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

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

Public Hearings

Audience publique

Commissioner

L'Honorable juge /
The Honourable Justice
Bruce Cohen

Commissaire

Held at:

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Vancouver (C.-B.)

le jeudi 14 avril 2011

Errata for the Transcript of Hearings on April 14, 2011

Page	Line	Error	Correction
25	18	one stop	one stock
34	29+30	market capture	mark-recapture
35	5+9	market capture	mark-recapture
65	33	ahs	has

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APPEARANCES / COMPARUTIONS

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

APPEARANCES / COMPARUTIONS, cont'd.

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

APPEARANCES / COMPARUTIONS, cont'd.

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

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THE REGISTRAR: Order. The hearing is now resumed.
MR. WALLACE: Good morning, Mr. Commissioner. Brian Wallace for the Cohen Commission. I just have a short administrative matter, which is to file as an exhibit the written re-examination - I think, Mr. Lunn you have it - from the Government of Canada. It is in a letter to the Commission dated April 7th. This is left over from the WSP Panel of the Regional Directors General of March the 4th, and at the conclusion of that day we ran out of time. I indicated I had one question in re-examination. On reflection, I don't. Mr. Timberg indicated he had two, and there was an exchange of correspondence, and the resulting letter from the Department of Justice to the Commission, including the two questions to the two panellists for re-examination, and their answers. And I would ask that that be marked as the next exhibit.
THE REGISTRAR: That will be marked as Exhibit 717.
MR. WALLACE: Thank you.

EXHIBIT 717: Canada's Written Re-Examination of WSP RDG Panel (Paul Sprout and Sue Farlinger)

MS. BAKER: Thank you. Mr. Commissioner, it's Wendy Baker for the Commission, with Maia Tsurumi. Today we have Mr. Karl English testifying in relation to Technical Report 7, entitled "Fraser River Sockeye Fisheries and Fisheries Management and Comparison with Bristol Bay Sockeye Fisheries". Mr. English will be reminded of his oath. He was here earlier.

KARL ENGLISH, recalled.

THE REGISTRAR: I wish to remind you that you are still under oath.
A Yes.
THE REGISTRAR: Thank you.
MS. BAKER: You'll recall, Mr. Commissioner, that Mr. English was here in the very opening panel of this

Commission in the fall.

Perhaps we can start by marking the report, and then I'll follow that with *c.v.*s for the authors of the report. So the report has been circulated to all parties and it's before you on the screen. If that could marked as the next exhibit.

THE REGISTRAR: Exhibit 718.

EXHIBIT 718: Technical Report 7, Fraser River Sockeye Fisheries and Fisheries Management and Comparison with Bristol Bay Sockeye Fisheries, February 2011

MS. BAKER: And then I'd like to mark the *c.v.*s of the authors in the order they appear on the cover of this report, and those *c.v.*s have also been circulated to the parties. So I will begin with the *c.v.* of Mr. English. And I will take him to the *c.v.* once we finish marking all of the authors' *c.v.*s. So if Karl English's *c.v.* could be marked as the next exhibit.

THE REGISTRAR: Exhibit 719.

EXHIBIT 719: *Curriculum vitae* of Karl K. English

MS. BAKER: Followed by Tim Edgell.

THE REGISTRAR: Exhibit 720.

EXHIBIT 720: *Curriculum vitae* of Tim C. Edgell

MS. BAKER: Robert Bocking.

THE REGISTRAR: Exhibit 721.

EXHIBIT 721: *Curriculum vitae* of Robert C. Bocking

MS. BAKER: Michael Link.

THE REGISTRAR: Exhibit 722.

EXHIBIT 722: *Curriculum vitae* of Michael R. Link

MS. BAKER: And finally Scott Raborn.

THE REGISTRAR: Exhibit 723.

EXHIBIT 723: *Curriculum vitae* of Scott W. Raborn

EXAMINATION IN CHIEF ON QUALIFICATIONS BY MS. BAKER:

Q Mr. English, you saw as those *c.v.*s were up on the screen for the different authors of the report, and can you confirm that those are the *c.v.*s provided for the authors.
A Yes.
Q Thank you. And I'd like to then take you to your *c.v.*, which is, what did we say that was, 720 --
THE REGISTRAR: 719.
MS. BAKER:
Q -- 719, thank you, and just review this with you. You have a Masters in Zoology from the University of B.C. in 1981?
A That's correct.
Q And you've worked in the area of fish science through your whole career, it looks like; is that correct?
A That's correct.
Q You have prepared numerous publications and reports and those are outlined in your *c.v.*; the publications being on page 6, and the reports are set out beginning on page 8. And if I could just review some of the project reports. You've prepared reports on the commercial sockeye salmon fishery in B.C. for the Marine Stewardship Council?
A That's correct.
Q That was in 2010?
A Yes.
Q You've also been involved in studies looking at radio telemetry for in-season assessment of sockeye returns in the Fraser system?
A Yes.
Q You were an author of a Tsawwassen First Nation Post-Season Fisheries Report in 2009.
A That's correct.
Q You have done work on review of salmon indicator streams and estimating escapement, catch and run size for conservation units?
A Yes.
Q You have looked at feasibility of fish wheel use for escapement estimation and looked at results from salmon radio tracking on the Lower Fraser.

A That's correct, yes.
Q You've looked at river entry, timing survival and migration behaviour of Fraser River sockeye.
A Yes.
Q You've looked at in-river migration behaviour and survival of summer-run sockeye caught and released in the Lower Fraser.
A Yes.
Q And many other topics. You've compared the Canadian-Alaska sockeye stocks harvested in the Northern Boundary area.
A Yes.
Q Your *c.v.* sets out obviously many more projects than I've highlighted, and many more, and you have articles on the topics that I've just reviewed with you. You've had publications published on those topics, as well?
A Some of them, yes.
MS. BAKER: Okay. Mr. Commissioner, I would ask that Mr. English be qualified as an expert in fisheries management and stock assessment.
THE COMMISSIONER: Yes, thank you.
MS. BAKER: Thank you. So I'll just review the report, Project 7, which has now been marked as Exhibit 718. First of all, your report, if I can just provide a bit of an overview, it deals with four -- oh.
MS. GAERTNER: Ms. Gaertner. I just have a question on the expertise.
MS. BAKER: Oh, all right.
MS. GAERTNER: I'm not doubting the expertise in any way, Mr. Commissioner. I'd just like to understand what we mean by "fisheries management" in that expertise. Are we talking about the management by DFO, or in which type of expertise are we talking about.
MS. BAKER: Mr. Commissioner, I propose that Mr. English be qualified as an expert in fisheries management, science generally, and of course in particular to sockeye in the Fraser system and in Alaska.
A Did you want me to respond --
MR. TAYLOR: I'm not sure that he's limited to the Fraser and Alaska.
MS. BAKER: No, I didn't say that. I said generally and in particular Fraser and Alaska.

CROSS-EXAMINATION ON QUALIFICATIONS BY MS. GAERTNER:

Q Mr. English, you're aware that aboriginal people have many forms of management; is that correct?
A That's correct, yes.
Q And are you in any way suggesting that you have expertise in their forms of management?
A I work with aboriginal fisheries managers, and as I have with federal and provincial fisheries managers, so but I'm not a fisheries manager, per se. I have worked with those people and studied their fisheries, but I certainly don't profess to know all the First Nation fisheries management strategies. They're very diverse across the province.

MS. GAERTNER: Thank you, Mr. Commissioner.
MS. BAKER: Mr. Commissioner, can I take this witness as qualified?
THE COMMISSIONER: Yes.
MS. BAKER: Thank you.

EXAMINATION IN CHIEF BY MS. BAKER:

Q Mr. English, your report deals with four broad topics, if I can just set the context for it, and I would describe these as, and I'm asking you to confirm this or provide your own summary, but I understand your report to deal with fisheries harvesting on the Fraser, fisheries management on the Fraser, fisheries harvesting and management in Bristol Bay, Alaska, and then a comparison of the Fraser and Bristol Bay fisheries.
A That's correct, yes.
Q I'd like to start with the first part of your report, which deals with fisheries harvesting. And again I understand this section deals with the accuracy, precision and reliability of catch estimates in the Fraser system, and also impacts of non-retention fisheries; is that right?
A That's correct, yes.
Q Thank you. So beginning with the catch estimate portions of your report, at page 21 you begin dealing with this topic. And there's a table on page 21, Table 2, which sets out just a useful summary, if I could just start with that and ask you with reference to the conclusions that are set out in that summary, what was the methodology that

you used in performing your analysis?
A So the first step here was to provide a definition of the terms, "accuracy", "precision" and "reliability", because those have different meanings to different people. So on subsequent or the previous page, I'm not sure which page it's actually on.
Q That's 17?
A Yes, 17, where the three definitions are provided. The important aspect here under "Fisheries Harvesting" is that we actually don't know the true value of the catch, true number of fish caught. They are all -- all the numbers for most fisheries are estimates. Some are certainly more reliable than others.

So in terms of definition for accuracy, we looked at that in terms of the degree that managers are confident in that the catch reported reflects the actual harvest. And it's often that we have fisheries on a relative basis, so accuracy is really focusing on whether the estimates are biased or not. So if they're relatively unbiased, you have a good estimate. If they have some known biases, then they get a lower rating for terms of accuracy.

Precision typically is looking at the variance around the catch estimate, how precise we actually know what that estimate is in a statistical sense. However, for a lot of fisheries estimates of precision are not provided or available, and, however, for ones where you're getting a complete count through a census type program, the precision would be very high, as would the accuracy.

And then reliability was looked at in terms of the degree to which managers can rely on the catch estimates for in-season and post-season assessment. And we used the similar ratings there. The most important to note is that while an estimate could have a known bias, it says here, it could still receive a higher rating, a medium rating for reliability if the direction of that bias is known. So that individuals are aware, that managers essentially are aware that it is an underestimate or an overestimate of the catch.
Q Okay. So that explains those three terms. What else was important to the methodology being used

to assess the catch monitoring.
A So from there we looked at methodologies used in the different catch monitoring programs, and any reports that we could obtain which actually described those methods, the numbers of samples taken, the numbers of surveys conducted. And also in the table it presents an indication of the relative size of each of these fisheries during the 2001 to 2009 period, so roughly a portion of the total catch.
Q Okay. So that's again looking at Table 2 on page 21.
A That's correct, yes.
Q All right. So if you can just summarize what your results found with reference to this table.
A So for the period noted there, and more details are provided further on about different periods, but for 2001 to 2009 being the most recent period, we found that within the First Nation fisheries that estimates for food, social, ceremonial catch were rated as good accuracy, unknown precision in terms of statistical estimates of precision, and medium reliability. For the economic opportunity harvest, for reasons that we can get into a bit later, it was rated similar in terms of accuracy, higher in terms of precision, and higher in terms of reliability.

Both the commercial and recreational fisheries were rated as fair in terms of accuracy, and unknown or unavailable in terms of precision, medium in terms of reliability.

The selective fisheries, which include fisheries that are targeting specific species and often are live capture fisheries, and frequently they have a requirement for 100 percent observer monitoring or dockside reporting, so they have higher degree of accuracy, precision and reliability.

And the systems in the U.S., Alaska and Washington, were also rated as higher in terms of accuracy, precision and reliability, as were test fisheries.
Q And the selective fisheries that you note there, that's a component of the Canadian commercial catch; is that right?
A Yes.
Q Okay. Now, I'd like to just go through each of

these, and fairly quickly if we can, just to outline the significant conclusions that you arrived at. The first area that you talk about is the First Nation fisheries, which again begins on page 21, as you see. And I think perhaps if we could go to page - I've got my page number wrong here - page 25, this sets out a table which breaks the fisheries down into a more detailed level. And also I'll just flag for you Tables 6 and 7. And I think if we can focus on those tables, those are found at pages 29 -- or, sorry, they're both on page 29. So if we look at Table 4 and Tables 6 and 7, perhaps you can just review what your conclusions were with respect to starting with FSC fisheries.

A All right. So for FSC fisheries, as you can see in the table, this was divided into three different strata if you like, or areas: the marine fisheries, the fisheries in the Fraser River below Sawmill and fisheries above Sawmill. The reason for the separation within the Fraser is they're different fisheries management situations below and above Sawmill, mostly related to the economic opportunity fisheries which occur below Sawmill.

The terms of the summary of the findings, again for this 2001 to 2009 period, the marine and Lower Fraser fisheries were rated as good in terms of accuracy, unknown regarding precision, and medium in terms of reliability.

A slightly lower rating was provided for fisheries above Sawmill, and that's primarily related to the difficulty in monitoring extensive fisheries over a large area with, in some cases, much lower levels of effort. So encountering fishermen and obtaining samples is much more challenging in the upper river.

And then lastly the economic opportunity fisheries were rated better, certainly for the period as it's noted in the footnote 2004 to 2009, and than in the previous periods. But they're given a higher rating because of the requirement for the fish to be landed at a specific landing site with complete enumeration or landing sites, I should say, not a single site.

Q So the first part of Table 4, which sets out the FSC fisheries, there's more detail on that, I

think in reference to Tables 6 and 7, perhaps we can turn there, page 29, and you can explain what data you reviewed and what the catch monitoring methods are that are relevant to these fisheries.

A Yes. So here we have two different periods noted, 1992 to 2000 and then 2001 to 2009. There isn't a similar table for prior to 1992 because in 1992 was when the Aboriginal Fisheries Strategy program kicked in and a lot of effort, a lot more effort was put into catch monitoring and working with First Nations to improve catch monitoring programs.

So in the early period here there was, you know, a lot of the fisheries methodology were being developed, a lot of individuals were being trained and get experience, so the reliability of the numbers was less than in the latter period. The distribution of the catch between marine fisheries at Lower Fraser and Upper Fraser, so below and above Sawmill also has changed, you can see in the table. And this also reflects the portion of the catch taken in these fisheries versus other First Nation fisheries.

Q And what are the monitoring methods currently being used in the First Nation fisheries, FSC fisheries, in the current period?

A So they're a combination of effort estimates, but I guess it varies between the areas. So in marine fisheries it's done by reporting. Essentially the First Nations report their catch numbers obtained from interviewing and talking with their fishermen, and providing those to DFO. In the Lower Fraser there's a variety of methods used to try and generate estimates. Certain First Nations do a complete enumeration of their FSC catch through interviews with all their fishermen. That's in the case of groups like Tsawwassen. And others, there's a combination of aerial over-flights to count effort, and interviews to get catch per effort estimates and generate an estimate which is independent of the total catch reporting for the fishermen on a voluntary basis.

And similar methods are used upstream of Sawmill. There they have a combination of aerial counts, on-water counts, shore-based counts using trucks to estimate effort, and then interviews again to estimate catch per effort.

Q Thank you. The economic opportunity fisheries, you touched on that earlier with Table 4, but that is dealt with in more detail in your report beginning at page 33. And if I can again take you to -- you've done another summary of the economic fisheries, which is at page 36, Table 10. Again could you in the same way review the conclusions of that you've set out, including the catch methods, monitoring methods that are used for the economic fisheries?

A So here we have the two different periods or three different periods identified: pre-AFS, when there essentially isn't information on First Nations catch portion; the early AFS programs in 1992 to 2003, where there had fisheries occurring for both FSC and commercial purposes at similar times, essentially not a complete separation as in the period after 2004; and the methods used since the beginning of AFS was to require fish that were landed for commercial purposes or either through the pilot sales or economic opportunity fisheries to be landed at specific landing sites and enumerated at those sites.

Q Okay. And then lastly in this section at Tables 11 and 12 you set out specific tables with respect to Musqueam, Tsawwassen and Sto:lo fisheries. What's the significance of this data in relation to the reliability of catch estimates?

A All right. So you can see in this table there is columns that refer to allocations, and the allocations are defined or not defined, depending on whether there's an agreement with those First Nations. And there's columns associated with the catch estimates for each of the years. For the period prior to 2003, there are I think generally agreements in all those years, but the separation of the catch between FSC and sales is not as reliable as post that period. But the total catch estimates are believed to be pretty reliable for the periods, and improving, as I said before, because the catch monitoring programs evolved and improved steadily since the '92 initiation of the Aboriginal Fisheries Strategy program. In --

Q So -- sorry, go ahead.

A Sorry. In years without agreements, there isn't an allocation, so and in some years there wasn't an actual estimate obtained, as you can see in

2003.
Q So the 2004 period and following that, where you see the allocation broken into FSC and sales, that correlates with the earlier table, Table 10, where you have your data broken into early AFS, '92 to '03, and then recent AFS, 2004 to 2009.
A That's correct.
Q Okay. So that you said that the total catch estimates you consider to be reliable. There may be inaccuracies between the two columns, FSC and sales, but the total is considered to be reliable?
A Yes. As you can see, there is large fluctuations from year to year in the numbers of fish that are in either the FSC or sales columns, and those are clearly not reasonable, given what we know about the fisheries. So the suspicion is that it's not being appropriately assigned in those specific years.
Q But the total for the year for that --
A Yeah.
Q -- First Nation is correct or reliable.
A Yeah, it's certainly the most reliable and improving over time.
Q Okay. Thank you. Now, moving to commercial fisheries, that section in your report begins at page 39, and there's a lot of detail in this section, and in the interests of time we're going to go through this fairly quickly.
I'd like to start with Table 14, which is on page 42. This sets out a summary of the different commercial catch areas and gear types, again with the quality of catch estimates for those different gear types and areas set out. Can you provide an overview of the monitoring and estimates for each of the fisheries.
A Yes. I think the first point I'd like to make is that this again covers the 2001 to 2009 period. Prior to '98 a lot of the estimates for commercial catch were derived from sales slip programs and since then they've been derived from a variety of other programs, including on-water gear counts, logbook programs, phone-in data, on-water hails, dockside monitoring and occasional observer programs. So it's changed quite dramatically from earlier years to the more recent timeframe. So this table is referring to the 2001 to 2009 period.

