Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River

Commission d'enquête sur le déclin des populations de saumon rouge du fleuve Fraser

Public Hearings

Audience publique

Commissioner

L'Honorable juge /
The Honourable Justice
Bruce Cohen

Commissaire

Held at:

Room 801
Federal Courthouse
701 West Georgia Street
Vancouver, B.C.

Thursday, January 27, 2011

Tenue à :

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

le jeudi 27 janvier 2011

Errata for the Transcript of Hearings on January 27, 2011

Page	Line	Error	Correction
12	12, 20 and 22	Ms. Grant	Ms. Baker
45	30 and 31	DR. RIDDELL	MR. LAPOINTE
100	26-29	This sentence should not be part of David Patterson's answer. The Salmon Commission will come up with different model selections and recommend them but, in some cases, it's the panel that actually adopt the model, the actual MA itself?	Question by Wendy Baker: The Salmon Commission will come up with different model selections and recommend them but, in some cases, it's the panel that actually adopt the model, the actual MA itself?
100	30-33		David Patterson's answer to Wendy Baker's above-noted question. The MAs are recommended. The MAs are calculated from the different models and then the Fraser Panel will then decide to adopt the MA, presumably based on one of those models.

APPEARANCES / COMPARUTIONS

Wendy Baker, Q.C. Maia Tsurumi	Associate Commission Counsel Junior Commission Counsel
Mitch Taylor, Q.C. Jonah Spiegelman	Government of Canada ("CAN")
No appearance	Province of British Columbia ("BCPROV")
No appearance	Pacific Salmon Commission ("PSC")
No appearance	B.C. Public Service Alliance of Canada Union of Environment Workers B.C. ("BCPSAC")
No appearance	Rio Tinto Alcan Inc. ("RTAI")
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")
No appearance	Area D Salmon Gillnet Association; Area B Harvest Committee (Seine) ("GILLFSC")

APPEARANCES / COMPARUTIONS, cont'd.

No appearance	Southern Area E Gillnetters Assn. B.C. Fisheries Survival Coalition ("SGAHC")
No appearance	West Coast Trollers Area G Association; United Fishermen and Allied Workers' Union ("TWCTUFA")
No appearance	B.C. Wildlife Federation; B.C. Federation of Drift Fishers ("WFFDF")
No appearance	Maa-nulth Treaty Society; Tsawwassen First Nation; Musqueam First Nation ("MTM")
No appearance	Western Central Coast Salish First Nations: Cowichan Tribes and Chemainus First Nation Hwlitsum First Nation and Penelakut Tribe Te'mexw Treaty Association ("WCCSFN")
Brenda Gaertner	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)
No appearance	Adams Lake Indian Band
No appearance	Carrier Sekani Tribal Council ("FNC")
No appearance	Council of Haida Nation

APPEARANCES / COMPARUTIONS, cont'd.

No appearance	Métis Nation British Columbia ("MNBC")
No appearance	Sto:lo Tribal Council Cheam Indian Band ("STCCIB")
No appearance	Laich-kwil-tach Treaty Society Chief Harold Sewid Aboriginal Aquaculture Association ("LJHAH")
Lisa Fong Benjamin Ralston	Heiltsuk Tribal Council ("HTC") Articled Student
No appearance	Musgamagw Tsawataineuk Tribal Council ("MTTC")

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THE REGISTRAR: The hearing is now resumed.

MS. BAKER: Thank you, Mr. Commissioner. There's a couple of little housekeeping things I wanted to take care of. When we were dealing with Ms. Grant's evidence yesterday, we dealt with two exhibits which have now been marked as 340 and 352, and if you'll recall, we had a document from Ringtail that was in black and white and as we were talking to the witness, we realized that colour was needed so Mr. Lunn was able to find a PDF that was in colour and we used that, but probably for the record, we should have the exhibit containing both of those, the colour and the black and white. The only reason to keep the black and white is that it has the CAN reference on it, which we did use in the questions.

So what I would like to do is, on Exhibit 340, which is the forecast for 2009, I'd like to have the colour non-Ringtail document marked as 340A so they'd just be kind of together in the record.

MR. TAYLOR: I have no difficulty with this. I'm taking it from Ms. Baker that she's satisfied herself they're the same document?

MS. BAKER: Yeah. I mean, we went through both with the witness, in any event. We flipped between them immediately so if that's acceptable.

THE COMMISSIONER: They'll be so marked.

EXHIBIT 340A: Colour non-Ringtail copy of Pre-Season Run Size Forecasts for Fraser River Sockeye and Pink Salmon in 2009

MS. BAKER: And the next one was Exhibit 352, which is the 2010 forecast research document. And so the same would be to have the colour non-Ringtail document marked as 352A.

THE COMMISSIONER: So marked.

EXHIBIT 352A: Colour non-Ringtail copy of Pre-Season Run Size Forecasts for Fraser River Sockeye Salmon in 2010

MS. BAKER: Thank you. Thank you. So I'll begin again with the witnesses.

MIKE LAPOINTE, resumed.

DR. BRIAN RIDDELL, resumed.

EXAMINATION IN CHIEF BY MS. BAKER, continuing:

Q Mr. Lapointe, we were talking yesterday about species composition impacts on the numbers that you are able to -- or the data that you're able to receive at Mission Hydroacoustics. One thing I wanted to just flag is when you were here much earlier, still in 2010, you dealt with this in cross, and an exhibit was marked, Exhibit 74, which I just wanted you to confirm that the bias through species composition issue is outlined in that report, in Appendix 5?

MR. LAPOINTE: That's correct. That's the best comprehensive review of the 2005 situation. So it's a good place to refer to on this issue.

Q Okay. Thank you. And did you have any other points you wanted to raise on the species composition issue?

MR. LAPOINTE: Yeah, there was one I forgot to mention yesterday that relates to one of the other potential solutions to this, and it involves the use of the DIDSON images. DIDSON images are quite high resolution and you can actually get not a perfectly accurate length, but a reasonably accurate length of the fish targets that are seen through the DIDSON. And so we've been exploring a method to use the lengths of the DIDSON to distinguish between pinks and sockeye. And because pinks are so much smaller than sockeye, there does seem to be quite a bit of potential in this approach, and it was actually presented at a conference, I think it was a pink and chum workshop in Nanaimo. So that would help us for the shore. We still don't have a routine DIDSON operating in the mid-channel right now and so we'd need to have that if we're going to implement it, but it does look like there's a way that doesn't involve test fishing that might actually hold some promise.

Q Okay. Thank you. One other area I wanted to

cover with you in terms of potential interference with the data at Mission is driftnet interference.

MR. LAPOINTE: Sure.

Q Are there problems, or can there be problems with driftnet interference in the numbers that you obtain from Mission?

MR. LAPOINTE: Sure. A bit of background. We've actually had, from time to time, fishers fishing near our site. It's not a bad spot to catch some fish so we've actually had set nets that occasionally have been actually anchored right off this dolphin that we actually use as a reference marker. And in those cases, in the past, we've been pretty effective at being able to have a conversation with the folks involved and explain to them the impacts and, in fact, the nets would just have been removed or moved to a different location.

Beginning in about '04/05, something new started happening, and this was drift gillnet fishing, and at that time, I believe, and I'm not clearly exactly on these dates, but I believe there was a period around that time when drift fishing above the Mission bridge became illegal, and prior to that, it wasn't illegal activity, and I don't know the exact dates there. But the initial activity was actually at night. It was in the middle of the night, our boat at Mission transects 24/7 back and forth across this river and so the transecting in this vessel would just appear with a net with some fish in it sort of drifting towards you. And there were a couple of incidents of very near collisions associated with that activity, and probably on the order of about a dozen, or two dozen interactions on an annual basis during that initial period. So subsequent to that, and again, I'm going to need some help as to the exact year, drift fishing became illegalized activity and, actually, the night-time activity stopped, which was a really good thing from a safety perspective, but we did have folks drifting through during the day as part of their normal, authorized fishing activities, you know, communal-licensed activities at the site.

And so the initial activity, the night-time activity seemed to involve from conversations with some of those folks and subsequent multiple

groups, it seemed like there were multiple groups involved. The daytime activity seems to be primarily one group, and it's primarily the Sumas First Nations. So the drifting seems to be more prevalent, more of an issue when there's more abundance. And what I mean by that is that in our dialogue with Sumas, and we have an ongoing dialogue on this issue, we try to get -- have sort of an informal agreement that folks should try to get their nets and their fishing activity completed before they get to our site. But when there's a lot of fish in the river, it's hard for them to get all the fish out of their net before they get to the site. It's just physically difficult.

So we have on the order of, you know -- well, for example, in 2010, you know, basically every weekend, we had activity, the fishery was open and activity going through the site. And you know, it's been a source of ongoing dialogue, I would say.

Q You've described a safety issue, but is there an issue in terms of how the drift fishing can impact the actual data that you're collecting at Mission?

MR. LAPOINTE: Yes, it basically disrupts the distribution of the migration so I think as I described yesterday, but perhaps I could review it briefly again, the most robust part of our estimation scheme at Mission is the shore-based part of it. That's the part that seems to be the most reliable. The vessel is a significant challenge. So what happens with the drifting activity is it tends to put more of the estimate into the vessel part of the estimate, which is the least robust. So the challenge is on the distribution site.

Now, I cannot provide to you a quantification of the impact. I think I want to be clear about that. It's a very difficult thing to quantify. You'd have to try to do something with fishing and without fishing and kind of see how it affects the estimates, but it just probably creates a significant amount of additional uncertainty in the estimates, and that would be the main concern that we have.

As I've said, we've had a very constructive and positive dialogue with the Sumas First Nation

on this issue, and it's ongoing, and we will continue to participate as needed.

Q Is that the primary reason why this is an issue for the Salmon Commission, is that there's an additional uncertainty in the data collected at that site which arises from that fishing activity?

MR. LAPOINTE: Yeah, it relates to protecting the integrity of the data collection scheme.

Q Okay. And there's a memo that you prepared in July 2008 dealing with this issue; is that right? An Email?

MR. LAPOINTE: Yeah, you might have to refresh my memory on it.

Q Yeah, it's in Tab 8 of the binder in front of you.

MR. LAPOINTE: Okay.

Q And it's document CAN204994.

MR. LAPOINTE: Sure, so -- yeah, this --

Q And if you've turned, really, over to the second and third pages, that's an outline of the issue and where things were at that time, I guess, in trying to resolve it.

MR. LAPOINTE: Yeah, so one of the roles that we've played in this discussion is that over the course of these events, there's been, I think, three different area directors in the Lower Fraser and so the context of this email was that Mel was the new area director and so I was trying to brief Mel on where we were at from, you know, PSC perspective, but trying to have all the issues so he would know. And I guess, you know, perhaps that would come internally, but I thought if I could do that, it would help him understand what was going on.

Q Okay. Has the situation changed since the state of the issue as described in this email?

MR. LAPOINTE: Not substantially. This is '08. So we have tried to engage Sumas First Nations in a test fishery at our site to deal with the species composition issue. I think I mentioned that yesterday. But in terms of a resolution, it's still unresolved. I don't know if this memo mentions it, but there is a boundary. It's about a 300-metre buffer zone. So there's actually two little markers on the side of the Fraser, and that boundary is intended to protect the site, but we have had, of course, some events occur. And this year, you know, for example, early in the season,

I think we did call Conservation Protection once, and they responded and removed a set net that was actually inside the boundary. So you know, it's still ongoing and unresolved, but like I say, we're still trying to be in a very positive dialogue and constructive dialogue about -- you know, I think we understand, each side understands each of our perspectives. Like, I think, Sumas understands the importance of the site, and I think we understand some issues from the Sumas side that I won't speak to, because I can't speak for Sumas, but they're kind of laid out in this memo, or this email to some extent.

Q Okay. Does the interference created by this site pose any challenges to the data? Like, can you use the data from Mission, or is this such a problem that it creates a significant uncertainty in that data? Or is it more just you're flagging it as a concern that needs to be resolved?

MR. LAPOINTE: Well, we obviously still operate. I mean, we have to deal with the data that we have, but it's probably the timeliness. The time that it occurs is a little bit, you know, unfortunate in some ways because it occurs on the weekends so typically, in our sequence of meetings, the important decisions are made on Friday and they might be made based on some sort of test fishing projections for some of those days. And then when we get the data on the weekend, if that's significantly different, and if that is different because of the interference, and I've already said I can't quantify this, then it could create a disconnect in the meeting process.

So we still work, we still do our best, but because I can't quantify the exact impact, I'm not sure how, you know, having it or not having it would affect things.

Q All right. And just to put it in really simple terms, if there's fishing before Mission, when you collect the data at Mission, it may create an artificially low run size based on, you know, your extrapolations from the test fishing site?

MR. LAPOINTE: Yeah, this is not fishing before Mission, this is actually drifting a net right through the actual site.

Q Okay.

MR. LAPOINTE: And so the actual direction of bias will

depend upon the impact on the fish behaviour. It could be low, it could be high in some cases, depending upon the impact on behaviour, but that's the idea is that there's some impact on certainty of potential direction that is unquantifiable at this point, that we're concerned about in terms of that assessment.

Q Okay. And we've talked yesterday and today about different potential biases in the data collected at Mission. Some of those include the species composition, uncertainty, fishing interference, uncertainty, sampling design challenges, boat interference and bias.

Given those uncertainties, first of all, first question, is the relative magnitude of potential bias at Mission consistent from year to year, given all these different factors?

MR. LAPOINTE: The short answer is no, for two reasons. One is that we tried to have a very consistent sampling scheme and so from that aspect, if it's consistent, you'd expect it to be a consistent level of bias, but we also obviously had improvements. So we talking about going from single beam from 1977, up until 2003 or 2004, was single beam technology, and 2004, the split beam estimator became the estimator. So clearly, if you're changing techniques, that could create an inconsistency over that time series.

The more fundamental challenge, though, is the fish behaviour challenge. So what the fish do, and a perfect example would be the pink salmon issue, is going to affect the relative degree of bias. So if you have early upstream migration of pinks, that can create a larger bias than if you don't. So the fish behaviour going from here on forward, now that we have the technique relatively consistent, although we are still working on a mid-channel program, is the thing that can create the differences in the biases between years.

Q Okay. And I'd like to ask this question to both of you. Is it fair to say that scientists generally agree that the statistical methods used at Mission are good and reliable, despite some of the problems that we have talked about today and yesterday?

MR. LAPOINTE: I'll go first and then I'll let Brian chime in. I think that if you ask folks, a fair

assessment of what they might say would be, and I don't know if statistics folks are the best folks, or the acoustics folks, but the point's probably the same either way. I think they'd probably say that what we're doing is the best that can be done at the site that we're working on with the caveat that the one area that we can improve is in the mid-channel sampling. That's still the weak link.

And I think they'd also be quite quick to point out that Mission is a very challenging site to do acoustics. You have tidal effects, you've got eddies, you've got 400 metres of river you're trying to cover, it's a very significant challenge.

So the techniques that we are using are good, but the challenge still remains and, right now, the biggest challenge is the mid-channel sampling.

DR. RIDDELL: There we go. If I could just comment for a second on the question before, too, I mean, I think the very obvious difference from year to year is Mike is talking about pink run timing, but the very fact that you have pinks even in odd years and not in even years is a huge change. And then, I mean, you can't really underestimate the concern you get with added uncertainty because of the environmental conditions.

With the profile of the stream at Mission, you could have years of low flow in a lower summer period where you really could have fish out in the middle in the main channel and so the issue of the appropriateness of the site for hydroacoustics really depends on the environmental conditions you encounter in the year, but Mike really touched on all those things.

I would agree almost completely with what Mike said when thinking about the sort of questioning you put to me before and coming from the departmental background, I think Mike encapsulated it pretty well exactly. It's very good work for the environment they're working in, but they're working in an extremely difficult environment. And I would repeatedly hear that from our staff, that we're the DFO experts on hydroacoustics.

And I think the other thing we should recognize there is we didn't start out actually having a really, really good working relationship

because there really was a very long history of thinking that Mission was correct. But as more and more uncertainty got involved there and the Department started putting more effort into trying to assist and evaluate what's going on there, I think the working relationship now is vastly improved and very constructive now.

Q Sorry, working relationships between who?

DR. RIDDELL: Well, there was always the departmental science staff looking at different types of technology and different environment, but they weren't the ones working directly in Mission so they would have a particular mindset about how hydroacoustics functions, how good could it work, but that is from their personal experience, not working in the Mission environment. So there was quite a long dialogue there, probably through the '90s, more than in the 2000s. And then with the development of Qualark, again, in the 2000s, there's been a much more open dialogue. So I think Mike has encapsulated it correctly.

MS. BAKER: Thank you. I didn't mark the memo that we referred to with Mr. Lapointe dated July 11, 2008. I should mark that as an exhibit.

THE REGISTRAR: Exhibit number 354.

EXHIBIT 354: Email from Mel Kotyk dated July 11, 2008, entitled, "Sumas FN fishing and Mission Hydroacoustics site

THE COMMISSIONER: Ms. Baker, I wonder if I could just ask just a couple of very brief questions.

MR. LAPOINTE: Sure.

THE COMMISSIONER: There's a lot of information here, Mr. Lapointe, so it's probably in there somewhere, but just --

MR. LAPOINTE: Okay.

THE COMMISSIONER: -- to remind me, just a couple of things, why was the Mission site chosen? Were other sites considered? Are you locked into the Mission site? The other query I have is I understand the escapement information comes from the DFO to the Pacific Salmon Commission, and the forecasting is done by DFO and that comes to the Commission. Why is it the Commission that's operating the Mission site, and not the DFO?

MR. LAPOINTE: Okay. On the first part of your

question, I suspect that you're going to be leading me through some evidence that speaks to why the Mission site is where it is so I don't know if -- I think that might be the most effective way.

THE COMMISSIONER: That's fine.

MR. LAPOINTE: I'm not sure, counsel, if you agree.

MS. BAKER: Yeah, that's fine. We are going to deal with it.

MR. LAPOINTE: Okay. Okay. On the second part of your question, I actually don't know the long-term history of the role of the PSC admission pre-1985, but if you actually look at the 1985 treaty, there's a diplomatic note towards the end of that document that clearly defines one of the bilateral responsibilities of the PSC, which was established in 1985 under that treaty, as being monitoring at Mission. And I suspect that probably is because as part of the IPSFC, which was the predecessor to the PSC, this program was started in 1977 so that's eight years before the new treaty. So I think it was something that evolved as the IPSFC recognized a need for monitoring lower over-escapements as part of the IPSFC, and then when the new treaty was signed, it's just sort of naturally got woven into the responsibilities of the PSC. I think I may have missed some of your other questions so you may have to help me out there.

THE COMMISSIONER: No, I think you've addressed it, I just recall you saying in one of your appearances here --

MR. LAPOINTE: Okay.

THE COMMISSIONER: -- when you were asked about whether the PSC could take on some of the DFO responsibilities around forecasting and whatever else comes into the data picture, and you suggested, for a variety reasons, that was probably not in the cards.

MR. LAPOINTE: Yeah, so this, I think, was in reference to a question under cross where -- and I want to say it was from the Area E group, but I'm not sure if that's correct, about the context, I guess, is kind of like, well, in the old days, when the IPSFC had all this responsibility, they did all this work. And it's true, the IPSFC did the escapements, they did the forecasting, and when

the new treaty was signed, some of those duties, and I wasn't around in that negotiation period, and maybe Brian will have some recollection and he can help here, some of those duties were transferred to DFO, most of them were. The only things that were retained, the main element was the in-season management data flow. And since Mission is such an important part of the in-season management data flow, it was retained, the spawning escapements, the forecasts.

Now, as Ms. Grant said yesterday, you know, it is definitely collaborative. Like, you were asking questions about the forecast and, you know, there was a time, even in the last decade, when because we have a responsibility under the treaty with respect to forecasting, that we might have provided our comments on the forecast in February, even though Canada's review might have occurred in November. And one of the things I've been trying to do is that wasn't effective because Canada already had an internal review. To have us now come and say something in February that's significantly different really kind of, you know, could throw a wrench in the spokes, so to speak.

So now, and Sue's testimony reflects this, we participate in November and provide our input then so that we're not creating those spokes in the wrench.

So hydroacoustic is an example, forecasting is an example, escapement enumeration, all examples of how -- I'm not taking credit for this, but how the philosophy is you try to be an effective partner in this, in terms of your timeliness of your participation, all those things, and so that's why I can see it could be a bit confused, our responsibility, you know?

If Catherine, my staff, can help to forecast, I let her help forecast, you know, to the extent she can do it within the duties I have with me. So it's trying to foster that collaboration that's important because we work so closely together and the information is so integrated that we've got to work together, and so we do.

DR. RIDDELL: My recollection would be identical, Mr. Commissioner, because in 1985, the Fraser River Panel was being defined in the Memorandum of Understanding, and as Mike pointed out, the

Mission hydroacoustics at the time, that was the final piece of the in-season management. And so it was a natural breakpoint between responsibilities of the panel for in-season management of Fraser sockeye and pink and then DFO responsibility for stock assessment more generally. And stock assessment doesn't occur actively in-season and so the Mission really is a clear break between the end of the in-season information and the beginning of DFO's responsibilities.

MS. GRANT: Mr. Commissioner, I don't know if it's useful, but Exhibit 65 has the Memorandum of Understanding, 1985, and page 134, potentially, it might have the -- I'm not sure about the page number, but at the very end has the breakdown of responsibilities. So it would be in higher, or earlier.

THE COMMISSIONER: Thank you, both.

MS. GRANT: We can provide that.

MS. BAKER: That's it right there.

MS. GRANT: Oh, there it is. Okay. Page --

MS. TSURUMI: 126.

MS. BAKER:

Q All right. Thank you. Now, I wanted to move on to spend a bit of time on Qualark. So Dr. Riddell, you're going to be the lead answerer for this next batch. First of all, the Department of Fisheries and Oceans operated a second hydroacoustic program from '93 to '98 at the Qualark site; is that right?

DR. RIDDELL: Yes, it is.

Q Okay. And that site was implemented in response to the Pierce and Larkin review in 1992?

DR. RIDDELL: Yes.

Q And I don't know if I need to take you to this exhibit. Let me know if you need to see it, but can I just ask you if you remember that Larkin recommended that hydroacoustic monitoring be located at every major tributary? Do you recall that?

