

February 10, 2011

Cohen Hearings

Witnesses: Carl Walters, Jim Woodey & Brian Riddell

Cross-Examination: Don Rosenbloom

(Area D Gillnet and Area B Harvest Committee)

MS. BAKER: Thank you, Mr. Commissioner. The next participant is represented by Don Rosenbloom for Area D, Salmon Gillnet, and Area B, Harvest Committee.

MR. ROSENBLOOM: Thank you very much. My name is Don Rosenbloom and I appear on behalf of Area B Seiner and Area D Gillnet. It's not often that the Government of Canada counsel pre-empts me on questions that I intend to raise in cross examination, but that has been very useful in allowing me to proceed with my questions.

CROSS-EXAMINATION BY MR. ROSENBLOOM:

Q *If I can just follow up on the very issue of the 2004 paper, and we have heard yesterday and today from you, Dr. Riddell, and from you, Dr. Walters, of your new thinking, which is totally understandable subsequent to the publication of the 2004 paper.*

What arises from the evidence that both of you have given at this Commission in respect to what I'll call your rethinking of some of the issues relating to the threat collapse from over escapement, my question is this: Appreciating what is your current thinking in respect to that critical question, as focused in that paper, what advice would you be giving to the managers at DFO if respect to harvest management in the context of your new thinking?

DR. WALTERS: Brian? Shall I start?

MR. RIDDELL: Do you want to start?

DR. WALTERS: Yeah, okay. I strongly recommend that DFO consider a return to the relevantly high harvest rates that produced good returns and increasing biodiversity and increasing spawning abundance through the '50s through '80s. And that they consider attempting to deliberately re-establish the cyclic dominance patterns for stocks like Quesnel and Late Stuart.

Now, there's a caveat on that, that yesterday Jim Woodey mentioned. He talked of the most serious problem in the Fraser today is pre-spawning mortality of Late run fish. I don't think that's correct at all. There is widespread decline in productivity of Fraser River sockeye, particularly in the upper part of the Basin that may be partly due to

delayed density dependence effects, but there also appear to be some severe environmental effects. Those environmental effects go beyond just pre-spawning mortality and warm temperature. Something's going wrong up in that part of the system. So the caveat would be that we should only return to the higher harvest rates if those survival declines reverse themselves.

Q *Dr. Riddell?*

DR. RIDDELL: Well, I don't think I would be as emphatic about increasing the harvest rates back to historic levels. The reality is that we have multiple management objectives now. But to the context that you could increase harvest opportunities, there's no question that I think the new data is indicating that there is a significant loss of productivity and production at those higher levels of spawning. I think you'll see that in the Quesnel, in Chilko and in the Adams. So those are your main producers.

The real task for the managers is how you can increase the harvest on those major stocks and meet the other objectives. Really, that was part of the intention of developing the FRSSI sort of modelling. Can you get back to historic levels?

I doubt that, to be honest. But would I recommend that you increase harvest where possible to meet the other objectives? Yes, I see no technical reason why you wouldn't try to come back to more of what we consider to be the sort of MSY paradigm.

I think that you have to recognize the wide uncertainty of some of the MSY estimates. I actually quite like the notion in Alaska of defining an MSY range. I think that recognizes that there's a range of acceptable values.

I don't think I could recommend going back to historical levels. Could we increase the harvest in some of the large stocks? I think that is consistent with what we're seeing in the productivity of the stocks now with some increased spawning, but within the constraints of the other objectives.

Q *Thank you. We hear from Dr. Woodey and from others, but from Dr. Woodey this morning that our recent direction in terms of increasing escapement into the spawning grounds is "a big experiment". My question to any of you and all of you is this: Obviously more research has to be done. We have the 2004 paper. There is then the revisiting or the rethinking of the 2004 material by the two of you who are authors of the paper. Obviously more work has to be done.*

I assume that you would be recommending to the Commission that part of the recommendations of this inquiry be that sufficient money be put into further analysis to satisfy the current thinking as both of you, as authors, have been speaking about for the last day or two.

DR. WALTERS: I think you have to be careful there. We certainly would recommend lots of research on the mechanisms that cause delay density dependence and so on.

But in the matter of determining whether or not we can reverse negative impacts of cyclic dominance, or whether those impacts are in fact due to environmental factors rather than cyclic dominance, you're not talking about investment in research. You're talking about what's called an adaptive management experiment.

The possibility of a deliberate change in harvest management policy aimed at causing informative variation about productivity in the spawning stock sizes -- and in fact, that was what when on from 1990 forward was essentially an adaptive management *experiment* to test to see if off-cycle lines could rebuild. That doesn't require extra research money. It requires a commitment in management to treat the management and the setting of escapement goals as a set of experimental treatments.