In terms of the different fisheries, you can see that the net fisheries, whether they're in Area 20 with seine nets, or gillnets in Area 29, or a combination of gear in Areas 11 to 16, they were given a fair rating and with medium reliability. The rationale for that is that for most of those fisheries and most of this period, compliance rates for phone-in reporting and were relatively low in the 10 to 25 percent of the fishermen providing phone-in records. And the lack of catch validation at landing sites for most of that period.

Q Can I interrupt for a moment. I wonder if you could, before we get into the results, just using this as a touch point, explain what the different monitoring programs are, catch monitoring programs are in the different fisheries, and then we can maybe move to the conclusion, so there's a context for that.

A Sure. For the net gear, the programs that are currently used are related -- use a combination of these aerial counts or on-water gear counts at the beginning of fisheries. These fisheries are often contained to a few days, so -- and possibly a single day. So there's a gear count. And then the on-water hails, phone-in data, logbook data, are combined to get catch per effort, and so the catch per effort is applied to the total effort to generate a catch estimate.

For troll fisheries they are distributed over a much longer period of time often, and so they'll get a gear count of trollers at the same time as they're doing a count for seiners or gillnetters. But they won't be doing gear counts every day, so there'll be an estimate of the number of trollers active. They might also use other information from contacting directly the trollers in an area to determine the number of boats active. And then again using the hail data and phone-in data to get catch per effort information.

I started off talking a bit about the compliance rates. The compliance rates for trollers are much better, and that's why you see a higher rating on this scale of fair, good to very good for accuracy, and higher in terms of reliability.

Q And then the last fishery is the selective

fishery.
A Okay. And so for selective fisheries, as indicated earlier, there's a requirement for 100 percent either dockside monitoring of catches, or observers on board in these fisheries to validate the catches, so it receives the highest rating.
Q In 2010 dockside monitoring was introduced into certain commercial fisheries. Can you describe which fisheries were the subject of dockside monitoring, where those fisheries -- which fisheries that was implemented in, and what the impact that dockside monitoring had on catch estimates in those fisheries?
A So 2010 it was a requirement for both seine and troll fisheries, and it was a requirement for 100 percent dockside monitoring in those fisheries, and in the Lower Fraser gillnet fishery, and in fisheries, I guess, also in Johnstone Strait, there was 35 percent requirement, requirement to have dockside monitoring represent 35 percent of the catch.
Q And what did that impact, or does that impact the reliability of the catch estimates?
A Yes. 100 percent dockside monitoring obviously should vastly improve the estimates of catch versus, you know, no dockside monitoring, and is generally the approach used in other fisheries to really improve the reliability of catch.
Q And did the experiment in 2010 with dockside monitoring change any of your assessment or impact of the assessment that you have in Table 14 on the quality of catch estimates?
A No, because the period is for 2001 to 2009.
Q Okay. How long would you need to have dockside monitoring in place at the 100 percent to change your assessment of the quality of catch estimates?
A Well, I think for whatever years it's done for, it would -- should immediately change the quality of the catch information.
Q Okay. Just while we're in the commercial fishery section, on page 43 of your report, the very first paragraph on that page, you'll see about halfway through the paragraph a reference to an "FOS" system. What does that FOS refer to?
A That's Fisheries Operational System, Fisheries Operations System.
Q And what is a Fisheries Operations System?

A It's the program that DFO currently uses to accumulate all the information on effort, estimates, from the various commercial fisheries, and catch per effort estimates from either fisheries officer hails, phone-in programs, logbooks, any sources of those information. It's also used to organize catch information from other fisheries now.

Q I'd like to move to recreational fisheries, which is page 48 in your report is where you begin that discussion. And on page 50 in Table 16 you set out the "Estimates of Fraser Sockeye harvested in Canadian recreational fisheries" and you have the percentage, which is defined as the recreational catch. Is that on this table, is that percentage calculated against the total Canadian and U.S. catch, or against the Canadian catch only?

A It combines both Canadian and U.S. catch.

Q Have you done a calculation to see what the percentage would be against the Canadian catch only?

A Yes, I have.

Q And does it change the outcome in that column?

A It does change the numbers, obviously, they all go up slightly because in most years the U.S. fisheries catch some Fraser sockeye.

Q Does it significantly chance the numbers in that column?

A No, it's fairly small. It's usually a percentage or a percentage and a half different.

Q Okay. So has the -- on your calculation has the recreational catch ever exceeded five percent of the total Canadian catch?

A Not in these years using the data I have.

Q Turning the page to page 51, Table 17. Again, can you review the results and review also what the catch monitoring program is for the recreational fisheries as shown on this table?

A So here we have three different areas in tidal waters. Tidal waters being for the -- in the context of the Fraser, everything below the Mission Bridge and to the marine environment. And non-tidal waters, most of the fishery occurs for sockeye between Mission and Hope, B.C.

In the tidal waters that is the Georgia Strait, creel survey has been conducted since the early 1980s, and I have a fair bit of experience

with that, since we conducted the survey from '86 through to about '99. The estimate, there's a column there shows the estimate of the portion of the recreational catch of sockeye that is coming from each of these fisheries, so you can see that in this time period, 2001 to 2009, Georgia Strait fishery only represented five percent of the catch, Johnstone Strait two percent, West Coast Vancouver Island less than one percent. So it's showing up here as a very small amount. And then most of the fishery is occurring in the Fraser River, between Mission and Hope, most of the recreational fishery.

The methods used to estimate catch are similar in Georgia Strait and Johnstone Strait. However, the level of effort applied in those two areas varies and can vary quite significantly between years. The effort estimate is derived in a similar manner to I think what you've already seen for the Lower Fraser, in that people do aerial flights over the strait, count numbers of boats fishing, sport fishing, and then interview people at landing sites to get information on catch per effort, and those two things are combined. They use activity patterns to figure out whether they're seeing a large portion of the effort, or a smaller portion and expand the effort appropriately.

The precision estimates for -- that are available for Georgia Strait are pretty broad, depending on the year, and even broader if you look at for specific statistical areas, parts of the fishery. And the reason for that is that sockeye are not the primary target for most of the marine fishery, marine sport fisheries. They're targeting chinook and coho primarily. And there's quite a variability in the efficiency of the anglers that fish, so you get variability in catch per effort. Some really know how to catch sockeye and a lot of people don't.

The result of that, plus the fact that there's relatively small catch compared to the target species, means that the sample sizes are poorer, so the estimates are only given a fair in terms of accuracy, but a medium in terms of reliability, because the fishery, you know, catch monitoring for Georgia Strait has good coverage of

the entire area and time when sockeye are caught.
Lower ratings for Johnstone Strait because of the lower effort and difficulties with complete coverage.
West Coast Vancouver Island is much more difficult because assessing what portion of the sockeye in that area are associated with the Fraser versus other stocks they can catch. Most of the catch out there is for Barkley Sound stocks. So the reliability estimates for Fraser are much less.
And then in the Fraser River itself, they're using aerial flights and angler interviews spread out over a wide area. The ratings there were somewhat lower, mostly because there's a huge, a large amount of the catch in some years is fish that are released, and so the numbers, you're relying on angler recall for the numbers of fish they've caught and released. You can't actually examine the numbers released when you interview a person, they only have the fish they retained.

Q The numbers that the catch estimates that we see on here for those non-tidal water recreational fishers that you just described, does that just reflect, then, the caught and retained fish, or does it also include the caught and released fish?

A I think those numbers are just the retained fish.

Q And I'm just not sure if creel surveys have been defined yet in the hearings, and I wonder if that might be something you could just quickly do here. Is it the same as angler interviews, or could you just give us a shorthand for what that means.

A Yeah, I use the term because that was the name given to the program used in Georgia Strait for years. Strictly speaking is directly related to interviews, so you're talking with people and you're examining their creel. People used to put their fish in a creel when it started. In these, when it's referred to as a particular program, like the Georgia Strait Creel Survey Program, it includes all the other elements of aerial surveys and effort counts. So it's more than just interviews.

Q Okay. On page 53 and 54 you discuss a study that you were involved in 2002, which recommended certain changes to the catch monitoring program. And in your report at the top of page 54, you

state that:

> It is unknown if all of these recommendations...

You set out six recommendations:

> It is unknown if all of these recommendations were implemented but, as mentioned previously, the precision of the estimates of sockeye salmon for GSCS has declined since 1999.

And I wonder if you could just review what you did in that work and what the recommendations are, and whether you have any more information now about whether they've been implemented.

A Yes. So at the end of our involvement with the Georgia Strait Creel Survey we prepared a report for the years prior to 1999, or including 1999 and before, and that was published in 2002. And in that it contained I think it was six recommendations. Some related to just the effort that we thought was appropriate to obtain reliable estimates for either catch per effort or what we refer to as activity patterns, the pattern of fishing activity over the day. It also proposed some changes to estimation methods to make them more robust. And some logistical suggestions with regard to how the estimates should be reviewed by people familiar with the survey.

So I did subsequent to preparing this report, we were able to talk with the people currently doing the program and confirm that they are targeting the numbers of interviews, and conducting analysis in a manner consistent with recommendations 1 and 2 in that report. The only caveat there is the issue of budgets and whether there's funds to carry out the work in all the areas.

There's some question about the current, how much of the analytical changes had been implemented. There's been reviews since this report was prepared that have suggested some other changes to the estimation procedures. The degree that those have either compensated for the same issues or been done in addition to these is yet to

be determined. And the current program has -- the programs that we wrote have been revised in what they refer to now as the CREST system. Don't ask me what CREST stands for because I don't want to answer that, but it's a system that they use to do the programming which allows the managers more flexibility in selecting information that they think is most reliable to get the estimates. So some of those recommendations that we had related to that are incorporated into the new CREST system.

Q Non-retention fisheries, you mentioned this in your discussion of recreational fisheries just now that there's a proportion of the recreational catch which is released. And if I can take you to that section of your report, it begins at page 56. If you can just describe for us what non-retention fisheries are.

A Okay. So we have two types of examples of non-retention, those where a fish is physically caught and then released because it's of a species that's not permitted to retain, or in the case of anglers, the individual has exceeded or achieved their bag limit so they can't retain any more of that species.

And then there's the types of non-retention where the gear doesn't retain fish. So in the case of a gillnet, for example, the fish may encounter it, the fisherman doesn't get to the fish in time, so the fish escapes that gear and is not retained by it, so it escapes capture.

Q Okay. And that second type that you've described, is that in your report you call it "net fallout". Is it also called "dropout"? We've heard that term.

A Yes.

Q Okay.

A Net dropout.

Q And what was the methodology that you followed in your analysis of the effects of non-retention fisheries?

A So for non-retention fisheries we did a review of the -- this was done by some of the individuals who have done extensive work on the physiology and stress of fish, there was a number of references regarding the work that has been done recently on the effects of handling, capture and handling on

the survival of sockeye. And then we looked at some of the initial results from studies that have been conducted in the last few years, specifically in the Lower Fraser where fish are captured, tagged and released, or tagged and held and released. And also information from sockeye telemetry studies that have been conducted from 2002 to 2009, which provide information on the timing, location of en route losses as well as portions that don't make it to the spawning grounds.

Q And is there a particular fishery where non-retention issues are of most importance for Fraser River sockeye?

A Yes. So the catch and release side of the non-retention, that's the Lower Fraser recreational fishery, is the place where most of that occurs.

Q And is there any significance of the non-retention fishery in relation to the total allowable recreational catch?

A Yes. In four out of the last six years the releases of sockeye in the Lower Fraser recreational fishery have exceeded the retained catch. I say the last four to six -- six years, the years I'm referring to is 2004 to 2009.

Q All right. And why does that matter if the fish have been released?

A Well, if the fish are released in healthy condition, been handled well, the temperatures are not too high, then there's a good chance they'll continue their migration and hopefully spawn. If those things are not true, then you could end up with a number of those fish dying before reaching the spawning grounds.

Q In Table 18 on page 60 of your report sets out some information with respect to survival rates. If you could review that information.

A Yes. So this is a study that has just been recently published, as you can see, by Donaldson et al, in 2011. And it provides information on the short-term, so up to 24 hours after capture, survival up to 48 hours after capture, to 96 hours after capture, and then results of tracking radio tagged fish from the -- caught using the different gear, from the release site to the spawning grounds, or to areas close to the spawning areas for these stocks that they were tagged.

There's three different capture methods and handling approaches, if you like. There's beach seine -- just two capture methods, really, beach seines and angling. And then some of the fish were retained in a net pen for recovery, thinking that it would -- actually it might help in the recovery of the fish. It obviously didn't.

Q Yes. So if you can just explain the results of the study.

A Okay. So for a short-term survivorship, whether it's caught with a beach seine or angling, it appears to be pretty high. You can see the percentages are over 95 percent survive that immediate period. They start to drop just within the first 48 hours, and further in the 96 hours. And then the portion of the fish that actually go from the release site to the spawning grounds is substantially lower.

The difference between the gear start to appear the further -- or to become more dramatic the further you go up, further from the release site. And by the time you're getting to the spawning grounds, you're seeing 52 percent of the fish that were released from beach seines have made it to the spawning grounds or areas, and 36 percent from angling, and only two or three percent from those that were held in a net pen.

Now, it's also important to note here is that there is a number of things that go on between the release site in terms of other fisheries, and other environmental factors. So these should be used as -- viewed as relative values, not absolute values that are specifically associated with that particular gear type. There's other things that can happen to the fish. Some of these fish could readily have been caught by other fisheries en route.

Q All right. What kind of scientific work has been done on post-release mortality associated with freshwater gear types across the different fishing sectors for Pacific salmon?

A Can you repeat the question, sorry.

Q Yes. I'm looking at page 57 of your report, the first paragraph on that. I'm asking you what scientific information there is in the community on post-release mortality associated with freshwater gear type.

A Well, there is not, as it says in the report, there is not a lot of information. That's one of the reasons for this study that was quoted here. There's an ongoing research program that has been funded through NSERC, and it's a program, it's a collaborative effort between Carleton University and UBC to actually examine the post-release mortality for fish caught using a variety of different gears. The recent stuff, which I just talked about, plus the information from fish that have been radio-tagged from either tangle netting or caught using fish wheels, also provides additional information on survivorship post-release.

Q You say in your report that there is:

> ...little research to quantify levels of mortality or to understand the mechanism underlying mortality in order to better mitigate or prevent mortality.

What do you mean by that?

A Well, that's specifically getting issue of that we need more information, especially under the higher stress conditions with warming temperatures in the river. If you're going to conduct fisheries that are having additional stresses on fish that are being released, then you need to take that into account when you're opening those fisheries, the timing of those fisheries, and the location of those fisheries.

Q All right. And what are the implications then to fisheries management of non-retention fisheries, catch and release fisheries.

A Well, I think it's what I said, is both the fishers and the managers need to consider the impact of their fisheries on the stocks they're targeting or releasing in some of these cases, during periods when these fish are stressed, either because of high temperatures or flow conditions in the river.

Q All right. And on page 61 in the middle paragraph you make the statement, you say:

> While there is little that can be done about annual water temperatures or difficult passage points, it is possible to minimize

cumulative effects environmental and fishery related factors by disassociating the timing and location of in-river fisheries from these other stressors.

And is that a summary of the point you were just making?

A That's correct, yes.

Q Okay. Is that being done now, that there is an awareness of mortality impacts in terms of fishing plans and recreational fishery openings?

A I think there's a growing awareness and consideration of these in the plans for fisheries in the last few years.

Q Okay. The next section that I wanted to take you through in your report deals with fisheries management. In this section, which begins at page 63, you address pre-season forecasts, in-season run size assessment, escapement enumeration, escapement targets, over-harvesting, and Cultus Lake recovery efforts.

I'd like to start with pre-season forecasts. What methodology did you follow in assessing pre-season forecasts used presently by the Department of Fisheries and Oceans?

A So the first step was to examine the types of models and methods that were used for the pre-season forecasting, and then to obtain the data, essentially the estimates of what the forecasts were for each year prior to the fishing season, and then compare those with the return that was tallied up at the end of the year.

The difference in our analyses for evaluating pre-season forecasting compared to those for the catch monitoring that we just talked about is that we actually know what the value is that's trying to be estimated. Although we might not know exactly how many fish truly returned in a given year, we know that we're trying to estimate what the number is that we're tallying up at the end of the year. So that was viewed as the true value that we're trying to estimate, and we compare the forecast with those post-season values. And --

Q Okay. Sorry, go ahead.

A Sorry. And we did that using two primary tools, a regression analysis, which I can describe, and estimates of absolute percent error, so the amount

that the forecast differed from the actual return.
Q And the page that's on the screen in front of you, underneath the indented paragraphs about the fourth line down, it says:

> The Fraser River Sockeye Spawning Initiative (FRSSI) process uses forecast of adult returns for each of the four run-timing groups to define the target harvest rates for each group.