DR. RIDDELL: Yes, I do.

Q Okay. And the establishment of Qualark was in response to that recommendation?

DR. RIDDELL: Yes.

Q Now, the recommendation said every major tributary, that was recommendation number 3, but

only one at Qualark was actually implemented. Why was that?

A Well, there were other sites evaluated for potential application of hydroacoustics, but the hydroacoustics programs are very intensive, labour intensive and you require a particular expertise. At that time, you were using the dual beam hydroacoustics that required quite a bit of data processing. And so for every site, you would have needed a fairly highly-trained staff and fairly extensive equipment, and you had to have physical environments in each of those sites that were conducive to getting good hydroacoustic information.

When our staff and DFO, at the time, did the assessments, it did evaluate a couple of other sites, but the incremental value of the information was not really viewed as being worth the substantial increase in staff, basically, because you had to have expert staff to operate these. And we thought at the time that Qualark was by far the preferred site because it did address fish enumeration that could be done hopefully while going into the canyon, and then we could use the escapement surveys in the upper river to acquire the other information.

Q Was there any need to have a new site close to Mission? Was that one of the factors you looked at?

DR. RIDDELL: Well, there was a consideration of being as close to Mission as possible in the sense that to do any direct comparisons, you didn't want long time lags, and that even Qualark is, approximately, three days of fish migration past Mission. Did I say that correctly? Three days' fish passage past Mission and so that's even getting to be up there.

Everything else above that, of course, is going to be substantially more because they have to get through the canyon, as well. And there was always the consideration that we wanted to be able to evaluate the accuracy at Mission if we were going to build something additional further upriver.

Q You said other programs were looked at. Where were the other sites, or what other programs were considered?

DR. RIDDELL: Well, probably the one that was most thoroughly evaluated was at Boston Bar, but Boston Bar is only another 45 kilometres up the river. If you were to do the major tributaries, you'd be looking at the lower part of the Thompson was a very, very difficult environment for hydroacoustics, and part of that is because of development along the Thompson. Anyone that's gone through that route will realize that you are confined by rail on one side and highway on the other, and if they're not on the river, they're very steep sides. And so it's a very, very difficult environment to work in. You'd have to go further up above that canyon reach. And the other river, it just gets to be a large volume of flow without the sort of added contour type of advantages you have at Qualark.

The other sites that were evaluated more intensively were actually in the tributaries, where we would look at trying to provide high-quality escapement enumeration without spending as much in the mark recapture programs in some of the very large stocks. And even there, we had limitations. You could probably address about half of the major stocks, I thought, if they looked at potential for using hydroacoustics.

Q Did you have anything to add to that, Mr. Lapointe?

MR. LAPOINTE: Thank you. Just on the Boston Bar site, some of the context of this relates to the history way back to Pierce Larkin and some of it's more recent so in a more recent context, there was a workshop that was held by the PSC, funded through the Southern Boundary Restoration Enhancement Fund, which looked at various possibilities for assessment programs within the Fraser River. And in terms of main stem applications, there were two sites that were considered. Just a minute, I've got something in my throat.

Q Okay. Well, while you're having a drink of water, I'm just going to ask you if you can open Tab 15, which is CAN064768 and you can let me know if that's the reference to the workshop you were just talking about.

MR. LAPOINTE: Sorry, Tab 15?

Q It should be 15. Sorry, maybe I've got -- sorry, 10.

MR. LAPOINTE: 10. Yeah, that's correct, that's the workshop report.
Q Okay.
MR. LAPOINTE: So in discussing potential opportunities for hydroacoustics, not just in the Fraser River, this actually included submarine applications, as well, but in the main stem context, it was clear that you would choose particular sites based on certain criteria. So from the standpoint of getting in-season feedback on the Mission program, as Brian said, being as close to Mission as possible was desirable because of the time lags and just having something that is as close to sort of apples to apples comparison as you can get.

From the standpoint of successive passage, which is part of the PSC mandate in terms of monitoring success through places like Hell's Gate, then Boston Bar made sense because it's above the Hell's Gate, most of the canyon, most of the difficult areas of passage. So that was a site that was clearly a possibility for that purpose. And as Brian said, if you talk about tributaries, you can do escapement enumeration, and we are, and DFO is doing escapement enumeration with acoustic technology at places like Chilko using DIDSON and so forth.

So site location was always in the context of the objectives of what you were trying to accomplish with those programs. Now, Boston Bar was a site that was identified, it was one that was, I think, promoted quite heavily, or favoured quite heavily by PSC because it related most closely to our mandate. So if Hell's Gate is a way of getting an index of successive passage, an acoustic site near Hell's Gate and Boston Bar is probably about as close as you can get and do work there just because of being able to get to the site and so forth. That was a logical place to go. So we actually did a feasibility study in 2008/2009. The documentation's at the end of Tech Report 16, PSC Tech Report 16, I think it's like, page 44. We went up there with a DIDSON and tried to say, "Hey, can you do -- and it looks like it's probably feasible to do it there, but that was it. I mean, it was a feasibility study, nothing really has come from that. So that's all I would really add.

Q And that Boston Bar site and the work that you did in terms of a feasibility study, is that going to be continued with? Are you going to be attempting to develop that site?
MR. LAPOINTE: Not at the present time. We have done a feasibility study, but like many of these things, it's just trying to fit it into the funding priorities that you deal with. And that's not intended to be a complaint, it's just the reality of trying to say if we have what we have, we, you know, focus on our Mission program. If we had incremental amounts, we'd think about whether we'd go to different locations.
Q And what would be the value added from that site that would be of benefit to the management of the sockeye?
MR. LAPOINTE: It would provide in-season, quantitative feedback of any potential migration challenges associated with getting through the Fraser River canyon. So knowing whether fish are making it through the canyon might impact, you know, how many fish you'd want to have be available to make it through the canyon if you're seeing high mortality.
Q Okay. One question, and then I'll come back to you, Dr. Riddell. We talked a few days ago about the difference between estimates, and I don't want to go back into that discussion, but --
MR. LAPOINTE: Sure.
Q -- is the information that would be obtained at a site, like at Boston Bar, would that assist in trying to narrow some of those biases?
MR. LAPOINTE: Yeah, potentially, it would be another check about the quantity of fish that made it to that point in the river. Yeah, it could be quite valuable in that way.
Q Okay. Sorry, Dr. Riddell?
DR. RIDDELL: Well, we kind of jumped to the more current period, here, but I was just going to add, thinking about your question about what are the programs considered, a significant program that occurred in the late '90s was DFO's study at Spences Bridge, which is another site evaluated, but the intention of that was not to design another site, but to use that as a verification of how accurately hydroacoustics could monitor the migration of sockeye moving upriver. At that

time, river hydroacoustic enumeration, it was fairly well developed in Alaska, but it was really being developed in Canada, to a large extent. And so that was an important program in our scientific staff's minds, to verify that the dual-beam hydroacoustics could work as well as visual counting through fences, but it depended on having the physical environment of the hydroacoustic site.

And then just to comment on Mike's point about the Boston Bar, I think, you know, it's nice to think that every site can add more information to it, but there could be some significant problems in directly mapping the fish back from Boston Bar to Mission -- sorry, Boston Bar, to Qualark, to Mission. The very reason you'd be at Boston Bar is you have to go through Hell's Gate. Hell's Gate, depending on flow, can have a very different delay from year to year and so it's maybe a little bit overly optimistic to think that we could get a very useful match there.

There's no question, as the year proceeded, you could get some sense of whether or not you were really losing a lot of fish, but I don't know how quickly you could really have drawn that conclusion. If you had a week or 10-day lag, that may be enough to make it not particularly useful in-season.

Q It may not be useful in-season, but would it provide useful information at the end of the season when people are trying to understand where losses happened and how they happened?

DR. RIDDELL: Well, your use of "where" is the critical thing. Not in terms of total magnitude, necessarily, but if we were able to partition where mortality is occurring, and later on, I guess we'll talk about the legacy program and the use of radio tags, that was a critical question in people's minds, where is the mortality occurring and what could be done about it.

Q In response to the suggestion that there should be more hydroacoustic programs developed, was any work done -- and I could have this out of sequence, but I understood some work was done, looking at using a DIDSON to estimate spawners at Chilko and sometimes at Quesnel. Was that in response to those recommendations?

DR. RIDDELL: Yeah, you've jumped to the second time period.
Q Okay.
DR. RIDDELL: So if you're talking about --
Q That's why I said I wasn't sure if I had the timeframe correct, or not. So we'll wait, then, and we'll come back to that one.
DR. RIDDELL: Okay, sure.
Q All right. So I had asked you first about the initial Qualark site that was in place from '93 to '98. I take it the Qualark site was suspended after the 1998 season?
DR. RIDDELL: Okay.
Q And why was that?
DR. RIDDELL: That was really a decision that the scientists involved felt that they had demonstrated the utility of the site and the technology. And as I said, these are specialized people. One of them was actually a nuclear physicist turned hydroacoustics expert and so we really only had two lead scientists and a couple of staff. And there were other sites that required attention, hydroacoustically. They spent a great deal of time working on the Yukon River, for example. And so we had set up a site in the Yukon that is still used to this day to get the Chinook and Chum escapements in the lower part of the Yukon coming into Canada, and that's been critical in eventually acquiring the agreement with the United States.

And we also had a hydroacoustic study going on at River's Inlet because of the debate about the lost sockeye, when it's returning and what was causing it, and what was the fishing pressure on it. So we just had a limited number of people and a number of other questions and the decision was simply made that if they felt that they had contributed what they can at the time at Qualark, that we could use them elsewhere. And as we've shown later, I mean, you can always come back to the site that you knew was a good site.
Q All right. So the Qualark program from '93 to '98 was carried out as an experimental science program; is that fair?
DR. RIDDELL: It was carried out in response to the reviews, but it was carried out as a science program to indicate that this could be used as a

site and provide information on abundance at that point.
Q All right.
DR. RIDDELL: But it was not immediately picked up by management and it wasn't immediately integrated into PSC work and so we moved the program at that point.
Q All right. And that leads to my next question, was the data during that five-year period used in in-season management at all?
DR. RIDDELL: Well, go ahead, yeah.
MR. LAPOINTE: Not in any in-season sense. And just to be clear, the program may have gone from '93 to '98, but actually, there were three years, '96, '97, and '98 where there was a time series of daily estimates. So it took a while to get the development going. So my recollection of this, and I was around then, was that it was more of a post-season evaluation. So I can recall doing some of the stock discrimination to parse out the Mission estimates to get the stocks that would actually be headed to Qualark because not all the fish that go past Mission head to Qualark and so there were comparisons done post-season, but not in-season.
Q All right. And Qualark did get restarted in a somewhat different format in 2007; is that right?
MR. LAPOINTE: Yes, it is.
Q Okay. And there were changes made to the Qualark hydroacoustic program in 2007 as compared with the program that was in place from '95 to '98?
DR. RIDDELL: Well, the major change is the evolution of the hydroacoustic equipment, itself. Whereas Mike and I have been referring to dual-beam hydroacoustics as sort of state of the art in the '90s, there was the introduction of what's called a DIDSON hydroacoustic system, I think first used by PSC in 2004.
MR. LAPOINTE: Mm-hmm. That's right.
DR. RIDDELL: And this has actually revolutionized hydroacoustics in river. I tell people it simply went away from estimation to what you can accomplish as direct counts. And so that reduces the uncertainty by a huge amount. It still is dependent on site quality and ensuring you have no blind spots, et cetera, but the technology took a huge step forward.

Q Can you, just for the non-science people, just give a thumbnail of what the difference is between a DIDSON and a dual beam? What's the difference in terms of the output? Why is it so much better?

DR. RIDDELL: Well, DIDSON stands for, I think it's direct identification software -- or sonar. Dual beam direct identification sonar. And the difference is where we talk about dual beam, you have the options, with DIDSON, of using 42 beams and a rage of 66 metres out, or at the high frequency -- well, that is -- yeah, that's the low frequency, high frequency goes to 92 beams, but it goes down to about 15 metres. Now, the difference is it's like seeing marks or tracks on a paper or a video screen for dual beam, where you can actually see fish migrating. You don't see the outline of a fish, but you see the length of a fish, you can see the tail beats. You can identify species of fish if you're looking at them from top down sort of thing. Now, we have some extremely nice examples where you happen to be sonifying a pool where there's a sturgeon. Now, you can recognize that as a sturgeon instantly. It really is like looking at a video screen. And so now you can align the beam past a particular area that the fish have to go by and you can just do direct counts. Mike referred to this yesterday because in dual beam, you're concerned about whether or not you may be saturating the signal, that you're not getting a response in direct proportion to the abundance of fish. We have not seen any example where we've saturated the ability to count using a DIDSON.

In 2009, the DFO staff actually counted 6.5 million pink salmon because it's a continuous movement, but it's not so much that you can't count it in any screen. And so it really has changed the ability for enumeration like that.

Q And is the system, this DIDSON system, and I'm not just talking about the equipment alone, but also the setup of the site, is it the same at Qualark as it is at Mission now because there is some DIDSON being used at Mission, as I understand it?

MR. LAPOINTE: Maybe I should take that one.

Q Yes.

MR. LAPOINTE: So at Mission -- well, first, Qualark, as Brian described, is DIDSON on each bank.

That's the estimation scheme, one DIDSON each bank. Some in my sub-sampling over time, like they don't count 24/7 every track. They sub-sample every 20 minutes, or something like that.

At Mission, the primary estimator, as I said, is a split beam. There's the boat that transects back and forth, and there's a split beam on the south bank, which would be the Abbotsford side of the river. And then we have a DIDSON also on that bank, which is used primarily as a diagnostic, just to kind of see if there's anything going on with the fish behaviour that we might not detect with a split beam. And then on the north bank, which is the bank that's on the Lougheed Highway side, I guess, where the Tourist Information Bureau is, on that side, we also have a DIDSON, and that is used for estimation. But because of the processing time involved with split beam data, we haven't yet adopted or processed the north bank data in real time, although we could. So the DIDSON is used on the north bank, not currently part of the in-season estimate, but could be, and on the left bank, or the south bank, just as a diagnostic. So there are DIDSONs there, but we're not -- they're not the primary estimator as they are at Qualark.

Q Okay. So what's the value in having Qualark in addition to Mission, or Mission in addition to Qualark as you've -- however you may want to describe it.

MR. LAPOINTE: We probably both should answer this. I don't know who wants to go first. Do you want me to go, or do you want to go?

DR. RIDDELL: Well, maybe I'll start because, I mean, you're really asking the question about now because if you'd asked this a couple of years ago, the value would have been that Qualark was re-established following the continued discussion about another review in 2004, and then the standing committee review. So the issues were not going away. And the Qualark reestablishment was really part of a bigger program that we'll talk about, I guess. So in the short term, in 2007, '08, and '09, really, Qualark was really considered a science program with collaboration with PSC. Most of it at that time still post-season and so it really was trying to address

developing how to resolve some of the problems that we recognize at Mission and what could Science Branch add by re-establishing Qualark. It was also part of the larger science program. And that -- in 2010, though, I think there was more direct communication in-season and so it started to be more accurately involved. And now why we need both, I'm sure we'll both identify that there are some sockeye populations that will leave the main channel, leave the Fraser River between the Mission and the Qualark site. I mean, in the past, they were relatively small stocks, but that's not true any more because of the Harrison River population is now up to a few hundred thousand. So there are potential errors between Mission and Qualark that you have to take into account. And then the majority of the pinks will spawn really between Mission and Qualark, but there's still a significant number of fish, pink salmon, that will go past Qualark, but the majority will be in the lower river.

MR. LAPOINTE: I don't know how much -- I'll try to keep any remarks brief here. So in the last three years, '08, '09, 2010, I think is only three, I don't think we had anything in '07, but we've had very frequent exchange of information between the Qualark folks and ourselves both ways. And so it wasn't used formally in the management, but there was very consistent dialogue between our respective staffs in the realm of saying, "Okay, are you seeing things that are consistent with what we're seeing?" You know, it was sort of a blind sort of exchange. We wouldn't know what they had until after. You know, we see the fish in Mission, they don't see those estimates until three days later so it was providing very good consistency with the Mission estimates. And that is the perspective that we think of it as sort of in relation to this workshop report, what you have here, is that for us to have corroboration in-season, which is the only thing that Qualark can provide that spawning escapements, for example, can't provide because we don't see those until sometime after the season, that in-season feedback is critical. But also in the context of the discussion we had yesterday, if you're trying to draw an inference about how your program is doing,

and you don't know what the true answer is, having a system that's systematic and similar in the way it collects data, not identical, obviously some differences are important, is a much better way to get that information than waiting until the fish show up on the spawning grounds so many months later. So we think of Qualark as a very good crosscheck, if you like, confirmation of what's going on at Mission that we can't really get any other way, really, in a real quantitative sense. So the last thing I would just say is in reference to 2010, in 2010 -- so the first two years, if I, you know, showed you a time series, and we could get to these spots if you'd like to see them, and I flashed them back and forth between you, between Mission and Qualark, I think you'd have a hard time telling the difference between them. They were just -- the correspondence was remarkable.

Now, to make it apples to apples, you do have to do some things. For example, you have to remove the catches that occur between Mission and Qualark from the Mission data, and you have to remove those stocks, like the Harrison and the Weaver that wouldn't be expected to be seen at Qualark. And when you do that apples to apples comparison, like I said, it's just -- you know, the probably of those being that close together, given the two independent sampling schemes and being 95 kilometres apart is just really remarkable.

Now, at 2010, we start to see some deviations during certain periods that happen to correspond with periods of fisheries in the river, in the Lower Fraser so there may be some mechanism there which we don't understand yet.

And myself, being responsible for keeping track of this stuff and saw that, and I reacted and said, "Okay, could this be a repeat of 2006?" And 2006 was a year when we had substantially more fish seen upstream than we estimated at Mission and we were seeing a signal at Qualark that suggested not -- you know, it was maybe 20 percent more on sort of a daily basis on some of the days. And so I just made a decision with my staff, and perhaps one that, you know, if I had to do it now on all the data I have, might have made differently in terms of the way I consulted my

staff, but that we actually used Qualark to correct Mission for those periods when there were differences. So we kept track of the ratio between them and we actually modified the Mission estimates based on that.

Q Sorry, you were seeing bigger numbers at Qualark than Mission?

MR. LAPOINTE: Larger numbers of fish than you would have expected based on Mission after you subtracted the catch and subtracted those stocks that don't swim to Qualark. So that's the one area where this year, even though it was an experimental program, and I think if you ask my DFO colleagues, they never would have expected me to do that, I did it and I accept responsibility for it. But now, of course, we're saying it's important to understand why they're different. You know, to lean on one in the middle of the summer without kind of a thought of thinking how they could be different was probably a bit of a hasty decision on my part. So we have plans post-season to investigate for those periods where they are different. It's not different over an entire time series, it's just certain periods where the peaks are different, to find out why they would be different, and that's part of the ongoing post-season research we'll be involved with through that hydroacoustics working group.

Q So will you be looking, in that working group, at whether Qualark should be used in-season to adjust Mission, or whether it should be just used at the end of the season, or in some other way?

MR. LAPOINTE: Well, I can tell you one thing that they're going to want to talk about is establishing some sort of protocol that would be applied when they are different. I think the way we think of these two sites, and the way PSC staff thinks of them is not so much one or the other, but how to use them together. And maybe some sort of an averaging type sense might be a way that we'll go in the future. And the reason I say that is not because I have -- you know, we do acknowledge, it's well understood that Qualark's an easier place to do acoustics, okay? The fish are pushed to the banks, you can count them with a DIDSON, you don't have tidal effects like you have at Mission. It's a much better site,

acoustically. There's no debate about that at all. But in an in-season sense, because our experience at Mission is that we always get surprised, the fish always -- you know, not just at Mission, you know, look at 2009 and 2010 and the total return and ask yourself, you know, about that surprise.

In-season, I think, it may be more precautionary, or perhaps a better way to go, scientifically is just to say either one of them could encounter something unexpected so it might be better to average them than say I'm going to lean on one or the other. And again, this is something that we're going to talk about more scientifically this winter, but that's kind of the way we're thinking about it. Yes, having them corroborate each other is good for both, but it's not really a question of choosing one or the other, it's trying to find the perfect way to blend the two tools, from our perspective.

Q All right. And you actually prepared, Mr. Lapointe, you prepared a memo in 2009 talking about the location of the Mission hydroacoustic program and the importance of that location, and that's at Tab 15, it's a memo dated November 17, 2009?

MR. LAPOINTE: That's correct. That's in the context of the ongoing dialogue with Sumas First Nations. So we were asked, "Why do you guys want to be here? What's so important about this spot?" And that's why I wrote this memo, was to document that for the folks so that people would understand. And so, again, getting back to the Commissioner's question about the history and so forth, when the Mission program -- when the PSC or IPFSC, I guess, in this case was looking for a site to do acoustics, they did actually explore a number of different sites. They looked in the Lower Fraser near Dease Island, they looked at a number of different possible spots, and my take on it, I wasn't involved at the time, but my take on why they ended up at Mission was kind of a couple of reasons. One is most of the sites below Mission had issues associated with bigger tidal effect. So even at Mission, the river is tidal.

MS. BAKER: I'm sorry, I don't mean to interrupt, but Mr. Lunn, could you put up this memo, it's Tab 15

on the list of documents. Thank you. Sorry.
MR. LAPOINTE: So again, the lower river is even more tidal than at Mission. There is a lot of islands, as you know, Annacis Island, different islands that make it potentially more costly to do the work because you've got to cover off different migration routes. And then the fundamental one that I think was also an important driver is that the Mission highway bridge, or the railway bridge, I'm not sure exactly which one, was the upstream boundary of the commercial fishery so there couldn't be any commercial fishing above there. So the concept was that if you had an escapement tool above the commercial fishing boundary, you would be monitoring what was left after all the primary removals from the fisheries downstream of it.

So tried these other sites, encountered challenges acoustically, management-wise, it made sense to be upstream at the bridge, ended up at Mission.

