

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



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

Public Hearings

Audience publique

Commissioner

L'Honorable juge /
The Honourable Justice
Bruce Cohen

Commissaire

Held at:

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

Monday, February 7, 2011

Tenue à :

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

le lundi 7 février 2011

APPEARANCES / COMPARUTIONS

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

APPEARANCES / COMPARUTIONS, cont'd.

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

APPEARANCES / COMPARUTIONS, cont'd.

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

TABLE OF CONTENTS / TABLE DES MATIÈRES

	PAGE
AL CASS	
In chief by Ms. Baker	1
PANEL NO. 17	
AL CASS, recalled	34
In chief by Ms. Baker	38/41/46/48/50/58/62/65/73/80/82/85/86
Cross-exam by Mr. Taylor (CAN)	87/90/91/95
ROB MORLEY, recalled	34
In chief by Ms. Baker	34/40/45/48/49/52/54/59/63/66/68/78
	83/85
Cross-exam by Mr. Taylor (CAN)	89/90/94
MICHAEL STALEY, Sworn	34
In chief by Ms. Baker	35/42/44/47/49/53/56/63/67/73/75/76
	80/84/85
Cross-exam by Mr. Taylor (CAN)	88/91/93/99
KEN WILSON, Sworn	34
In chief by Ms. Baker	36/41/43/46/49/51/58/61/66/72/75/77
	79/83/85
Cross-exam by Mr. Taylor (CAN)	89/93/98

EXHIBITS / PIECES

<u>No.</u>	<u>Description</u>	<u>Page</u>
394	<i>Curriculum vitae</i> of Al Cass	2
395	Fraser River Sockeye Management and Enhancement Plan Summary Report prepared by Fraser River Sockeye Task Force for Area Planning Committee, December 1988	3
396	Cass, Folkes et al - Methods for Assessing Harvest Rules for FRSSI	11
397	Workshop to Assess Population Dynamics of Cyclic FRS and Implication for Management, Feb 7-8 2006	12
398	Collaborative Development of Escapement Strategies for Fraser River Sockeye - Summary Report 2003 to 2008	20
399	Updated Methods for Assessing Harvest Rules for Fraser River Sockeye Salmon - May 18, 2010	27
400	Fraser River Sockeye Spawning Initiative (FRSSI) - A review for the Cohen Commission by Michael Staley	36
401	<i>Curriculum vitae</i> of Michael Staley	36
402	<i>Curriculum vitae</i> of Ken Wilson	37
403	A Framework for Socio-Economic Analysis to Inform Integrated Fisheries Management Planning and Fish Harvest Decisions	72

1
Al Cass
In chief by Ms. Baker

Vancouver, B.C. /Vancouver
(C.-B.)
February 7, 2011/le 7 fevrier
2011

6 THE REGISTRAR: Hearing is resumed.

7 MS. BAKER: Thank you, Mr. Commissioner. Today we will
8 be dealing with the Fraser River Sockeye Spawning
9 Initiative, also known as FRSSI in these
10 proceedings. My plan is to begin the day with Mr.
11 Al Cass, who you've met before in this hearing and
12 then have him cover the background for the
13 development of the model and then have him join --
14 be joined with -- by a few other people. We're
15 going to have him joined by Rob Morley, Mike
16 Staley and Ken Wilson and then I'll complete my
17 direct evidence with that panel in the stand and
18 then once I've completed that, we'll open it for
19 cross-examination. So that's the plan for today.
20 I guess we can just reconfirm his oath.

21 THE COMMISSIONER: Mr. Cass, you've been in before, so
22 your oath is still in effect.

24 AL CASS, resumed.

26 EXAMINATION IN CHIEF BY MS. BAKER:

28 Q And I understand that when Mr. Cass was here
29 before, his c.v. was not marked, so I wish to
30 probably just do that for consistency, so his c.v.
31 is in Tab 7 of the binder before you, Mr. Cass, if
32 that's helpful, and it's CAN185914. This is your
33 c.v. that you've provided to us; is that right?
34 Can you turn your mike on? Thank you.

35 A Yes, that's correct.

36 Q And bring it -- thank you. And it's -- you do
37 need to speak quite close to the mike, so...

38 All right. And just to recap, you have a
39 Master's of Science in Environment and Management
40 from Royal Roads University?

41 A That's correct.

42 Q And you have been a research scientist with -- a
43 research biologist with the Department of
44 Fisheries and Oceans from '77 to -- well, probably
45 you're still considered to be a research
46 biologist, but you certainly had --

47 A Seems like a long time ago, but that's correct.

February 7, 2011

2
Al Cass
In chief by Ms. Baker

1 Q Had that title from '77 to '85 and since '85 to
2 '82 you were the head of assessment and
3 forecasting within stock assessment at the
4 department?

5 A That's correct, yes.

6 Q And 2002 to 2010 you've been the head of the
7 Centre for Science Advice Pacific and the chair of
8 the Pacific Science Advice Review Committee at
9 that Department of Fisheries and Oceans?

10 A That is correct.

11 Q Okay. So as you heard me outline for the
12 commissioner, what we want to do today is go
13 through some of the background for what's known as
14 the FRSSI model and just to recap, we've heard
15 from Mr. Grout and from Mr. Rosenberger and others
16 about how the FRSSI model is used in in-season
17 planning -- oh, sorry, your c.v. that I've just
18 reviewed with you, I need to mark that as an
19 exhibit.

20 THE REGISTRAR: Exhibit 394.

21

22 EXHIBIT 394: *Curriculum vitae* of Al Cass

23

24 MS. BAKER:

25 Q So we have heard from people so far in this
26 commission about the use of the FRSSI model. Just
27 to set some background, it's a tool that's used by
28 the department in setting escapement targets for
29 Fraser River sockeye; is that right?

30 A Yes, that's correct, Mr. Commissioner. It was
31 developed as a -- to help guide with some
32 consistent principles in an open method to advise
33 or at least allow managers to assess the
34 consequences of different alternative harvest
35 strategies.

36 Q Okay. So just before we get to the FRSSI model, I
37 think it's useful to just know where we came from
38 and I just want to ask if in '86 the -- when the
39 setting of escapement targets became the
40 responsibility of the department following the '85
41 treaty, were you involved in setting escapement
42 targets at that time?

43 A My capacity at that time was technical support for
44 a working team, Mr. Commissioner, that was
45 developing the so-called 1987 rebuilding plan.

46 Q And that rebuilding plan, was that a plan
47 developed to help the department set escapement

February 7, 2011

3
Al Cass
In chief by Ms. Baker

1 goals for Fraser River sockeye?

2 A The way I would -- that's correct. The way I
3 would characterize it is that it was an experiment
4 to test the production levels for the purpose of
5 increasing or at least assessing how much
6 production in terms of yield could be achieved
7 given the uncertainty at the time about what the
8 habitat capacity was and the productivity of
9 Fraser sockeye, so, yes.

10 Q All right. If you could turn to Tab 5 of the
11 binder before you, this is CAN185434. It's
12 described as a draft document December 19, 1988
13 but I understand this to be an outline of the 1987
14 rebuilding strategy; have you seen this before?

15 A Yes, that is correct.

16 Q And is it as I described?

17 A Yes.

18 MS. BAKER: Okay. Can I have that marked, please, as
19 the next exhibit?

20 THE REGISTRAR: Exhibit number 395.

21
22 EXHIBIT 395: Fraser River Sockeye Management
23 and Enhancement Plan Summary Report prepared
24 by Fraser River Sockeye Task Force for Area
25 Planning Committee, December 1988
26

27 MS. BAKER:

28 Q Thank you. Just -- there's a few terms that I
29 think might be useful for you to give us an
30 understanding of because they do come up again and
31 again during escapement planning and harvest
32 management planning. And I wonder if you could
33 just explain what the term "affixed escapement
34 strategy" or "affixed escapement policy" is?

35 A Affixed escapement strategy in theory is one of,
36 say, three classes of strategies, but it really
37 refers to a plan, a management plan, that allows a
38 fixed or constant number of spawners to reach the
39 spawning grounds in order to result in recruitment
40 and sustaining population. So it is a term that's
41 used to describe a particular management strategy
42 that puts the same number of spawners on the
43 spawning ground, Mr. Commissioner, year after
44 year.

45 Q And then the harvest would be anything in excess
46 of that fixed escapement goal?

47 A That's correct.

February 7, 2011

4
Al Cass
In chief by Ms. Baker

1 Q And then another term that we hear quite often is
2 a "fixed harvest rate"; can you explain what that
3 is, as well?

4 A A fixed harvest rate or exploitation rate is where
5 a fixed or constant removal rate of the abundance
6 of fish that is the target for fisheries, so for
7 example a 60 percent harvest rate would mean that
8 60 percent of the available fish would be removed
9 from a fishery and that would be -- allow some
10 sharing at that level. Sixty percent goes to
11 catch and 40 percent would then be the escapement
12 target. There are nuances of that which would
13 include for Fraser sockeye the management
14 adjustment, for example, for -- example for
15 accounting for environmental conditions in the
16 river, but fixed escapement and fixed exploitation
17 rate strategies are the two classic management
18 models, if you like, for managing fisheries.

19 Q Okay. Thank you. Now, the 1987 rebuilding
20 strategy, can you describe what that is and if
21 it's helpful to talk about fixed escapement or
22 fixed harvest rates in the context of that plan,
23 then please do so.

24 A Yes. Mr. Commissioner, the -- at the time in the
25 late or the mid-'80s with the signing of the
26 Salmon Treaty, there was added benefits to Canada
27 inferred by the treaty and so there was a process
28 at the time which had some buy-in from industry to
29 attempt to rebuild escapements and hence returns
30 on the Fraser to -- with the purpose of increasing
31 the returns and hence the yield. And this was
32 planned over a three- to four-generation period,
33 which is in terms of Fraser sockeye of 12 to 16
34 years, so from, say, '87 up to 2002, in that
35 range, this plan was in operation. And it
36 essentially developed a strategy for increasing
37 escapements at intervals over the rebuilding
38 period.

39 It was designed to reduce harvest rates that
40 were at the time in the order of 75 percent or
41 higher, to reduce harvest rates to 65, 75 percent
42 in that range, the minimum of 60, I believe, but
43 the notion was to, Mr. Commissioner, was to
44 increase escapements that was with interim goals
45 that were set for each of the cycle lines and the
46 goals were described as interim because there was
47 high uncertainty based on a couple of sources of

1 analyses. One was the estimates at the time of
2 spawning ground capacity, estimates at the time of
3 the rearing or in-lake capacity, if you like,
4 which were quite different. And so there was this
5 uncertainty about what exactly we may be able to
6 build to in order to increase production yield on
7 the system. And so there was escapements, interim
8 escapement goals set to reach the interim -- or an
9 attempt to reach the interim goals over the course
10 of 12 to 16 years or three to four cycles.

11 And so now that's the premise of the '87
12 rebuilding plan and at the time, there had been
13 fair success in rebuilding or increasing
14 escapements before the signing of the treaty and
15 going way back to, you know, post Hell's Gate
16 slide in 1913, the old International Pacific
17 Salmon Fishery Commission had increased
18 escapements and increased the returns of most of
19 the productive stocks, those stocks which
20 contributed to the main economic yield at the
21 time. So in 1987 or post-Pacific Salmon Treaty,
22 Canada, again with the benefit of receiving the
23 gains, invested in a rebuilding plan that, as I
24 said, was designed to increase escapements with
25 foregone catch in the early years, so that there
26 would be some economic loss certainly in the early
27 years of the plan and that with the hope of
28 achieving higher economic yields through
29 rebuilding and to assessing the factors that are
30 responsible for maintaining production on the
31 Fraser.

32 Now, so that was -- that was from the outset,
33 that was the intent of the plan, and so by the
34 time the mid-'90s rolled around, it was -- there
35 was indications that productivity was declining
36 and the plan as it was set at that time, Mr.
37 Commissioner, was therefore somewhat constrained
38 because of the -- one of the rules was to maintain
39 at a minimum the brood year escapement. In other
40 words, you wouldn't go below in a given year, you
41 wouldn't have a target that was designed to go
42 below the target, say, four years before and
43 otherwise it would have been a rebuilding
44 strategy.

45 But the intent was to, of course, take
46 advantage of those years where productivity was on
47 the rise and -- but then as I said starting in

1 around the mid-'90s when things started to slide,
2 there was concern amongst -- certainly amongst the
3 stakeholders who had invested in this rebuilding
4 plan, that things had gotten off the rails and
5 that the benefit that they were potentially would
6 have reaped had productivity not declined was in
7 their minds not to be realized. So that was sort
8 of where I would say, you know, in 2000, 2002,
9 with the decline and the loss of yield that was
10 not achieved, that's where rethinking about the
11 '87 plan started to take hold.

12 Q And do you know why the plan didn't work, why
13 there started to be a decline in the later years?

14 A Why there was a decline in --

15 Q Why the stocks --

16 A -- productivity?

17 Q -- didn't rebuild in the way that was anticipated
18 under the rebuilding strategy?

19 A Yeah. We didn't understand why it was declining.
20 I mean, there's a number of hypotheses that you
21 will hear or have heard throughout these
22 proceedings but, you know, the current thinking, I
23 guess, was that productivity was declining because
24 of changing environmental conditions, primarily in
25 the ocean and it was a natural occurrence and part
26 of fluctuating changes in productivity over time.
27 But in this particular case in the 1990s, it
28 turned out to be a rather persistent decline.

29 Q And during that timeframe, the 1987 rebuilding
30 strategy, did the escapement targets that were set
31 using that policy or that rebuilding strategy, did
32 those targets take into account cyclic dominance
33 of Fraser River stocks?

34 A There was, as part of the design of the rebuilding
35 plan, the population dynamics, the models at the
36 time that were designed to attempt to represent
37 the population dynamics of Fraser sockeye had
38 taken into account or had considered models that
39 accounted for the cycles that had been seen on the
40 -- in the Fraser system, as well as a -- that was
41 -- has been called the Ricker model, which we'll
42 talk about later I'm guessing -- the Larkin model,
43 rather, and then there is a Ricker model which did
44 not purport to account for cycles in terms of
45 interactions between the different year classes.

46 In answer to your question though, Mr.
47 Commissioner, there was an attempt at the time to

7
Al Cass
In chief by Ms. Baker

1 assess rebuilding plans based on the notion that
2 needed to account for cycles in the populations.

3 Q All right. Now, just to kind of carry the
4 sequence around you said 2000 to 2002 there
5 started to be some concern that the strategy, the
6 rebuilding strategy, wasn't working and I take it
7 that the department started to look at new ways to
8 determine escapement strategies?

9 A That is correct.

10 Q And there was an initiative that began in 2002
11 which is known as the Fraser River Sockeye
12 Spawning Initiative or FRSSI, and that is a
13 modelling tool and that was developed as a way to
14 look at new ways to develop escapement strategies?

15 A Yes, that's correct. It -- it -- I should have
16 added, though, that in terms of the 1987
17 rebuilding plan, there was also an experimental
18 plan that was designed to reduce harvest rates
19 rather aggressively down to 50 percent, to learn
20 quickly, more quickly, about which dynamics may
21 have been affecting or are affecting or are
22 important to understand in managing Fraser
23 sockeye.

24 So the FRSSI, which is the question that
25 you're asking, or the spawning escapement
26 initiative, was really trying to look at a fresh
27 look of how you actually balance or assess the
28 trade-offs between reading spawning escapement
29 targets to avoid having stocks or, in the
30 vernacular of the Wild Salmon Policy, CUs, which
31 would be at risk because of low escapements or low
32 numbers of spawners reaching the spawning grounds.
33 So when we say escapement, Mr. Commissioner, we're
34 talking about -- or escapement targets, we're
35 talking about ensuring or considering the trade-
36 offs in the management system that would allow
37 some certainty of maintaining or reaching spawning
38 targets, reaching the number of spawners that --
39 on the spawning grounds for future propagation of
40 the -- and sustainability of the population.

41 And so -- but then obviously, that's one
42 objective was to ensure that escapement targets
43 were reached. Another objective was to balance
44 the rate at which escapement targets were achieved
45 or at least the amount of escapement that reached
46 the spawning grounds, with harvest management.
47 And so FRSSI was really a method of or a tool that

1 takes into account (1) the population dynamics,
2 the biology of the beast, as well as the
3 objectives of management in terms of realized
4 catch and so a set of performance indicators or
5 performance measures were developed to try to
6 assess how well you met those objectives.

7 And in a sense, that is the nutshell or at
8 least the overriding purpose of FRSSI was within a
9 consistent framework allow the inclusion of what
10 we know about the biology, i.e., the population
11 dynamics that are described by currently, at
12 least, the Ricker model and a Larkin model, but
13 also to include the objectives that were at the
14 time starting to be thought of in a more of an
15 open process. In the ensuing years after 2004,
16 certainly, there was a series of public
17 engagements in terms of workshops to elicit
18 preferences by stakeholders in an attempt to
19 identify the range of preferences that would
20 become the objectives and then also to build on
21 the understanding of what is -- our understanding
22 of the population dynamics, which model should we
23 use, taking into account uncertainty.

24 Q Okay. Let me break some of that down. That's
25 quite a big history there. So if I can you to a
26 paper that you authored in 2004, this is in Tab 1
27 of the binder before you, and its CAN002790 and
28 this is a research paper prepared by you, Michael
29 Folkes and Gottfried Pestal called Methods for
30 Assessing Harvest Rules for Fraser River Sockeye
31 Salmon. Just before I ask the question about this
32 document, if I could just back up and ask you,
33 FRSSI has a model component, but it also has a
34 process component that you were just alluding to
35 at the end there in terms of workshoping with
36 stakeholders and others; is that a fair
37 characterization?

38 A Yes, that's a fair characterization, yes.

39 Q Okay. So this paper I take it goes to the
40 analytical tool like the mathematical model that
41 is part of FRSSI; is that right?

42 A That's correct.

43 Q Okay. And can you give us an overview of what
44 this paper in 2004 and the model that was
45 developed at that time was intended to do? How
46 does it work?

47 A Yeah, okay. Just some context. This was the

1 first review, scientific review, if you like, of a
2 few years of work that started in 2002 and led up
3 to the development of this particular research
4 project -- or, sorry, research report, research
5 document in the vernacular of CSAS. And so it was
6 a description of the methodology that was used at
7 the time to provide management input and
8 ultimately to set escapement goals for Fraser
9 sockeye. And as I was saying, it includes -- it
10 describes the biological components, the models
11 that were considered at that time, as well as the
12 objectives that were considered at the time and it
13 -- two things that are -- I guess the main
14 features, I think that are worth pointing out in
15 this particular paper compared to where we are now
16 is that these were the early years of development
17 of this model within a technical group. And so we
18 explored how we -- what's the range of methods
19 that we should be exploring in terms of assessing
20 the stock dynamics of the model. So we considered
21 a Ricker model and we considered a rudimentary
22 model in my words that looked at just the data in
23 the very dominant years and also in the Larkin
24 model. So it had some models which are not
25 included now in the way that we described the
26 biology.

27 It also used a harvest rate curve that is
28 quite different than what is applied now. And
29 this particular curve was solved for, if you like,
30 analytically given the underlying biology and
31 given the objectives, but it could not be
32 described as a fixed escapement policy because it
33 did have this notion of increasing escapement at
34 higher run sizes and but also not a -- in the
35 theoretical sense a fixed exploitation rate policy
36 in that it did not have a constant harvest rate
37 policy at some -- over some range of run sizes.
38 So -- and that's quite different than what's done
39 today. So -- and I can talk about what's
40 currently -- what changes were made from that
41 particular construct.

42 The other thing was that we -- sorry. We
43 changed the shape of the -- so the -- we had a
44 particular curve that is different that we use
45 today, but we also had a different way of
46 evaluating what the -- how the curve should look.
47 And this was in the spirit, if you like, of

1 optimization. It's got various jargons attached
2 to it, but solving for multi attributes within a
3 -- in a modelling context that actually weighted
4 different attributes of a function. So, for
5 example, one of them might be to avoid low number
6 of spawners, avoid low catch or -- and maintain
7 catch at some constant level, so those are three
8 objectives that would be built into this multi-
9 objective function.

10 And then stakeholders would then, in terms of
11 their preference, weight each of those objectives
12 and then that would be solved analytically. So
13 the curve that would be the outcome of this would
14 be determined by how you might choose to weight
15 the various factors that were in this objective
16 function, so typically would weight the avoid low
17 spawner objective at a higher rate than avoid low
18 catch objective, or maybe not. But that was the
19 state of this particular paper and so, Wendy,
20 that's where -- that's kind of where we got to in
21 the 2004 review that occurred.

22 Q Okay. And then I think you had mentioned that
23 this model, once it was presented, was then
24 followed with workshops with different stakeholder
25 groups to work through some of the objectives that
26 you just identified; is that right?

27 A Most of the stakeholder kind of involvement
28 started to occur - now I may be -- this might be a
29 good question for the panel, but I think 2005 is
30 where we felt the model was at a state where it
31 was -- we needed -- we thought it would benefit
32 from inputs from a broader stakeholder community.
33 So we started on this road of having multiple
34 staged workshops that helped inform the
35 development of the tool and helped solicit
36 preferences from the various stakeholders involved
37 in the process.

38 Q Okay. And I'll come back to that in a little bit.
39 You also had -- I take it there was a workshop
40 that dealt with cyclic dominance and its
41 application to the goals that are described here
42 in 2006; do you remember that?

43 A Yes, that's correct.

44 Q Okay. And the proceedings from that 2006 workshop
45 are at Tab 9 of the binder before you and it's
46 CAN002835. And what was the --

47 MR. LUNN: Ms. Baker, did you want to mark the previous

11
Al Cass
In chief by Ms. Baker

1 document?

2 MS. BAKER: Oh, sorry. Yes, please. Mark that.

3 THE REGISTRAR: Marked as Exhibit 396.

4

5

EXHIBIT 396: Cass, Folkes et al - Methods
for Assessing Harvest Rules for FRSSI

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8

MS. BAKER:

9

Q So the proceedings from the workshop on cyclic
dominance, what -- why was this done? Why was
there a workshop to assess population dynamics and
implications for management?

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A Mr. Commissioner, this was one of the most widely
debated scientific issues that has emerged in the
last 50 years with regard to Fraser sockeye which
is to address the question of why is it that we
see in sub populations in the large lake systems,
in particular in Fraser sockeye, that have
persistent cycles, have had persistent cycles,
back to the origins of data in which you have
varying patterns that emerge, but the most
striking was -- one was you had a very strong what
was called the dominant year within the four-year
cycle, followed by a lesser what was called a
subdominant year, followed by two off cycles. And
for some populations, that particular pattern, for
example, Quesnel Lake sockeye, Adams river
sockeye, Stuart Lake sockeye, that pattern has
persisted with uncanny regularity over time. And
so, you know, as I said, in 50 years of scientific
inquiry there has been no consensus on what
exactly is the cause of these cycles.

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And so the workshop that -- the proceedings
that are before us, the workshop was an attempt to
bring together the issues in a DFO-sponsored
workshop, but that also included academics from
UBC and SFU, if you like, as well, and -- but it
was to start looking at how we could deal with
cyclic dominance in the context of its
implications for management of the Fraser River
sockeye. So it was seen as something that needed
to be done in order to move forward on how we
would incorporate this notion of cycles in the
population of the dynamics of Fraser sockeye and
in the simulation testing that went forward to
account for cycles. So that was the impetus, the
motivation, Mr. Commissioner, for this particular

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12
Al Cass
In chief by Ms. Baker

1 workshop at that time.