We have spent some time talking about the FRSSI process and the FRSSI model in these hearings, and I just want to be clear here you're not -- are you suggesting that the FRSSI computer model is in any way the same as the pre-season forecast computer model?
A No, the FRSSI model is not the same as the pre-season forecast model. They might use similar stock recruitment analyses as some of their options, but they're not the same model.
Q Okay. And what, turning to page -- looking, I guess, still at page 63 at the bottom, what were your conclusions about the reliability of the pre-season forecasts as being explanatory of actual returns?
A Okay. So the forecast for the total return to Fraser sockeye in a given year, so at that level that's combining all the different stocks and run-timing components. As explained, 44 percent of the year-to-year variability in returns, this leaves more than half of the variability unexplained. So it's accounting for not all the variability. The percent error in the forecast for most of the Fraser stocks is high compared to some of the other fisheries, specifically Bristol Bay sockeye fishery, and that's described sort of later in the report.
Q And do you draw any inference from that?
A Yes. So there's the more detailed inferences come with trying to look at the components of the stock, not just at the overall estimates for the Fraser, and that was done using this regression analysis. The important thing, regression analysis is relating the returns over time to the forecasts over the same period. So what you're looking for there -- I don't know whether it's

possible to put up one of the appendices. I can show what the relationship looks like.
Q Yes. If you can just tell us the page number.
A Okay. So in one of the appendices back here, we could put up the one for the overall Fraser, which is I think the first one on page G-2. So it's Appendix G, page 2.
MR. LUNN: Is there a page number for that?
MS. BAKER: No, there's not, I'm sorry. It's about halfway through the appendices. I don't know where that is. Sorry.
A You've got to go find "G". All right, It's got to be close there. Yes, G-2.
Q There we go. Perfect.
A So these are done on a logarithmic scale and you have the forecast on the lower axis and the return, the estimated return for each of the years on the "Y" axis, the perpendicular axis. And what we were doing is looking to see if there is significant relationship between these two values. The important things that are being examined are the "R" value, so whether it's significant or not. The "P" value there indicates whether it is significant. So you can see it's much less than a .05 level, which would typically be used for evaluating significance. So it's a significant relationship.

The other things we examined, whether the slope is significantly different than zero. If it was zero, the slope of that line would be horizontal. So that the reason why that's examined is to see whether when we forecast more fish, that more fish actually return. So there's a relationship between the two values. And then also look to see whether the intercept, where this line intersects with the "Y" axis, the vertical axis, is significantly different than zero. And all those things tell you about the quality of the relationship between forecasts and the return.
Q Okay. I wonder if we could go to page 77 of the report, and on this page you have a figure that sets the year-to-year variation in returns, as explained by the forecast.
A So here it is displaying the R^2 value, so this is the degree to which those points you saw in the last line are tight to the curve, so that -- or the lines are not differing a lot and you have a

significant relationship or not. So where there is an asterisk over the column, it indicates that the relationship is statistically significant, and the height of the bar indicates the R^2 value. So the higher the bar, the better the relationship.

On the very far right you have the Fraser River as a total, so all component stocks combined. The next four bars on the right are for each of the run-timing groups, and then the bars, the remainder bars are colour-coded according to the different run-timing groups. So the dark bars are for Late run fish. The clear bars are for Summer run. The shaded bars are for Early Summers, and then the one with the diagonal hatching is for Early Stuart. So you can see the Early Stuart component is identical in both the far left and in the right graph, because it is just one stop.

Q And in the text that follows this table you say that the:

> ...forecasts for all run-timing groups were deemed to be statistically significant, since they tracked the patterns of rise and fall in the actual returns for the period 1980 to 2009.

That's correct?

A That's correct. Yes. But there is quite a difference in the R^2 value in the level of confidence you have in the relationship between these variables, between what we see for Late Summer and Early Stuart a much higher R^2 value than we do for the two Summer time groups.

Q Right. And the table that follows, Table 21, is this an analysis of those run-timing groups in a bit more detail?

A Yes, that provides the other statistics from the regression analysis and also provides the MAPE, which is the median absolute percent error. So that gives you an indication of how variable the points are around the line. The slope is what you look at to see if that value is close to 1. so slopes that are close to 1 are more reliable relationship or more useful relationship to ones that are further away. And then the regression intercept, that's whether it intersects "Y" axis

at a point significantly different than zero or not. So for every one of these cases the intercepts are not significantly different than zero and the slopes are significantly different than 1.

The most, the reason for the poorer regression values for -- sorry, the "R" value for the Summer time groups, and also Early Summers, they are slightly different. To go back to the previous graph, I can maybe describe it better with that up. So you can see that some of the Summer time groups have a high R^2 and significant R^2 where two of them don't, they're non-significant and low, Chilko and Stellako. So they're resulting in, you know, much less reliable forecasts. And it's particularly noteworthy because the Chilko stock contributes on average about 24 percent to the total return. So that's a significant difficulty when the forecasts are low, low in terms of R^2. And for the Early Summer forecast, because the components of the stock are relatively small and three of the eight stocks, you can see the shaded bars, are non-significant relationships. That's the reason for the overall timing group to have a lower R^2.

Q Right.

A Plus these fish are distributed throughout the whole watershed, as opposed to some of the other ones that are more confined in parts of the watershed.

Q The table that we were just looking at, Table 21, I just wanted to draw your attention to the title or the caption. The third line down it says:

> Proportional size of CU relative to total Fraser return...

Is that really supposed to read:

> Proportional size of run-timing group relative to Fraser return...

A That's correct. The CUs are provided in the appendix.

Q Okay. And the "Return Explained by Forecast (R^2)" column on this table is what we see in Figure 10 that we've just been looking at, the 44 percent,

76 percent, et cetera, that's the -- if we go back to Table 10, that's the values you see on the right-hand side of that table?

A That's correct.

Q Okay. And then is there a relationship, does this tell the whole story, or do we need to also look at what the information is Figure 9, which is page 76, the page previous to this?

A Yes. Now, this figure was provided because the regression analysis doesn't tell the whole story. It's very important for the management of resources to have a small error, or a small difference between the forecast and the return. And you can see from this graph that it shows the distribution of estimates over this period, that from 1980 to 2009, and it's summarized in what's called a box and whiskers plot.

The box defines the space between the 25th and then the 75th percentile, so the middle 50 percent of the estimates falling within those -- that box. The line is the median, so it's 50 percent of the estimates are below that line, and 50 percent of the estimate are above that line. And the whiskers extend out to either the lower fifth percentile or the upper 95th percentile. So the length of these whiskers, now some -- in order to be able to see this on a graph, the scale was limited to 1 to 350 percent of the estimate. You can see the values at the top of some of those lines extend to as high as 844 percent, or 882, I guess the highest for Portage.

So there have been obviously returns that vary very substantially from the forecast. And this becomes most graphic in the comparison between these values and the ones for Bristol Bay, which we'll talk about later. But it shows pretty clearly that there's a fair bit of uncertainty associated with the estimates, both for individual stocks and for the different timing groups.

Q Does whether a stock is a cyclic stock, or a strongly cyclic stock, versus a non-strongly cyclic stock have any impact on the reliability of the forecast?

A Yeah, what we see in most cases with the more cyclic stocks, if you go back to the other graph, the other plot, so you can see it in both, but I'll start here. The Late Shuswap stock and the

Quesnel are two of the most cyclic stocks, and also Early Stuart is a somewhat cyclic stock, but not as extreme as the other two, we have higher R^2 and this is because the range of returns is very large. So you get a better regression, if you like, if you have a larger range of returns, and you can distinguish between, you know, the small years and the big years based on those cycles.

The other thing that it does is if you go back to the previous graph, Figure 9, you could get for Late Shuswap, for example, if you are -- if you mis-estimate a very small return, but you could easily do it by three or four times. Whereas virtually all the large returns for Late Shuswap would be well within the box. So the length of the whisker or the length of the line is more determined for that stock and for Quesnel by the returns in the off-cycle years, in the small years.

Q Just to finish this section and then I guess we'll take the break. But if I could ask you to turn to page 80 of the report. Your final paragraph in the section -- oh, no, back up. Stop. You say at the last sentence really that:

> Importantly, our trend analysis is based on historical data and may have limited ability to predict the future reliability of forecasts for a particular stock, especially if changing environmental conditions undermine the utility of even the best performing pre-season forecasts based on historical data, yet another reason why pre-season forecasts are of little use in the management of Fraser sockeye and many southern B.C. salmon stocks.

And earlier in that paragraph you note that managers rely on in-season information in the Fraser system to manage the stocks. So I just have a couple of questions about that. First, is it reasonable for managers to rely on in-season information to manage fisheries, first of all.

A Yes, it's both reasonable, safer and a more robust approach.

Q Okay. And do you think pre-season forecasts could be made more accurate so that managers didn't have

to rely as heavily on in-season assessments?
A Yes, they probably could be made more accurate, but they would need to still rely on in-season assessments, mainly for the reason that the forecasting is all based on information you have from the past, and the information that you really need is what's going to happen in the future, or what's going to happen in the specific year in question. So you need that in-season information.
Q All right. Do you think that the pre-season forecasts are of use to -- that pre-season forecasts, maybe not these ones, but pre-season forecasts as a concept are of use in managing the Fraser sockeye system?
A Yes, I think you need to have something to work with for the pre-season planning for, you know, setting initial fishing plans. But those fishing plans need to be robust to substantial changes in the returns, because that's going to happen.
Q So you agree that there -- we did hear in this Commission testimony from fisheries managers, both at the Department of Fisheries and Oceans, and from the Pacific Salmon Commission, that they did use pre-season forecasts, and they described the value that they put on those forecasts. And it sounds like you're agreeing that there is a role for pre-season forecasts in management; is that right?
A Yes, there is definitely a role for it.
Q Okay. So how do you think your -- do you think there should be a different way of using pre-season forecasts or a different way of generating pre-season forecasts that would be better used in the Fraser system than what's being done now?
A Yeah, I think that it's the amount of resources spent doing the forecasts versus some of the other tasks that might need to be done by in many cases the same analysts. So I personally recommend that forecasts be done expeditiously so people don't spend a lot of time with them. They have a number. They know they're going to -- managers are going to not pay a lot of attention to that number for in-season management. They've used that number for planning, but then get on with the tasks of doing some of the other work, like defining benchmarks for the CUs that will require some of the -- a lot of the same analysis and

effort, and would be a far more useful expenditure of the time and energy.
Q So how would you recommend the pre-season forecasting process as it's currently being done to be changed.
A Well, to the extent that -- and I don't know exactly how long it takes to go through that process, but to the extent that it could be made simpler or done very efficiently, so that there's a number that people could use for the planning, recognizing that it's going to be changed in-season, and the focus should be on more robust management systems, so that you can respond to changes in-run.
Q All right. Do you recommend that they continue to assess the best fit model pre-season, or, sorry, stock recruitment model each year for each stock?
A Well, that's one area which has been examined in Alaska. We may talk a bit about it in a review of the Bristol Bay fishery. But there is a different approach to evaluating the models every year. There's quite a number of models, as you can see in this report, that have been used. And there's quite a number of times they shift, and there's often -- for most stocks, there's rarely the same model used in successive years, whereas in Bristol Bay they tend to use the same model that has had a good result for the last three years, at least, if not more.
Q This is probably a good time to take a break. So I just wanted to leave with you, are there any other comments you would make on pre-season forecasts before we take the break?
A No, I think that pretty much covers what I was hoping to say.
MS. BAKER: Thank you. Mr. Commissioner, could we take the morning break now.
THE REGISTRAR: The hearing will now recess for 15 minutes.

(PROCEEDINGS ADJOURNED FOR MORNING RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: The hearing is now resumed.

EXAMINATION IN CHIEF BY MS. BAKER, continuing:

Q Now, Mr. English, when we broke, we had just finished pre-season forecasts. Now I'd like to look at end-season run size estimates. And I should say we're moving through your report very quickly and certainly, the report is taken as read and everything that's contained within it is evidence in the hearing. I'm just trying to go to the high points as we move through. There's a lot to cover. So looking at in-season run size estimates, can you just explain what methodology you used in this section?

A Sure. So here we looked at obtaining the information that was available for in-season forecasts for recent years. This extended back to 1997. So '97 to '99, we obtained estimates of forecasts made in season for each day or each period that the forecast applied to, and then, of course, the final in-season forecast, it amounted to 13 years, so 13 points per day was what we were using, essentially, as the analysis. I've been asked by some to liven this up a bit so it's sort of like --

MS. BAKER: I told Mr. Rosenbloom that if you crack any jokes, it's coming off his time, just so you know.

A Oh, okay. This is kind of like, you know, what people were thinking in September, October with regard to the Canucks and those in-season forecasts might not have been as optimistic as they are now in the post-season, but right now, we're right at the what we would call the final in-season forecast and it's looking promising, but anyway, that's the nature. I'm not sure how many times they make forecasts for the hockey teams in season, but they do it a lot for sockeye.

Q Okay. And I think it's typically described as an estimate in season, they don't use the language "forecast" as often; is that fair?

A Yes, in-season forecasts referred to here are in-season estimates, the returning run size.

Q Okay. And just a couple of minor points. On page 81 of your report, you have a paragraph that has some information that's very similar to what shows up on page 84. So before we move, if you see, halfway through this paragraph, there's a line that reads:

> The accuracy of in-season run size estimates tend to be biased high (i.e. forecasts larger than runs) with low precision, 25 to 78-percent error.

Do you see that line?

A Yes, I do.

Q And then if you turn to page 84, you'll see virtually the same language in the third full paragraph, but the difference is that the percentages in that range I just read off are different, and I just wanted to get you to explain that. So the first line there, says:

> The accuracy of in-season run size estimates tend to be biased high (i.e. forecasts larger than runs) with low precision, 50 percent to 78-percent error.

And in the previous page, it says 25 to 78-percent error. Can you just tell us what's going on there?

A Yeah, the value, or the numbers on this page you're looking at right now are the correct ones. The previous page was not corrected between the draft on the final report. And when we did the final report, we had to respond to some comments from reviewers that wanted to see the estimates calculated for the percent error done slightly differently so we went back and redid the analysis of it. And the previous was an overview for the section, was not updated.

Q Okay. So on page 81, we should just stroke out the "25 percent" and replace it with "50 percent," is that right?

A That’s correct, yes.

Q Okay. And one other small correction, on page 82, under "Cumulative Normal Models" --

A Yeah?

Q -- the very last line of that first paragraph says:

> Particularly important is the determination of whether Summer Run sockeye are delaying off the mouth of the Fraser.

Is that right?
A No, that should be Late Run sockeye.
Q Thanks. All right. So --
A That was put in to see if the biologists were reading the report. And very good, the lawyer caught that one. Three biological reviewers missed it.
Q So in this section, you deal with an explanation and a review of the in-season estimation done for the Fraser system, and at the end, if I can just ask you what your conclusion is, are the in-season estimation methods presently employed on the Fraser system sufficient to manage the fisheries to meet management objectives?
A Yes. And generally, as stated on page 85, however there are significant challenges associated with the Late Run timing group and the achievement of management goals for specific indicator stocks or CUs. So those shouldn't be ignored. For example, the variable delay in Late Run stocks in lower Georgia Strait makes it difficult for the total run size and available harvest to be determined for marine fisheries. So the other timing groups move more consistently between the marine test fishing sites and the Fraser River site at Mission so they can get a better handle on the size of those returns in season, whereas the Late Run timing group, as evidenced from the returns last year, you know, there's more uncertainty once they passed the test fishing sites as to exactly how many there are, until we get to see them at Mission.
Q Okay. I think I'm going to leave that section. It's clearly written and the conclusion is as you've just described.

Moving to escapement enumeration, again, what's the methodology that you used in assessing escapement enumeration methods?
A So first of all, we looked at both the in-season escapement estimation methods and the post-season monitoring program and assessed it with regard to the accuracy, precision and reliability of the estimates on a relative basis because here again, like with catch, we don't know what the true value is. We can be pretty confident in areas where there's a complete ability to count all the fish past the counting fence, but those are few and far

between. There's a lot of places where we use other methods to try and get a precise estimate. When I say "we," I mean the people actually doing this work, Department of Fisheries and Oceans, but we don't know the true value.

Q Table 22 sets out the results of your analysis. That's on page 89. If you could just review the results there.

A Yes.

Q And maybe also comment on why it's broken into two different timeframes.

A Yes, the first point is that there are two different time periods, that the second time period from 2006 to 2009, we received detailed information from Keri Benner, who works with DFO at Kamloops from the annual escapement reports for all the years in that period. We didn't get those for all the years between 1980 and 2005, but there was a review done, it got completed and published by Schubert and Houtman in 2007, that described the evolution and the most significant developments with regard to escapement estimation during that period, for most of that period. That report was discussing the returns most specifically to the 1998 returns. So the coverage between '98 and 2005 is less good for either that report or the information we obtained from DFO.

The three primary different methods for estimate escapement, market capture, fence counts and visual surveys. Market capture methods are essentially you put a tag on a fish close to the spawning grounds, either within the spawning river, or adjacent to the mouth of it and then look for recaptures in dead pitch survey, so the carcass is examined, fished for tags, and use a variety of different models to generate a population estimate. It's considered to be a reliable method in the Fraser as long as they can apply lots of tags to the returns. The fence counts, these are they put a weir across the river and count the fish through the weir, either visually or using DIDSON technology, acoustic technology, in more recent years.

