHIBIT 407: Document titled "Fraser River Sockeye Escapement Strategy 2010, Model Overview and Summary of 2010 Planning Simulations

MR. TAYLOR: Now, if you turn to page 12 of that, please, Mr. Lunn, I've got a couple of questions of Mr. Cass.

Q This page is speaking to the "History of Model Revisions" under FRSSI, and you'll see that in the second bullet in the first half of the page, there's a heading "Model Structure". Then it reads:

> The model now includes the option to specify stock-specific escapement strategies (as in Figure 1, previous page) --

And that is a figure that we've seen before in other documents.

MR. TAYLOR: Maybe just for a moment, Mr. Lunn, can you just go to the previous page and then back again to this page?

Q You're familiar, panel, with those charts that we've seen before in other documents. Then if we go back to page 12:

> The model now includes the option to specify stock-specific escapement strategies --

As per what we just looked at.

> -- so that the total allowable mortality for stock would be based on its individual abundance rather than aggregate abundance.

So from this it's evident that the option is there to do what's said. Can any of the panel members say to what extent that option is then applied in fisheries management in any given year?

MR. CASS: Mr. Commissioner, I guess I'm hesitating a bit because while I understand what that sentence says in that bullet, yes, it's possible to derive a TAM rule for each stock, and that has been done as it says. There would need to be some assumptions about how the in-river environmental mortality is included in that, because the last I had been aware, the en route mortality is based on a run-timing aggregate, so if you're talking about stock-specific escapement strategies and using the in-river mortality that's included in the TAM, it would have to reflect a particular run-timing

group in the absence of assumptions about in-river mortality being attributed to at the stock level.
Q So is what you're saying that the option is there, but it would be very difficult to execute in practice because of the nature of beast, so to speak?
MR. CASS: You could execute it. If it was confined to a particular timing group, that's possible. To the extent that it has actually been considered and adopted in management, I don't know the answer to that.
Q All right. Mr. Staley or Mr. Wilson, do you have anything that you want to add to that?
MR. WILSON: No.
MR. STALEY: I do recall, actually, the model being used with this option, but it wasn't in a management context. It was in the context of evaluating some options for discussion with the United States as to how to aggregate and disaggregate the stocks in the round of negotiations which has now been postponed.
Q Was that being done in a theoretical sense or in a real world on-the-fishing-ground sense?
MR. STALEY: In a theoretical sense for the purposes of determining what the consequences of different aggregations that may be agreed to with the United States for management.
Q All right. Thank you. Mr. Morley, did you want to add anything to that?
MR. MORLEY: No, thank you.
MR. TAYLOR: Okay. If we could, may we go to Exhibit 398, please? Specifically page little Roman numeral (iii). Well, first we should go to the cover, I think, so that people can orient themselves.
Q You'll recall this document, I think, panel members, from yesterday. This is the report of 2008 that Pestal and others prepared. If we could go to (iii), this being a report on the "Collaborative Development of Escapement" work, now you'll see there a list of participants at one or more workshops. As I understand it, both you, Mr. Morley, and you, Mr. Wilson, were present at these workshops; is that right?
MR. WILSON: Not all of them, no.
Q All right.
MR. MORLEY: I was present at most of them.

Q Okay. Thank you. Mr. Wilson, were you present at very few or most of them or half and half, or what?
MR. WILSON: I was involved at the beginning of the process for several years, and the organization that I work for removed itself from that process. I was also involved later on, on behalf of the Upper Fraser Conservation Alliance.
Q All right. This page is indicating that you were present at one or more workshops in 2007, and a workshop in 2008; is that correct?
MR. WILSON: I'd have to check my own records, but I'm not certain that I was at the meeting in 2007.
Q All right. Well, we'll leave it at that. With that, these workshops and meetings were a bringing together of stakeholders and scientists to develop consensus or aimed at consensus and developing recommendations for then being incorporated into the Harvest Management Plan; is that right, Mr. Morley?
MR. MORLEY: Well, these workshops were totally directed at developing the FRSSI model and coming up with the options that would be considered as part of the integrated fishery management process, yes.
Q Yes. Thank you. And were these workshops attended by representatives of First Nations, commercial fishers, recreational fishers and industry?
MR. MORLEY: When you say representatives, there are members who are part of there who do come from those sectors. As to whether they represented their sector at the meeting, I wouldn't suggest that was the case.
Q All right.
MR. MORLEY: Certainly from the First Nations prospective, I would suggest that most of the people who were there were technically-oriented people and not sort of the policy or management-directed First Nations representatives.
Q All right. Well, you've put it better than I, thank you, that people attended who were from the sectors that I've described; is that right?
MR. MORLEY: Yes.
Q And you recognize from the list in front of you a number of names who are First Nation people; is that right?

MR. MORLEY: There's several names that are First Nation people and some that are technical non-First Nations people who may be employed by First Nations organizations.
Q Right. Well, you recognize Brian Assu, Pat Matthew as First Nation people, Morgan Guerin; is that right?
MR. MORLEY: That's correct.
Q And were these meetings part of a structured decision-making process?
MR. MORLEY: There were exercises of structured decision-making that were part of the meetings, but that didn't run the entire process by any means.
Q Okay. As a result, was the outcome of these meetings that a fair level of consensus was developed and recommendations made for onward movement to being considered in the Harvest Management Plan?
MR. MORLEY: I wouldn't characterize it as being consensus from the participants whatsoever. That wasn't the nature of the input of the participants. We provided our view and advice, and the technical people in DFO went away and developed their model and put forward the options.
Q All right.
MR. MORLEY: That was certainly not consensus amongst the participants that that was the appropriate approach.
Q All right. The model was then developed, informed by the input that had been provided at the meetings, was it?
MR. MORLEY: You'd have to ask DFO as to how they used the advice.
Q Okay.
MR. MORLEY: Because I wouldn't suggest that my advice, in particular, informed their approach.
Q Mr. Wilson, do you have anything to add to that?
MR. WILSON: Yes. I would certainly say that the advice I provided doesn't appear to have been incorporated in large part.
Q All right. Mr. Staley, am I right that you were not at these meetings, or have I got that wrong?
MR. STALEY: No, I believe I was at most of the workshops in one form or another, yes.
Q All right. And you've heard what Mr. Morley and Mr. Wilson have just said, which is that there was

input provided. You agree with that, I take it?
MR. STALEY: There was input provided, yes.
Q And did you see aspects of the input provided reflected in the ultimate Harvest Management Plan?
MR. STALEY: I would say there were aspects of all of the input, yes. Some parts of them were incorporated, yes.
Q You'll never be able to include everyone's input, recognizing the diverse nature of the stakeholders in the Harvest Management Plan, will you? It will always have to be an amalgam and bits will be included and some won't.
MR. STALEY: I seldom say never.
Q Okay. Will you agree with me, Mr. Morley, that the meetings added transparency to the developing the harvest numbers and the escapement numbers?
MR. MORLEY: I don't like the terminology "transparency". I think that there was some discussion of some of the options and some of the consequences with some of the stakeholders, but a large number of people who are affected by this certainly were not involved in those discussions, and certainly weren't informed of the technical nature of how the FRSSI model incorporated the objectives setting that DFO put into it.
Q Well, at the meetings you could ask questions of the DFO people, couldn't you?
MR. MORLEY: You could ask questions of the technical people who were doing the work. Most of the technical work was not done by DFO people. It was done by Gottfried Pestal, who was a consultant to DFO.
Q Will you agree with me, though, that the meetings offered any number of stakeholders, including yourself, an opportunity to hear what DFO had to say and provide input on the FRSSI work?
MR. MORLEY: Yes.
Q You'll agree with that too, Mr. Wilson?
MR. WILSON: Yes.
Q All right. And Mr. Staley?
MR. STALEY: Yes.
Q Now, Mr. Cass, I want to take you to two documents that are in what's called Canada's list of exhibits at Tabs 5 and 6, and there should be a binder up on the witness table, I believe, that will have those in it.
MR. TAYLOR: Again, Mr. Commissioner, these are

documents which I understand have not yet been provided to you. This is the document at Tab 5 that's up on the screen now. If, for a moment, we could go to the next one at Tab 6.

Q Do you recognize each of those documents, Mr. Cass?

MR. CASS: Yes, I do.

Q Can you recognize them as the 2007 and 2008 version of a document that we've already seen for 2009 being Exhibit 322, I think it is, that's been referred to?

MR. CASS: Yes, that's correct.

MR. TAYLOR: I'd ask that these two documents be marked as the next exhibit.

THE REGISTRAR: Do you wish them independently or together?

MR. TAYLOR: I think independently is the best route to go.

THE REGISTRAR: Document number 5 will be 408. Number 6 will be 409.

MR. TAYLOR: Thank you. So just to be clear, then, the Escapement Strategy for 2007 is Exhibit 408, and the Escapement Strategy for 2008 is Exhibit 409.

EXHIBIT 408: Escapement Strategy for 2007

EXHIBIT 409: Escapement Strategy for 2008

MR. TAYLOR:

Q Now, one further document I want to take you to, Mr. Cass, is again in the binder of Canada's exhibits at Tab 1. It's a deck that was prepared apparently for a CSAP meeting in May of 2010. Do you recognize that document, Mr. Cass?

MR. CASS: Yes, I do.

Q And just remind us CSAP stands for what?

MR. CASS: It's Canada Science Advisory Secretariat. CSAP is the Centre for Science Advice Pacific.

Q All right. If you turn to pages 7 through 9 of that document -- I'm not sure if Mr. Lunn can -- probably can't show all pages at once, but if we take -- oh, there we go.

Pages 7 through 9 set out what's referred to as "Guiding Principles". They're now getting quite small on the screen. If you want them enlarged, say so. But if you could have a look at that, then my question of you is whether what's

set out there are the guiding principles underpinning FRSSI, as you understand it.

MR. CASS: Mr. Commissioner, these are certainly -- you could call them guiding principles, yes. I'd have to look very closely to make sure I understood what each one says, but we did have some certainly guiding principles that were used to guide the process, if you like, so I would agree that these are -- these represent those.

MR. TAYLOR: All right. If that could be marked as the next exhibit, please.

THE REGISTRAR: Exhibit 410.

EXHIBIT 410: FRSSI presentation to CSAP meeting May 2010

MR. TAYLOR:

Q Then one more document I'd like to take you to, Mr. Cass, is at Tab 4 of that same binder. This is entitled "Guidelines for Applying Updated Methods for Assessing Harvest Rules for Fraser River Sockeye Salmon." Do you recognize that document, Mr. Cass?

MR. CASS: Yes, I do.

MR. TAYLOR: If you just -- can we just get the whole of that page on, Mr. Lunn?

Q This document appears to be January of 2011; is that right?

MR. CASS: This document, there's been various drafts of this document, so I'm not sure exactly what version this is, but it does have the Science Advisory Report number, so yes, you --

Q Maybe you could explain what is this document? Who prepared it and what's its purpose?

MR. CASS: This document is an output from the science advisory process or the peer-review process of the -- in this case, the document that was the draft research document, if you like, or working paper that was reviewed by DFO at a peer-review meeting in May 2010. This particular document is called a Science Advisory Report.

The intent is to summarize the content of the meeting in terms of what was reviewed. It also contains conclusions of participants at the meeting as well as recommendations based on the review and provided by reviewers at the meeting.

So it is a DFO document, as I was saying.

The series is a Science Advisory Report that is available at a DFO public internet site.

Q This is all in relation to FRSSI, is it?

MR. CASS: This particular document is, yes.

Q Yeah, it's an evaluation of the FRSSI methodology?

MR. CASS: That is correct.

Q If you turn to page 5 of this document, you'll see there at the bottom, and then over onto the next page, page 6, "Conclusions and Advice". It says that:

> The application of the FRSSI model for Fraser River sockeye salmon planning is endorsed. It was concluded that the alternative assumptions currently available in the FRSSI model establish reasonable bookends on plausible scenarios and allow users to explore a comprehensive suite of "what if" scenarios in the collaborative planning process.

So when it says this "is endorsed", who is it endorsed by?

MR. CASS: At these peer-review meetings, one of the main issues is whether the methodology is considered by those who have participated, whether it's considered sound and considers all the inputs that's available. It's the best available information at the time. So participants are asked, or at least given an opportunity to reflect whether they believe the methodology meets the standards from a scientific point of view.

So, in this particular case, this document was approved -- or, sorry, the content of the working paper, the methodology, was approved by the committee subject to revisions that would be laid out at that meeting, and so approval has a condition that the revisions to the document, in the case of the research document, which the working paper eventually becomes, that those revisions are approved and signed off by the chair of the meeting to indicate that the revisions meet the standards that were agreed to at the meeting.

Q And are the peer reviewers, both inside DFO and outside scientists?

MR. CASS: That is correct.

Q Do you know who or what organizations or where the

peer reviewers came from for this one?
MR. CASS: Well, I think Mike Staley was a reviewer, but --
MR. STALEY: Not a formal one.
MR. CASS: Oh, okay.
Q That's fine if you don't know.
MR. CASS: I believe Randall Peterman was but I'd have to check.
MR. TAYLOR: That's fine. May this document be marked as an exhibit, please?
THE REGISTRAR: Exhibit 411.

EXHIBIT 411: Guidelines for Applying Updated Methods for Assessing Harvest Rules for FRSS, January 18, 2011

MR. TAYLOR: Now, I have a few questions of Mr. Cass to do with Policy and Practice Report number 5, which is the Policy and Practice Report on harvest management. These, Mr. Commissioner, as you may recall, are papers that the Commission staff have put together, and then they file them as exhibits for use in the hearings.
They're no-name authors as I understand it, and I've got some questions of Mr. Cass on a couple of points.
Q If you turn, please, to paragraph 96 on page 40 and 41, this paragraph is speaking to the productive capacity of Fraser sockeye may possibly be limited in freshwater spawning or rearing areas.
Mr. Cass, can you say anything about whether there are real or possible issues for Fraser sockeye productivity relative to their time in the marine environment?
MR. CASS: There are estimates of marine survival, or at least survival of Chilko smolts, mainly going back to the early '50s, late '40s, 1940s. When I say Chilko smolts, I mean from the time that these fish leave the lake, there is a facility there that estimates the numbers of Chilko smolts that leave the lake and are bound, then, for the ocean. So there are estimates of marine survival, or at least the survival from the time they leave the lake and the time that they return based on the return of adults. So there are estimates of survival for Chilko Lake.

There are also some estimates based on Cultus Lake sockeye, but they are -- there's not a continuous series. So there are estimates of survival, if you like, which are different from freshwater survival based on the smolt survival, if you like. So there are estimates of ocean productivity if you make some assumptions about what mortality may have occurred in the river outbound towards the ocean.

Q And, from that, can you say whether there are limitations that may be placed on the productivity due to the marine environment?

MR. CASS: There are certainly marine factors that affect the survival, inter-annual survival if you like, over time. So that affects the productivity of the population, yes.

Q Okay.

MR. CASS: It's a little different than if you think about the capacity of the ocean, but in terms of productivity, there are measurements based on survival.

MR. TAYLOR: I note the time. Ms. Baker wanted to break at a certain point.

THE COMMISSIONER: All right. 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.

CROSS-EXAMINATION BY MR. TAYLOR, continuing:

Q Continuing with PPR-5, Mr. Cass, if you could turn to page 45 and paragraphs 109 and 110, I'll give you a moment to have a read through those and, in particular, I'm looking at 109(c) and paragraph 110. My question of you is whether you have a comment on the accuracy of what's said there, and with that question I'll let you read and absorb it and then answer.

MR. CASS: Yes, in reference to 109(c), that has been done. That is a recent add-on, if you like.

Q And more specifically, what is the recent add-on, and what correction are you making?

MR. CASS: Others can help me on this, but the idea was

to, because we are constrained, if you like, by the timing groups that are the aggregates of individual stocks, and so the point here was to, I believe, although it's not exactly stated there, to get at this issue of overlapping run timing groups and to account, attempt to account, for different TAM rules for the different run timing groups and whether there's an overlap, in order to adjust the exploitation so that you can separate the exploitation for the timing groups in the area that they overlap.

Q So are you saying that the FRSSI model can and does simulate the effect of TAM rules on the four running groups at once?

MR. CASS: Yes, I believe that is now built into the model.

Q All right.

MR. CASS: You might ask my colleague, Mr. Staley, whether it is --

Q Mr. Staley or Mr. Wilson, do you want -- Mr. Staley has something?

MR. STALEY: Yeah, I believe the new version of the model -- I'm not sure which document we're -- this is the --

Q This is a report that the commission staff have prepared, that's in front of us on the screen right now.

MR. STALEY: Oh, commission staff, okay. Earlier versions of the computer model did not allow -- they were correct, did not allow -- FRSSI did not simulate them all at once; it did them individually. But the current version that was the subject of the May CSAP review, that version of the model will be able to run the four -- or any type of aggregation/disaggregation of the 19 units together --

Q All right.

MR. STALEY: -- to look at the interaction or overlaps, as it's represented and extracted in that model.

Q All right. Thank you. Mr. Wilson, do you agree with that?

MR. WILSON: As far as I know, yes.

Q Thank you. Now, we heard some evidence from panel members yesterday about the fact that the modelling uses the past to look to the future. With that, can the model, is the model capable of taking account of variables to the extent that

they're foreseeable that may arise in the future and bring that into the modelling work? Mr. Staley?

MR. STALEY: Yes, it's capable to represent many of the things that we expect are possible to happen.

Q Do you agree with that, Mr. Wilson?

MR. WILSON: Yes. The model looks at a range of future possibilities.