Now, after having been there since 1977, of course, there's a pretty tremendous inertia associated with being at that site. There's the whole long time series of management adjustment data sets that we use in-season. There's the familiarity with the site that really contributes to the scientific integrity of the program. You know what's going on, you've been there for so many years, you've encountered all the different things that occur. There's the fact that Brian mentioned that you're downstream of most of the major tributaries that would be peeling off the Fraser into the various streams, like Birkenhead, and Weaver, and so forth. There's only -- I think it's the Pitt and the Widgeon that are still downstream of Mission. So you've got most of the fish that are heading to spawning areas at Mission. So there's a number of reasons why now that we are there and have been there since 1977, that that's really an important site. And I don't know if I've gone through them all. I can see that I've kind of hit, I think, most of these first, A, B, C, D. Oh, the timeliness one is the one that I didn't touch on. Well, maybe it's two I didn't touch on.

Not only is it upstream of the commercial

fishing boundary, but it's downstream of a lot of the primary First Nations harvest areas. So from a fisheries planning tool, and I can't really speak for DFO on how they might use it in this way, but knowing the quantity of fish that are available for planning those fisheries that are upstream at Mission may be important. You know, it may be important for folks to know that.

And then the timeliness issue relates to this travel time in terms of Qualark. So in a test fisheries sense, we have marine test fisheries in Juan de Fuca Strait and Johnstone Straits and it takes the fish about six days, plus or minus, to get from those test fisheries to Mission. Mission is kind of used, as I described yesterday, as sort of, you know, verification of those test fishing projections, and it takes the fish six days.

If you move up river, you're going to wait another number of days. Say, Qualark, three days. You're delaying the time for that verification. The reason that's important in the current context is that the allocations in terms of fisheries, specifically, commercial fisheries, but also First Nations. If you look at the First Nations, you'd have about, in a notional sense, 750,000 fish for the river, and 260,000 for marine, so about 25 percent of the First Nations is in marine areas. All the U.S. fisheries, of course, are in marine areas. About 80 percent of the commercial allocations, if you added up all the percentage here, the (indiscernible) types are in marine areas.

If we wait -- so when the peak of the run is at Mission, it's eight days past the peak in those marine areas, or six days past the peak in those marine areas.

If you're now talking about waiting for a verification at Mission three days more, you're now 11 days past the peak in those marine areas --

Q This would be if you were to use Qualark instead as an example, that's what you're talking about?

MR. LAPOINTE: Yeah, as an example. So I'm trying to get at this timeliness issue. So what Fraser Panel members are telling us, and we keep hearing, "We want you to get something equivalent to Mission in Johnstone Straits, or farther seaward, more close to the timeliness of where the

allocations are." So it's that challenge that -- the pressure for the adjustments is actually to move downstream in terms of timeliness issue.

So we call this issue, I think we call it the catch allocation run size uncertainty mismatch, and there's actually some information on our website that kind of describes this in more detail. It's really germane to the test fishing discussion that you're going to have next week. You know, those are the reasons, I think, and this document is hopefully a pretty readable document that kind of outlines that and doesn't do it in a way that says that -- there are many purposes, just as I describe, where, in fact, being in a different spot would be more valuable for some objectives, but from an acoustics perspective, it's really not possible to get downstream of Mission and really do a good job, with the tidal effects and the braided channels and so forth.

Q Okay.

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

THE REGISTRAR: Exhibit number 355.

THE COMMISSIONER: Ms. Baker, did you mark the earlier document, or did I just miss the number?

MS. BAKER: The proceedings from 2007, I didn't mark that. I'll come back to it, though, later in my questions and I'll mark it at that point.

THE COMMISSIONER: So this is Exhibit --

MS. BAKER: The one that's up on the screen right now is 355.

THE COMMISSIONER: 355.

MS. BAKER: Yeah.

EXHIBIT 355: Memo from Mike Lapointe dated November 17, 2009, entitled, "Importance of the location of the Mission acoustics program"

MS. BAKER:

Q And just to touch on one of those -- the historical dataset, if we were to move to, or if you were to move to a different location, what impact would that have on the certainties or the uncertainties in your use of the data, or the time series of data that you have for Mission, as compared with a new site?

MR. LAPOINTE: So a couple of them. One would be you'd have to get familiar with that site, okay? Every site has some nuances that you learn about as you work there. It doesn't matter where it is.

From a data consistency perspective, so let's talk about, say, management adjustments and, you know, the differences between assessments at one site and another site, with Mission being the lower site and, say, spawning grounds being the upper site as what's used in the management adjustment, clearly, that difference is related to the assessments at each of the sites. So if there's an assessment error component, that component may vary if you move the site -- the lower river site, for example. How -- you know, the characteristics are related to the site, but also to the extent that that management adjustment difference is related to enroute loss, there's going to be a component of that that's related to how far the two sides are apart from each other, right? So if the fish are migrating a further distance, then you might expect, all else being equal, under a stress, they might see more loss because they have further to go to get between the two sites. So both of those would be affected by a move. And in addition, if you were to do a move, I would suggest it would be prudent to do a calibration where, in fact, you'd have a period of time when you'd probably have both sites operational to calibrate one against the other.

Q All right. Thank you. Dr. Riddell, have you got anything to add on this?

DR. RIDDELL: No, that's fine.

Q Mr. Lapointe, you also prepared a memo looking at the value and the uses of the Qualark acoustics program, and perhaps we can have a look at that document now. That's Tab 18.

MR. LAPOINTE: Okay. I don't have 18, do I?

Q This is a memo dated November 19th, 2010. So it's pretty current, and Dr. Riddell, I believe you've had a look at this memo, as well; is that right?

MR. LAPOINTE: Yeah, Brian had a review of it. Did you want a specific question, or did you want me to -- how do you want me to handle this? I don't want to steal the point that you want me to make.

Q Okay. Hold on.

MR. LAPOINTE: So I'm going to hold my breath here and

listen to your questions.
Q Okay. This document was prepared by you and addressed to the Fraser River Panel, looking at Qualark and whether it should be continued as a program and what its values are to the management process as a whole; is that fair?
MR. LAPOINTE: That's correct.
Q Okay. And you outline, on page 2, some of the uses and value of the Qualark program. You identify that the primary benefit of the Qualark site is that it provides in-season feedback on the Mission estimates?
MR. LAPOINTE: That’s correct.
Q And I think you've talked quite a bit about that already today. You also say in your second point that estimates from Qualark have been used to support lower river estimates used in the estimation of differences between estimates, DBEs. And is that the discussion that we had with you a few days ago, when you were talking about DBEs?
MR. LAPOINTE: Yes, so the concept there is that if you have two lower river sites that seem to corroborate each other, then it may cause you to look elsewhere for the sources of that difference.
Q All right. The third one, biases resulting from species composition issues should be lower at Qualark than at Mission, and this is reflecting the pinks being less abundant at Qualark?
MR. LAPOINTE: Yeah, and so, as the next sentence says, that you still have to be aware that both sites had test fisheries, and whenever you put a net in the water, you're challenged by whether that net is a random sample, but yeah, we should have fewer pinks relative to sockeye at Qualark because most pinks -- well, I don't know about most, a substantial fraction of the pink salmon population spawns in the main stem Fraser below Qualark.
Q And turning the page, you say the fourth point is that the agreement between Qualark and Mission should bolster confidence in the in-river catch estimates that are made for areas between the two sites. And you note that's from a DFO perspective so what do you mean by that?
MR. LAPOINTE: Well, for example, as I said for 2007 and 2008, when we compare Mission and Qualark and the Mission projection of the fish to Qualark is made by subtracting the catch that occurs between

Mission and Qualark, as one of the things that makes it apples to apples, if those two estimates then agree with each other, then you have a very strong corroboration that the calculation that you've used, which includes the catch, must be in the ballpark, there shouldn't be any significant issue with it. So in the case of 2010, what we see is more fish being observed at Qualark than at Mission. So again, there's data there that can be used to draw an inference about the catch estimates that I think is helpful in terms of being independent scientific estimates.

DR. RIDDELL: No, that's fine.

Q [Mike turned off]. And then the last point that you make is that Qualark estimates, themselves, may be used as an estimate of the amount of fish entering the canyon and that that could be useful for planning inriver fisheries. And this is the point that you've just described; is that right?

MR. LAPOINTE: I don't know if it's the point that I just described, but --

Q That you described about --

MR. LAPOINTE: Oh, previously, a few minutes ago, yes.

Q Yeah.

MR. LAPOINTE: Sorry.

Q All right. Are there any other uses for Qualark that aren't identified in this memo? Perhaps, Dr. Riddell, have you got anything else to add?

DR. RIDDELL: No, not in an in-season management. We had other uses where when we're talking about the Science Program, we use it as sort of a critical site for getting a mark recapture estimate by counting radio tags by, but that's not an ongoing application.

Q Okay. And then the next part of your memo, Mr. Lapointe, talks about options for future funding and I take it what was on the table in November of last year was is there going to be funding for Qualark, is it going to become part of the regular management of the Fraser River system; is that correct?

MR. LAPOINTE: We were directed, staff was directed to write this memo in the context of trying to explore whether or not this would be funded by U.S. or Canada. It was part of our secretary of budget and so that was the context for why this memo was drafted in the first place.

Q And did that discussion happen?
MR. LAPOINTE: Yes. In addition to this memo, it also provided a presentation which compared the two time series from the 1996/97/98 period, and also the most recent period just to provide the -- show the data because people hadn't seen some of these data. So that was presented to the Fraser Panel on January -- the first week of January. And the outcome of that is that we've been instructed to write a proposal, PSC staff write a proposal to seek funding potentially through a bilateral source, but we're just in the process of drafting that now and we do expect a decision certainly by the end of February.
Q If Qualark is not continued, would that have a significant negative impact on the work that you're doing in terms of estimating in-season and post-season?
MR. LAPOINTE: I think there's a tremendous value added. Obviously, if it doesn't happen, we still have to do our work so we'll do our work. The timeliness of this right now is somewhat important with respect to the fact that we have ongoing research at Mission to include the mid-channel sampling, which having Qualark for that period of the development would be particularly advantageous. So from that perspective, I guess that opportunity would potentially be lost if Qualark wasn't funded, but clearly, if we -- you know, we've been using Mission up until now, other than 2010, and trying to manage the fishery and we'd continue to do that, obviously, if we don't have Qualark, but it would be very valuable to us to have Qualark, particularly during this developmental phase.
Q And Dr. Riddell, what is your view on the value of this site to the overall program?
DR. RIDDELL: Well, I agree with Mike's use of term, "invaluable." I mean, I think it's proven that this is an essential site if we really want to improve our understanding of migration and improve our estimates of the differences between estimates, particularly in the odd years. And if we're looking at building pink salmon in the last few cycles, then the conflict between pink and sockeye will continue.
We probably haven't really even pointed out

that we started off yesterday talking about verifying estimates. Until you actually had a separate upstream site, whether in the mid-'90s or now, more formally, with Qualark, in 2000, there wasn't really any way to directly evaluate Mission. Mission was always accepted as being a very credible estimate because until the -- probably, the mid-'90s, we really hadn't seen major discrepancies between estimates. Once you do all the escapement estimates, basically, reconstruct the run down to Mission, there had been pretty good correspondence for a long, long time. And the difficulty now is the environmental conditions in-river and so you have multiple sources of potential error where, you know, you may have statistical counting errors at Mission, but how do you separate that from in-river migration errors that you may not see the fish after they're counted at Mission, until they get to the spawning ground. So independent sites and verification is really becoming increasingly important, I think, in terms of everyone's credibility and the fisheries management process, and in understanding and providing explanation to users.

MS. BAKER: Thank you. Could I have this marked, please, as the next exhibit, this memo of November 19th, 2010?

THE REGISTRAR: Exhibit number 356.

EXHIBIT 356: Memo re Qualark prepared by Mike Lapointe dated November 19th, 2010

MS. BAKER: Mr. Commissioner, I see the time and I'm moving to a new area so --

THE COMMISSIONER: All right. I just had a couple of thoughts as both witnesses were addressing these memos and I'll just raise them and we can take the break and because I don't know what Commission counsel's questions are now to follow so I just wanted to raise these in case they may fall within other questions that she's going to ask, but if not, perhaps she'll consider asking them.

You have both discussed the history of Mission and Qualark, and now you've addressed an examination of the two sites in terms of their continued usefulness for the programs that you've

been conducting. I just want to return to the Wild Salmon Policy and maybe after the break, I can learn from both of you as to how the hydroacoustic programs have been considered within the Wild Salmon Policy, and when it comes to evaluating the go-forward position on these sites and the future usefulness of these sites, how that resonates within the Wild Salmon Policy in terms of structure. In other words, has there been a blue-sky consideration of where we will go in the future with the implementation of the Wild Salmon Policy and the future usefulness and upgrading of hydroacoustic technology, incorporating it with the other programs that the Wild Salmon Policy addresses in its report, as well as, of course, counting.

The other point you raised, and it may be coming in a different session, or it may be coming in this session, you talked about the escapement surveys and I just apologize, but I may have missed it, but just how they work together with the other programs that are in place for counting.

MS. BAKER: Are you asking about spawning escapement?

THE COMMISSIONER: Well, I think it came through an answer that Mr. Lapointe gave when he talked about escapement surveys and I just missed the context of the point you were making.

MR. LAPOINTE: I think I can probably help you out after the break on that.

THE COMMISSIONER: All right.

MR. LAPOINTE: We'll come back to it.

THE COMMISSIONER: Thank you very much.

THE REGISTRAR: The hearing will now recess for 15 minutes.

(PROCEEDINGS ADJOURNED FOR MORNING RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: The hearing is now resumed.

MS. BAKER: Thank you, Mr. Commissioner. So I'll let Dr. Riddell answer the questions that you posed before the break.

THE COURT: Thank you.

DR. RIDDELL: Mr. Commissioner, concerning the Wild Salmon Policy, I guess one aspect that we haven't talked about very much is that there are samples routinely taken at the test sites for stock

composition. And that information is analyzed in-season. And so if we were to think forward in terms of how you would incorporate this type of information under Wild Salmon Policy, it would be that you would track some of the conservation units that you may be having to get them out of the so-called red zone up into the amber zone where they're considered to be safe from immediate risk of extinction sort of thing. And so you may well interject new management objectives to recognize specific conservation units in real time. That is not really done at this time but it could be taken into account. Mike, do you want to add something?

MR. LAPOINTE: Yeah, just to add, in fact, there is an example of how it is done in real time right now as it relates to the Early Stuart, which, I guess, actually might be more than one CU, I think, as there's a couple lakes.

DR. RIDDELL: Yeah.

MR. LAPOINTE: So quite often a tactic -- because the Early Stuart has been at a very low run size in recent years, there's a strategy or harvest tactic called "Early Stuart closure". So the idea is to delay the start of fisheries until the Early Stuart sockeye have passed and the stock ID combined with the acoustics can tell you when maybe 90 percent of the abundance has passed, which would then mean that you could start fisheries that would not impact the Early Stuart, as adversely might be. And Early Stuart is a bit of a unique case because it has such a distinct timing but --

DR. RIDDELL: Yeah.

MR. LAPOINTE: -- the opportunities are there for other applications of that nature.

DR. RIDDELL: Your second question, sir, on the escapement surveys, I don't know that we were clear on exactly what you were looking for. We are using -- I shouldn't say "we" anymore -- the department is using hydroacoustics in some freshwater spawning escapement estimations. So the large programs where you have to conduct mark-recapture over a six or eight-week period, they tend to become very, very expensive. They're accurate and they're very precise but they're very expensive. So we have now developed an

application used once in Quesnel in the Horsefly River and annually now in the Chilko River. So the department has been watching for opportunities to reduce costs and use funds elsewhere by putting these high-quality hydroacoustic systems in to better enumerate escapement. You still have problems with species composition and so they have an added little burden there because even in Chilko you have sockeye and Chinook in the same timing and areas and you'd have different -- well, maybe not as much in Horsefly but Horsefly very likely could have sockeye and maybe some Coho issues in that area. But they wouldn't be abundant enough to cause an error with the abundance of sockeye.

Is there another question that we can answer for you on that?

THE COMMISSIONER: I apologize. It may have come up in this context, the DBEs.

DR. RIDDELL: Mm-hmm.

THE COMMISSIONER: And I think Mr. Lapointe was talking about --

DR. RIDDELL: Yeah.

THE COMMISSIONER: -- Qualark and Mission having some bearing upon tightening up on information with respect to that. But I had understood, perhaps wrongly, that in addition the escapement surveys would be part of the picture of trying to tighten up on the information --

MR. LAPOINTE: Sure.

THE COMMISSIONER: -- about these issues. And I may have connected a whole bunch of different dots I shouldn't have.

MR. LAPOINTE: No, that's okay. So in the context of Brian's comments then, to the extent that a DIDSON would provide a more robust estimator, say, in a system like Quesnel where there's multiple streams that aren't always surveyed with the intense methods then, yeah, having a system-wide estimate with a DIDSON at Quesnel would really shore up the spawning ground part of that DBE thing. So you actually haven't really misconnected things, I don't think.

The only other thing I'd say about the spawning escapements is that in the scheme of things, you talk about the mid-channel sampling acoustically being an in-season tool. When you're

talking about spawning escapements, you're talking about an outcome of the management at the end of the season, which is obviously critical. It's the primary objective and also the thing that drives what comes back in the future. So it's in-season, main stem stuff versus upstream stuff, which are the outcomes which we obviously, within the context of Wild Salmon Policy, have to understand something about the distribution of those. So in other words, a main stem program couldn't replace the distribution information.

Two other quick points on terminology just because some of my hydroacoustic staff are going to probably say we're misspeaking here. Dual frequency is actually a technology that came after single-beam and it's not the same as split-beam. So I think when Brian was using the word "dual frequency" what he really means is split-beam in most of the context, which he used. And this DIDSON is, I think, dual frequency identification sonar is what that word actually stands for. So just for the record, just to make sure that people aren't confused when they read the transcripts.

MS. BAKER: Thanks. Do those answers --

THE COMMISSIONER: Yes, thank you.

MS. BAKER: -- cover what you need? Okay, thank you.

EXAMINATION IN CHIEF BY MS. BAKER, continuing:

Q One document I meant to take Dr. Riddell to before the break is a document found at Tab 12 and it's CAN171500 and it's titled "A brief history of Fraser River hydroacoustics". It's written by John Holmes, George Cronkite and Hermann Enzenhofer.

Q Dr. Riddell, you've read this document?

DR. RIDDELL: Yes, I have.

Q And is it a reasonably accurate summary of the history of the hydroacoustic program in the Fraser?

DR. RIDDELL: Yes, I think it's an excellent summary. It really captures the two time periods with a few graphs for comparison and really highlights the sort of sequence of development in hydroacoustics.

MS. BAKER: All right. So as a useful outline of the history, I would like this marked as the next exhibit, please.

THE REGISTRAR: 357.

EXHIBIT 357: A brief history of Fraser River hydroacoustics by John Holmes, George Cronkite and Hermann Enzenhofer (CAN171500)

MS. BAKER: All right. I'd like to move on now to a different area, the Integrated Assessment Program. And these questions are primarily directed at Dr. Riddell.

Q In 2006, Dr. Riddell, while you were still at the Department of Fisheries and Oceans, you proposed an Integrated Fraser River Assessment Concept to senior management in the Pacific Region; is that right?

DR. RIDDELL: Yes, it is.

Q And I have a copy of an outline of that program, which you should be able to find at Tab 17.

DR. RIDDELL: Yes.

Q Do you have that?

DR. RIDDELL: Yeah.

Q Okay. Who was this proposal -- I guess why was it developed and who was it presented to, this proposal?

DR. RIDDELL: Well, it was developed because I was division head of salmon assessment and freshwater ecosystems at the time and so I was considering the repeated sort of concerns about the accuracy and issues in the Fraser sockeye assessments. And I was increasingly concerned about the credibility and profile of the department, as this repeatedly came up publicly. And at the time, really looking at using current technologies that were available to improve how we actually do the core assessment, it was developed by myself and Al Cass and presented to the senior regional management committee, at that time managed by Paul Sprout.

MS. BAKER: All right. Thank you. And I'd like this marked, please, as the next exhibit.

THE REGISTRAR: 358.

EXHIBIT 358: Integrated Fraser Assessment Concept, August 3, 2006, by Brian Riddell

MS. BAKER:

Q Okay. And what happened with this proposal?

DR. RIDDELL: We proceeded to implement this proposal.

It was implemented as a science program. And the scale of the program is such that there were a number of parties involved, not just the department.

Q And I don't know if we've made this clear yet in the hearings but a science program, a project that's funded through science is typically not an ongoing program; is that correct? It would be almost like an experimental program that would maybe, if it was successful, be then moved over funding-wise to management and carried on through management fundings, as an ongoing program; is that correct?

DR. RIDDELL: That is the theory.

Q That's the theory, okay.

DR. RIDDELL: In this case, if we continued it as a science program because one component is taking a long-term look at the risk Fraser sockeye are to climate change and how are we going to actually evaluate the upstream mortality issue and the animals' behaviour.

Q All right.

DR. RIDDELL: So there was both a science and a management component. But the thinking at the time was definitely that if this worked, it would become a significant in-season management program.

Q All right. But it did start its funding life as a science project?

DR. RIDDELL: Yes.

Q Okay. And when did that program start to get underway, was it 2007?

DR. RIDDELL: Yes, in 2007, and this is building off some work that started before 2007 because of the late-run Fraser sockeye mortality studies that were being funded by the Pacific Salmon Commission through the southern endowment. And so there was some radio-tagging going on in the river. This program, as all its components, was starting to be implemented in 2007. It really wasn't fully implemented until 2008.

Q Okay. And this program is still ongoing; is that correct?

DR. RIDDELL: It was ongoing through 2010. Because of the funding through a number of endowment funds and the Pacific Salmon Foundation and a significant sum from the Southern Endowment Fund, it is currently not planned to be fully

implemented in 2011.
Q Okay.
DR. RIDDELL: All right. With the exception that we've already talked about, Qualark and the Pacific Salmon Foundation has maintained some money put aside to do some more radio-tagging, if the opportunity exists.
Q All right. Well, let's go through what is in that program and then we can talk about what components you think should be continued. So as it was conceived and implemented in 2007, what were the components of this program?
DR. RIDDELL: Well, basically, this is really what we would call a mark-recapture program. Mark-recapture statistics are used around the world in all sorts of different species and so the statistics are pretty well worked out. The innovations here were things as simple as using the fish wheel and trying to apply that in the Fraser River to see if you could get a random sample of fish without damage from gillnets, et cetera, and that would be in good health so you could give them a tag with a radio tag and then follow their survival. The radio-tagging was a continuation of some work that had been conducted in the past. Some expertise through LGL Consulting and Karl English. And then Dr. Scott Hinch's group at UBC, they're doing an extensive amount of work in looking at the upstream survival of sockeye and the physiological stress on the animal.