And then there's where it could be largely done from the ground, walking along the streams, counting fish in spawning areas and enumerating the dead fish. Also, it's done from the air for

some streams so there are aerial surveys.
The reliability of these methods is good or likely good, depending on how well they can apply the marks. Essentially, the reliability's high. The accuracy is good or likely good for market capture and fence counts. There is a number of reports that indicate that the visual surveys are likely biased low. And there are estimates of precision associated with the market capture estimates. The fence counts, as long as it's a complete count, would have very high precision, and the visual surveys tend to be unknown or undocumented precision.

Q And what is your overall conclusion on the reliability of sockeye escapement estimates on the Fraser system?

A The methods, you know, in all the areas that I've looked at and done escapement monitoring and directed programs elsewhere, they seem appropriate for the types of runs that they're enumerating, and the application of the methods, themselves, is as good as anywhere else in B.C.

Q Okay. I'd like to move now to escapement targets, which begins on page 99 of your report. Now, is it fair to say that in this section, while you do briefly describe the FRSSI process, your focus is primarily on commenting on what you see as a preferred method of setting escapement targets?

A Yes, primarily the need to define both lower and upper benchmarks for each stock, as well as the specific escapement goals. What is the number of spawners you would like to have for a particular population.

Q Okay. All right. And what were your objectives and what was the methodology that you used in addressing this issue?

A So information has been provided through the review of Fraser sockeye that was done for the Marine Stewardship Council's certification of Fraser sockeye and that provided information on, essentially, limit. What is referred to in that process is limit reference points and target reference points. These could be similar to lower benchmarks and upper benchmarks, but not necessarily identical. And that information was compiled from those submissions that were provided by DFO and compared with the historical escapement

data for the 1960 to '99 period. That's what the graphs are, yeah, 1960 to 2009, sorry, period. And as well as a four-year moving average of the escapement values.

Q Okay. And on page 101, you have some discussion about the four-year average, and you described some concerns you have with using a four-year average as an escapement goal for cyclic stocks. And because we've heard quite a bit about FRSSI already in the hearings, I just want to clarify with you, do you agree that the FRSSI model uses a four-year average as an interim lower benchmark, but it doesn't actually use that four-year average to directly set the escapement goal?

A The lower benchmark is not the escapement goal.

Q Okay. And the FRSSI model takes into account the cyclic nature of stocks by using the Larkin stock recruitment model; is that fair?

A It does and has used a variety of stock improvement models to take into account both cyclic and non-cyclic stocks.

Q Okay. And your discussion on page 101 and over to 102, is it fair to say that in this section, this is reflecting your view that rather than using a process which allows an escapement goal to vary with run size, which is what the FRSSI model does, in your view, fisheries managers would be better served in using a fixed escapement goal for each cycle line of a stock?

A Yeah. So the issue here is the definition of the actual escapement goal, what value you're targeting for a specific stock. And for non-cyclic stocks, you might have a single escapement goal that would apply to all years. And whereas ones for cyclic stocks, you might have a higher goal for the on cycle, and a lower goal for the off-cycle stocks, that these escapement goals set in this context, what I'm referring to, would be based and have a biological basis based on the capacity of the spawning area and rearing capacity of the lake-type stocks, or the spawning ground capacity for river-type stocks. And the ability of managers to achieve these goals, obviously, would be largely dependent on the returning run size, but the goal would not change just because the run size is small or large.

Q And why do you think that that -- sorry, before I

ask that question, a fixed escapement goal, that's how that escapement setting method is described, it's the same goal for that stock no matter how big the run size gets, right, it's just that number?
A Yes.
Q Okay. And why do you say that is a better way to set escapement goals?
A Well, it gives the managers a very clear target so that people can evaluate whether they're achieving that goal on a year-to-year basis, or headed towards that goal over time, recognizing that in any one year, you might not achieve that goal because there may not be sufficient returns to achieve that goal.
Q Okay. And what about for users, how would a fixed escapement goal work for users of the resource? Would there be any difference?
A No, because the people's access to the resource will be determined by the management strategies that were discussed with them when you're setting the fishing plans.
Q Okay. What about other values? Are there other values that may be supported by escapements larger than a fixed escapement goal? So for example, using FRSSI, where the escapements may increase with run size, does that increased escapement support other values, like habitat enhancement values, for example?
A Sure, there could be other reasons why you might decide that you would allow for escapements or target escapement levels that were higher than the biological goal for a specific stock that was based on a rearing capacity or a spawning-area capacity, but managers need to, and users need to be cognizant of the fact that there could be other implications of exceeding a biologically-based escapement goal.
Q All right. Would protecting co-migrating stocks at risk be a reason why you might exceed a fixed escapement goal?
A That’s correct, that's one.
Q In your report, you suggest that escapement goals need to be clear and easier to understand. Is your view that the escapement goals set through the FRSSI process, and as currently implemented by the Department are not understood by the actual

managers of the Fraser River system?
A Well, I cannot speak for the managers. I'm sure some of them understand them very well and others might not, but I do hear from a number of the people associated with the groups that harvest Fraser sockeye that they don't understand, they have misunderstandings, or don't understand the FRSSI process, don't know what the escapement goals are for various stocks, or why those escapement goals change from year to year, or between cycles and non-cycles.
Q All right. So you're reflecting a concern that the users may not understanding the goal setting using the FRSSI model, is that primarily what you're talking about?
A Yeah, and the importance of having understanding not just within the management system when you're managing people, you're managing the fisheries, the people who are impacted and need to know why decisions are being made.
Q Right, but the manager is the actual fisheries managers who allow for openings based on an ability to meet the escapement goals that are set through FRSSI, you're not commenting on their ability to understand the FRSSI goal-setting process?
A Well, I can't comment on what their perception might be of this particular process because there's a large number of them and different ones may have different opinions.
Q All right. I'd like to move on to your section of your report on over-harvesting. That begins on page 111. What was the method that you used in addressing the potential of over-harvesting from 1995 to the present as set out in the Statement of Work?
A So for the over-harvesting component, we focussed, as it mentions in there, not on the impacts, but the evaluation of whether there might have been periods when over-harvesting occurred. They did it looking at each of the different run timing groups and looking at run size, trends, and exploitation rate levels. So figure 22 on page 116 is the relevant figure. And these show four charts where abundance is on the left axis and exploitation rate is on the right axis of the numbers, at least. And the dark line is the trend

in exploitation rate. The blue bars are the returning run size for each of the different timing groups in each of the years.

Q On page 113, you sort of review the extent of potential for over-harvesting in the different run timing groups and for your first paragraph, you talk about the Early Stuart Run, and partway that paragraph, you say, about halfway through:

> With declines in recruits per spawner starting in the mid-1980s, it's likely that some degree of over-harvesting occurred during the 1984 to 2000 period.

Can you explain that? How did you arrive at that conclusion?

A There ought to be a correction in there that it was in the early '80s, late '70s that there was quite a dramatic reduction in recruits per spawner so just slightly before the mid-80s, if you like, and this was from some of the analysis that Randall Peterman reported on in his 2010 report from a workshop and activities, I think at the Pacific Biological Station. That was the end. If you go back to the graph, I can show you the high exploitation rates on Early Stuart, it's on page 116. And so if we can just focus in on the Early Stuart graph. It's in the top left-hand corner on this page. And you can see that harvest rates from 1960 through to the early 1980s, '83, roughly, I can see it better now, are very high. And this is a pattern you can see for a lot of the run timing groups. The harvest rates in this period were much higher than what they have been, obviously, in recent periods and pretty high for sockeye stock, not just the Fraser stock.

There is a period, looking in the late '70s and early 1980s when productivity is dropping for this particular stock, but the harvest rates were not being adjusted as quickly. And so those high harvest rates probably resulted in some level of over-harvesting during that period. Plus just the harvest rates, probably, throughout that period at least through 1960 to the late '70s were probably holding this stock down and once the harvest rates dropped, you can see that the returns during the mid to late '80s and through the '90s for the

various run timing groups were actually higher at somewhat lower harvest rates, on average, exploitation rates, sorry.

Q And then for maybe each of the run timing groups, you can just comment on whether you saw evidence of over-harvesting in the different run timing groups. So maybe you can move to the next graph.

A Yeah, so if you flip to the Early Summer group next, so that's across, here, you have a situation where, again, the exploitation rates from 1960 to a little bit later, to the early '90s, are fairly high, averaging over, I think, 75 percent exploitation rate. And once the exploitation rates were reduced, in the mid '90s, and have been held lower, we've seen an increase in the run size. Now, it's also going to be a function of marine productivity, but this suggests that the exploitation rates may have been a little bit high early in this period and not allowing this stock to grow to levels that we have seen in some of the years in the '90s and early 2000s.

Other figures, if you go to Summer, so we don't see as -- we have high exploitation rates, again, through from 1960 to the early 1990s, but what we also see is that the dominant cycle for Summer Runs had built up even through these high exploitation rates, and then subsequently has declined, even though exploitation rates have dropped. So it appears like these populations, and certainly the major contributing ones, are more being determined by productivity, both freshwater and marine factors, other than the exploitation rates, alone. And then you have the Late Run, which is the next one to the right, again, there's a very cyclic pattern. This is driven largely by the Shuswap Lake, or, essentially, by the Shuswap Lake sockeye returns, Adams River, and Lower Shuswap, being the major ones. And the runs building through this period, despite these pretty high exploitation rates, and then exploitation rates dropping in the mid-90s and we don't see, you know, a massive increase. We're seeing, again, the returns on the cycle years largely being the dominant returns for this stock. And they're within the range of the historical average, even at reduced exploitation rates.

Q Thank you. I'd like to move to the Bristol Bay analysis, and that section begins at 125 of your report. And you do a detailed analysis of the Bristol Bay fishery, looking at, basically, the same aspects that you looked at for the Fraser system, and then you followed that with a comparison between the Bristol Bay fishery and the Fraser system, correct?
A That's correct, yeah.
Q What I'm going to do, I think, today, is go directly to the comparison section just as a touch point to go through your evidence, and we may go back into the details periodically, but I think we'll use the comparison section just to go through the questions, and that begins at page 62 (sic) of your report.
A Mm-hmm.
Q 162, sorry. Now, the first topic that you deal with is management structures, and if you could just describe for us the significant differences between the Bristol Bay fishery and the Fraser fishery.
A Yes. So on the management side, and I should make the point here that this part of the report was prepared by Michael Link and Scott Raborn. Michael Link works in the Anchorage office for our company, and Scott actually works out of Louisiana, but he travelled up to Alaska and has worked with Michael on a variety of these projects in Bristol Bay. And so their knowledge is obviously much more in depth than mine, and if you need to drill deeper than what I can provide, you can always try to tap into those guys.
Q You have your own knowledge, though, of the Alaska fishery; is that fair?
A Yeah. No, and I've talked with them and discussed this with them for quite a while. I think I probably can -- I'm certainly familiar with what they wrote here and was involved with editing and trying to clarify a lot of the points.
Q And do you have your own experience with the Bristol Bay fishery, as well as what you've read in this report?
A I don't have direct experience with the Bristol Bay fishery. I have not worked with managers in that fishery, myself, no.
Q But you are familiar with that system?

A Yes.
Q Okay.
A So what's identified here in the management section as the key difference is, obviously, with the Fraser system, we have a Salmon Treaty that is very active with the Pacific Salmon Commission in the management. We have a very complex situation where you've got to balance the domestic and the international commitments. In Bristol Bay, it's entirely within the United States and under their jurisdiction so they don't have the same complexities as would be the case in the Fraser.

There is a Fraser Panel, which you've probably heard all kinds of details on already, but they're ones that do a lot of the in-season decision making and discussions, providing recommendations and, essentially, managing the fishery.

In Alaska, the Commissioner of Alaska Department of Fish and Game delegates full management authority for the four management areas in Bristol Bay to these area management biologist. So that's a really important distinction, is that they bring people in specifically to take on the tasks. They're going to be experienced people, people that they have a lot of history working with and understanding, and their job is to make the decisions, get the advice they need, but their authority is very high for making decisions in each of their respective districts in season. So it's a much less complicated management process and decision-making process in Bristol Bay than in B.C.

Q And why is that significant? In terms of practical differences on the ground in B.C., what difference does it make?
A Well, I guess there's -- the other thing you should note is the Bristol Bay fishery is a much shorter duration fishery so decisions often have to be made more quickly because if they don't, they're going to miss the fish and so that's another reason for having this system where they put a lot of faith and responsibility in a few individuals to make decisions.

The degree to which decisions can be made as quickly down here is the function of the degree that there's agreement between the parties that

are all part of the panel, Fraser Panel discussions, and slightly to create some delays in decision making and a lot more effort to make decisions in season.

Q Do you have any actual knowledge of delays in decision making on the Fraser system?

A Well, you see that there -- if you read the various in-season updates, there is discussion and conclusions that they're not going to adjust the run size, they're not going to do this until a little later point. And to the extent that that's because there isn't agreement with all the groups, or if they just don't have enough data, I'm not privy to those occasions, but I do know that from the way they described the Alaska, or the Bristol Bay system in specific, it has the capability with an individual, on a matter of a few hours' notice, can open or close any of these fisheries based on the information they're provided and their concerns about abundance of returns.

Q Okay. I think it's important to understand the difference between the two river systems, and I think if we turn to page 29 of your report, you have a map of the Bristol Bay fishery, and we've all seen maps of the Fraser system so we can probably hold that in our memories, and maybe you can, using this map, explain --

MR. LUNN: Sorry, Ms. Baker, which page?

MS. BAKER: 129.

MR. LUNN: Ah, thank you.

A Yeah?

MS. BAKER:

Q Can you just describe the differences between the Fraser system and what we see in Bristol Bay in terms of the fisheries, itself, what the river systems are and what --

A Yeah. So the most graphic and fundamental difference is that there are a number of separate districts here identified. There's the five districts, they're in purple, and they have a variety of sockeye-producing rivers or river systems within those districts. And the vast majority of the catch that is taken in Bristol Bay, certainly, in the most recent years, occurs within those district boundaries that are seen -- that go across the mouths of the bays associated with each of the different districts. And this

allows for less mixed stock harvesting than, clearly, on the Fraser, where you've got runs from a variety of different populations, but they all have to travel through the same fisheries.

Q In the Fraser system, there's a significant marine fishery that would be quite a ways from the mouth of the Fraser. Is that also the case in Bristol Bay?

A No, the vast majority of the harvests occur in these areas. There's small fisheries that have occurred further out, but, you know, I'm not sure of the exact statistics, but it's probably more than 90 percent of that harvest occurs within the districts.

Q Okay. And harvest up the river system, it appears that this harvest is limited, really, to the mouth of the rivers. The Fraser system has harvests going up along the length of the river to the interior of B.C. Is there a similar harvest in Alaska?

A There's a very small subsistence harvest in-river and there's some sport fishing that occurs, but I think the numbers are in the report and it's either close to or less than one percent of the catch.

Q Is subsistence a recreation?

A No, subsistence fisheries in Alaska allow for anyone to go out and set a net to collect fish for personal use.

Q And what's the volume of that percentage? What's the volume of that fish on a percentage basis?

A Well, the subsistence and recreational fisheries, I think it's in the report, or somewhere, but I can't remember exactly where, but I'm pretty sure the number is close to or less than one percent.

Q Okay. And what are the implications of the terminal nature of the fisheries we see in Bristol Bay as compared to what's been described as a gauntlet-style fishery in the Fraser system?

A So the management decisions whether to open a district, exactly when to open it, getting down to the specific tides, when you're going to allow fishing to occur are made very close to where their enumeration sites are so just a short distance up the major river systems, they enumerate the numbers of fish escaping a fishery. And so there's a very close connection in-season

between where the fish are caught and where they're going to escape and there's a much less mixed stock issue. Most of the population in these areas is fish destined for those specific streams, which is substantially different from the Fraser where we can't distinguish until you're getting well up the river between a lot of the major populations in terms of fishing pressure. The bulk of the management decisions related to the Fraser are associated with run timing. So we distinguish between the stocks based on timing groups as opposed to geographic location of rivers.

Q All right. So is it simpler, then, in Bristol Bay to manage those fisheries?

A Yes, much less complicated.

Q In your report, you talk about the stocks, as well, and there's reference to a portfolio effect of the Bristol Bay fishery. Can you explain what that refers to?

A So that really is focussed in on the diversity of the populations and probably the most significant part of that is in the age structure. There's quite a diverse age structure in Bristol Bay sockeye. If you look at -- I think there's a table.

Q Yeah, Table 28 on page 157.

A Yeah, that's right. If you can pull that up, you can see that there is a number of different ages and depending on the specific river system or district you're in, and they have -- a substantial portion are these ones that are referred to as 1.3, which is fish that's been one year in freshwater and three years in the ocean. So that 1.3s are similar to what we have in terms of Fraser sockeye. These are fish with a similar life history for a lot of the Fraser sockeye population, but there's substantial numbers that spend two years in freshwater and then two years in the ocean. There is others that spend one year in the freshwater, two years in the ocean, and then significant numbers in some of the population that spend two years in the freshwater and three years in the ocean. So if you combine these two numbers, you get the total age of the fish. So there's many more age five fish in the Bristol Bay fishery than there are in the Fraser.