2 MS. BAKER: And I'll have the proceedings marked,
3 please, as the next exhibit.

4 THE REGISTRAR: Exhibit 397.

5

6 EXHIBIT 397: Workshop to Assess Population
7 Dynamics of Cyclic FRS and Implication for
8 Management, Feb 7-8 2006

9

10 MS. BAKER:

11 Q Did the workshop make -- result in changes being
12 made to the FRSSI model?

13 A Yes, it did. This was, in my mind, sort of the
14 fundamental workshop that reshaped how we
15 proceeded forward from the -- from what's
16 documented in the 2004 CSAS research document.
17 And the fundamental change was an acceptance that
18 probably the best way to model the dynamics of
19 Fraser sockeye was to include this so-called
20 Larkin model which essentially is a Ricker model,
21 but with some added terms to account for the
22 importance of previous spawning escapements on
23 determining the survival of a brood year in the
24 sense that there was a delay density impact of
25 depending on the size of the spawn, numbers of
26 spawners, and on the degree of interaction between
27 the spawners. So essentially it was a way to
28 account for the cycles in terms of how these
29 particular year classes interacted to result in
30 differences in mortality associated and driving
31 cycles. So that was one fundamental change, I
32 think, in the way that we chose to model the
33 population dynamics in the FRSSI model.

34 The other, I think, fundamental change was in
35 the way that the harvest rule is -- changed from
36 how it was characterized in the 2004 document to
37 how it exists now. And it was recognized at the
38 workshop that the -- by trying to optimize a
39 particular curve to meet some objectives, was not
40 a fixed exploitation rate strategy, nor was it a
41 fixed escapement strategy, but that the more
42 appropriate way to manage according to a rule was
43 to have a fixed exploitation rate applied across a
44 large run size range with some contingency for
45 ramping down on that harvest rate at low run size
46 abundances. And so that was the second sort of
47 fundamental change in the way that the tool was

1 designed, so the shape of the harvest rule curve
2 or what's called a total allowable mortality curve
3 now, was changed and is quite different from what
4 was reported in the 2004 report.

5 Another thing that occurred around that time
6 was -- well, maybe I'll leave that there 'cause I
7 think that's the fundamental importance of that
8 particular workshop at that time.

9 Q All right. And just as we're talking about the
10 curves and the harvest rules, I think it might be
11 helpful for the commissioner to relate that
12 discussion to the -- an example of an escapement
13 strategy that was in use, is currently in use, the
14 -- and we've already gone to it once in these
15 proceedings, the 2009 escapement strategy which is
16 Exhibit 322. If you turn in that to CAN page
17 number 9. This shows a curve. Is this -- can you
18 relate what you were just talking about to this
19 curve?

20 A Yes. So the top curve, the top curve, the -- if
21 you look at the run sizes which is shown on the
22 bottom axis, the X-axis in millions, so this is a
23 range of run size over which a harvest curve has
24 been developed. So in this example, at one
25 million fish, there is a dotted line, vertical
26 dotted line that represents a point on that curve
27 where you would start ramping down on the total
28 allowable mortality, which is shown on the
29 vertical axis as a total allowable mortality,
30 which would include the harvest. And so the cap
31 at which is described as the cap at that -- right
32 at the point of the one million run size, is the
33 exploitation rate cap that would be applied to a
34 particular run if the run was above, in this case,
35 one million fish. And so as the run -- if a run
36 comes in below one million fish, then there -- the
37 harvest rule implies that you would reduce harvest
38 rates in the way this curve is shown down to a
39 minimal fishing point at somewhere below half a
40 million fish and then minimal fishing from then
41 on. Now, so that's the relationship between the
42 run size, Mr. Commissioner, that would be
43 observed, and the total allowable mortality, which
44 would include harvest.

45 Now, if you flip that and ask what -- how
46 that translates into an escapement strategy and
47 you can see from the plot at the bottom of that

1 figure, Figure 1, that between -- what is that
2 point just below half a million fish and the one
3 million fish, where those two vertical lines are,
4 the strategy there is to have a fixed escapement
5 strategy over that range of the run size that
6 corresponded to the decline or the cutback in the
7 harvest rate should the run size in this
8 particular example, fall below a million fish.
9 And then to the left of the dotted line, the
10 vertical dotted line, which is called the no
11 fishing point on the top graph is results in a
12 decline in escapement. There is no fishing, but
13 as run size declines, the escapement will also
14 decline. So this is the, if you like, really the
15 fundamental way in which the tool that the harvest
16 rule -- I keep calling it a harvest rule because
17 of my lengthy history in this, but which is now
18 called the total allowable mortality or TAM rule,
19 this is the construct that exists today.
20 Q Right. And these curves are generated through the
21 model that you have just been talking about?
22 A The -- there's a range of curves that would be
23 explored given some benchmarks that would be used
24 to assess whether the -- you know, how well the --
25 a particular curve, total allowable mortality
26 rule, how well that worked in meeting the
27 objectives of not falling below a particular
28 spawning escapement with some frequency, say nine
29 out of ten, over the course of the forward
30 simulations. And -- I've lost my train of
31 thought, but -- could you help me, Wendy?
32 Q I was asking if the curve that you see there is
33 what's created by the use of the FRSSI model and
34 then you were explaining the --
35 A Yeah, the --
36 Q -- different curves can be created --
37 A Sorry. The particular curve that satisfies the
38 constraints, that is, you don't want to fall below
39 the spawning escapement or don't want to fall
40 below some particular catch value --
41 Q Sorry. I'll just ask if you could turn to page
42 CAN15 and that may help you in explaining what
43 you're talking about now. Go -- show the whole
44 page, if you could. There. You see the different
45 options at the bottom.
46 A Right. So at the bottom, those are, in fact, the
47 harvest control rules or the TAM rules, and then

1 the panel at the top corresponds to the
2 performance indicators, in this case for Early
3 Stuart sockeye that over the long haul would
4 result from the -- applying these various options.
5 And so ultimately there's a large number of
6 options that you run with this model and are
7 assessed against performance indicators and those
8 harvest rules or inputs that do not meet the
9 options, for example, do not meet the performance
10 of -- or the goal of avoiding low spawners by some
11 frequency, then those are filtered out. Likewise
12 -- or could be filtered out. Likewise, options
13 that result in catches that fall below some
14 agreed-to level get filtered out.

15 So the notion here is to -- Mr. Commissioner,
16 is to exclude those options which do not satisfy
17 the objectives and to, if you like, home in on a
18 set of objectives that satisfy -- or home in on a
19 set of curves, if you like, that meet the
20 objectives based on the performance indicators
21 that are identified.

22 Q And the idea of having a fixed exploitation rate
23 ceiling, the 60 percent, was that a new addition
24 in 2006 following the workshop, as well?

25 A Yeah. So then it became okay, what do you set the
26 cap at? Once we agreed that the control rule
27 would be a fixed exploitation rate across a range
28 of run sizes, then the question is what would you
29 set the total allowable mortality rule at? And so
30 it's at that stage where we, throughout the
31 workshop environment, came to a value of 60
32 percent and it's important, I think, to note that
33 that's not based on an outcome from modelling the
34 population dynamics for the stocks that we
35 included in the model. It was designed to reduce
36 the probability of doing harm, if you like, to
37 stocks that had a lower productivity that weren't
38 reflected in the model, so it was a way to guard
39 against populations, reduce the harvest rate from
40 what might be the optimal to guard against over-
41 fishing small stocks in mixed stock fisheries. It
42 was also designed to mitigate, if you like, or
43 reduce the impact of uncertainty in in-season
44 management, so uncertainty in run sizes that
45 higher exploitation rates could have the
46 undesirable impact of removing too many fish if
47 the run size was estimated to be lower than it

16
Al Cass
In chief by Ms. Baker

1 actually was. And it also guarded against what's
2 been called sort of implementation error. You
3 can't precisely implement a fishery with an exact
4 harvest rate, so there's some uncertainty about
5 what exactly the harvest rate you can achieve,
6 given your target.

7 And so those three things resulted in a
8 policy choice, if you like, to have a 60 percent
9 cap, which is what is currently in the plan.

10 Q And one other --

11 THE COMMISSIONER: Ms. Baker, could I just --

12 MS. BAKER: Yes.

13 THE COMMISSIONER: -- ask a -- so I continue to follow
14 this evidence, just ask a question of the witness.
15 Earlier on, Mr. Cass, you talked about fixed
16 harvest or exploitation rate and there you talked
17 about 60 percent as an example. I've heard about
18 total allowable catch or TAC and now you're
19 talking about TAM. Are all these terms the same?

20 A They're not the same. They're related and they're
21 part of the jargon in this whole affair. But a
22 total allowable mortality rate, if you like,
23 includes harvest, the harvest rate, and the
24 harvest rate would determine the TAC. So
25 translate the harvest rate applied to a run size,
26 the total allowable catch, the TAC, would follow
27 from that.

28 But the TAM is -- includes the harvest rate
29 that would ultimately result in a TAC, but also
30 include environmental losses that are developed
31 through the management adjustment.

32 THE COMMISSIONER: Sorry, the environmental losses then
33 are...?

34 A Environmental losses in the river that would be
35 projected based on environmental conditions in a
36 given year which would be removed from what would
37 be allowed to be taken.

38 MS. BAKER:

39 Q These are the -- what have been referred to as
40 management adjustment numbers; is that right?

41 A Yes.

42 MS. BAKER: So we've started to talk about management
43 adjustments, Mr. Commissioner, but that evidence
44 has not been completed yet.

45 A Yeah, maybe a different way to say it is there are
46 projected losses in the river because of
47 environmental high river temperatures, high flows,

17
Al Cass
In chief by Ms. Baker

1 for example, removals of catch up-river,
2 unaccounted for removals of catch, so those would
3 be, if you sum those all up in a given year, those
4 would be subtracted from the total number of fish
5 that would enter the river but would eventually
6 result in less fish reaching the spawning grounds.
7 They would be fish that would be either caught or
8 die en route towards the spawning grounds, but
9 that would be -- that would reduce the actual
10 number that reached the spawning grounds. So the
11 TAM rule was a way to account for that -- those
12 differences.

13 MS. BAKER:

14 Q You had talked about this idea of having weighting
15 different objectives, that how you might weight
16 some more heavily than others in the prior
17 version, the 2004 version, was that continued
18 following the 2006 workshop, that weighting of
19 objectives?

20 A The weights, explicit weights that were used to --
21 sort of as knobs on this objective function were
22 not used following -- I think they were disbanded
23 probably in the plan for 2006, and went to more as
24 I was trying to describe, went to more of
25 assessing the range of options available in terms
26 of a TAM rule and how they satisfied the meeting
27 objectives in terms of the performance measures
28 that were used to assess the performance of how
29 each of these TAM rules performed.

30 Q Okay. When did the FRSSI model first -- when was
31 the first use of the FRSSI model in setting
32 options for Fraser River sockeye escapement
33 planning?

34 A The TAM rule first appears formally as a method
35 for guiding escapement targets, options, occurred
36 in 2006, I believe, IFMP. It had been used in
37 2005 as sort of a transition between the
38 rebuilding plan, if you like, and into FRSSI, but
39 it was not explicitly used on its own in 2005.
40 2006 marked the first year that its influence on
41 setting escapement targets was viewed.

42 Q And have changes been made since the 2006 year to
43 the model?

44 A There's been a number of changes made to the
45 model, to the actual biological model, the tool,
46 if you like, Mr. Commissioner. There was
47 certainly at the time an interest in developing

February 7, 2011

1 plausible forward simulations that accounted for
2 changing productivity over time, so given the
3 atmosphere at the time or conditions at the time,
4 that populations were declining. There was an
5 interest in looking at more research or more
6 assessment of how you would evaluate the impacts
7 of changing future productivity changes over time.
8 That was key to the changes that were made in
9 around 2005 and built on right up till now.

10 There was also changes or thinking around how
11 you include the en route mortality that's used to
12 remove the effect or partition the effect of
13 environmental conditions in the river from the
14 actual harvest rate or the human removal. There
15 has been thinking around how you account for
16 declines in productivity at very low stock sizes.
17 That's this so-called depensatory effect, that if
18 you -- in theory, that if you cross or have
19 spawning escapements that are below a certain
20 level, then the high productivity that is modelled
21 if you do not consider losses that -- other losses
22 that occur at low spawning escapements will over-
23 estimate the productivity in that range. And
24 causes of this with -- what's in this depensation
25 thinking is that genetic effects, that perhaps
26 fish can't -- they get so low in abundance they
27 can't find mates, genetic bottlenecks, predators
28 that, Mr. Commissioner, that could swamp out low
29 abundances of their prey, in this case Fraser
30 sockeye, if they're at such low abundance.

31 So the FRSSI model, while it didn't purport
32 to estimate what that degree of depensation was,
33 it -- just as in trying to account for future
34 changes in productivity, the future model allowed
35 users of the model, if you like, to run scenarios
36 that included this kind of low mortality at low
37 stock sizes to assess the impact of that on the
38 actual long-term harvester energy that would
39 result from including depensation, including
40 things like various scenarios of future
41 productivity, declines in productivity and how you
42 model en route mortality to potentially account
43 for increases that may occur over time as a result
44 of climate change.

45 Those were some of the changes that have been
46 -- in addition to ongoing data refinements, so we
47 moved from 12 stocks that had a longest data set

1 of the spawning and escapement data set. We added
2 on seven more populations that had or stocks that
3 had less routine data and higher uncertainty in
4 the actual population models, the parameters that
5 are the outcome of these models, and so we moved
6 from 12 stocks to 19 stocks and we -- as each year
7 went on, we added on additional years of data and
8 so there were some refinements of the actual data
9 and the models that were used.

10 Q Could the depensatory effect that you just
11 mentioned there in that answer, I wonder if you
12 could explain that more simply, just so that we
13 have it on the record. The concept, if I
14 understand it, is that there -- if you can imagine
15 productivity on a slope, the theory is, and I
16 think the way the model was originally run was
17 that the lower the number of spawners, the higher
18 the productivity of those spawners. But there's
19 some point on that line where that theory stops
20 working right and you can actually have lower
21 productivity with a lower number of spawners.

22 A It's been called a number of things - a predator
23 pit, but whatever the cause, yeah, if you don't
24 account for that and it actually exists, then
25 you're over-estimating the productivity in that
26 range of low stock size, correct.

27 Q What about all these things that you have just
28 described, are those a kind of sensitivity
29 analysis? Is that how you would explain some of
30 those factors you've just reviewed?

31 A Yes. So sensitivity analysis, Mr. Commissioner,
32 would be a way within the simulations, simulation
33 testing, to evaluate how important various
34 assumptions, in this case various assumptions
35 about future changes in productivity, various
36 assumptions about depensatory mortality, various
37 assumptions about en route mortality, how that
38 translates into an outcome in terms of the harvest
39 rule or the behaviour of the performance
40 indicators that you're using to come up with the
41 harvest or allowable TAM rule.

42 So the idea behind sensitivity analysis is
43 one, to assess how -- what's the influence of
44 assumptions of going into the model, and then to
45 evaluate whether there are robust management
46 procedures that can alleviate to the best extent
47 the occurrence of those factors that may or may

1 not occur.

2 Q All right. In 2008 Gottfried Pestal, Paul Ryall
3 and you prepared a report on the development of
4 FRSSI and that included a number of the
5 improvements that you've just reviewed and
6 outlined some of the workshops that were held with
7 participants over the years and that document is
8 called Collaborative Development of Escapement
9 Strategies for Fraser River Sockeye - a Summary
10 Report 2003 to 2008 and it's Tab 3 in the binder
11 and it's CAN002907; is that right?

12 A Yes.

13 Q And this document sets out the history really of
14 how the model was developed and what workshops
15 were held with different stakeholders and the
16 outcomes of those workshops and sort of the
17 refinements to the model as time went on; is that
18 right?

19 A That's correct.

20 MS. BAKER: Okay. Can I have that marked, please, as
21 the next exhibit?

22 THE REGISTRAR: Exhibit 398.

23
24 EXHIBIT 398: Collaborative Development of
25 Escapement Strategies for Fraser River
26 Sockeye - Summary Report 2003 to 2008S
27

28 MS. BAKER:

29 Q If you could turn to page 25, which is CAN33 but
30 it's 25 in the actual body of the document. That
31 set out the simulation model. This is again just
32 a summary of the model that you've been talking
33 about. But at the bottom it might be helpful for
34 the commissioner just to outline, you have some
35 policy choices set out there. And are these the
36 kinds of choices that FRSSI is designed to allow
37 managers and stakeholders to assess, for example:
38

39 Policy choice: Trade-off between harvest
40 benefits versus providing protection to
41 individual stocks;
42

43 Policy choice 2: Trade-off between short-
44 term and long-term benefits
45

46 Policy choice 3: Trade-off between stability
47 in catch and maximizing opportunity

1 A Yes.

2 Q Okay. And the -- those sorts of policies, how are
3 those policies incorporated into the model or
4 dealt with in the model; can you just give the
5 commissioner an understanding of how that fairly
6 non-mathematical sort of summary finds its way
7 into this model and this process?

8 A Yeah. First of all, I think it's, Mr.
9 Commissioner, you need to understand that this is
10 a long-term -- or model that looks at long-term
11 strategies, if you like. In this particular case
12 it goes out to 48 years and so it's important to
13 realize that it's assessing the trade-offs in
14 terms of harvest benefits, as well as sustaining
15 escapement in a long-term sense. Now, the model
16 has been and can be used to look at more shorter-
17 term trade-offs and, you know, this was an
18 interest by stakeholders, if you like, to sort of
19 separate in terms of eight years versus the long-
20 term. But, yeah, essentially it's -- in terms of
21 trade-offs, and given the harvest rule that was
22 just described or the TAM rule that was just
23 described, it's a way of looking at given some
24 objectives, don't want to fall below a certain
25 number of spawners, and don't want to have the
26 catch -- now, that was -- that's a stock-specific
27 or CU-specific objective. Don't want the catch to
28 fall below some particular low catch limit which
29 would -- from the perspective of stakeholders
30 would -- is not a desirable outcome, and so
31 essentially the model then looks at how can you
32 meet those objectives and satisfy the interests of
33 conservation? What particular harvest control or
34 TAM rule is best for reducing impact or staying
35 above some particular benchmark, i.e., don't want
36 to result in a conservation risk, and at the same
37 time to result in the best harvest benefit, given
38 those constraints.

39 And so choice 3, which really refers to you
40 could maximize catch but you would have
41 potentially high variability from year to year
42 whereas the long-term catch which might satisfy
43 the best long-term catch, but which results in
44 higher frequency from one year to the next of
45 whether you get good catches in one year and poor
46 catches in the following year.

47 So the simulation model was set up to explore

1 those choices and ultimately to come up with a
2 plan, i.e., a TAM rule, that met the performance
3 -- the preferences that were used to evaluate
4 these trade-offs.

5 Q If you could turn then to page 39 or CAN39 which
6 is page 31 in the actual report. And go down to
7 the bottom of that page. It sets out how
8 alternative escapement strategies were chosen and
9 it -- if you go -- we read at the bottom and turn
10 over the page, it describes -- this document
11 describes how the spawning initiative workshops
12 went through some of those choices and identified
13 the different trade-off options. You'll see that
14 there's a bullet at the top of the page which you
15 can go past and then the first bullet following
16 says:

17
18 Participants were asked to assign preference
19 scores to different management objectives and
20 performance indicators.

21
22 The next one, bullet, describes how they were
23 asked to assign preference scores to alternative
24 options, and then finally, there's a review of the
25 trade-off analysis that showed where things landed
26 following these workshops and where the
27 participants settled on their different options.
28 And that sort of describes, does it, what happened
29 at those workshops, where people tried to work
30 their way through this model and work their way
31 through different performance indicators and
32 objectives to come up with what was going to be
33 workable going forward?

34 A Yes, that's correct. That was the idea to look at
35 the broad suite of outcomes from the model and
36 given the objectives and, you know, the
37 preferences of those at the workshops, at least,
38 way to render down, if you like, the various
39 options down into a set of options and eventually
40 a single option that would be part of the plan.

41 Q And the third bullet under the paragraph that
42 beings with the word "briefly", it says:

43
44 Options deliberately designed as a compromise
45 weren't strongly rejected or endorsed, and
46 established a middle-ground that served as a
47 platform for 2007 pre-season planning.

1 Is that what happened, in fact?

2 A Yeah. This was the sort of search for the common
3 ground among the participants.

4 Q And just to identify the participants at those
5 workshops are set out or at least some of them are
6 set out on page CAN3 which is Roman numeral III on
7 this document, sets out some of the individuals
8 who attended the workshops in 2007 and 2008,
9 that's right?

10 A That's correct.

11 Q Can I ask you to identify whether the FRSSI model
12 at this time in 2008 was able to model the effect
13 of the rules on overlapping run timing groups or
14 did it simply address a TAM rule on each run
15 timing group in isolation from each other?

16 A Yeah. Now, you know, before I saw this document I
17 couldn't pin down the chronology very well, but,
18 yeah, the idea was that we -- you know, it's
19 recognized that this, the TAM rules, were modelled
20 on -- they were modelled on run timing groups that
21 were themselves contained where a roll-up of
22 various stocks that were assumed to be -- have
23 similar timing groups. So the history of it is,
24 you know, you have the Early Stuart, which is a
25 timing group which in many respects is the first
26 -- it overlaps to some extent but it's usually
27 passed through the system before the large summer
28 groups. But the Summer, Early Summer and Lates
29 all have timing group -- or their timing groups
30 have some overlap.

31 So the way to assess the impacts of the
32 overlap, in other words, to take into account that
33 the TAM rules could well be different on each of
34 the run timing groups, where they overlapped there
35 was a need to account for the fact that there are
36 -- there would be constraints on a harvest rate,
37 simply because the overlap of -- and mixture of
38 the stocks within a timing group that overlapped
39 may have had a TAM rule that is different than
40 what is -- what would be operating on another run
41 timing group, Mr. Commissioner, so the idea was to
42 assess what the actual realized harvest rate would
43 be, given the constraints of the TAM rule on -- in
44 overlapping stocks.

45 So within the model, to assess that there was
46 a need or an interest in doing some simultaneous
47 modelling of each of the run timing groups to

1 estimate what the impact of the overlap would be.

2 Q All right. And has that been done? Does the
3 model now allow you to address that overlap?

4 A There are methods that are applied currently that
5 -- with that objective, yes.

6 Q And I just wanted to touch on something that you
7 raise there, the FRSSI model does create TAM rules
8 for these run timing groups that we've heard a lot
9 about in these proceedings and run timing groups
10 or management groups, but the Stuart and the
11 Summer and the Early Summer and the Late runs,
12 could you do escapement strategies using the FRSSI
13 model for a different set of groups or for the
14 individual 19 stocks that are modelled in it; is
15 that possible?

16 A Well, Mr. Commissioner, you can, because we have
17 the information for each of the discrete
18 populations that get rolled up into the run timing
19 groups, you can come up with a TAM rule for each
20 of those populations. However, implementing that
21 particular strategy, in other words, if you were
22 attempting to manage each of those populations in
23 mixed stock fishery environments where there are
24 certain sampling requirements or precision
25 requirements in test fisheries or within the in-
26 season inputs, there are problems associated with
27 certainly with small stocks in large populations
28 that are sampled in attempting to estimate what
29 the abundance of each stock is. So the more
30 populations you have within a mixture that you
31 assume within a mixture, there is an issue with
32 one stock ID in the actual fisheries based on the
33 test fisheries, to estimate the abundance of the
34 larger number of stocks that would be managed for
35 in the example that counsel has used.