Q *Thank you. Dr. Riddell?*

DR. RIDDELL: Well, I don't think there's any question that we need to do more targeted research. I think we've done a lot of the adaptive management.

It has been as structured as the sort of adaptive management design would actually like, so we could probably improve on that. But I think that we've let the escapements build, and now I suppose what Carl is referring to is that we need to fish to see if the population dynamics as we now understand it, respond as we predict.

I think you still have to acknowledge that you'll need more resources directed to conduct the necessary research. We're spending a lot of time talking about density dependence within fresh water and then linking it to marine. I am not confident that we understand the marine survival enough to sort out these two effects. So, yes, you need to do the work in fresh water.

Unfortunately, we also have to spend more effort in the marine survival, particularly, I think, in the early marine survival in the Strait of Georgia.

Q *I'll be coming back -- it's my last question to this panel about funding issues and budget of DFO and I will be directly questions about the research side of it, so I'll leave that for now. Much has been said about this Alaska paper which is actually a paper that we have brought before the Commission and wish to have filed as an exhibit, and then I have questions to ask of a few of you regarding the significance of the Alaska paper. I don't believe it has, as yet, been*

MR. ROSENBLOOM: That paper is the biological and fisheries related aspects of over-escapement in Alaska sockeye salmon. I would ask that that paper be filed as an exhibit. I understand Commission counsel had it in hard copy to be filed.

THE REGISTRAR: It's been passed to the Commissioner.

MR. ROSENBLOOM: Oh, good. Thank you very much. And it has already been marked as an exhibit?

THE REGISTRAR: Not yet.

MR. ROSENBLOOM: No. In which case, may I suggest that it get marked as an exhibit? Thank you.

THE REGISTRAR: Exhibit number 419.

MR. ROSENBLOOM: Thank you.

EXHIBIT 419: *Biological and Fishery-Related Aspects of Overescapement in Alaskan Sockeye Salmon dated December 2007*

MR. ROSENBLOOM:

Q *Could I direct these questions in particular to Dr. Riddell and Dr. Walters, and not to slight the other two panel members, if they do have comments they wish to make about it.*

My question is this: What is the significance of this paper from your perspective as scientists? Much has been said generally about it. Where has it taken us? Where are we today because of this paper that we weren't otherwise? Dr. Walters, do you wish to proceed first?

DR. WALTERS: You mean the Alaskan over-escapement paper?

Q *That is correct.*

DR. WALTERS: No, it's just -- there's nothing added in to anything. It's just a reiteration of standard definition of Type 1 over-escapement as Brian and I would have called it. Escapement surplus to that escapement level that will produce the maximum average yield.

Q *Thank you.*

DR. WALTERS: As Brian mentioned, there's a couple of little goodies in there about operating with a range, a target range rather than a single statement value, but there's nothing new in that.

Q *All right. And, Dr. Riddell?*

DR. RIDDELL: I would agree. I think if it adds anything, it adds a couple of clear examples of the sort of density dependent -- delay density dependent element. Other than that, it's very much an assessment like many other organizations would conduct.

Q *Thank you very much. Dr. Walters, we were speaking of SR modelling and we had before us from your 2004 paper, a model. I have been in the audience of a lecture that you gave to academics and to students on SR modelling. Do you have anything to add in terms of educating the Commission about SR modelling, meaning spawner-to-recruit modelling, or are you satisfied, as you conclude your evidence today, that you have said your piece.*

DR. WALTERS: Well, no, I would add two points. One of them is to reiterate that that curve that we draw is not used just for point forecasts. It can be, but it isn't a good point forecaster. There's wide scatter around the curve, meaning there's wide variation in recruitment not explained by the size of the spawning stock. The curve is only there to help us identify the spawning stock level that, on average, produces the highest yields, and beyond which there's diminishing returns to adding additional spawners in terms of potential yield.

I would add another thing is that in recent years, for a lot of stocks of fish, we have seen apparent persistent changes in the parameter values of the curve. That is, the curve is actually shifting more or less slowly and progressively, and apparently irreversibly in time. In some cases, towards higher productivity, and in other cases towards declining productivity. In other cases, a simple shift from one position to another position. We have to be alert to those changes and to adjust the spawning stock goals to those changes.

We don't treat the spawning stock number even if we could estimate it precisely from historical data, as carved in stone for the future.

Q *I don't know if anyone -- the other panel members wish any comment. If not, I will proceed with my next question. The panel has -- excuse me, yes, Dr. Riddell.*

DR. RIDDELL: I'd just add I agree completely with what Carl said. I would point out that there was an analysis done by Dr. John Schnute, and I think Al Cass and Dr. Beamish. What they did is they actually looked at different time periods of the SR modelling in the Fraser sockeye and they did theirs on the basis of changes in marine productivity in the North Pacific. They see the very same thing that Carl's referring to.