To do mark-recapture, you must account for all of the marks and where they're being lost from the system. So you have to implement catch monitoring and sampling of all fisheries. So if there are Native and sport fisheries between where you applied the tag and where you're going to estimate their marked/unmarked ratio, you must sample for the loss of tags at that point. And so in this case, it was the fishing that could occur between Mission and Qualark.

At Qualark, we've talked extensively about the DIDSON program. The innovation here that we initially had was one of a directional antenna for the radio tag in the water and aligned through the DIDSON beam. And the intention of this is that you would know exactly when a radio tag went by

and then because of the clarity of the DIDSON, you could get an exact estimate of the unmarked fish going by with that marked fish. And the final component then is that, to study things like upstream migration, look at the difference between estimate concerns, study the effects of climate change and then we had receivers strategically placed throughout the watershed so that we could track each individual fish with a radio tag.

Q Okay.

DR. RIDDELL: There were five integral programs.

Q And if I can ask you to turn to Tab 9 of the binder in front of you, which is -- I'm not sure if we have a CAN number for this -- oh, yes, 064973. This is the Fraser Salmon Legacy Project. It's a presentation. Is this legacy project the project that you've just been describing?

DR. RIDDELL: Yes, and it's called the legacy program because this is actually presented in 2009 and it served two purposes. At the time we were dealing with the downturn and economic cycle and we had lost a lot of money coming from the Pacific Salmon Commission's Southern Endowment Fund and so we were going to the Pacific Salmon Endowment Fund to get money from another source to pay for it. And at the same time this level of detail was gone through because these Pacific Salmon Endowment Fund was changing its board of directors going from Rick Hansen as the chair, setting up a new structure managed through the Pacific Salmon Foundation.

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

THE REGISTRAR: Exhibit 359.

EXHIBIT 359: Fraser Salmon Legacy Project (CAN064973)

MS. BAKER:

Q If we turn to page 4 of this exhibit, that sets out the five components that you just ran through with us? It should be on the screen in front of you hopefully.

DR. RIDDELL: Yes.

Q Okay. And you talked about mark-recapture but I'm not sure that we've yet had an explanation about what that actually means. If you can give us just

a thumbnail of how those programs are designed to work?

DR. RIDDELL: Yeah, sure. Well, we initially designed this, and as you've heard from the discussion with Mike and I, we probably don't need to really go to this extent anymore because of the match between Qualark and Mission is so good. The initial intention here was one of you put tags on at a particular site and, this case we were using it as a fish wheel. The fish wheel was actually located either at Crescent Island just below the Mission Highway Bridge, it was actually about two or three kilometres below it, and then the fish would be released from the fish wheels and our sampling then, to make any population estimate you have to have a secondary site of sampling where you can determine the ration of the marked fish to the unmarked, in this case, the radio-tagged to the not-tagged.

And once you know that, plus the number of tags that you've released them, and can account for the numbers of tags that were removed in between those two sampling sites with a couple of assumptions that can be attached, you can actually make an estimate of the population that passed your point of tagging. And so this would have included the Mission hydroacoustic site, which would have been right above that.

Q Okay.

DR. RIDDELL: Now, there are some basic assumptions and this is where much of the discussion has gone for a couple of years. The one that we struggled with a lot is we thought the fish wheels would give us an opportunity to get a very good random sample. And it turns out both because of the sampling nature of fish wheels in a river, the fish are very, very sensitive to vibration and noise. And so we had some concerns developed there. And the one that's really been, I think, most revealing to us is the sensitivity of the animals to temperature.

So in 2010, for example, the sensitivity of that was so great that we actually put the tags on in the marine environment now. So there's a real almost knife-edged survival. If you tag around up to 18 degrees Celsius then we had reasonable survivals. If you tagged above 18.5, then we

immediately had significant higher mortalities. And so you can't really have the thermally-based mortality due to handling and try to study the natural environment at the same time. So we had to remove that handling stress from the fish.

Q Okay. What was the cost of running this program?

DR. RIDDELL: Well, the costs differed a bit in the development, of course, because that large fish wheel in your package, which is pictured in slide 6. That had to be completely designed and rebuilt because the small fish wheels proved to not collect enough animals. So the total cost, in my recall, is roughly three million dollars over about three-and-a-half years. But some of that now, of course, is all in these capital investments for equipment. The radio tags are not cheap in themselves so there is a significant annual cost.

Q All right. In this program, you've described some of the funding sources for it. But whose program is this? Is this a DFO program? Is it a Salmon Commission program? Is it a Salmon Foundation program? Like whose program is this?

DR. RIDDELL: Well, it's really all of the above. It's not really the Pacific Salmon Foundation's program because the foundation is not around to do science. I managed it because of initiating it within DFO. But the information is shared openly amongst all parties. There is some limitation on how quickly this is because if people are doing scientific investigation within it, then we do recognize their involvement to publish that information. LGL, the consulting firm that actually manages most of the program in-season, they are the principal group that managed the radio-tag data, they maintain the database, create a lot of these graphics you see on distribution but that information is always open to other members of the study to participate. And it's open to anyone in the Fraser basin that we talk with.

Q I think you indicated that there's some concern about funding and I take it there's a concern about whether Qualark, which is a component of this, will continue to be funded but there's also concern about where the funding will come for the other components; is that right?

DR. RIDDELL: Well, yes. We had to be creative in finding funds. We even have private donors who liked the idea so much that in one year they contributed almost $100,000 to this because they believed that it was going to improve the situation in the Fraser. And that doesn't happen every year. The concern here now is whether we need to continue to doing it at this scale because it was done as, what is the utility, what can we learn from it. For example, going outside to put the tags on in the marine environment, that may reduce some costs but it has others where you have to have access to vessels to get tags on sockeye, et cetera.

So the big costs are labour and an annual basis for running the fish wheels. If we don't use the fish wheels, then we give up some of the stock composition information that we talked about yesterday. Not stock; I should call it really "species composition". But I mean the program could still be put together. The Qualark discussion with DFO is the major change in the sense that that had always been their significant contribution to this legacy program. And if they're not doing it now, then Qualark could continue on its own.

Q Sorry. Qualark could continue on its own?

DR. RIDDELL: It could continue on its own because it has its own merit.

Q Oh, I see, sorry.

DR. RIDDELL: All right.

Q Well, I think we should probably go through the program. You've done an assessment, I take it, of these different components to see if they are useful or whether you want to continue with them so maybe we can do that now. Running through the components that you've identified, what are the values of those different components having now implemented this program for a few years? And do you see a need to continue them?

DR. RIDDELL: Well, I mean, if you go through each of them starting with the fish wheel, I think we just commented that there are issues with the fish wheel because of the temperatures in the rivers now. There are still some nagging concerns about how random a sample of sockeye the fish wheels along the shore were providing. It may be better

to simply apply the tags in the ocean. Now, there is a direct cost of tagging in the ocean if you have fisheries. So this year with the unexpectedly large run, we lost over 50 percent of the tags applied in Johnstone Strait and Juan de Fuca to fisheries. Now, you can recover some of those but you don't get those fish going into the river where you can get then the upstream migration information. So you save some money some places and you spend more elsewhere.

The fish wheel may not actually be continued this year. We don't have any plans to do that. I have kept some money within the Pacific Salmon Foundation because we are still working to see, with the Yale First Nation, if the fish wheels could be used at Qualark to get a better estimate of species composition. The canyon at Qualark actually is quite a good site for a fish wheel to use because the animals are very shore-oriented.

Now, the radio-tagging has proved to be extremely --

Q Sorry. I'm just thinking it might be useful if we went piece-by-piece and maybe Mr. Lapointe could provide --

DR. RIDDELL: Sure.

Q -- his comments as well. On the fish wheels, do you have anything to add?

MR. LAPOINTE: I think Brian --

Q Oh, your mike's off.

DR. RIDDELL: Thank you.

Q Thank you.

DR. RIDDELL: I think Brian captured the main issues. I mean conceptually I think the design of this was excellent. But what happens is you put these things in the water and you learn. And so I think we really were learning and so what Brian's going to be telling you, and this is a good example of the fish wheel, we learn and started with a small fish wheel, thought we could catch more fish with a big fish wheel, could catch more fish but then you talk about trying to look at climate change and the warming Fraser River and you say, well, if we're putting tags in the river that we're trying to track the changes in, it's going to create a challenge for us. So I have nothing more to add on the fish wheel.

Q Thank you. So moving to the next, radio-tagging.

That might tie in with what you've already talked about but you can...

DR. RIDDELL: Well, the radio-tagging is proven to be one of the most informative assuming we can get around this bias, if you're handling fish and adding mortality to it. Going back to 2006, actually, there was a very large marine-tagging program and they did lose tags to fisheries outside. But the reason I bring it up is that once you detected a fish moving past the receivers at Mission then we had a very good accounting for those fish all the way up the rivers. So if there was something to be continued under climate change, then the radio-tagging really does provide a really useful tool to monitor what's going on in the river.

We are definitely seeing patterns where you're losing fish in the river that you could not possibly really detect without using the shore-based receivers and applying radio tags. And there are two or three significant places where we tend to have problems in losing tags. We've only really come to that by doing this over a few years. So the radio tags are certainly things that, if we can find a way to continue that resources or the money for that, it's very informative. We are using the radio-tag information in building the first in-river management model for Fraser sockeye as well. And Mike's staff and all the discussion we've talked about managing fish to Mission basically so that we have an accounting of fish at that time. Beyond there, until the fish are on the spawning grounds in the past, there's really not an active management program. So there is an estimate of what passes Mission but then there are fisheries that are conducted, catches that are sampled, biological samples taken. There's not an active management of what's going actually on in the river.

So using all the information that we've acquired in this program and working with Simon Fraser University and some models there, we are building a risk model for saying, what if our First Nation in the upper basin signs an agreement to have two or 3,000 food, social and ceremonial fish every year? What would that mean in terms of

really trying to manage to directly provide those fish to that community? And so you can actually build a model using the information in the lower river and what you know about loss in-river, what would it take to deliver fish to that community?

Q Right. I don't want to take you off topic, but just for reference, Exhibit 337, if you can just quickly go to that and we can just identify that this is the program you're talking about? This was the concept for that program that you're referring to?

DR. RIDDELL: Sean Cox, yeah.

MR. LAPOINTE: I recognize it as being that -- Brian, I don't know if you --

DR. RIDDELL: Is that the one?

MR. LAPOINTE: -- are as familiar with it as Sean Cox's in-river model proposal.

DR. RIDDELL: Yeah, this is a couple of years old but yes, that's the program.

Q Okay. Thank you. I just wanted to identify that for the record. Sorry. And we can go back to the screen that you had up prior.

MR. LAPOINTE: Did you have anything more on the mark-recapture, Brian? I don't really have anything more --

DR. RIDDELL: Not in the mark-recapture. We were talking --

MR. LAPOINTE: -- to add on it. I think the main challenge, as Brian said, is the effect of the tag. And by moving the marine area issue, reduce the effect of the tag but then you have this incremental cost, which is annoying, I guess, in terms of making it work. So I wouldn't --

Q Does it provide any different information as to counts at Qualark than what you would have just with the regular DIDSON at Qualark?

MR. LAPOINTE: Not counts at Qualark *per se*. You have the counts at Qualark and the counts at Mission. One of the challenges with doing the in-river tagging, and it seemed like the most acute effect of the tag, was in the area between Mission and Sawmill, relative to the marine area fish. So it made the mark-recapture part of that challenging from the standpoint of the fact that there's this tag effect that occurs. Now, that you're in the marine areas, I guess we're going to look at this data this winter, I guess, and see. I suspect the

marine area tagging may have something informative because you don't have to worry about that tag effect between Mission and Sawmill. So we haven't done that work yet so we have to do that analysis.

DR. RIDDELL: An example of where it would provide an incremental bit of information, we have talked about Qualark and the difference in terms of the numbers with Mission because there are some populations that diverge from the river in between. If they were large populations and where your tagging would capture some of them, you could look at the distribution of the radio tags to be somewhat informative, what portion of the population is going into those other tributaries. Now, if you were talking about the Chilliwack Summer Sockeye, that's a pretty small population. And the likelihood of getting a tag on that is fairly low. But if it was the Harrison River sockeye that are now up in the hundreds of thousands abundance, then there's probably a good chance that you'll tag a few of those. So whenever you're talking about ratios like that, you really need to look at the numbers of animals that you have a likelihood of tagging because it could be very, very sensitive to small sample error. So I think that's all we need on the radio-tagging.

Qualark, we've spent quite a bit of time talking about and we'd assume that it's proceeding.

Q Yeah, I don't think we need to go into that.

DR. RIDDELL: The catch monitoring. This program has worked very closely with DFO and it will continue. The emphasis on the tag recovery and the reward program will simply be reduced. Catch-sampling and catch-monitoring is a routine task conducted in-river by DFO. We have done work with them, more closely in the last couple of years, to try and identify exactly why tagged fish aren't making it through a couple of fishing locations. Is it repeated encounters of nets? Is it just something to do with how the tag is handled? Is it because we didn't get the tag back from particular fishers? And so on. And so they were doing a lot more work on that in the last couple of years. But in the absence of the tags, if that doesn't continue then we would still continue catch-

monitoring.

And then the radio-tracking through the river system, again, really dependent on whether you do that work or not. There is a long-term cost to the department, well, to Canada or whoever pays for it at this point, because we have been very, very fortunate to get almost all of our receiver equipment from the Columbia Basin. A number of the power utility groups down there do very extensive radio-tagging to study the effects of the dams on the migration behaviour of fish returning. And when they stopped doing those programs because of the contact that LGL had with them down there, they provided all of that equipment to us basically for free. And so where we've had anywhere from 27, I think, to about 35, receivers, we now, I think, have lost 23 of them that are going back for studies in the United States. So to continue that work, we would have to buy receivers.

Q So 23 were loaned on a short-term basis only and they have to go back?

DR. RIDDELL: Well, we did it on an annual basis basically because they weren't certain exactly when they'd have to do something. But each year, they were very generous in providing them to us.

Q And when will those have to go back? Is that for 2011?

DR. RIDDELL: They're gone.

Q Oh, they're gone, okay.

DR. RIDDELL: They're gone.

Q And were they in place for 2010?

DR. RIDDELL: Yes.

Q Okay.

DR. RIDDELL: Yeah.

Q So what's being contemplated for 2011?

DR. RIDDELL: Well, if we have money and we proceed with the radio-tagging, then we would look to see a group like Pacific Salmon Foundation, again, might be able to buy some of the receivers and start to acquire these over time. Community groups that are interested in a particular area. These are not really expensive. The current models are about $8,000 apiece. And even if you have 11 or 14, whatever that difference really is at this point, you could put those in a very strategic location and capture most of the

distribution of the tags.
Q And do you think that the data received from that upriver monitoring is useful for the --
DR. RIDDELL: Oh, absolutely.
Q Yeah.
DR. RIDDELL: I mean, it's the only way to really test the model and it provides us the data to put it in because it's information on mortality but as well as migration rates. Where do they hold in the river? So there's a lot of information that is being acquired by the radio-tagging.
Q Is some of this information received through the in-river monitoring the kind of information that would be useful in trying to flush out some of the DBEs that we talked about earlier?
MR. LAPOINTE: Has been used extensively in the late run, in particular, but also in summer runs in 2005, it wasn't part of this program but the initial rate of tracking program was conducted in that year. In 2006, the rates of loss were actually used to back calculate how many fish should have been at Mission because it appeared that we had a low bias at Mission. So it's been used very extensively. The pattern of mortality of late-run sockeye with respect to river entry timing that we talked about, I think, when we I was here last week, is very well-documented from the mortality rates of these tags related to the river entry date. So in other words, the fact that almost none of the fish that ran to the river prior to the 14th of August actually made it to the spawning grounds where you see a very dramatic increase in that survival rate, as you look at later-arriving fish. So as Brian said, it's been very freely shared and used quite broadly by a lot of different folks in relation to these issues.
Q Thank you. The next area I'd like to cover, which I think is my last area, is the recommendations --
THE COMMISSIONER: Could I just ask --
Q -- from --
THE COMMISSIONER: Ms. Baker --
MS. BAKER: Oh, yeah?
THE COMMISSIONER: -- could I just ask a couple of quick questions?
MS. BAKER: Yeah.
DR. RIDDELL: Sure.
THE COMMISSIONER: One is, I'm assuming that none of

these programs you've addressed are used or have been used for out-migration?

MR. LAPOINTE: That's correct. There have been some programs done related to out-migration, some very recently, in fact, on the Chilko but this one does not address that specific issue.

THE COMMISSIONER: Okay. And when you're talking about the radio tags, when you say "mortality", are you talking about recovering tags from fish that have been caught or the ability to recover tags from fish who simply die in the river system?

MR. LAPOINTE: It's both really.

THE COMMISSIONER: Okay.

DR. RIDDELL: Yeah.

MR. LAPOINTE: So what you get from the radio-tag data by itself is the number of tags that made it to the spawning grounds, the number of tags that pass various points. So that ratio would be, depending on how you calculate it, a mortality rate or a survival rate, depending upon what you use. The tricky part is to try to assign why the fish that didn't make it, what was the reason that they didn't make it? Was it catch? Was it natch (sic) mortality? What was the cause? Obviously, if you get that fish from a fisherman who's caught it, you know that it's clearly a fishing mortality.

And there's also work done in relation to, if you don't have a recovery but you know that that fish went missing in a reach when there was an intensive fishery ongoing and you look at the harvest rates that were associated with that fishery, you may be able to draw an inference that that was a fishing mortality. One of the areas where I think we could improve, if we continue in the future, is to have a more intensive catch sampling so that we can really sort that out. Right now, it's a little bit -- I don't know if "circular" is the right word, but so the Mission escapement number is used for the abundance, the observed catches are used for the catches and the ratio of those provides a harvest rate. That's fine in a science sense. Like I think that we would accept that that's good. But in the climate, political climate that we're in in-river then you have to ask, well, if those are the two pieces of primary data, and those are the pieces that people are concerned about, there's a bit of

a lack of independence there.

So I'm not saying it's not valid scientifically; I'm just saying that a better way might be to just have a test area like in a reach of the river where you have a receiver on one side, a receiver on the other side, very intense sampling to get that mark rate, the reporting rate of the number of fish that are caught. So it's separate from the pieces of information that have sometimes been part of the controversy, I guess, for lack of a better way of saying it. And I think we could do a more extensive job but obviously when you're talking about the Fraser Watershed, it's not a trivial task.

DR. RIDDELL: But that is being done. That's exactly what's being done.

MR. LAPOINTE: Sure.

DR. RIDDELL: I mean the other verification you have, using multiple tools, by having the marked-to-unmarked ratio at Qualark, we can sample the up-river fisheries and if someone tells us, well, we caught 20,000 sockeye, then we can say, well, you should have seven tags for us. I'm making these numbers up. And in most cases, we are within plus-or-minus a tag. Sometimes we actually have more, sometimes we have one less but if you actually look at catch estimate and total number of tags, it's been very, very close each year. So we are doing exactly what Mike says.

And this year, we put particular emphasis on an area around Bridge Rapids. And the intensity there was to look at what is the interaction? Are the fish being caught encountering the net multiple times but not being caught so that they're not going by but they're dying? Or are they actually all being taken out of the river as catch? And you really have to actually be there to get that intensive sampling. But just to give you an idea of the extent you can take this to, we have two sites where we're looking at fishing pressures and trying to separate effects. But the other interesting one is in the Thompson River, the fish are actually dying mostly at the outlet of Kamloops Lake. So they've made it through the canyon, which is a significant pressure. It can be extremely warm if you're going through there in the summer.

MR. LAPOINTE: Talking about Thompson Canyon now, Brian, just to -- Thompson and Fraser, right?
DR. RIDDELL: Well, you're above the Fraser Canyon --
MR. LAPOINTE: Yeah, yeah.
DR. RIDDELL: -- and you're through the Thompson Canyon and up to the outlet of Kamloops Lake. And we're seeing a significant loss of tags at that point. That actually is a resting point. People in the area know that the animals come through there and before they enter Thompson Lake, they hold there for a while. And it's quite possible that some of the animals are succumbing.

Now, the other thing we're doing with the radio tags and David, I don't know if he's still here, but he'll talk about it today probably, we have a little what's called a "button tag". And it simply glued on the back of the radio tag. And it tells us in a very, very short time interval the entire thermal history of the fish once you recover that tag. And so we can see fascinating things about how they actually use the lakes. And the come in and they go down and they're hold for a while at cool temperature and then they'll come back up and they'll move and they'll go down again. I mean there's probably years of study and really capturing all this data. But it's all been extremely useful and informative.

THE COMMISSIONER: I have just two brief questions following from what you just said, Dr. Riddell. One is when you use the term "we", I'm not sure which hat you're wearing.
DR. RIDDELL: Yeah, well, that's a very good point. I do get frequently confused. I call myself "we" in this case because we still are involved through the Pacific Salmon Foundation. But the program really is the Department of Fisheries and Oceans. And David is Department of Fisheries and Oceans.
THE COMMISSIONER: Okay.
DR. RIDDELL: So the button tag is his information. That's the department's data.
THE COMMISSIONER: Okay. But the Pacific Salmon Foundation is a partner or has an involvement but...
DR. RIDDELL: We are a partner. We've paid a large portion of the funds in the past three years.
THE COMMISSIONER: I see.
DR. RIDDELL: And that's through the Pacific Salmon

Endowment Fund. There's some donors. But the major fund is the Fraser Salmon and Watersheds Program, which is a major program within the Pacific Salmon Foundation funded by federal government and the B.C. Living Rivers Fund from the province.

THE COMMISSIONER: And finally, just a quick question. How engaged are the First Nations on the Fraser and the programs that you've described?

DR. RIDDELL: Within this program, there are a couple of groups that are very involved and others that are interested and returning tags so not as directly involved. Matsqui First Nation are the people that man the fish wheels. And in the last couple of years, we've tried to work with the department to allow them to use the fish wheels as a fishing platform. And then the Yale First Nation is very involved with Qualark. And then in the sampling of the catch throughout the river system, of course, there are First Nation monitors for the catch reporting and recovery of tags. The receiver monitoring, not very much. That's really been managed by LGL and the Department of Fisheries and Oceans. And anything else they've been...? I think that's the major involvement of them.