36 So one of the big drawbacks is the precision
37 of the stock ID for small runs. There's also
38 issues related to the fact that we have en route
39 mortality which is based on run timing groups, so
40 we have estimates on en route mortality in the
41 river based on run timing groups and not currently
42 isolated by stock, so the -- there's some loss of
43 precision there if -- but, you know, that's
44 something that maybe one could test. I would say
45 the major problem, Mr. Commissioner, with trying
46 to manage large numbers of populations in mixed
47 stock fisheries is the current sampling regime in

- 1 test fisheries that does not result in precise or
2 accurate estimates, particularly of small stocks.
- 3 Q All right. Now we've talked about the 60 percent
4 ceiling and you described that as being kind of a
5 management decision that was made to put the
6 ceiling at 60 percent. Did you consider trying to
7 understand the optimal ceiling for the stocks that
8 are made up within any given aggregate? Like why
9 is it always 60 percent and not different for
10 different run timing groups?
- 11 A Yes, I did mention that the 60 percent was a
12 policy choice given the data gaps and the
13 inability to account for all the populations, all
14 the stocks that would be within a timing group.
15 So that's an area where I would say some priority
16 in terms of research should be attacked. I mean,
17 we have assumed a 60 percent since the outset and
18 the IFMPs, but that's an area where we need to
19 look at the -- from a scientific point of view,
20 given the understanding about population dynamics,
21 about that. But I don't think we're going to
22 completely solve the problem. There may be
23 populations that are -- have a low productivity
24 that aren't accounted for in the suite of stocks
25 that we currently use, and certainly the small
26 populations would not be -- they're very small,
27 very difficult to detect in the test fisheries.
- 28 Q And there's also -- it's -- you'll recall from
29 looking at the graph when we had it on the screen,
30 and maybe it would be helpful, Mr. Lunn, to put
31 Exhibit 322 back up on the screen and go to page
32 15, CAN15 in that document, just might be useful
33 to have that while I'm asking these questions. So
34 the 60 percent that we were just talking about is
35 that top line on the escapement strategies table
36 or graph, right?
- 37 A Yes.
- 38 Q Okay. And then there's also a no fishing point
39 which is the bottom, zero percent line. How is
40 that no fishing point set using FRSSI or in FRSSI?
- 41 A Well, the way the TAM rule is set up now with a
42 fixed exploitation rate over a wide range of run
43 sizes and a ramping down at some point, the way
44 the TAM rule is set up now with a fixed
45 exploitation rate over the period that the -- that
46 triggers the reduction in harvest rate, because
47 the fixed exploitation rate at that period, the

- 1 actual no fishing point is -- simply falls out
2 from trying to find the -- that one point on that
3 curve that determines the cutback rule, given that
4 you have a fixed escapement below that.
- 5 Q All right. And what is that cutback rule related
6 to? Is it related to a benchmark of some kind?
- 7 A Yes. So the benchmarks that we have been using,
8 the interim benchmarks up till now, the cutback is
9 designed to look at the frequency of a particular
10 TAM rule that results in a -- that compares the --
11 or looks at the frequency with which a particular
12 rule would result in an escapement that is below
13 or doesn't meet the benchmark.
- 14 Q Right. And the interim benchmark that you
15 described is a number of fish that you don't want
16 to fish below, right? Just in plain language?
- 17 A In the WSP language, it's a value or an escapement
18 or that is considered to be -- put the CU at risk
19 and it's actually defined as -- in various ways,
20 but it's really some proportion, if you like, or
21 some number less than a fully-seeded population.
22 So it's really the point between the red and the
23 amber in the WSP diagram that's often used to show
24 the various -- the health of a CU in terms of its
25 abundance level.
- 26 Q All right. And those interim benchmarks that
27 you've described, those are interim why? Why are
28 they still interim?
- 29 A Well, I mean, we started -- the FRSSI process
30 started before the WSP was finalized and certainly
31 it's carried on during the implementation phase,
32 Mr. Commissioner, of the WSP but interim
33 benchmarks were used as surrogates or proxies, if
34 you like, to guide the process up until the point
35 when we actually do adopt the WSP benchmarks. So
36 the WSP benchmarks would be -- like once they're
37 finalized and agreed to would be used as -- they
38 would be used as the actual benchmarks and there
39 would no longer be interim benchmarks.
- 40 Q Thank you. And then I just have a couple of
41 questions left and I'll be able to -- we'll be
42 able to take a break and then we'll move to the
43 full panel. So I'll just try and get through that
44 next set of questions.
- 45 In 2010 there was a CSAP review of the FRSSI
46 model; is that right?
- 47 A Correct.

27
Al Cass
In chief by Ms. Baker

1 Q And the paper which outlines that review is found
2 at Tab 6, which is CAN185438. Okay. So this is a
3 working paper prepared by Gottfried Pestal, Ann-
4 Marie Huang and you appear as the third author and
5 the FRSSI working group. You're familiar with
6 this document?

7 A Yes.

8 MS. BAKER: Okay. I'll have this marked, please?

9 THE REGISTRAR: Exhibit number 399.

10

11 EXHIBIT 399: Updated Methods for Assessing
12 Harvest Rules for Fraser River Sockeye Salmon
13 - May 18, 2010
14

15

MS. BAKER: Thank you.

16 Q All right. Why was this review done in 2010?

17 A It was felt that there had been progress made on a
18 number of fronts in the development of FRSSI since
19 the last peer review, the last PSARC review in
20 2004. So this was really a catch-up to document
21 and have review of the current state as it existed
22 at that time.

23 Q And this document appears as a working paper, so
24 it's unlike the 2004 document that we've marked as
25 an exhibit in this proceeding. How far along the
26 process is this document now? Is it now
27 finalized?

28 A This document is not finalized. It was reviewed,
29 as I said, I think in May and the report was
30 accepted, endorsed, if you like, by the
31 participants at the meeting which means that the
32 methodology as it was presented in the paper is
33 accepted. And so the loose ends, if you like, Mr.
34 Commissioner, are that it's accepted but with
35 revisions, which is usually the case in reviews,
36 so as long as the authors or the leads on a
37 particular research paper agree to revise the
38 paper pending the recommendations from the actual
39 peer review process, the paper is not accepted
40 until the revisions are made, at which time if the
41 revisions meet the standards and are agreed to by
42 the chair of the meeting, then the paper stands as
43 a research document which would be in this case
44 the course of events.

45 I might say that the methodology was strongly
46 supported by external reviews and so it was a good
47 signal that the process -- the tool itself was on

1 the right track. So that's, Mr. Commissioner,
2 where this sits.

3 Now, there's also -- Ms. Baker, I'm not sure
4 if you want me to go here, but there's also a
5 product that comes out of these peer review
6 meetings that's called the Science Advisory
7 Report, which isn't authored by individuals. It's
8 a summary, if you like, of the peer review meeting
9 and it's authored by DFO and that is the actual
10 advice that flows from the meeting in terms of the
11 acceptance of the paper and the review. So
12 there's two -- these two documents, if you like,
13 which will -- neither of which are finalized and
14 approved, which would be the outputs from these
15 meetings.

16 Q Right.

17 A This meeting.

18 Q For our purposes does Exhibit 399 that you see
19 before you, does that set out the state of the
20 model that is currently in use?

21 A That is correct. Yeah. The model that is
22 currently developed that could be used by end
23 users, put it that way.

24 Q But the tool, I guess, that is described in that
25 document, Exhibit 399, is the tool that's
26 available for the department to use in --

27 A That's correct.

28 Q -- doing its planning? Okay. I take it one of
29 the things that this paper, the Exhibit 399,
30 didn't address is whether the FRSSI model is an
31 appropriate tool for using -- to use in making
32 management decisions; is that fair? It reviews
33 the model but it doesn't kind of look at that
34 broad overview of is this the best tool or should
35 we be using this?

36 A The model, I must say, doesn't come from a vacuum.
37 It, Mr. Commissioner, is the current thinking
38 globally, if you like, on how you do these kinds
39 of policy evaluations and so it's really, I think,
40 considered certainly by reviewers who -- and
41 experts who work in these kinds of environments,
42 that it does represent the state of the art, if
43 you like, for how you evaluate fisheries
44 management and outcomes in terms of preferences as
45 far as meeting objectives and doing it in an open
46 transparent consistent framework.

47 Q Is a further review intended to see how -- this

1 model, I guess, has been in use for four years
2 going on five years, so you've seen one full cycle
3 come back after using the model. Is it intended
4 that there will be a further review to see if the
5 model is performing and it's a useful tool in
6 management planning for Fraser sockeye?
7 A My understanding that is correct, so each year
8 that we apply the model or if it gets used in
9 setting escapement targets is a learning
10 experience. So after one complete cycle, it was
11 agreed that we would review where we stood at that
12 point, which would be, I guess, 2011, and yes, so
13 it would be a review of the performance of this
14 model.
15 Q And is that happening now? Is there a review like
16 that in place now?
17 A The review is not -- is not in place as yet.
18 Q Is it intended for this year, 2011?
19 A It was intended to be this year. Whether or not
20 that will occur, I don't know.
21 MS. BAKER: All right. Thank you. Mr. Commissioner, I
22 think this would be a good time to break and I'll
23 bring the panel up after the break to complete the
24 evidence on this.
25 THE COMMISSIONER: Can I just ask a couple of questions
26 before the full panel comes on?
27 Do I understand your evidence to be that
28 there were two unknowns, if I can use that term,
29 that you described earlier: one was -- and you
30 described a pattern of persistent decline in the
31 stocks in I think you mentioned the mid-1990s or
32 thereabouts. And the other was you mentioned a
33 persistent pattern of the dominant cycles followed
34 by subdominant. And so both of those were
35 unknowns in the --
36 A Certainly the decline in production that you
37 referred to first, you know, it was occurring --
38 THE COMMISSIONER: No, I apologize. I think I may have
39 misled you. Not unknown in the sense that it was
40 occurring, but unknown in the sense as to why it
41 was occurring.
42 A That's correct. That's correct.
43 THE COMMISSIONER: And similarly with the persistent
44 decline, why that was occurring. So you had two
45 patterns that you didn't have knowledge of as to
46 the why or an answer as to why they were
47 occurring?

1 A Yes. The cyclic dominance, the persistent pattern
2 of high/low populations over time, I mean, it's
3 quite apparent in the data, the -- and given how
4 apparent it is in the data, there was no
5 scientific consensus, if you like, about what was
6 causing those. There was a number of theories but
7 uncertainty about what was causing those.

8 THE COMMISSIONER: And if I could just -- I don't know
9 which -- I've forgotten the exhibit, Ms. Baker.
10 It's Tab 3 of the binder, which is the 2008 --

11 MS. BAKER: Exhibit 398.

12 THE COMMISSIONER: On small Roman vii, Mr. Lunn, that
13 document, I just wanted to ask Mr. Cass, there are
14 two paragraphs there at the top, just under the
15 names, if you can see them. It talks about FRSSI
16 being a six-year process, et cetera, but the
17 second paragraph, I wonder if you could just
18 explain to me what that second paragraph means.

19 A So, Mr. Commissioner, are you -- you're trying to
20 make the link between FRSSI and the Wild Salmon
21 Policy?

22 THE COMMISSIONER: Yes.

23 A Yes. Yeah, initially prior to the Wild Salmon
24 Policy being adopted in 2005, we had -- FRSSI had
25 a couple of years under its belt, if you like, and
26 but we did see that it did meet the standards, if
27 you like, of the Wild Salmon Policy in that it was
28 clearly dealing with a Strategy 1, if you like, of
29 the Wild Salmon Policy. It was adhering to the
30 five-step process, which I think is in Appendix 2
31 of the Wild Salmon Policy. It was designed to be
32 open and transparent, consistent and involve
33 stakeholders and user groups and as well as
34 environmental groups that had an interest in the
35 resource.

36 So it melded well with the intent of the Wild
37 Salmon Policy and it was ahead of other regions in
38 the province, if you like, in the sense that it
39 was developing harvest rules with benchmarks and
40 included design to get preferences or solicit
41 preferences from stakeholders. So it met the test
42 at the time, I guess, of the direction of the Wild
43 Salmon Policy.

44 THE COMMISSIONER: And it makes reference there about
45 the pilot implementation and then it goes on to
46 say the new escapement strategies were fully
47 implemented, so was it no longer considered a

1 pilot in 2007?

2 A It, I think, met the tests of the pilot. There
3 was an interest in pilots in other areas, as well,
4 Barkley Sound, for example, where there was a
5 fairly mature consultation process as well as --
6 it was a smaller contained place with multiple
7 species whereas the Fraser was focused on Fraser
8 sockeye, so I think it's still a pilot, still met
9 the conditions of a pilot. It has not been
10 abandoned. But there are other pilots being
11 thought of as well, so -- but it wasn't dropped as
12 a pilot from being a pilot because it didn't meet
13 the test. It continued to meet the test, I
14 believe.

15 THE COMMISSIONER: Okay. And in Tab 6, again, I'm not
16 sure of the exhibit number, it's the 2010.

17 MS. BAKER: Exhibit 399.

18 THE COMMISSIONER: Thank you. I think it's page 25 in
19 my tab in any event. It's under the Part 4
20 discussion - I apologize to reading to you but it
21 might just help me ask you this, Dr. Cass. It
22 says:

23
24 The model presented in the Working Paper, as
25 well as the planning process it supports,
26 focus on long-term strategies, and don't
27 attempt to capture all of the operational
28 complexities of in-season management.

29
30 And then on the next page -- I'm sorry, no I think
31 it's just on that one page. What I was trying to
32 gather from you is because just in the last few
33 questions you answered for Ms. Baker you were
34 talking about sort of a year-by-year analysis of
35 how it's working. But is it a policy that is
36 aimed for in-season use or is it --

37 A There are some shortcomings of this particular
38 model for in-season application. It does not
39 account for, you know, the fish and fisheries that
40 change over time and space. So it is an overall
41 long-term strategic approach but it is and has an
42 annual -- it runs on an annual cycle, but the
43 performance measures are based on the sort of
44 cumulative forward simulations that occur. But it
45 does not -- it's not a tool that apart from
46 overall setting escapement targets, it's not a
47 tool that allows you to differentiate between

1 where harvest might occur and certainly doesn't
2 purport to make any recommendations about how the
3 resource is allocated amongst stakeholders. So it
4 is not an in-season model from that perspective.
5 It's a pre-season model with -- that advocates a
6 long-term plan that avoids or attempts to avoid
7 changing course and a lot of the rhetoric and
8 finger-pointing that goes on in season with
9 uncertainty about what the run size is and what
10 management action should be taken. So it's an
11 attempt to minimize the in-season issues by having
12 a prescribed plan that applies across that is
13 agreed to and applies across a range of run sizes.
14 It does not, as I said, deal with nuances of
15 harvest rates from various fisheries or strategies
16 that might change where fisheries occur.

17 THE COMMISSIONER: So its use as -- is primarily for
18 pre-season forecasting?

19 A Pre-season in the sense of it is agreed to, if you
20 like, the strategy is agreed to for developing the
21 plan pre-season, so it's a tool to guide the
22 development of a plan pre-season. But I wouldn't
23 want to say that it is not useful in-season
24 because it is the tool by which you say okay,
25 here's a particular run size at some date in-
26 season; what's the corresponding harvest rate for
27 that particular run timing group in-season to
28 achieve the escapement goal? So it does have a
29 purpose in-season but it's not the tool that's
30 used in-season to manage all the complexities
31 about changing run sizes and changing run timing
32 and it doesn't have those -- that capability.

33 THE COMMISSIONER: So is it --

34 A Long-term planning.

35 THE COMMISSIONER: Is it used for the Integrated
36 Management Plan?

37 A Yes.

38 MS. BAKER: Mr. Commissioner, I wonder if I just -- it
39 would be helpful if I just took you back to
40 Exhibit 322, just to illustrate that, that link.

41 THE COMMISSIONER: Three --

42 MS. BAKER: So it's Exhibit 322 and if you could turn
43 to page 15 again.

44 THE COMMISSIONER: Which tab is that?

45 MS. BAKER: It's not a tab. It's an exhibit. It's on
46 the screen. It was brought -- we used -- we
47 brought -- marked this exhibit when Mr. Grout was

- 1 in the stand.
- 2 Q And so this, as we've been talking about the FRSSI
3 model develops these different options, correct,
4 which show these different curves that you see
5 under the escapement strategies, correct?
- 6 A Yes.
- 7 Q Mr. Cass?
- 8 A That's correct.
- 9 Q And then once a decision is made to choose one of
10 these options, say Option 3 was chosen, then that
11 curve would -- so that decision-making is pre-
12 season, right? So you use the FRSSI model to
13 create the options and then the stakeholders and
14 the department review the options and a choice is
15 ultimately made as to which of these options will
16 govern a run timing group in-season, right?
- 17 A That is correct.
- 18 Q And then that option finds its way into the IFMP
19 as a harvest rule, correct?
- 20 A That's correct.
- 21 Q And then that harvest rule, which has been
22 described through one of these options, then
23 governs as the fish come in, when you actually see
24 the fish coming in and you actually see the run
25 size materializing, this rule tells you when
26 you're allowed to start harvesting that run size
27 and at what rate, at what point in time; is that
28 right?
- 29 A The tool, once there's a run size pegged in-
30 season, then -- and it's assumed that that is a --
31 represents the actual run size, then this tool is
32 the tool that is used to guide what the harvest
33 rate is, given the uncertainty in the en route
34 mortality, as well as what the escapement target
35 is.
- 36 Q Right. So it says before the run starts pre-
37 season, we say -- say we choose Option 3, that
38 tells us that when the run size gets beyond
39 110,000 or whatever Option 3 shows here, then we
40 can start harvesting that run size and the
41 percentage that you can harvest is shown on that
42 curve, up to a maximum of 60 percent?
- 43 A That's correct.
- 44 Q And that's how it works between pre-season and in-
45 season, so you're not re-running this model in-
46 season, but you're using the decision that was
47 made pre-season to create the harvest rule that's

1 then -- governs in-season?

2 A That is how it's designed, that's correct.

3 MS. BAKER: Is that helpful? Shall we come back maybe
4 after the break and --

5 THE COMMISSIONER: Why not?

6 MS. BAKER: -- do that again? Okay. Thank you.

7 THE REGISTRAR: Hearing will now recess for 15 minutes.

8

9 (PROCEEDINGS ADJOURNED FOR MORNING RECESS)

10 (PROCEEDINGS RECONVENED)

11

12 MS. BAKER: Thank you, Mr. Commissioner. We're now
13 joined, as I said, by Rob Morley, Mike Staley and
14 Ken Wilson. And Mr. Morley has already been a
15 witness in these proceedings, but this would be
16 the first time you've met Mike Staley and Ken
17 Wilson so they both need to be sworn in as
18 witnesses.

19 THE REGISTRAR: Thank you. Mr. Cass and Mr. Morley,
20 you've already been sworn when you were last here.

21

22 AL CASS, recalled.

23

24 ROB MORLEY, recalled.

25

26 MICHAEL STALEY, sworn.

27

28 KEN WILSON, sworn.

29

30 MR. STALEY: I do.

31 MR. WILSON: I do.

32 THE COURT: State your full name, please.

33 MR. WILSON: Ken Wilson.

34 THE REGISTRAR: Thank you. And your name?

35 MR. STALEY: Michael James Staley.

36 THE REGISTRAR: Thank you. Counsel?

37 MS. BAKER: Thank you.

38

39 EXAMINATION IN CHIEF BY MS. BAKER:

40

41 Q Mr. Morley was here already in these hearings.
42 His c.v. has been marked as Exhibit 7 already so I
43 won't need to take you to that, but I'll just ask
44 you, Mr. Morley, to identify that you have been
45 involved with the FRSSI model and you've been to
46 several workshops, or at least one workshop
47 dealing with the implementation of that model?

1 MR. MORLEY: Yes, several workshops.
2 Q Okay. And you are familiar with the review of the
3 different options through the IHPC process, as
4 well as through work on the Fraser Panel?
5 MR. MORLEY: Yes, I am.
6 Q Thank you. Mr. Lunn, were you able to find --
7 MR. LUNN: I don't have it here --
8 MS. BAKER: Okay.
9 MR. LUNN: -- but I'm checking with the office.
10 MS. BAKER: Okay. Okay. Thank you. Mr. Commissioner,
11 we don't have ready access right now to Mr.
12 Staley's resume for some reason so we'll probably
13 mark that after lunch.
14 Q But if I could just identify that you have a
15 Masters of Science from UBC in 1978, and your work
16 was on the optimization of sport and commercial
17 salmon fisheries in B.C.?
18 MR. STALEY: Yes, it was.
19 Q And you were a consultant to the Pierce Commission
20 in 1982?
21 MR. STALEY: Yes.
22 Q And you have been involved in fisheries planning
23 throughout -- from 1978 until the present; is that
24 right?
25 MR. STALEY: Yes.
26 Q And from 1988 to the present, you have been an
27 advisor to various First Nations and aboriginal
28 groups on fisheries issues?
29 MR. STALEY: Yes.
30 Q And from 1995 to the present, you've been a member
31 of the Fraser River Panel Technical Committee?
32 MR. STALEY: That's correct, yes.
33 Q And you are a member of the fisheries working
34 groups for several First Nations present; is that
35 right?
36 MR. STALEY: Yes.
37 Q And what are those First Nations?
38 MR. STALEY: Well, there's First Nations organizations,
39 the current one would be the Fraser River
40 Aboriginal Fisheries Secretariat.
41 Q Okay. And you are also familiar with FRSSI; is
42 that right?
43 MR. STALEY: Yes.
44 Q And in fact, you prepared a report for this
45 Commission on FRSSI which is in Tab 8 in the
46 binder before you. It doesn't have a CAN number,
47 but it was prepared for the Cohen Commission and

36
PANEL NO. 17
In chief by Ms. Baker

1 it was prepared in October 2010, that's --

2 MR. STALEY: Yes.

3 Q Thank you.

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

5 THE REGISTRAR: Exhibit number 400.

6

7 EXHIBIT 400: Fraser River Sockeye Spawning
8 Initiative (FRSSI) - A review for the Cohen
9 Commission by Michael Staley

10

11 MR. LUNN: I have that resume now.

12 MS. BAKER: Oh, thank you. And then I'll have your
13 resume pulled up. I think we've got a bunch of
14 personal information on this so I won't have this
15 one marked, but we'll provide a redacted version
16 after the break that we can mark as an exhibit so
17 maybe we can just have this flagged that it will
18 be marked as Exhibit 401, and we'll provide the
19 redacted copy after the break.

20 THE REGISTRAR: Exhibit number 401.

21

22 EXHIBIT 401: *Curriculum vitae* of Michael
23 Staley

24

25 MS. BAKER: Thank you.

26 Q And Mr. Wilson, your resume is in Tab 12 of the
27 binder before you.

28 MS. BAKER: His resume is in Tab 12 of the binder.

29 MR. LUNN: Thank you.

30 MS. BAKER:

31 Q You have a Masters of Science with Dr. Larkin from
32 1980; is that right?

33 MR. WILSON: Yes.

34 MS. BAKER:

35 Q And you were a biologist with the Department of
36 Fisheries and Oceans from '84 to '96?

37 MR. WILSON: Correct.

38 Q And from 1997 to the present, you've been a
39 consulting fisheries biologist for a number of
40 groups, including First Nations and conservation
41 organizations?