So if we talked about the long time series in the Fraser sockeye, I think the important thing with Carl's is that we tend to run these analyses through the entire time series and think that that's the more robust way to look at all the data, but you could be missing important changes in the productivity of the stocks, or change in the capacity prime area (sic) that Carl's referring to. So I think just to emphasize that some people are looking at

periods within the data, but we probably need to be more vigilant in examining that effect.

Q Thank you.

DR. RIDDELL: We can do these models with a year dependent parameter to look at change through time, but if it's shifting back and forth, that may not be informative.

Q *We have discussed over the last two days the issues of what I'll call ecosystem benefits from over-escapement and evidence has been given, but this will be our last opportunity to have you as panellists speaking to the matter.*

Dr. Walters, you have spoken about it, and today you were speaking about the marginal returns to the fertilization or ecosystem in terms of benefits reaching a certain point. Before I invite the other panel members to this debate, because it is obviously a critical question for the Commission, do you have anything further that you want to add in respect to the argument that over-escapement is beneficial to the ecosystem?

DR. WALTERS: Let me just reiterate that if we're going to be honest and scientific about this, we need to look at benefits to the ecosystem on the margin as spawning stocks increase, not make some absurd assumption that they're always going up when there's more spawners, which we've been, I believe, invited to do. A good example of that idea of there not necessarily being a marginal value, if you go to Rivers Inlet today where the stocks are severely depressed, the bears have left. The grizzly bears and the black bears have left Rivers Inlet. So you say, my goodness, Rivers Inlet is not supporting bears anymore and eagles. But if the spawning stocks were to recover to just even half of what we calculated from the long-term data to be the optimum, there would be an abundance of spawning fish and the bears and eagles would come back. Beyond that two or hundred thousand spawners, there wouldn't be any additional benefit to those components of the ecosystem of having extra spawners. A bear standing there on a spawning creek where there's 100,000 fish for him to eat isn't any happier than a bear standing there where there's 10,000 for him to eat. That's what I mean by we need to look at these benefits much more carefully than has been done.

Q Before we're likely to take our break, do the other panellists have any contribution to make in respect to this question? Dr. Woodey?

DR. WOODEY: Yes, Mr. Commissioner. The thing that has come out in at least one case in the Quesnel system speaks to this over-escapement issue and marine-derived nutrients. In the recent years, the 2001 and 2002, there were approximately 3.5 million fish that escaped in 2001, three million roughly in 2002, and the marine-derived nutrients under the theory that you're fertilizing the environment and thus getting better growth, the growth actually went down. We don't know why necessarily that occurred, particularly in the 2001 dominant line spawning population offspring.

But in the 2002, what's called a colonial algae became the dominant phytoplankton species in the lake for a period of time sucking up a lot of nutrients, but because they're colonial, they're large and unavailable to the zooplankton as food, and therefore the zooplankton presumably didn't increase in proportion to the nutrient input.

Because I did my doctoral studies on Lake Washington, that was the issue there, was cultural eutrophication in Lake Washington. When you have a situation where you have too much nutrient, you actually tie up those nutrients and species of phytoplankton or algae that are unavailable to the zooplankton that fish feed on. So there is some known mechanisms here and why -- from a fertilization point of view, not necessarily going to realize the benefit in terms of juvenile sockeye.

At 2002, juvenile sockeye were the smallest on record by quite a large amount in terms of percentage decrease in size. We're talking 20, 25 percent decrease over the next small of juveniles and was contributing to this decline in the Quesnel stock.

Q Any other comments before I invite the Commissioner to adjourn for a break?

MR. WILSON: I think Dr. Woodey raises a very good point, and so does Carl. In my earlier comments, I was not implying that all of the benefits of large escapements directly translated into future increases in the productivity or carrying capacity for raising salmon. I was simply suggesting that in a watershed like the Fraser, 100 million pounds of salmon arriving in a particular year is going to be a very significant event, and it will change the productivity of the Fraser River, likely in a very positive way.

Whether that's good or bad for salmon, I can't say. It may even be related to the mechanism that drives cyclic dominance. I'm simply suggesting that those very large influxes of nutrients were, in general, important to the productivity of the watershed and there is evidence to suggest that for some lakes that are nutrient limited, it can have a positive influence on even salmon growth.

But I totally agree with Carl that we need to have a thorough scientific review of the available evidence. It should certainly be something that's considered in the setting of escapement goals for the Fraser River.

Q Dr. Riddell?

DR. RIDDELL: Well, I can assure you that when you start talking about ecological values, this is one of the toughest discussions in the *Wild Salmon Policy* as we went through before.