Q All right. And the model has the flexibility to take account of differing variables that might be foreseeable, and that can be incorporated into the modelling, can it?

MR. WILSON: Is that a question for me?

Q Yes.

MR. WILSON: It does what it does. There are some things the model can deal with, and some things the model can't deal with.

Q Okay. Do you have anything to add, Mr. Cass?

MR. CASS: Only that I think, as the way you've phrased that point, Mr. Commissioner, that it's a model to look at long-term strategies, so as Mr. Staley pointed out, any view or scenario can be constructed that would be an attempt to bookend or represent possible future scenarios.

Q All right. Yesterday, Mr. Morley gave some evidence in relation to Exhibit 322, that's the document that's been up on the screen several times with the curves that are now well familiar to many of us and very familiar to you as panellists, and maybe if I could just bring up 322, page 15, I think it is? Yeah. Now, looking at that bottom graph and the curves there, Mr. Morley gave some evidence that in a given year there's no difference, conservation-wise, between options 2, 3, and 4, and yet the impact on the harvest rate of taking a different option, one from the other, was quite substantial, as he pointed out.

Now, with that, and I'll ask Mr. Staley first, while you might not see a conservation difference in one year or in a one-year sample, could you, using different options, see differences or an improved probability of survival of a weak stock in the long-term? In other words, long-term, does the use of different options make a difference?

MR. STALEY: It's my understanding that this graph

represents, or at least the top panel represents the probabilities of occurrences, I guess, in the simulations of catches and escapements being above or below various benchmarks, but in the long-term. And so the graph at the bottom is more of a long-term. However, these are sort of updated and reviewed on an annual basis. But I look at this one particularly, and this may or may not be a good example, that the conservation, what might be considered a conservation performance measures, such as the spawning escapement numbers, they're relatively insensitive, I think very insensitive, to where you set the one lever or knob we have on these policies, which is the setback.

So this example here, I'd have to say, you know, is the long-term estimation that's in the models, is that this particular model population is not sensitive. The two measures we have shown here of escapement, which are representative of some of the conservation issues, are relatively insensitive to which of the TAM rules is chosen. That would be my reading of this graph.

Q Okay. I'm just going to ask if you could bring that down to plain language and picking up on my question, are you saying that you would expect to see improved probability of survival of a weak stock in the long term, using different options, or no difference?

MR. STALEY: I would expect that, depending on what the weak stock was, but this graph doesn't show us -- isn't dealing with what we can -- well, Early Stuart is currently weaker, but it's managed as a separate entity. But if there were a weak stock mixed in with this stock, it may behave different. The performance measure that is not modelled in FRSSI, if there is such a thing, and if it were, if we were able to construct those same performance measures for that, they may show some different sensitivity to which TAM rule you choose.

Q All right.

MR. STALEY: So I guess there's no yes or no answer. You'd need to tell me what the - not exactly, but approximately - what the productivity and so on and the parameters were of that weak stock to be able to understand whether the difference in these TAM rules would have a consequence on a

conservation measure such as the escapements.
Q Okay. Mr. Wilson, do you want to take a run at this? Have you got something to say in answer to my question?
MR. WILSON: Not at this time.
Q Okay. Mr. Cass?
MR. CASS: No, I think that's a good summary of what's in these graphs.
Q Okay. Now, Mr. Morley, you opened this up, to some extent, with your evidence. You were speaking, as I understood you yesterday, no difference conservation-wise in the given year that this was being done for, but would you agree with me that while you might not see a conservation difference, option to option, in the year in question, would you expect to see improved probability of survival of a weak stock long-term using different options?
MR. MORLEY: Mr. Commissioner, I believe the learned gentleman has misunderstood my comments yesterday. I said exactly the opposite, that what this analysis shows, as Mr. Staley just said, is that there is virtually no difference, conservation-wise, long-term between option 2, 3, and 4. There is a considerable difference on what might happen within a given season, depending on the size of run coming back, and that was the point I was making about one of the weaknesses of how the FRSSI model is being used to evaluate escapement options, because it is not demonstrating some of these significant differences that will impact on all users in the short-term from applying some of these long-term models.

And, in fact, you know, your question about a particular weak stock can't be answered by looking at this particular graph, and so you have to know the characteristics of the weak stock and what levels of exploitation it can withstand in order to answer your question.
Q All right. So the answer, then, is whether there's going to be a difference long-term will depend on the particular characteristics, the particular parameters that apply to the weak stock in question, then?
MR. MORLEY: Yeah, assuming, I mean, as I say, we keep using these terms of "weak stock", "small stock", and what have you, and unless you get more clear

as to what you're talking about and what the productivity levels are, it's very difficult to answer the questions.

Q All right. Mr. Wilson, yesterday you expressed some concern about using the historical data to then look into the future, and as I understood your evidence, you were questioning whether you would get an accurate picture by doing that and you, at one point, said that one should look at the present, but will you agree with me that it is useful to look at historical data as an information source and to inform what could be happening in the future?

MR. WILSON: Yes, I'd agree with you.

Q Now, a couple more questions, then I think I'm done. Mr. Morley, it seems to me that a consequence of your approach, and I'm taking 2010 as an example, and you referred to 2010 yesterday, is that you would say where there's a lot of fish, fish hard have a high harvest rate even though it's not known what the impact of that would be on small or weak stocks, however you want to call them, that are mixed in, and you could thereby do damage unknowingly to those small or weak stocks; isn't that the case?

MR. MORLEY: Mr. Commissioner, again, I think my comments are being misconstrued and, in fact, what I suggested was that there needs to be a much more dynamic analysis of the risks and the consequences on an in-season basis, depending on the relative strength of the runs we see coming back, whether they be an amalgam of the whole Early Summer population that might place a constraint on your ability to catch the larger Summer run population or whether, as in the case of 2010, it was the Cultus Lake sockeye that were placing a constraint on our ability to optimize or maximize a harvest of the Late run composite.

In 2010, I think the analysis that was done was based on a feeling -- or a forecast that in fact the population that we were concerned about, i.e. Cultus, was, in fact, coming back at a level that was much higher than what had been identified as being an objective to meet in the Cultus Rebuilding Strategy, a group -- I was on that Cultus rebuilding team that developed the objectives, and the analysis that was undertaking

in-season was one that said, instead of putting an extra one or two thousand or three thousand Cultus fish on the spawning grounds, when we expected to see, based on the size of the runs coming back and the forecast for Cultus, a run of ten to fifteen thousand, that if we had held to the preseason exploitation rate that was in the TAM rules that were laid out in the plan, we would have given up somewhere in the range of two to three million sockeye in the catch for all user groups for the Late runs.

So that was an assessment done based on what we saw in-season, rather than suggesting that we stick to TAM rules that are developed in the long run for a 40-year simulation based on some evaluation techniques that I think are suspect.

Q You're referring to Cultus in the answer you just gave, but you know, of course, that there would, in any given year, including 2010, be other weak stocks that we simply wouldn't have information about, mixed into the run, right?

MR. MORLEY: We certainly do not have any other stocks that, so far, have been assessed in the same kind of status as Cultus. In terms of what levels of exploitation those populations may be able to withstand, I don't think you have the evidence to demonstrate that they couldn't withstand a harvest trade in the range of 50 percent. In fact, the evidence we do have is that the populations that are smaller populations continue to exist at some level within the river system and have been around for the last 80 to 90 years when we have had exploitation rates in the range of 75 to 80 percent. So I would disagree with you that we would be concerned about those populations.

Q In your answer there you seem to have hit on what I see as a fundamental difference of approach between some of the things you've said and, for example, the WSP. You seem to suggest that there should be evidence of harm, and absent evidence of that you go fish, as opposed to in areas or in times or situations of uncertainty one should be cautious. You seem to be very bullish and the WSP takes the opposite approach. That's a fundamental difference between your thinking and the WSP, isn't it?

MR. MORLEY: With respect, Mr. Commissioner, I don't

think the WSP has been fully implemented to the point of having reached those conclusions as to what the appropriate mix is between yield and biodiversity in the Fraser, and in order to come to that assessment as to whether or not I'm being bullish, or looking at trying to analyze the relative impacts here, we need to learn a lot more about those populations that you profess to be concerned about.

We have not had an official assessment of those populations. We have not had an analysis of what is causing those populations to be in the state they're in. We have not had an analysis as to what impact exploitation rates may or may not have on those populations. So I cannot, in a sense, the evidence we do have, as those populations continue to exist at some levels and have withstood far higher exploitation rates than we're looking at under any of these scenarios we're developing today.

So bullish, you know, when we're harvesting in the 30 to 40 percent and maybe get to 50 percent once in a while, that's not bullish; that is very, very conservative exploitation of Fraser sockeye.

Q Will you agree with me that where you have uncertainty, it's better to be cautious in fisheries management than to charge ahead?

MR. MORLEY: Where you have uncertainty, you need to evaluate the risks and the consequences taking into account the uncertainty. The question as to whether you should be risk-averse, risk-neutral or risk-prone, I think the evaluation needs to be risk-neutral and we need to have scientific advice that provides risk-neutral advice to the decision-makers.

Caution, in the sense that you're putting forward, is something that the decision-makers need to take into account when they determine, again, what this trade-off is between biodiversity and benefits to the resource users.

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

MS. BAKER: Thank you, Mr. Commissioner. The next counsel is Mr. Leadem.

MR. LEADEM: Leadem, initial T., appearing as counsel for the Conservation Coalition. I should also

indicate, Mr. Commissioner, for the record, that Mr. Wilson is affiliated with Watershed Watch, one of my clients that make up the Conservation Coalition, and in that sense, I'm going to start by asking him questions in direct, and then I will move to my cross-examination of the entire panel.

CROSS-EXAMINATION BY MR. LEADEM:

Q Mr. Wilson, in your evidence, you said that you and Mr. Young, Jeffery Young, from the Marine Conservation Caucus, withdrew from the discussions around FRSSI sometime in 2007 or so; is that right?

MR. WILSON: Yes, it would have been early in 2007.

MR. LEADEM: I'm going to ask Mr. Lunn to pull up a document. It's document number 9 from the Conservation Coalition Book of Documents.

Q And you should have before you a letter dated February 28, 2007, to Mr. Ryall from DFO. It's a three-page letter - and if you can just flip to the last page, Mr. Lunn - it appears that you signed that document, Mr. Wilson?

MR. WILSON: Yes, I did.

Q And does that letter spell out the reasons why the Marine Conservation Caucus suspended involvement in the FRSSI?

MR. WILSON: Yes, it does.

MR. LEADEM: Might that be marked as the next exhibit, please?

THE REGISTRAR: Exhibit 412.

EXHIBIT 412: Letter from Wilson, Orr and Young to Paul Ryall, dated February 28, 2007, re: FRSSI/WSP Pilot

MR. LEADEM: I'm not going to go into this document at length, Mr. Commissioner.

Q But I will ask you, Mr. Wilson, to look at the language at the bottom of the first page, if we could go back to the first page, please, Mr. Lunn. I find these words:

> Specifically, the FRSSI process is asking the question, "What is the best way to manage sockeye aggregates and what are the consequences of harvesting these aggregates

in mixed-stock fisheries at different rates?" The MCC is interested in asking a different question. We want to understand the consequences of alternative harvesting strategies on the individual conservation units that the WSP is intended to protect.

Is that still your opinion today?

MR. WILSON: Yes, it is.

Q You also gave evidence concerning your critique of FRSSI and referenced the fact that, at some stage, you appeared at a FRSSI workshop on behalf of the Upper Fraser Fisheries Conservation alliance; is that right?

MR. WILSON: That's correct. I attended meetings on January 21 and 22, 2009.

Q What kind of organization is the Upper Fraser Fisheries Conservation Alliance?

MR. WILSON: It's a group of First Nations.

Q And I assume, from the name, that they're situated in the upper Fraser River system?

MR. WILSON: Correct. Generally, from Williams Lake north to the top of the watershed.

Q And as part of your attendance at that workshop, did you produce a document for the Upper Fraser Fisheries Conservation Alliance?

MR. WILSON: Yes. My contract was to provide a critique of the FRSSI process and provide that at a meeting between the Upper Fraser Fisheries Conservation Alliance and DFO.

MR. LEADEM: Mr. Lunn, could you please pull up document number 3 from the Conservation Coalition Book of Documents, please?

Q Is this the document that you prepared for the Upper Fraser Fisheries Conservation Alliance that you just alluded to?

MR. WILSON: Yes, it is.

MR. LEADEM: Might this be marked as the next exhibit, please?

THE REGISTRAR: Exhibit 413.

EXHIBIT 413: FRSSI Report, prepared by Ken Wilson for UFCA, March 2009

MR. LEADEM:

Q You've had an opportunity to review this before testifying here, today, have you?

MR. WILSON: I have, yes.
Q And are the conclusions and critiques contained in there still your opinion today?
MR. WILSON: Yes, they are. Generally, I'm still concerned about the same things.
Q And just so that I can draw this to the attention of the Commissioner - if we can look at page 7 of that document, please, Mr. Lunn - under the heading Conclusions and Recommendations, you say:

> There are multiple and significant possible sources of error and uncertainty in the FRSSI process and its application. I consider the loss of stationary -

-- should that be "stationarity" or "stationary"?
MR. WILSON: Stationarity.
Q Okay.

> - lack of data for the majority of CUs, and the assumptions around the makeup of run timing or management aggregates and the assumptions around the impacts of fisheries on these aggregates to be the most critical immediate concerns.

And those are still your views today, are they?
MR. WILSON: They are.
Q I want to turn, now, to asking some questions of the panel as a whole, and I want to begin by asking any of the panel members, and you'll have to excuse this question, because I am not a modeller and I don't quite understand how the model functions, but who runs the model? How is it handled?
MR. CASS: Mr. Commissioner, the model is run within DFO, there's a team associated with that, there's a consultant, Gottfried Pestal, who has the pen, if you like, on any technical issues or add-ons or changes to the model that are agreed to in the spirit of developing the capability of the model fuller.
Q And you mentioned, I think, Mr. Cass, and some of the other panel members mentioned, some of the variables that are fed into the model. So I gather from that, that what occurs is that various simulations are conducted of the model to produce

certain results that emanate from that model; is that how it works?

MR. CASS: Mr. Commissioner, there are inputs to the model that, as we've discussed, are largely driven by what we -- how we model the biological process and the main input for that are the spawners and recruitment data that we use to characterize the population dynamics. So that's one part, is the input from the biological perspective.

And then there are the harvest management levers, if you like, that vary the TAM rule according to the objectives, and then this is simulated on an annual timestamp forward 48 years, as we've described, and then the output is used, then, to assess the performance of a particular -- of those inputs, including the TAM rule, assess the performance of those inputs, in terms of the objectives that is used in the model.

Q So I take it from your answer then, Mr. Cass, is that - and if I can just break it down and make it simple so that I can understand it - is that numbers are put into this model and then some numbers are derived from the model, and then somebody takes those numbers and provides advice to somebody else in terms of management decisions that are made, then, on the fishery. Is that generally, from a simplistic perspective, how it works?

MR. CASS: Yes and no. I mean, the objective is to look at the consequences of alternative management strategies in the long-term. So the consequences are in terms of the performance of the range of harvest management scenarios and the biological assumptions about what's driving the biology. And so those consequences are really the output of what the model, the tool, provides. And so that then becomes the information that's used to guide management decisions.

Q All right. So obviously, then, somebody then conveys what the model says to the managers. Do the managers have some appreciation, in your view, to how the model functions and how it works?

MR. CASS: Well, certainly the key DFO managers that have been part of this process would have an understanding of the model. The model's been developed over a course of eight years, now. But I can't comment on others who may, internally

within DFO, who may use this at some point in time about their expertise.

Q All right. When the model is being applied in the sense of deriving certain strategies or certain results for in-season use, how is that then conveyed? I mean, is it conveyed to the Fraser River Panel, to the Fraser River Panel Technical Committee? What's the process involved in that?

MR. CASS: I'm not involved with the Fraser River Panel process anymore, but the process that occurs is this preseason management planning time, which starts up, well, in a month or so, but FRSSI would be used to generate the tables that you've seen in the various management plans, so at various run sizes that the FRSSI, the TAM rule would be used to identify the target escapement --

Q All right.

MR. CASS: -- based on the runs.

Q All right. I think I'm getting it, now. So when Ms. Grant came and gave evidence and she had lists and lists of tables and 50 percent probabilities of return and 75 percent probability return, those numbers actually came from the FRSSI model?

MR. CASS: No, those numbers are from the preseason abundance forecasts that currently Sue Grant is responsible for.

MR. LEADEM: Okay. I think I'm just going to confuse you, Mr. Commissioner, as well as myself. I'm hopelessly confused by some of this stuff right now.

Q I'm going to move on from that and suggest to you, based upon some of my confusion and some of the remarks I heard from you yesterday, that if we wanted to go forward in terms of some recommendations that would better assist the model and how it's being applied, that I seem to hear from you some consensus building that the communications of what this model does, how it's applied, why it's used and why it's used in decision-making, that all of you seem to indicate that there can be better communications around that aspect of the FRSSI process; do I have that right?

You're all looking at one another. Maybe I'll start with you, Mr. Staley.

MR. STALEY: Yes, I'd agree that one of the most challenging parts of this process has been trying

to communicate it to both people who have some, you know, educational capacity to absorb it. They even have difficulty. There's also those who have not had exposure to the kinds of tools -- these kinds of tools in the past. Communicating to them is a challenge, and I think that's certainly something that would benefit from more effort.

Q Would you agree with that, Mr. Morley, that better communication of what the model does and how it works would assist the people with whom you're connected with the commercial fishing sector?