42 MR. WILSON: Correct.

43 Q You're a member of the Canadian Caucus of the
44 Fraser River Panel?

45 MR. WILSON: Yes.

46 Q And you're a member of the Marine Conservation
47 Caucus?

February 7, 2011

1 MR. WILSON: Yes.

2 Q And you're also a member of the COSEWIC Marine
3 Fish Species Specialist Group?

4 MR. WILSON: Not any more.

5 Q Okay. And when did that -- you were?

6 MR. WILSON: I was, yes.

7 Q And when did that -- what were the years that you
8 were involved in that?

9 MR. WILSON: I was involved for several years.

10 Q When did that stop?

11 MR. WILSON: It's a good question. If it's not on the
12 resume, I don't remember, but it's probably three
13 or four years ago now.

14 Q All right. And you also have been involved in the
15 development of the FRSSI model. You were part of
16 the FRSSI working group for a number of years?

17 MR. WILSON: I was never a member of the working group
18 proper, I don't believe.

19 Q Okay. You were -- but you did participate in some
20 meetings and --

21 MR. WILSON: Consultations, yeah.

22 Q Consultations okay. And have you been involved in
23 consultations with the -- with respect to the
24 FRSSI model recently?

25 MR. WILSON: Well, as part of my work with the
26 Integrated Harvest Planning Committee, I received
27 the usual reviews and updates from the Department
28 on the development of the FRSSI model, and most
29 recently, I was under contract to the Upper Fraser
30 Fisheries Alliance, Upper Fraser Fisheries
31 Conservation Alliance, and I attended meetings on
32 January 21 and 22, 2009, on their behalf, in order
33 to provide them with a review of the model as it
34 was at that time.

35 Q Okay.

36 MS. BAKER: Could I have your resume marked, or Mr.
37 Wilson's resumed marked as the next exhibit?

38 THE REGISTRAR: Exhibit number 402.

39

40 EXHIBIT 402: *Curriculum vitae* of Ken Wilson

41

42 MS. BAKER: Mr. Commissioner, before we move to the
43 panel's evidence, I just want to take one more run
44 through the use of the FRSSI model to create
45 preseason and in-season plans. Could I have
46 exhibit -- and these questions are, again, to Mr.
47 Cass, Exhibit 322, again, in front of us, page 15,

1 CAN 15 of that document.
2 Q So again, Mr. Cass, those options that we see at
3 the bottom are the different options that are
4 created by the model for consideration in the
5 planning process; is that right?
6 MS. BAKER: That is correct. And Mr. Lunn, if you
7 could pull up, please, Exhibit 325 and turn to CAN
8 68.
9 Q And you see on -- this is the Integrated Fisheries
10 Management Plan, one of the drafts before the
11 final, and it sets out for the different stocks at
12 the 50-percent probability level all these
13 different options, options 1, 2, 3, 4, et cetera.
14 Those options, I take it, correspond with the
15 options that would be presented in an escapement
16 strategy document like we have seen marked as
17 Exhibit 322?
18 MR. CASS: That's correct. That would be an outcome
19 from that document, or from that process.
20 Q Okay. So the escapement strategy memo, which we
21 just had a look at, and that shows the different
22 options and the curves, with the different curves
23 for the different options, those correlate to the
24 text that we see before us, now -- of the
25 different options. That translates those curves
26 into actual numbers.
27 MS. BAKER: Can you, yeah, pull that bottom one up a
28 little higher, if you could. Oops. There. No, a
29 little more. There.
30 Q Okay. So those options would then translate into
31 the different numbers that you see on the screen,
32 the cutback points and the TAM sizes, et cetera;
33 is that right?
34 MR. CASS: That's correct. I'm assuming that that Table
35 10(a) references those curves, yeah.
36 Q Right. And I could have the wrong curves, but
37 just for --
38 MR. CASS: Yeah. No. Yeah.
39 Q -- reference, I think this is correct. And then
40 finally -- so the draft that we're looking at on
41 the top of the screen, which is Exhibit 325, and
42 it's draft number 2 of the IFMP for 2009, that
43 shows the options that are being considered by the
44 people reviewing the draft IFMP document.
45 Ultimately, an option is settled upon and finds
46 its way into the final IFMP, and that document is
47 Exhibit 317. And if we turn to page CAN number

1 67, this shows the choices that were made for the
2 different options, and it translates those options
3 into the different points, the total mortality
4 guidelines, the run size. So it shows that if you
5 have a run size for Early Stuart of 255,000,
6 you're going to have -- the reference points show
7 there that if you have less than 255, there's
8 going to be no -- that's within the no-fishing
9 point. All right. But below 156, sorry, is
10 within the no-fishing point. 156 to 390, it's in
11 that curve that shows the percentage increasing up
12 to 60 percent; is that right?
13 MR. CASS: That is correct.
14 Q And then the 390 and above, is that a fixed 60-
15 percent rate?
16 MR. CASS: That is correct.
17 Q And the rules that you see on this table, here, in
18 the final IFMP, those are the -- that's the
19 fishing plan for the year that will be implemented
20 by the managers; is that right?
21 MR. CASS: Correct.
22 Q So that's how we kind of move from the pre-season
23 planning using the FRSSI model to create these
24 curves and these options. Once an option is
25 settled, it translates into actual numbers that
26 will be used in-season by the managers; is that
27 right?
28 MR. CASS: That is the current process, yes, correct.
29 MS. BAKER: Does that clear things up a bit?
30 THE COMMISSIONER: It does, Ms. Baker. I think I was
31 able to follow that earlier. What perhaps just
32 sidetracked my thinking a little bit was the use
33 of the term "in-season management" to the extent
34 that there are significant changes that appear
35 from the run size assessment once Mission starts
36 to develop some numbers for the managers. And I
37 understand the meetings that take place in April
38 and May, and into June, but once harder numbers
39 arrive and are then reviewed, how FRSSI would
40 operate or how these models would operate, because
41 I understood these to be preseason numbers --
42 MS. BAKER: Right.
43 THE COMMISSIONER: -- not actual in-season, but you
44 used the term "in-season management" and that was
45 confusing me a little bit.
46 MR. CASS: Yeah, and I apologize. I think that was
47 confusing. I think the way Ms. Baker has taken us

1 through this, it -- FRSSI, while it's the plan
2 that's developed preseason, it is the plan that
3 goes forward for management.

4 MS. BAKER: Thank you.

5 Q All right. Now, I'd move off of that. Oh, sorry,
6 apparently I'm not to move off that yet. Just to
7 be clear, where you see the run size reference
8 points, that's telling the managers that when the
9 run comes in zero to 156, this is what's going to
10 happen, there'll be no fishing. If the run size
11 comes in between 156 to 390, there'll be an
12 exploitation on that curve that we saw so it will
13 vary as it reaches 390, and then once it's beyond
14 390, it will be fixed at 60 percent. That's what
15 the plan is for the Early Stuart on this example,
16 Mr. Cass?

17 MR. CASS: Yes, that's correct.

18 Q Okay. All right. Thank you. Now I think we can
19 move on. One thing I think we've established
20 already, but just to be clear, the FRSSI model
21 uses the 19 stocks that there is good stock
22 recruit data for in modelling the outcomes through
23 the FRSSI model; is that right, Mr. Cass?

24 MR. CASS: Yes, that's correct.

25 Q Okay. Now, is that data that is available for use
26 in the model from those 19 stocks, the data that's
27 been collected for over 50 years, is that adequate
28 to provide a stock recruit relationship that
29 explains enough variability in the data to be a
30 sound basis for management? Is the data good
31 enough for what we're using it for in this model?
32 And I guess I'll start maybe with Mr. Morley.

33 MR. MORLEY: Could you repeat the question?

34 Q Is the stock recruit data that we have for the 19
35 stocks that are used in the FRSSI model adequate
36 for the use that it's put to in the FRSSI model?
37 Like, do we have good enough data to run this
38 model?

39 MR. MORLEY: In my opinion, absolutely, yes. It's
40 probably the best that you can expect to get
41 anywhere in terms of managing sockeye populations
42 for this kind of purpose.

43 Q Mr. Cass?

44 MR. CASS: I would just add the caveat that because not
45 all the stocks are included, there is some risk
46 that the uncertainty described by the 19 stocks
47 may not represent all the populations that are in

1 the watershed. Having said that, of course, you
2 know, the 19 stocks, certainly in terms of
3 abundance, represent, you know, well over 90
4 percent of the fish in the system, but just by the
5 fact that it does not include all the populations,
6 there is some risk that there could be populations
7 which would be at lower productivity and,
8 therefore, vulnerable to a management plan that
9 doesn't account for some losses that way.

10 Q All right. But for the 19 stocks that we do have
11 data for, is the data that we have adequate for
12 those stocks?

13 MR. CASS: Adequate in the sense of for -- well, the
14 top 12, let's say, which have data going back to
15 the '50s, early '50s, late '40s, there's a long-
16 time series of spawners and associated recruitment
17 for those. The other seven were added on, but
18 have typically shorter time series and more
19 uncertainty in the actual parameter estimates.
20 But those are as good as it gets, globally,
21 probably, in terms of fisheries science data for
22 managing.

23 Q Mr. Wilson, what are your views on the adequacy of
24 the data that we have to use in this model?

25 MR. WILSON: Well, I have several concerns. First of
26 all, while the data for the 19 stocks may
27 represent 90 percent of the catch, it represents
28 less than half of the conservation units, or half
29 of the conservation units on the Fraser, and it's
30 each and every one of those conservation units
31 that needs to be protected through management.

32 I'm also of the opinion that 50 years of
33 data, while it may seem enormous to a fisheries
34 manager, is a relatively brief window of time when
35 you're looking at the long-term dynamics of salmon
36 populations in the Fraser.

37 And finally, I guess, my concern has to do
38 with the variance in the quality of the data from
39 stock to stock and the way those data are used to
40 enlighten us about what might happen in the
41 future. These are historical data and so we're
42 essentially looking through a very limited frame
43 of reference backwards at a set of information and
44 trying to understand how the world might work in a
45 way that's consistent with those data. But it's
46 one thing to, you know, fit a model to historical
47 data, it's another altogether to forecast the

1 future. And in evaluating harvest policy, that's
2 really the problem, we're setting the model.
3 We're trying to understand how this policy applied
4 into the future for 48 years, how we will manage
5 the risks and benefits that are associated with
6 that management policy, and I think there's a high
7 degree of uncertainty that may not be adequately
8 reflected in the model. Although, I totally agree
9 with Mr. Cass's point that stocks that aren't
10 modelled, aren't modelled.

11 Q All right. And Mr. Cass referred to 12 stocks
12 that have data back to the '50s, and seven with a
13 shorter time series. Do you agree that the 12
14 that have data going back to the 1950s do provide
15 a good data set for running this model, for at
16 least in relation to those stocks?

17 MR. WILSON: Not really. My concern is a simple one.
18 If you have 50 years of data and you're going to
19 use those data to understand how a system behaves,
20 you're making an assumption about how stable the
21 relationships between the various factors that
22 affect the population will be over that time
23 period. 50 years of data may seem like a long
24 time, but it is what it is. Is it representative
25 of the 50 years going forward that the model's
26 attempting to help us understand? And that's
27 where the problem occurs in my opinion. Yes, I
28 think that those data, to some degree, are an
29 adequate representation of the past performance of
30 these stocks. Whether the past performance of
31 these stocks will enlighten us very much about the
32 future performance of these stocks is really at
33 the heart of the matter.

34 Q All right. So your concern is whether we can use
35 the past to predict the future, but in terms of
36 looking at the data we have for the past, you do
37 agree that it's adequate for 19 of the stocks; is
38 that fair?

39 MR. WILSON: I don't think I would agree with that, no.

40 Q Okay. Mr. Staley, what's your view on the
41 adequacy of the data that we have?

42 MR. STALEY: Well, adequacy would have to be looked at
43 in context of the purpose you're using it for.
44 We, in the FRSSI model, are the analytic tool. As
45 Ken points out, we are suggesting that we're
46 projecting into the future, but I think it's --
47 and there, there's all kinds of issues about

1 whether that's an appropriate purpose, I guess.
2 But certainly in terms of projecting or testing
3 whether our prescriptions on what to do would be
4 consistent with what happened in the past, it is
5 adequate. I agree with Mr. Wilson that, you know,
6 we don't know what the future holds, but we have
7 to learn from the past.

8 I think there are some of the stocks in the
9 19 that have a short time period and perhaps some
10 more exploration as to the relative weight one
11 should place on those versus the other ones may be
12 a useful exercise that I don't think has been done
13 yet. But I would say for those that we have 50
14 years of, or more, of data, that they are adequate
15 in the context of the art of the science that all
16 of us are involved in.

17 Q When Mr. Cass was here this morning, we talked a
18 little bit about this dispensatory effect. And
19 maybe, Mr. Wilson, you can just explain what that
20 is again, just as a recap.

21 MR. WILSON: Sure, at very low run sizes --

22 THE RECORDER: Microphone, please.

23 MR. WILSON: Sure. At low run sizes, the sort of
24 standard model generally predicts that stocks will
25 become more productive because competitive
26 pressures and other pressures are relieved. So at
27 low run sizes, stocks are highly productive and
28 have a tendency to grow quite rapidly. The
29 concern is that at extremely low run sizes, there
30 may be an abundance of predators that eat all the
31 available sockeye in the lake. I think Mr. Cass
32 referred to it as a predator pit. There's a
33 number of other mechanisms which might lead to
34 lower productivity at small run sizes and it's a
35 very important issue if you're trying to evaluate
36 the risk of small stocks and on modelled stocks to
37 a particular fishing regime and evaluate that risk
38 in the context of the probability of extinction.
39 So it's quite a critical assumption and we really
40 have very little data to help enlighten us.

41 Q And does the FRSSI model take into account that
42 dispensatory effect? I think you touched on this
43 earlier, Mr. Cass. Is there anything you want to
44 add to what you said earlier, before I turn it
45 over to the other members?

46 MR. WILSON: No, I mean, Mr. Commissioner, the model
47 has, you know, a knob in the model that you can

1 adjust what assumptions you want to make about
2 dispensatory mortality. It doesn't estimate
3 dispensatory mortality, it's just a way of
4 exploring the effect that it may have on the
5 outcome of the model.

6 Q And Mr. Wilson, are you satisfied with the way the
7 dispensatory effect is treated in the model as
8 described by Mr. Cass?

9 MR. WILSON: Well, I think it would be very helpful to
10 have real data to show us whether or not the
11 assumptions we're making are correct, or not. So
12 I guess, I don't see it as a key issue in terms of
13 my concerns around the model, but it is a
14 significant issues in evaluating, particularly,
15 the impact of a particular policy or fishing
16 regime on small stocks that may not be in the
17 model at all.

18 Q Mr. Staley?

19 MR. STALEY: In terms of the TAM rules and the
20 structure of them currently that are being used,
21 it's hard for me to see that the dispensatory
22 issue which happens at low abundance would be
23 something you'd be too worried about. I think the
24 reason being is that the difference between the
25 various alternative TAM models is the cutback
26 point at abundance. And certainly, the model, the
27 way it's structured, at the low abundance is that
28 -- which we -- dispensatory processes might be --
29 as someone characterized this morning, might be
30 operating, in those population levels, the
31 prescription would be to do as little fishing as
32 possible. So the policy is to avoid those when
33 you're down in those areas, and the prescriptions
34 that are coming out of the FRSSI process are
35 dealing with when to cut back at much larger
36 abundances than where those dispensatory issues
37 are carrying out.

38 I suppose, and I believe that's been done in
39 the past, one of the sensitivity analyses one
40 could do is to see whether the presence or absence
41 of dispensatory construct at the low population
42 sizes affects significantly where the best cutback
43 point might be when the population is in
44 abundance. And my recollection, if that work's
45 been done, it wasn't sensitive, but I'd have to
46 refresh my memory on what -- there's been a
47 significant amount of sensitivity analysis been

1 done on the model by the people who have been
2 working on it. Some of it's available in reports
3 and others are in gigabytes of data that I have
4 sitting on my computer that I haven't been able to
5 figure out how to look at.

6 Q So if I can put it in layperson's language, is it
7 your -- would you agree that the dispensatory
8 effect is not a particular concern because the
9 model is being used to evaluate harvesting
10 decisions and escapement decisions and there's
11 already -- the interim benchmarks already require
12 no fishing at low levels so that you're not going
13 to be making a fishing decision that would be
14 impacting or creating a dispensatory effect,
15 something like that?

16 MR. STALEY: Under the assumption that the dispensatory
17 effect is occurring at very low population sizes.

18 Q Okay.

19 MR. STALEY: And I mean, if we look at the stock and
20 recruitment data from all of these populations,
21 there's very little statistical evidence for that
22 dispensatory effect. That's because there's a lot
23 of noise around the data in that lower area, in
24 part, or it may be because it is or isn't there,
25 and it's hard to distinguish those alternatives.

26 Q All right. Mr. Morley?

27 MR. MORLEY: I mean, I have to actually agree with my
28 colleague, Mr. Wilson, on some of this because I
29 think that, in fact, the unmodelled stocks, if
30 they're not behaving the same as the modelled
31 stocks, and they're at different population levels
32 when we're talking about the application of these
33 TAM rules that certainly, there could be some
34 impact. And the issue here is that we're never
35 going to know because we don't collect enough
36 information on those unmodelled populations to
37 understand that. And although I tend to agree
38 that looking at the overall what we're trying to
39 do in managing the four run timing groups, I would
40 agree with what Mr. Staley is saying in terms of
41 the situation.

42 Q All right. You say we're never going to know
43 because we don't collect enough data on the
44 smaller stocks. Is it the case that we collect
45 spawning enumeration data on the very small
46 stocks?

47 A We have some -- as I think you went through the

1 other day in terms of looking at stock assessment,
2 that you do collect some visual surveys of all of
3 these populations, but the reliability of the
4 estimates is a lot lower than some of the more
5 accurate methods and certainly, the dispensatory
6 impacts would probably be, as Mr. Wilson
7 indicated, perhaps in a lake kind of environment
8 and you do very little in terms of monitoring
9 what's going on with the ecology in those
10 ecosystem. So that's why I think you're not going
11 to know a lot about it and we're not putting our
12 monies into looking at some of the smaller
13 populations which potentially, depending on how
14 the Wild Salmon Policy is implemented, could have
15 a significant impact on how you might want to
16 manage the 95 percent of the fish that we all are
17 involved in harvesting.

18 Q Right now, the FRSSI model, as I think you touched
19 on, Mr. Cass, only models the 19 stocks for which
20 the Department does have stock recruit data and a
21 long time series. And as Mr. Wilson and you have
22 both noted, there's a number of stocks in the
23 watershed which are not accounted for in those 19
24 data sets that we have. So what is the mechanism
25 by which FRSSI accounts for those small stocks for
26 which there is no time series for stock recruit
27 relationships?

28 MR. CASS: Well, there's a buffer built into the --

29 MS. BAKER: You need to put your mike on.

30 MR. CASS: Oh, sorry. Mr. Commissioner, as I touched
31 on this morning, there is a buffer built into the
32 TAM rule by way that the fixed exploitation rate
33 that's prescribed the large range of run sizes is
34 in the low range of what the analysis on stock
35 recruit would tell us in terms of productivity and
36 the exploitation that it can withstand. So in
37 answer to the question, there is a mechanism built
38 in there to guard against over-harvest of less
39 productive stocks.

40 Q This is the 60-percent maximum rate?

41 MR. CASS: Yes. Yes. Yes.

42 Q Okay. Mr. Wilson, what's your view on this?

43 MR. WILSON: Well, the TAM rules apply to aggregates of
44 multiple stocks. So within an aggregate, there
45 may be stocks that are relatively unproductive and
46 stocks that are more productive. I don't think a
47 rising tide lifts all ships equally in this case.

1 Some stocks, for example, the Adams, might come
2 back very strong, and as a result, the entire
3 aggregate is fished at 60 percent, notwithstanding
4 Cultus for the time being. That could lead to a
5 situation in which because we're only harvesting
6 at 60 percent, we may have more fish on the
7 spawning grounds in the Adams than we might like,
8 but other stocks would have escapements that are
9 far below the levels that we would like to see to
10 protect them from extinction and to ensure that
11 they're not listed. So it's not clear to me how
12 aggregate escapement goals applied to a mixture of
13 stocks with different productivities necessarily
14 protect the weaker stocks from over-harvest.

15 Q Okay. Mr. Staley?

16 MR. STALEY: Well, I think there's two quite different
17 types of stocks we're talking about. One is the
18 ones that are modelled that are in the current
19 FRSSI model, but are part of an aggregate for
20 which an aggregate TAM rule is being applied. In
21 those cases, it's my understanding that the
22 performance measures that are used to sort of look
23 for inflections on one of the graphs you showed,
24 where the choices of the cutback points, there
25 were slight inflections in those performance
26 measures. Some of those performance measures are
27 the probabilities or likelihoods of individual of
28 the modelled stocks that are in those aggregates
29 falling below some benchmark. So to a certain
30 degree, the existing construct sort of accounts
31 for individual stocks. If your performance
32 measure is that one or two or some individual
33 stocks within the modelled stocks within that
34 aggregate don't fall below some threshold, and
35 that's your performance measure, then the TAM
36 rule, appropriate TAM rule would be obvious from
37 those -- the kinds of graphs you were looking at
38 earlier.

39 The other issue is the ones that -- stocks
40 that are not represented and I guess there's a
41 couple of things you might say to that. One is
42 that the 60 percent, while albeit a somewhat
43 arbitrary number, it's at the lower range of what,
44 in general, we believe the sockeye stock's
45 productivity on a coast-wide basis would sustain,
46 at least at some level. Those that are still with
47 us now and who are with the -- have sort of

1 average productivity or recent productivity would
2 probably still be with us after a regime of 60
3 percent for some time. That's the sort of general
4 rule of thumb.

5 That being said, you know, we've experienced
6 a decline in the productivity and perhaps, you
7 know, the world has changed and 60 percent may or
8 may not be still appropriate, but that's related
9 to the -- but I think there has to be a
10 distinction between those populations that are not
11 included in the analysis from those that are
12 included in the analysis because the current
13 analysis does address at least the potential for
14 one of the model stock, one or more of the model
15 stocks in an aggregate falling below some
16 benchmark.

17 Q All right. Mr. Morley?

18 MR. MORLEY: I don't have anything to add to Mr.
19 Staley.

20 Q Okay. So you talked about using a 60-percent
21 ceiling as a buffer or to create some protection.
22 What about using a proxy stock? Has that been
23 considered, using a proxy for some of the stocks
24 that we don't have a good time series of data for?
25 Mr. Cass?

26 MR. CASS: We have, Mr. Commissioner, entertained the
27 notion of a proxy stock which would represent, or
28 the intent was to have it represent a less-
29 productive stock, for example. So the model does
30 have the capability to model proxy stocks with the
31 idea of looking at the impact on that stock, even
32 though we may not have stocks representing the low
33 productivity that the proxy would be designed to
34 do. It's one way to look at how the model deals
35 with a fictitious stock, if you like, that has the
36 properties of a low productivity stock.

37 Q And how would you know what the characteristics of
38 that fictitious proxy stock would be?

39 MR. CASS: Yeah, I mean, that's the rub, of course, is
40 if we don't know what the range of productivities
41 are for the full suite of CUs, say, then you're
42 forced to make an assumption about what the proxy
43 should be representing. So you know, my view is
44 in the range of populations that we're seeing now,
45 you know, Cultus falls in the low range with, say,
46 a mean productivity rate in terms of exploitation
47 might be 50 percent. I'd have to look at the

1 numbers. So that might be some lower range that
2 you might want to attach to a proxy stock.