There are very, very strongly felt sentiments about cultural values and aesthetic values and not just economic values. But I do agree with Carl, and the reason that we included the -- we, I'm sorry, when I was with DFO again -- why we included Strategy 3 in the *Wild Salmon Policy* is that I think that it can be completely consistent with the objectives in that policy because if you accept these management goals, the upper benchmark

targets for management, if you were to sustain those, you would have a pretty health ecosystem in our assessment.

You can do the assessments and then you'd be looking at these marginal values, but I think if we did have a system where you could achieve these MSY type levels or in that range, which we equate to the upper benchmark in the Wild Salmon Policy, that I think it would, for the vast majority of people, meet their expectation of these ecological values.

MR. ROSENBLOOM: Thank you. If there is nothing more from the panel in respect to that question, I will invite the break. Thank you.

DR. WALTERS: I'm sorry, Don, could I just make one real quick point?

Q I thought that might come. Go ahead.

DR. WALTERS: You can have your break and think about this. I want to ask all of you who, in their right mind, would use our most valuable salmon as fertilizer deliberately?

MR. ROSENBLOOM: I thank you very much, Dr. Walters.

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

(PROCEEDINGS ADJOURNED FOR MORNING RECESS)
(PROCEEDINGS RECONVENED)

(PROCEEDINGS RECONVENED)

MR. ROSENBLOOM: Thank you very much.

CROSS-EXAMINATION BY MR. ROSENBLOOM, continuing:

Q *To muddy the waters even further, Dr. Walters, am I correct in understanding that Dr. Larkin did assert that the MSY should not be the objective for harvest management, or do I have that wrong?*

DR. WALTERS: Larkin was my mentor at UBC when I started there and I helped him a bit writing a paper called "An Epitaph for the Maximum Sustained Yield" where he warned fisheries scientists about three things. One of them is he warned about slavish adherence to MSY, as a management goal and, more particularly, a slavish belief in the models used to estimate MSY where those models have a substantial risk of overestimating MSY and leading to over-harvest. He also warned about the erosion in stock structure or biodiversity that can occur in a complex system like the Fraser when MSY goes for what harvest rates are set at the MSY rates for the larger and more productive stocks.

And then thirdly, he warned that there are other goals in management besides just yield. There are, in particular, economic goals. For example, if we wanted to maximize the profits from our fisheries, we would fish at lower than MSY rates. The marginal economic gain from taking more fish is exceeded by the costs of taking them at harvest rates below the MSY harvest rates. Larkin did not offer, however, clear recommendations about how to deal with the stock structure and biodiversity issue. He basically sidestepped that. He said we should take care to try not to cause irreversible extinction of small stocks that could become important in the future but didn't offer specific portfolio management recommendations about how to achieve a balance between yield and diversity.

Q Well, speaking to that very issue, Dr. Walters, I cross-examined Dr. Holt in these proceedings -- and Mr. Lunn will put the transcript before us -- on December the 7th of last year, and I'm referring to page 55. If you don't have it on your screen, I'll be reading this passage of my question and her response. And I want to elicit from you your response to Dr. Holt's answer to me.

DR. WALTERS: I have that material. What page, please?

Q *It is page 55 of the transcript of that date.*

DR. WALTERS: Gotcha.

Q *And I start my question at line 23. And if you have that in front of you, it reads:*

Q Now, my first question to you relates to the whole substance of the Wild Salmon Policy and, in particular, the assertion that maintenance of high biodiversity also use, in other words, above their lower benchmarks, is necessary to maintain a fully sustainable fishery for the Fraser Sockeye. And I assume you general subscribe to that approach, do you not?

DR. HOLT: Yes.

Q That being the case, my question to you is this. Isn't that fishery largely dependent on a relatively small number of large stocks? Let me start with that question. Do you agree?

DR. HOLT: That is true for the current period. As Dr. Irvine mentioned a few minutes ago, it is possible that the stock ratios may change over time so the ones that are dominant now may be small in the future but other ones that are small now may become dominant in the future.

Q Right.

DR. HOLT: So maintaining that diversity is important for the long run.

Q *So you speak of -- I'm sorry, yes. So you speak of Dr. Irvine's comments a few minutes ago about Bristol Bay, do you not?*

DR. HOLT: Yes, that was one example that he gave.

And then it goes on from there. I have a couple of questions arising out of that testimony. Firstly, do you agree with Dr. Holt?

DR. WALTERS: On which point, that maintaining all stocks is necessary for the future?

Q Precisely.

DR. WALTERS: No, absolutely not. That's equivalent to your stockbroker telling you that you have to keep every stock you ever owned in your stock portfolio.