THE COMMISSIONER: Thank you very much.

MS. BAKER:

Q Thank you. So I would like to just go through some recommendations that have been made in past Commissions to see how those have been dealt with. You should have in front of you Exhibit 14, which is a Table of Recommendations and Responses prepared by Canada. Do you have that? If you'd turn to page 244.

DR. RIDDELL: Yes?

Q These are recommendations from the Wappel Review. And then 252 is the recommendations from Williams. Both dealing with some of these issues. So starting with 244.

THE COMMISSIONER: That's Exhibit 14.

MS. BAKER: It's Exhibit 14, page 244, recommendation number 6.

MR. LUNN: I don't think --

MS. BAKER: Is that not --

MR. LUNN: We have David Paterson's *c.v.* at Tab 14?

MS. BAKER: It's Exhibit 14.

MR. LUNN: Exhibit 14, thank you. That was my confusion.
MS. BAKER: Do you have a copy of Exhibit 14 or not?
THE COMMISSIONER: It will come up on the screen. I don't think it's in his file.
MS. BAKER: No, it's a separate exhibit that's been marked earlier.
DR. RIDDELL: Right.
MR. LUNN: Sorry, what page number, please, Ms. Baker?
MS. BAKER: 244.
Q All right. Recommendation number 6.
DR. RIDDELL: Yes?
Q This is from Wappel. Again, that:

> That the Government of Canada ensure, as a matter of priority, that the Mission hydro acoustic station be equipped with the latest technology and --

And then the next part:

> -- establish additional acoustic estimation stations at various strategic locations in the Fraser and Thompson rivers to accomplish quantitative estimates of fish and their stock identity.

We did talk about some of the sites that were evaluated after 1992. Were there any additional sites looked at following this recommendation?
MR. LAPOINTE: What is the year?
DR. RIDDELL: What is the year?
Q This is 2005.
DR. RIDDELL: Yeah. So the Boston Bar feasibility study would have been done after that.
Q All right. So the one you've already described today?
DR. RIDDELL: That's right, yes.
Q Okay. And page 252 sets out the Williams recommendations at number 1. Again, reference to Boston Bar or Qualark so this again is the evidence that you've already given today about your evaluation for the Boston Bar site?
DR. RIDDELL: Yeah. With respect to Boston Bar, that's the only work that I know that's been done there and Qualark we've already talked about.
Q Yeah, Qualark was re-established following the

Williams Commission?
DR. RIDDELL: Yes.
Q Okay. Don't put away Exhibit 14, but just put it to one side. We talked earlier about a workshop that was held in 2007 by the Salmon Commission.
MS. BAKER: If that could be put up again. That's document at Tab 10. That's it.
Q Was this workshop done following the Williams and the Wappel reviews and in response to them to look at some different sites?
DR. RIDDELL: In part. It was also in part to inform another ongoing project that was probably a result of those reviews and that was development of an Integrated Fraser River Sockeye Stock Assessment. So there was money provided to DFO to design or develop a framework for choosing between all the potential projects that might be proposed for particularly in-river but also in general. And so this workshop was, in part, to inform that framework so that there'd be a discussion of at last the hydroacoustic side of those potential projects.
MS. BAKER: All right. Could I have this marked, please, as an exhibit?
THE REGISTRAR: Exhibit 360.

EXHIBIT 360: Workshop on Hydroacoustics for Salmon Management, March 22-23 2006 Vancouver, BC - Pacific Salmon Commission Technical Report No 21 (CAN064768)

MS. BAKER:
Q There was a couple of sites mentioned in this document, which I'm not sure we have covered. If you turn to page -- I think it's CAN23-24 but in the document itself it would be page 17, I think. There's Upper Fraser River hydroacoustic site. What do you know about that assessment?
MR. LAPOINTE: Just what I heard from Dave Levy at this workshop. I do know that they were exploring, I believe it was -- I don't believe it was DIDSON, I think it was split-beam technology for application at the area near Prince George. And one of the things that you encounter when you start moving these things up the river in terms of cost benefit, these programs are not inexpensive to run on an annual basis. Even if it's DIDSON, DIDSONs

are about $80,000 each. There's a capital cost. There's an operating cost and so the challenge becomes, okay, what's the management application or the application that's being used and is the cost consistent with the DNA sampling associated with this program. And DNA for us costs us about $19 a fish. So you start adding this stuff up. And so I think -- and you could ask David to talk to this -- but I think his conclusion was perhaps this program, while it was feasible to conduct at this location, might not have been justifiable relative to the cost of the program but he'd be best to speak to that.

Q But the Salmon Commission or the Department of Fisheries and Oceans haven't pursued a site here?

MR. LAPOINTE: Not that I'm aware of it beyond this study, no. This was a feasibility study and there's nothing ongoing.

Q All right. I'm just going to leave those proceedings for a moment and ask Dr. Riddell about a POST array system. Is that also a hydroacoustic kind of project? And what is it? And has it been explored?

DR. RIDDELL: POST is not hydroacoustics. POST stands for Pacific Ocean Shelf Tracking. And what it is, is passive receivers that are set on the ocean bottom or at least they're moored on the bottom. And you have active sonic tags that are put in fish. And as the fish passes over the array or the string of receivers, that signal from the fish is detected and retained in the receiver's databank. Then you have to actually have people that are trained to go out, locate the array and put basically, call it a coupling system that goes down and triggers the data upload from the receiver to the receiving information system on the boat. And POST has become the sort of name of the group that looks after that technology. It was largely developed by a fellow named David Welch working with Vemco, a Canadian company. And David has since gone out on his own and is a private consultant and so there is a group that is actually housed at the Vancouver Aquarium that manages the POST program.

Q And is that POST program being used now in terms of Fraser River sockeye assessment?

DR. RIDDELL: Well, sort of a yes/no. And again, not

in management. I think that's true.
MR. LAPOINTE: Yeah, that'd be fair to say, not in in-season management, sure.
DR. RIDDELL: It is in science. Some of the university programs, for example, they do have a raise set in the lower part of the Fraser and I believe two towards Mission. And they are used for studies of adult salmon coming in and looking at their migration rates up-river. And there has been some research conducted on juveniles, particularly like Coho and steelhead. And last year for the first time, the Pacific Salmon Foundation, DFO and UBC applied a POST technology on juvenile Chilko sockeye smolts. So not in management; definitely in some science programs.
MR. LAPOINTE: I can maybe just add one specific Fraser reference is that acoustic tides have been used in the late-run sockeye issue. There's a bit of a ying-yang between acoustic tags and radio tags. Acoustic tags have to actually be, or currently at least, surgically implanted in the fish. There's actually surgery conducted on the fish to insert the tag. Radio tags are actually pushed through the mouth into the stomach basically. So there's that trade-off. You can't detect radio tags in saltwater whereas acoustic tags you can detect in saltwater clearly. So in the late-run application with the Fraser, it was being able to detect the fish off the mouth of the Fraser that the acoustic tags were valuable because you couldn't do that with a radio tag. So it's mainly in the late-run application other than juvenile stuff that Brian mentioned that the acoustic tags have provided some value.
Q Are there any limitations of using the POST technology in-river?
MR. LAPOINTE: There are, in fact, associated with that project, these hydrophones, as they're called, because they're listening for the tag in the main stem Fraser. There was an array at Mission. There was an array at the Harrison. There were a number of arrays that can be used in freshwater systems. There's no limitation in freshwater to use them. You have to have the receiver and you have to be able to retrieve the information but it can work in freshwater fine.
Q And are there any limitations or any impacts from

the tag size used in this kind of (indiscernible - overlapping speakers)?

MR. LAPOINTE: That mainly relates to juvenile application. Right now, the Chilko study is the most recent one, I think. The smallest fish that they were comfortable putting those tags in was around 120 millimetres or 110 millimetres. The average one-year-old Chilko smolt would be about 80. So the tag is not quite small enough to be confident that it wouldn't affect a fish that's more of the average size in Chilko. So it's mostly a juvenile issue primarily.

DR. RIDDELL: Well, I mean the tag size and duration is the trade-off. And there are some limitations that we encountered last year. For example, if you're dealing with adults and you want to extend battery life, you only need to have the signal maybe generate every 30 seconds or even one minute. So you can actually have a prolonged battery life doing it that way. But if you're coming down the Fraser River and if you are moving with the current, then what we did is had the tags all reprogrammed so that they were actually putting out a signal every 11 or 12 seconds. And so that really reduced the battery life.

But the limitation in-river is one of background noise and so there are some areas if you have a lot of cobble moving through on the ground, that actually generates a lot of background noise that you have trouble detecting the signal against and you have to have the signal be transmitted as it goes past a transponder and it would have to be within about a hundred metres. And so it is a bit of a trick in terms of how many transponders you need in a river to look at downstream migration. The adults you can just put in more tags, it's less stressful. But there clearly are some limitations.

MR. LAPOINTE: There's one other value actually mentioned on the Fraser, that it's limited by dollars more than anything else but tags were put on Cultus sockeye. These sockeye were reared to a certain size to make them big enough to handle a tag. And they have a technology with a tag where they can actually make the tag be dormant to save battery life basically. So the tag was emitting its sounds while the fish were out migrating,

going out past the detection receivers up in southern Georgia Strait and northern Georgia Strait and up shelf and then went dormant and then turn back on about the time they would come back as adults.

And about two years ago I think was the first time we saw an actual demonstration of this technology where a hundred Cultus sockeye were tagged and sure enough two years later, because it takes them two years in their ocean migration, two of them came back and were detected by the array off Juan de Fuca Strait. And the reason I bring this example up is that if you had enough tags on, you could conceivably get a pretty good idea about the migration timing of the adults coming back of a stock like Cultus sockeye. It would cost you a considerable amount of money but you cannot do that with genetics because of the needle-in-the-haystack problem of a few Cultus mixed around a bunch of other stock.

So here's an example of a stock that's in trouble, a conservation unit where knowledge of when it's present in the marine area where fisheries are planned, would be very valuable. But of course, you have to put more than a hundred tags on, obviously, because you only had two back but you could conceivably do it. It's feasible but it would be costly.

DR. RIDDELL: There are groups working on making the tags smaller. And really what's going on is not to do with the electronics anymore than it is to do with batteries. And there's a new tag that will allow us to tag down to about 9.5 centimetres, which people think is stretching it. But you could do the same thing. You could ask the tag to only function for about a month, let it go to sleep for two years and then turn it back on when the animal is coming back. It's the exact same thing as Mike's talking about but the way this tag would be manufactured, it's much more open market and people are thinking that if we buy large volumes, you can start getting the price down so we could tag more fish.

The real value of the study last year with Chilko was to actually, for the first time, tag fish that are strictly wild. They were never put in a hatchery. These are just a sub-sample of the

smolts because they're by far the largest of the smolts but they're strictly wild fish. So if we could tag the nine-to-ten-centimetres with this tag then you could get into an area. Even that won't allow you to tag all the populations. I mean the fish coming out of Quesnel Lake, for example, you'd never be able to put a tag on like that. So it's not going to be a panacea of new studies but you could apply in some areas.

Q Right. And one last question again --

THE COMMISSIONER: Can I just ask --

MS. BAKER: Yeah.

THE COMMISSIONER: -- just before we adjourn for lunch. The program you're talking about, is that the program that we saw at the beginning of the Commission's hearings when it was Mr. Welch was (indiscernible - overlapping speakers)?

MR. LAPOINTE: David Welch, exactly. Some of the data from that --

THE COMMISSIONER: So that's the same program?

MR. LAPOINTE: -- program.

THE COMMISSIONER: All right.

MR. LAPOINTE: Exactly it, yeah.

MS. BAKER:

Q The one last question I would like to ask again relates to the recommendations so it's Exhibit 14, page 71, and this is a recommendation from John Fraser's report in 2005. We see number 5, that they recommend that DFO explore application of new technology to collect information and stock levels in ocean areas. And if you would move to the DFO response column under the heading, "Subsequent Actions", second paragraph, it's one line, it says, "Starting in the mid 1990s, hydroacoustic technology was tested in Johnstone Strait." And I'm wondering if you could tell us a little bit about that. Did that happen? What was tried? And did it work? Is it worth pursuing?

MR. LAPOINTE: Yeah. So I'll try. I'm more familiar with the most recent work. But there were a number of folks, almost all this work was based out of -- a number of scientists based out of IOS, the Institute of Ocean Sciences in Sidney. David Farmer is a name that comes to mind. David Farmer is a name that comes to mind. There was a gentleman named Mark Trevorrow, I think, that was doing some of this work. And they have explored a

number of different hydroacoustic techniques and I'm going to have a hard time remembering the details on this because I wasn't directly involved with these programs. But even things like Doppler radar, long-range sonar, all these kinds of potential applications were tried back then.

And then more recently, through the Southern Boundary Restoration Enhancement Fund, so this would have been 2007 or 2008, a gentleman named Svein Vagle, who was I think a consultant based through IOS, led a program in Discovery Passage to look at the applications of long-range acoustics to measure salmon passage in that area. Far as I know, there's nothing ongoing right now. Challenges would probably be fairly obvious due to Johnstone Straits is very highly tidal so fish can be fluxing back and forth so that's a challenge you have to deal with. Always with acoustics pretty well you have to deal with a species composition sampling because you get an acoustic signal but it doesn't tell you which species. So Svein's report is actually available on our website. All the Southern Endowment Fund reports are available on our website so I'd direct you to that for more details.

But there have been explorations, high potential value. It's one of these things I'd probably put in the R and D category. It's like it's always good to keep apprised of these developments because sooner or later what you thought was impossible turns out to be very possible. But not there yet in terms of our capability to make it sort of feasible in an implementation phase would be my view of where it is right now. And I don't know, Brian, if you wanted to add to that.

DR. RIDDELL: No, your recall is pretty good. When we look at Johnstone Strait hydroacoustically, it is a very, very challenging environment. There is a great deal of background noise. There's so much background noise that when we were designing the juvenile program last year, it was the assessment of David Welch and Kintama that runs a lot of these arrays that they could not put even a POST receiver in Johnstone Strait and actually trust the information back.

And the other thing that they've discovered

is that there's actually quite a bit of bubbles entrained in the water in Johnstone Strait because of the extent of turbulence and mixing. So a number of these things were tried and the staff at IOS are expert in this because of their work in marine hydroacoustics for a number of applications. And really not too much has really proven to be fruitful yet.

Q If work was done and some of the challenges in Johnstone Strait or in a marine area were overcome, what would be the advantage of that kind of hydroacoustic sample?

MR. LAPOINTE: Same kind of thing relative to the value of a test fishery versus a Mission in-river program. It's the volume of fish that are sampled. It's the actual number of targets that are part of the sample that's the critical part. So I said yesterday, I think, talking about test fisheries we probably catch on average about one-half of 1 percent of the fish going by from one test boat in Johnstone Straits. Potentially, if you could develop this technology, you could get up into the 10, 15, 20 percent range pretty easily given where we've been in the river. So that kind of a difference, in the order of magnitude difference in the sample size has a very big impact on accuracy and precision. But we have all these challenges, of course.

Q Right. And then just to close off, I just wanted to flag in the exhibit marked now as Exhibit 360, at pages 15 and 16 on Ringtail, which is page 9 in the actual document. There's a reference to Svein Vagle's hydroacoustic estimation for salmon in marine waters. That's what you were referring to?

MR. LAPOINTE: That's exactly it. Yeah, that's right. And this report is actually available -- the more detailed report is available.

MS. BAKER: Thank you. Those are my questions.

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

(PROCEEDINGS ADJOURNED FOR NOON RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: The hearing is now resumed.

MS. BAKER: Thank you. It will be Canada examining the witnesses next.

MR. SPIEGELMAN: Good afternoon, Mr. Commissioner. Jonah Spiegelman, counsel for Canada.

CROSS-EXAMINATION BY MR. SPIEGELMAN:

Q I am just going to take the opportunity to ensure that I understand what was said this morning, and then ask just a very few questions.

So from what I understood from your evidence this morning, there is both positive and negative aspects to Mission as a location to conduct hydroacoustics for fish, and primarily the positive aspects of the location of Mission and the system you have set up there are that the geographic location is convenient in terms of being upstream of commercial fisheries and downstream of in-river portions of the migration; is that correct?

MR. LAPOINTE: That's correct.

Q But it also has some challenges, mostly associated with the hydroacoustic suitability of the site?

MR. LAPOINTE: Yeah, in relation to fish behaviour. Sure.

Q And as well I believe I heard you testify that there was the older technologies are in place there and they aren't quite as accurate and state-of-the-art as some of the newer DIDSON technologies?

MR. LAPOINTE: There's a level of interpretation to the split beam that's not needed for the DIDSON technologies, that's for sure.

Q And, sorry, I'll go back to the positive aspect. One of the other things that you mentioned was important was the long time series and experience you have at the site, and it allows you to interpret data more accurately; is that correct?

MR. LAPOINTE: That's correct.

Q And as I understood the evidence this morning, the Qualark has something of the reverse scenario happening, in that the hydroacoustic suitability of that location is very good.

MR. LAPOINTE: That's correct.

Q And you have the state-of-the-art equipment installed there and it has been tested and the folks are satisfied that it's working well?

MR. LAPOINTE: That's correct.

Q Conversely, though, the geographic location of

Qualark isn't ideal, in that it's harder to, in terms of timing, to get in-season run size estimations in time for marine fisheries?
MR. LAPOINTE: There's a timeline, a longer timeline, yes.
Q A longer timeline. So just taking those considerations into account, Mr. Lapointe, you testified that Qualark does have value for in-season management of the fishery.
MR. LAPOINTE: Yes. Yes, I would agree.
Q Yes. And that value is primarily, in terms of in-season management, is related to the sort of cross-checking, I believe you said, to the Mission estimates?
MR. LAPOINTE: Yes, the confirmation, the consistency aspect.
Q Right. And you set this view out fairly clearly in the memo of November 19th, 2010, which has been marked as Exhibit 356.
MR. LAPOINTE: That's correct.
Q And it's fair to say that the use of Qualark data and collection of Qualark data increases the confidence that you would have in your Mission estimates; is that correct?
MR. LAPOINTE: Yeah, having that confirmation is certainly something that my scientists in the program would really value.
Q And the error in estimation at the Mission site is one component of the difference between estimates that you calculate?
MR. LAPOINTE: That's correct.
Q And so taking it one step further, having increased confidence in those Lower river estimates will have an impact on the calculation of management adjustments?
MR. LAPOINTE: Yes, in differences between estimates it provides some strong rationale to try to dissect the causes a little bit more carefully.
Q And would you agree that that's useful to have?
MR. LAPOINTE: I certainly would.
MR. SPIEGELMAN: Thank you. Mr. Lunn, could you pull up the Canada's document number 3.
Q This is an e-mail dated September 29th, 2010. And, Mr. Lapointe, you were one of the recipients of this e-mail; is that correct?
MR. LAPOINTE: Yeah, I recognize it.
Q You recognize it. And on the last page of this

document, could you describe what that is?
MR. LAPOINTE: So are we looking at the very bottom of the page that's in front of me? I'm just trying to...
Q Oh, no, sorry, the last page of the document, page 4.
MR. LAPOINTE: This is the detail budget form that looks like it's in the one that maybe have gone to the Southern Endowment Fund at one point, but I think that's what that is. Yes, that's detailed project breakdown costs for Qualark associated with a past year's Southern Fund proposal, I believe. But it may not be from that source, but it is budget, detailed budget breakdown.
Q Perhaps, Dr. Riddell, do you recognize this document?
DR. RIDDELL: Well, only from reviewing it in preparation. I didn't see this in advance. I can say from my experience in managing Qualark in the past that this is definitely the sort of right breakout.
MR. LAPOINTE: Yeah. I'm not questioning the numbers. I'm just trying to question the recollection of where the form was originating from, that's all.
MR. SPIEGELMAN: Thank you. Can I get that marked as the next exhibit, please.
THE REGISTRAR: Exhibit number 361.

EXHIBIT 361: E-mail and chart regarding Qualark operating costs breakdown Qualark Acoustic Site dated September 29, 2010

MR. SPIEGELMAN:
Q Finally, I just want to talk a little bit about the progression of what's been happening in terms of hydroacoustic estimation for Fraser River sockeye. And we've heard a lot of evidence up to this point about various uncertainties and developing the technologies along the way, and I think that those are pretty clear in the evidence. And we've also heard a lot about techniques and methodologies that have been developed after having identified certain biases or potential biases in the data, and a lot of work has been done to try and address those biases. Are those fair statements?
MR. LAPOINTE: Yes.

Q And have these scientific or technological advancements been subject to peer review in the larger scientific community?

MR. LAPOINTE: Some have. And some are more in internal tech report documents. So I could probably -- my scientists would be the lead author on most of these papers. Many of the methodological sort of formulaic things have been peer reviewed. Precision estimates at Mission, even in the old program were peer reviewed, but there are some that do remain kind of in the grey literature, in the sort of technical document domain. So there's a kind of mix and match: some have, some haven't.

Q Okay. And those that have or haven't, they've been generally -- you've done a lot of collaboration with outside agencies and researchers; is that correct?

MR. LAPOINTE: Yeah, so I would say that even the ones that haven't, because they would have been reviewed by, for example, our DFO colleagues in the Hydroacoustic Working Group would probably have been subject to almost the same or more level of intensity review than they would be from going outside. The fact is that the expertise on river acoustics happens to primarily reside in the Pacific Northwest, and so we are working with the experts. We are the experts. So I think that the review is fairly good that way, and there's even some collaboration with folks in Alaska on these things. So I think it's a good review, but not all of it is peer review in the refereed journal sense.

Q Thank you. Do you have anything to add, Dr. Riddell?

DR. RIDDELL: Well, actually, in the History of the Fraser Hydroacoustics that we discussed this morning and was marked, it actually has a literature list on the back. And you'd note there that there are a number of scientific publications, and that there have been efforts to undergo peer review. And I think the other group we would note that there is interaction with, is University of Washington and the Biosonics industry in Seattle. So there's no question that, as Mike says, the in-river expertise for hydroacoustics is definitely in the Pacific

Northwest, and Mike's staff and the Departmental staff are definitely amongst the leads of that.