MR. MORLEY: Well, it would certainly assist them to understand how the harvest rules and escapement rules are developed. I'm not sure it would assist in being any happier with what those roles end up being.

Q And Mr. Cass?

MR. CASS: Yes, I would agree that a challenge is to communicate at a level that people can understand in order for them to be part of the process. I think communication is key.

Q And finally, Mr. Wilson?

MR. WILSON: Yes, I agree very much.

MR. LEADEM: Thank you. Those are my questions.

THE COMMISSIONER: Before Mr. Leadem sits down, I'm going to try - I'm going to try - if we take 2009, the evidence I've heard at this commission is a much lower run than was expected or forecast, and 2010, in the evidence I've heard, is a much larger run than was forecast or expected. Take me through, if you can, Mr. Cass, the preseason, in-season and postseason use of the FRSSI model. And I'm understanding that there's a point in time before the fish arrive, when there's a lot of discussion taking place around what might be expected. But as Mr. Leadem alluded to, when we get to the point in time when the fish are showing up, what happens on the ground, and what happens postseason?

Maybe I can just frame it by looking at Tab 6 in your book, which is the 2010 - I don't know what exhibit it is - but the Updated Methods for Assessing Harvest Rules for Fraser River Sockeye Salmon, and on page 5 of that document, which may be on the screen, I don't know. It's the model overview under Methods. It's Tab 6, and page 5. And it says this:

The model is simply a thinking aid, a consistent way of linking and tracking some of the many considerations that are debated during the annual planning process.

So it would be helpful for me if you take 2009 and 2010, two bookends, I think, that are helpful for me, at least, because one, the evidence is far below expectations, and one far above expectations. And pretend that I'm a group of stakeholders trying to understand the use of this model, both preseason, in-season and postseason. Is it possible for you to do that?

MR. CASS: I'll give it a try --

THE COMMISSIONER: Thank you.

MR. CASS: -- and perhaps I could be helped by my colleagues on the panel.

THE COMMISSIONER: All right.

MR. CASS: So, yeah, preseason there's a model that we have that, as stated in this document, I'm not sure I'd use the words "a thinking tool", but it's certainly a guide to develop an escapement plan. So the objective preseason is to look at -- take 2009 for an example, look at the preseason forecast of abundance that is prepared by DFO and the abundance forecast is cast in terms of a probability distribution, so it's not a point estimate. But you have before you an estimate of the run size and the uncertainty around that run size.

So moving from the work that FRSSI does is to then take, in the preseason planning process, is to take that forecast and look at ranges to evaluate the different fishing scenarios. And Mike Staley may be able to help on the details of that. As I say, I've been removed a bit from that process.

So in the preseason planning process, FRSSI would then be used to develop various scenarios, if you like, in terms of an escapement plan that would be part of the usual preseason preparation. And 2009, of course, with going into the season, there was no indication that the forecast would be off or that the distribution that describes the abundance forecast would be off. But as we know, at the end of the season the evidence is quite strong that suggests, obviously, the runs were

very low and probably in terms of the forecasted distribution for some of the key runs, the 2009 estimated run season postseason would be far outside the normal range that we would have considered, so it was probably, you know, something that you might see one in a hundred years, for example. I don't have the distribution in front of me, but that's sort of the story.

So you have, going into the season, then, a preseason forecast that would be much larger than the run actually occurred, and so the estimates of in-season then that would be starting to be generated as the run entered our waters would be -- via the test fisheries, there would be signals starting around July, I guess, or certainly by the end of July, that would indicate that the run was likely to be lower than the forecast run.

So with the TAM rule and the escapement plan, because the TAM rule is designed to identify the target escapement based on the estimated in-season run size, there would then be a target escapement that would be the result of applying the FRSSI TAM rule and that, of course, would also identify what the overall harvest rate would be, depending on the run.

So as the information started to accumulate in-season that indicated the run was much lower than anticipated, there would be some recognition of what the impact would be of fisheries and in order to achieve the target escapement. And, of course, in the postseason sense, or near the end of the season, it was seen that there was no opportunity for fishing and, in fact, the escapement targets that were identified were on the very low end of the TAM rule, if you like, down in the non fishing zone.

So that's sort of 2009, how that would have played out. And I would invite, you know, somebody who's closer to the actual panel process, where I've gone astray, but I think that's my understanding of how FRSSI would be at least used in 2009, and Mike might...

MR. STALEY: I think, to give a little more clarity on it, the FRSSI model, itself, probably isn't used in-season at all; it's used preseason. It's used preseason to help evaluate alternative TAM rules, which are the total allowable -- which are a rule

that is, in theory, supposed to be applicable regardless of the run size that actually occurs. So it's a TAM rule that applies if there's almost no fish, and it's a rule that applies if there's lots of fish, like 2009 and 2010. That's the theory of it. So it's set preseason.

And then, in-season, the rule is then used to calculate what is the available harvest at any point in the season based upon the current estimate of run size, the current estimate of the management adjustment, and some other factors, test fishing and other things, the amounts of those, and from that is calculated the available catch. So that's what's used in-season, but the FRSSI model, itself, is not used in-season; it's used preseason to set up these rules which are, in theory, supposed to apply regardless of the run size.

In 2010, as Mr. Morley has pointed out, and perhaps -- not so much in 2009, but certainly in 2010, there were events and the estimates of some of the populations returning which were not necessarily outside of the rules, theoretically, but they were outside of the thinking of the people who evaluated those rules preseason, I think that would be fair to say. And so there may have been some adjustments to some of the aspects of those rules recommended, and in some case perhaps adopted, to recognize that not all we were -- the preseason was trying to appear like we were accounting for all possible futures, but we hadn't actually thought too much, I guess, most people hadn't thought about what the potential of the run that we did experience in 2010, what it meant.

So that's my explanation of the use -- I think, of your question, Mr. Commissioner, of what's used. Preseason it's used. It's not used in-season. The products of all the work that's done preseason is used in-season. And as I don't believe it's the FRSSI model, per se, is even used to any great extent postseason. There's some postseason accounting. Certainly the results of the season are then fed back into the dataset, the stock and recruitment dataset, and new stock and recruitment models are updated based upon the experiences from those previous seasons.

So the evaluation that a FRSSI model will now

or soon in the future will include the experience we had in 2009 and 2010, may give us different results than it would have without it. So that's how it might be used in the postseason, in that sense, but that's for planning for future seasons, that that will have some impact.

THE COMMISSIONER: Maybe you can just help me with one more thing. Both the FRSSI model materials that we have in front of us, the exhibits, and earlier this morning the management adjustment materials that we have, both used the term that these models are developed to assist with or the objective is escapement strategies. To the extent that both models are attempting to deal with escapement strategies, how do they interrelate and is there an element of double counting?

In other words, I'm more familiar with taking contingencies into account once, not twice or three times or four times. To the extent that contingencies, or if you want to call them uncertainties, are factored into these numbers, these models, which I take it the managers are using in-season as well, in other words, they have some guidance from these models, they have some numbers that have popped out of the models, using Mr. Leadem's example of people getting numbers and using them, how many times are uncertainties factored into these models?

MR. CASS: In the actual model, there's been various fine-tuning of the models, if you like, to account for things like what are plausible scenarios of future productivity. So that's one thing that's being treated seriously. There is also the actual structures of the model. So we've talked about Ricker models and Larkin models, but those are models that describe the population dynamics, and so that drives the population dynamics with including changes in productivity, for example, what we might think are plausible scenarios in terms of en route mortality, if you want to consider things like depensation. So there's a number of inputs into the model that you can vary to account for the uncertainty.

At the end of that, though, you have a TAM rule which is, going into the season, that is the -- we call it a TAM rule because it includes the management adjustment based on information that

occurs in-season. We would then have the TAM rule which is, if you like, if you're in the run size range of where the TAM rule is a fixed exploitation, has included a fixed exploitation, then the management adjustment is then estimated in-season and it's then included along with any estimates of fishing in the actual understanding of what the TAM rule tells you. It tells you what he total mortality is. Take from that the management adjustment, and you end up with what is leftover for removal.

And so when you ask the question on terms of the various uncertainties, there's uncertainty around, of course the management adjustment, there's uncertainties accounted for in the simulations used in the model, and so those are the, you know, so it's uncertainties that are part of the process of every step. There's an evaluation of the uncertainty that at least that we can estimate.

But as far as double accounting goes, you know, we have one TAM rule going into the season, we have a management adjustment that's applied in-season, and we have an escapement target that is the consequence of the TAM rule, and so opportunities for double accounting, I mean, there's opportunities for errors in terms of what you might expect to be in-river losses, so there's errors there, but double accounting, I don't see an opportunity where that would occur.

MR. STALEY: I think you explained it correctly, but I think one of the problems perhaps people are having is the use of the -- free exchange of the use of the words "the management adjustments" with what the actual mortality might be. The management adjustment is exactly that, it's an adjustment that management takes to try and account -- or try and best offset or ameliorate or - I forget the word - the effects of mortality or losses in the river that may occur. So in the context of FRSSI going in its analysis, it's not really modelling the management adjustment; it's using a historical representation of the kinds of differences that have occurred in simulating forward, and in simulating forward it's generating total runs and partitioning that into catch and mortality, and so some of the performance measures

that are based upon the catch side of -- catch types of calculations have been effected by the sort of this representation of this en route mortality.

Once we get in the season, then the concept of the management adjustment plays, and that's where we try to compensate for any potential losses, either mortality or other losses, in the management -- in the calculation of what's available to harvest. I hope that helps.

THE COMMISSIONER: Thank you all very much.

MR. ROSENBLOOM: Yes, Don Rosenbloom. I appear for Area B Seiner, Area D Gillnet.

CROSS-EXAMINATION BY MR. ROSENBLOOM:

Q I'd like to feed on the theme of what we have just been discussing most immediately, and speaking to the in-season processes, you have already told us that the FRSSI model is not applied for in-season management decisions. Mr. Morley has testified, yesterday, of the, I believe, his testimony of the inflexibility of making changes in-season in light of the results that are coming out of the test fishery and the early fishery.

First question to you in respect to in-season fishery is: Are you satisfied that there are appropriate parameters for the managers to make in-season management decisions through the course of the fishing season? That is my first question. In other words, FRSSI is not an applied principle and you are applying other principles as discussed, including adjustment issues, are you satisfied that all stakeholders would have an appreciation how the decisions are being made by management in respect to in-season decisions? I put that out to any of you and all of you.

MR. MORLEY: I mean, as I said, I don't know that a lot of the stakeholders fully understand exactly the things that everyone here is struggling with, in terms of how a TAM rule works and how the management adjustments play into it, and how it changes in the course of the season, so I'm sure there's a number of people who don't understand how the managers are making those decisions in-season.

I mean, I think, to me, the key point is Mr.

Staley talked before, and so did Mr. Cass, that some of the scenarios that we're seeing happen on a more regular basis are outside the realm of what we had anticipated in the preseason planning and that my analogy to how this works right now is that the -- I mean, we -- the DFO is trying to develop a cookbook for managing this fishery and put it into the IFMP and say, "Based on our analysis of all these scenarios, if 'X' happens, turn to page 89 in the IFMP and we will implement 'Y'," and just whatever the rules are, we'll do that.

And so in order to do that, we have to anticipate a lot of things that might happen, because we've seen there's a lot of variables around these fish. And, in fact, you spend a long time trying to develop "what if" scenarios for things that -- for many, many things that actually will never happen because, in fact, 99 percent of the things that you're trying to plan on will never happen. So you're spending a lot of time developing those kind of rules. And yet, in fact, what we've seen happen more lately is what does happen is something you didn't anticipate.

So I guess, from my point of view, the strict cookbook approach that's been developed is insufficient for managers to be able to react to what actually happens in the season and try to meet some broad objectives for conservation and sustainable use, and that's where I think the managers need more than what's been given to them in that cookbook.

Q And can you give us a sense of what that "more" is that should be given to the managers so that there is better predictability by all parties to the process of in-season management?

MR. MORLEY: Well, as I've been saying all along here, I think we're developing -- I mean, a lot of these things are developed as mathematical formulae that go into a model, and it's something that modellers love, because they can -- and now that we have computers, they can do umpteen simulations and come up with all these things. But again, it doesn't provide for the ability for a manager to have some broad goals and objectives, some ways to evaluate success in those goals and objectives, and to say, "Okay, given that this scenario is

different than what we thought was going to happen, how do I take that kind of evaluation and make an informed decision as a manager in-season?"

And I think we could give them those tools and those abilities and can, in fact, get user groups to understand that system better than the current one, which is a very deterministic and mathematical approach to management and doesn't provide any flexibility for a seasoned, experienced manager who has some feel for what's going on with the resource to apply some evaluation techniques in-season to come up with the best approach.

Q Do any of the other panel members have anything to comment on in respect to Mr. Morley's response and my question? Mr. Staley?

MR. STALEY: Yes, I think we have to be clear that what most of what Mr. Morley spoke about was not specifically relating to FRSSI. FRSSI is a process for developing some guidelines. How those guidelines are used and what the protocols are to adjust them are part of the IFMP process, which is bigger than FRSSI, it has a lot more in it than just the FRSSI.

So I just want to make sure that that's clear, that FRSSI is a process which includes a very analytic tool as well as some work on how to use that analytic tool to evaluate options, but how those options are -- and the rules that come out of that, how those are expressed in the IFMP and what the policies and protocols for adjusting the IFMP in-season, those are separate from the issue of what FRSSI is and isn't.

Q I appreciate that, but in the course of the parties formulating -- applying the FRSSI principle and formulating the Integrated Management Plan, there is expectation to try to get your calculations as accurate as possible so that you don't have in-season management decisions; you would agree with that, wouldn't you?

MR. STALEY: That would be the objective --

Q Yes.

MR. STALEY: -- but how often we can meet that objective is...

Q Right. But then the question I have, and if I'm ruled out of order and I'm informed by commission

counsel when this question is more appropriate, I gladly will move on. Mr. Morley testified of the inflexibility in-season in making changes to what is the Integrated Harvest Management Plan, which is founded upon a FRSSI principle, Mr. Morley, why did you say that? Why is there that inflexibility, from your perspective?

MR. MORLEY: Well, again, it does relate back to the IFMP process and the approach, currently, is that whatever rules are laid out in the IFMP process are signed off, as we see, by the minister on the preseason plan, and the process to get ministerial change to some of those details, I think, is a very involved, detailed process, going up through the bureaucratic chain, and most of these decisions are ones that -- and most of these circumstances take place in the middle of the summer, when many people are away and very difficult to get a hold of, so I think it's a very cumbersome process to have to go back for every minute detail in that plan to get a ministerial sign-off on a change.

Q Is that inflexibility, from your perspective, been prejudicial to the resource and certainly to the harvesters?

MR. MORLEY: You know, I think that the rules that we have adopted in the IFMP are robust enough to situations that where we end up with fewer fish coming back that I don't think that, in any case, that we have ever been prevented from taking action when there was serious conservation problems. I don't think it's at all been prejudicial to conservation, but it certainly has limited the ability for sustainable harvest to be taken by many of the users, yes.

Q Thank you. In your testimony yesterday, you, as a panel, you spoke about the need for reliability of the data to obviously inject into the FRSSI formula, and if I understood most of your evidence, and I'm just generalizing, there was, I thought, a general sense of comfort by you with the reliability of that data, assuming that I have accurately spoken of your testimony, and particularly you, Mr. Morley.

I ask you this: There is testimony before this inquiry, and I appreciate you don't sit here day in and day out, fortunately, and there is

testimony, for example, and I am happy to start bringing documents up to the screen, but I don't think it's necessary, of correspondence from the Fraser River Panel directed to the commissioners of the Pacific Salmon Commission, expressing concern about stock enumeration, deficiencies of stock enumeration, and not meeting treaty obligations between the two countries.

And in testimony given last Thursday, again, where you would not have been present, I was cross-examining Mr. Whitehouse and he acknowledged in testimony, and again, I can refer you right to the transcript on the screen there, if you wish it, that indeed there has been ongoing communication between the commission and DFO regarding the insufficiency of data, in terms of stock enumeration, that has forced DFO to take remedial steps to try to upgrade the deficiencies, the shortcomings.

My question is this: Are you familiar with the fact that there appears to be tension between the Pacific Salmon Commission and DFO as to whether they're meeting their stock enumeration responsibilities so that there's compliance with the treaty?

MR. MORLEY: Yes, I'm certainly aware of that, and I did look at some of the testimony at last week's hearings. I think that the issues that perhaps were not fully canvassed in that testimony and that bears onto this FRSSI process here, is that when we talk about the 19 modelled stocks here, that most of them are of a sufficient size that we are getting reasonably good estimates of spawning escapements.

The issues are perhaps more acute and more difficult than -- you talked a little bit about the stocks between the 25,000 and 75,000 threshold and the deficiencies that were identified and problems that have been there and tensions between the Salmon Commission and DFO over undertaking those analyses. What wasn't spoken about was the populations that are of a smaller size and that, which are some of the ones that clearly are potentially deterministic if we are to listen to some people's interpretation of how the Wild Salmon Policy might be applied, and could have significant impact, and I think that in those

smaller populations undoubtedly I don't think that anyone on the panel here would disagree that we could have a lot more effort put into it to get a lot more accurate understanding of what's actually happening in those populations.

Q Mr. Morley, with the smaller stocks that may have a deficient or inaccurate data, does that not have a huge consequence to the FRSSI model and to the outcome of the harvest plans for any given year?

MR. MORLEY: Well, in fact, it doesn't have a huge consequence to the FRSSI model because the assumption is that they are acting the same as the stocks that are modelled, and so that --

Q That they are what, sorry?