Q Right. And you made mention of that yesterday. If you have nothing more on that particular matter, about Bristol Bay, can you or Dr. Riddell --

MR. TAYLOR: May I just point out in fairness to the witness; I think Mr. Rosenbloom said "maintaining all stocks". I see the evidence to say "maintaining diversity".

MR. ROSENBLOOM: Maintaining diversity. I'm sorry. Did I misread the...?

MR. TAYLOR: Well, I'm looking at line 43 on page whatever this page is.

MR. ROSENBLOOM: Line 43, "Dr. Holt, 'So maintaining that diversity is important for the long run.'" And I misread that? I'm sorry.

MR. TAYLOR: I thought you said "all stocks".

MR. ROSENBLOOM:

Q *Oh, no. Having heard that exchange, that doesn't change your testimony, does it, Dr. Walters?*

DR. WALTERS: No, not at all. There is also an assertion in that testimony about small stocks potentially becoming the large stocks and, in particular, a reference to Cultus Lake being much, much larger, potentially much, much larger than it is today. I don't believe that kind of argument is correct. Most of the stocks that are small today, with a few exceptions like the Harrison River, are small because they live in very limited habitats. They do not have the potential to become very large and to replace our big dominant stocks. You can't grow that many fish in those small lakes.

The Bristol Bay reference is to a paper by Ray Hilborn where he pointed out that, in the Bristol Bay system, that has eight major stocks that contribute to it, the dominant pattern of those stocks has shifted. That's not small stocks becoming important. That is shifting patterns of contribution among large stocks. Another study in Bristol Bay by Daniel Schindler pointed out that when you have a large number of stocks contributing to production, you obtain a portfolio of stabilization effect on yields so one's down, the other's up. The situation that Daniel was referring to is one where there's a very large number of small spawning stocks going up and down, not a few large dominants and many small ones that can't become large.

The closest we have to the situation that Schindler referred to in the Fraser is in the Early Stuart Complex where there is a large number of small streams that contribute to the production and some of them haven't done well and others have and so on. This whole argument speaks to Dr. Larkin's point. We have not resolved the issue of how to select a portfolio for the long-term. And it is not just a matter of saving every stock.

Q Thank you. Again, borrowing Dr. Woodey's comments about this experiment that we're experiencing of late in terms of harvest management since 1995 to the present, Dr. Riddell, can 1 you tell me, has there been a retrospective estimate of the yield loss? So I'm speaking of harvest loss over this period of what I'll call the experiment.

DR. RIDDELL: I don't believe there's been any retrospective in assessment of loss, no.

Q And you would agree with me, depending on whether you apply the Ricker or Larkin model, that the figures could be very, very significant in terms of financial loss to the harvesters?

DR. RIDDELL: Well, I'm sure that you will show a significant number of fish lost to the harvest opportunity. My concern in doing that retrospective is similar to my concern with Carl's response. I don't know. Were you going to come back to the panel with respect –

Q I'm sorry. I'm happy to. So let's go back to Dr. Walters' comments and then allow you to carry on about this retrospective estimate of loss.

DR. RIDDELL: Mr. Commissioner, I think the answer is very, very similar to both from my perspective in a sense. I have no question or concern with Carl's comment about "many of the small stocks will be small". Their productive capacity is quite limited. But we already noted today that we have these 19 stocks that we are focused on in the production assessment of which there were actually 38 conservation units. We're really only looking at production from about half. They are the majority of the production. I think they make up 80 to 90 percent in most years but not on the off cycle years.

And so if you were even concerned about potential fishing opportunities, there's certainly a concern about delivery of fish to First Nation communities in the off-cycle

years. These small stocks have an aggregate value that can be quite important to local communities. And so I have no problem agreeing that Fraser Sockeye salmon in this portfolio issue is not a very equal comparison with Bristol Bay. They just don't have the same sort of capacity to compensate for the magnitude of loss that occurred in Bristol Bay.

But I do think that in doing the retrospective and in considering the value of the biodiversity we're referring to in the Fraser, you must look at the full set of management objectives again, including the local values of the smaller lakes to the First Nation communities and to the local ecosystems.

So from a strictly economic perspective, I don't have any concern really with what Carl's saying, that the small stocks in the Fraser simply don't have the productive capacity to compensate like they did in Bristol Bay. But I don't think that that takes away the value of maintaining the diversity just like Dr. Larkin referred to a long time ago. I think that paper was '74? '77? Well, he has another one, "Play It Again Sam," in '74, which is another sort of paper that everybody should read if you're in salmon biology. But it's just a matter of saying that these small populations are acknowledged to have significant values that are not just economic and this was very, very strongly expressed by many people advising on the *Wild Salmon Policy*.

But the real art of this, and I think the concern that we need to get to in resolving this issue with biodiversity versus opportunities for harvest is Carl's analysis recently suggesting some of the small populations are getting increasingly unproductive. That is a critical issue we'd have to investigate because that could be a significant limitation on how we can conserve these populations.