Q All right. And what's the significance of that?
A I means that you're going to have returns from a couple of different brood years, that the ocean conditions and freshwater conditions encountered by the fish are going to differ and so you'll have what is referred to as a portfolio effect. It's like a more diverse portfolio of life history strategies than you have on the Fraser.
Q All right. Does that have -- oh, sorry, I'll come back to this in a minute. I'm conscious of time here and I want to move to your section on variability and returns, and escapement goals. How are escapement goals set in Bristol Bay?
A All right. So that's --
Q In your Comparison section, it's page 165.
A Yeah, I think it doesn't really deal explicitly with it as earlier in the report so probably page 139 is the best place to look for the specific statement, and it's partway down the page. It begins with the word, "Today," and it's the second full paragraph. So it says:

> Today, all Bristol Bay sockeye escapement goals are characterized as sustainable escapement goals, SEGs, as opposed to MSY-based BEGS, biological escapement goals.

These are further described in the next page, and with some examples, as to how they're set. So in the section, there, "Bristol Bay," it talks about the annual escapement goals and it's the statement, at this stage, the Board of Fisheries, they accept the escapement goals, which is most common, or modify them to accommodate social, conservation and allocation concerns by users and ADF&G. So these goals are discussed and evaluated in that context.

There are occasions when the escapement goals may be higher or lower from the biological reference points to protect weak stocks in mixed stock fishing districts. So there could be a variety of different stocks within a district that have concerns similar to some of the situations on the Fraser so that could affect the escapement goals. As well as there are occasions when the escapement goals have been -- well, I guess, the next point is also that there's examples of where

the escapement goals have been raised to protect weaker stocks.

Q So is this a variation on the escapement goal setting that you were recommending for the Fraser system?

A I think the biggest difference here, and it can be seen by the figures, is that the escapement goals have been pretty consistent across a long period. There's a range defined. If you look in the figures, on Figure 28 for a couple of districts here, page -- sorry --

Q The next page.

A -- page 141, you can see that -- and in most cases, it's similar to this, where there's a lower value, sort of like the minimum target escapement goal for this particular stock, and then an upper value. And in virtually every case, the escapements are above the minimum and there are a few instances when they've exceeded the upper part of the range, but they try to manage the fisheries so they are in that range, or close to that range of escapement for each of the districts.

Q And so unlike the FRSSI escapement goal-setting process, those goals don't vary with run size, is the point?

A Yeah, and they have had some periods when stocks were cyclic. During this particular time period, you'll note that you don't see cyclic patterns and returns for these or any of the other stocks, with the exception of Chiniak (sic) has some indication. If you look at page 143, just so that you can see that, they're not without some cycles, stocks that cycle. All right. So it's the second graph, there. It's not Chiniak, it's the other name, it's the Kvichak system. The pronunciation of that word is Queejak (phonetic). You know, we can see that in 83 and 84, for example, then followed up by 89 and 90, and followed up by 94, 95, there are a couple of strong cycles. That pattern has broken down more in recent years, but it was very common for this particular stock prior to this period.

Q How are escapement --

THE COMMISSIONER: Ms. Baker --

MS. BAKER: Oh, sorry.

THE COMMISSIONER: -- I think it's a good time to take the break? Thank you.

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

(PROCEEDINGS ADJOURNED FOR NOON RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: The hearing is now resumed.

EXAMINATION IN CHIEF BY MS. BAKER, continuing:

Q We were talking before the break about escapement goal setting in Bristol Bay. And my next question is, how are escapement goals met in Bristol Bay? Is there a difference in how they manage to meet their escapement goals?

A Yes, so the goals, once defined, they become the primary objective of the fisheries management biologists, the area management biologists, to achieve that goal. That's what they're evaluated on pretty much solely post-season whether they've been able to get the escapement above the lower line. And somewhere between the lines is good.

Q In your summary on page 165, you talk about the high variability in returns and uncertainty associated with optimum escapement goals for Fraser sockeye resulting in managers and fishers selecting more complex abundance-related harvest rules to set management goals. Can you explain that further?

A Yes, so the goals vary with run size on the Fraser so they're substantially different from ones that are the same, not only for all different sizes of runs but across years and there isn't -- as I started to point out there, there is only one stock in the Bristol Bay that has this cyclic pattern like some of the Fraser stocks have and even that has been much less in recent years so they define the goals for a particular population and strive to achieve those. Whereas, in the Fraser scenario, while people are defining goals, they vary substantially. And it's more of an escapement target, I guess, is the best way to describe what's done in the Fraser, as opposed to a specific goal for a specific stock. So they define escapement targets by run timing group.

Q Whereas the goals are on a stock basis in Bristol Bay?

A Yes.
Q And is that partially a result of the fact that stocks -- they don't have as much of a mixed stock fishery in Bristol Bay in that they are all going to different river systems?
A Well, it gives them more latitude, I guess, to control the fisheries to achieve a specific goal so they're not having to balance the goals for multiple stocks. But they do have that -- in the different districts, they'll have sub-population goals. But the one that is really clear is the goal that the -- the primary goal that they're striving for is whatever goal they set for that particular district not for the sub-component stocks.
Q So maybe it's not a run timing group but it is an aggregate of certain stock groups?
A Yes.
Q Okay. Moving to pre-season forecasts, how are pre-season forecasts generated in Bristol Bay?
A So they use a lot of the same tools as the ones for the Fraser. I think there's a whole list of them described under that in the report. I don't remember what page the pre-season forecast is on. I'll just find that here quickly. The description of the forecast methods is on page 146. And right at the bottom of that page, it talks about the -- or actually, that's the in-season one.
Q Perhaps on 149?
A 149? Okay. Yes, that's what I'm looking for. So pre-season, top of 149. So they're using what they refer to as four types of models, very similar to the models that are used in the Fraser. These mean models, which refer to sort of average returns per spawner. There's stock recruitment models, which might be like the Larkin model or other, Ricker models, that look at relationships between spawners and recruits. Sibling models meaning the use one age population to predict returns of another.

So you're using a younger age return for sockeye. And because they have multiple ages of sockeye, that works better than in the Fraser where you have most of the returns are age four. And then smolt-related model, so this is looking at the smolt output. They do a number of enumerations on out-migrating smolts for various

stocks and look at the relationship between that and adult returns.

Q All right. In your comparison section on page 166, you say that:

> When all stocks are aggregated, median absolute percent error appears slightly better for Bristol Bay than for the Fraser, but not by much.

Can you just comment on that?

A Yes. So probably the graph to look at there is on page 152. And so the top chart shows you the absolute percent error and the bar once again shows you the median. So where the line goes through the box is the median. And if we actually look at the value, I think it's 25 percent is the value when you look at all systems combined. And that's the most far right box and whiskers. And then the districts, the five management districts, are the next five things that you see on the graph there. And this is the top graph I'm referring to.

And then you can see across the different -- on the left side of the dashed line are all the different major river systems within each of those districts. You can see by the bottom which ones are in each of the districts. They should have colour-coded the ones on the right-hand side. Then you could have seen which ones refer to each of the districts. But the first, just so people know, Egegik just has one major river system. And then the first two have -- Togiak has one and there's three in the Nak and Kvichak systems. So there's the three dark bars refer to that. And then the last three are in the Nush, Wood, Igu district.

The important part of this graph is that you saw the previous one for Fraser, the length of the whiskers, the amount of variability in any one given year is substantially less for Alaska forecast compared to returns than what we're seeing in for Fraser.

Q But just picking up on what you have to say in your summary paragraph, I take the lower figure is similar to the Figure 10 we saw for Fraser sockeye and you see all systems are given a 48 percent R

value for reliability; is that right?
A Yeah, so that's the R square value that compares with the 44 percent for the entire Fraser River.
Q All right. So the differences appear more on the individual stock level?
A Yes, and also the biggest difference is in the absolute percent error, as opposed to the R value.
Q And is there a reason why the pre-season forecasts in Bristol Bay have a lower absolute percent error than on the Fraser system?
A Yes, that's mostly because of this portfolio effect, the diversity of populations. And also the stability of returns assists in that, as does the lack of cyclic dominance. So you have more consistent returns year-to-year in Bristol Bay than you do in the Fraser.
Q So is it fair to say that the better accuracy you see on the individual stock level analysis results not so much from better models in Bristol Bay but really just the predictability on a biological level with the stocks themselves?
A Yeah, there's that element. Another one I should mention is they're using more consistently the same model for each of these populations year in and year out, which may provide and seems to suggest it provides a greater degree of precision. If you look on page 153, it shows the trends in mean absolute percent error across time. So that's Figure 35. And you can see that in the most recent period, 2001 to 2010, the mean absolute percent error has been reduced over what it was historically. And it's in that period when they started using the model that is performed best in the number of years not just the most recent year.
Q Okay. Thank you. In-season estimates in your summary section and your comparison section to B.C., focusing on the differences, what are the differences in the way in-season estimates are generated in Bristol Bay, as compare to the Fraser system?
A Okay. So that's back on page 146. And it talks about the different in-season methods used. So right at the bottom of this page. So in terms of in-season, they have an offshore test fishery at Port Moller. This is a gillnet test fishery not dissimilar to some of the gillnet test fisheries

that are used in British Columbia. Then they have district test fishing. They have commercial fishery performance with catch and age sampling. So that's looking at the actual fisheries information. They might have a test fishery inside the commercial fishery, which looks at fish that are escaping that particular district fishery. They have aerial surveys where they might count quantities of fish from the air, as well as escapement monitoring, which is lower down in the river system.

Q All right. Is in-season estimation used by fisheries managers in Bristol Bay to manage the fishery in the same way in-season estimation as used by Fraser River managers?

A Yes.

Q Okay. Do the Bristol Bay fishery managers rely on in-season estimation to the same extent as Fraser River managers do?

A Yes, they rely very heavily on it.

Q All right. And in your summary underneath the heading "In-Season Forecast", you state:

> In-season forecasting is of limited use to Bristol Bay managers who rely mostly on daily escapement counts and day-to-day movements of fish in the districts to manage the fishery.

So do I take it from that, that when you look at the seven different methods that you just reviewed, the primary one used by managers in Bristol Bay is escapement monitoring and not so much the other test fishing methods, for example?

A Yeah, the primary one is combining catch and escapement data. So they get catch data from the fishery immediately following fishery and then they have escapement data for the same period.

Q All right. And is that different from what happens in the Fraser?

A Yes, because the catch information in the Fraser, well, it's used as is information on escapement. There is a greater reliance, I think, on looking at abundance using the test fisheries in approach waters. The fishing may be more sporadic as well and probably is more sporadic on the Fraser than it is in Bristol Bay when they have major fisheries happening every couple of days. So

they're getting a lot of information from the fisheries. This is really more similar to what the situation was back ten or 15 or 20 years ago on the Fraser where they were using a lot more data from fisheries to do in-season assessments.

Q And has the situation in the Fraser changed such that it would not be reasonable to rely on catch and escapement as the primary methods of doing in-season estimates in the Fraser system today?

A Well, if you don't have a fishery, you'd be waiting for just the escapement information and the first escapement information you'd be using would be that from the Mission hydroacoustics site and there has been a number of difficulties with that site providing reliable estimates depending on the conditions and the year. And so it would be much more tenuous to just rely on that versus conducting some additional test fisheries in the ocean.

Q And in your conclusion on the Fraser River test, in-season estimation process was that it was, in the Fraser system, a reliable system. Is that right?

A Yeah, the reason why it has been developed and what makes it a more robust approach than relying on one thing or another is that you're looking at abundances of fish as they're moving through the approach waters in Johnstone Straits or Juan de Fuca and then assessing for the Early Stuart, Early Summer and Summer timing groups, how many of those fish are passing Mission. So you're comparing what is seen in the ocean test fisheries with what's seen at Mission and it's giving you sort of two indications of whether -- if one says there's a lot more fish and the other says there's a lot fewer fish then you have -- a red flag goes up that, hey, we may not be measuring as big a run as we thought. But if you see a consistency between those two, you have a higher comfort level. And they have been performing pretty well with that regard. The *caveat* is on Late run where the fish don't move in every year right through to Mission. So you have this gap of could be two, three weeks of holding time or more in the Lower Gulf and so that doesn't give you the same degree of confidence on Late Run, as it does on the other timing groups.

Q Are you suggesting that the Alaska method of in-season estimation is superior or would be better used on the Fraser system?
A Well, it can't be done the same way as it's done in Alaska because things are confined more in space and time. You couldn't use it identically. But if you changed the fisheries to operate in those similar spaces and times where you have reliable information on escapement and good information on catch and there was substantial catch, yes, you could use the same system.
Q So if we limited our fishery to the mouth of the Fraser, for example? Is that what you're saying?
A Well, no, to have the exact analogy, you'd probably have to limit it to fishing more terminally than even the mouth of the Fraser. But because they don't have the stock -- the ability to -- because part of the Bristol Bay system should be clear to everybody is that they have the ability to turn on and off the fisheries' four specific stocks, not just the whole fishery all at once. So they can close one district, open another district, move it around, depending on what stocks they want to target.
Q And this is because there's multiple rivers in that fishery; is that right?
A Yes, multiple rivers and geographic separation between the fisheries.
Q All right. So that's not an option for the Fraser system?
A It's not an option with the current model for how the Fraser's managed with marine interception fisheries and lower river interception fisheries.
Q Okay. Escapement enumeration and abundance estimates. I'll deal with these together. How is escapement enumeration conducted in Bristol Bay?
A All right. So that's described in a section here. In a nutshell, they rely heavily on these tower counts, which are located a short distance from fisheries so in the lower river. The big difference in Bristol Bay with regard to the enumeration is that the rivers they're enumerating sockeye return to, you can see the fish. So they're actually visible. And they have towers, which is a counting platform raised up above the shoreline so that he can look out and count fish moving past a certain point. And they also use

acoustic systems on one of the rivers. But the tower counts, the vast majority of the escapement information, has come from these tower counts.

Q And is there a count done on the spawning grounds in Bristol Bay?

A They do not rely on spawning ground counts and don't put a lot of effort because if you looked at that map we had out before, you'd see that the spawning areas are spread out over quite a range of locations. And they would be costly to go in and enumerate at all those different spots. And they don't believe that they're going to get a more reliable estimate than from the tower counts.

Q And is there any catch of any significance past the counting stations that must be accounted for in their escapement enumeration?

A No. So that's the reason for having more confidence. That, plus the shorter distance between the tower counts and where the spawning grounds are so you're not losing -- there's no indication that they lose substantial numbers of fish through mortality and they know that they don't have significant fisheries above those towers.

Q All right. So given those differences, could the escapement enumeration system from Bristol Bay be used reliably on the Fraser system?

A Not if the first escapement enumeration site is at Mission because there's lots of both fisheries and other sources of mortality between Mission and the spawning grounds.

Q Okay. Given the differences between estimates at Mission and on the spawning grounds in the Fraser system, which we didn't talk about today but we have heard quite a lot about earlier in the hearings, and also the distances travelled by spawners after Mission, is there anything from the Bristol Bay escapement enumeration systems or abundance estimating processes that we can learn from here on the Fraser system? Does Bristol Bay have any lessons for us that we should be paying attention to here on that topic?

A Yes, I think it's just the basic one that it's obviously easier to manage multiple stocks in terminal stock-specific fisheries than it is in mixed stock fisheries.

Q And the mixed stock fishery is what we have here

in the Fraser system?
A Yes.
MS. BAKER: Mr. Commissioner, I don't have time, I don't think, to go through the state of science in the report, Project 7. It's clearly laid out, though, in the state of the science and so I'll leave it as read and same with the recommendation section. And I'd like to turn the questioning over to Mr. Taylor for Canada at this time.
A If I could add one point before I leave (sic) --
Q Yes.
A -- because I did make a mistake earlier that was pointed out to me by Randall Peterman, was that when I quoted the age structure associated with Table 28, so if you could pull that Table 28 back up. It's on page 157. This is for Bristol Bay again. It's the 1.2 age group, that is, our four-year-old fish, one-year in freshwater and two full years in the ocean, they come back after four years. The 1.3 would be five-year-old fish, as would be 2.2 fish, both five-year-olds, and then 2.3 would be six-year-old fish. So I was one year off in my total age. So you have both four or five and six-year-old fish representing significant portions of returns in Bristol Bay where in the Fraser it's primarily age four.
Q Thank you.
MR. TAYLOR: Mitchell Taylor and with me, Hugh MacAulay. We're counsel for the participant, Government of Canada, Mr. English, and that, of course, includes the Department of Fisheries and Oceans. Mr. Commissioner, I have, I understand, 70 minutes, seven zero, starting at 2:25.