3 And I honestly am not sure where that work
4 has led. I mean, others may know about it, but I
5 do know that we entertain the idea of a proxy
6 stock, but I'm not sure if it's followed through
7 or continues to be one of the bells and whistles
8 that we have in the current version.

9 Q Okay. Mr. Wilson, do you think a proxy stock
10 would be a reliable or a useful way to understand
11 the impacts of the stocks we don't have a full
12 data set on?

13 MR. WILSON: Well, I agree with Mr. Cass, the problem
14 is how do you, if you'll pardon the jargon,
15 parameterize this proxy stock? How productive do
16 you think it is and what is the carrying capacity
17 of its habitat? You have to make some assumption
18 about those things if you're going to put it in
19 the model as a proxy stock. So I think it's a
20 useful way to provide general guidance about what
21 might happen to a stock of any particular low
22 productivity under a long-term fishing regime, but
23 it doesn't necessarily protect you from the
24 downside risk of driving small stocks to
25 extinction if they're not in the model. Your
26 proxy stock will be as productive as you say it is
27 and since you have no data, you simply have to
28 pick a number and that's my concern about the
29 whole approach to managing unmodelled stocks
30 within the FRSSI process.

31 Q Mr. Morley?

32 MR. MORLEY: I mean, I agree that the proxy stock will
33 only be as good as the assumptions you put into
34 what the productivity is so I don't think it's
35 particularly instructive in terms of moving us
36 forward or --

37 Q All right. Mr. Staley?

38 MR. STALEY: All the caveats that the others have said
39 about parameterizing an unknown stock are
40 appropriate and -- but it occurs to me that one of
41 the places -- and this may be a piece of work that
42 needs to be done, would be to search for, you
43 know, the types or levels of productivity of a so-
44 called virtual stock or a proxy stock that would
45 not be sustainable. So how unproductive do stocks
46 have to be that would not sustain the kind of
47 exploitation and mortality that's in some of these

1 TAM rules, such as the 60 percent. That would be
2 an informative thing to do, and then it would be
3 up to a group of experts, perhaps, to sort of
4 think broadly about how viable those stocks may be
5 anyway, and that sort of thing. Thank you.

6 Q Has any work been done in that respect with this
7 model, or has that been a proposal that's been
8 considered?

9 MR. STALEY: That has been -- I don't know of any work
10 that's been done with it. I know that was briefly
11 discussed when the capacity of putting a virtual
12 stock in the computer model was discussed, but I
13 don't believe any work explicitly on that, and,
14 actually, it just occurred to me today.

15 Q We've talked a few times about the TAM rule, the
16 60-percent ceiling, and my question is whether --
17 we've talked a little bit about where that came
18 from. Mr. Cass has talked about that, but my
19 question is whether that is an appropriate ceiling
20 in years where there's a very large abundance like
21 2010 as an example. And let's start with you, Mr.
22 Cass.

23 MR. CASS: Well, you know, I mean, these things, Mr.
24 Commissioner, are case specific and in the perfect
25 world, I guess, where you knew what the optimal
26 escapement would be, then perhaps you could manage
27 to that, but in the world of mixed stock
28 fisheries, in particular what we saw in 2010,
29 where Cultus, for example, is mixed in with the
30 very abundant Late Run group, then you have to ask
31 yourself about how you trade the biodiversity, the
32 conservation issue off with a reduced benefit to
33 the harvest sector and a potential for too many
34 fish on the spawning grounds for future
35 production. So there are -- certainly, the model
36 could be adapted to constrained escapement at some
37 level. It's your case-by-case world in mixed
38 stock fisheries that may have impacts other than
39 on large populations.

40 Q Do you agree, then, that the 60-percent level
41 should be reassessed, then, on a yearly basis in
42 relation to the different aggregates to see what
43 is the appropriate ceiling, rather than --

44 MR. CASS: I think that is a healthy exercise. I think
45 that research to look more at where we are now,
46 given the uncertainties, and I think it's worth a
47 review of the cap.

1 Q All right. Mr. Wilson?

2 MR. WILSON: Well, it's a matter of compromise, isn't
3 it? On one hand, we can fairly quickly evaluate
4 the economic benefit of fish that are killed in
5 harvest and sold. And the future production
6 benefit of putting a spawner on the spawning
7 grounds, we evaluate through our view of stock
8 recruit dynamics, the so-called Ricker curves or
9 Larkin curves. But that said, there's also a
10 whole host of benefits that can come from large
11 escapements that aren't captured by the model or
12 evaluated in any way. And by this, I'm talking
13 about the nitrification of freshwater ecosystems,
14 the benefits to the zooplankton populations and
15 even salmon. Salmon, in fact, benefit
16 substantially from the nutrients their parents
17 bring to the watershed and some authors have
18 suggested that both the care and capacity and
19 productivity of stocks can be influenced by the
20 escapement strategy, in particular, by allowing
21 larger escapements to provide nutrients to support
22 the entire ecosystem. Those benefits are not
23 included. But I do agree that it's a conversation
24 around values that we all have to have. So not
25 all values are captured by the models and not all
26 values are equally well quantified in terms of
27 dollars and sense.

28 Q Well, the question was -- your evidence is
29 helpful, without doubt, but the question was
30 really whether the 60 percent is something an
31 appropriate level, does it provide enough buffer
32 and it should be maintained going forward, or is
33 it something that should be looked at an
34 reassessed and perhaps changed for the different
35 aggregates in any given year?

36 MR. WILSON: I'm not confident that a 60-percent
37 exploitation rate will be protect weak stocks and
38 unmodelled stocks. There is an argument to be
39 made that more than 60 percent of some stocks in
40 strong years can be harvested without facing a
41 penalty in terms of future production. If your
42 primary focus is yield, then there would be reason
43 to reconsider these TAM rules. If your major
44 objective is conservation of all stocks and
45 protection of weak stocks, there may be times when
46 very large returns should not be harvested at 60
47 percent. So I'm struggling with a way to provide

1 a general answer to something that can really only
2 be evaluated in the specific context.

3 Q All right. Mr. Morley?

4 MR. MORLEY: I guess I have a -- I agree with Ken in
5 the sense that one of the drawbacks in the entire
6 FRSSI model in my opinion is that it is trying to
7 develop -- it's a simulation model based on sort
8 of looking forward 48 years and applying some very
9 general rules that if you had them in effect for
10 48 years, that this is what is likely to happen.
11 And that in reality, we don't make decisions on
12 harvest or escapement for 48 years, we made a
13 decision every year based on what is coming back.
14 And in fact, those decisions need to evaluate the
15 consequences of adjustments to that even within
16 season depending on the relative strengths or the
17 runs we see coming back. So there are tradeoffs
18 to be made of the kind that Ken talked about in
19 terms of evaluating them, but those evaluations
20 need to be done in a dynamic sense as you see the
21 actual -- because the trade-off may be very
22 different when you're potentially giving up 10
23 million fish in order to put an extra thousand
24 fish on the spawning grounds for a run that is
25 somewhere in the 20,000 range. But if it's
26 putting an extra 1,000 fish on the spawning
27 grounds on a run that's down to less than 100,
28 maybe there's a different impact there, it's a
29 different weighing of those values. And that
30 can't be done in a simple application of a rule
31 for 48 years. And that's one of the drawbacks
32 that I'd like to get into in more detail.

33 The other issue here is that we keep talking
34 about exploitation rates and we're not -- it's a
35 total allowable mortality rate. So our
36 exploitation rates are -- given what we're
37 assuming about en route losses and en route
38 mortality is that our exploitation rates are very
39 much lower than that in the vast majority of
40 cases. We're not harvesting anywhere near 60
41 percent.

42 Q Right.

43 MR. MORLEY: And we're harvesting more in the 30-
44 percent range, and sometimes we might get up to
45 50, if we're really, really lucky, but most times
46 we're way, way well below 60 percent.

47 Q Can I just ask you if your first comment that you

1 made, it's really a reflection on the fact that
2 the FRSSI model creates pre-season harvest rules
3 and is your comment really that those rules need
4 to be more flexible in-season, that you can't --
5 not only can you not project a rule forward for 48
6 years, but even to make a rule hard and fast in
7 the spring may not be the right rule by the time
8 we're in the end of the summer? Is that the
9 point?

10 MR. MORLEY: Both cases, I think, are important.

11 Q Okay.

12 MR. MORLEY: That you need to evaluate it based on the
13 expected returns and the makeup of the populations
14 in any given year, what cycle of year you're on,
15 those kinds of things, relative to, again, the
16 returns that are coming back from all the
17 populations. And even within season, if we set
18 these fixed rules for each of the run timing
19 groups and, again, the relative strength for the
20 run timing groups may provide a different kind of
21 trade-off decision in the middle of the season
22 than you thought it was going to be at the
23 beginning of the season and we have been stuck
24 with some fairly inflexible rules in the past that
25 have hamstring -- and really have provided any
26 huge additional conservation benefits to stocks
27 that are at risk but have certainly prevented some
28 significant harvesting opportunities for all of
29 the user groups.

30 MS. BAKER: Mr. Commissioner, I wonder if Mr. Staley
31 could answer this question and then we'll stop for
32 the break.

33 MR. STALEY: Maybe you could repeat the question?

34 Q My question was whether the 60-percent ceiling is
35 a ceiling that should be in place even on high-
36 abundance years, and I used 2010 as an example.

37 MR. STALEY: Well, I think that the -- whatever the cap
38 is, it's currently 60 percent, is there regardless
39 of the abundance. It's purpose is to protect
40 components or populations that are not abundant
41 and not strong, and which we suspect are there and
42 we may not have hard evidence to show, but we
43 suspect there are smaller populations and weaker
44 populations that are mixed in. So I don't think
45 you'd want to change it just because of the run
46 size. In fact, you know, the analysis is done on
47 the assumption that the analysis includes

1 occurrences of very strong run sizes, as well as
2 very weak mixtures in the FRSII model, as it's
3 constructed.

4 That being said, you know, I don't know
5 whether 60 percent is or isn't the right number.
6 It's a number that was chosen and I expect it
7 should be reviewed in an informed way with a fair
8 amount of discussion. But the other side of it is
9 there are, you know, as with the changing nature
10 of the fisheries, there are opportunities to
11 harvest some of these surpluses, for lack of a
12 better word, in places where the mixtures aren't
13 quite the same or strong. And so the FRSSI model,
14 unfortunately, only has one fishery and one time
15 and doesn't represent the sort of suite of
16 possible responses that a management -- that could
17 be used to access unexpected abundances like we
18 had in 2010.

19 Q Thank you.

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

22
23 (PROCEEDINGS ADJOURNED FOR NOON RECESS)

24 (PROCEEDINGS RECONVENED)

25
26 THE REGISTRAR: Order. The hearing is now resumed.

27 MS. BAKER: Thank you. Mr. Commissioner, you'll recall
28 when we started with this panel, I didn't have a
29 redacted copy of Mr. Staley's c.v., which we now
30 have. And we had flagged Exhibit 401 for this
31 c.v., so if that could be now officially marked,
32 that would be appreciated.

33 THE REGISTRAR: So marked.

34 MS. BAKER: Thank you.

35
36 EXAMINATION IN CHIEF BY MS. BAKER, continuing:

37
38 Q All right. Just before we broke, we were talking
39 about the TAM rule and the 60 percent ceiling.
40 And I want to -- I don't want to talk about that
41 particular piece anymore but I do want to talk
42 about the TAM rules and ask you a question around
43 their appropriateness of TAM rules being developed
44 for each run-timing group. Right now, the way the
45 FRSSI model is run and the way the IFMP is
46 developed, there is a TAM rule, TAM harvest rule,
47 developed for each run-timing group, which, as we

1 know is an aggregate in many cases of various
2 stocks. So my question is, is that the right way
3 to make management decisions? Should the TAM
4 rules be formulated for the run-timing groups, as
5 we know them, or should they be created for a
6 smaller, a finer resolution, perhaps on a
7 different aggregation of stocks or a CU level or
8 should all of the stocks be run together and a
9 rule be developed -- one rule for all of the
10 stocks in the system? So I'll start with you, Mr.
11 Morley.

12 MR. MORLEY: Well, Mr. Commissioner, I think that the
13 -- with the extent of overlap between the run-
14 timing groups, that it is difficult having a
15 separate TAM rule for each of the four run-timing
16 groups. I know that some of my colleagues here
17 are going to suggest that we should be looking at
18 separate run-timing rules for each of the
19 individual conversation units and I'll let them
20 speak to that. I don't think that's at all
21 practical, if you want to have any kind of a
22 fishery in a mixed area, which is where 95 percent
23 of the fisheries, First Nations and recreational
24 and commercial take place currently.

25 But I do think that we could, in fact, look
26 at simplifying things a little bit because
27 although Early Stuarts are probably reasonably
28 separated from the other run-timing groups, the
29 extent of overlap between Early Summers, Summers
30 and Lates has, in many cases, been increasing in
31 recent years and it makes it very difficult to
32 operate separate TAM rules for each of them and
33 that we could perhaps look more at TAM rules that
34 would apply to time periods rather than run-timing
35 groups that if you wanted to fine-tune it a little
36 bit you could have one that operated for a two or
37 three-week period then change it for the next two
38 or three weeks and then change it for the next two
39 or three weeks. But that could identify some of
40 the issues between the different stocks.

41 But I don't think that having -- that the
42 current problems with the overlap is causing us to
43 lose some production in terms of yield for all the
44 fisheries and really when we are not creating any
45 significant conservation problems for the one
46 whose run-timing rule at that time period is
47 ruling the day in terms of managing the fishery.

1 So I do think that we could simplify a little bit
2 more from what we currently are and have something
3 that would meet conservation goals as well but
4 provide for better opportunities for yield.

5 Q All right. Mr. Staley?

6 MR. STALEY: I'm not as certain as Mr. Morley is about
7 what the appropriate aggregation/disaggregation
8 should be. To date, I don't believe there's been
9 -- although there's been a lot of sensitivity
10 analysis done, I don't think we've actually -- the
11 model's been actually challenged or the process
12 has been challenged with exploring all the various
13 combinations and permutations of aggregation and
14 disaggregation yet. That being said, I don't
15 think -- well, the FRSSI -- the calculation
16 framework that's in the model right now only has
17 the capacity to deal with one fishery at one time
18 per year. And so it, by design, I guess, reflects
19 a single, mixed stock area.

20 There's been attempts to try and disaggregate
21 a little bit by having some approximations to
22 overlapping timing represented on the annual time
23 step but it's been -- they are only, you know,
24 approximations. So as I said, I'm not certain at
25 this point. I don't think I can answer that
26 question one way or the other. I suspect that
27 there is value, certainly from the conservation
28 side of things and probably, if they were to
29 consider having the types and locations of some of
30 the fisheries that are represented in the model
31 changed so add more fisheries and so on, there
32 might be some utility in exploring a more
33 disaggregated set of management groups.

34 One of the other issues with the current set
35 of management groups we have is that they were
36 established with a certain set of assumptions
37 about timing and distribution. And one, either
38 that timing and distribution has changed in
39 reality, or our ability to observe it has changed.
40 Certainly, our ability to observe it has changed
41 in the sense that we're now using DNA as a stock
42 identification tool, as opposed to the scales that
43 were used prior to, I guess, the turn of the
44 century. And the consequence of that is that, I
45 think, there's probably room -- whether there
46 should be four or not, probably the current set of
47 four may not be the most appropriate set of four.

1 There are stocks within some of the current
2 management groups that are quite separate from the
3 other members of that group in both timing and
4 geography. So I think some more work needs to be
5 done on that and I guess at the end of it I can't
6 answer the question one way or another without
7 doing more work.

8 Q When you said that right now the model only can
9 deal with the one single mixed stock fishery at
10 one time, do you mean -- are you describing one
11 run-timing group at one time? Is that what you're
12 indicating?

13 MR. STALEY: Whatever the aggregation is --

14 Q Yeah.

15 MR. STALEY: -- it is only fished together with all the
16 other members of that aggregation --

17 Q Right.

18 MR. STALEY: -- in the model construct.

19 Q So there's not a concept of having them overlap or
20 the model can't run the overlap effectively; is
21 that what you're saying?

22 MR. STALEY: Well, as I say, there's been an attempt to
23 approximate the overlaps and it doesn't represent
24 the sort of richness the decision-making that can
25 go on in-season to try and separate stocks or the
26 information that challenges people in-season. So
27 while it may be a useful sort of guide or
28 indicator, it's not going to, you know, really get
29 at what the costs and benefits are of various
30 aggregations and disaggregations. There needs to
31 be some more detailed work on an in-season basis.
32 And trying to replicate that in-season over the
33 many seasons that this longer-term view has to
34 accommodate. And that's work-in-progress, as far
35 as I can see.

36 Q And just one final question for you on this. If
37 the models were run down to a very small, fine
38 level, like a level of CUs, for example, would you
39 have the same problem that those CUs are not
40 running independently; they're running in a mixed
41 stock run all the time? So would you continue to
42 have this problem of knowing what stocks -- or
43 what the impacts of stocks running together at the
44 same time?

45 MR. STALEY: Well, I'm not sure if you're talking about
46 the modelled world or the real world.

47 Q I'm talking about if the model could be run not

1 for an aggregate but for an individual CU or an
2 individual stock, I take it you would still run
3 into this problem of not being able to understand
4 the overlap of that stock or CU with other stock
5 runs with at the same time.

6 MR. STALEY: You wouldn't be able to replicate it
7 completely. You could certainly scope out or
8 expose the regions of where there may be some
9 advantages to complete the segregation and where
10 there's no difference if they are aggregated from
11 a management perspective. In terms of the
12 performance and conservation performance, yield
13 performance, catch performance, measures that Mr.
14 Cass talked about earlier, you'd want to look at
15 the response of those to -- the sum of the
16 responses of the individual groups, as compared to
17 the response of the aggregate to those groups and
18 see. If there's a big difference, then it's
19 important to disaggregate.

20 Q All right.

21 MR. STALEY: If there's not a big difference, then it's
22 not so important.

23 Q All right. Mr. Wilson?

24 MR. WILSON: I agree with Mr. Staley's comments. My
25 concern is that within the modelled world, a
26 fishery takes the same proportion of each of the
27 constituent stocks but in the real world that's
28 not the case. And as you correctly point out,
29 it's not the case because the timing of migration
30 and other behavioural characteristics in the
31 location of fisheries can cause the harvest of a
32 higher proportion of one stock than another even
33 though they're part of the same timing aggregate.
34 And that places the stocks that are less abundant,
35 in my view, at risk.

36 Q Mr. Cass?

37 MR. CASS: I guess the only thing I have to add from
38 what's already been said is, Mr. Commissioner, to
39 disaggregate them all, you know, down to the CU
40 level. And you may want to check with the Salmon
41 Commission staff on this but from an in-season
42 management point of view, the resolution on some
43 of these small stocks where there's an assumed
44 large number of them, or at least management is
45 focusing on all the stocks independently, the
46 stock ID error, as I said before, is something
47 that needs to be considered. You know, so that's

1 an example of some practical issues that you need
2 to take into account. But I thought the issue was
3 -- I agree with my colleagues here.

4 Q What about modelling -- instead of having the four
5 aggregates, all of the stocks together in one big
6 aggregate; is that a --

7 MR. CASS: So one TAM rule.

8 Q Yeah.

9 MR. CASS: One TAM rule that covers all stocks. Yeah,
10 not been tried that I'm aware of. You know, it
11 becomes a harder problem in trying to then post-
12 season, if you like, evaluate how well you've met
13 your escapement targets because those are CU-
14 based. And so one TAM rule to fit all -- I'm
15 assuming now without having done the work and I
16 agree with Mike that this is an area that could be
17 explored, this issue of timing and how much the
18 information can actually help you, what data do we
19 actually have, needs more work. Yeah, I think the
20 work needs to be done. I think trying to manage
21 to a single TAM rule is the resolution there to do
22 that. I couldn't answer that question without...

23 Q Mr. Morley, you touched in your answer on some of
24 the practical issues in managing to a selective CU
25 harvest. Could you elaborate? Do you think that
26 is a practical -- is it possible to manage to a CU
27 level?

28 MR. MORLEY: Well, taking into account two things.
29 One, that Mr. Cass just went through, which is the
30 question of being able to differentiate individual
31 CUs when you're in certain areas given that some
32 of these are so small that in test fisheries or in
33 any kind of data generation sampling, that you're
34 unlikely to find a representative enough size of
35 sample to, in fact, find out what you've got in
36 many of the individual CUs and put that together
37 with where most of our fisheries currently are. I
38 think that would mean that if that was your
39 objective, to set a TAM rule for each of the CUs
40 and that you wanted to manage that, that would
41 mean that you would have to do it in a place where
42 you could identify the individual harvest and
43 distinguish them enough which, in my opinion,
44 would be when they were essentially separated from
45 each other given some of the small CUs.

46 So you would have to only implement that rule
47 when you could find them separate, which would be

1 when the fish were on their natal stream spawning
2 grounds. So that the only fisheries that you
3 could manage under that regime would be ones
4 where, in fact, you were fishing when the fish
5 were completely separate on the spawning grounds.
6 We don't really have any fisheries that match that
7 at the current time to any great degree. And so
8 you would be basically shutting down all of the
9 fisheries in Johnstone Strait, the lower river and
10 Sto:lo area. In fact, until you got essentially
11 onto the individual stream spawning grounds.

12 Q And have you thought about whether there are any
13 risk management issues, which arise comparing a
14 mixed stock in the marine environment to a
15 selective CU harvest in the river?

16 MR. MORLEY: The selective CU harvest is -- again, we
17 would be developing a number of very new
18 fisheries. Presumably, if you wanted to take
19 advantage of the full yield, they would, in some
20 cases, have to be fairly large fisheries. So you
21 would have to have a whole new slew of assessment
22 programs to evaluate the run sizes in those areas
23 because right now we do not do in-season run-size
24 evaluation for each of the individual populations.
25 We wait until we see how many fish respond and we
26 do an assessment of how many fish we saw on the
27 spawning grounds to determine how many there are
28 on each of those individual CUs. And we do run
29 reconstruction based on sampling at the catches to
30 make up the rest of it. If you wanted to manage
31 fisheries on each of those CUs, you would have to
32 do in-season run-size assessments in each of those
33 areas. And that are brand new programs that would
34 be very expensive to implement and would have,
35 certainly in the initial years, a very high degree
36 of uncertainty and a high degree of risk as to
37 what actual levels of population you were
38 measuring.

39 Q And the next topic I want to talk about is
40 something, which has been called "stationarity".
41 And I might have this wrong but perhaps you could
42 just confirm for me, Mr. Wilson, is stationarity
43 the concept that historical data can be used to
44 predict the future so that we sort of look at the
45 past and say that the assumptions that we can draw
46 from analyzing past data will be consistent and
47 valid assumptions moving into the future? Is that

1 a fair...?

2 MR. WILSON: I think you've captured the essence of it.

3 Q Okay.

4 MR. WILSON: But for the most part, our concern is
5 around productivity and how productivity changes
6 over time. These models actually assume that
7 productivity is, in some way, stable because you
8 have to make some assumptions about the
9 relationship between past data and the likely out
10 come of things in the future, if you're going to
11 evaluate alternative policy. The concern, of
12 course, is that when we look at Fraser Sockeye or
13 any other biological system, for that matter,
14 stationarity is hard to find. The world isn't a
15 stable place and in many areas it's quite chaotic.
16 And although you can fit a model to historical
17 data, that doesn't necessarily mean you're going
18 to be reliably predicting the future.