MR. MORLEY: That they have the same productivity, essentially, as the stocks that are being modelled, so it's not a -- if we're deficient in data on some of the smaller populations, it won't impact on what the results are in terms of the FRSSI model, itself.

Q But it will impact on harvest decisions, will it not?

MR. MORLEY: Only to the extent that there are specific harvest decisions for something like Cultus put forward separate from what would be coming out from the run timing aggregates in the FRSSI model. So it's...

Q With the FRSSI model it has been said, and again, Mr. Morley, I focus on you, but I think others have really said it, that the FRSSI model does not incorporate into its analysis, for want of a better term, socioeconomic issues, and you did say that, Mr. Morley, did you not?

MR. MORLEY: I said it, in my opinion, doesn't adequately canvass socioeconomic issues, yes.

Q Yes. And that economists, I'm going to suggest to you, were not part of the team that developed the FRSSI modelling; is that not fair to say?

MR. MORLEY: Not intimately, in terms of developing the model, itself. I think that the compass research group perhaps had people who have some economic training involved in it, but the kind of approaches that are undertaken, in terms of performance indicators and the analysis undertaken, I wouldn't consider to be a socioeconomic analysis.

Q And so it's fair to say that FRSSI does not employ

any cost benefit analysis approach to evaluating options?
MR. MORLEY: That's correct.
Q And it's also fair to say that FRSSI does not incorporate any habitat issues or options when addressing FRSSI, the formula?
MR. MORLEY: Yeah, I think we had quite a bit of discussion about this yesterday --
Q Yes.
MR. MORLEY: -- and it does and it doesn't, but it certainly doesn't look at using habitat as a lever for addressing future production in terms of making alterations to habitat to improve productivity, no, it doesn't include that.
Q Precisely. Now, before I go to what is the thrust of my questioning in this area, do any of the other panel members have any contribution to make on what Mr. Morley has responded to so far?
MR. CASS: Mr. Commissioner, on the habitat side, I just wanted to clarify that Mr. Morley is correct in that there has been no alterations to account for case specific habitat changes that may have occurred, but it does include, at the very root of the stock recruitment analysis that occurs, it does account for habitat capacity in that sense. So habitat in the sense of how many sockeye can you seed, given a piece of real estate with, it does account for that, if you like.
Q Indirectly, in that your spawner recruit figures will be partly dependent on the habitat environment; is that fair to say?
MR. CASS: Yes.
Q Yes, okay. Appreciating that and assuming the other panel members -- I'm sorry, yes, Mr. Staley?
MR. STALEY: On that point of habitat, the FRSSI is used as a harvest management tool; it's not used as a habitat management tool.
Q Yes.
MR. STALEY: So as Mr. Morley said, it doesn't have a lever - or maybe it was Mr. Cass - it doesn't have a -- the only control rule we have is on mortality, and the only part of that we have is the harvest part of it. So that's the model, itself.
In terms of the socioeconomic piece, while it wouldn't fit probably some professional standard criteria, there are performance measures that are

being produced which could be used by someone skilled to compute cost benefit-type things. It does calculate average long-term catches, average variability in those catches, and so on and so forth. But the process to date has not, other than to, as we saw with those graphs earlier, looking at sort of sensitivity of some measures of catch, has not -- and measures of a conservation has not, you know, gone into the detail of cost benefit.

On the socioeconomic piece, there has -- the people I work with, First Nations, have been concerned about the representation of the so-called food, social and ceremonial part of the puzzle and that's not explicitly accounted for in there. And that would require some retooling of the model in order to -- because it would have to be identified, I suppose, at a separate fishery, and I believe right now the model only deals with one fishery. But at some of the workshops those issues have been raised and, to date, they haven't really been incorporated directly and explicitly in the FRSSI process.

Q Thank you. Let me focus on the thrust of this line of questioning, and forgive me if I inarticulately make my point to you and ask for your response. FRSSI is a model established for the purposes of determining harvest rate, in part, to determine harvest rate for a given year and to incorporate it into the Integrated Harvest Management Plan, I assume that's obviously trite, and assuming that to be the case, do you not see a danger to where so many eggs are put into one basket where FRSSI becomes the model or determinant for that harvest rate which leads, I'm going to suggest to you, to a complacency by DFO to respond to other factors that should be playing into harvest rates, such as habitat issues, restoration of habitat, things of that sort, does it not lead us all to a complacency where the DFO chooses to look at the FRSSI model, make its application to an adoption to the Integrated Harvest Management Plan, and then to govern the issues of conservation by way of fishing or no fishing, TAM, harvest rate, TAC, without really being forced to deal with the habitat issues which are also critical to the life and conservation of

the fish? Your response? Any of you and all of you.

MR. CASS: Mr. Commissioner, certainly where there are, if you want to use the word "levers" that are deemed now or into the future important to consider for management, for fisheries management, then there would be a motivation, I suppose, to start thinking about different approaches either within FRSSI or as a separate way. So on the complacency side, I would hope that complacency doesn't become the -- overwhelms the process, but I have some optimism that where there's habitat issues that need to be treated in a modelling sense that would guide decisions about whether you want to, you know, where you want to put your emphasis in terms of habitat restoration, in cases where that might be required.

So in the big picture I think DFO should be open to challenges of changes that might move FRSSI in a different direction, or some other management tool, but it's a model that, you know, I mean, models are models, of course, and they need to be, in some way reflective of the reality of the world, and so if habitat were deemed to be a lever that you might want to use in some -- in the future, let's say, or as a recommendation, then I think it should be listened to. But the current FRSSI model is, as has been said, the only tool we have, the only management lever is harvest rate, at this time.

Q But it doesn't have to be the only lever if, indeed, DFO and your department paid more attention to habitat issues, restoration issues, and saw that as another lever, a critical lever to the sustenance in conservation of the resource; you agree with that?

MR. CASS: I can't disagree with that, yes.

Q And as an employee of DFO, I believe you're the only one that is currently an employee of the DFO on the panel, you would agree that your department has not been putting proper emphasis on habitat restoration issues in the last, let's say, decade?

MR. CASS: Yeah, I can't comment on that. I mean --

Q Why can't you comment on that?

MR. CASS: Because I'm not an expert in habitat management, and so I think it's an important question, but I have no expertise in that area.

Q Thank you very much. I open my questioning to the rest of you. Yes, sir?
MR. WILSON: Yes, I wanted to make an observation. As you know, Cultus has been listed as an endangered stock, yet we still harvest about 30 percent of it. Part of that justification is based on habitat remedial work that's being undertaken. So, for example, while the harvest rate that might be allowed on Cultus would normally be quite low, we have included programs to remove pike minnow from the watershed in large numbers, to harvest milfoil weed, which we feel interfered with spawning, and those programs contribute to our willingness to allow greater harvest on Cultus in addition to enhancement activities.

So I don't think it would be fair to say that the department is entirely unresponsive to habitat concerns.
Q It wasn't necessarily totally unresponsive; I was saying there were shortcomings, significant shortcomings. Evidence was given, and I'll put it to you, sir, a few days ago by Mr. Whitehouse that only three lakes in British Columbia have what I believe he referred to as nursery habitat assessment programs, where it used to be almost all the lakes of the province, under the old International Pacific Salmon Commission. He agreed that that was obviously a shortcoming over what it had been previously. I am simply asking you: Is it not in the interest of everybody, and particularly the harvesters and, for that matter, the environmentalists, that there be a full-fledged comprehensive habitat restoration -- sorry, habitat assessment and restoration program by DFO? You can't disagree with that, can you?
MR. WILSON: But I cannot comment. I guess my concern here is that on the habitat side, DFO does what DFO does. I'm not a habitat expert, either. But I'm simply pointing out that in the application of harvest rules we do take into consideration remedial work on habitat where we have evidence that that work is going to increase productivity and allow harvest. I'm just making the observation that that's been done in the past.
Q Yes. But there's a great deal of work that doesn't come to your attention because it's not been done by DFO; is that not fair to say?

MR. WILSON: That's fair to say.
Q Yes. And is it also fair to say that where we've heard about the decisions by DFO back in 1994, to change the threshold for stock enumeration for high precision enumeration from 25,000 to 75,000, there, again, is a significant gap of information which, with high precision, one would be more comfortable relying on in respect to the FRSSI model?
MR. WILSON: I agree that we can always use more information to make our models better.
Q Any other comment for other panellists in respect to this exchange?
MR. CASS: Just a point that you made in terms of the 25,000/75,000 change. You said, "May have significant consequences," something like that, and there is work, now, to look at how -- what are the consequences of that change. So there is some work to look at that.
Q Yes.
MR. CASS: And so I guess the jury's still out on that particular move. But, yeah, there's reducing programs on monitoring, for example, escapement enumerations could have an effect on the precision of estimates.
Q On the what?
MR. CASS: On the precision and accuracy of estimates of escapement that would be used as a measure of how well you're doing in terms of performance.
Q Yes. And that, sir, in turn, has a significant effect, among others, to the fishers of the province with a determination to what extent they will be able to harvest? You're nodding in the affirmative?
MR. CASS: Yes, uncertainty in escapements could have an impact on decisions that affect harvest.
Q In fact, a dramatic impact?
MR. CASS: I haven't seen any analysis that indicates what the --
Q All right.
MR. CASS: -- impact would be, but...
Q Thank you. The other two of you, any comments?
MR. STALEY: I guess my only comment is back to your original question, which was, "What does FRSSI have to do" -- the focus on FRSSI somehow has led to a complacency in DFO, and I guess I don't have -- I'm not an expert on DFO's complacencies.

Q Thank you. The last question I have, which I'm sure I'm the only one that doesn't understand this, you have the FRSSI formula for purposes of sockeye of the Fraser River. Is this formula and this approach only being applied by DFO for sockeye of the Fraser River, or is this level of sophisticated statistical analysis being done for other systems within British Columbia?

MR. CASS: I could take a crack at that, Mr. Commissioner. In terms of salmon, these TAM rules are not applied in the formal sense that they are in the Fraser, but there are other examples in B.C. marine fisheries where the population models for providing advice are as or more complicated than what's here, so this is not, if you like, it's a -- in the salmon world it's probably more developed than in other areas, other regions, other species, but certainly on the marine side there are very mature, very complex models that are used in the management of marine species.

Q Thank you. Mr. Morley?

MR. MORLEY: I just had one comment on your last question that I didn't get a question --

Q Yes?

MR. MORLEY: -- to put in, Mr. Commissioner, and that is your view of the FRSSI and approach to harvest management having DFO being complacent. I wouldn't call it complacent. I think that, and again going back to the example that Mr. Wilson presented in terms of Cultus, I think it is -- when DFO is presented with a problem as to whether there's a conservation issue or whether there's -- with a particular stock or a run, it is dealing with harvest management is their easiest approach and something over which they have a great deal of control in terms of trying to manage a population and can see immediate impacts. And the costs are not borne by the Government of Canada. There's no out-of-pocket money from DFO's budget in order to protect a stock.

When you're dealing with something like Cultus Lake, and I sat on the Cultus Recovery Team and was intimately involved in looking at all the strategies, and the modelling work that was done in conjunction with that is sort of expanding on what Mr. Wilson said, in fact, demonstrated that harvest management was not really deterministic of

the future of Cultus Lake sockeye that, in fact, unless some of the critical issues to do with freshwater survival and potentially some of the issues to do with the ocean survival, unless something was done to improve freshwater survival or unless ocean survival picked up, it didn't really matter whether you harvested Cultus at 50 percent, 70 percent, 30 percent, or zero, okay? The future of Cultus, as an independent wild population, was more than likely in serious question, and that without doing something else we could very well not see Cultus survive. And that, in fact, trying to address those other issues does cost real money. The real money, so far, for the major program that's been undertaken, a predator control, and even the milfoil work, has come from the commercial fishing sector, okay; it has not come from the Government of Canada.

Q As we've heard.

MR. MORLEY: And so the Government of Canada, again, in terms of your question about complacency, is certainly the first place they turn when dealing with an issue is harvest management, because there's no direct cost, but there potentially are considerable costs to society and to commercial, recreational and First Nations fishers, but some of the other case, and in Cultus, for example, unless we do some of these other things, that harvest management is not going to be effective.

MR. ROSENBLOOM: All right, thank you very much. I have no further questions, thank you.

MS. BAKER: Thank you, Mr. Commissioner. So we will have to continue with this panel after lunch. I would ask my friends to tell me what their estimates are. Some of the questioners have gone over their estimates, so we're behind schedule, so we need to get in line with that. Thank you.

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

(PROCEEDINGS ADJOURNED FOR NOON RECESS)
(PROCEEDINGS RECONVENED)

MS. BAKER: Mr. Commissioner, just a little bit of housekeeping. We're back with our panel, of course. Mr. Wilson may have to leave at 3:00 so I've talked to the other participants to find out

how we can make sure the people are able to ask him questions who want to do so, and so we'll start with Mr. Eidsvik representing the Southern Area E Gillnetters and B.C. Fisheries Survival Coalition. And then we'll follow with Ms. Gaertner and hopefully all the questions for Mr. Wilson will be completed by 3:00 and then we'll carry on with the West Coast Trollers Area G which is Mr. Watson and then the B.C. Wildlife Federation, Mr. Lowes.

MR. EIDSVIK: Good afternoon, Commissioner. My name is Philip Eidsvik, E-i-d-s-v-i-k - it's not an easy name to spell - and I'm here on behalf of the Area E Gillnetters and B.C. Fisheries Survival Coalition.

CROSS-EXAMINATION BY MR. EIDSVIK:

Q And I have a number of questions to ask the full panel members and I'm not as interested in the workings of FRSSI as I am interested in why FRSSI - and perhaps, Mr. Staley, you can help me a little bit and give us a very short history of Fraser River sockeye. Am I correct in saying we had pretty good abundance until the Hell's Gate slides?

MR. STALEY: It's believed so, yes. The data, though, is on the catch, not on the escapement. There's no escapement data from that period.

Q That's true. And then we had a long period of rebuilding following the installation of fish ladders and then in about the '60s we hit another low in the early '60s?

MR. STALEY: Yes, sir.

Q And then a fairly successful rebuilding program until about 1990?

MR. STALEY: The abundance increased into early '90s, yes.

Q At that time, is it fair to say that I think you were involved in management then and a number of people that we've heard so far were that fishery managers, Fraser River sockeye managers, had kind of a worldwide reputation through the '60s, '70s and '80s as doing impressive work?

MR. STALEY: Certainly many of the -- some of the managers who were also scientists also ended up in the academic field and I think of people like Dr.

Larkin, for example, and Dr. Ricker, work for DFO. They sort of were world leaders in the population dynamics of salmon and recognized as such.

Q Well, perhaps at this point I'll open it up to the panel members. What I'm curious about is why FRSSI? We had a really good fisheries management model from the '60s to the early '90s that successfully rebuilt runs and we could go back to the '40s and go to the '90s. Why the need for FRSSI? We didn't have FRSSI during this tremendous rebuilding period. Why the need for FRSSI? Anybody want to take a crack at that? Mr. Cass?

MR. CASS: Mr. Commissioner, I think one of the -- I mean, the history is important to understand, yes. We had come off of a good series of years in rebuilding and -- but I think times have changed recently, too, because we now have the Wild Salmon Policy, although FRSSI by a couple of years pre-dates that. But certainly the thinking about how you deal with the trade-offs in a consistent way within a framework that takes advantage of the fisheries science that exists. So it -- and I think as Rob Morley had pointed out, the modelling capability is -- with fancy new desktop computers and laptops, is enhanced. But really, I think it's a way to look at how you trade off escapement on the conservation side, but also with a need to ensure that you have escapement for future sustainability, but -- and to trade off the -- with the socioeconomic side of things. So -- but I think the main point is that it allowed for consistent assessment and evaluation of trade-offs. I'll leave it at that.

Q Well, I guess my point is we obviously had a lot of trade-offs through the '60s, '70s and '80s and some years we probably took less fish than we wanted to for that rebuilding effort. At the end of the 1980s we could be pretty proud that most runs were in much better shape than 30 years earlier, so we had a really effective fishery management model. And what I'm trying to figure out is why we abandoned that model and now we've stepped into FRSSI? Are we trying to solve problems that happened between 1990 and eight years ago when we developed FRSSI?

MR. CASS: I guess -- I guess -- specifically, sorry,

Mr. Commissioner, the existing rebuilding plan, the so-called 1987 rebuilding plan, was rules-based, as is FRSSI, but it was designed to at a minimum maintain escapements but also to increase escapements on the brood year, so not -- to not go backwards. And so that works okay in a situation where abundance is stable or increasing, but in the -- as in the '90s when things declined, the plan that was in place then would have been difficult to continue implementing because of declines and the inability to maintain broods as in the rebuilding phase.

Q So what were the reasons for the declines in the '90s?

MR. CASS: I mean, there's a list of hypotheses, if you like. Not sure you want me to go into that, but...

Q Well, I think it's useful, because you said that FRSSI is a response to problems and declines in the '90s, so I think it's helpful if we understand what the reasons for the decline were and how FRSSI responded to those particular problems.

MR. CASS: Yeah, I'm not sure, Mr. Commissioner, the reasons for the decline were an issue with FRSSI, although certainly within the model there needs to be some understanding or some way to develop future scenarios, if you like, or scenarios for the future but, you know, the fact is we don't know what the reasons are for the decline. There's hypotheses that are described to explain them, but the fact is it was in response to a decline and the causes of it were unexplained. And FRSSI was -- I mean, the 1987 rebuilding plan was targeted for 12 to 16 years, which takes us up to whatever that is, 2002, in that range, 2005, so it had -- that rebuilding phase had reached its limit, if you like, in terms of what initially was planned.