MR. SPIEGELMAN: Okay, thanks, that's helpful. Those are my questions.

MS. BAKER: Thank you. I think the next person is going to be Ms. Gaertner.

MS. GAERTNER: Thank you, Mr. Commissioner. Brenda Gaertner for the First Nations Coalition.

CROSS-EXAMINATION BY MS. GAERTNER:

Q I just have a few questions, actually. I'm pleased to say that most of the questions I had prepared have been covered in the material today, so I'm just going to pick up on a few things and be able to move on. I just wanted to confirm historical information, if I may, just to start with.

MR. LAPOINTE: Sure.

Q Just to make sure I've got it right. When Mission was first chosen in the late '70s, and really up during the '80s or so, the primary goal of Mission at that point in time was to help to assist in -- well, maybe you could just tell me.

MR. LAPOINTE: Sure.

Q What were they doing then and how would you compare that to what they're doing now?

MR. LAPOINTE: Sure. So probably up until even as late as the mid to early '90s, I would characterize the primary purpose of Mission would be to monitor progress towards escapement targets, so to see what has come out of the fisheries remaining left. Because it was upstream of the primary harvest, particularly commercial harvest, and the First Nations harvest upstream of Mission was smaller at that time. So it was used to monitor something that we call gross escapement, which I think we talked about probably more than we care to remember last week. But the idea of making sure there's a sufficient number of fish for the spawning grounds, management adjustments, any allocations of catches upstream of Mission. So it was used as kind of a tool to see, given the management actions that were taken downstream, what are the outcomes to date in terms of potential spawning escapement to the spawning grounds and fish for First Nations and others

upstream of Mission.
Q And at that time when they first started, one of the tendencies in the fisheries was actually to fish fairly strongly at the early part of the season, and only wait till the end of the season, really, to begin to ensure spawning escapement. Is that a fair way of putting it?
MR. LAPOINTE: Well, no, I would say if you go back in history into the turn of the century, like the late 1800s, 1900s, before there was the development of stock discrimination techniques, people did fish the front half of the run and expect the escapement that was left -- and those fish happened to also be of somewhat poor quality, particularly in the river, because they were fish that delayed, they were essentially --
Q And when you're saying "people", you're talking about the commercial fishery there, am I correct?
MR. LAPOINTE: I'm talking about, yeah, I mean, it was largely commercial fishery back then and we're talking about fisheries downstream of the Lower river, so that would primarily, I don't know what the marine First Nations or other fisheries were at that time. So definitely if you go back to that period of time there was a lack of understanding that in fact the fish that were coming later were actually from different stocks. So it was really a convenience and an ignorance about the stock dynamics that existed at that time that led to that kind of fishing pattern.

Now, if you go back, start getting into the modern era, and I'm talking about -- this may not seem modern, but you go from like the 1952 area to the 1990s, which is sort of the start of the dataset for these 19 forecasted stocks that we've talked about, there is clear development already at that point of the stock discrimination techniques. That's why we can parse out the recruitment in those years and the catches to individual stocks. So in those years I wouldn't say it would be fair to say that the fisheries were frontend loaded in time. I would say that there was a very consistent pattern of effort, so essentially very regular weekly openings of fisheries throughout the run, beginning in probably the third week of July, right through to September, and these are outlined in the schedules

of the PSC Annual Reports.

So your comment about intense harvest, that's absolutely correct in terms of exploitation rates in the sort of 70 percent and higher range, but it was definitely spread out breadth-wise through the run across all the stocks.

Q Okay. But the goal of Mission at the time was still quite different than what you're using it for now.

MR. LAPOINTE: Yeah, if you think about it, if you're going to have a fishery out front of Mission that harvests 70 percent, you'd better ensure that your monitoring of the 30 percent that you need for your spawning escapement is reasonably accurate. Because if it's not, then clearly you could have some mistakes that would not be beneficial to the resource in the long run. So that was clearly the role of Mission at that time.

Q And so if I have remembered your evidence correctly from last week, what we're doing now is quite different. And, Mr. Commissioner, you'll recall that last week we heard about the importance of measuring the peak and just after the peak, and how challenging that's becoming in many, many ways. But that that's the key component of when we begin to do --

MR. LAPOINTE: Yes.

Q -- some in-season. That's quite a different task for the Mission acoustics; is that correct?

MR. LAPOINTE: Yes. So now it's actually designed, it's used for both. So it's still used for the escapement monitoring, but the critical part of that is perhaps somewhat diminished, given the fraction of the fish that have been harvested in recent years. In other words, if you're harvesting a lower fraction, 30 percent range in the last few years, the importance of that monitoring from a conservation perspective becomes a little less than if it's 70 percent. But the primary tool in the run size is Mission. So in the past we would have used some of these commercial seine models that have been discussed last week, and so forth. Now, without those tools, because of the way the fishery is being managed, we need to do something else and the thing we're using is this Mission program coupled with the test fisheries. So it definitely was not

a run size, primary run size tool prior to the '90s, late/mid-'90s.
Q And therefore some of the decisions that are made as a result of Mission are getting more and more sensitive also in terms of its impact. Would you agree with me, also?
MR. LAPOINTE: Yes. Yes, because of its impact on the run size estimation, absolutely.
Q And so that verification role that others play, in fact Qualark and otherwise, is becoming actually not only useful but extremely important. Would you agree with me on that?
MR. LAPOINTE: Yes. And even from the standpoint of the accounting of the run. So now in many of these years, maybe 70 percent of the run will actually pass Mission, as opposed to previous years maybe 70 percent of that run would be in catch. So as a component of the total run calculation, it's a much more significant component now than it used to be.
Q Thank you. To the best of your knowledge, in a year like this year, or 2010, I guess we're in 2011 now.
MR. LAPOINTE: Yes, thanks.
Q Sorry. In 2010 with the level of abundance that we were dealing with, what's your present knowledge on the overall range of percentage reduction that we're going to be looking at in a post-season environment to the in-season run estimates?
MR. LAPOINTE: Are you talking about post-season run size now, I'm just trying to...
Q Post, yeah, you're nearing completion of the post-season run size, and I'm just interested in the level of change that we're anticipating.
MR. LAPOINTE: Yeah, we don't have the post-season data right now because spawning ground estimates are not complete.
Q That's why I'm not going to nail you down, so I'm just asking you --
MR. LAPOINTE: No, no, but I think it came up already, maybe yesterday, and I can't, it's all melding together for me, sorry, Mr. Commissioner, I'll try to remember when it was. But so the final in-season adopted runs were around 34.5 million for 2010. The Late run component of that, which is the Late Shuswap primarily, is about I think 24

million, or something like that. If we look at the accounting at Mission as another check, that accounting at Mission would be about 29.5, and all that difference between the 34.6 and the 29.5 is in that Late run group. So instead of 24 million, it's going to be about 20. So you're looking at, what is that, four or five million out of 30, that would be kind of the percentage reduction, based on where we are right now. Now, we're going to get spawning ground estimates and we're going to go through those all again. And I'm not going to prejudge, I haven't seen any of those numbers. I don't know what they're going to say, but they'll determine the post-season run size.

Q Okay. So I was actually getting at more just as a comparison. I didn't want to pin you.

MR. LAPOINTE: Sorry.

Q I know those numbers -- no, it's good. So that's about in some cases a 20 percent reduction, is that about right?

MR. LAPOINTE: Yeah, 15, 20, something like that.

DR. RIDDELL: Yes.

Q And would you agree with me, and Dr. Riddell, if you'd like to add to any of this, please do. But would you agree with me that for some stocks or some conservation units that level of error could be extremely difficult for the stock to be able to handle?

MR. LAPOINTE: It would depend upon the level of exploitation rate out in front. So that would be the only caveat I would say. So if that level of reduction converts to a level of reduction in escapement, then that clearly is something that would have an impact, but it would depend upon, like I say, what the abundance of that stock was to start with and how that reduction translated into escapement.

Q Is there anything else you'd like to add, Dr. Riddell?

DR. RIDDELL: No, I mean, I think that is correct what Mike has just said. It's also a trade-off with the survival of the stocks of concern. You do have a particularly good example this year with Cultus Lake, because that is a component of the Late run Mike's talking about. So it will have been overestimated by 15 to 20 percent. But you're going to have to keep in mind that I

believe the escapement there is over 12,000, and we have been struggling along at a couple of thousand for a number of years. So the 20 percent error is not going to have as big an effect. If that stock had not done well, if it had not shown the recovery of some of the others, then your point is certainly correct, that you would have increased the harvest rate inappropriately. In this case you potentially have an error in the harvest rate, but it's really going to have a relatively minor effect. So you would probably add, what, in the range of 1,500 to 2,000 more spawners on top of what was accomplished.

Q I guess what I'm going to with that is just if we look for conservation for precautionary purposes and we want to make sure that our numbers are as best as we can, that verification between Mission and Qualark is only going to potentially, if productivity declines, become more important into the future. Would each of you agree with me on that?

DR. RIDDELL: Yeah, and this is a topic that has been debated for a while now, because when the Cultus recovery plan was developed, the Department did go through a number of discussions in terms of what's an appropriate in-season harvest rate to set, whether it was 20 percent or 30 percent. The difficulty with that is if you set the target at 30 percent and your control error is plus or minus 50 percent, then a couple of years that we set 30, we ended up with 40 and 45. So I'm sure that some people feel that that's not an appropriate error. And so what we'd really want to make sure we do is say with a certain level of confidence, just like forecasts, we would like to be 75 percent confident that you don't exceed 30 percent harvest rate on a stock of concern, in which case you need to go into your season with a target of maybe 24 percent harvest rate. So these numbers are becoming increasingly important to us so that we can track these values, because people are setting standards now that we haven't had to meet in the past.

MR. LAPOINTE: And since you asked, I would agree with the statement that you made and just indicate that if Qualark and Mission are combined, the variation should be less in a combined estimate than it

would by either by themselves.
Q Thank you. That's very helpful. I just wanted to pick up on one of the realities of Qualark, not so much a problem, is that we've lost our account of a certain amount of stocks that have already left the main stem of the Fraser, that's just the Harrison and the Weaver and the Cultus. Dr. Riddell, do you have other recommendations or are you aware of other locations in which we're marking in-season abundance for the stocks that have segued out and that could complement with Qualark? So how are we doing in-season assessments on Harrison and Weaver and Birkenhead. Are you aware of that, and do you know?
DR. RIDDELL: Well, my last recall on that is a lot of the relative size of those stock is being drawn from the DNA analyses. So you can get an estimate in-season of what the relative composition was and then you can look at the numbers of fish that would be returning to those streams.
The hydroacoustic staff did look at implementing hydroacoustics in the Harrison River, but the problem really is one of siting there. It's very shallow along the levee. It's difficult to really get a good estimate of passage without doing some sort of shoreline modification. But I think right now, really the only estimate or tracking in-season is done via DNA.
MR. LAPOINTE: I would agree with Brian's comments.
Q Thank you. Two questions, I'll begin with Dr. Riddell and, Mr. Lapointe, if you have anything to add, please do. But, Dr. Riddell, my next two questions are blue-sky questions a little bit. If for conservation or precautionary purposes we wanted to increase fisheries targeted on abundant stocks and leave either conservation units or others that are weaker to return to the spawning ground, where would you best locate the hydroacoustic assessments in the river?
DR. RIDDELL: Well, unfortunately that depends on the stock. If it's an upriver stock of concern, then clearly Qualark is the place to get the best estimate of what's proceeding upriver, assuming that you're also putting in place a DNA sampling program to track it. If you're interested in Cultus Lake as an example, though that is in the Lower river, all right, and so you'd need a

different assessment site for that. So the placing of these assessment programs is very dependent on the location of the stock, where you can actually get data of good quality so you can make a good judgment. So I'm not sure it's quite as easy as that. But Qualark clearly for most of the CUs are upstream of the canyon and therefore Qualark will give you the best estimate of what's leaving the downstream fishing area.

Q So Qualark plus DNA.

DR. RIDDELL: Qualark plus DNA for the upriver.

Q All right. Mr. Lapointe, is there anything you'd like to add to that?

MR. LAPOINTE: Well, I think Brian's basically right. I think that I would characterize it a little bit as we're talking about in-season. So you always have this trade-off in-season between the timeliness of the information and wanting to have the information be the most relevant for the conservation of whatever CU it is that you're trying to protect. So from a most relevant to the CU perspective, you could almost say if you could get in-season feedback upstream of the last most significant fisheries, that would provide you the best evidence of what may be going to make it to the spawning grounds, which might allow you to react in-season.

The trade-off is if you talk about some upriver stocks, like Bowron, for example, which is way up by Prince George. If you had a site, say, I don't know, Prince George or something, that's about 15 days travel from the mouth of the river. So by the time you got that information about Quesnel, if that's how far you had to go up to take into account all the significant potential impacts on Bowron, most of your ability to take any action that would protect Bowron would be lost, because Bowron would have already been subject to all those fisheries. So it's that trade-off between the timeliness to take an action that makes a difference to these stocks, and the information value that you're always struggling in with siting these things, in addition to the geography that Brian mentioned.

Q Is that why, Dr. Riddell, you started with Qualark so quickly is that it gives you a good assessment of everything that gets past the canyon,

essentially, before the canyon?
DR. RIDDELL: Yeah. And like this morning, I mean a number of the reports talked about having some sort of monitoring or particularly hydroacoustics at each of the major tributaries, that's very difficult to do. I mean, as Mike is saying, if you have a principal fishing area, so if you're going up the main Fraser, you have fishing going on through the canyon and then probably the principal First Nation fishery then is still one at Bridge River or Bridge Rapids. So if you have monitoring there, so you know what the catch is. Once you know the assessment at Qualark and you have a stock of concern, then you can make an estimate of what you think the allowable removal in-river should be, and then the First Nations and the Department can monitor what's going on. You can work with these things, particularly if it's high quality. But all the additional information of course gives you more confidence.
Q I just have a quick question that an elder's, I think, knocking at my ear right now. I heard a number of times and a number of questions over the years as to why aren't we doing something right when the Thompson and the Fraser split out? That seems to be something that from many perspectives is an obvious place. I wonder if you could speak to that, Dr. Riddell.
DR. RIDDELL: Yeah, we've been there, done that.
Q Okay.
DR. RIDDELL: We've looked at the bridge going across the Upper Fraser and looked at the bridge in the Thompson. They're difficult environments to work in. They're still big with large flows. And I think if you had the resources really, because really the bottom line in much of this is that you could probably develop more sites. You simply don't have the resources and people at this time to be everywhere all the time. But they're very difficult sites.
Q Okay.
DR. RIDDELL: And we wanted to put receivers in there for juveniles, and we couldn't make that work. So they're very noisy for the sonic tags, and they're just a challenge hydroacoustically, but with enough effort, I'm sure you could do more.
Q Thank you. One more blue-sky question. I'll

start with you, Dr. Riddell. If we were trying to use hydroacoustics and these other integrated processes that you were mentioning today that have been part of your effort and DFO's efforts, to better understand juvenile outmigration, including specifically what's going on in Johnstone Strait, and health and abundance of juvenile outmigration, what would you recommend would be some of the things we might want to do?

DR. RIDDELL: Well, actually, I and Dave Welch and Scott Hinch thought about that quite a bit this summer. The first thing I think we would recommend is a site in probably about a third of the way up Johnstone Strait, where you could find a way to monitor the rate of passage of the Fraser sockeye moving through Johnstone Strait. And the reason for that is there is sampling going on within the Strait that the Department is undertaking, and the criticism of that has always been that you're sampling the end of the run, that you don't know the portion of the run that you're sampling. And so you could mount a single site program, so a fixed location monitoring fish passing that location.

Where we went was opposite Sayward in Johnstone Strait, and the intention was that in the very narrowest portion of Johnstone Strait you could use a purse seine during slack tide to sample the fish moving through the Strait, or you could even potentially use a DIDSON to look at smolts. Because what you need is an index of the abundance moving by on a day. That was the first place that we went to try and do something like that.

And then David Welch is certainly promoting the idea that we need an improved sensor array at the north end of the Straits of Georgia, and that's doable because there is actually a fairly narrow section that's very deep. And so you probably could get a good measure of the fish moving through there.

Right now there is a big gap of the POST arrays that we talked about. The last detection would really be at the top of Hornby, Denman over to Texada Islands, and they call that the northern Strait of Georgia line. I don't call that the Northern Strait. That's sort of central Strait to

me. And you go from there right to the top of Queen Charlotte Sound. I believe that was about 16 days passage in our smolts this past summer. And so to really try to narrow down where we're losing Fraser sockeye smolts, we need to partition that big area.

It's very difficult to work in Johnstone Strait, as I said. David does not think that you can actually work in the actual narrow channels because of the background noise. So we could get closer to the mouth of Johnstone Strait, but then we'd probably have to wait till the top of Johnstone Strait. But you could do more within the Strait of Georgia, and Juan de Fuca, we shouldn't leave that off. There is an array that's about two-thirds of the way out to sea through Juan de Fuca.

Q And these are all doable at this point in time?

DR. RIDDELL: Well --

Q Subject to resourcing.

DR. RIDDELL: The so-called northern Strait of Georgia line, the Queen Charlotte line, the Juan de Fuca line, they all exist. The people that work in that technology want to what they're saying is re-instrument that, and that's actually costly because the new ones are actually substantially more expensive. The only one we wanted to add is one across the north part of the Georgia Strait, essentially across the Strait at Campbell River.

Q Thank you. Mr. Lapointe, is there anything you'd like to add, or is...

MR. LAPOINTE: Really briefly, I agree with everything Brian said. And just so a POST-type program with a small enough tag to put it on more germane to the average size of Fraser sockeye juveniles, which will require some modification to the receivers, because there's less of a travel that the sound goes. But just to reiterate the monitoring aspect that Brian mentioned in Georgia Strait, we've been collaborating with a group, Mike Price and his group, to provide DNA support to a program designed to sample more in relation to the sea lice issue than Fraser sockeye, per se. But in Mike's samples of Fraser sockeye for the last three years, the genetics of those samples suggest they make sense. The stock proportions, we're talking about samples of 300 fish sampled

near Discovery Passage with a seine boat, makes sense relative to the abundance of spawners that would have been in the brood year. So for example his samples for the out-migrating fish that came back this year showed a high fraction of Adams River sockeye, which is exactly what you'd expect. So I'd say just from the little bit of sampling that wasn't even directed at monitoring that we do have, it shows a really high probability of being able to build a program there that would actually be successful.

Q Thank you. Dr. Riddell, do you have anything to add?

DR. RIDDELL: Well, I would just point out that there is a lot of sampling for DNA. I mean, the trawl surveys are all sampled for DNA, and so that's sampled in July and September, and now they've added an early June. The only thing I would say, though, about the southern Strait of Georgia around the aquaculture sites, I'm really cautious about putting too much faith in the random sampling. Yes, you know the stock composition. We get the exact same reasonable outcome by sampling by trawls. We get the exact expected mixture based on the adult spawners in the middle of July in the Strait of Georgia. So I think that that's just a very robust type of measure. We get what we expect to see.

My concern is random sampling around the farms, is that we're not directly testing the effect of the farms. And the debate will simply continue if we don't have direct measures of effect. And so a number of groups are working at thinking about experimental designs that would directly test whether or not and to what extent there is an effect on survivorship of Fraser sockeye. It's not going to be easy, because one thing we all agree on is that handling juvenile sockeye when they're in the early phase in the marine environment is not easy. They have a high mortality. Their scales come off easily. They do not like to be held, and so they are a challenge.

But we will continue this debate about aquaculture, you're probably going to talk about later, if we don't come up with some direct studies to really demonstrate whether or not there's a serious problem. To what degree is the

problem real. I don't think there's any question that there can be an effect, depending on the quality of the environment in a particular year, but you know we need to put it in some sort of perspective.

Q Thank you, that's helpful in terms of what's available to do the testing on the juveniles at that stage.

I'm just going to briefly touch two more items before I'm finished, and one of them is you've helped us to understand well the importance of the verification between Qualark and Mission, and I also, I guess, just want to suggest that that verification has also helped to increase the confidence in numbers, and confidence in numbers is an extremely important component of creating collaboration going forward. Would you agree with me on that?

MR. LAPOINTE: Yeah, I certainly hope it has outside of the people that I work with. I know inside with the people I work with, it definitely has and I hope it has outside, as well.

Q Dr. Riddell, would you like to comment on that?

DR. RIDDELL: Yeah, I don't think you can overstate the importance of that. That was one of the primary reasons for implementing the Legacy Program, restoring Qualark. I have people telling me that we haven't demonstrated anything for all the money, and I think that's just grossly uniformed.

Q And so one of the reasons perhaps is an observation that this issue has come up in almost all the more recent inquiries or Commissions, as Ms. Baker had tendered to you, is there was a great concern during the '90s about the accuracy of Mission and there was a lot of distrust on those numbers, which was creating a fair bit of disagreements and a fair bit of challenges amongst the harvesters and the managers. Would you agree with me on that?

MR. LAPOINTE: I would, but I would just clarify by saying that it's in the context of the political environment. There are fingers pointing in a lot of directions, and certainly Mission was one of the places.

Q Yes, and that the importance of trusting the numbers.

MR. LAPOINTE: Absolutely.

Q Exactly. All right. And so if we understand that the Qualark is helping on that, is there anything that you'd like to suggest to make sure we keep the verification as independent as possible between Qualark and Mission? I know it's important to collaborate, but I also think it's probably important to make sure there's some independence and some ways of ensuring that they're complementary. Any suggestions, any cautions that, Dr. Riddell, you'd like to bring, and then I'll turn to Mr. Lapointe.

DR. RIDDELL: Well, I'm probably visually smiling, because this was a debate when we implemented the program. I mean, to really verify something independently, there should not be a continuous dialogue. But when you have debates like you're talking about, and you have distrust about numbers, there is a significant pressure, of course, to share information and to sort out what the problem is. So, I mean, I think there was some integrity of the sort of independent test compromised the way Qualark evolved over the 2008 to '10. But I think it's understandable because of the pressure that they were under in terms of sharing the information.

It is preferable, I think, to have some independence for verification because they should be independent. You cannot have a sort of circular argument going on and saying that they're independent samples. How much you can do of that without really drawing a very, very firm line, I think is really tough to implement.

We did enter Qualark saying it would be Science program for a couple of years and we didn't even get through the first six months -- well, we didn't get through the first three months, right?