19 And that's a fundamental issue that we
20 haven't, I don't think, adequately addressed,
21 common filters or not. Trying to track changing
22 productivity, particularly if there's a time trend
23 through the course of your data where productivity
24 is in relatively constant decline for some time
25 period, you're left with the problem of what's
26 going to happen if the trend continues? Will the
27 trend break? At what level will productivity
28 recover to and how long will it stay there? And
29 those are all questions that you have to have
30 answers for, if you're going to run the model 48
31 years into the future. And I don't believe we
32 have answers for those things and it causes me to
33 fundamentally question whether maximum sustainable
34 yield is anything more than a theory.

35 Q Mr. Cass, what's your response to that? First of
36 all, do you agree that the past productivity is an
37 assumption of future productivity in the FRSSI
38 model and, if so, is that a reasonable assumption
39 to make?

40 MR. CASS: Well, I mean, as Ken pointed out, Mr.
41 Commissioner, the world is non-stationary. As we
42 know, things change. They change to varying
43 degrees. The difficulty is, of course, in
44 predicting long-term let alone the short-term.
45 And the approach that's been taken is to go down
46 the track of, as Ken mentioned, common filter,
47 which is a way to track productivity over time.

1 But it's tracking productivity that we've already
2 seen. And so the notion is that, okay, if we are
3 in a period of productivity that differs a fair
4 amount from the overall historical trend, then
5 perhaps we could use that tool or other tools that
6 identify or estimate productivity for a more
7 recent period and then use that as one scenario,
8 if you like, to project forward into the future.

9 And of course, that's a way to hedge against,
10 you know, low productivity continuing into the
11 future, is to use a period of productivity in
12 history to give you some bounds about what you
13 think -- or some plausible scenarios that might
14 play out in terms of future productivity changes.
15 But as I think I heard Ken say, even accounting
16 for what you might think are plausible changes for
17 future productivity based on historical
18 information, we don't know how future productivity
19 is going to play out. So all you can do is create
20 scenarios. What we've done anyway is create
21 scenarios that we are hoping would bound future
22 productivity changes and then assess, based on a
23 model like this, what's the impact or how rigorous
24 or how sensitive are those future scenario
25 productivity changes? How sensitive is, in this
26 case, a TAM rule or is there a TAM rule that's
27 robust to what we think are the reasonable ranges
28 of productivity in the future? So it's a
29 difficult challenge to do that.

30 But we have come from a period where we have
31 assumed the entire 50 years of historical data on
32 Fraser Sockeye, likely representative of future
33 outcomes. We have come from that particular base
34 case scenario, if you like, which has been
35 applied, to a lot of thinking around now about how
36 do we create scenarios -- future scenarios that
37 account for changing in productivity in ways that
38 might bound it or at least some characteristic
39 trends that we might see. So that's a hot area
40 not just in this FRSSI world; a hot area more
41 directly in forecasting. And also in the work
42 being done on WSP benchmarks where benchmarks
43 themselves are linked to future states of
44 productivity, future states of nature because
45 they're linked to, Ken mentioned SMSY.

46 They're linked to where we are, what's the
47 state relative to, say, a healthy population? And

1 so that's state may change over time. So the
2 benchmarks and those indicators that measure
3 healthy populations are, in fact, changing. So
4 it's an area of interest and research but very
5 challenging to predict the future. The only thing
6 we really can do, I think, is evaluate TAM rules,
7 to look for rules that are more or less robust to
8 the way we think things might play out in the
9 future.

10 Q Mr. Morley, do you have anything to add to that?
11 MR. MORLEY: The only thing I have to add is that, if,
12 in fact, we assume in the modelling here that the
13 productivity is higher in the future than it turns
14 out to be, that what that does for the course of
15 this modelling is to allow us, or, in fact, lead
16 us in the direction that would put the benchmarks
17 higher than they would be in the low productivity
18 scenario. So in fact, the TAM rule on the
19 modelling process results in a situation where if
20 you think it's going to be more productive then
21 you're willing to put more fish on the spawning
22 grounds because you're going to get more back from
23 it. But if it turns out to be less productive and
24 the run comes in lower, the TAM rule is such that
25 you, in fact, harvest at a much lower rate. So
26 the kind of feedback mechanism that we're talking
27 about and robust rules is built into this model to
28 a certain extent already in the sense that if the
29 productivity ends up being lower, we actually are
30 going to be harvesting under these TAM rules that
31 we're delving in now, at a lower rate than if we
32 had developed TAM rules with a lower projected
33 productivity expectation. So there is some built-
34 in conservatism already in the way these rules are
35 constructed that deals with a significant part of
36 the concern that Mr. Wilson is identifying.

37 Q Mr. Staley?
38 MR. STALEY: I like to think of it not as much are we
39 trying to predict the future; that we're trying to
40 find a control rule or policies or TAM rules,
41 which are more robust to whatever future we might
42 face. And by robust in this case we'd mean of a
43 set of alternative TAM rules does the sort of rank
44 order of those TAM rules, it's almost independent
45 of what the future might bring. That would be a
46 very robust TAM rule, if it was the best one no
47 matter what happened. And so that's the search

1 that we really are under, not the search to be
2 able to predict the future better or worse but to
3 be able to find a set of actions that we can put
4 in place that can be responsive and be the best
5 set of actions or the better of the worst, I
6 guess, regardless of whether we're in a
7 productivity regime that's growing or shrinking or
8 staying the same.

9 The extent to which the current model and the
10 use of it to date has been successful at that, I
11 think it's modest success. Some of the things Mr.
12 Morley raised are appropriate. There's a fair
13 amount of conservatism in the TAM rules we have
14 that have been in play for the last cycle of
15 salmon than there were for several decades in the
16 latter part of last century. And so at least, if
17 we've made an error, we've erred a little more
18 towards the conservative side than we might have
19 otherwise been. But I think our search is for the
20 rule that will be the best rule no matter what the
21 future is, not to be able to predict the future
22 with any more accuracy than anybody else can.

23 THE COMMISSIONER: Could I just ask a question? just
24 following up on that? I'm not sure I can
25 articulate this adequately and I apologize for
26 that in advance. But in the binder I have, and it
27 probably appears in other places, but at Tab 1,
28 again, I apologize, Ms. Baker, I'm not sure what
29 the exhibit number is for that.

30 MS. BAKER: It's 396.

31 THE COMMISSIONER: 396. It's on page 1, Mr. Lunn. I
32 think it's under "Introduction". Just after the
33 first two paragraphs, which introduce the subject
34 matter, and then it starts off:

35
36 This modeling framework is intended to help
37 assess the following questions.

38
39 And maybe I'll try and make this, for me at least,
40 as simple as I can to ask you this.

41
42 For each stock and stock aggregate, what are
43 the optimal harvest rules given different
44 management objectives and assumptions about
45 population dynamics?

46
47 Just so I have some understanding where each of

1 you are coming from when you answer the questions
2 of Ms. Baker, are you all on the same page about
3 what is an optimal harvest rule? In other words,
4 in the weighting of your answers, are some of you
5 coming at it from more of a conservation
6 perspective than others? Are you giving the same
7 weight when you answer these questions to
8 conservation versus harvest? Maybe there's a
9 definition section in this document, which says
10 was an optimal harvest rule but frankly, I'm not
11 sure after hearing some of your answers that I
12 really understand what an optimal harvest rule is.

13 MR. CASS: I can, Mr. Commissioner --

14 THE COMMISSIONER: Your mike is going to have to be on,
15 Mr. Cass, I'm sorry. Your microphone.

16 MR. CASS: I'm sorry. I think you're right to point
17 out optimal is different in different people's
18 views. Optimal is only optimal given a set of
19 conditions. So if the history of the numbers of
20 spawners and the subsequent recruitment from that
21 are in, say, the green zone, to use the WSP
22 vernacular, then optimal might mean to maintain a
23 harvest rate that keeps the population in that
24 zone. But there may be optimal in the sense of
25 optimal to account for or to hedge or provide a
26 buffer against some of the knowledge gaps such as
27 stocks that aren't in the model and are
28 unproductive, optimal in the sense that we don't
29 quite -- we know that estimates in-season of run
30 size are uncertain so what's optimal to guard
31 against errors associated with uncertainty in run
32 size or optimal in the sense of given errors in
33 the ability to, even if we knew run size
34 perfectly, as it has been explained by some, to be
35 able to hit the bull's-eye even though we know
36 what the harvest rate should be given perfect
37 information that there's going to be errors in the
38 way we implement the harvest of a stock.

39 So optimal can be relative terms. It is used
40 in fisheries science many times to mean that it is
41 the harvest rate that maximizes the long-term
42 sustainability of the population. And so in the
43 FRSSI world, we have a 60 percent harvest cap and,
44 as I mentioned, it's designed because of some of
45 the knowledge gaps related to the number of stocks
46 that we use in the model, uncertainty in run size,
47 uncertainty in being able to hit the actual

1 harvest rate that we are trying to make. So
2 that's the classic use of optimal.

3 In the FRSSI world, though, because we are
4 developing a TAM rule that is conditioned on
5 performance indicators, the performance of
6 avoiding low populations with some frequency, the
7 avoidance of falling below catch with some
8 frequency and potentially the ability to stabilize
9 catch. So optimal in those senses could mean
10 different things. So I've gone on enough. I
11 suppose I'm just trying to categorize what optimal
12 is under certain circumstances. And certainly
13 optimal changes with changing productivity over
14 time. So if you're in a long-term low regime, the
15 optimal for that particular regime could be
16 different and would be different than for a stock
17 that's in some other regime, to use the word. So
18 it needs to be probably better described than
19 what's in here maybe.

20 MR. MORLEY: Mr. Commissioner, going back to your more
21 direct question in terms of different values
22 between different people, I certainly believe that
23 to be the case. And aside from all the technical
24 aspects of optimal that Dr. Cass has identified,
25 certainly the key item in that phrase, from my
26 point of view is what your management objectives
27 are. And certainly, your definition of optimal
28 might be different between Mr. Wilson and myself.
29 Mr. Wilson may, not putting words in his mouth, be
30 more concerned about preserving every one of the
31 conservation units and the genetic diversity in
32 terms of his view of sustainability, whereas I,
33 coming from my perspective as a user of the
34 resource, might be more concerned about a balance
35 between long-term sustainability of the total
36 population and also trying to find some way to
37 maximize yield over time. So in terms of optimal
38 in the context here, I think was trying to balance
39 both those kinds of objectives in determining what
40 an optimal TAM rule might be.

41 Q Did you want to add something, Mr. Wilson?

42 MR. WILSON: Yes. I agree we all bring different
43 values to this table. And those values will
44 change the way we view the optimum solution. If
45 you believe that conservation is our primary
46 obligation and that each and every CU needs to be
47 conserved, you'll take a different approach than

1 if your primary obligation is to sustain a
2 commercial fishery. As I understand it, we have a
3 clear commitment to conservation under the Wild
4 Salmon Policy. We need to address that
5 obligation. We have obligations to First Nations,
6 which are not necessarily adequately addressed
7 within the context of the FRSSI model since stocks
8 from large geographic areas can all decline at the
9 same time.

10 We can still meet our escapement goals but
11 we're not fundamentally honouring our commitment.
12 Those values all need to be expressed and
13 addressed in the process of setting TAM rules for
14 stocks and aggregates. And it's my concern that
15 they're not so I think it's absolutely true that
16 we bring different values to the table depending
17 on where we're at. Most of the people at the
18 table harvest fish. That's what they do. If you
19 don't harvest fish, then your optimum solution
20 might be quite different because you'll value
21 other things. You'll value the opportunity to go
22 look at the spawning grounds full of fish in the
23 Shuswap or you'll value First Nations' catches in
24 remote areas of the watershed. And different TAM
25 rules will accomplish those objectives to a
26 different degree and will weight the solution
27 different ways.

28 Q Mr. Staley, I think you're the only one who hasn't
29 had a kick at this can.

30 MR. STALEY: Yeah, I guess so. Yes, I agree with Mr.
31 Morley and Mr. Wilson that we all have different
32 values in this. But this question or discussion
33 is more instructive about what Mr. Cass set out --
34 or this morning was discussed as the two
35 components of the FRSSI. One is basically
36 machinery that tries to replicate the best we can
37 what the natural world may or may not do. And the
38 other is how to gather the people that are going
39 to be affected by that and articulate their
40 interests and try and balance their interests.

41 And so in that context, I think the optimal
42 harvest rules, given the different management
43 objectives, are exactly those different management
44 objectives we've just heard between Mr. Wilson and
45 Mr. Morley and others but balance those against
46 the various kinds of possible population dynamics
47 that are out there and try and find a set of

1 responses and management controls that both
2 maximize those are optimal in the sense that they
3 maximize some weighted aggregate of the values

4 And the FRSSI process, we heard about some
5 workshops earlier this morning, well, some of
6 those workshops were explicitly there to try and
7 quantify some of those weights and trade-offs.
8 And how successful that is, is, I think, still for
9 a matter of discussion and review. But you're
10 quite right that those of us at this table
11 probably all have different weights that we put on
12 the conservation pieces, that we put on the catch
13 piece, albeit that the catch and the conservation
14 are intertwined.

15 THE COMMISSIONER: Thank you.

16 Q I was going to ask some questions about this area
17 and I think maybe I'll just move ahead to those
18 now and it touches on some submissions that we
19 have heard at public forums as well. So I'd like
20 to talk a little about some of the trade-offs that
21 have to be made and I think that's another way of
22 talking about the balancing of interests that
23 we've just been discussing. I take it everybody
24 would agree that, as part of the planning process,
25 it's important to consider where those trade-offs
26 are made between biodiversity or conservation and
27 sustainable fisheries. That seems to be a given.
28 Is there anybody who disagrees that that's an
29 important part of the planning process? Nobody's
30 speaking up so I'll take that as an agreement with
31 me.

32 So the FRSSI model, as I understand it, has
33 been designed to allow for some explicit
34 discussions on those trade-offs. And that happens
35 in different venues such as the Integrated Harvest
36 Planning Committee, meetings with groups and just
37 an interpretation of the options that are set out
38 by the FRSSI model. How should decision-makers be
39 making those trade-offs? Ultimately, it's the
40 department who produces an Integrated Fisheries
41 Management Plan. How should the department or
42 decision-makers evaluate and make those trade-
43 offs? And I'll start with you, Mr. Morley.

44 MR. MORLEY: Well, I think that the department needs to
45 be much more explicit in terms of doing some
46 evaluation of, as much as they can, the financial
47 costs and benefits, as well as the social

1 implications of the various management scenarios
2 that are available to them. And frankly, the
3 process that has been undertaken in terms of FRSSI
4 on this issue, I think, has been very deficient
5 and it's not very good at any of those things.
6 And if you could perhaps bring up Exhibit 322,
7 page 15 again, I can kind of through an example
8 here and explain. It was what Dr. Cass was on
9 this morning and those two graphs that are on that
10 page.

11 The process that has been described in the
12 FRSSI process was that you get a bunch of
13 stakeholders in a room and the model is here.
14 I've tried to develop some kind of objective
15 function that they can plug into this model that
16 will sort of solve the equation for this social
17 trade-off based on a group of people in a room
18 defining their preferences. And that's resulted
19 in this kind of a table. And you got sort of the
20 -- ignore Option 1 on the bottom there because
21 it's kind of a non-option because it's not
22 evaluated at the top. But if you look at Options
23 2, 3 and 4, they describe very different TAM rules
24 that have come out of this process.

25 And the performance indicators that the model
26 has used based on this surveying of people,
27 there's three lines graphed above. The bottom
28 dotted line is the probability of the four-year
29 average level spawners being lower than some lower
30 benchmark. And the second line up is the
31 probability that any individual year is lower than
32 that lower benchmark. And then the top line is
33 this so-called probability of whether or not the
34 catch is lower than the low benchmark of a low
35 catch benchmark, as being the evaluation from a
36 catch or a yield point of view.

37 My problem with the way it's done in this
38 process is that the interesting thing here is
39 that, number one, Option 2, 3 and 4 perform almost
40 identically on the two so-called conservation
41 objectives. There's no difference in those
42 options between them in terms of significant
43 difference as to probabilities on this evaluation.
44 There's a very small change in the low catch one.
45 It does, in fact, if you've got a higher spawning
46 goal like in Option 4 and you're cutting back your
47 harvest at lower levels of run sizes to achieve

1 that, then clearly you're going to catch a little
2 bit less from time to time. But none of those
3 evaluations really look at what happens in-season.
4 So we're making a decision on Option 2, 3 and 4
5 based on that kind of input. But if you look at
6 what might happen in-season, there's a huge
7 differential between choosing these options.

8 If you go down to the bottom graph, if we had
9 decided, as a group, that Option 4 was what we
10 wanted to take, and if the run size came at
11 200,000, you, under the TAM rule, your total level
12 of mortality would be somewhere in the range of 20
13 percent. But if you had chosen Option 2, your TAM
14 rule would be 60 percent. So if the run size on
15 this particular run, and we're just using Early
16 Stuart as an example here, then you were talking
17 about at a 200,000 run size, a difference between
18 potentially harvesting 120,000 or harvesting only
19 40,000. And the value of that in terms of all the
20 harvesters, in this case, given the allocation
21 framework for Early Stuart, these would be all
22 First Nations harvesters. There'd be no
23 commercial harvest on this at all. And yet we're
24 at a situation where the FRSSI process has
25 basically said there's no difference between those
26 options. And yet I think when you look at in-
27 season as the decision to be made here, there's a
28 huge difference in social benefits to a large
29 group of people. And yet, going through the FRSSI
30 process, it leads you -- I mean we can't make that
31 decision. And the actual evaluation of what
32 you're achieving in terms of harvesting those
33 different rates in-season needs to be looked at.
34 What are the values to incomes to First Nations
35 fishers in Johnstone Strait, to gillnetters in the
36 lower river, to First Nations economic opportunity
37 fisheries in the river to First Nations very
38 important FSC fisheries all the way up the river?

39 That evaluation is not done in the context of
40 analyzing these escapement goals. And once we set
41 these rules, currently, they have been extremely
42 inflexible in-season. So we're stuck with them.
43 And so I just think that the kind of economic
44 evaluation that lays out these numbers in dollars
45 and cents and in benefits to people has got to be
46 done more explicitly and in the discussion and
47 evaluate it then, not just someone going into a

1 room and putting a little tick beside a box so
2 that a modeller can develop an objective function,
3 which is essentially what has been done so far.

4 Q And how would you see that kind of socioeconomic
5 analysis being done?

6 MR. MORLEY: Well, first of all, you've got to include
7 economists in the process. And they don't do that
8 currently. The department has got a serious lack
9 of in-house people who can actually do this work
10 and do the evaluation. You have to actually go
11 out and find out what incomes people are making in
12 the fishery, what additional catch means to their
13 income and means to the communities they live in
14 and that kind of economic analysis of what's going
15 on in the fishery, again, has not been done for
16 many, many years.

17 Q Do you think that the people who participate in
18 the IHPC or the different harvest sectors that
19 meet individually with the department can provide
20 enough information on those fronts?

21 MR. MORLEY: If the people who go there can provide
22 their personal point of view. But what we need in
23 addition to the information they provide is a
24 professional evaluation from a socioeconomic
25 directive, someone who can go out and, as far as
26 possible, boil these things down into, for
27 example, a treasury board cost analysis, that
28 would be to acceptable, professional standards, as
29 well as bringing in some of the environmental
30 variables that you can actually quantify some of
31 those and look at the scenarios and say if we
32 adopt Option 3, for example, we can anticipate
33 this level of income and this level of
34 environmental benefit and this level of social
35 benefit.

36 If we adopt Option 2, then you get this level
37 of income, this level of each of the other
38 attributes we're looking for and compare those
39 results in a quantified sense. Not just using
40 stakeholders' opinions and not just a popularity
41 contest or a political issue but something that's
42 done, evaluated on a more consistent, technical
43 basis from year to year.

44 Q If you could turn to Tab 2 of the binder before
45 you? This is CAN002915. This is A Framework for
46 Socio-Economic Analysis to Inform Integrated
47 Fisheries Management Planning and Fish Harvest

1 Decisions. Have you seen this document before?

2 MR. MORLEY: The first I came to see it was, in fact,
3 when I was reviewing documents as part of this
4 Commission. I didn't know it existed until I saw
5 that.

6 Q Okay. So has this been brought to your attention
7 in any of the planning work that you've done with
8 the department?

9 MR. MORLEY: No, it hasn't.

10 Q And have you reviewed this document?

11 MR. MORLEY: I have looked at the document, yes, and I
12 think it's an excellent start in looking at some
13 of the things the department should be doing in
14 both objective-setting process in terms of
15 spawning objectives, as well as evaluating
16 different management plan alternatives for sure.
17 If they implemented this in a professional way, it
18 would go a long ways to deal with some of the
19 issues that I've been raising.

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

22 THE REGISTRAR: Exhibit 403.

23
24 EXHIBIT 403: A Framework for Socio-Economic
25 Analysis to Inform Integrated Fisheries
26 Management Planning and Fish Harvest
27 Decisions
28

29 MS. BAKER: Thank you.

30 Q Mr. Wilson, can I ask you -- I know the question
31 is probably a long time ago, but the question was
32 something along the lines of, how should
33 policymakers or decision-makers, excuse me, be
34 making trade-offs in making the decisions with
35 respect to trade-offs between economic interests
36 and conservation interests and any other
37 interests, such as First Nation interest, I
38 suppose, that you brought forward?

39 MR. WILSON: How should they? Well, it seems to me
40 that the way we've framed the problem is an
41 attempt to maximize the economic benefits while we
42 minimize the biological harm. So we're trying to
43 harvest the abundance from strong stocks while we
44 protect the weaker stocks as much as we can. But
45 in many respects, that sets us up for almost a
46 lose/lose situation so we're making trade-offs
47 that compromise the biological health of the

1 resource in some cases and we're doing that in
2 order to achieve economic benefits, or social
3 benefits or some other set of benefits.

4 Buzz Holling put it another way. He said
5 that really we should be looking for Golden Rule
6 management. In other words, you do what's best
7 for the fish in the hopes that over the long-term
8 what's best for the fish will also lead to the
9 best stream of benefits for those that rely on
10 fish for harvest. We certainly need to be
11 explicit about the values that are on the table
12 and how we're going to weigh those values in
13 making this compromise.

14 Q Mr. Staley, have you got anything to add on this
15 topic?

16 MR. STALEY: Just from my experience of working with
17 First Nations, I would like to offer that, to date
18 at least, the approach to trying to gather and
19 inform itself of the values and whatever trade-
20 offs, if that's a concept that's -- the trade-off
21 concept is somewhat difficult for many First
22 Nations to absorb it, but I don't think it's done
23 a really good job of it, to put it bluntly. One
24 of the reasons is that within and among the First
25 Nations, there's a vast divergence and diversity
26 of interests and values, particularly when it
27 comes to Fraser Sockeye. And I haven't seen to
28 date a place that and a process that grapples with
29 that diversity and represents it well enough to be
30 balanced, if that's an appropriate approach with
31 the other interests.

32 Q And Mr. Cass, what do you say to the criticism
33 that the model doesn't adequately allow for trade-
34 offs between socioeconomic interests and
35 conservation interests?