Q *All right. Before we go back to you, Dr. Riddell, on the issue of estimates of yield lost from making these decisions from this grant experiment, Dr. Walters, do you have anything to respond to Dr. Riddell in respect to the issue of small stock?*

DR. WALTERS: No, no --

Q *Thank you.*

DR. WALTERS: -- certainly DFO recognizes values of the small stocks associated with First Nations use and so on and --

Q Thank you.

DR. WALTERS: -- that's a public policy issue beyond the scope of my competence as a biologist.

Q Thank you. Dr. Riddell, back to you on the question of stock value or, as I put it, yield lost to harvest, you don't believe that work has been done, correct, to the best of your knowledge?

DR. RIDDELL: I'm not aware that it has been done, no.

Q And does it not strike you that it's critical in the application of the *Wild Salmon Policy* that *socioeconomic analysis* is done on a constant basis before decisions are made or would be made under the *Wild Salmon Policy*?

DR. RIDDELL: Well, the policy --

Q Isn't that part of the policy?

DR. RIDDELL: I was just going to say the policy recognizes the need to do that. Outside of the policy, though, I mean we're referring to the rebuilding objective as an experiment. And it is unfortunate that the experiment hasn't been fully assessed in that perspective. And as Carl's talking about the adaptive management approach and where we go in the future, it's probably a good time to do that before you start designing another approach for the next ten years. But to my knowledge, that retrospective has not been conducted.

Q Thank you. Dr. Walters, do you have any comment to make on this very question of retrospective estimate of yield lost to my clients and other harvesters from this so-called *experiment*?

DR. WALTERS: Yes. As the Scientific Advisory Committee was being disbanded for the Cohen Commission, I contacted Dave Levy and recommended very strongly that such a retrospective analysis be carried out as part of the Commission's work.

I recommended it be an add-on to Randall Peterman's work or contract with Steve Martell. Martell and I had done a similar analysis on earlier data from the Fraser. I also contacted Jeff Grout from DFO and recommended that they do that. And I sent a spreadsheet with the beginnings of a retrospective analysis to Al Cass with the request that DFO's FRSSI team use the big FRSSI model to carry out such an analysis.

There's been no response to the request to the DFO people and I don't know what the Commission decided to do about it. I believe there is a study that is going to attempt something like that.

I carried out a retrospective spreadsheet analysis for the 1995 to 2009 period and looking forward for about eight years. And using the model, that retrospective analysis showed that the total loss in value from harvesting, if the Larkin-type models are correct, has been about \$200 million not including the loss from 2010, which would be another

probably \$40 million. So it appears to me that the economic losses were very substantial.

Q *When you referred to the Commission, for example, in reference to phoning or contacting Dr. Levy, you're, of course, referring to this Commission as opposed to the Pacific Salmon Commission?*

DR. WALTERS: That's right.

Q *Thank you.*

DR. WALTERS: Right, right, right.

Q *Sorry. Did you have something to say, Dr. Walters?*

DR. WALTERS: Yeah. Now, the way this retrospective analysis is done is we build a multi-stock. I used a ten-stock population model using the Ricker and Larkin equations. And we provide that model with the actual historical recruitment anomalies that occurred over the years. We provide it with the pre-spawning mortality patterns that occurred so that if we give that model the historical harvest rates by timing group, it gives us back exactly the observed historical catches. And then what we do is to vary the harvest rates away from those that actually occurred and then ask, "What if we had harvested higher rates or lower rates?"

I explored two options. One of them was a steady 60 percent harvest rate through the 1995 to 2009 period; in other words, followed basically the TAM rule that ignore pre-spawning mortality.

And a second scenario with a 70 percent harvest rate. And the estimate of \$200 million of fish lost comes from that higher harvest rate of 70 percent, which is about what the Larkin model indicates overall is the best for the Fraser. I did not make adjustments, as one should, for the very low returns in 2007, 8 and 9, which would have reduced the losses a little bit, if I did. I just supposedly just ignored all of the complications that occurred and just --

Q Excuse me, Dr. Leadem wishes to interject.

MR. LEADEM: For the record, Leadem, initial G., for the Conservation Coalition. Dr. Walters is obviously referring to some work that he's done that's not before the Commission. And he's given some oral testimony about it. But I think it would be helpful if we were to see the work of Dr. Walters at some stage and be able to offer some commentary on it and perhaps have him come back to answer some questions about this. It certainly takes me a little bit by surprise.

MR. ROSENBLOOM: I'm in the hands of the Commission.