Q Without needing the assistance of others to...

DR. RIDDELL: Well, just to get the feedback. People hear about it. They go and talk to other people, make comments about the numbers. Sometimes the information that they're sharing is wrong and so you have to actually open the whole thing up and correct it.

Q So is it accurate, Dr. Riddell, that the collaboration appears to be more useful than the independence?

DR. RIDDELL: Now I would say so, yes. I think in the early going if you'd asked me that when I started the Count on Salmon as the Legacy Program, we actually did put a fairly serious effort in independence for a couple of years to really test the verification. But it simply didn't hold up, and this is probably a better outcome, given it's a very public environment that we work in in the Fraser River.

MR. LAPOINTE: Maybe I'd just add one small comment, and that is that the reality is that the Mission estimates come out and they're published on a website, and then three days later the Qualark estimates for the same fish come out. So I don't know if that's a good direction or a bad direction, but we can't change the estimates that we publish for three days before by what happens at Qualark three days later. The chronology is such that our estimates are released. So conceivably Qualark could change their numbers, but I think that maybe that sequence is perhaps helpful in some regard, relative to the problem.

Q Right, thank you. That is a good observation for me, helpful to me. Thank you.

Two very brief questions. One is a historical question, Mr. Lapointe. We've heard a little bit about the dialogue you're having with the Sumas First Nation. I just needed to confirm to your knowledge when the Mission site was first established in the '70s or '80s, was there any dialogue with the Sumas First Nation about the location?

MR. LAPOINTE: I'm not aware of that. I was in high school in Massachusetts, but I'm not aware that that dialogue occurred.

Q But to your knowledge, that dialogue did not occur?

MR. LAPOINTE: My knowledge is that I have no knowledge that any dialogue occurred.

Q Thank you. And, Dr. Riddell, do you have anything to add to that?

DR. RIDDELL: No, I don't.

Q And then, Dr. Riddell, I have one final question around the integrated Fraser assessment concept. One of the goals in that concept was to help address particular issues that First Nations have to meet their FSC allocations. Ms. Baker talked

about the second one, which was their involvement in the stock assessment programs, where you actually responded to a question of the Commissioner on that. Could you go to the first goal, which was to what extent has the integrated Fraser River assessment concept helped to provide better understandings and better information in order to assist in meeting the allocations of FSC needs upriver, or actually anywhere.

DR. RIDDELL: Not being as directly involved, I don't know that I can. I can comment on the past couple of years, and in the beginning it would really have been in evolution. I get very positive feedback within the work of the Salmon Foundation through the Fraser Salmon Watershed. We have I think about 40 percent of the projects have direct involvement of First Nations, so we are in good communication with a number of the groups.

There were concerns expressed to us that we didn't have open enough communication. And actually we had, the Pacific Salmon Foundation had a workshop on the Count on Salmon Program last April, and all of the technical advisors for the First Nations participated. Actually it was held at the Salmon Commission. And so I think that some people would certainly feel that we should have made greater efforts to involve a broader group of First Nations and be more open in communication. I think the reality is it was just a matter that once these programs get off and rolling and you've got the tag, the radio-tagged fish out there, and that the keeping up with everybody in-season is very difficult. But I think that the workshop was very productive in the end and people all supported the program.

Q Great. And just to conclude on that, it's your understanding and I know we have to separate these topics out in order to cover them, but the abundance that hydroacoustics helps us with has to be very balanced with the stock assessment that is being done in other ways, would you agree with me on that, to get a best picture of where our populations are at? It's not just abundance, it's stock assessment, that so they're very tied together, they're a very integrated program.

DR. RIDDELL: I'm not sure I fully understand. I mean, if you're asking about the stock assessment being

the spawning ground assessments...
Q And the health of the salmon going up, and the assessments of what stocks are still there.
DR. RIDDELL: Right.
Q All of that work is a necessary complement --
DR. RIDDELL: Yes, it is.
Q -- to the work on abundance.
DR. RIDDELL: Well, and the fish health is a good point, because of the recent paper in Science, for example. So we do the DNA for the stock identification. As well, David may talk about some of the work looking at genomics and fish health, and physiological stress on salmon migrating upriver. So there is a lot more work being done on the health of the sockeye salmon as they're migrating upriver.
MS. GAERTNER: Thank you. Those are my questions, Mr. Commissioner.
MS. BAKER: Any re-exam from Canada? No.

RE-EXAMINATION BY MS. BAKER:

Q You mentioned the Count on Salmon Program and the Legacy Program. Are those the same thing?
DR. RIDDELL: Yes, they are.
Q Okay. So it's just a name change after a couple of years.
DR. RIDDELL: Yes. Mr. Hansen, as anyone who knows him, likes to talk about legacies and foundational changes, but most people don't understand what the intent of that was. And so the Count on Salmon, according to my staff, was much more transparent.
MS. BAKER: All right. I have no more questions for these witnesses.
THE COMMISSIONER: Ms. Baker, I just have three brief queries.

QUESTIONS BY THE COMMISSIONER:

Q The first is, and perhaps I should have asked Ms. Grant this question, but with regard to hatcheries or Weaver Creek, or other similar kinds of operations, Alouette River, for example, the data that's collected in terms of run size or return salmon and so on, is that data fed into the other data that is looked at with respect to forecasting and run size assessment?

MR. LAPOINTE: Sure. So example would be Weaver Creek, there's a spawning channel, that the count of fish into that spawning channel is a significant part of the overall spawning population for Weaver Creek, which would be used to predict the returns of Weaver Creek in future years as a population that spawns in the creek, as well. But, yes, fully integrated --

Q Okay.

MR. LAPOINTE: -- into the forecasting.

Q My next question is this. You mentioned, you used as an example, the modern era being from the early '50s through, and I think that's fair. But when the witnesses were here talking about the Wild Salmon Policy at the last session we had, I believe a term was used, was transformational around the Wild Salmon Policy. So if we have been through a couple of eras in terms of the evolution of our understanding of the species, the stocks, and the technology that we use in our work to assess the run size, and so on, can you tell me where you think we are in terms of the evolution of our understanding and the technology that could come on the scene fairly soon to take us to the level that's being talked about in the Wild Salmon Policy.

MR. LAPOINTE: I'm not sure if I'm the best one to answer this, or Brian's the best one to answer. So maybe we'll let him have a crack, and if I have anything to add, I'll see if I can.

DR. RIDDELL: I think he wants to avoid saying "Wild Salmon Policy", basically.

MR. LAPOINTE: No, I just want to avoid trying to speak of ignorance about all the elements of the Wild Salmon Policy, which Brian is way more familiar than I.

DR. RIDDELL: I think in 2005, basically, you started entering the next era, if you want, because now we are talking about managing production for all users, including the commercial fisheries, First Nation fisheries, and recreational and public. And now we are also talking about sustaining diversity because of the concerns we have about climate change, and the value of biological diversity that people are seeing in species around the world.

How technology might help, well, I used to

call myself a geneticist, but it's evolved so much that I don't even use that term any more, because now you have the DNA analyses, they can tell brothers and sisters in populations, and the genomics studies that are looking at these virus-like signatures. We have tools that I think we're just scratching the surface of really using.

The fundamental question I think we're adding in some of the sockeye populations is we know that these populations really are irreplaceable lineages. That if you lose those populations, even if they're small and not being what some people call economically important, when you have lost something you can't replace. You may be able to put other fish back there and get some production. The difficulty is in sockeye salmon and the history is that you cannot do that. We have lots of examples where you've lost populations and you try to put sockeye back and they simply do not come back and produce fish, and produce sockeye.

So it makes the diversity element we're talking about the criteria for assessment of a conservation unit, is the number of fish back and the distribution of the fish amongst all the spawning populations. So that now must be built into the assessment criteria. Because as I said in my first introduction to the Wild Salmon Policy, diversity starts from parents. Those are very, very localized events, and you start with the small spawning populations that really function in networks of these small demes, and those are what we then call the populations. So you need to actually sustain that habitat. And the reason that we went that direction, of course, the fullest use of habitat and maintaining habitat quality is the way to maximize production of salmon for everybody in the future.

Q And my final question, is really just a general one that's come up today, and I think counsel have asked, and you've given a fair assessment of this, and I think Mr. Lapointe in particular addressed the prior Commission, that is, prior to the current Commission, and why perhaps we cannot go back in some way to adopt some of the practices of that. But just for my information, is there anything from the old system that you think,

looking back and now looking forward, is something that ought to be embraced by those who are in the game, if I can use that, of managing the salmon.

MR. LAPOINTE: So when you say "prior Commission", just so we're clear here, I think you're referring to the --

Q 1985.

MR. LAPOINTE: -- IPSFC, International Pacific Salmon Fisheries Commission.

Q Right.

MR. LAPOINTE: Okay, that's just so we get that part.

Q I'm sorry, I should have said that.

MR. LAPOINTE: So a lot of the changes that have occurred since the IPSFC, some of them relate to who's doing what job. Okay? So some duties that were Salmon Commission/IPSFC, are now DFO. I think that it doesn't really matter. We're working well together. We can do the job. It doesn't matter where it's being done.

Other changes relate to the way the fishery has changed. So if you go back to up to 1985, that, or you can maybe extend it to even part of the PSC era, the 1993 era, we had a fishery that was primarily based on a very large commercial harvest, and a U.S./Canada split, and the old IPSFC had both authority and the responsibility for most of the things involved with the management of what that was.

But then you start looking at the changes. So you have changes resulting in Aboriginal Fisheries Strategy in 1992. You have changes not only in the aboriginal component of the fishery, but also in the non-aboriginal component. What I'm talking about is the amount of the fishery that's in the Panel waters control, all those Johnstone Strait fisheries that started to expand long before 1985. Now all of a sudden this agency that has very good responsibility for a particular area has got less and less jurisdiction over the areas that affect the ultimate outcome.

So I think some of the questions I had when I was here about the PSC were kind of along these lines. And what if they had all the power and the authority, and I guess the way I look at it now is a little bit differently. I look at it as sort of the hierarchy objectives in the Treaty, spawning escapement, international allocation, and

misallocation, some of that hierarchy is kind of vested in any fishery that's been charged with, you know it might not even be a treaty, that would have, well, spawning escapement should be the first priority in any fishery conducted on Fraser sockeye. So it's a shared responsibility that's evolved with the change in the way the fishery has evolved.

So and we have had discussions about whether having a single agency be empowered, that is one model and it worked for the IPSFC, one that had jurisdiction over most of the fisheries. Is that the appropriate model going forward? Well, there would be significant challenges to that model because of the changes. So in thinking about, getting back to I think the essence of your question, about could you bring forward I think the most important aspects to try to maintain, which is definitely more of a challenge when you have more people, diverse agencies involved, is to keep that communication and understanding still going on. In other words, there was a period of time over the evolution of this where there were kind of almost battles between the PSC and DFO, keeping that integration is more of a challenge in the current environment, and that's the thing that I think I would emphasize we really have to work on, so that we're all working together, not kind of fitting ourselves into the timelines. We do a lot of work now making sure that the PSC process is well coordinated with other Canadian processes, so that there's a natural flow as opposed to having it be disjointed.

So the task I think is pretty well the same. The environment that it's being done in is different, and it's just important to have the folks involved that are all entrusted with kind of a dual responsibility here to be working towards the common objective. And I am not convinced that putting it all under one roof is the only model that can work in that context.

DR. RIDDELL: If I could add to that. I agree with Mike's comment about the structure, and I think we really need to look at the time sequence of other events, not just the change in the structure. Right after the Treaty in '85, there was an immediate review of Fraser sockeye to see whether

or not we could increase the escapements to provide more fish for harvest. And industry was involved, PSC was involved, DFO was obviously a lead in this whole thing, and we came up with the Fraser sockeye rebuilding initiative. I believe the sort of main paper of that would be Collie and Walters, and that I think has been submitted. That set a whole track. We would change to fixed escapement and we had plans to build escapement to a higher level to monitor whether we could provide more fish. So that was an additional objective that was built in right away. That was a fundamental change. You weren't fishing necessarily at the 70-80 percent they had for a while. You were looking at rebuilding that.

Right after that, then you start coming in where we had change in the marine survival, and now you've got the issue of multiple stocks, not all at the same status any more. That then amongst other species led to objectives the Department had to look at, such as ***SARA*** potential for listings.

And then following that a lot of that led from the mid-'90s where we definitely saw a change in the fish behaviour, huge challenge in terms of in-season management. Much of the debate about the over-spawning was how well can you predict what's going to happen to those fish when they're moving, and we -- not we, I shouldn't say us at all, it was the in-season management process of Fraser Panel. Now they're being faced with you could have a 50-60-70 percent mortality of fish moving upriver, and in some years that worked out, and other years the environment changed and you had lots and lots of fish on the spawning grounds.

So the whole environment has really become substantially more complicated. I don't think it really is structural at all.

I think that Mike's correct that there were times on particular issues that there were differences of opinion. But overall the groups of people, both highly dedicated, number one, and very competent and work quite well together. But the issue is substantially more difficult than it was, what are we talking, 25 to 30 years ago.

MR. LAPOINTE: And maybe just one last thing, I know we're short of time, is if you look at where the

Treaty was in the IPSFC years, we had a 50/50 split of the harvest. Okay? So clearly in that situation there's a strong bilateral interest to be involved with all aspects of decisions. You look at where we are now. You have 83-and-a-half percent of the share of sockeye being in Canada's hands. You have the Wild Salmon Policy initiatives. You have the importance of priority for First Nations allocations. It clearly makes sense for Canada to have more authority, more responsibility in the context of Fraser sockeye in that context than it did when prior context we had 50/50 in each country. You didn't have all these environmental problems. You didn't have the Treaty obligations and First Nations priority rights. I mean, you had them, but they weren't as a forefront that they are now. So clearly it makes sense for Canada to have more authority in that context, because they have a lot more at stake and lot more involvement than it was back when it was 50/50 between the United States and Canada. So that logically makes sense for me for the country that has a lot more going on in terms of this to be kind of have a little bit more responsibility and accountability than they might have had under the old regime.

MS. BAKER: Well, thank you, Mr. Commissioner. It's three o'clock. Should we have a short break --

THE COMMISSIONER: Yes.

MS. BAKER: -- before we start Mr. Patterson.

THE REGISTRAR: The hearing will now recess for ten minutes.

THE COMMISSIONER: Oh, I'm sorry. This panel is finished? Maybe we can just go back on the record just for minute. I thought Mr. Patterson was joining this panel.

I just wanted to thank both Mr. Lapointe and Dr. Riddell. You have been here often and you have shown a willingness to cooperate with counsel, and I am very grateful for that, as I am sure other counsel are. So thank you very, very much.

DR. RIDDELL: You're welcome.

MR. LAPOINTE: You're welcome.

THE REGISTRAR: The hearing will now recess for ten minutes.

(PROCEEDINGS ADJOURNED FOR AFTERNOON RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: The hearing is now resumed.
MS. BAKER: Thank you, Mr. Commissioner. Our next witness is Mr. David Patterson.

DAVID ANTHONY PATTERSON,
Affirmed.

THE REGISTRAR: Could you state your full name, please?
A David Anthony Patterson.
THE REGISTRAR: Thank you. Counsel?
MS. BAKER: Thank you. And you will need to either bring the mike closer to your mouth or something because it doesn't pick it up if it's too far away. Thank you.
A Okay.

EXAMINATION IN CHIEF BY MS. BAKER:

Q Thank you, Mr. Patterson. I'm just going to review your c.v., and that's available at Tab 14 in the binder before you. You have a Master's of Science from SFU?
A Yes.
Q In Biological Sciences?
A Yes.
Q Thank you. And you are an employee of the Department of Fisheries and Oceans right now?
A Yes.
Q All right. You're the program head for the Environmental Watch Program?
A Yes.
Q And you are also an adjunct professor at the School of Resource and Environmental Management at SFU?
A Yes.
Q Can you just describe a little bit about what your position entails in the Environmental Watch Program?
A I'm the Program Manager. I basically oversee biologists, technicians, supervise students, all toward the program goal which is looking at the impact of environmental conditions on migratory success and reproductive success in Pacific salmon.

So we have a physiology lab out at West Van. We have incubation facilities at SFU, so just general program management.

MS. BAKER: Thank you. Could I have this c.v. marked, please, as the next exhibit?

THE REGISTRAR: Exhibit 362.

EXHIBIT 362: *Curriculum vitae* of David Patterson

MS. BAKER:

Q Now, you've just briefly described the objectives of the Environmental Watch Program. Can you give us a bit of information about what the program actually does? What are the components of that program?

A Yes. Basically, as I mentioned earlier, the whole program is really geared towards looking at migration biology and the environmental factors, predominantly in fresh water, that influence migration success. That involves sort of three main areas of the program.

We look at, we monitor and do research on environmental conditions, mostly water temperature is our main focus there.

We also do a lot of biological research in migration biology. This is mostly in collaboration with the universities and other groups within the Department.

The third part of the program is leading from the environmental forecasting and monitoring in conjunction with the biological research. We also provide science advice on the impacts of different freshwater factors on migration success.

Q And do you do modelling?

A Yes. The advice comes in the form of, in some cases, quantitative modelling, which is mostly what we're talking about today, as well as we have more general advice, write papers. The advice can come in many different forms.

Q Okay. And who does the advice get provided to? Who are the subjects?

A Right now, the main provider is we provide advice to fisheries management. We also provide advice to habitat management as well, and other habitat-related issues. We provide advice to the general science community and also the public.

Q As you noted, we're going to be talking about the modelling side of your work today. Does the quantitative modelling that's done with respect to management adjustments, which is the focus of your evidence today, is that modelling work used by the Fraser River Panel in the management of Fraser River sockeye?
A Yes.
Q Okay. We've talked a bit about management adjustments already, but it probably would be helpful to hear from you what is a management adjustment? Just define what that is and what are some of the key data inputs to management adjustments?
A A management adjustment is simply -- the easiest way to describe it is the foregone catch that is added to ensure that we actually meet the spawning escapement requirements. In other words, additional catch is foregone to past Mission to achieve the spawning escapement targets.

Now, the data required to doing that, the MA model -- just have to back up a bit here, but the MA model itself, what it does is it uses both environmental data, temperature and flow, as well as biological data such as run timing, to predict the difference between estimates. From that prediction from that model, we can then transform the difference between estimates to calculate actual numeric value of the foregone catch that's needed to achieve your spawning escapement target.
Q Okay. We did hear about difference between estimates from Mr. Lapointe in terms of the assessment they do once the run has completed. Are management adjustments -- how do management adjustments relate to what has been described as DBEs or differences between estimates?
A The difference between estimates is when you subtract the spawning ground escapement estimates from the Mission escapement estimates, the difference between those two after you've accounted for in-river catch.

The management adjustment is related to the DBEs because it's the outcome for management adjustments for the in-season anyway. We generate the model to predict the difference between the upper river and lower river. That's the calculation from that that's the actual management

adjustment to compensation for it.
So in those years when we know high temperature example, you're going to lose a certain percentage of the fish in the river, you had to add an extra value of fish to that, and that extra value of fish, you have to want to escape past Mission as the management adjustment.
Q So would it be fair, just as a shorthand, to think of the difference between estimates being a calculation that's done after all the data is in at the end of the year and you're trying to figure out what the run size actually was, so it's kind of a backward-looking number, and the management adjustment is sort of a prospective number trying to imagine what you're going to need to achieve your target, but it's a forward-looking number.
A For the case of the in-season management, yes. That would be an easy way to describe it.
Q Okay.
THE COMMISSIONER: Ms. Baker, I wonder if the witness could use some real numbers for me. I'm trying to understand the relationship between the MAs and the DBEs.
MS. BAKER: Yes.
THE COMMISSIONER: So if he could just give me an example of what he does by using some real numbers?
MS. BAKER: Yes, we're definitely on the same page.
THE COMMISSIONER: Okay.
MS. BAKER: That's where we're going.
Q It is confusing for us. We're all a bunch of lawyers, not scientists, so if you can break it down and exactly give us an example of how you would do that calculation just using some round numbers.
A Sure. If, for example you had -- first of all, we'll start off with the primary objective, which would be the spawning escapement target. So if you were looking to get 100,000 spawners onto the spawning ground. You had an in-season estimate of approximately 300,000 fish this past -- in marine approach areas as your estimate, and then you wanted -- and if all things were perfect, then you could harvest 200,00 and leave 100,000 to pass Mission to achieve your 100,000 fish at the spawning ground.
However, if you know, based on prior

experience, the relationship between Mission and spawning grounds in, say, a high temperature year, you're going to lose 50 percent of those fish that you went by, then you'd have to allow an extra 100,000 fish to compensate for the expected forecasted in-river mortality. So in this case, your management adjustment would be 100,000. I think I've got my math right there. I hadn't thought about doing an analogy, sorry.

Q So the idea is to get 100,000 on the spawning grounds, you've got to let 200,000 go through because --

A Yes. That would be an extreme example, but that's exactly what we're talking about. That way, you'd end up with a harvest of 100,000, a management adjustment of 100,000, a spawning escapement of 100,000 and, at the end of the day, the calculations would be equal.

Q And when we're talking about management adjustments, you're talking about that forward-looking calculation. Here's the number we have at Mission. How much have we got to make sure is not caught --

A That's right.

Q -- to make sure we have the right number that goes on the spawning ground. That's right?

A That's correct.

Q Okay. And then I don't want to confuse it, but the difference between estimates is where you actually say, "This is the number that landed on the spawning grounds. This was the number that we had at Mission." What happened to those fish in the interval?

A Yeah, that's right. Which is probably why I should have chosen a different set of numbers here. But post-season, now, the actual difference between the estimates themselves will still be the spawning ground escapement estimate and the Mission escapement estimate. So that's the actual difference between the two of them.

Q So with your example, if you do the spawning ground assessment and you have 80,000 fish at the end of the day, then your management adjustment wasn't big enough? Or if you had 150 fish on the spawning ground, your management adjustment was a bit too big from what you were predicting you would need?