36 MR. CASS: Well, I certainly would accept the idea that
37 if the model does not match the reality of the
38 world that is the -- what are the important
39 economic factors that the model does currently not
40 entertain? Then that's an area where we should be
41 looking. It comes back to the values. You are
42 struggling with, what's the common currency in
43 terms of values? One of conservation and
44 protecting biodiversity? There is a consequence
45 to economics and social benefits from the system.
46 So I think it's a healthy discussion to consider
47 how more realistic you could make the model. But

1 you're still down to some choices about what are
2 the key indicators? And one is I have not heard a
3 criticism about, other than the details about
4 where the benchmark should be, is the trade-off
5 that considers what's an acceptable frequency with
6 which you would fall below a particular benchmark?
7 So that's a very explicit performance indicator is
8 the number of times, in this case over 50 years or
9 so, that the indicator falls below the benchmark.

10 If you want to weight that with, you know,
11 some more balanced economic or at least some
12 method that takes advantage of the current
13 thinking about managing economics, then I'm for
14 that. But I still think it's -- you know, the
15 trade-offs are, in my mind, pretty clear. It's
16 conservation/biodiversity versus harvest in an
17 uncertain world. Maybe part of the problem is, or
18 one of the issues is, stretching this out for 48
19 years in this case and knowing that the world is
20 going to change fairly dramatically over that
21 time. It gets back to the original intention of
22 this process and Mike has brought it out a few
23 times, which is trying to come up with the best
24 set of alternatives that meet the objectives of
25 the community and stakeholders and user groups at
26 large. And so that's, to me, where the search
27 needs but perhaps flushed out with a better way to
28 include socioeconomic indicators or
29 considerations.

30 Q The Wild Salmon Policy says that we need to
31 maintain existing diversity. Has there been any
32 discussion or evaluation by the department as to
33 how much biodiversity is required to maintain a
34 long-term sustainability of Fraser River Sockeye?

35 MR. CASS: The Wild Salmon Policy in words at least,
36 it's articulation is to maintain and recover. So
37 there's a bit of a line in the sand there. If you
38 cut down to the nuts-and-bolts, I suppose, if
39 you're looking at trade-offs between human
40 impacts, harvest, for example, and the percent
41 loss of CUs that are vulnerable to a fishery, then
42 for Fraser Sockeye, I'm not sure that analysis has
43 been done. It's been done elsewhere. But I think
44 whether it's been done or not, the Wild Salmon
45 Policy is fairly explicit about maintaining
46 biodiversity with the off-ramp, of course, that
47 depending on how a particular case-by-case basis,

1 how a particular CU, if its status is poor, then
2 it's unclear. There needs to be an evaluation of
3 then what happens? What would that trigger, if
4 anything?

5 Q Does anybody else want to take a stab at that
6 question? Mike Staley?

7 MR. STALEY: I'm not certain it's a tension between
8 biodiversity and sustainable fisheries. I think
9 sustainable fisheries require a degree of
10 biodiversity. I think your question is how much
11 of a degree. Again, going back to my experience
12 with people that I've worked with throughout the
13 watershed who are in many of the communities,
14 exist and reside on the CUs and not by accident do
15 they live on those areas. They're there because
16 of the fish. And perhaps some argue the fish are
17 there because of them but is that that --
18 maintaining sustainable fisheries requires
19 maintaining their fishery where they are
20 accustomed to practising it. So diversity and
21 sustainable fisheries are one in the same to them.

22 Q I just want to go back to one point. We talked
23 before about the stationarity concept. And I just
24 want to put it to the panel, if the past isn't
25 necessarily a good indicator of what might happen
26 in the future and we don't know what the future
27 will hold, what else can we look at to make
28 planning decisions except the past, however
29 imperfect the past may be? And I can start with
30 you, Mr. Wilson.

31 MR. WILSON: Well, I suppose one of the things we can
32 use to manage our affairs is the present. I think
33 we all agree that in-season management, because it
34 can account for the actual returns and not just
35 projected returns, is the key to successful
36 fisheries management. Having said that, though, I
37 think it's helpful to make as few assumptions as
38 you have to -- the minimum number of assumptions
39 you have to make about the future. Guarding
40 against surprise is a serious matter for resource
41 managers. We expect surprise. There are things
42 outside the model that are un-quantified and
43 unconsidered in the model that all affect the
44 population dynamics of Fraser Sockeye. To me, the
45 key to success is placing fish on the spawning
46 grounds. It's as simple as that.

47 We need to maximize diversity and abundance

- 1 going forward in the hope that by sustaining these
2 population and maintaining weaker stocks that may
3 not always be weak, that over the long term will
4 receive the maximum benefit. I don't think you
5 need to speculate a great deal about the future.
6 You can just deal with the present. But
7 certainly, if you've got steady declines in
8 productivity, there should be a huge note of
9 caution in the way you manage because there's a
10 message in the data in the past. I think Mike
11 said it best, we have to learn from the past but
12 we have to live our lives going forward.
- 13 Q Mr. Staley, you work with First Nations in
14 understanding in helping to communicate the FRSSI
15 model outcomes to them; is that right?
- 16 MR. STALEY: One of the elements of my work plan with
17 the Aboriginal Secretariat is following the FRSSI
18 process and, where possible, trying to communicate
19 it, yes.
- 20 Q All right. And do you think that the people
21 you're working with have an understanding or are
22 able to understand the details of the FRSSI model
23 in a way that allows them to make informed
24 decisions?
- 25 MR. STALEY: I'd have to say yes to both of those but
26 we haven't found out how to do it yet.
- 27 Q Sorry. Can you explain that?
- 28 MR. STALEY: Well, I think they are able to and they
29 can. That's the optimist in me, in the sense they
30 can. The reason I don't think that they have yet
31 is because those of us who are supposed to do that
32 haven't figured out to do it yet in a way that is
33 meaningful to them. And there's a whole series of
34 -- and there probably are a whole series of
35 reasons why that's the case. I don't know if you
36 want me to get into those in detail but I say in
37 general I think they're certainly capable of
38 understanding the complexity and a lot of the
39 nuances that are present in a construct like the
40 FRSSI. And I'm hopeful it can be done. We just
41 haven't done it yet.
- 42 Q So are you satisfied then in the work that you're
43 doing that the people you're communicating with
44 are able to provide meaningful advice to the
45 department on options and decision-making that is
46 being required through the options developed
47 through the FRSSI model?

1 MR. STALEY: I'd have to say on balance not yet, no.

2 Q Okay. And for the rest of the panel as well, do
3 the different sectors that are being asked to
4 respond to options created by the FRSSI model, do
5 they have the capacity to understand and evaluate
6 the impacts to them of decisions that are to be
7 made based on the options developed? Mr. Wilson?

8 MR. WILSON: I think our primary concern, speaking now
9 from the perspective of the marine conservation
10 caucus, the analogy I use is a bus. The FRSSI
11 process is going somewhere and we understood at
12 the time that we were involved in it that the bus
13 was not going where we wanted to go and we didn't
14 really want to take responsibility for the
15 decisions that were being made, nor did we have
16 any confidence that changes were going to be made
17 to the process that would make that process work
18 for us. So we disengaged from the process. It's
19 an expensive thing to be involved in.

20 I think there's a danger in replacing an
21 extremely complicated reality with an extremely
22 complicated model. If the model's going to help
23 us make decisions, then we all have to understand
24 the model, not just in its broad sweep but in the
25 specifics. We have to understand that the devil's
26 in the details and in the little assumptions, in
27 the little errors in the data. It's entirely
28 possible that the model behaves in a way that's
29 quite different than we expect and perhaps
30 different than we understand. So I think as a
31 tool for helping us reach a consensus about what
32 values to express through our management approach
33 and coming up with rules to make those trade-offs,
34 the FRSSI process has a long way to go. Some of
35 it's going to be a change in the way we express
36 our interests in the model, describe the model so
37 that it's accessible to people with sort of
38 ordinary interests, that aren't specialists or
39 scientists.

40 So we have a job to do in simplifying the
41 models in a way that makes them most useful, as a
42 tool for communicating. And at the same time, we
43 also have to develop a group of people that are
44 well enough informed about the model to actually
45 understand how it might affect their interests. I
46 don't think we're there yet.

47 Q Mr. Morley, what about the commercial sector? Do

1 you think that the commercial sector has the
2 capacity to understand the models and understand
3 and make informed decisions in response to the
4 options presented by the models?

5 MR. MORLEY: I think the commercial sector,
6 unfortunately, suffers from not having the
7 technical back-up and capacity in terms of having
8 scientific staff that are available and work for
9 them on a regular basis to understand all the ins-
10 and-outs of the model by any means whatsoever. We
11 don't have the kind of capacity support that First
12 Nations are getting through AFS kind of agreements
13 and we certainly -- and from the marine
14 conservation caucus, certainly the background of
15 many of the members there are, in fact, biologists
16 and scientists and probably understand the
17 technical aspects better than many of the people
18 on the commercial side.

19 So certainly I'd say that from the scientific
20 capacity point of view, we lack that. Some of the
21 people obviously are very intelligent and are
22 smart enough to understand it, given the exposure
23 to it. Not enough of them have been exposed
24 directly to the inner workings of the model to
25 fully understand what's going on in there. I
26 think that most people only understand the output
27 from the model, which has meant very low
28 expectation rates and too many fish going up to
29 the spawning grounds and have seen lack of
30 commercial fishery as a result of the application
31 of this. So we certainly understand the outcomes
32 from the model but we don't really understand
33 particularly well how it's put together and
34 whether or not it reflects our values properly.

35 Q This is a question for the panel. Do you think
36 that the sectors need to understand to a high
37 level how this model works? Do you need to have
38 the scientific background in order to use the
39 outputs or can the department who provides the
40 expertise simply explain the outputs to the
41 sectors in a way that would allow the sectors to
42 understand the outputs? We don't have to know how
43 to create an MRI machine to listen to our doctor
44 interpret the results. Is it the same thing here,
45 that the model is maybe complex but maybe sectors
46 don't need to know how it all works? They can
47 simply have the outputs explained to them by

1 scientists who do understand it. I'll start with
2 you, Mr. Morley, seeing as we left off with you.

3 MR. MORLEY: You know, I think this is a little
4 different here because, in fact, the model
5 purports to incorporate some of the sector's
6 values in terms of how it is evaluating different
7 escapement strategies. And so really people need
8 to understand who their values are being
9 incorporated and whether they're being represented
10 properly in order to feel comfortable working with
11 the outputs. And frankly, I know I personally
12 don't feel comfortable with the way the model is
13 incorporating commercial values when it talks
14 about "a scenario that avoids low catch".

15 Okay. That's not all I'm interested in, in
16 terms of yield from the fishery. So certainly I'm
17 more in tune with maximizing some kind of benefit
18 rather than just avoiding a minimum low level. So
19 I do believe that given what the model is
20 purporting to try to do, which is to "optimize the
21 strategy" that people need to be much more
22 involved in how it's put together and whether or
23 not it does help us to reflect and model what
24 people really want.

25 Q Okay. Mr. Wilson?

26 MR. WILSON: Well, to follow your analogy, I don't
27 think I need to understand how an MRI works but
28 I'd sure like to know that someone did. And of
29 course, my doctor, I would hope, would have only
30 my best interests at heart. So in that sense, I
31 should be able to rely on him to provide me with
32 good impartial advice. On the other hand, if MRIs
33 could give you cancer, as well as detect it, you
34 might take a very different approach to how you
35 use that tool. It's a tool. And it's a tool
36 that's supposed to help us make decisions and
37 trade-offs.

38 And I think if we're the ones using the tool,
39 as your doctor is using an MRI, then I think there
40 is some positive obligation on the part of the
41 person using the tool to understand the tool.
42 Otherwise, it becomes one more black box and it
43 leaves everyone not only abdicating their
44 responsibility to manage the resource in a way
45 that's best for all of us, but it also leaves us
46 open to manipulation because we take the model
47 output at face value because we don't understand

1 how the model works and we accept that the model
2 can do what we can't and that's navigate through a
3 complex set of trade-offs and tell us what to do.
4 But to me, all we're really doing is trying to
5 frame what is a political problem, balancing
6 people's values and interests and trying to re-
7 frame it as a technical problem so that science
8 gives us the answer.

9 Q Mr. Staley?

10 MR. STALEY: I don't know what to say after that. I
11 think that Rob sort of hit the nail on the head.
12 I think the people who -- in order for someone to
13 trust the doctor, they have to be sure, as Ken
14 said, that the doctor has their interests. And if
15 it's not really transparent how their interests
16 are being expressed and dealt with in the process
17 then it's difficult for them to trust anybody,
18 including people who work for them, to explain how
19 the model works or how it doesn't work. And so
20 it's -- I think there's a threshold of trust in
21 this, particularly for First Nation, which is a
22 big one, one that's probably -- you know, it's
23 generations old so it's not something perhaps we
24 can all solve today but it's there as a trust
25 issue. And until we get over or addressed a
26 little bit more of the trust issue about whether
27 the interests and values are being honoured
28 appropriately, they're going to have difficulty
29 listening to people like me talk about technical
30 stuff.

31 Q All right. Mr. Cass, maybe we'll just end with
32 you, if you've got any response to some of those
33 statements.

34 MR. CASS: From the outset, Mr. Commissioner, I don't
35 think we've said this is the perfect tool but you
36 know I guess I would flip it around that here's a
37 process, as Ken's described as a bus, and it has
38 some elements of consistent framework, if you want
39 to call it that, for evaluating trade-offs. And
40 yes, there's a complexity there that if you're not
41 close to it, you're not going to understand the
42 nuts-and-bolts and the details and what it's
43 spitting out. So this bus has learned a lot over
44 time about what's worked and what hasn't worked.
45 But I would sort of maybe flip it back to the
46 people who perhaps have the most at stake here and
47 they have to live with something like this, that

1 is going to be a guide about how you make
2 decisions and how you wrestle with different
3 values that different sectors have.

4 One of the steps that we've heard a few
5 variants of these include a better socioeconomic
6 framework that is used to assess performance of
7 the economics. How do we assess values right down
8 to the nitty-gritty? How do you assess values of
9 the different sectors? But I would ask my
10 colleagues here, what would they see as a next
11 step to fix some of the problems? Mike has
12 mentioned trust, which is an issue, a clear issue.
13 If you don't understand how something works then
14 how are you ever going to trust it? The hard part
15 here is anybody with the kind of background being
16 a technician to develop a model, anybody can
17 develop a model.

18 You put the pieces together and it has an
19 output. Where we've come in the last ten, 15
20 years is more of an acceptance that that's
21 probably not the best way to proceed especially
22 when there are competing trade-offs or there's a
23 need to search for common ground because the hard
24 part is trying to engage. It's trying to bring
25 people to the table to inform the details to learn
26 and to gain trust. So over eight years or
27 whatever it is that this thing has been on the
28 road and a dozen or so workshops, we're left in a
29 situation where there appears to be some clear
30 issues related to what is this thing called FRSSI
31 supposed to be doing and how does it bring
32 together the various interests of the different
33 stakeholders and be useful and guide in terms of
34 some long-term strategy for management. The
35 people engagement is, in my mind, the difficult
36 issue and it is costly and it takes an inordinate
37 amount of people's time.

38 Q Thank you. Mr. Commissioner, if you'd like to
39 take the break now. I'll try and be very quick
40 when we get back or we can keep going, whichever
41 you prefer.

42 THE COMMISSIONER: We'll take the break now.

43 THE REGISTRAR: The hearing will now recess for 15
44 minutes. Oh, sorry, ten.

45
46 (PROCEEDINGS ADJOURNED FOR AFTERNOON RECESS)
47 (PROCEEDINGS RECONVENED)

1 THE REGISTRAR: Order. The hearing is now resumed.
2 MS. BAKER: Thank you.

3
4 EXAMINATION IN CHIEF BY MS. BAKER, continuing:
5

6 Q Two small areas and then I'll sit down. FRSSI, as
7 we've talked about, is a tool to manage the stocks
8 and it reflects the productivity of stocks, and it
9 allows for a management by controlling harvest
10 rates, essentially; is that fair, Mr. Cass?

11 MR. CASS: Yes, the control of harvest rate.

12 Q Okay.

13 MR. CASS: Yeah.

14 Q But one thing that the FRSSI model doesn't
15 consider, and even the FRSSI process, as far as I
16 understand, doesn't consider, is the effect that
17 habitat has on productivity; is that correct?

18 MR. CASS: I mean, the population dynamics, you know,
19 there is a parameter in there that attempts to
20 estimate the capacity, the habitat capacity, of a
21 CU, say, in that case, so there are also other
22 approaches that directly attempt to measure the
23 carrying capacity, the habitat capacity, for
24 sockeye based on in-lake assessment of the
25 nutrients that are in-lake to support juvenile
26 salmon.

27 So there is a concept of using what we know
28 about the habitat and build that into the
29 population dynamics. But I think you're going
30 somewhere else entirely.

31 Q But the model doesn't look at how habitat could be
32 changed to improve productivity; that's not a
33 factor that goes into the model in any way?

34 MR. CASS: It doesn't look at how habitat could be
35 changed.

36 Q Yeah, it makes no assumptions about how, if
37 habitat was changed one way or the other, it could
38 improve or make worse productivity of the fish; is
39 that right? What you're talking about is more the
40 retrospective; it looks at -- it's incorporated
41 into the models that are run within FRSSI, right?

42 MR. CASS: Yeah. Now, you could, given the right data,
43 you could use information from the habitat -- or
44 changes in habitat, for example, that would --
45 that could change the way the model is
46 parameterized, so it would use information from
47 the habitat, if there's been a change in the model

1 to compensate for that change. You could do that,
2 but it requires data.

3 Q And it's not being done now?

4 MR. CASS: No.

5 Q All right. Mr. Morley?

6 MR. MORLEY: Just to expand on that, I think one of the
7 issues that Mr. Commissioner raised was the sort
8 of relationship between the FRSSI model and the
9 Wild Salmon Policy and how this is being put
10 forward as a pilot implementation of the Wild
11 Salmon Policy, and I guess I would say that it is
12 -- it isn't really, in the sense that Dr. (sic)
13 Cass answered the question, because the Wild
14 Salmon Policy is supposed to include a significant
15 habitat component in looking at the influence of
16 habitat and the availability of habitat and
17 potential alterations in habitat as ways to
18 address a population that might be in the red zone
19 or in a lower status in addition to harvest
20 management. FRSSI only looks at -- your only way
21 of controlling the status of population is through
22 harvest management, and so it doesn't look at
23 other ways that you could, either through removing
24 obstacles, improving spawning ground habitat, lake
25 enrichment, whatever you could do to alter the
26 habitat to improve productivity to boost a
27 population is not one of the things that is
28 considered within the FRSSI model, and therefore
29 it's not really a full implementation of an
30 example of implementing the Wild Salmon Policy.

31 Q Mr. Wilson?

32 MR. WILSON: Could you give me the question again,
33 please?

34 Q I wish I could kind of come up with a coherent
35 question. I don't think it was coherent the first
36 time I asked it. But it was really whether
37 habitat impacts are contained within the FRSSI
38 model right now to either look at how productivity
39 could be improved or worsened, depending on
40 habitat changes in the future.

41 MR. WILSON: Well, I think, to some extent - I hate to
42 defend the FRSSI model - but to the extent that
43 productivity changes that are related to habitat
44 damage or loss are reflected in the historical
45 dataset, they've had their influence on
46 productivity within the dataset, so the FRSSI
47 model will be assuming that those things have

1 happened, if you like.

2 Q But it's looking to the past.

3 MR. WILSON: Yes.

4 Q It's not looking to the future, if improvements
5 were made to habitat that would then influence
6 productivity; those assumptions are not put into
7 the model?

8 MR. WILSON: No. We can imagine any kind of future
9 productivity we'd like and have that in the model,
10 and if we imagine that we're going to do something
11 dramatic to not only reduce the loss of habitat
12 and habitat damage but to actually improve
13 habitat, for example, lake fertilization or some
14 other process, we could speculate that future
15 productivities will be somewhat higher than
16 historical productivities and try to address it in
17 that way.

18 Or if we imagined that ongoing climate change
19 and loss of tree cover and changes in the
20 hydrograph would all work to the disadvantage of
21 sockeye, then we could speculate that future
22 productivities would be somewhat lower.

23 So since we don't know what the future
24 brings, it's entirely up to the people that run
25 the model to set those things going forward, and
26 the model will do whatever you ask it to do.

27 Q Mr. Staley?

28 MR. STALEY: I think habitat -- "habitat" is a big
29 word. It plays into the historical data analysis
30 at least in four places in the model. One, the
31 so-called productivity parameter; the other is a
32 carrying capacity parameter, both of which are
33 habitat related. There's also a parameter which
34 deals with how variable, innately variable, a
35 population is, which has a habitat component to
36 it, as well as the other mortality, other
37 harvesting, is related to habitat issues as the
38 adults move upstream.

39 So there are several places in the
40 representation of the population dynamics where
41 habitat plays a role, all of which, as Ken said,
42 could be -- you could hypothesize changes in and
43 look at how robust the control rules are to those
44 changes. But, to my knowledge, that kind of
45 analysis has not been done yet.

46 Q All right. Mr. Cass, did you have anything to
47 add, or --

1 MR. CASS: (Microphone off) try to, sorry, portray, is
2 that if there's a change in the habitat and there
3 is a measure of that in terms of data, there are
4 methods, now, to use that in the same construct as
5 the stock recruitment model is used. As Mike
6 said, there's a productivity parameter and a
7 habitat parameter that can be -- that then you can
8 add to include habitat, but we haven't done that.
9 I don't recall instances of data being available
10 that shows there's been some change in the habitat
11 that we could account for somehow.

12 Q All right. My last question is just a big picture
13 question. We've talked a lot about FRSSI today
14 and heard some criticisms of it and some places
15 where people think it provides useful information
16 and places where people think it could be
17 improved. Big picture; are the FRSSI escapement
18 targets, as they're presently being developed,
19 useful for managing Fraser River sockeye? Is it a
20 useful tool? And I'll start with you, Mr. Staley.

21 MR. STALEY: Yes, I would have to say it's useful. It
22 incorporates -- it's probably one of the best
23 approaches to incorporating historical data that
24 we have available. It uses the best available
25 modern tools to analyze that data, and in that
26 sense it's very useful. It provides some
27 guidance, whether people like that guidance or
28 not, at the beginning of the season.

29 Q All right. Mr. Morley?

30 MR. MORLEY: I think it has been useful. It is
31 developing and it needs to continue to develop to
32 make some of the improvements that I was talking
33 about previously. I do think that it, as with a
34 lot of our IFMP rules that are developed, it tends
35 to be somewhat inflexible in-season and needs to
36 have a built-in mechanism to sort of make changes
37 to the goal post in-season, based on an in-season
38 evaluation framework, because we have had a number
39 of instances where those inflexible rules put you
40 in perverse situations during the years. But it
41 has been a good process and it needs to continue
42 to improve.

43 Q Mr. Wilson?

44 MR. WILSON: Well, yes, clearly the TAM rules are
45 useful, because we use them. That's how we set up
46 our preseason plan. To me, though, the question
47 is whether or not the guidance that the FRSSI

1 process is providing in the form of the TAM rules
2 is reasonably impartial and unbiased.