DR. WALTERS: It's a pity that it does take you by surprise. It's a pity that there has not been a follow-up on the recommendations to do this and to get it before the Commission, particularly by DFO staff using their more complete datasets and so on. The spreadsheets that I used, or at least an early version of them, I believe you actually do have. But they were listed among the exhibits for this panel. There are a couple of Excel spreadsheets that were early versions of the calculations. The versions that I sent to Jeff Grout I think are listed amongst your exhibits. But you would have to be an expert in population dynamics and spreadsheet techniques in order to make any sense of those. They are not documented.

DR. RIDDELL: Don, could I comment?

DR. WALTERS: A quick analysis I did to test the feasibility of doing it and so that I could recommend clearly that it be done.

Q Thank you. Dr. Riddell wishes to speak.

DR. RIDDELL: Just a simple comment pretty much to the comment that Tim just made in the sense that, as Carl's inferring, this will be a very technical assessment. The standard procedure would be to have this go through a technical review, a scientific review, so that when it comes before the Commission you have confidence in the analysis, in its supports, or we all agree on what is presented. There are obviously a number of critical assumptions Carl's would have to make in terms of meeting these multiple objectives. So I mean I think there's a couple of steps here. I had heard of this work in the background but I've not had any opportunity to review this sort of material. Yes, it would have been nice to have the Commission have it as a piece of work for the future. But I think realistically right now, this is going to be highly technical, as Carl has just referred to, and it would be probably of greater service to the Commission if you had people review this with Carl and maybe submit a report to you later on this. It's not something that's easily discussed without seeing the documentation.

Q Well, we leave that with the Commission. It's obviously out of our hands as counsel but you have heard Dr. Walters' plea for this work to be done by the Commission and that he'd previously made such a request. Unless there are further comments in that regard, I come to my last area, which, quite frankly –

DR. WALTERS: Excuse me, Don. Before you go on, I do have one additional comment.

Q Right.

DR. WALTERS: I don't particularly see this as something the Commission should be doing. I see it as a fundamental responsibility of the FRSSI team and of DFO to be looking retrospectively at their management performance to be asking how they could

inform that performance. And I'm frankly a bit shocked that it was not part of the FRSSI process. That kind of careful retrospective analysis wasn't part of the FRSSI process in general.

Q *Thank you very much, Dr. Walters. I now come to the last area of my examination, which, frankly, I consider probably the most important in terms of long-term sustainability of the resource. And it relates to the budget issues of DFO. And Dr. Riddell, you have spoken about this during previous appearances before this Commission. Discussion was had briefly yesterday by the panel about research that was necessary. In fact, I believe, Dr. Riddell, if I got your words down correctly -- I don't have it from the transcript -- you spoke about the information system going in the wrong direction right now. You did use the term "wrong direction". I wish to put before you a series of questions and answers that I had with the deputy minister, Ms. Dansereau, before these very proceedings where I raised the whole question of DFO budgeting and raised the question of the 5 percent reduction in the upcoming budget, as she's being ordered by Treasury Board to reduce by that 5 percent.*

Dr. Riddell, to put this in context, you did testify a few days ago, and please correct me if I misstate your evidence, that that 5 percent reduction, as you understand it, really is very, very significant and much more than 5 percent because DFO does not apply the 5 percent to the salary portion of DFO's operations, which is around 70 percent of their total budget; the 5 percent gets hit from the operating expenses of the remaining 30 percent. Is that your testimony of previous day?

DR. RIDDELL: Very similar to it. Frequently when you get a budget reduction, the 5 percent I know and I should qualify, of course, that I am not in the department in the last two years when these 5 percents have been applied, but the statement that I've heard about the 5 percent is that it's across total budget. That then includes, as I described, your capital, your salaries and wages, your operating funds. The only salary dollars that could be redacted would be salary dollars that are vacant positions. And typically, we don't leave those salary dollars vacant. They would be used elsewhere. But when I left the stock assessment department, as an example, we had pretty well 75 percent of our budget in salaries and so you can do the math very simply. So a 5 percent across total multiplies substantially up by about, well, three full minimum. So that you then have to apply that across your operating budgets.

Q *And have you not testified that it really represents maybe a 15 to 25 percent reduction?*

DR. RIDDELL: It can, depending on how it's actually applied to different programs.

Q All right. The 5 percent hits the department. How it's transferred to the actual regions could differ. It's possible some areas could have none, some could have ten. That's at the discretion of the Department of Fisheries in Ottawa. When it hits the region, there's another decision process involved of how it's actually assigned to particular programs.