CROSS-EXAMINATION BY MR. TAYLOR:

Q Mr. English, I have some questions that mostly focus on two areas. We think your report is mostly solid and commend the report. There are two areas of concern and questions associated with them. One has to do with your treatment of the pre-season forecasts. And the other has to do with consideration of the TAM rules, which I'll come to each of those. I have a number of questions on various other statements in your report and matters arising from what's said. Before we go into the content of the report, let

me ask you this. I understand that there's multiple authors to this report and you're the lead author; is that right?
A That's correct, yes.
Q And can you say which parts of this report you wrote?
A Yes, it might be easier to say what parts the other people wrote.
Q That would be fine.
A Okay. So Bob Bocking focused mostly on the recreational fishery component. The pre-season and in-season forecasting component for the Fraser side of things was done by Tim Edgell. The Alaska section was drafted by Michael Link and Scott Raborn. And of course, I edited and contributed to all those sections at one form or another but the rest of the report was primarily written by me and edited by them.
Q All right. And I take it then that you reviewed everything before it came before the Commission?
A That's correct, yes.
Q Thank you. So specifically then the pre-season forecasting was written by Tim Edgell, was it?
A Edgell, yes.
Q Edgell, thank you. And what particular expertise does he have? I've read his resumé but can you capsulize (sic) in a nutshell what is his expertise? He says to be an ecologist and analytical biologist.
A Yes, well, he's a good statistician in terms of can do analysis with any numbers whether they're coming from Fraser sockeye fisheries or other sources, has a good statistical background. And that was the main reason for focusing in on the datasets, which were provided by the Department and just analyzing them with regard to some very specific tasks.
Q Okay. Am I correct then that your expertise is not particularly focused on pre-season forecasting?
A Well, I don't know. We've done a fair bit of work with pre-season forecast, not as extensive as what's been done on the Fraser. I've been involved with other fisheries in the Nass and Skeena looking at forecasting methods. But it wouldn't be an area where I've spent a lot of my time.

Q All right. Is your knowledge and experience focused mainly on in-season work?
A I guess most of the stuff that I've personally done has been trying to design programs to improve the information available for fisheries management. Some of those are in-season, some of them are more post-season in escapement monitoring programs but also catch monitoring and run size estimation.
Q All right. In the consideration in your report of pre-season forecasts, as I read it, you or your firm or Mr. -- and I apologize. Hopefully I'll get it right --
A Edgell, yeah.
Q -- before the end of these questions, Edgell?
A Edgell, yeah.
Q All right. Thank you.
A Think about the razor, the edge --
Q All right.
A -- edge and gel.
Q I'll do that.
A There you go.
Q For the moment I'll say "his". His writing seems to regard the pre-season forecasts as point distributions. And by that, I mean the number that's given as the 50 percent number is taken as a point distribution, as distinct from a statement of probability.
A That's correct.
Q So you agree with me that the report takes it as a point distribution?
A That's right.
Q Now, would you agree with me, though, that really what that is, is what I said a moment ago, it's a statement of probability? So for example, there's a 50 percent chance that the run size is going to be more or less than the number that's then stated?
A Yes.
Q All right. And I want to, if I may, take you to some evidence that's been given already in these proceedings. It's evidence of Sue Grant, who's a Department of Fisheries and Oceans biologist. It's on January 26th. And I'm at page 45. Am I right that you know Sue Grant?
A Yes, I do, yes.
Q All right. And she is a well-respected fisheries

biologist, is she?
A I think she must be. She's been doing a lot of work on these issues.
Q All right. You say she must be. Do you agree she is?
A Well, I know of her work and the stuff that I've seen I think is good quality. I don't know what other people's opinion of her are.
Q All right. Now, at page 45, about two-thirds of the way down the page in a large paragraph that begins "So-so", and this is Sue Grant speaking in answer to questions by Ms. Baker. And you can see the question at the top essentially is asking Ms. Grant about whether the pre-seasons forecasts are reliable or unreliable or accurate or inaccurate, or is it all a communication problem. And partway down that paragraph that begins, "So-so," about halfway down, at line 26, there is a passage that's picking up in mid-sentence, and you can read the whole sentence for yourself there but it says:

> DFO never expects the 50 percent probability level to be what will return. That's a midpoint in the probability distribution and we actually have a one-in-two chance that the run will come in above or below that actual value. So that value isn't a deterministic DFO expects 10.6 million to come back.

Do you agree with what she says there?
A I think that's probably true, yeah, but I imagine the reason for presenting a probability distribution is it defines the level of uncertainty associated with the pre-season forecasts. And we did include those, by the way, in our report, the ranges.
Q All right. And what you just said is a big part of the equation, isn't it? There's a high level of uncertainty with regard to forecasting Fraser sockeye returns.
A Yes, that's right.
Q And you've spoken to some of the reasons why. But when you're doing pre-season forecasting, am I correct that you're looking to the past to predict the future?
A That's right, yes.

Q And the theory is that if you have a set of data that reaches back far enough in time, you're going to be better off than if you have only a short span of data, right?
A Well, yes and no. If you're reaching back a long way in time and a lot of your data is associated with a time period that doesn't resemble a current time period's trends then going back a long way is not going to be helpful. It might actually lead you astray.
Q Okay. If we could go to the chart in your report that's at page G-2, that's the appendix we were in before. Thank you. And I'm looking at the bottom chart there at the bottom part. That chart has an approach, it seems to me, that you are using as a reference point the forecast number as a deterministic number, if I could put it that way, as distinct from a statement of probability?
A That's correct, yes.
Q Would you agree with me that that makes that number then look more firm than it really is meant to be?
A It definitely is a firm number that's being compared with another firm number, yes.
Q Sorry. Could you say that again?
A It's trying to compare two firm estimates, as opposed to a range of alternative estimates. So we're trying to get a sense of how close the return was to this point estimate which may be based on the 50 percentile.
Q Isn't it, though, comparing apples and oranges because you're taking a statement of probability, you're turning it into or pretending to turn it into a deterministic number and then comparing it against the actual returns?
A No, because there is -- whether the number is precise or imprecise because of uncertainty doesn't prevent those numbers from being used as to drive a management planning process, which they're input in. So the harvest rates or the exploitation rate numbers or the TAM rule, which you'll probably get into in a minute, is derived from picking a number within the range of the forecast and applying it to the TAM rule that comes out of the FRSSI process and so you have to pick a number at some point. The range is useful to know. It's useful for managers to know that

there's a fair bit of uncertainty with the number but part of the reasons for doing it this way was so we could compare forecasts in Alaska in Bristol Bay with forecasts for Fraser in a head-to-head manner. And they don't use the same forecasting models exactly and these probability forecasts in Alaska.

Q Maybe I could put it another way and I think you've spoken to this in your answer just now and see whether I've got it right or you'll agree with me. Do you agree with me that there's a high level of uncertainty built into the probability forecast that you, for example, have then used to make the chart on page G-2?

A Around the forecast estimate, there is a high degree of uncertainty, yes.

Q And one of the elements of that uncertainty is that environmental conditions could make things turn out to be quite different from what might be forecast; is that right?

A That's correct, yes.

Q And so in fact, if environmental conditions go off what we've seen in the historical time period then the forecast is going to be probably off?

A That's correct.

Q In terms of pre-season forecasting, are you aware of the terms of the Pacific Salmon Treaty that require that there be pre-season forecasting done?

A Yes.

Q All right. So it's not an option; it has to be done, right?

A That's correct, yes.

Q And do you agree that pre-season forecasting has value to it? I think you've spoken to this but I want to sure that I've got it right.

A Yes.

Q So you're not quibbling with pre-season forecasting; you're more speaking to the particulars of what's done, are you?

A I think my main point is that the forecasts have their use but they're -- they're not used extensively in-season because people rely more on in-season information. And that is the vital piece here because of all the reasons we've just talked about, the uncertainty with the forecasts, the changes associated with environmental conditions that could lead you to very different

returns than what is forecast, as we've seen most graphically in the last two years.
Q Okay. Well, let me suggest that there's at least three reasons for doing pre-season forecasting. One we've spoken about already and, that is, it's required under the treaty. So secondly, and you were just speaking to manager's use of pre-season forecasting a moment ago, but let me suggest as a second reason beyond that it's required under the treaty, that DFO managers use the pre-season forecasting early in-season and early in the post-season to set up the current year against the long-term averages and get a sense of what's happening or going to happen. Do you agree that they use it for that aim?
A Yes.
Q All right. And then a third broad purpose, I'll suggest to you, as to why pre-season forecasting has value and it's useful to do, is that it helps scientists to understand the population dynamics and the uncertainties associated with that.
A Yes.
Q Okay. And if you come to the 2009 and then I'm going to come to the 2010 year, were you at all part of the work that was done and then -- I don't mean within fisheries but within the science community, the work that was done and then the observations made and I expect at some point in time there was a sort of, oh, my gosh, what's going on here realization by scientists. Were you engaged in that in 2009?
A In the actual evaluations in-season, do you mean, of what's going on?
Q Well, I don't mean doing the evaluations but as part of the science community engaged in the something important and quite dramatic has happened here and is happening.
A Well, it was evident. We were doing studies in 2009, which had the requirement for us to try and put tags on returning sockeye and we were trying to allocate those across the run. And so from that perspective, I was involved in-season to looking at what was going on with the run and talking with managers and people at the Salmon Commission about what was happening and whether the run was late or a variety of different explanations for why we were not seeing anywhere

near the numbers that we had expected to return.
Q And so in the 2009 year, would you agree with me that with the pre-season forecast in-hand and then seeing what was starting to happen, or rather not happen in terms of the non-return, would you agree with me that that allowed managers very quickly to understand that something important was happening and allow them to adjust their early in-season planning and actions accordingly to take account of that?
A Well, what allowed them to do that was the in-season monitoring because the forecast just gave him a number to compare against but assuming that they could define what their goals for that run were, they could have compared their goals for that particular return with what they were seeing in the test fisheries and at Mission and said, okay, we have a problem; this run is way less than what we anticipate or would like to see return for that particular stock.
Q They could see in absolute terms that not very many fish were returning but they could also see in those early days, couldn't they, that not only was there not many fish returning, but they could compare that lack of fish against what the probabilities were set out to be in the pre-season forecasting and realize the magnitude of what was going on, if you like, because there was a comparator to put it against based on the pre-season forecast, which, in turn, relies on historical returns.
A Sure. But what I'm saying is that, especially in these extreme cases, but even in less extreme cases, you could compare returns that occurred and what your test fishery tells you about returns in a given year with the size of returns that you expect or would like to see for a specific timing group of Fraser sockeye and tell you right away whether, number one, is what we're seeing consistent with the timing we want the fish returning under, and the abundance? So you could have thrown out the forecast entirely and just said, okay, we want to see x number of thousand fish and they should come in over this time period, compared those numbers to what you would expect in the test fishery and seen, boy, we're way under expectations and, therefore, we need to

close the fisheries.
Q I think you're saying some of this but I'd like to take you back into the transcript of the evidence of Sue Grant, if I may, January 26 again, at page 48. And she's speaking of the 2009 return and she started doing that -- and this is a continuation of the evidence that I took you to earlier. But she started and just maybe for a moment, Mr. Lunn, if we could go to the bottom of page 47, you'll see that -- that's fine -- you'll see that it says, "So 2009 we saw 1.3 million." And she goes on. And then over the page, to page 48 and about halfway down at line 17, Ms. Grant says:

> So the forecasts are useful from that perspective, placing the returns in the perspective of what we have seen historically.

Do you agree with that?
A Whether it's a forecast that you're using or just an expectation based on trends with the stock, I guess there are different ways of doing the forecast, if you like. There's some kind of expectation you have to have to compare the returns to what you've seen and your goals for that stock.
Q All right. Just while we're here, towards the bottom of that page, at line 36, Ms. Grant says, and this is now speaking to the use that can be made of pre-season forecasts and in particular by mangers, I expect. Line 36:

> So for pre-season planning, early in-season forerun, early in-season run size models, I know they --

She's speaking of managers.

> -- use the pre-season forecasts as a tool to help as a starting point for what we're seeing and what we expect to see. As in-season data becomes more and more available, these pre-season forecasts start dropping off in terms of their usefulness as inputs into the model but they're still useful from a qualitative perspective to place you on the

map as to where you are. Do you agree with that?

A Yes.
Q Do you agree that pre-season forecasting has value in terms of showing or giving some early evidence as to fish productivity for that year?
A Yeah, you're going to derive your pre-season forecast from information you have on productivity. That's one of the models.
Q All right. Okay. And do you see it as having pre-season forecasting, that is, having value in terms of being able to map out where are the stocks and what is the timing as to them coming back by using the pre-season forecasts as against what you're starting to see as the season unfolds in its early days?
A Yes.
Q Really, shortly stated, having some evidence of what you can expect to come at you assists in giving context and perspective to what you, in fact, end up seeing happen?
A Yeah, we all like to make a prediction like with the playoffs and hopefully it happens, right?
Q I've concluded that you're a hockey fan.
A Well, you know, I just imagine it's on some people's minds so it might wake up a few people.
Q All right. Well, hopefully it'll stay on Vancouver's minds for another couple of months or so, which would mean that they're doing well. Are you aware that the pre-season forecast methodology that's been used and continues to be used by fisheries ahs been peer-reviewed?
A Yes.
Q And it's been given a thumbs-up, right?
A Yes, by the PSARC or the CSAS method or committees.
Q In an environment of high uncertainty, which you've spoken to on a number of occasions already in your evidence, but in an environment of high uncertainty to do with Fraser sockeye stocks, do you agree that it makes sense to estimate your pre-season forecast in terms of probability, as opposed to trying to be deterministic?
A I think it's good for any biologist to express the uncertainty associated with their estimates when they can and they have the data to do it.

Q But do you agree it's good to put it as a probability as distinct from trying to make a point distribution because you're bound to fail given the high variability if you try to be precise?
A Yeah, knowing what the point estimate is, is important for a number of parts of the current process that's used, but also an understanding that it is variable and that you're communicating that. Or the uncertainty is there so you're communicating that to the users that don't put a huge amount of faith in the point estimate.
Q All right. Do you have knowledge of the approximate number of resources that DFO devotes to pre-season forecasting?
A I know some of their best people that I've worked with in the past, people like Al Cass and others, have allocated significant time preparing papers and pre-season forecasts and models and analysis. I don't know exactly how long that takes for those people to do that and whether they have that streamlined to the point where it's a relatively fast task.
Q I've been given some information that there's a relatively few people, relatively few biologists, that are devoted to pre-season forecasting. Is that your understanding?
A I think there's been only a few people that have the full knowledge of these models and the methods so they would tend to rely on those few individuals, yes.
Q As I understand it, in the information given to me, it's a relatively modest amount of resources that are put into pre-season forecasting in terms of the number of people and it's only a portion of their time that do this. Does that accord with what you understand?
A Yeah, as I say, I agree that it's probably only a few people. I have no idea how long it takes them to generate these forecasts. Some of these reports and documents are fairly complicated and unless it's been really streamlined, I could see it taking a significant amount of time for some of them to do these and push it through the various approval systems that are in place to officially approve a forecast.
Q All right. And in doing this work, is it your

understanding that Fisheries is able to leverage things so that they engage with academics and the Pacific Salmon Commission and, if you like, have synergies and build and feed upon each other so that they can leverage and get greater gains than just the few resources Fisheries puts into it?

A So you mean getting help with this work from academics and the Salmon Commission sort of thing?

Q Yes.

A Yeah, no, I'm sure they engage there wherever they can to get that "free" labour.

Q Now, at page 64 of your report, in reviewing the pre-season forecasting methods, you cite there the Cass report of 2006. And you mentioned Al Cass a few moments ago. I take it you know of Mr. Cass, do you?

A Yes, I do.

Q And that 2006 report that you cite in your paper at page 64 as Exhibit 351 in these proceedings, will you agree with me that it's important to understand the pre-season forecasting and important to evaluate the pre-season forecasting to have regard to all of the papers and publications that are of recent vintage that bear on that topic, not just the one paper that you cite there?

A Yeah, the focus for our report was clearly to look at the most recent information on forecasting and models because a lot of things have changed in how these things have been done over the years and we're trying to keep our report as few pages as possible, believe it or not, but you know, we didn't want to go back and have to describe all the history of forecasts from 1980 to present.

Q All right. But going the other direction, that is, moving forward in time from 2006, there's another report I'm going to ask to have you look at, it's Tab 11, to Canada's list of documents. And this is a document, "Pre-Season Run Size Forecast for Fraser Sockeye and Pink in 2007". Are you familiar with that document?

A Yes, that's also, I think, reference in our --

Q Oh, is it? All right. Thank you.

A Yeah, and in the following sentence, we reference the reports for 2006, 7, 9 and 10.

Q Oh, that's what that's -- I see. I get it. And so one of those references is this report?

A I would think that's the 2007 reference unless it was done in a different year. That one probably would be the 2006, the CSAS 2006.
Q All right. Well, that's fine. What I wanted to --
MS. BAKER: Mr. Commissioner, if I can be of assistance in the list of authorities at the back you'll see these are numbered and these authorities are all listed in the --
MR. TAYLOR: Oh, thank you.
Q What I wanted to take you to, though, is page 3 near the top. And as I understand it, for this year, that is 2007, there was a change made to the Cass 2006 approach where the Larkin model was added in. Is that to your understanding?
A Yes.
Q And the Larkin model accounts for delay density effects, as it sets out there. Could the paper that I've just referred to, "Pre-Season Run Size Forecast for Fraser Sockeye and Pink for 2007," be the next exhibit, please?
THE REGISTRAR: Exhibit Number 724.