Q So I think that helps a little bit, but it doesn’t answer my question. I'm just trying to get why FRSSI now, what problem does FRSSI solve? And does anybody else want to take a crack at that?

MR. MORLEY: Mr. Commissioner, I guess just to sort of expand a little bit on the sort of the history as to how we got here, I think the -- when the IPSFC was managing Fraser sockeye and setting escapement goals for that period of time of long rebuilding

from the time they took over management after building the fishways up through the '50s and the '60s, into the '70s and the '80s, that the general approach was one of trying to have fairly significant fisheries virtually every year, but certainly to have escapement goals that looked at building the populations in a measured way instead of looking at sort of doubling escapement in any one population from one cycle to the next, look at a gradual increase in the escapement goal and see what the response was. And as was indicated, there was a gradual increase in the runs over that time period.

Sort of the radical departure to that kind of policy came about, I think, as it has been described in the rebuilding strategy of 1987 where Canada decided that that approach was too slow and that there were greater gains to be made by having massive increased of escapement that we would hopefully see a significant response and have increased yields to the fisheries in Canada, given that the Americans were now capped under the Salmon Treaty at a fixed total number and not getting 50 percent of whatever was caught in the convention waters.

And I think clearly what -- so that was one significant change that happened and how the stocks responded to that is you're going to hear a lot more about, I think, in the next panel on over-escapement and theories as to what the response to those massive escapements that we've been putting on the ground since then are. But certainly that is one of the potential reasons why we have seen some of the stocks decline, in particular some of the more populous stocks like Quesnel. But then you can look at those stocks as being the ones that actually now have the lowest productivity. So it's not the small stocks that are the weak ones. It's actually the biggest ones that are currently facing the worst productivity as a result of massive over-escapement.

The -- but the other confounding factor that comes into this in terms of -- so the -- clearly the rebuilding strategy had some drawbacks, as Dr. Cass has mentioned, and it resulted in having to look to a new approach here that would be a made-in-Canada approach. So the question -- I don't

think at this point, given that the escapement goals have been increased so dramatically that people were prepared to go back and look at reducing them to what they had been prior to Canada taking over management responsibilities. So we needed to have some way to analyze it. FRSSI is a tool, but as I think we have talked about here, it is only a tool to analyze the potential impacts of different harvest rules and spawning escapements.

Two other confounding factors sort of happened here in the sort of 1990s, as we started the -- well, three other factors. We started to see high water temperatures and en route losses, we started to see early entry of the late runs, and again, associated high mortalities with that. And we had the ***Sparrow*** decision and a change in the allocation and a change in the amount of fishing that was taking place within the river sort of all the way from the mouth up to -- up through the canyon. And all of those things had an impact on what was happening to Fraser sockeye as they were going up towards the spawning grounds and clearly we needed to try to figure out how to develop an escapement and harvest rule in response to all that.

How they all play out and what -- where the sort of cause and effect in these things are is very difficult to sort out, but certainly -- I mean, so FRSSI's response to that, in terms of how good it is as a response to that is a question that I -- you know, I have certainly.

Q Yes. So maybe to sum up then, we had successful fisheries management from about 1940 to 1990, had a cautious plan for escapement and FRSSI is responding to problems from 1990 onwards that Mr. Morley has given some sense of what they might be, Mr. Cass is reluctant to. Mr. Staley or Mr. Wilson, do you have anything to add to that?

Maybe I can go to fisheries management, and I know FRSSI is an attempt to control fishing effort. Mr. Morley, I think you would agree that the lowest point in the recent history of Fraser sockeye was about the '60s. We've gone over that. What was the traditional harvest rate in the commercial sector prior to the early 1990s? I think you've said it's about 75 to 80 percent; is

that about right?
MR. MORLEY: That was the traditional total harvest rate of all commercial recreational and First Nations fisheries.
Q And how many years would that harvest rate have been in place?
MR. MORLEY: I mean, I think probably that harvest rate would go back to the turn of the century. Certainly in some years when there was very low abundance and low fisheries that you wouldn't have had that harvest rate every year, but the -- and for most of the years on an average it would be in that range.
Q And from the perspective of a fishery manager in 2010, we had a much bigger commercial fleet. Roughly how many seiners would have fished on Fraser River sockeye prior to fleet reduction?
MR. MORLEY: I think at the maximum number of seiners, there was about -- there was over 500 seine boats.
Q And how many now?
MR. MORLEY: There are --
Q If the full southern fleet --
MR. MORLEY: The southern fleet is -- I think there's 169 licences but in terms of active vessels, I would suggest there's -- on a given year, there wouldn't be more than 130 or so.
Q Now, any change in fishing techniques? Has it lowered the productivity rate or the seine fleet in the last, say, ten years, 15 years?
MR. MORLEY: The seine fleet is now required to braille all their catches, so they can't use their drums to drum in the net, and so each -- when they make a set, they have to slowly dip out a couple hundred fish at a time and sort the fish to put back live all of the non-retention species like Chinook.
Q Any sense -- do you remember how big the troll fleet was on Fraser sockeye prior to fleet reduction?
MR. MORLEY: I don't have it -- I mean, it's --
Q Okay.
MR. MORLEY: -- was --
Q Substantially bigger?
MR. MORLEY: Substantially -- you know, the fleet --
Q What about -- what about gillnet --
MR. MORLEY: The fleet is probably, you know --
MS. BAKER: Mr. Commissioner, we are having a whole

section on commercial fisheries coming up as soon as we finish harvest management, and I wonder if the questions might be more appropriately saved for that period of time.

MR. EIDSVIK: Mr. Commissioner, there is a reason why I'm -- and I'll be there shortly, why I'm asking these questions. If you'd just go with me for another minute or two.

Q And on an average opening in the Fraser River, how many gillnetters?

MR. MORLEY: Currently?

Q Yeah, roughly.

MR. MORLEY: About 300, 400.

Q Compared to prior?

MR. MORLEY: Eight hundred, 900.

Q So my point is fishery managers have a much easier job managing the commercial fleet today as compared to in the days when they had no computers, we didn't have a FRSSI model; is that fair to say?

MR. MORLEY: I think the amount of effort in the commercial sector, the sort of fishing power, is certainly reduced from what it was and that would provide them with -- it would slow the rate of harvest down and they certainly have better technology in terms of communications and monitoring catches available to them.

Q In the development of the FRSSI model, other than avoiding low catches, was there another model that should have been considered maybe in that? Because we had the low catch model, but I'm curious, we used to try and fish and catch a fair amount of fish. Was that considered in FRSSI?

MR. MORLEY: As I think Mr. Staley pointed out, the model does certainly provide the potential harvest as an output in terms of the numbers of fish that can be taken in -- from any particular run timing group in any particular year. So that, as one of the outputs, is available. It is -- currently there's nothing done with that in terms of analyzing the options per se and if you were going to look at a sort of cost benefit kind of analysis, first of all you'd want to really look at what that meant in terms of jobs and income to people and so you have to translate that, numbers of fish, into where it might be caught, what it might be worth in terms of commercial value and

what the costs of accessing it might be. So it's a fairly detailed analysis that has not been attempted with -- through this model.

Q Yes. And that brings me to the role of fish scientists in development of FRSSI models and issues like that. And, Mr. Cass, maybe you can help me. Is it traditional for a DFO scientist to take an advocacy position, say, for weak stock management or high escapement or low escapement or is their job to say here's what'll happen if you do high escapement, here's what'll happen if you do low? Can you fill us in a little bit on that?

MR. CASS: Yes. Mr. Commissioner, the point of the science is to be objective and to assess data and build models or platforms for analyzing data. It's -- doesn't have the role in advocacy as you questioned.

Q Thank you. Now, for Mr. Staley and Mr. Wilson, both of you represent interest groups that have interest in the fishery. When you're a fish scientist, these groups must have retained you for a reason. Can you give me some assistance on that? Why would a fish group want a scientist working for them?

MR. STALEY: First of all, the organization I work for in the main right now is actually a joint First Nation/DFO organization, so it's not strictly working for First Nations in that capacity. But in other cases I have done work for individual First Nations and First Nations groups. They -- the reason they're interested is that they see that they have a role in management and they'd like, and they ask me for -- to help them understand some of the analysis that DFO is doing in -- that supports the management and that provides them explanation to them about that.

Q So would you -- you're on the Fraser Technical Committee, I gather, the Fraser Panel Technical Committee?

MR. STALEY: I'm on the Fraser Panel Technical Committee, yes.

Q Any other user group on that technical committee?

MR. STALEY: Not to my knowledge, no.

Q In your role on the technical committee or as scientist for aboriginal groups, have you ever argued that a public fishery, commercial or recreational, should be closed to accommodate

aboriginal fisheries in the river? And I'm not being critical of you, Mr. Staley. I'm just trying to understand what the role of science is in the management of the fishery and whether sometimes scientists can become advocates.

MR. STALEY: I think I would, in some cases, point out when and if plans were being made for harvest that would not be consistent with the distribution that's set out in pre-season plans and some of that distribution of catch is directed towards First Nations, as is -- do the -- you know, the priority right that they -- that many people and they believe they have.

Q Not disputing those at all. In the drafting of the FRSSI model or an escapement model or a weak stock management plan or a setting escapement levels, would there be, depending on how those models are set, would there be a benefit for your clients if those models were developed one way or another?

MR. STALEY: There would be benefits, I suppose, for different groups if they were done one way or the other. Currently I work for an organization which encompasses -- on issues about where the harvest might take place, that encompasses everywhere from the marine area right up to the top of the watershed, so I think -- I don't -- I'm not there to -- which I think would probably encompass most harvesting interests or perspectives, I guess, and interests. So my role is to be as neutral as I can, at least with the FRAFS organization about where -- about those issues.

Q Thank you. Mr. Wilson, you said that you were unhappy with the FRSSI model because you thought -- you didn't like the 60 percent number and there were some other questions about it. I'm curious. What -- is there a general acceptable level of harvest that you would say as a rule was okay if --

MR. WILSON: No.

Q And why not?

MR. WILSON: Well, for example, in recent years we've seen average productivity in the Fraser decline to approximately one which is to say that there is no harvestable surplus because each spawner only reproduces itself. Under low productivity scenarios, there may be no harvest.

Q Now, so you -- do you have an ideal escapement level then for each stock?
MR. WILSON: Do I?
Q Yes.
MR. WILSON: No.
Q How would you set an escapement level then? Like I'm saying Early Stuart sockeye, do you have a number or --
MR. WILSON: No. It's not my job to set escapement levels.
Q All on escapement levels. And do you accept that even in off-cycle years versus peak years, you're always trying to get to what we would say is a maximum escapement level then?
MR. WILSON: We would have to have a conversation about the role of cyclic dominance and the values we were trying to promote through the management of the resource at that time.
Q That wasn't what I asked. I asked do you believe that every cycle in every year in every stock in every year should have maximum escapement? Or do you recognize that there is ups and downs?
MR. WILSON: I recognize that there's ups and downs.
Q And those are natural.
MR. WILSON: To some degree, yes.
Q Okay. Now, do you ever believe there's any point when there's too many fish in the spawning grounds?
MR. WILSON: That depends on your frame of reference. I think from the standpoint of the harvester's perspective, there are certainly going to be times when there's too many fish in the spawning grounds.
Q Almost done. I'm sorry. I was distracted. What was the final bit of your sentence there, your answer?
MR. WILSON: There are times when large spawning populations are unlikely to produce large harvestable surpluses in the future. So from the standpoint of maximizing harvest, it is possible to put too many fish on the spawning grounds.
Q How many Fraser sockeye stocks have gone extinct in the last hundred years, do you know?
MR. WILSON: I don't know.
Q What kind of condition is the Early Stuart run in, as a general rule?
MR. WILSON: Well, it's recognized as a stock of

concern.
Q And how much public commercial mixed stock fishing has occurred in that run in the last 20 years?
MR. WILSON: You're probably asking the wrong person.
Q Mr. Morley, do you know the answer to that?
MR. MORLEY: Almost none.
Q So despite no public commercial fishing, we have a run that's in trouble. So in other words mixed stock fisheries aren't the only determinant on whether a stock can be in trouble or not? For example, issues like habitat, water temperature?
MR. MORLEY: Well, there's a very large range of factors that affect the stock's productivity and it's matching your harvest to the available surplus, if you want to call it that, or to the productivity of the stock. It's really the art of management. I'm not suggesting that, nor have I ever suggested, that commercial fisheries were solely responsible for all the ills of Fraser sockeye.
Q How long has the Early Stuart run been -- do you call it a stock of concern or interest or...?
MR. MORLEY: Well, it went into decline -- gee, I guess it's been -- in my experience, perhaps the last 15 years or so we've been worried about it.
Q So the last 15 years, despite no public commercial fishing, but I guess my point is you saw it as a stock of concern and virtually no public commercial fishing on it, there was no FRSSIs, there was no TAMs, but it was recognized that the stock was in -- an issue of concern and the commercial fleet didn't fish it; is that fair to say?
MR. MORLEY: I guess it's fair to say.
Q Thank you. Mr. Staley, I know one of your complaints about FRSSI was not enough aboriginal consideration in the model. What did the model people need to include an aboriginal portion to consider it in the model?
MR. STALEY: One of the things that would have been needed would be a separation of -- or an accounting for two different fisheries, at least, a minimum of more than one and currently the model only in its structure assumes that there is only one fishery.
Q What do you mean, one fishery?
MR. STALEY: Means there's only one harvest rate. The

harvest rate isn't separated by user group or...
Q I see. Did the aboriginal groups give the model makers a number to say this is how many fish you need to build into the model for us?
MR. STALEY: Not in aggregate, no.
Q Can you tell me why?
MR. STALEY: No, I can't tell you why.
Q But you're their representative in this processes, aren't you?
MR. STALEY: No, I'm not representing them in the process. I'm assisting with technical aspects and trying to explain those technical aspects to them.
MR. EIDSVIK: Those are my questions, Commissioner. Thank you.
MS. GAERTNER: Mr. Commissioner, Brenda Gaertner and with me Leah Pence for the First Nations Coalition.

CROSS-EXAMINATION BY MS. GAERTNER:

Q I just want to clear this up. Mr. Wilson, you gave evidence earlier today that at one point in the FRSSI you were actually there for the UFFCA. As you know, UFFCA is one of my client -- in the coalition I represent.
MR. WILSON: Yes, that's correct.
Q And you're not here representing the UFFCA today in any kind of way; is that correct?
MR. WILSON: That's correct.
Q And Mr. Staley, you're also not representing any client base in your evidence today; is that correct?
MR. STALEY: That's correct.
Q Thank you.
MR. STALEY: Correct, yes.
Q All right. Thank you, Panel, for being here and working through these issues with us. I just have a couple of initial questions. As I see the FRSSI model and process, I'm going to say that they're somewhat a combination of them both, there's two components that I'm using to understand it. One is the technical considerations that inform the modelling, Mr. Commissioner, and the other is the management objectives or trade-off discussions that also inform the modelling and the outcomes. And I'm going to ask some questions first about the modelling and the technical components and

then I'll turn more to some of the more management objectives and trade-offs discussions. And I want to first ask what can be done to correct the possible errors associated with the assumptions. Mr. Wilson, perhaps I'll start with you on this and could I have Exhibit 413 at page 4 and 5?

Mr. Wilson, you say at -- in your report to the UFFCA at page 4 and 5 that all the stocks within each timing aggregate have the same time running and are equally vulnerable to each fishery is an assumption and it's an assumption in that part of the report and I'll take you to your report and if we begin at page 4 of the report at the bottom, it's in a section called Inappropriate Assignment of Stocks to Timing Groups.

MR. WILSON: Yes.

Q Are you with me, Mr. Wilson?

MR. WILSON: Yes.

Q And you see the sentence that it is at the end, second-last sentence -- third-last sentence of the paragraph:

> It is assumed that all the stocks...

MR. WILSON: Yes.

Q Are you with me? So:

> It is assumed that all the stocks within each timing aggregate have the same run timing and are equally vulnerable to each fishery. In reality, we know that Fraser sockeye stocks within the same run timing group can and often do have very different run timing. Depending on the number and timing of fisheries, individual Cu's within a timing group can be harvested at very different rates.

And then I want to take you one step further in your report in the next paragraph at the -- you go on to talk about overlaps between these managed stock aggregates, and you'd agree with me that these two concerns are somewhat related?

MR. WILSON: Yes.

Q And with me -- in the paragraph you begin at second-last sentence again of that paragraph:

Obvious problems with the assignment of stocks into aggregates were discussed by Dr. Jim Woodey in 1996 --

And as you know, Dr. Woodey is going to come here.

-- during his tenure as Senior Biologist for the PSC. Dr. Woodey recommended modifications to the stocks included in each group to better reflect their run timing and to improve management control. In the 13 years since Dr. Woodey's memo, little has changed.

I'm wondering if you could help us understand the nature of that concern as it relates to within the FRSSI model, and then perhaps go one step further and give us some suggestions on how we might improve that.

MR. WILSON: Well, my concern is not so much with the FRSSI model as the difference between reality and the FRSSI model when you attempt to apply the advice that FRSSI suggests. For example, within the Early Summer group, we have a range of stocks. The earliest stock to come in from the Early Summers actually migrates with the Early Stuarts. That's the Chilliwack.