Q Thank you. Now, we've heard testimony throughout these many months of a clarion plea for research to be done in various areas that up till now have not been considered or carried out by DFO. I want to put Ms. Dansereau's evidence before you. I want your response. And quite frankly, Ms. Dansereau is coming back at the concluding days of this inquiry and I intend to probably put your responses back to her. She said, and I'm referring to transcript of November 1 the 2nd of last year. I'm referring to page 63. And Dr. Walters, you do not need this to be before you, I don't believe. At page 63, line 12, where we were speaking of this 5 percent reduction as directed from Treasury Board. Line 12:

Q Well, the fact is, there's going to be a 5 percent cut is obviously consequential to all stakeholders in respect to this industry, isn't it?

MS. DANSEREAU: I would say, well, to -- it could be. It depends on -- we hope we've done a significantly good enough job to make sure that we -- that there is not that much pain felt.

Q Well, this is an awfully general question to you, Ms. Dansereau, but would you agree with me, or let me ask you this, are all science programs, departments, projects, stock assessment, stream enumerations, et cetera, adequately funded up till now, in your opinion, during the time of your tenure?

MS. DANSEREAU: I would say yes. But it -- you know, I'm sure if we spoke to them, had a greater, more directly-connected to each of the activities, they would probably prefer to have more money.

Q And you'd probably agree with me that within your department there would be controversy and there would be those that didn't agree with you on that question?

MS. DANSEREAU: Always.

Maybe start with you, Dr. Riddell. This appears to be the thinking of the senior people within DFO in the context of facing down a 5 percent reduction in the upcoming year and obviously having experienced previous reductions, as you spoke about them. What is your response to the mindset of the senior people within DFO that they believe that the budget, as currently before them and currently about to be cut, is adequate to meet the very critical matters that have previously testified to in terms of research?

DR. RIDDELL: Well, thank you for that loaded question. Well, I don't think there's any question that I disagree. I am not surprised at all at her reply because, of course, these people are under significant pressure for national priorities and I'm sure there's a very substantial debate in Ottawa where the money goes to the various departments. But I don't think there's any question that you would get a very common response on the west coast with respect to salmon stock assessment, I have said publicly here, I believe, that it's definitely at a marginal responsible level that sort of what we would define as a core stock assessment responsibility is barely being met now. I suppose the

irony of this is that I've also told you that there's always a direction to ensure that Fraser Sockeye assessment is met.

We've heard that there's a couple of exceptions to that. So the funds that come here –

Q Excuse me. At great expense to other stock.

DR. RIDDELL: Thank you. I was just about to point out that –

Q Thank you.

DR. RIDDELL: -- what happens is the money, on a limited budget, goes to the Fraser Sockeye first and there are other salmon species in the Fraser that are not sufficiently funded. And then outside the Fraser in years where money is tight definitely takes a major reduction in order to meet the requirements of the Fraser Sockeye. And as I point out again, we are not even doing assessments of Fraser pink salmon. So to say that we're meeting a minimum core is simply not accurate. But in all honesty, how would you know what sort of advice is getting up to that level?

She may well believe that's true because that's what she's told. I think that it would be a matter of record, of simply looking at the history of the stock assessment programs, that they are not being funded adequately.

Q Well, you speak of competing interests of all departments at Treasury Board level. You would agree with me the responsibility of the senior managers of DFO is to fight out their cause at Treasury Board to ensure that they get their appropriate portion of the national budget?

DR. RIDDELL: I can say in all honesty that the people that I have personally known in Ottawa that are responsible for that try very hard. But you get down to national priorities, fishing on the east coast gets a certain priority, fishing on the west coast may not be as much. Arctic is, of course, now getting a significant priority. So these sort of challenges change over time. And we have significant funding challenges within the department because we now have Coast Guard and ships. And anyone reading the paper knows that there's a significant investment going into ships in the near future.

Q *Well, when you say from the people that you knew at very senior level, that they tried very hard, would you not agree with me that this deputy minister's testimony before this inquiry, giving this testimony under oath, before a Royal Commission, isn't trying very hard to fight the good fight at Treasury Board to get them necessary money?*

DR. RIDDELL: Well, I don't think I can comment on that. I mean I think you can draw your own conclusion from her comment. That's not a reflection of necessarily how hard she's trying but if she's been given a budget and she believes that you've allocated within that budget, these budgets are very large at a departmental level.

There is discretion about where you send money within that department. So there are many levels of decision involved before it gets down to the Pacific salmon on the west coast.

Q Before I stand down, I wonder if any of the other panellists have any response to the testimony that the deputy minister gave in these proceedings. Dr. Walters?

DR. WALTERS: No.

Q I'm sorry, you don't. Do either of the other two panellists?

DR. WOODEY: No.

MR. ROSENBLOOM: Hearing nothing, I thank you very much, gentlemen, for answering my questions.

MS. BAKER: Thank you, Mr. Commissioner. Mr. Eidsvik is next for the Southern Area E Gillnetters and B.C. Fisheries Survival Coalition.