A Absolutely.
Q Okay. And this idea of creating a management adjustment, an adjustment to your numbers to make sure you meet your spawning targets, when did that first start being done by the Department of Fisheries and Oceans?
A I'm not sure of the exact dates. The early '90s is the first time I've heard about them recognizing there was a difference between the pattern, I guess, in the difference between the Mission numbers -- Mission estimates and the spawning ground estimates and, from that -- so strictly based on historic discrepancy, not using environmental information at all, I believe they actually then did some adjustments to the escapements. And that process, that additional fish, the extra fish they added to the escapement was called a management adjustment, which is where the name comes from.
It wasn't to do with temperature or discharge at the time. It was strictly based on historic pattern.
Q And was it in -- you said it was in the '90s. Was it in response to, for example, the Fraser Inquiry in '94?
A No, not that I'm aware of, no. I think this pattern was recognized before then.
Q Okay.
A The subsequent -- the transformation of the management adjustment model to one that's environmentally based was in response to the '94 inquiry, but...
Q Okay. The prior one that you described, was that a model or was it a judgment call? How was that number arrived at, that management adjustment number in the early days?
A I honestly don't know. The only discussions I've had with people in this in the past, my understanding it was just simply a regression between the two numbers and adjustment.
Q Okay. But right now you do work with a model to determine those numbers; is that right?
A Yeah. And basically, after the '94 fishery season, and then the subsequent inquiry, there's pretty good evidence that high temperatures were causing some of the problems and the discrepancies, so there was increased effort on

the panel. The recommendation was to set up the temperature monitoring programs and develop a model to forecast the actual loss in the river because of high temperatures, for example.

In 1997, yes, you had these different situations but it was, in this case, high flows. That was the first year that they actually came up with a model to predict the -- the in-river loss, and therefore came out with a model to compensate for that expected in-river loss. That was my predecessors, Ian Williams, Steve MacDonald. They developed that model.

Q And then has this model now gone through the science review process that the Department has, the PSARC process?

A No, it's not gone through a PSARC process. It has been peer-reviewed in the science literature, but it's not gone through a formal DFO science review process.

Q Okay. But it has been peer-reviewed, the model that you use now?

A The rationale for using an MA model, 'cause there's more than one type of that model has been gone through peer-review, yes. The actual specific that gets used on an in-season basis can actually vary, the actual form of it.

The rationale and the reason behind it and the actual input variables that were used, that's all been peer-reviewed.

Q Okay. And what are the environmental factors that influence spawning migration mortality? What are the key drivers?

A Most conspicuous one is water temperature. Then we have discharging flow, so high flow as being a problem. We also -- in suspended sediment, there's general water quality issues, and then we have biological factors, you know, predation, disease. However, the other environmental factors would be fishing itself and incidental harm from that. But these are all -- these can all interact as well and be cumulative, so it's not just -- you can't think of these things in isolation. All these factors work together and contribute to an overall increase in mortality.

Q Is there a year where you could have ideal conditions and you wouldn't need a management adjustment? Is that a feasibility that we should

know about?
A Yeah, just because you have ideal conditions, that does not necessarily mean your management adjustment would be zero, because I think as you've heard before in the -- the difference between estimates is also a function of some of the other factors that contribute to it.
For Summer run -- this would be specific run timing groups, for example, Early Summer. There has been a consistent bias towards -- negative bias in terms of the en route discrepancy estimates, so in that case it's unlikely, even under ideal conditions, that any MA model you have would actually be zero. There'd be some adjustment to the escapement because of that, because the historic is biased, so...
Q Okay. Well, we've been talking, I think, primarily about in-season management adjustments. There's also a pre-season management adjustment that's calculated; is that right?
A Yes.
Q And what is the pre-season management adjustment based on? What data is used in that model?
A For the pre-season management adjustment, they're very similar in terms of the input variables. However, the structure can't -- it's a little bit -- there are subtle differences, but primarily it's based on temperature and flow, and then run timing for the Late run group. So those inputs are put into the model and then pre-season, ahead of time, we try and -- when I say "we", the actual information is given to the Salmon Commission and they run the models themselves now, 'cause were just involved in the development aspect and provided advice on them.
Q Okay. So what's the difference on the pre-season model? Like for example, temperature, is that available in the pre-season to do predictions?
A It is available pre-season. However, the confidence you have in that value, as you can well imagine, is not as good. We do do it, and it's based on relationships between snow pack and water volume, and also forecasted air temperatures.
Q Okay.
A And the actual -- the big structural difference is that the temperature forecast we provide pre-season are for a 31-day mean, for a monthly mean

for the season. Whereas in-season, we do a much shorter 19-day temperature forecast because of the constraints associated with the fishing itself.

Q Do you use any previous year's results for, say, DBEs or management adjustments in prior years as part of your pre-season model?

A Each year - let me be clear again - we're involved in the actual development and the initial implementation of the MA models, and we are involved in providing advice on model selection. The actual models that get used on -- for every given fishing season, pre-season, that's determined by the Salmon Commission itself.

However, they do update, on a yearly basis, the new information from the previous year, so if that's your question.

Q Right, okay. So that prior information does get put into the models that are then run by the Salmon Commission as far as you know?

A Yeah, yeah.

Q Okay. And the -- you mentioned the temperature input. That's updated from your E-Watch Program to the Salmon Commission in-season; is that right?

A Yes.

Q Is there any other data that comes from your program and is given to the Salmon Commission for input into the models during this in-season time frame?

A Yes. The temperature data is the temperature we actually collect as well as the temperature we forecast using the forecast models. Similarly, we simulate water discharge data that is measured by Environment Canada, but then we run it through our models to forecast discharge as well. Then we provide that to the Pacific Salmon Commission and we post it online for the public as well.

Q Okay. And when we had Mr. Lapointe here, and actually I think it was perhaps with Mr. Rosenberger or Mr. Lapointe - I can't remember - we looked at some of that data that is in front of the Fraser River Panel for their decision-making and it included a chart which showed water temperature and water flow. That's the kind of information that's provided by your program?

A Yes, that's the primary information. We will provide advice and feedback as well if contacted to do so.

Q All right. And the management adjustments, they are calculated for each stock or for each run timing group?
A They are calculated by run timing group.
Q As you mentioned, there's a number of different models, and you said the Salmon Commission selects the model for each run timing group. But can you just describe what the models are, like what's the difference between them?
A Basically, they all have this very similar form. You either have temperature, temperature plus discharge, temperature discharge or run timing. Those are the three variables that can come -- when whether the -- it will vary by each, the run timing groups. For example, Early Stuart can be a combination of temperature and discharge. The Late run group is predominantly going to be run-timing based.

However, you can have different structural equations. You can have quadratic equations, thresholds models. There are different variations of temperature discharge and timing that go into these things. That sort of model -- that's where the different models come in. The selection of those models is actually done by the Fraser River Panel. The Salmon Commission will come up with different model selections and recommend them but, in some cases, it's the panel that actually adopt the model, the actual MA itself?

The MAs are recommended. The MAs are calculated from the different models and then the Fraser Panel will then decide to adopt the MA, presumably based on one of those models.

Q We've heard a lot about uncertainty in this hearing so far, and particularly in the management hearings. Is uncertainty modelled when you calculate the -- when you run these models?
A In the pre-season, we do generate uncertainty estimates for the temperature and flow parameters that we provide. We provide basically 10,000 pairs of temperature and discharge information for each of them. So, from there, you can generate a distribution of expected outcomes which is a way of quantifying the uncertainty.

We have looked at model uncertainty, that structural model uncertainty and the actual in-season. As far as I know, the actual uncertainty

is not modelled explicitly. And we don't even for our temperature forecast, it's really hard to actually get a handle on the uncertainty in the forecasts.

We do a pro-season retrospective analysis to actually see how well we did and how well we performed, but I think, to be honest, I mean, the people know from weather forecasts. It's the same thing if you -- our temperature and flow forecasts are driven primarily from the weather, so people intuitively understand there's uncertainty associated with weather forecasts. Therefore, similarly, you'd expect the same thing from a temperature and flow forecast that was based on it.

Q And is your uncertainty analysis presented to the Fraser River Panel along with the other data that's provided?

A Our uncertainty analysis that we do for the pre-season is documented in one of the technical reports that we have. I have seen variations of where the model uncertainty has been presented. I don't know about in-season, but that would be -- you would have to ask the Salmon Commission in terms of what they actually do, the in-season model uncertainty aspects.

Q But you provide this pre-season to the Fraser River Panel?

A We do, and we also will provide -- well, it's available for them, yes. We provide the uncertainty estimates in the pre-season, yes.

Q Okay. And, as a member of the Environmental Watch Program, do you attend Fraser River Panel Technical Committee meetings to present the various data generated by your program?

A One person from our organization typically attends the May-June pre-season meeting to present on environmental conditions, as well as whatever other topics we've been researching that's associated with our program.

The actual Salmon Commission themselves will present the MA models that were based from our pre-season forecasts.

Q Okay. The different models that you describe, the temperature model, the temperature flow model and the run-timing model, could those models be run on all the different management groups, or do you

always run certain ones on certain groups?
A Theoretically, they could be. I would not recommend it. When we're involved in our model selection and rationale part of this process, we went through and did a rigorous evaluation of the different combinations of those particular variables to make sure that they're defensible, both biologically and statistically.

From that, you can see Fraser run timing groups, there are certain combination of variables that are only applicable to -- makes more sense both from a biological point of view and from a statistical and rigor point of view, to apply to certain run timing groups.

I mean, the same phenomena exists, but there's no necessarily statistical support for temperature and discharge combination, for example, for one run timing group because the data just doesn't exist to verify it. So you'd expect there to be differences.

Q And is there a formal process that you're involved in to select the MA model for the pre-season? Do you attend that June meeting with the Fraser Panel? I take it that it's their decision to make, but are you involved in a formal process as to evaluating different criteria for model selection?
A No, there's no formal process for doing that. It's informal. We're involved in discussions and email exchange pre-season, but there's no formal process for doing it.
Q And do you provide advice to the Fraser River Panel as to best choice for model selection for the different run-timing groups?
A Directly to the panel? It's been a long time if I've done that. It's mostly toward -- would be directly to the Technical Committee or the DFO representatives on the Technical Committee is the most common way, or directly with the PSC staff.
Q So you --
A We provide input but --
Q You provide the data, but your group also provides some advice as to which would be the best model to use at the Technical Committee level?
A Well, yeah, we will provide advice on model selection, yes.
Q Okay. When do the in-season environmental

forecasts start to be generated for planning?
A We start the models up at the end of June typically, in time for the first -- in time for the Early Stuarts passing the marine fisheries.
Q Okay. And once the in-season begins, are you involved in advising the Panel, you or somebody else from your department, involved in advising the Panel or the Technical Committee on the choice of models in-season?
A No, not unless directly contacted by them.
Q Do you know if your predecessor, Mr. MacDonald, was more involved in providing advice in-season?
A Yes, Dr. MacDonald was definitely more involved. At the same time, though, it was during the development and implementation, so there was very good reason why he would be more involved.
Q When did he leave the program?
A In 2004.
Q Is there some reason why you didn't continue to be involved in those Panel discussions or the Technical Committee discussions in the same way that he did?
A There was probably several reasons. I think, first, he did a great job of actually educating the Panel and Technical Committee on the actual convincing them that there's a real relationship between temperature, flow and in-river mortality. There's changes in the actual Fraser Panel itself in terms of whether the advice was necessary, and also, I couldn't be in two places at once myself, so I had other things, different priorities I guess.

I mean we were in the business of developing science tools for management. We weren't -- we're not involved in the management itself. So, for us, it was basically trying to get there and develop these things and present them to them. It's up to them to run them.
Q Has there been a reduction of resources to your department? Like when Dr. MacDonald left, was he replaced with an equivalent FTE?
A He had two hats, but no, not directly.
Q So the work that he was doing was now -- you're doing, and you're doing what you were doing prior as well.
A At the time, in 2004, yes. But he also had another -- he is also the head of another program

and section as well, so I didn't take over all of his responsibilities, Dr. MacDonald's responsibilities, but those are -- especially with this program, I took them all over, yeah.

Q Okay. We talked about how the panel chooses a model, and MA model pre-season. Once that's model's been chosen pre-season, is it used consistently in season, or could it change in-season? Could they choose a different model in-season?

A No, they're likely to change it in-season.

Q And what would be a reason to change the model in-season?

A The same predictor variables that are available pre-season - we're talking about the 31-day mean averages - may not necessarily be the same ones that provide the best fit or model performance to the ones that be in season, so there are legitimate reasons for switching from a pre-season model to an in-season model.

Q When would be circumstances where you would use the temperature only model?

A The temperature only model would be -- if, for example, we had gone through a process -- I personally just be careful I don't -- I'm not giving these models out in-season, but I would use a temperature only model if the rationale and the justification for doing so was there, or you could switch over temperature of a model if, for example, you hadn't -- flow data was not available. And systems do break down, they may not be available.

Or, for example, if you're into new territory where you've got a combination of temperature and flow that you've never seen before, in which case you have to rely on sort of judgment, biological judgment, I guess, on whether you think it makes more sense to use temperature only versus discharge.

There'd have to be pretty clear reasons by you'd want to switch. But if, ahead of time, you accepted one model which seems to be the best for getting at what you wanted to do.

Q All right. And do you know what the decision-making is within the Fraser Panel as to choices of different models in season? Is advice given? Are you part of that process?

A No, I'm not part of that process, not in-season.
Q So is it transparent, then, how different models get chosen in-season or changes are made to model selection in-season?
A Well, no, not from where I sit, but I'm not there, so I haven't seen any documentation about that.
Q Is there a way to develop certain criteria for model selection that would provide a more transparent and consistent way of selecting models?
A We have explored looking at different performance measures to basically match what the management's objectives are with the types of models that you we like to use. This would be done sort of before the fishing season starts, where you can sit down and evaluate what it is you want, your objectives are, and then you can then make decisions on what your model selection should be based on performance criteria. So not just model fit, but also other -- like model bias or precision are two different things that you could be trading off.
But if you knew ahead of time what they were, then you could actually help. Different models perform differently, depending on what your objectives are.
Q What are some examples of the kinds of objectives that could be set before the season began, and that would help you to determine performance measures for the models?
A Well, I'm not really in a position to -- I'm not going to -- I don't know what exclusively the objectives in management are going to --
Q But what are -- what kinds of objectives? Like what can you give as examples so we know what you're talking about?
A If you were looking for -- right now, if you're looking for a model that would -- basically you looked at the existing data and said, okay, look, you know, we've got 20 years of data here and it shows a good relationship between temperature and loss. On this relationship, this seems to be the best model you want to be doing, it's got the tightest fit in terms of the r-squared value.
However, if you go back and you look at how well that model performed in the past through time, you may notice actually it has a bias in it and the bias might be in the direction of maybe

overestimating the amount of harvest you need to take out, or even opposite, you could be under-estimating spawning escapement.

So if your long-term goal, or your goal was to avoid certain outcomes, then you'd pick a model that had the least amount of bias in that case, or you'd pick a model that was biased away from your -- 'cause in some cases, it's not about -- I mean, the objectives may see that, you know, get the spawning ground and get the harvest, but in many cases it can be a (indiscernible) outcomes as well.

So how the -- different models will take you down -- if you look at them over a long period of time, they can take you in a different direction. So it's not just about how well the models did in the past, but also how well they can perform on a continuous basis.

I'm not the expert on this sort of stuff, but the guy what was involved in this, Randall Peterman (phonetic), as done a lot of work on this work.

Q Okay. So just to help, to see if I'm understanding, so you could -- if you had a model that tended to bias in a way that you didn't get enough fish on the spawning grounds, or that seems to be an outcome, and your objective was to make sure that you had always enough fish on the spawning ground, you could choose a different model that biased the other direction, that biased perhaps putting too many fish on the spawning ground rather than too little.

A Yes, although it's -- yeah.

Q And right now, there's not a clear method that's established in the Panel, or you haven't provided advice on the specific method to identify those objectives and present performance indicators for the models that would allow those objectives to be met or not met.

A I think, in fairness, I mean, this is an evolving process where we are -- we have presented this idea to the panel, but this is sort of a work in progress issue where things take time, right? You start to -- you know, they adapted the MA, they adapt the MA with environmental conditions. They're looking at different model fit now. It's a sort of a progression, I suppose, in terms of

where we can go with this MA modelling.
Q I'll come back to something in a minute. I just want to cover off a recommendation that was made in the Williams review. That's in Exhibit 14 which is probably sitting beside you, but not in the binder you're looking at.
A Is it on here?
Q Yeah, it'll be on the screen in a minute. It's at page 260 of this binder. This is a table that Canada has prepared. It sets out all the recommendations from prior inquiries and their responses from Canada to those recommendations. So recommendation number 13 says:

> The estimate of accumulated degree days should be considered as an approximation of the environmental stress experienced by migrating Fraser River sockeye salmon to inform in-season management decisions.

Is the work that you're doing related to that recommendation? Like has that recommendation been complied with and, if so, is your work part of the work that was done?
A The short answer is yes. We have done a lot of work on this. In the case of how informative this actually is for the in-season, we looked into the feasibility, we did a pretty big study where we actually compared performance of using a model, looked at accumulated thermal units versus a more simple model that we use now, and we realized that although it may help in terms of describing and after the fact where the mortality differences are, it just really wasn't pragmatic for in-season use for many reasons. Probably some of the more notable are that you have to have much more detailed information on migration rates. These fish go to -- each different stock would have its own different accumulated thermal units. You'd have to have much better assessment DNA. It's a trade-off, right, and a lot of these things are just not available in-season.
We also found out that the actual relationship between the lower river temperatures and the upper river temperatures are very good, so we can feel more confident about what we're actually doing in the first place. But there's

very good reasons for doing it.

We also did a lot of work on the biological side, looking at mortality associated with the temperature and how the relationship between temperature and time and fresh water is critical for predicting mortality.

You could inform management in the sense that we could feel much more comfortable about the decisions we're making in terms of adjusting harvest because of temperature. However, using this explicitly is probably not a viable option at this point.

Q Staying with the same exhibit, page 260, 261, this is recommendation 14 of the Williams, 2004. I can't see which is which number on your screen, if you could make it a little smaller. Okay, there we go. So this one says:

> The factors contributing to the discrepancy between gross escapement at Mission and spawning ground escapement...should be separated from proved data collection and modelling. In the interim, the EMA model should be renamed to eliminate the perception that it only accounts for environmental factors.

Is the EMA model what we now call the management adjustment model, or is it something different?

A No -- yes. No, it's -- hold on. The EMA is essentially the MA.

Q It used to be called an environmental management adjustment?

A It did. Once we started using environmental information to adjust the management adjustment, then we started to call it the EMA. Because, as I mentioned earlier, the regional MA model was just based on the stark discrepancy. That name was changed. It was sort of semantics as far as I was concerned.

Q All right. But the main thrust of the recommendation was that you should separate out the factors for the discrepancy, so separate out river temperature, river flow, et cetera. Has that been done?

A I can't really speak to the -- you're talking about the four sources of discrepancy here, the

Mission escapement estimates, the in-river catch estimates, spawning escapement estimates and then the actual in-river mortality part. I mean, I can speak about that in a second, but I just maybe -- I think Brian's earlier testimony talking about the Legacy program and the count on the salmon I think is part of what I would consider sort of DFO's -- part of DFO's response to the bigger picture of parsing it out.

So, I mean, it's not my area, but I think that's kind of -- in the general sense, I think this is where the actual -- the general picture now in terms of what we have done in terms of looking at in-river mortality, we've been involved in a lot of work in the last five or six years. I think if you look at the work through Scott Hinch and Tony Farrell and Steve Cook and some of the other colleagues at DFO, Christie Miller and Steve MacDonald, I mean, there's a lot of work being done looking at getting drilling down to what are those environmental factors and the connection between fish mortality.

So I think we've definitely done a lot in that case. In terms of what's the data needed and things like that, I mean, we increased some of the temperature monitoring. But really, we're getting at trying to remove some of the uncertainty with regards to the impacts of temperatures on fish survival and potential interaction with fishing gear and things like that.

Q And are we yet at a point where we can break those things out and understand them, or are we still in a learning process?

A Yeah. Are we at a point in terms of being able to parse out each of the different components within the DBE?

Q Right.

A I would say no. We are probably at a point where we can take a look independently and separate from the DBE, because with the DBEs, you're tying it up with four potentially large sources of uncertainty. So trying to piece out and break them all up at one time is a tricky thing to do. However, I think, because of all the other research on the side, we've done a much better job of actually understanding the in-river mortality component and what are the factors that drive it.

We can come up with an independent estimate of - I'm not going to say a point estimate here - but independent estimate of migration survival and mortality.

MS. BAKER: Mr. Commissioner, it's four o'clock. As you know, I was hoping we'd finish with this witness today. I don't think that's going to happen. I don't know how late you'll want to sit today. We'll definitely have to ask Mr. Patterson to come back on another day, though, because I'm not going to finish in ten minutes, and nobody else has had a chance to talk.

THE COMMISSIONER: We'll have to arrange for him to come back, then, Ms. Baker. I don't know when that will be.

What follows next week?

MS. BAKER: Monday we have test fishing and that's followed by a decision-making panel. Then we're moving into stock assessment and another decision-making panel. So one suggestion, if people would want to consider this, would be to have Mr. Patterson come back in a morning, maybe start a little bit early at 9:30 and see if we could perhaps cover it off. Tuesday might be a good day for that because we hopefully will have finished test fishing by then.

THE COMMISSIONER: What is your time estimate for your remaining time with this witness?

MS. BAKER: I think I have probably got 15 minutes.

THE COMMISSIONER: And probably half an hour or so of cross?

MS. BAKER: I'm not sure. Before, at the break -- that would be an outside, unless people's estimates have changed.

THE COMMISSIONER: Well, if in total we have another hour, let's say, Mr. Patterson, we can try and fit that in one day by starting at 9:30 one morning next week, and then break at 10:30 and bring the next panel on.

MS. BAKER: Okay.

THE COMMISSIONER: Does that make sense?

MS. BAKER: I think so, yeah. We may have to add another half hour here and there in the week to get it done, but I think that would probably make the most sense.

THE COMMISSIONER: Maybe that's the way to go.

MS. BAKER: Okay.

THE COMMISSIONER: All right. Well, then, we'll adjourn for the day.
MS. BAKER: Okay. Thank you.
THE REGISTRAR: The hearing is now adjourned for the day and will resume on Monday at ten o'clock.

(PROCEEDINGS ADJOURNED AT 4:00 P.M. TO JANUARY 31, 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.

Irene Lim

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

Karen Acaster

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

Pat Neumann

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

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Diane Rochfort