At the other end of the spectrum, we have Scotch and Seymour, which essentially behave as Summer run stocks. Now, when you're managing an aggregate that includes stocks that are overlapping with both Early Stuarts and Summers, and you have a model that suggests that a fishery will harvest at any particular time during the migration of the Early Summers will harvest in equal proportion of each of the stocks within the Early Summer aggregate, it seems to me a likely source of error in your analysis, because there will be some stocks that will be dominating the Early Summer run at particular times and if they happen to be there when your fishery takes place, you'll harvest a much larger proportion of them.

Q Okay. Thank you. Mr. Staley, I'm wondering if you could help a little bit on this topic also. That notion of the overlaps, if I might call it that, amongst the various run timing groups, if I may call it that for a moment, what implications

to the modelling that FRSSI uses does this have and how can we better improve that in the model itself?

MR. STALEY: The -- well, it depends on whether you're talking about the model that has been used for the four years that we've just come through or you're talking about the model that has just been retooled and put through -- presented to PSARC last year. The new version of the model on this point are quite different than the one, the version of the model that was used four years ago or three or four years ago, in the sense that the new model, the computer model, can actually operate on individual groups so the timing and overlap, if you were to manage them separately, would be not relevant, I suppose.

Where the problem is is trying to make the -- bring that modelled world into some sense of reality, where they are overlapped in many of these -- in most fisheries, and probably all -- most fisheries and try and make some sense of the real world, as Mr. Wilson said, and the modelled world. But I think that in terms of improvements to the model, at least one step has been made and that is to be able to operate the model using on an individual stock basis of the 19 stocks.

Q All right. So the model is improving and the task of applying that model is most challenging in-season then?

MR. STALEY: That's correct, yes.

Q Okay. Thank you very much. I want to go now to the second arm of FRSSI, if I may call it that, which as I understand it is the identification and consideration of escapement and harvest options which can be managed after choosing certain options. And I'm just going to summarize a couple of things I've heard from the evidence and move from it and make sure that my summary is correct to start with.

As I understand it, there are three primary objectives that Mr. Cass, you reviewed for us of the FRSSI model and Mr. Staley, at page 17 of your report, I also see the performance measures that are related to those. We don't have to take you to that unless it becomes helpful to you and we can if you want. So we've got the objective of keeping the spawner abundance above the minimum

level each year, and I'm assuming the performance model -- or measurement of that is conservation; is that a fair summary?

MR. STALEY: That performance measure is trying to represent conservation.

Q Okay.

MR. STALEY: Reflect conservation.

Q All right. And then we have the total catch above the minimum level each year and the performance measure on that would be a stability of supply?

MR. STALEY: Correct.

Q And I know this seems -- sounds obvious, but I think it's important to put it together for where I'm going, and then the maximum average catch over 50 years, that's another objective of the model and that again is the stability of supply. It's just over a longer period of time. That's the performance measure.

MR. STALEY: May be more than stability. It may be actual quantity, the size of it. It's not an objective, it's a performance measure and then there would be a -- there might be objectives associated with catching the most fish over 50 years, as opposed to the stability of catch from year to year.

Q Okay. So I'd like to go one step further now and ask you if it's possible that another objective - and I'm wondering if you could comment on this, Mr. Staley or Mr. Wilson or the panel - that another objective could be ensuring geographic distribution of the stocks throughout the watershed. That's something that actually could be an objective when looking at this type of model. Mr. Wilson?

MR. WILSON: Yes. We could have as an objective the delivery of some quantum of fish by geographic region, for example, if your interest was in ensuring that First Nations fisheries were able to access the fish they needed.

Q And Mr. Staley or -- if you wanted to add to any of that, is there anything you need to add to that at this point?

MR. STALEY: I -- well, just in terms of the version of the model which has been -- was reviewed last year, the only way currently to represent that, calculate that in that calculation framework would be on a -- by recognizing the stocks, where each

of the 19 stocks originates and assume that some portion of the harvest is taking place close to where they originate and that that would generate a distribution of geography.

Q So that's both the objective and how you'd measure the objective, if that's correct.

MR. STALEY: There would have to be an objective about the -- yeah, the geography. If there was an objective about the geography, about the distribution in geography, then the current version of the model would have -- could partially represent that.

Q Okay. So the model has that capability. Now, if you added another objective which would be ensuring fish in order to reach FSC priority fisheries throughout the watershed, could the model be tweaked or adjusted to provide for that?

MR. STALEY: It might be a challenge in its current form, because the -- well, I said, distributional. In order to distribute the fish to the various groups, the First Nations groups within the river and outside the river, may require a representation of more than one fishery and there is a sort of a key technical point in this, that one fishery -- modelling one fishery makes it a lot simpler. Model two, might as well model a hundred. It's -- the computational and set of assumptions expand sort of exponentially when you add more fisheries. But in order to represent properly the distribution, for example, of catch in the lower river versus catch in the upper river, you'd have to have more than one fishery.

Q Mr. Wilson, at page 5 of Exhibit 413, which is your report, you touch on this particular issue which is you suggest that performance of First Nations fisheries be part of -- one of the concerns you raise with respect to the model and at the end of that paragraph you suggest:

> In addition to setting minimum benchmarks to protect Fraser sockeye populations from extinction, it may be appropriate to set minimum abundance levels by geographic area to protect First Nations food fisheries.

Do you believe that the model should be adjusted to provide for that and it could be adjusted to

provide that in a meaningful way?
MR. WILSON: Well, it was my understanding that a model was in preparation at SFU that would try to address that side of the question, so it would follow fish into the river, sequentially harvest them and look at the patterns of escapement and abundance by geographic region. That's a separate model entirely. I don't know how he would combine the two, but certainly it's been recognized as a shortcoming of the FRSSI model, if you want to call it that, for some time.
Q All right. I'm going to get to that SFU model in a few minutes in another part of my question, so I'll pick that up in a second if I may, Mr. Wilson. Were these objectives, Mr. Cass, to your recollection the objective of ensuring geographic distribution and the objective of providing FSC priority fisheries raised at any of these earlier workshops and if so, were they considered by DFO? And even if they weren't raised, given DFO's obligations to First Nations, did you consider those when looking at these models?
MR. CASS: That was not considered. There was no consideration for how you might allocate or arrange stocks geographically. The model, as Mr. Staley pointed out, has one harvest rate that is -- and any sort of allocation scheme or -- beyond what FRSSI was originally designed for.
Q All right. Maybe I'll just pick this up. I know that my clients are concerned with this and so I need to understand it. Mr. Staley, you raised it briefly, but this model, FRSSI model, is relatively recent. There have been some case law that's been developed around priority of FSC fisheries and how that might happen. Why was the status quo of one mixed stock fishery used as an assumption within this model, given the complexities of DFO's management obligations? And perhaps I'll start with Mr. Cass and then go to Mr. Staley.
MR. CASS: Sorry, could you repeat that?
Q Why was -- why did -- when you began FRSSI, you were aware of the complexities associated with meeting FSC priority requirements within the Fraser River and so I'm curious why, when you began this modelling work, did you assume one mixed stock fishery and have maintained that

assumption through the development of the model?
MR. CASS: Well, it didn't assume one mixed stock fishery. I mean, it assumed a fishery that -- or, you know, there could be several fisheries that would be, if you like, you would need to parse out the harvest rate, the harvest rate that FRSSI would produce, so again, it's related to, you know, the intent of FRSSI originally was to balance or assess the trade-offs and consequences of a range of harvest options. It was not to go further than that in terms of allocation or specify particular stocks that would be given different weight in the model, although as I think Mr. Staley pointed out that that could be done, depending on the specific objective.
Q Sorry. Just want to make sure I understand this correct, and Mr. Staley, please correct me if I'm wrong. I've heard the evidence quite a number of times come down to it's assumed that there's one mixed stock fishery in order to run these models.
MR. STALEY: Well, it's -- there -- as Mr. Cass says, it is one harvest rate and in the computer model, it's just one multiplication of one factor against the population size at the time as you simulate forward. So that one is not divided in any way. And as Mr. Wilson pointed out in his report, it was applied is that one harvest for any of the aggregates that was operating, it was operating on all of those aggregates at the same time, the time being a time period of one year. So in that sense, they were mixed together, so it was a mixed stock fishery and there was only one.
In part, that was -- as Mr. Cass says, it was -- the intent was to look at the, you know, sort of biologically at the trade-offs on productivity on long-term production of harvest versus escapements and versus spawning of making those choices, to assist in making those choices. Also at the time it was developed, I guess since the time it's developed, or at the time it was developed, the -- in order to expand the number of fisheries, in addition to the number of assumptions and data that would -- which are not insurmountable but would be substantial. There was some constraints on the amount of time that someone was willing to dedicate their computer to it. Some of the original computer runs of this

model took several days on some people's laptops. Laptops today, only eight years later, would be just a matter of probably minutes rather than hours. So that has changed. So perhaps, you know, the technology has changed, so in principle, this sort of refinements and additions that might more better reflect some of those realities could be done. Which one -- but perhaps not all that should be done, so there's some choices and planning has to be made as to if you're going to use -- continue to develop the model. But that was basically the point. It was there to -- currently is there's one harvest rate which is not divided in the model. There's -- and it's applied to all stocks that are in the model at the time it's being run, so whatever mixture it's placed on, and it's -- basically that's the way it works.

Q All right. So if I understand, Mr. Wilson, your evidence earlier and if I've understood this well enough, that that other model, so to speak, as to -- that would bring in these other objectives, often people -- we've heard through stock assessment, they referred us back to the SFU model, Mr. Commissioner, and we're now being referred back to the SFU model again today. In terms of this other model that could help to better understand some of the changes that we may need to see in management, where would that marriage of these two models best occur? Is it during a FRSSI analysis or is it during an IFMP analysis? Where does it make the most sense? Or both?

MR. STALEY: I'm not sure about the IFMP. Certainly many of the people that I work with, First Nations, are not engaged in IFMP, so it wouldn't engage the appropriate mix of them if you had to do that. Perhaps an expanded version of FRSSI or perhaps another process. But there are some technical challenges to, as Mr. Wilson pointed out, some technical challenges to putting the more detailed in-season migration, both with a lot of detail and time and space with in-season, together with this longer-term view. There are some technical challenges. As I say, probably not insurmountable, but will take some time.

Q Okay. Just before I leave this line of questioning, I just wanted to give Mr.

Commissioner an example of something that I expect he'll hear about during the aboriginal fisheries, which is totally related to what we're talking about. Often aboriginal people raise a concern around science, around -- it depends on what question is being asked. And so would you agree with me that even in the creation of the initial models that are being reviewed, that's much informed by the objectives that have been set and the questions that are first asked of the biologist that perform the initial modelling? Is this a good example of that problem? There might be different initial models that are created, depending on who's asking the question and depending on the objectives that are being run?

MR. STALEY: I'm not sure it matters who asks the question, but more what the question is.

Q What the question is.

MR. STALEY: And --

Q Fair enough.

MR. STALEY: -- yeah, I'd have to agree with that. I mean, we saw earlier a document that laid out what were called guiding principles and they had in them that there would be only four aggregates. I must admit, that was -- I don't recall reading that in quite -- that stark language, but if that's a principle that was guiding the development of it, then the model has met that guideline, I guess.

Q All right. Thank you. I'm going to next turn my questions to the area around the collaboration on the structured decision making that is part of the FRSSI model and in particular, I noted that you, Mr. Cass, you, that Department of Fisheries and Oceans' efforts around the implementation of FRSSI was largely informed by these workshops that you held in 2007 and 2008. Is it a fair observation to say that in 2007 we did have some technical representatives directly from the groups? I see Pat Matthew is there, Mr. Commissioner has met Pat Matthew and Gord Sterritt is there, Neil Todd is there, Byron Spinks is there. None of these people seem to have attended in the following year. I'm quite sure it's not because they're not interested in salmon. Mr. Staley, could you perhaps comment on why it may be difficult to get these First Nations people to continue to

participate in a FRSSI discussion?
MR. STALEY: Well, it would be a combination of factors. I recall that the -- I believe it was the 2007 workshops, the workshops that engaged the structured decision-making, whether they were 2007, 2006, I can't recall, but many of the people there, including the ones you listed who are First Nations origin are really technical people. They're not representing the sort of the positional or, you know, interests of their groups. In some cases they may represent the interests of their group, but that's not broadly representative of the -- in that context, much like the question that Mr. Morley responded to earlier that they were there as participants.

They felt very uncomfortable, being asked the questions of interest and objectives that was being put to them, so I know that some of them decided not to return. The other is that also it's very challenging technical exercise and some of them thought that their time would be better spent doing something else than -- because they were struggling with understanding some of the concepts -- not the concepts, but some of the output and the approaches that were being used.

Q Mr. Cass, in Exhibit 398 which is the report that was done on this process by Mr. Pestal, Mr. Ryall and yourself, we've seen a number of times, at page 22 of that report you're summarizing the challenges associated with the -- what worked well and what needs to be improved and at the end of the page, page 22 at the bullet that begins:

> The spawning initiative...

At the very last sentence, you say:

> In particular, additional First Nations participants would have been able to provide a more varied perspective on local issues.

What steps have DFO taken since the writing of this report to encourage and to try to have First Nations representatives participate in this process?

MR. CASS: Yes, Mr. Commissioner, I'm not sure I can give you an answer to that because of my -- my

involvement was largely focused on the model and the technical side of it and so I'm not sure what steps might have been taken to help with that particular statement in this.

Q All right. Mr. Ryall's coming later to talk about these things, so I'll pose the question then. Mr. Wilson, do you have anything you'd like to add, any observations that you have with respect to the challenges of First Nations participating in these processes?

MR. WILSON: I guess my primary concern is that we go the extra mile to make sure that people really understand the tools that are being used to manage their fishery. I recognize how complex the FRSSI model is, but I'm still not prepared to accept the argument that it can't be explained sufficiently so that people can use it. If people don't understand it, then they really shouldn't be using it, because they're really just taking the output from the model as -- on faith, if you like. And I have a serious concern with that. I think people that are making management decisions about their own fisheries should have the tools in their own hands to evaluate the outcomes of the actions they plan to take. So I think it's critically important that if we're going to go down this road of developing complex computer models to guide our fisheries management decisions, that we at the same time invest a lot of effort in learning how to explain these models to the people that are being affected in language that they can understand.

Q Thank you, Mr. Wilson. Mr. Staley, I'm just going to pick up this point right here right now. In your report you actually go as far as suggesting that research be done with respect to this, and so there's two things I want to clear up, one of which is Ms. Baker yesterday asked if First Nations are able to understand and you responded yes. And from there, you were talking about the sheer ability, the brain ability, of course, of First Nations; am I right on that?

MR. STALEY: Yes.

Q Yes. But in your report, you do suggest that it's important to do research, in fact, in how to communicate; that's correct?

MR. STALEY: Yes.

Q Now, Mr. Staley, I'm going to make a fair observation about your work. As you know, I've watched your work for many years. You're a non-aboriginal expert who likes to work with numbers and actually understands numbers and you've stood the test of time in First Nations communities. Those three things are something to note when asking this question.

Why is it, given that you have been able to do your best at communicating and you have stood the test of time, that you are recommending research be done on how properly to communicate this? This is not from lack of ability. This is a lack of concern -- or this is an actual concern; am I correct in that?

MR. STALEY: Yes.

Q And what do you suggest, what do you think we should be doing, to try to better understand how to communicate the implications of these types of modellings on people's ability to fish?

MR. STALEY: Well, I guess the reason I put research in there is because I don't know and I'd have to research it. I have some ideas that others than people like myself should be engaged in first of all understanding the model and trying to understand how to communicate that to, you know, people in -- certainly in First Nation communities who are going to be affected by it and need to understand, as Mr. Wilson said, need to understand how it affects them. So that's what I recall I was meaning by the comment of research, is that we need to spend some time to try and -- with the -- one, people who know how to speak to these people -- that's not the right word, but speak -- but also get them to understand as well as they can. I -- you know, I've tried to explain FRSSI in several settings in several workshops over the last two or three years and I don't think I've been successful yet, so...

Q So is it fair to say that we need to take care to assume that biologists, people that are trained in science, have these skills?

MR. STALEY: Well, they have some of the skills and have support from people who have the full set of those skills.

Q I wonder if another one of the challenges associated with the communication is access to the

right First Nations people in a timely manner. So I'm going to switch it now. We've talked about the challenges of the communicator. Now I'm going to talk about the challenges associated with who's being communicated to.

So would you agree that some of it also includes challenges associated with getting consistent representatives at the meetings on behalf of First Nations who have mandates?

MR. STALEY: Yes, that is true, yes.

Q And would you also agree that the challenge is having leadership attend alongside technical support when trade-off discussions are occurring?

MR. STALEY: Yes.

Q And, Mr. Wilson, would you also agree that the implications of these options may be very different, depending on the First Nations interests that are being considered?

MR. WILSON: Yes, I would.

Q And Mr. Staley, would you also agree with me on that?

MR. STALEY: Yes.

Q Mr. Wilson, I know that you're under extreme time pressures and you need to leave. Why don't I -- would you like to stay or would you like to leave and if I can do my best to ask the rest of the questions of the panel and anything else --

MR. WILSON: That's fine.

Q -- I pick up with you tomorrow is -- would you prefer that?

MR. WILSON: Yeah, tomorrow I'll be here.

MS. GAERTNER: All right. I'll do that, finish with -- if there's any further questions I have of Mr. Wilson on these topics, then I'll pick it up with him tomorrow, Mr. Commissioner, if that's agreeable.

THE COMMISSIONER: Mr. Wilson, do you have a couple more minutes?

MR. WILSON: Yes.

THE COMMISSIONER: I just wanted to ask one query while he's here --

MS. GAERTNER: Please.