EXHIBIT 724: Pre-Season Run Size Forecast for Fraser Sockeye and Pink Salmon for 2007

MR. TAYLOR:
Q And then there's another paper I want to take you to, Mr. English, and you may point out to me that it, too, is cited in your paper but let me check with you on this. It's Tab 14 to Canada's list of documents. And this is what's commonly called "Sue Grant's 2010 paper". Are you familiar with that?
A I'm trying to think of whether I reviewed that one or not. I'm aware of its presence. I'm not sure whether I've actually reviewed it.
Q Okay. This is Exhibit 352 in these proceedings. And it sets out, on page 8, towards the bottom -- sorry, page 8 at the top, the models that were being used and it's a paper that is amending the approach, as I understand it, that Mr. Cass had put in place in 2006. If you haven't -- if you're not familiar with this paper you may not be able to speak to that. But looking at it now, is this a paper you're familiar with?
A We did produce a table in our report, which looked

at the different models that had been used in recent time period. I'm just trying to find it here. Seventy-two. But I think the information for 2010 was obtained from the CSAS 2010 report, not from the more detailed report by Sue.

Q All right. Will you agree with me, though, that DFO is keeping current and keeps on top of modelling approaches and is using the best model available for pre-season work for the year that they're doing it?

A Yes.

MR. TAYLOR: Mr. Commissioner, do you want me to stop for the break now or continue on?

THE COMMISSIONER: No, that's fine. You can carry on.

MR. TAYLOR: All right.

Q If I may, and I think this will be the last document I need to take you to, Mr. English, go to Tab 6, if we may, of Canada's list.

THE REGISTRAR: Mr. Taylor, did you wish to mark that last document?

THE COMMISSIONER: I think it's marked, is it not?

MR. TAYLOR: The Sue Grant paper, which I'm going to give the formal name, is Exhibit 352, and that would be the CSAS paper Pre-Season Run Size Forecast for Fraser River Sockeye 2010 by Sue Grant and others.

Q If we go to Tab 6 of Canada's documents, this is a paper from I'm not sure what year at the moment but we may find it as we go along, written by MacDonald, Patterson, Hague and Guthrie. Are you familiar with those authors?

A Yes.

Q And they're reputable scientists in Fisheries, are they?

A Most certainly.

Q Pardon me?

A I say most certainly.

Q All right. I thought you said "most of them". Now, I want to go through some of the -- not all of them but just a couple of passages on this first page here. This is a paper, "Modeling the Influence of Environmental Factors on Spawning Migration Mortality for Sockeye Salmon Fisheries Management in the Fraser River". You'll see on the first page there in the body of the paper, not in the abstract, in the first paragraph halfway through that paragraph, there's a sentence

beginning "Therefore". And it says:

> Therefore, maintaining spawning populations may depend on our ability to provide a quantitative link between environmental factors and measures affecting productivity, including abundance, fish condition, migration success and spawning success.

And there's some citations. Do you agree with that statement?

A Yes.

Q And then in the next paragraph, it says:

> Fisheries management has become more precautionary in recent years, in part because fish abundance has declined and uncertainties in forecasts of abundance are increasingly being recognized.

What I'm interested in asking if you agree with is that part of the sentence that says "uncertainties in forecasts of abundance are increasingly being recognized".

A Definitely, yes.

Q And then one more passage in this same paragraph in the right column, about a third down that column, there's a sentence that begins "Given large". Do you see that sentence?

A Yes.

Q

> Given large uncertainties in environmental effects on population productivity, rigorous model selection procedures are essential when evaluating empirical relationships and identifying predictive models.

Do you agree with that statement?

A Yes.

MR. TAYLOR: As far as I know, this document is not yet an exhibit and I'd ask that it be the next exhibit.

THE REGISTRAR: Exhibit 725.

> EXHIBIT 725: Modeling the Influence of Environmental Factors on Spawning Migration Mortality for Sockeye Salmon Fisheries

Management in the Fraser River, British Columbia

MR. TAYLOR:

Q Now, I want to ask you some questions about the TAM rule, if I may, Mr. English. DFO uses total allowable mortality, or TAM, in setting spawning escapement targets. As I understand it, you suggest that escapement goals for each run timing group are the route to go; is that right? You're not keen on the TAM rule; you'd rather have what you refer to as escapement goals?

A I think it's not an either/or in my mind. It's I think we need to have defined escapement goals. You also need to figure out how you're going to get there and the way you get there may be from using rules that come out of things like the TAM rule. But you need an escapement goal. You need to know what you're striving for.

Q All right. So do I take it then that you're accepting of, and maybe you'll go so far as to be in favour of, TAM, but you're wanting something more. Is that what you're saying?

A Definitely wanting something more explicit with regard to what the target is, what the escapement goal is. And I think that there are issues associated with the TAM rules that may be resolved as the governments and other parties set these lower and upper benchmarks that are a requirement under the Wild Salmon Policy. But the types of relationships between run size and exploitation rate that the TAM rules is mostly related to are ones that can be effective at getting to ultimate goal of specific escapement for specific stock, as long as that goal is defined.

Q All right. You're familiar, are you, with a term that's been called the "cutback point" and there's a graph that that is visually displayed on. I don't have it right at my fingertips but do you know the --

A It's in page 104 in our report. So if you looked at that, it should have that.

Q Okay. Let's go there. Yes, that's the one. Now, that aims, as I understand it, to provide a structure within which fisheries managers can plan and apply the TAM rules to account for what's happening in-season. Have I got that right?

A Yeah, it relates the run size to a specific TAM estimate, or total allowable mortality, rate.
Q And it, in turn, is then allowing them to decide what fishing to allow by reference to what is appropriate or what's needed in order to allow for proper escapement, right?
A Yeah. Yeah, that's the idea.
Q And does that not achieve what you have been speaking of when you refer to escapement goals?
A Not necessarily. Because the escapement goal is not defined by this graph. It defines what you are going to do in terms of allowing harvest at a variable run size.
Q Aren't we really talking about the same thing coming at it from two different angles? Isn't what you would allow by way of harvest or not allow really the same thing as having an escapement goal because it's the reverse side, if you like? The structure or the chart that you see here is saying when to stop harvest, which does have the effect of allowing escapement to occur.
A Yeah, if you were managing perfectly and obtained a specific harvest rate that you were targeting for that run, it will tell you what escapement would occur if you do that. It doesn't tell you what your goal is. It just tells you what the escapement will be.
Q All right. Summing up then, as I understand what you're saying and I invite you to comment on this, you are in agreement with the approach that's taken insofar as the TAM rule exists and is applied but you would like to see in addition to that, and as part of the equation, a goal so you know your end game, if you like?
A That's correct, yes.
Q All right. So in other words, you're proposing to add something to what's already there?
A Yeah.
Q You're not tearing anything down and rebuilding?
A Yeah, that's right. And to use a sports analogy, which might be easier, you know, you want to know where that goal line is. That's the thing you've got to cross at the end of the day. You don't want it to be constantly shifting.
Q All right. Do you agree with me that the TAM rule allows for there to be a proper account taken of less productive stocks and gives the ability to

protect those less productive stocks?
A Yeah, where you put these particular cutback points and no-fishing points will provide greater or less protection for the non-target stocks.
Q And you've spoken to some of this already but where you have those less productive stocks running with more productive stocks, applying the TAM rule is going to have the effect of cutting back on fishing for all stocks, right, because of the nature of what you have, that is, you've got mixed stock runs?
A Well, that's going to be taken into consideration presumably when the people define these points. The TAM rule will tell you where the no-fishing point is and whether it's completely no fishing or a minimum harvest level, which is what it's evolving to now because there are fisheries -- an expectation that there will be some level of harvest even at low stock sizes due to overlaps. It's important to note that the TAM rules are defined by run timing groups and the run timing groups are not completely distinct. So you have issues with overlap between the run timing groups but then you also have to define at what point you believe it is safe to have your maximum exploitation rate. And depending on what those numbers are, we'll provide more or less protection for the less productive stocks.
Q One of the effects of all of this, though, is that, in protecting the less productive stocks, you're going to be cutting back to a great extent on stocks that are more productive that are running with the less productive stocks?
A Yes, you're going to have a lower exploitation on those that could, in theory, handle a higher exploitation.
Q And that's a trade-off, if you like, that has to be made in order to favour conservation?
A Yeah.
Q Now, you'll be asked questions by others after me that will come at all of this from a different angle, I'm sure, and we can all see the controversy that can rise up in some quarters over this, but it really comes down to putting conservation of stocks ahead of individual fishing and economic opportunity or the other way around, doesn't it, when you're dealing with the Fraser?

A Yeah, in any river. Fraser's not unique.
Q Well, the Fraser has added complexity in part because of the mixed stock runs, doesn't it?
A Well, I think there's no fishery that I'm aware of in B.C. that doesn't have some degree of mixture. There's ones that have -- none that have as complex as the Fraser but whether it's the Skeena, Nass or Barkley Sound, they all have a mixture of stocks that are being harvested, just fewer numbers in some cases. Like Barkley Sound doesn't have as many sockeye populations as the Fraser for sure, or even the Skeena.
Q One of your criticisms, as I read your paper, of the TAM rule, is that it's hard to communicate and, therefore, something clearer should exist?
A Yes.
Q Have I read your paper right?
A That's correct.
Q But you'll agree with me, will you, that the fact that something is hard to communicate is not a reason to not do it, if it's the right thing to do?
A No, just it makes it complicated doesn't mean you shouldn't do stuff but you should find a way of communicating very clearly what your goals are so that people understand what the goals are and then explain how -- well, I view the TAM rule as a means to an end. The end is what I need to have defined.
Q All right. That's a fine way of putting it. Thank you. Do you agree with me that the methodology used in the TAM rule is a sound one?
A It's very reasonable, yes.
Q You're shifting onto en route loss. Your report, as I read it, could be read as equating en route loss with en route mortality. But whether I've read it right or not, will you agree with me that such things as measurement errors and biases, for example, Mission, and you've talked some of Mission, can contribute to what's included in this term, "en route loss"?
A Definitely. And where it's actually referred to in our paper, it relates it directly to the difference between the estimates of escapement past Mission and spawning grounds.
Q All right. But you agree that en route loss is more than just fish dying?

A That's correct, yes.
Q Now, I'd like to turn to Bristol Bay and the work there vis-à-vis the Fraser. And I realize this is not a part of the report that you wrote but you clearly have good knowledge of what's there. And the report compares in contrast as the approach in Bristol Bay with the Fraser situation. And you've spoken to differences between the two and you've spoken to the greater complexity that exists on the Fraser. But I'd like to drill down a bit and just be sure and see if we can get clarity on some of these differences. And I thank you for what you've said already. But I'm going to try and list them out and see if I've got it right.
So I'm going to go through it, item-by-item, if you like, and there's maybe ten or so of these, comparing the Fraser to Bristol Bay. The Fraser fishery is, in part, an international fishery that's governed by the international treaty and the Fraser panel that you spoke of. And Fisheries, as a department, is constrained in what it can do by reference to the treaty versus Bristol Bay where, as you've described, the area biologists are given preliminary authority really to manage their area, as they decide best.
A Yes.
Q So the difference being there is international aspects with an international treaty on the Fraser and constraints that come from that versus no constraints up at Bristol Bay?
A Yeah, no international constraints in Bristol Bay, correct.
Q And in terms of the geography and what the fish have to do, on the Fraser, they travel a very long distance towards the Fraser and then a very long distance in the Fraser versus Bristol Bay where they don't actually travel too far by comparison to get to the mouth or the river and they don't travel very far in the river, do they?
A Well, the travel to the river, it may not be that -- they don't go maybe as far physically but they're coming from rearing areas in the northeast Pacific and the Bering Sea and then into Bristol Bay. It's just that there aren't a lot of fisheries along those routes that are intercepting them.
Q All right. Well, just focusing on that for the

moment, that is another difference, isn't it, that there are no interception fisheries with regard to Bristol Bay but there are with the Fraser?
A Yeah, they're really small associated with Bristol Bay, as opposed to the Fraser.
Q But back to the distance, when you look at the map, you can see that the Bristol Bay sockeye travel to the river, maybe a third at most the distance that the Fraser sockeye travel when they're coming from the Gulf of Alaska?
A Yeah, assuming they're all rearing in the same place. If you look at the distribution of Bristol Bay sockeye in the northeast Pacific, it could be very much different than Fraser sockeye and it could be coming from areas much farther west than where the Fraser sockeye arrived from.
Q All right.
A But my knowledge on those distribution is limited.
Q All right. And you've spoken to this next point but on the Fraser you've got all the stocks going into one river whereas up at Bristol Bay each stock feeds into its own river; there's nine in total?
A Yeah, there's a number of stocks. The way it's managed is for these nine major populations. There could be sub-components of those and there no doubt are different lakes. So if you looked at it from the point view how we define CUs, conservation units, for sockeye, there could be multiple ones within one of those particular river systems because there's multiple lakes.
Q All right. But the fundamental difference being, though, you've got one or a few stocks going into each of the nine rivers up at Bristol Bay, as distinct from all stocks going into one river with the Fraser?
A Yeah.
Q Now, this next point, I think is one you haven't spoken to so far but there's many different gear type associated with fishing Fraser sockeye and different user groups as well. As I understand it, though, up by Bristol Bay, there's only two gear type and I think you reference this in your report --
A Yes.
Q -- although I don't think it came out in the evidence this morning but have I got it right,

there's only two gear type up there?
A That's correct.
Q And on the Fraser, there's many First Nations. I don't know the number exactly but there's well over a hundred, whereas in Bristol Bay area, there's very few First Nations that are doing fishing, as I understand it?
A There are some that harvest both in the -- participate in the marine fisheries, in the district fisheries and also in the subsistent fisheries in-river but nowhere near to the same portion of the catch as it can be in the Fraser.
Q And the total catch, and you said this, this morning, I think, and it's in your paper, the total catch by First Nations in Bristol Bay is less than 1 percent of the total?
A Yeah, that includes subsistence fishing and sport fishing. Subsistence fishing is not necessarily all First Nations in Alaska.
Q Yes, as I understand it, and see if I've got this right, subsistence fishing in Alaska is anyone, whether you're First Nation or non-First Nation; is that right?
A That's correct, yes.
Q And another difference --
THE COMMISSIONER: Mr. Taylor, in keeping with your sports theme, could I call a timeout?
MR. TAYLOR: Sure.
THE REGISTRAR: The hearing will now recess for 15 minutes.
THE COMMISSIONER: I think it's ten, Mr. Registrar.
THE REGISTRAR: Ten minutes.

(PROCEEDINGS ADJOURNED FOR AFTERNOON RECESS)
(PROCEEDINGS RECONVENED)

THE REGISTRAR: The hearing is now resumed.

CROSS-EXAMINATION BY MR. TAYLOR, continuing:

Q Still with Bristol Bay, Mr. English, there's a number of other differences, but I think a lot of them are covered in the paper and people will eventually make submissions on them. I'm only going to go to, as a final point on this, some differences that bear on en route loss, as I understand it, differences between the Fraser and

Bristol Bay. You've got warmer river temperatures on the Fraser system, and that's not a factor in Bristol Bay, is it?
A No, it's not been to date, anyway.
Q All right. And you've got a lot of in-river fisheries in the Fraser, but you don't at Bristol Bay, do you?
A No, we don't.
Q And you just have to look at the map, but you've got a much longer freshwater migration on the Fraser system than you do in any of the nine Bristol Bay rivers, correct?
A Yes. For some of the stocks some have a short migration on the Fraser as well, but a lot of the bigger ones have long migrations.
Q Quite so. And the significance of that, and there's been some evidence about this, but from the point of hitting the freshwater in the Fraser or the rivers in Bristol Bay, the fish are on a mission to spawn and then die, correct?
A That's correct.
Q And the longer they have between entering that freshwater environment and getting to the spawning grounds and spawning, the more chance there is for parasites and any other problems to arise and cause them to die before they get to the spawning ground, correct?
A That's correct.
Q I just want to ask a couple of quick questions about tower counts, or the use of towers. That's done in Bristol Bay. As I understand it, and you alluded to this, it's literally a tower that someone stands at the top of and counts the fish?
A Yes.
Q And they use a clicker that you would see traffic monitors and so forth use, do they?
A I think some form of keeping track of the numbers that go by.
Q Now, as I understand it up on the Bristol Bay -- firstly, these towers are at the mouth -- or near the mouths of the river, aren't they?
A They've very low down, yes. Wherever they can find the right substrate stream with not too much depth so that they can have a good vision into the water column.
Q All right. And as I understand it, where the towers are the water's shallow and the water's

clear, is that right?
A That's the idea, yeah.
Q And that's quite not what the Fraser is?
A The Lower Fraser doesn't look at all like that, no.
Q You can't see a fish in the Fraser like you can up at Bristol Bay?
A You couldn't see your hand if your elbow was at the surface.
Q All right. And you allude to this at page 168 of your paper, and I won't take you to it in the interest of time, but do you agree with me that Bristol Bay can afford to have a fixed escapement approach because the variability year to year is much less -- far less than on the Fraser?
A Yes, much less variability in returns for the different stocks.
Q Now, one thing that I think we haven't spoken of already is to do with the co-position of the age of fish returning up at Bristol Bay. You know who Mike Lapointe is, chief biologist at PSC, correct?
A Yes, I know Mike.
Q He gave evidence earlier, and specifically on January 19th, and we don't need to go to this, but he gave evidence about key biological, geographical and fisheries management's decisions and the differences in comparing them as between Bristol Bay and the Fraser, and he cited that a key fundamental difference is the fact that the portfolio of Bristol Bay sockeye are composed of fish that return at various ages, not just the mostly four-year-olds that come with the Fraser sockeye, and he said that's a key reason why Bristol Bay sockeye returns are more robust and less variable than the Fraser. Do you agree with him on that?
A Yeah, I think looking at Bristol Bay as a total unit and Fraser as a total unit, that's the reason. If you look within Bristol Bay at specific populations -- I want to make it clear from my previous statement that it's less variable. There's actually more variability within individual populations over a number of years because of the size of the populations in Bristol Bay. You could get from a few -- very few million up to 25 million returns from a single one of these districts.