THE COMMISSIONER: -- and with these panel members, if I might --

MS. GAERTNER: Yes.

THE COMMISSIONER: -- and I apologize for interrupting --

MS. GAERTNER: No.
THE COMMISSIONER: -- Ms. Gaertner. I do.
MS. GAERTNER: Please.
THE COMMISSIONER: I just wanted to pick up on something that Mr. Eidsvik asked the panel and see if I can get an understanding of your answer to him. He asked why FRSSI? And I don't mean to be overly simplistic and I don't mean any insult to him. He was -- he gave more than that, but essentially that was the topic. And then he went back and you heard his historical references and I think, Mr. Morley, you picked up on the historical references.

In Tab 6 of your binder, which is the CSAP working paper at page -- it's under two methods. I'm not sure -- the page number is 5, I think. After talking about what FRSSI does, it then says what it doesn't. And you talked about, Mr. Wilson, and any of the members of the panel talked about this earlier today, but it says:

> However, the current model is not set up to address the following:
>
> In-season management strategies.

And I may be misunderstanding the dialogue between yourselves and Mr. Eidsvik, but if it's not dealing with in-season management strategies, how is it different than pre-FRSSI in terms of managing the in-season fishery? If this model is not designed - and it says it here - to address -- not deal with, but address in-season management strategies, alternative fishing plans, catch sharing, annual adjustments, how is it different than pre-FRSSI for in-season management? Because that's where I'm a bit lost in the exchange you had with Mr. Eidsvik. You're saying it's needed, and you said why it's needed, what the changes were, what it was addressing in terms of the changes, and yet here it says it's not dealing with in-season management. So it either is or it isn't.

MS. GAERTNER:
Q Mr. Commissioner, I wonder if I could ask one question in addition to that, that may be helpful to that question and the panel, which is, as I

understand it, and correct me if I'm wrong, there is a guiding rule as to the total annual mortality that comes out of FRSSI that is actually applied in-season. How it's applied and the variations that are determined in-season is still the challenge of managers, but that as a rule that through the FRSSI we take into in-season, Mr. Staley, since you're on the Fraser River Panel, you might be the best to answer that question.

MR. STALEY: I'm on the technical committee.

Q The technical committee, sorry.

MR. STALEY: Mr. Morley's on the panel.

Q Oh, Mr. Morley is on the panel, so that could be helpful.

MR. STALEY: So, yes, that's the case. I mean, the FRSSI is, as I said before, FRSSI is used before the season. In-season it's the results of FRSSI that are used as guidelines to guide but not -- but the model itself is not used in-season to do any other calculations. The calculations that are used in-season are using the agreed-to or the pre-season TAM rule which is informed by the FRSSI process and established by the minister now to -- as guidelines for doing the calculations for what is the allowable catch at any point during the season.

Q So we don't -- sorry. We don't make adjustments to the TAM rule in-season any longer; is that correct?

MR. STALEY: That's correct.

Q Is that helpful, Mr. Commissioner?

THE COMMISSIONER: Well, it does, because does that mean that there should be an amendment to the statement or still a clear statement?

MR. MORLEY: No, that's -- that's -- from my point of view as a panel member that -- it is definitely a clear statement and I think the distinction that was being drawn in -- before is that we're -- through this process, through the FRSSI process, we're developing these TAM rules for each of the four run timing groups, which are then fixed and it's based on this long-term 48-year projection as to what, given all the uncertainty and the variables and the potential changes, what the strategy over the long term might -- what the implications might be for these populations and given their population dynamics. That, as Mr.

Staley indicates, informs the decision that's made on the rule. Once the rule is put in for each of the four run timing groups, regardless of what we actually see come back in that given year, if you -- if based on the actual experience in-season you might want to make a different decision, FRSSI isn't used for that, isn't set up to analyze that. It only analyzes this long-term kind of approach to things.

And previously we might change our management based on the relative strengths of the particular run timing groups that were coming back in that particular year. With this current approach that's inspired by FRSSI, we have these fixed rules that don't change.

THE COMMISSIONER: So based upon historical data, you're able to project and do I take it there's a consensus on the panel - that's why I wanted Mr. Wilson be here, that this model which uses historical data to project the future, that then fixes the TAM for the annual assessment is a better management model than was there pre-FRSSI? Is that what you're saying? It's a model. I think Mr. Cass has said many, many times it's just a model, but it's being used and it's being used, as you are telling me now, to fix the TAM for in-season management. So you're saying based on historical data but projecting 40 years into the future, using the TAM for in-season management, that's a better model than pre-FRSSI? I'm just curious as to -- because that's something that would help me understand your dialogue with Mr. Eidsvik.

MR. WILSON: I would agree that it's a better model for two reasons: one is that the exploitation rates are generally lower. The other is that the TAM rule allows us to set maximum mortalities and accounts for fish that might disappear on the way to the spawning grounds. So we don't harvest fish and later find out that even more are missing and see shortfalls on the grounds. We estimate as well as possible how many fish may disappear or be unaccounted for on their homeward migration and we reduce fishing pressure to compensate. So I think for those reasons particularly it's an improvement. It's a step in the right direction.

THE COMMISSIONER: Thank you.

MR. MORLEY: I would say that the -- it's telling that Mr. Wilson's first response as to why it's a better model is because he's looking at results. From his point of view, which is he wants to see more escapement and exploitation rates are lower. So I think that again, from my point of view, I think it is a model that tries to capture more of the changes that we've seen in the environment than were there previously. And so it tries to deal with things like en route mortality and certainly does a better job of understanding what's happening with the population dynamics.

In terms of making decisions as to what the best strategy is for balancing escapement needs, biodiversity versus yield, I think it has some serious deficiencies that need to be looked at. And so there are some explicit trade-offs made that rule out a lot of the analysis of some of the options. For example, we talked about having a maximum 60 percent TAM rule in our discussions yesterday and there's no analysis within this process to what might be the implications of a maximum 65 percent or a maximum of 70 percent or 80. It's just sort of been taken off the table and there's no analysis at all done.

So from that point of view, we're limiting the options and we're limiting the information that's being put in front of decision-makers. So it's -- while it might characterize the underlying biology better, it's, I think, a not a very good way to analyze this trade-off currently between yield and biodiversity.

THE COMMISSIONER: Mr. Wilson, thank you very much for your patience. I realize you have to leave and thank you, panel members, for those answers.

(MR. WILSON LEAVES HEARING ROOM)

MS. GAERTNER:

Q I just want to pick up on this discussion again, if I may, one more further question. It seems to me that one of the possible benefits of having some rules before you go into in-season is the complexities of in-season. And so we've at least established a guideline in-season one less variable. Would you agree with me that that's useful during the in-season hecticness of

management, Mr. Staley and Mr. Morley?
MR. STALEY: Well, it does sort of take one of the moving balls off the table, so we can focus on the other ones. But that being -- well, the other thing it does is it provides a -- for those who are outside the room, which much of this decision-making is taking place, such as both inside DFO and the Fraser Panel, it provides some understanding of what the goalposts and what the guidelines are for those decisions to those who don't follow -- who are affected by it but don't follow it as closely as people like myself and Mr. Morley. So it's important from that perspective.
Q Mr. Morley, would you agree that helping to determine some goalposts prior to in-season is useful?
MR. CASS: I think absolutely trying to set out some goalposts and some ways in which you are going to evaluate changes to those goalposts is something useful to do ahead of the season, yes.
Q Thank you. Just while we're on the topic, there is this move of from FRSSI, the IFMP and then we're in-season. How has the FRSSI process and the work that's been done help to inform perhaps the usefulness of more concrete or transparent guidelines for in-season decisions?
MR. STALEY: Could you ask it again, please?
Q All right. You've done some work at across -- you know, you're struggling with representation from First Nations, we've heard that evidence, but let's assume that for a moment you're doing work cross-sectorally and with the department to establish certain rules and guidelines that help to make decisions in-season. From that experience with participating in that process, would it be useful to have clearer in-season guidelines or decisions, decision-making structures that you would implement? And having had the FRSSI experience, what type of guidelines would be useful and, you know, you're using objectives and performance measures and you're trying to use both of those actively. Would that be useful for in-season discussions and guidelines associated with that at the Fraser Panel?
MR. STALEY: It might be useful. I expect that the pace at which decisions get made in-season, it would be a challenge to implement, you know, an

analysis -- sort of a real-time analysis of the type and debate and discussion of the type that goes on in the -- well, did go on in the development of the work associated with FRSSI. That being said, I guess as Mr. Morley said, there also needs -- the guidelines and goalposts are set up pre-season, we've had some experience that they're -- you know, that there may be reasonable reasons to adjust them in-season and we don't have a process, a transparent process, in order to do that now and so perhaps some work on the -- how to -- in addition to guidelines like FRSSI and other parts that are in the IFMP, some mechanism that can make adjustments to that but that the others who are not in the room are made aware of and is -- I mean, I don't like the word "transparency" either, but are available to and accessible to others who are going to be affected by it.

Q Mr. Morley?

MR. MORLEY: I would agree with that.

Q Thank you. Just turning briefly, I -- the logic of the order is a bit skewed 'cause I was helping -- trying to get Mr. Wilson out of the room. I want to go back to the generation of the options and I just want to ask some basic questions. Who does the initial short-list of these options? Is that a DFO exercise? You could have a hundred and fifty options, as I understand it from the evidence. The modellers might have fun doing that, but you don't come up to the first meeting with a hundred and fifty options. You come down with three to five, as I understand it. Who selects those three to five?

MR. CASS: I'm thinking back a few years now, but it's in the 2008 report with Pestal et al that there is a working group, a cross-sectoral working group. Now, I had to think back when I read that about what that really meant, but in that report it -- there is -- there was some choices made annually based on the outputs from FRSSI to render down the number of choices to some options, and part of this was in 2007 I think was also this so-called structured decision-making was designed to, if you like, separate the important from the unimportant based on the preferences that were explored then. Others might have a...

MR. STALEY: It's my recollection that, yeah, that the

set of options that emerged for the early part of the implementation of FRSSI which was in 2006/2007, were discussed and I guess reviewed in these workshops that have been identified. Since then, it's been my understanding that it's been basically those -- the sort of general character of those options hasn't changed very much and there's been some slight alterations, but they've been basically carried forward and the sort of -- the process of doing that's been done internally in DFO for 2009/2010, I think.

It was my understanding that the original implementation was going to be for one cycle, 2006-2010 we were going to -- there was going to be a process to review it for 2011 which, I guess, given where we are in the season and what people's schedule is already is unlikely to happen before the 2011 season, according to my understanding. But maybe I'll be surprised. But -- and at that review, that would open that up and there perhaps would be different approach to setting those. But my recollection last two years anyway has been, you know, -- has been proposed by DFO. They've been effectively proposed, but they were based, in part, on the discussions that went on for the earlier seasons, sort of modified to whatever -- minor ways to sort of match 2009/2010 seasons.

MS. GAERTNER: Mr. Commissioner, I have two areas left to ask questions of. Would you like to take the break now?

MS. BAKER: Mr. Commissioner, I do note we have two other parties that still need to ask questions before this panel sets down.

MS. GAERTNER: I'm still within my time estimate.

MS. BAKER: You said 45 minutes. I think we're past that now.

THE REGISTRAR: Hearing will now recess for ten minutes.

(PROCEEDINGS ADJOURNED FOR AFTERNOON RECESS)
(PROCEEDINGS RECONVENED)

MS. GAERTNER: Mr. Commissioner, the benefit of a break is that I've gotten rid of a couple of questions. I'll only be a few more minutes on my feet.

CROSS-EXAMINATION BY MS. GAERTNER, continuing:

Q Mr. Staley, I just wanted to pick up and have you assist the Commissioner a little bit in understanding. We spoke briefly yesterday about the trust issue and the challenges associated with trust. And I don't want to go over that too quickly because sometimes people just assume that it's just a historical distrust, that's the only distrust that we're talking about. Could you provide other examples of distrust that occur and perhaps if you want me to give you some suggestions on that, what happens when First Nations, in your experience, see models that are being run by desk science and aren't ground-truthed in particular ways, there aren't involvement of ground-truthing. Does that cause concerns? What other kinds of distrust occurs in this kind of setting that we have to be sensitive to when moving forward?

MR. STALEY: Well, certainly, that is one. Most of the First Nations that harvest these fish live in the area, they're in the field so to speak, they're not at the desk, although a lot of them I work with spend a lot of time in meetings these days, but they are field oriented. Many of them do fish themselves and so they try and relate what people like myself and Al talk about in terms of what they see on the river and it's almost impossible to make that connection for them. They also -- I mean, their trust, there's a phrase that strikes me quite often that I hear some of the leaders use and that's "being planned out of the plan." And that's a trust issue. They don't have confidence that they'll be planned into the plan. And especially when they don't understand how the plan is developed, they don't have a good ability to grasp it.

In some cases, I've been able to, you know, sort of use my position with some of the people to say, "Well, as far as I know, this is what it means to you," and that's come some way, but they have difficulty trusting things that they can't see, they can't feel, doesn't appear real to them.

Q And another example I wonder if you could comment on so, for example, with the FRSSI model in particular, again, the assumptions behind that

model, and which is that one fishery that occurs in time, when they learn about assumptions like that, does that make it a model that, in some cases, makes it more difficult to trust?

MR. STALEY: Well, they don't see themselves in that one fishery so if they can't see themselves there, they can't trust it. So yes, that does affect them. As I said, they need to see things. They need to see themselves, where they fit in, where is their -- where has their reality been reflected? And it's hard to demonstrate to anybody that their reality is somehow running around on electrons inside of a little box on the top of the table. So there's problems that side, but there's also just the general problems, even of trust even amongst -- particularly, I guess, amongst some of the leadership for the dealings that have occurred over generations and, in some cases, continued to with Department of Fisheries and Oceans, some interactions with them which find their way into venues similar to this eventually. And it's difficult to overcome those, difficult to bridge that gap.

That being said, the relationships that are -- some of that trust needs to be personal. The leaders have to develop real relationships with real people and I think in some places on the Fraser River, that has started, both with some of the DFO staff, with some of the participants in some of the other sectors that meet with them on a regular basis. There's beginning to be at least a degree of trust that not necessarily that their interests are being preserved in any way, but at least they understand what the other party might be doing to them.

Q All right. And then I wondered whether or not when explaining the FRSSI model, has it been difficult for them to understand that the model is geared towards a 40 or 50-year horizon, especially when they're not seeing any changes in the immediate future?

MR. STALEY: Well, that sort of cuts both ways. They don't see anything in the immediate future and 40, 50 years isn't long enough. It's not seven generations so it does cut sort of both ways. But that was a -- the choice of the horizon was, I guess, a convenience for the modellers as much as

any sort of policy decision. It was -- and maybe that can be reviewed, but yes, they haven't seen much change recently in their position amongst the -- in the management of the resource and at the same time, it doesn't appear like -- it appears like 48 years may be too short a time horizon for some of their cultural needs.

MS. GAERTNER: Thank you. Mr. Commissioner, I only have one remaining question and it's not particularly on topic.

Q Mr. Staley, when I was asking questions of Mr. Lapointe quite a while ago, or maybe even just last week, we went to one of your reports in June 2007, and Mr. Lapointe wanted to, from his perspective, correct something, a paragraph in that report. Am I correct that in that report, you chose the Bayes model to reflect the range that was being considered, but at that time, you were -- but there were other models that were also being considered and those were not included in your report?

MR. STALEY: Yes, that's the case. The Bayes model of the time, the new version of the Bayes model would have -- the sort of misunderstanding that Mr. Lapointe and I had over that paragraph would not have occurred.

MS. GAERTNER: All right. Those are my questions, Mr. Commissioner.

MR. WATSON: Mr. Commissioner, it's Chris Watson. I'm counsel for the Area G Trollers on the West Coast of Vancouver Island, and the United Fishers and Allied Workers' Union.

CROSS-EXAMINATION BY MR. WATSON:

Q I'm going to start with one or two general questions, but leading into that, put out a couple of trite points that I believe that there's consensus on, but correct me if that's not the case. There's consensus among the panel that with increased escapement at some point along the range, there is decreased productivity and to maximize productivity, the returns of fish, you want to avoid both under-escapement and over-escapement. So I don't think there's any doubt there's consensus on that. But with that in mind, what I'm thinking about is what Mr. Cass said, I

think it was yesterday, there were -- I heard the phrases "harvest ceiling" and also a "no fishing point." So you have, at both ends of the run size range, cut-offs for harvesting. With the points that we have consensus on, though, that with increased escapement, there is a decline in productivity, would you agree that there ought to be an escapement ceiling, Mr. Cass?

MR. CASS: In a perfect world, and you knew what that ceiling was, I would say that's correct. It would pose challenges in mixed-stock fisheries where different components of the aggregate in a mixed stock have different optimal or fully-seated capacities, they have different sized lakes and nutrients, that kind of thing. So it's a yes and no answer. It's what you don't want to hear, but that's what --

Q And Mr. Morley?

MR. MORLEY: I mean, I would agree somewhat with Dr. Cass that, in fact, certainly, if you were looking at maximizing total productivity across the range of stocks, then you would look at wanting some kind of escapement ceiling. If you were concerned about impacts on certain individual stocks, then that could cause a problem in mixed-stock fisheries, but that's the kind of trade-off analysis that needs to be undertaking to look at just what the extent of biodiversity impacts there may be and whether or not some of these other populations can be sustained at a lower level than their optimum level, and doing those kind of analyses could help determine, you know, where we might want to get to in that maximum escapement level.

Q That brings me to another point. One of the questions of Ms. Baker in direct yesterday, and I thought it was one of the most important questions that we heard, and that is how much biodiversity is enough? And I don't, from what I picked up in the answers, I didn't pick up a very clear answer. I heard from Dr. Staley, though, albeit this was in response to a different question, that we just don't have that information. But would you agree that finding out to the extent possible the answer to how much biodiversity is enough is a critical thing to have in determining the right escapement numbers? Dr. Staley?

MR. STALEY: Well, I don't -- I'm not sure it's directly relevant to what the escapement should be. The biodiversity is more about what are the different kinds of animals in different kinds of habitats you might want to have, not -- so it's the numbers of occurrences of them, not the density or the population of any particular population as much. So you want to -- you know, biodiversity is about having a variety of genetically-programmed responses that the fish might have to unexpected or unknown, or even known potential threats. And that's usually by having representation of different kinds of fish as opposed to the total number.

In terms of whether there can be too many spawners, I think that's where you're getting to, and whether there should be an escapement cap, I guess two comments to that. One is that it is -- some people would say it's still just a hypothesis that there is sort of a bending down of the stock recruitment curve at higher points. That was a proposition by Dr. Ricker over 50 years ago, I guess. Some observation of the data suggests that we haven't observed very many occurrences out at that range. Others would suggest that what we've seen in -- as referred to earlier, what we've seen in the last decade, or so, of the declining productivity is as a result of that downturn on the productivity. I don't think the answer to that is clear yet. I don't think we've seen enough of either side of that. The 1987 rebuilding strategy, one element of that was to try and test to see if there is a bending down of the stock recruitment curves. And also to deal with issues of whether the cyclic dominance was a limiting factor in the total production from the resource. But those two -- I don't think, at least my observation of the data, and look at the information that we haven't answered those questions, the test isn't over yet.

Q But you would agree, Dr. Staley, that the decreasing productivity with the increasing escapement numbers, that's the leading hypotheses or the leading theory; isn't that true?

MR. STALEY: The models that assume that are the models that are most prominently used. Whether it's because that part of the model is the most likely

or most believed is a matter of question. Dr. Ricker, in his original proposition of that model proposed several mechanisms for why that might occur, and those are all reasonable mechanisms. But as I suggested, we have had little -- over the time period when we've been observing these animals with precision and with the kinds of precision we have over the last 50 years, we haven't observed many -- enough occurrences at that high population to know statistically whether it exists, or not.

Q I'll ask you about the rebuilding strategy that you referred to, but before we get to that, just approaching it chronologically, prior to 1987, prior to the rebuilding strategy, or the rebuilding plan as it's called, we've already heard that the harvest rates were in the range of 75 to 80 percent. And Mr. Eidsvik took you through what the returns were, what the productivity was when the harvest rates were in that range. He took you through various decades and asked you answer.

One other question about the state of returns prior to the rebuilding plan is were the returns more stable than after the rebuilding plan and FRSSI came into effect?

MR. STALEY: I'm not sure what you would mean by "stable." I believe the variability from year to year was similar, it may have been somewhat smaller, but it may not have been as -- I'd have to look at the data, look exactly what you mean by that. I know that the variability in the last 10 years, or so, has been significant. There have been significant periods of variability in historical record. There's also been other changes in the environment. We've had other occurrences of warm and cold events. And whether the variability may have as much to do with those kinds of things as it does with harvest, we don't have the tools yet or the data yet to completely answer that question one way or the other.

Q I'll ask the same question of Mr. Morley. Are you able to say whether before the rebuilding plan in FRSSI the returns were more stable than after?

MR. MORLEY: I mean, I think that it's difficult to take your perspective away from what's happened in 2009 and 2010 and, clearly, there is no period in

history where you had returns as dramatically different from one year to the next as that. And in terms of the overall timeframe from 1987 upwards versus what happened prior to that, I think we had a time period when we saw some fairly strong returns in growing returns from 1985 to the early 1990s. Since then, I would say that -- I guess it's really a matter of your timeframe that you're looking at in terms of stability, and you can pick 10-year periods where things are stable, but if you look over 30 or 40-year periods, there's variability in both regimes.

Q Okay. I'll press ahead here. The rebuilding plan, we've heard, started as an experiment, and you were asked why FRSSI, but I'd also like to step back and ask why the rebuilding plan? And my understanding from what I've heard so far is that the only issue that lead to the rebuilding plan was the Salmon Treaty. And we've heard, a short while ago, of the U.S. having a fixed number of fish under the treaty and so Canada wanted increased escapement. But was that the only issue? That was the only if it can even be called a problem that led to the rebuilding plan?

MR. MORLEY: Well, one of the other issues at the time was this debate surrounding, again, cyclic dominance and whether cyclic dominance was an artefact of the Harvest Management Plan where, in fact, the IPSFC for the non-dominant cycles actually had exploited them at a higher rate and deliberately put fewer spawners on the spawning grounds. So whether that was an artefact of that harvest regime, or whether there was some underlying biological cause of that, and part of the experiment was, in fact, to try and increase production on the off cycles in the ones that had cyclic dominance. So that was part of the experiment, as well, and part of the reason for it.

MR. CASS: Yeah, I was just going to add, Mr. Commissioner, that at that time, too, as the populations were growing, there was a realization that there was still high uncertainty in what the habitat, freshwater habitat could support. And quite varying estimates, depending on whether you were looking at the spawning ground areas, and the lake rearing capacity. Quite different estimates,

depending on whether you looked at the spawning grounds, or within the lakes where the juveniles rear. So apart from what's already been said, there was still a lot of uncertainty about how far you could increase the production capacity of the Fraser system and, hence, the economic yield from that.

Q And by that, you mean increasing production?

MR. CASS: Yes.

Q Increasing returns?

MR. CASS: Yes.

Q And the rebuilding plan, as it's been called now several times, being an experiment, we did not see, of course, increasing production following the introduction of the rebuilding plan, you would agree with me with that?

MR. CASS: Well, we say, you know, depending on which year you want to pick in the '90s as a turning point, a peak in say, '93, and a decline since then so --

Q Right. Persistent declines, I've heard, being the evidence through the '90s. But an initial increase, and then it went into persistent decline; is that right?

MR. CASS: Some of the large lake populations went into a persistent decline, others did not.

Q All right. And so this experiment that was followed by years of persistent decline in the '90s wasn't the subject of a scientific review until 2002; is that right, with a research paper produced in 2004, 17 years later?

MR. CASS: Sorry, the 2002, are you referring to the DFO --

Q It's Exhibit 396, by my note. I don't know what it's called offhand.

MR. CASS: Yeah, this particular exhibit is the 2004 research document, but you mentioned 2002, which I'm assuming was the original review of the Fraser River at that time.

Q My recall of the evidence was that in 2002, the research that led to this paper started.

MR. CASS: Oh, I see. That's correct.

Q Yes. So 17 years later, though, there's a research paper that shows the results of what was an experiment through the rebuilding plan, is that -- do I have it right?

MR. CASS: Well, this certainly started, you know, the

development of FRSSI started in, as you say, 2002. I've sort of lost track, but --

Q Okay. Just in terms of the harvest rates, in terms of percentages, we have it already that the harvest rate prior to 1987 was in the range of 75 to 80 percent. Under the rebuilding plan, 1987 to 2002, am I right that it was in the range of 60 to 70 percent?

MR. CASS: The intent was to reduce the harvest rates from the 75 to 80-percent range down to, I can't remember the exact numbers, but say, 65 to 70, in that range, in order to increase escapements.

Q All right. And under FRSSI, it turned from talking about harvest rates to talking about TAM and it's a 60-percent cap. I want to ask you a couple of questions about FRSSI really quick here. In direct examination, Dr. Cass, you talked about the no-fishing points again, and by my note, you defined the no-fishing point as the point below the fully seeded population. Now, I interpret that to mean, by "fully seeded," that fishing, harvesting doesn't begin until there would be enough fish on the spawning ground to parent the next generation of fish. So correct me if I'm wrong, but fishing wouldn't start until we're in the, or beyond the optimal escapement point. What am I missing there?

MR. CASS: That wasn't the intent of FRSSI. The intent of FRSSI was to have a benchmark that was less than that point that you're describing to guard against the conservation risk.

Q Let me ask it in a different way.

MR. CASS: But no, you've got it wrong, that that was not the -- the no-fishing point was not at a fully seeded population.

Q Okay. Okay. Perhaps you're going to have to give me the definition again, then, because that was my note of what the no-fishing point was. What is the definition of the no-fishing point?

MR. CASS: Well, the no-fishing point is really the result of the simulation testing given a particular benchmark and given the objectives, what is the shape of that TAM rule down where you're calling it the no-fishing point, or the minimal fishing point that satisfies the objective based on a performance measure. So the no-fishing point in the TAM rule is a result of that, a

result of how well a set of TAM rules compare to other TAM rules that don't meet the objective. Maybe others can describe it differently.

Q Does anybody else wish to weigh in? All right. Nobody wants to touch that. There was another question. This question flows from a question from the Commissioner earlier today. It was asked whether there is a double accounting for uncertainties. And what I noted from your evidence yesterday, Mr. Cass, is that the 60-percent TAM rule was a policy choice made, in part, because of knowledge gaps or data gaps, but in coming up with the TAM, or the total allowable mortality, you also have to apply the management approach. And does the management approach also account for uncertainties in the sense of not knowing how many fish are going to make it, or not, to the spawning beds, or spawning grounds?

MR. CASS: Each component has uncertainty associated with it in this model.

Q Because management adjustments account for en-route loss?

MR. CASS: Yes.

Q Correct. And you would agree with me that we don't know how many fish are going to be lost en-route to the spawning grounds so there's uncertainty --

MR. CASS: Yes.

Q -- in that sense?

MR. CASS: Yes.

Q All right. All right. Is there, in determining the 60-percent rate, already an accounting for that uncertainty in terms of the number of fish lost en-route?

MR. CASS: Well, that is a candidate for -- although, as you say, there's an uncertainty around that and the sort of history of the en-route loss, what's been called the difference between estimates, which includes en-route loss, or whatever, any other factor that may result in a difference. And so that is accounted for in the TAM rule, given that there's uncertainty around that estimate. That is part of the simulation model, the testing that's an input. So that's the, you know, simulation model to develop, in terms of the long-term strategy, to have a TAM rule that accounts for that.

The 60-percent cap, if you like, on harvest is a buffer. Imbedded in that is a buffer to guard against uncertainties in terms of, as we've talked about, unmodelled stocks with different productivities than which are modelled to account for uncertainties in their in-season run size estimate, to account for the fact that the target harvest rate based on the TAM could not be achieved. So the 60 percent has these -- I would call them buffers, but it's to guard against the gaps in the information that we have. But it does include an estimate of the management adjustment.

MR. WATSON: Thank you. Those are my questions.

MS. BAKER: Thank you. It's two minutes to 4:00. Mr. Lowes still has some questions. I don't know what his time is now at, if it's still five to 10? Five minutes? Can Mr. Lowes complete his questions? Thank you.

MR. LOWES: Yes, J.K. Lowes for the B.C. Wildlife Federation and B.C. Federation of Drift Fishers.

CROSS-EXAMINATION BY MR. LOWES:

Q I really have one question that kind of wraps around a number of answers that were given throughout the day and it boils down to a couple of questions that the Commissioner asked, which was the respective roles of FRSSI and human judgment, I suppose, in in-season management.

Mr. Morley, you gave evidence of an adjustment from the FRSSI-generated TAM rule in 2010 with respect to the Adams river run; do you recall that earlier today?

MR. MORLEY: Yes, I do.

Q And as I understood your evidence, what happened was that when someone, a human being, presumably, put his mind to it, he realized that following the TAM rule would result in a disproportionate trade-off between foregone catch of the Adams component of the run and savings of the Cultus stock; is that correct?

MR. MORLEY: That’s correct. I mean, the TAM rule per se for Cultus doesn't actually come out of FRSSI, the FRSSI modelling, but it was a limitation of an exploitation rate that certainly provided considerable restriction on how much of the very populous Adams River run could be harvested.

Q Yeah, but somebody, in his wisdom, realized that it would take a foregone catch of some one to two million Adams River sockeye to save a couple of hundred to a thousand extra Cultus; is that --

MR. MORLEY: Yeah, I don't know if the number's exactly correct, but the order of magnitude are that we're talking about millions versus thousands, yes.

Q Yes. And I guess the thrust of my question is that -- and this is for Mr. Staley, too, because he mentioned the 2010 adjustment. What was the mechanism for that final -- whose mind was applied to the issue and what was the mechanism in which the decision was made?

MR. STALEY: Well, I suspect there were several minds that did the calculation. I mean, it's a straightforward calculation that Mr. Morley put out. I'm not sure who did it first, probably Rob. But you know, we could all do the math. It's not that hard. And then the decision about the trade-offs required -- well, a departure from the IFMP. It's not necessarily a FRSSI problem, it's a -- how the IFMP has adjusted in-season.

Q Yes. Yes.

MR. STALEY: And my understanding was that, in part, there were discussions with some of the First Nations who have direct interest in Cultus, and they made recommendations to DFO staff, and then DFO staff took those, with other recommendations, to the Minister, met with her and the Cultus constraint was no longer operational within the context of the information we had to make that decision.

Q Yeah. And over what time period did that process take?

MR. STALEY: Well, the key parts of it would have taken place over about three days.

Q And you --

MR. STALEY: Maybe it was realized a little less than a week prior to the decision.

Q And how many people were involved in sort of assessing the information and providing the advice and making the decision? I get the impression it was a pretty small group over a pretty quick time?

MR. STALEY: Well, most of the panel was aware of it. The technical committee was aware of it. There were staff within DFO and as well as others that were consulted with, some of the First Nations

directly responsible, those numbers were provided to them, and they provided some response back to DFO on that.

Q Yeah.

MR. STALEY: So in terms of doing the calculations and discussing it, it would have been the Canadian section of the panel, maybe 15 people, of which of that, there probably would be only eight or 10 that would be directly engaged in it.

Q So eight or 10 people over a period of about three years made the decision?

MR. STALEY: Three days.

Q Three days, rather?

MR. STALEY: Well, the decision was made by the Minister so --

Q Okay.

MR. STALEY: -- and there were more -- I suspect there were --

Q On the advice of eight or 10 people who had put their heads together for about three days?

MR. STALEY: I don't know what advice she got, I'm not privy to that, and who provided it to her --

Q Yeah.

MR. STALEY: -- but the people who did the calculations and made the original -- both made the original suggestion, assisted in some of the calculations, it's probably a matter of about 10 people.

Q Yeah.

MR. STALEY: 10 people.

Q Would you agree with me that the lesson is that it all comes down, really, to decisions being made by experienced people using their best judgment?

MR. STALEY: Well, one hopes that that's always the case.

MR. LOWES: Thank you.

MS. BAKER: Thank you. I have one re-exam point, if I could ask that.

RE-EXAMINATION BY MS. BAKER:

Q Ms. Gaertner asked a question about whether the location of the fisheries was contained in the FRSSI analysis in any way, and I just wanted to ask you, is it fair to say that the point of the FRSSI model is to set the global number by aggregates of what the total mortality can be on that aggregate to ensure escapement targets are

met? That's the point of that model. Is that fair? I'll ask Mr. Cass.
MR. CASS: Mr. Commissioner, that's one point of the model.
Q Okay.
MR. CASS: I mean, the fact that you're considering trade-offs between escapement and harvest is -- there are those objectives. Yeah.
Q Right. And in terms of figuring out what the total mortality, total allowable mortality will be, it makes no difference to the operation of the FRSSI model where those fish are killed? It doesn't matter whether they're killed by commercial fishers, or sport fishers, or First Nations fishers, or disease, or bald eagles, they're -- how many fish can be killed to still meet the escapement target is the point, right?
MR. CASS: That is correct.
Q And it doesn't make any difference whether those fish are killed in the marine areas or the river areas, it's just the total for that aggregate that can be killed; is that fair?
MR. CASS: That's correct. The model makes no distinction.
Q All right. And once that total allowable mortality has been calculated, then it's up to the managers to divide and allocate that mortality amongst whether natural causes, or commercial fishers, or sport fishers, or First Nations, or however that's done, that allocation is then done by managers once the TAM rule is set; is that fair?
MR. CASS: Yes, those are different processes.
MS. BAKER: Okay. Thank you. That's my only question. Mr. Commissioner, tomorrow morning -- sorry, you'll recall we had planned to have Mr. Woodey here this afternoon, and Mr. Ryall, as well. What I've decided to do is to have Mr. Woodey come back first thing in the morning and sit with the panel. He was going to be part of the over-escapement panel in any event so I'll just move his questions on escapement to the front end of that panel and then go right into the questions with the panel overall. So we won't have a separate cross-examination for Mr. Woodey on those points, we'll just roll it into the overall panel. And we'll try and figure out what we're going to do with Mr.

Ryall's testimony in the next few days, but we've got some contingency plans that we're working through. And we start at 10:00 tomorrow, I believe.

THE COMMISSIONER: Thank you very much. Yes, I do have something going on at 9:15. I should be here by 10:00, but I might be a few minutes late so I apologize to counsel if I'm a little bit late. You can study the models.

MS. BAKER: We have Mr. Walters coming on the screen tomorrow so we might be ironing out a few wrinkles anyway.

THE REGISTRAR: The hearing is now adjourned for the day and we'll resume at 10 o'clock tomorrow morning.

(PROCEEDINGS ADJOURNED TO FEBRUARY 9, 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.

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Diane Rochfort

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

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Karen Hefferland

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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Susan Osborne

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