Q All right. A couple of quick questions about the Mission hydroacoustics monitoring. You're familiar with the operation there, are you, that the Pacific Salmon Commission runs?
A Yes, I am.
Q And while location, location, location can be everything and it is a good location in terms of its position on the map as a geographic layout in the shape of the river basin, it's not very good for hydroacoustics, is it?
A No, that's what the hydroacoustics people have determined through a number of reviews that I've read.
Q All right. And does that underline, in your mind, the need for ever improving the technology that's there as new technology becomes available?
A Yes, and that's what I understand they're doing with using more DIDSON systems, a different type of acoustic system than what they've been using in the past.
Q All right. And does it also lead to the need for other means of estimating in-season? In other words, to support Mission because Mission, itself, notoriously has got bias in it, high or low, or other errors?
A Yeah, so your choice is either put together something that's going to replace Mission, be better than Mission, or put in a secondary system, like has been done at Qualark, to help crosscheck Mission.
Q All right. But anywhere near Mission is going to have the same kind of river basin-shaped problems that Mission has, isn't it?
A Yeah, you're not going to find any better site for acoustics, probably, in the Mission area, than the one at the current site.
Q Do you also agree with me that it underlines the need for having pre-season forecasting in place to assist with crosschecking, if I could put it that way?
A I don't think they're using the pre-season forecast to crosscheck Mission or the test fishery results, because there's more confidence that the test fisheries combined with -- even with the problems at Mission, there's more confidence, at least early in the run, prior to the arrival of late-run fish, there's more confidence that

they're going to get closer to the actual returns by doing the in-season test fisheries than they will by relying on pre-season forecasts.

Q All right. And almost finally, I want to take you to your recommendations and specifically recommendation 3, and your recommendation there - this is on page 173 - your recommendation there is that:

> The analytical resources currently allocated to preparing pre-season forecasts should be re-allocated to defining a clear set of escapement goals and in-season management models that will assist managers in fisheries planning and the achievement of these goals.

Now, I'd like to, in light of what you've said in evidence so far, ask if you would consider amending that because, as I understand you, you're not saying to shut down pre-season forecasting, you've got some questions about it, but you see it as a valuable tool, and yet you recommended that it be stopped?

A Yeah, it was probably a mistake not to say "some" of the analytical resources, as opposed to "all".

Q All right.

A Yeah.

Q So you're not proposing to shut it down, you're simply questioning how much?

A Yeah, it's on a priority basis. The other ones would have as high or higher priority and there may be ways of doing it simpler so that we can use these limited DFO resources and limited people who have these capabilities to -- and Sue Grant, by the way, was the person who prepared the initial submission last fall on setting benchmarks, she and a bunch of others working with her, for Fraser sockeye. So obviously you're relying on the same people for multiple tasks.

Q Yes, and I think you're alluding to a paper that has been talked about here that's upcoming in publication, but not yet.

With that, and my final questions, if, in fact, the amount of resources put into pre-season forecasting is fairly modest in the scheme of things, then that would bode for leaving that in

place because pre-season forecasting is useful, you wouldn't cut it back to zero, and if it's already modest there wouldn't be much need or room to cut it back then --

A Yeah.

Q -- would you agree with me on that?

A Yeah, if it doesn't amount to much. You're not gaining a lot by stopping it.

MR. TAYLOR: Exactly. Thank you, Mr. English.

A Sure.

MS. BAKER: Thank you. Mr. Commissioner. The next questioner will be Mr. Leadem for the Conservation Coalition.

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

CROSS-EXAMINATION BY MR. LEADEM:

Q I'd like to focus predominantly on your recommendations, Mr. English, and I will ask Mr. Lunn to bring up pages 173 and 174, if he could.

The first one I'd like to begin with is actually number 6, in which you advocate that escapement goals be put into place for each indicator stock and run-timing group. And then you go on to suggest that there should be at least two different lower benchmarks and two upper benchmarks for each cyclic stock.

So what I'm trying to understand is why you would have the benchmarks -- why you would have two benchmarks. Is that only because the cyclical stock would be that in the good year you would want that to be a different one than it would be in an off year; is that what you're driving at there?

A Yes. Yes.

Q And I noted that there is some discussion in some of the recommendations that were critiqued by Dr. Sean Cox about this concept, and maybe I can just take you there.

A Sure.

MR. LEADEM: If we could have Appendix M? and I believe the comments from Dr. Sean Cox would be found at M-32, Mr. Lunn.

Q Now, firstly, you are aware that Dr. Sean Cox is a professor at Simon Fraser University; is that correct?

A Yes, that's correct.
Q And he is a professor in the Fisheries Science and Management Department at SFU; is that not right?
A That's correct.
Q And his focus is primarily on aquatic conservation and management of human impacts on aquatic ecosystems; are you aware of that?
A Yes.
Q So he says, there, that:

> I agree that having a clear set of easily understood operating rules would benefit everyone involved in Fraser River sockeye fisheries, including harvesters. However, the authors could be more specific about what they mean and what potential consequences might follow from their recommendations. For example, (1) do they mean stock-specific, fixed escapement goals? (2) how well could those be determined? (3) how would 19 stock-specific escapement goals make it easier to manage fisheries given that many stocks will sometimes have returns below these goals?

All of which I think are very excellent questions. And then you go on to provide an answer to those comments and the critiques of Dr. Cox, and this is where I'm a little bit confused and perhaps you can help me. You say:

> What we are suggesting is similar to what is proposed under the [Wild Salmon Policy].

So let me just stop you there. Obviously, you're quite familiar with the Wild Salmon Policy and what it says in terms of establishing benchmarks, lower benchmarks, upper benchmarks, for each of the conservation units; is that correct?
A That's correct. Yes.
Q And so you go on to say:

> We are recommending that a Limit Reference Point (LRP) and Target Reference Point (TRP) be defined by cycle year for each indicator stock.

So let me just stop there, because I've seen these

terms before, LRPs and TRPs. They arise in the context of MSC certification, do they not?
A That's correct. Yes.
Q And limit reference points are points at which there's absolutely no fishing occurs. Is that your understanding of what an LRP dictates or how it's to be interpreted?
A Well, the way it's proposed to be used is that as you approach a limit reference point you start severely curtailing fisheries. If you have runs below that, then you would not have fisheries.
Q Right. And so are you equating, then, limit reference points, as they're understood in the MSC process, to lower benchmarks as they're understood in the Wild Salmon Policy and as they are defined for conservation units?
A Yeah, that's -- they could be interpreted that way and that could be a proposal to -- depending on how the lower benchmarks were defined, they could be -- meet the criteria for a limit reference point as defined by MSC.
Q Right. And you're quite familiar with the MSC process, are you not, because you were one of the scientists that was involved in the certification process for Fraser River sockeye, were you not?
A I was, and I'm more familiar than I want to be.
Q All right. I take it by your answer that it was a quite arduous process, was it not?
A It was very involved. It took over 10 years to get to where we are today, and it's not done yet, because it keeps on going. It's one of those nightmares you keep having again and again.
Q Well, let's hope that we don't have that nightmare by some of the things that we're going into in the context of this inquiry, although we seem to be repeating patterns of looking at Fraser River sockeye time and time again from -- based upon other inquiries that preceded this one. You're aware of that, are you not?
A Yeah. No, there's been lots of these.
Q So what I'm curious about, and this is what's driving me, is how are we going to meld the Wild Salmon Policy and the conservation units into what we see in the existing structure with 19 indicator stocks, and these are the 19 indicator stocks that DFO has defined; is that correct?
A Yes.

Q And we know, for example, that if we look at some of the conservation units that have been defined in the Wild Salmon Policy, at least so far, appears to be anywhere in the range of something like -- I'll have to approximate it, because no one has ever actually come and said there are a definite number of conservation units, but it seems to be around 30 or so. Does that accord with your understanding as well?

A Yeah, there are 25 conservation units that are very clear. There is a number of others that there's an ongoing debate about whether they qualify as conservation units, depending on who you talk with, and there could be up to 36, as I'm aware of, as the largest number for conservation units for Fraser sockeye.

Q Right. So if you were to actually take your answer there in order to be more accurate, even though we only have the 19 indicator stocks, we really should be focusing upon the actual number of conservation units that are finely defined in the work that's being done by Sue Grant and Carrie Holt and others; is that fair to say?

A Well, the focus for setting goals should be one that's based on available information, and there's not much point in pulling a goal out of mid air, because it doesn't do anybody any good to do that. So the stocks where we have good, reliable information are obviously the first place to start in setting these goals.

And so what I'm recommending here, and I've said it earlier today, that the key is to find the goals. These limit and target reference points might refer to those goals, in fact, in some places limit reference points are defined in terms of your ultimate goal, your -- and target reference points might be the escapement goal.

The reason why I use these terms is because there's a link to a process which is underway through MSC certification and it's approach that has been proposed not just for salmon fisheries but for a variety of fisheries across the world, is specifically stating what your goals are and identifying the point when you are going to, you know, say, "Okay, at this point we're not going to have fisheries."

Q Right. And that's what I think everyone in this

room is concerned about is some certainly about when can harvesters actually go out and fish and when can they not.

A Mm-hmm.

Q And from the perspective of my clients, who are conservationists, they want to know when the fish will be saved, when, in other words, when conservation will be the superseding factor, and when will harvesting be allowed to occur. I think all of us are striving for that.

So can you help us to see how we can arrive at that point? Is there a methodology that you are proposing here, or elsewhere, that would allow us to get to a stage where everyone in this room, with their disparate interests, would be able to focus upon a finite point and say, "Okay, we're fine with fishing after this point, but if it goes below that point we're not fine with it"?

A Mm-hmm.

Q Can you help us see how we can arrive there?

A I think the problem you referred to at the beginning was that we have multiple stocks and so we have multiple goals, not just one goal we're striving for, for the entire Fraser. But the first place to start is with the information we have on our 19 well-assessed and monitored for a long time period stocks. So define the goals for those very clearly. They're all part of one or another, one of the run-timing groups, so you're going to have to pull those goals together for a specific run-timing group and say, "This is how, when we're managing these stocks together, as long as we have fisheries like we have today, mixed stock fisheries, we're going to have to deal with these multiple goals from within a timing group."

And that's the level where you'll have to deal with the trade-off question of you have a goal which says where you want to be. How fast you are going to get there, how strict your fisheries regulations are to protect the fish from harvest will determine the time period it takes you to go from where you are today, which, you know, a number of these stocks that are below what a reasonable goal might be, so you have to increase them, and the speed, so as determined by how strict your fisheries regulations are, but also on productivity, which you've heard a lot

about, about how productive the stocks are, how many return in a given year. So if you have a really strong return on one of these populations, then, you know, backing off and not harvesting a lot of it will get you to your goal faster because you've got a lot of fish.

In a low abundance year, you could back off for a long, long time, or low abundance, low productivity, and you may not get any closer to your goal.

Q Well, one of the solutions to the dilemma that we all are facing, now, would be to somehow try to segregate out the units of concern, the conservation units that are in that red zone or that are endangered or whatever language you may wish to use, trying to segregate those out in some fashion from the actual conservation units that can be harvested and will come back and are sustainable. Isn't that one potential solution to the dilemma that we're in?

A Yeah, definitely looking for opportunities where you have a surplus, if you like, a number of fish that can be harvested of a specific stock, that where you can harvest those fish without impacting the other ones you're trying to protect.

Q Right. Because if we stick with the mixed stock fishery that we have now, we're going to end up not making anybody happy, because the conservationists are not going to be happy because the conservation units are going to decline, Cultus Lake and other units are going to decline, because there will be incidental catches of those conservation units. And on the other hand, the commercial fisheries are not going to be very happy, because they're not allowed to fish those stocks that are sustainable.

So really what we're after is finding some solution to this dilemma, and I can't see how we can continue with the same model of fishery that we've been espousing for decades now and come up with a solution. Am I just completely off base with my reasoning and logic here?

A You're correct in that you can't keep doing the same thing and hoping for a different result. I think that's the definition of insanity, right? So, you know, clearly you have to make some changes to how we execute the fisheries in order

to get to these goals. But right now, in this point in time, we don't even have the goals defined. And this is a fundamental problem. It's not to say that nobody has a goal or nobody has some idea of what we're striving for, but we haven't explicitly defined these goals for these populations.

Q All right. So that's a starting point?

A Yeah.

MR. LEADEM: Well, this, Mr. Commissioner, since I don't think you don't want to go into overtime, is probably the end point for today.

THE COMMISSIONER: Maybe we could just take a minute, Mr. Leadem, to follow up on that last answer, and it might help me, and I'm sure it will help others. I'm still not sure I understand what you mean by "defining goals". I know what goals are. For example, let's say in a corporate setting your company wishes to generate five million dollars in revenue, that's your goal, next year, or in 2011. So you can take action as best you can to achieve that goal.

But your report and the evidence of others has brought home to us the complexity of this fishery, both the human dynamic involved as well as the natural dynamic involved. So when you say "setting goals" I may be the only one in the room, sir, that doesn't understand what you're talking about in that limited area; in other words, being able to set a goal for a CU in terms of its sustainability, what we want to get to, versus reacting to nature and how it plays out in terms of the abundance of the fish, as well as all of the human dynamics that are involved in this fishery, be it those who harvest the resource or those who perhaps, through their conduct on the land or in the water, have an impact on the resource.

So if you could just explain to me what you mean by, I think you said, "We have to make changes to the model, but we have to explicitly define the goals," I'm not sure what you mean.

A In the case of sockeye, and in other salmon species, there are numbers of spawners that we would like to see in the spawning grounds for specific stock, and in the case of sockeye, it could be because there's an estimate of a rearing

capacity for a lake. So the lake will support so many juvenile sockeye. And so we'll look at the spawning grounds around the lake and say, "Okay, if we look at average egg to," or, "survivorship from adults to fry, and this many adults will produce this many fry that will then go into the lake," and that will fully seed that habitat.

And if that's the goal, is to fully seed the habitat, taking into consideration the other species that may also occupy that habitat, that could be the goal we're talking about here. We want to see this habitat fully seeded, because then it'll produce the maximum amount of fish that that particular lake can produce. Those fish will still be vulnerable to survivorship once they leave the lake, and also within the lake, but, you know, we'll seed the habitat, like a farmer seeding his completing field and not just half of it, and then those fish go out and rear and come back from the ocean and presumably, if we've done a good job of putting the right number of fish on the spawning grounds, we'll get a better return so there'll be more opportunities for harvest.

And how you manage the harvest is in terms of how you distribute it. How you have the trade-offs between the productive stocks and the non-productive stocks is the second challenge once you have the fish coming back.

And you define them as goals because you're saying, "For each of these populations, this is where we'd like to be." So what actions are you prepared to take to get there?

And some populations there may be some cold, hard facts that where this may be where we'd like to be but we can never get there because -- or we can't get there in the current regime because there's just not enough survivorship. So that's where you may have to step in and take other actions, like is being done at Cultus, where you have an enhancement, other habit alterations, predator removal, you know, you have to take other actions to give the fish a better chance at coming back to what your goal is.

THE COMMISSIONER: And do I understand you to be saying to me and to the participants that at the present time within the structure of the management of the sockeye fishery in the Fraser, that model that

you've just described is not used?
A Yeah, it's not explicitly stated that these are the escapement goals for each of these populations.
THE COMMISSIONER: You may have a follow-up to that, Mr. Leadem. I'm content to wait a few minutes if you'd like to just follow up to that.
MR. LEADEM: Well, I do have one follow-up question to that.
Q When you used the terminology "escapement goals", I just want to make clear in my mind that, are you equating that with the setting of benchmarks and the setting of limit reference points and target reference points? Are you defining that in the same way?
A Well, it's most similar to a target reference point. It's where you want to be with a particular stock. A limit reference point is going to be at a point much less than your goal in most places, because you recognize that you're not going to get immediately to your goal on every population, and for social reasons you don't want to curtail fisheries entirely until you've reached the goal. The goal is just like in the corporate sense, you know, it's something you strive for over time. You're not instantaneously expecting you're going to achieve your goal.
MR. LEADEM: Thank you, Mr. Commissioner.
THE COMMISSIONER: Thank you very much.
THE REGISTRAR: The hearing is now adjourned for the day and will resume at ten o'clock tomorrow morning.

(PROCEEDINGS ADJOURNED AT 4:07 P.M. UNTIL FRIDAY, APRIL 15, 2011, AT 10:00 A.M.)

I HEREBY CERTIFY the foregoing to be a true and accurate transcript of the evidence recorded on a sound recording

apparatus, transcribed to the best of my skill and ability, and in accordance with applicable standards.

Pat Neumann

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

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.

Karen Hefferland