3 So I have a number of reservations about the
4 way these models are built and the kinds of
5 information they use and the kinds of information
6 they don't use that lead me to question whether
7 the outcome, the long-term outcome from applying
8 these TAM rules is what we think it is. For
9 example, when it comes to weak stocks, one of the
10 things we do is try to understand the probability
11 of extinction of these weak stocks by measuring
12 the frequency by which they drop down below a
13 particular benchmark for escapement. It may,
14 however, turn out that if our assumptions around
15 productivity are incorrect, we may dramatically
16 underestimate the likelihood of extinction from
17 some of these stocks, particularly if we see a
18 dramatic change in the future that was
19 unanticipated in the use of the model.

20 So yes, they're useful, but they're also
21 somewhat dangerous.

22 Q Mr. Cass, I'll leave the last word to you.

23 MR. CASS: Well, I'm not a user. I was involved in the
24 technical level of the development of the tool,
25 but I would have to say it's only as good as, you
26 know, how good it is to take account preferences
27 of those who are affected by it, and the only way
28 it seems like, at least our experience over the
29 last eight years or so, or the only way that we
30 have been able to really see if we're making
31 progress or taking steps back, is to learn from
32 one season to the next, I guess, and build on what
33 we have as the way forward.

34 You know, we came from a time when we,
35 originally, when we'd just take the -- trying to
36 assess how we would model future changes and
37 productivity, and, you know, again, I think Mike
38 said it best, it's difficult, if not impossible,
39 to predict the future - that's sort of a joke -
40 and so you look for strategies or TAM rules that
41 are, as best they can, be robust and to whatever
42 scenarios you think are important for the future.

43 The wrestling with different sector's view of
44 the world and their value on the components of the
45 model, and the ability to communicate, is, I
46 think, where the challenges lie here.

47 MS. BAKER: Thank you. Mr. Commissioner, those are the

1 questions I have. The counsel who follow me will
2 be Mr. Taylor, for Canada, followed by Mr. Leadem,
3 for the Conservation Coalition.

4 MR. TAYLOR: Mitchell Taylor, for the participant
5 Government of Canada, Mr. Commissioner, and with
6 me is Hugh MacAulay. I have a number of questions
7 for the panel. Just to let you know at the
8 outset, I don't anticipate finishing my
9 examination this afternoon. I understand that
10 this panel is available and coming back tomorrow
11 morning.
12

13 CROSS-EXAMINATION BY MR. TAYLOR:
14

15 Q I'm going to ask this question of the panel, and
16 I'll start Mr. Cass, in part because Ms. Baker
17 asked this of you in the first go, but then I'm
18 going to ask the other panel members about this as
19 well.

20 Towards the end of Ms. Baker's questioning,
21 she asked you, Mr. Cass, whether FRSSI was all
22 about managing by controlling the harvest rate,
23 and you seemed to pause, in giving an answer, and
24 then said something to the effect, "I guess so,"
25 or something like that, and it may be a case of
26 how one approaches this or, by analogy, the glass
27 half full/glass half empty, it all depends on your
28 approach and attitude, but at the end of the day
29 the glass is the same, however you characterize it
30 being with half the total volume of water in it.

31 Is the focus of FRSSI really aimed at fixing
32 escapement levels or targets, as distinct from
33 controlling the harvest? Which is the overriding
34 or most important aspect, if you like; fixing
35 escapement targets or dealing with the harvest
36 management? One flows from the other, of course,
37 but which is the emphasis or the predominant -- of
38 predominant importance, or does it all depend on
39 one's view?

40 MR. CASS: I guess it would start, Mr. Commissioner,
41 with it depends where the run size is relative to
42 the TAM rule. You know, at low stock sizes, where
43 there's -- the TAM rule declines at some point and
44 reverts to a fixed escapement policy, then, at
45 that stage, it's designed to -- or that level of
46 run size is designed to provide the same number of
47 fish with a declining harvest rate over that

1 period. However, above that trigger point, where
2 there is the fixed exploitation strategy, then the
3 purpose, Mr. Commissioner, is to divide, in some
4 way, with a 60/40 rule, or whatever it turns out
5 to be, and taking into account the environmental
6 conditions during migration, then it's a fixed --
7 it's a harvest rate managed system where the, you
8 know, equal proportions go to both harvest and to
9 escapement, and that's in the traditional sense, a
10 fixed harvest or exploitation rate strategy,
11 notwithstanding the environmental -- the TAM part
12 of the rule.

13 So it's a combination of both, but you can
14 think about it as the way I think it's been
15 described in our 2006 workshop that we had that
16 looked at cyclic dominance, is it's a fixed -- in
17 one sense it's a fixed exploitation rate strategy
18 with this contingency down at the lower end to
19 solve some of the conservation problems and ensure
20 that there's adequate escapement for future
21 propagation. So what I'm trying to say is there's
22 two -- depending on where you are in run size,
23 there's two different views of what that TAM rule
24 is designed to do.

25 Q All right. Thank you, that's helpful. Would it
26 be correct that the fundamental point, at the end
27 of the day, is to get an appropriate number of
28 spawners on the spawning grounds?

29 MR. CASS: That is the overriding priority of
30 conservation, and it is a key to sustained
31 populations in the future. That is the number one
32 factor that you're trying to ensure.

33 Q Other panel members, do you have a comment on
34 this; that is, what FRSSI is all about? Is it at
35 one or both of escapement or harvest control? Mr.
36 Staley, do you want to go first, or go next?

37 MR. STALEY: I'd say that, at the basis of it, it's
38 about assessing performance, where performance has
39 elements of catch, has elements of escapement, has
40 elements about the variability in catch and
41 escapement, and perhaps other things. And it's
42 the assessing of the performance with regards to
43 the harvest management, I think. That would be my
44 -- in terms of the structure of the model and the
45 inputs and outputs that are set there, we are
46 measuring the model, measures performance of
47 various aspects, and so that's what the model is

1 trying to do. The model is driven, given the
2 control, which is on the harvest component of the
3 mortality. So I'd have to say that those are the
4 focuses.

5 Clearly, escapement is important, but it's
6 one of many performance measures, and FRSSI was
7 intended to try and assist when conservation, I
8 guess, where conservation would mean that there
9 aren't -- you know, there's some danger of the --
10 or some inability to sustain itself. Populations
11 find themselves in -- inability to sustain
12 themselves. Not just those kinds of situations,
13 but situations where there's abundance of fish,
14 and how much of that abundance should be taken now
15 and how much should be put in the bank for future
16 production.

17 Q Mr. Wilson, do you have anything to add?

18 MR. WILSON: Not at this time, no.

19 Q Mr. Morley?

20 MR. MORLEY: Mr. Commissioner, I would say this is a
21 chicken and egg question, and we're actually
22 interested in both the chickens and the eggs. So
23 really, it's not just a -- it's easy for people to
24 say, "Well, conservation is the number one
25 objective and, therefore, we're really trying to
26 get spawners to the spawning grounds," but as I
27 indicated in my first session in front of you
28 here, I said my view of conservation is broader
29 than that, and it includes long-term sustainable
30 use, and certainly we're interested in sustaining
31 the productivity of the resource and looking at
32 what mix of benefits it can generate over the
33 longer term. So that's what FRSSI is attempting
34 to assess, as Mr. Staley said.

35 Q All right, thank you. Now, I'll ask this of Mr.
36 Cass, I think, and I'm picking up on a question
37 that Commissioner asked this morning, where he
38 asked about, as I recall, exploitation rate,
39 harvest rate, TAM and TAC, and whether they're all
40 the same or different, and you explained some of
41 the differences at that time, Mr. Cass. I'm going
42 to try this again by putting some number into it,
43 to see if we can add some more clarity to this
44 than what already exists.

45 If you have a forecast run size of two
46 million fish and you identify that the escapement
47 that you should have is 800,000, it follows, does

1 it, that the exploitation number would be one
2 point two million; is that right?
3 MR. CASS: The harvest from two million, was that the
4 first number?
5 Q Two million fish, 800,000 --
6 MR. CASS: Yeah.
7 Q -- escapement, so the total exploitation -- sorry,
8 the TAM, rather, the TAM, I guess is what I'm --
9 MR. CASS: The TAC would be one point two, is that what
10 you're --
11 Q Well, that's the TAM, isn't it, the total
12 allowable mortality?
13 MR. CASS: The TAM, yeah. But the one point two, if
14 you have a point one or 800,000 escapement, is
15 that the number you're referring to?
16 Q Yes.
17 MR. CASS: Yeah, so then you take that from the total
18 run, you get one point two. One point two is then
19 what's leftover as the TAM, correct.
20 Q So that's the total allowable mortality
21 MR. CASS: Yeah.
22 Q And then the TAC would be a smaller number than
23 one point two; it would be the TAM minus the
24 management adjustments, would it?
25 MR. CASS: Yes.
26 Q And put another way, the harvest rate is whatever
27 number plus management adjustment which equals
28 your TAM?
29 MR. CASS: Yes.
30 Q Mr. Morley, earlier this morning, when one talked
31 about a TAM of 60 percent, you then spoke of the
32 actual harvest being less than 60 percent,
33 sometimes being 30 or 50 percent, and that's what
34 you're referring to, was it, Mr. Morley?
35 MR. MORLEY: No, that was -- I wasn't talking about the
36 management adjustment in that context. I was
37 talking about the overlap between different run
38 timing groups. So if you had an Early Summer TAM
39 that conflicted with a Summer TAM, you may end up
40 going to the lowest common denominator, and so you
41 would not necessarily be harvesting at the TAM
42 rule that might be higher for the stock -- the
43 stronger stock or the stock that was at a
44 different level of MA.
45 Q Okay. Mr. Staley, you appear to be nodding as
46 though you had something to say? Did you want to
47 add anything?

1 MR. STALEY: No.

2 MR. TAYLOR: All right. Mr. Commissioner, have I added
3 any clarity, or added confusion in putting numbers
4 into it?

5 THE COMMISSIONER: I'd rather not say, Mr. Taylor.

6 MR. TAYLOR: Thank you.

7 Q Now, Mr. Cass, am I correct that in order to
8 identify what the escapement should be, there is a
9 suite of tools that are used, and that includes
10 the preseason forecast and the test fishing, the
11 hydroacoustics, and some of the other aspects that
12 come into stock assessment, which we've heard
13 about in evidence over the last 10 days or so, and
14 you take the information from all of that and that
15 is going to give you what you're looking at in
16 terms of a run size and then the ability to
17 develop your escapement target?

18 MR. CASS: So just walking through it, Mr.
19 Commissioner, the preseason run size forecast
20 informs the preseason planning process, one of the
21 plausible scenarios to consider in developing a
22 plan, and so then that becomes, I guess, a
23 benchmark by which you can then develop a plan
24 around that, but realizing, of course, that the
25 preseason forecast is just that, with a lot of
26 uncertainty which has already been presented here.

27 But the other tools that you described, for
28 example, the hydroacoustics or other tools for
29 estimating run size, is a way, in-season, to
30 understand what the run size is and then, from
31 that, is derived the target escapement, so that
32 the TAM rule then would be applied to the run size
33 that would be based on whatever methods are
34 available, test fisheries in-season,
35 hydroacoustics in-season, and so the TAM rule
36 would be applied to those estimates of run sizes
37 based on those tools -- those assessment tools.

38 Q All right. Thank you. Now, I'd like to ask about
39 the 60 percent ceiling that has been talked about
40 already, and how you got to that point. I'll
41 start with you, Mr. Cass.

42 Can you explain how the department reached 60
43 percent, both in terms of who did you get input
44 from and what factors or criteria with and apart
45 from input from any number of people you had, what
46 factors went into coming up with 60 percent; how
47 did you get there?

1 MR. CASS: Well, I can tell you, as I think has already
2 been said, the choice of 60 percent TAM rule was a
3 policy choice, but with some background in
4 understanding what the underlying uncertainty was
5 in estimating what the optimal exploitation rate,
6 or TAM, would be. So that's kind of a, you know,
7 there's the background of data, there's the
8 understanding that not all the data is -- not all
9 the CUs are not included from which you derive the
10 estimates of optimal escapement. So the 60
11 percent, the thinking around the choice of 60
12 percent is that it is on the low end for most of
13 the stocks that we consider in the 19 stocks, say,
14 that we consider in our estimates of productivity
15 and, therefore, the optimal exploitation rate.

16 But to guard against the possibility that
17 there are unmonitored stocks with limited or no
18 data that have low productivity, the numbers that
19 were considered were thought to be more
20 precautionary by going on the low side of
21 distribution of exploitation rate, you know, to
22 guard against stocks that aren't represented and,
23 as well, implementation error in the estimates of
24 run size in-season as well as the ability to
25 actually effect a perfect harvest rate.

26 But now, you asked about the process and
27 who's involved and how did we get to that
28 decision. It's a little vague to me how that was
29 aired out or discussed within the stakeholder
30 workshop process, and I'm not certain exactly to
31 what level there was discussion about what are the
32 alternatives other than 60 percent, but I do know
33 that eventually it was a policy decision to hedge
34 against uncertainty.

35 Q All right. And in the course of questioning, I
36 think that Mr. Morley and Mr. Wilson, who I
37 believe were at some of these workshops, may shed
38 some light on that, and we'll come to that. Mr.
39 Staley may have been there, I'm not sure.

40 In terms of the 60 percent figure, if you
41 have one -- if you could identify one stock and
42 fish one stock and that one stock was a healthy
43 stock, is there a rule of thumb as to what the
44 optimal harvest rate is, if you're fishing one
45 healthy stock? What percentage, is what I'm
46 getting at. Mr. Staley, or Mr. Wilson, do you
47 have a view? Do you understand what I'm getting

1 at?

2 MR. WILSON: Well, there's no single rule of thumb,
3 because different numbers of fish will return each
4 year, even from a healthy stock.

5 Q All right.

6 MR. WILSON: So if you're trying to put a specific
7 number of fish on the spawning grounds, then the
8 number that you can harvest will vary by year. So
9 will that be a constant percentage? No, because
10 productivity changes over time, and so the number
11 of offspring produced by each spawner will vary.
12 So there really isn't a rule of thumb, unless you
13 want to consider the, you know, the stock recruit
14 curves that we developed that try to describe the
15 general relationship between the number of
16 spawners and the number of subsequent offspring,
17 would be a rule of thumb.

18 Q Has 65 to 70 percent harvest on a healthy stock,
19 if you could identify that one stock that you're
20 harvesting, been used in the fish management
21 world?

22 MR. WILSON: I don't know of very many places where
23 fixed exploitation rates are applied regardless of
24 the number of fish returning.

25 Q All right. Do Mr. Morley or Mr. Staley want to
26 add anything to that?

27 MR. STALEY: I'm trying to recall. I haven't done
28 recent research on that. I recall a discussion
29 with some of the academics that I worked with, who
30 referred a paper, which I haven't -- which I
31 apologize, I was meaning to dig out before today,
32 but the discussion, at least, was they had read a
33 paper - so it's all second-hand - that had
34 systematic -- had attempted to fit a stock and
35 recruitment relationship, or Ricker relationship,
36 to as many sockeye stocks up and down the Pacific
37 coast as they could and sort of provide a sort of
38 an average -- sort of the average healthy sockeye
39 stock on the Pacific coast, and if that were to be
40 managed. That's one of the points in the -- on
41 the spectrum of abundance for any particular
42 stock, is the point at which maximum sustainable
43 yield, if the world was equal -- if equilibrium
44 existed and the world behaved in some hypothetical
45 way, and someone -- at that point your sort of
46 sustainable harvest rate, if my recollection is
47 correct, is in the 60 to 70 percent range.

1 But most of you -- if you look at the stock
2 recruitment curves that you get from most healthy
3 stocks, the 60 to 70 percent range is where you
4 would find, theoretically, the MSY level.

5 Q All right. Thank you, that's helpful.

6 MR. MORLEY: I'd just like to add to that is that it's,
7 again, I think it does vary according to the
8 productivity regime you're in, and I'd certainly
9 -- if you looked, for example, at Bristol Bay,
10 with which I have some experience, since we've got
11 operations -- our company's had operations up
12 there for a couple of decades, and it is -- we're
13 seeing a situation up there right now where
14 they're probably harvesting more in the 80 to 90
15 percent range on a sustainable basis over a long
16 period of time with healthy sockeye populations.
17 During the time period when the IPSFC was managing
18 the Fraser sockeye fishery, we did see building
19 populations on a slow long-term growth curve over
20 a long period of time when they were harvesting at
21 in excess of 75 percent, on many populations.
22 That was with the strong ones. And they were
23 harvesting, in some of the non peak cycle years,
24 at a higher rate than that, even.

25 So depending on the productivity regime and
26 the situation you're in, it can be sustainable at
27 much higher levels.

28 Q Now, the Bristol Bay situation that you refer to,
29 is up in Alaska, correct?

30 MR. MORLEY: That's correct.

31 Q And that's a different situation than the Fraser,
32 isn't it? There's not nearly the length of
33 migration or river system up there, as compared to
34 the Fraser, is there?

35 MR. MORLEY: None of the individual river systems are
36 as large as the Fraser, but there's about six
37 major systems there and each of them does have a
38 number of different stocks in it. Certainly the
39 fishery is somewhat different and it's managed
40 somewhat different than what we manage here.

41 Q Is it the case that the geography is such up there
42 that you're able to get a handle on what you're
43 dealing with, in terms of the stocks, sooner than
44 you can in the Fraser system?

45 MR. MORLEY: I wouldn't agree with that.

46 Q All right.

47 MR. MORLEY: I think that, again, it goes back to

1 certain time periods, and there was a time period
2 when Bristol Bay populations were not as
3 productive as they are today and where harvest
4 rates were lower and the overall production was
5 lower, and certainly we've seen a time period in
6 the Fraser River where productivity was higher
7 than the current situation.

8 So I think those are, you know, if you have
9 to look at the number of returns per spawner, and
10 if you look over the 50-year time period we have
11 on the Fraser, you can see the number of returns
12 per spawner in any given year are varying from
13 less than one to one, which we've seen on a couple
14 of occasions, very difficult -- 2009 being one of
15 them, but other times when we've had returns per
16 spawner for some of the populations in excess of
17 25 to one. So it's highly variable, and what a
18 sustainable harvest rate is depends on the long-
19 term regime. So 60 percent, I'd say, would be
20 very conservative in terms of sustainable for
21 healthy sockeye populations.

22 Q Now, Mr. Cass, are you familiar with the Ricker
23 and Larkin models, both of which have been
24 referred to today and other days, in evidence?

25 MR. CASS: Yes, I am.

26 Q Do each of them play a role in the FRSSI
27 modelling?

28 MR. CASS: Yes, they do. And again, following the 2006
29 workshops, cyclic dominance workshop that we had
30 here, there was a recommendation to adopt the
31 Larkin model for in order to deal with the delay
32 density impacts that were being estimated by that
33 model.

34 Q Can you explain for the Commissioner in --
35 firstly, before I ask this question, which I'll
36 have the word -- I'll be wanting you to briefly
37 describe it --

38 MR. TAYLOR: -- but I just noted the hour, Mr.
39 Commissioner. Do you want me to take another five
40 or seven minutes?

41 THE COMMISSIONER: Okay.

42 MR. TAYLOR:

43 Q Can you briefly describe for the Commissioner,
44 what is the Ricker model and what is the Larkin
45 model and what is the difference between those
46 two? These are models that we've heard about and
47 they underpin some of the modelling that has been

1 considered in this evidence and elsewhere, and so
2 it's important to understand what they are.

3 MR. CASS: Well a Ricker model, Mr. Commissioner, is a
4 statistical model that looks at the, as you may
5 have heard, looks at the relationship between the
6 number of spawners that contribute to future
7 progeny. So if you look at the relationship
8 between the number of spawners in a given year
9 over a range of years and the subsequent
10 recruitment or progeny that are produced, there's
11 a relationship that describes the productivity of
12 that particular population, as well as the
13 capacity limits of that particular relationship.

14 So it's formulated in terms of two
15 parameters, really - Mike said it's three - which
16 describes the innate variability in the data
17 points, the individual spawner data point and the
18 recruit data point over time.

19 But the Ricker model is really -- and then
20 there's the other, the third parameter, if you
21 like, so there's a productivity parameter, a
22 capacity parameter, and a parameter that provides
23 an index of the variability of the data around
24 that relationship that's described by the Ricker
25 model.

26 So that's the fundamental model. Now, there
27 are, of course, one of the interests in fisheries
28 science is to -- and one of the issues in terms of
29 how you take a model and estimate of parameters is
30 how you deal with the uncertainty in terms of the
31 precision of the, say in this case, the
32 productivity parameter and the capacity parameter,
33 is how do you take account the uncertainty in
34 those parameters. And interestingly, for the
35 Ricker model, what is reasonably well determined
36 is the productivity parameter, which is the
37 productivity at low stock sizes. And so the
38 productivity parameter is determined with much
39 more confidence than the capacity parameter, and
40 the capacity parameter is the measure of, you
41 know, what's the number of fish, what's the
42 optimal - I'll use that word again - the optimal
43 number of fish to meet a certain objective,
44 whether it's to fully seed the habitat with
45 juveniles, or whether it's to seed sufficiently to
46 have the highest surplus yield.

47 So it's really a three-parameter model that

1 statistically compares the number of spawners over
2 time with the progeny that it's produced. So
3 that's the Ricker model.

4 The Larkin model is a Ricker model but with
5 added terms, we call them lag terms, that describe
6 the degree of delay density that each of the
7 preceding, in the way it's formulated in FRSSI,
8 each of the preceding spawning years from the
9 current years. So for example, in 2010, there are
10 a number of spawners observed on the spawning
11 ground. If you use that spawner in a Ricker
12 model, which doesn't have the ability to assess
13 the degree of interaction or the delay density,
14 then you just simply project that spawning
15 abundance forward in time a generation to come up
16 with the progeny that are produced.

17 The Larkin model, on the other hand, takes
18 into account the three preceding years, at least
19 the way it is formulated here, on the -- to test
20 the assumption that there is a delay density
21 effect, large -- very large dominant years can
22 effect the subsequent years by resulting in a
23 large food resource - there are a number of
24 hypothesis about this - result in a large food
25 resource for predators, such as Rainbow trout in a
26 lake, that then become conditioned and,
27 themselves, becomes -- their dynamic is influenced
28 by their -- their survival is increased by the
29 fact that they have a lot of food to munch on,
30 because you have had a strong year class come
31 through, but that very healthy Rainbow trout
32 population, to use the example, then is able to
33 live long enough to munch on the three -- the next
34 three years to come along, next year's results of
35 spawning to come along.

36 So that's the notion of delay density, that
37 there's some -- it doesn't have to be predation,
38 it could be some predator -- or, sorry, some
39 disease or parasite factor that's influenced by
40 the population dynamics with sockeye, or food
41 availability.

42 So the Larkin model is, again, a statistical
43 model with added terms to test how important the
44 lag -- the delay density effects of preceding year
45 classes are on future production.

46 Q So is it the case that the Larkin model takes
47 account of cyclic dominance, whereas the Ricker

1 model does not?

2 MR. CASS: Now, that depends on what you're assuming to
3 be the cause of cycles, because you can have
4 cycles in a Ricker model situation with very high
5 harvest rates and, given the four-year age
6 structure of the populations. So you can set up,
7 in the way that you harvest, given the age
8 structure of the population, you can set up cycles
9 in a population, but that doesn't mean that there
10 is the kind of delay density effects that are
11 biological driven, or assumed to be biologically
12 driven by the Larkin model.

13 So the Larkin model will, under many cases of
14 harvest, or many ranges of harvest, will generate
15 cycles because of the delayed density effect, the
16 interaction between the cycles.

17 Q I think you've alluded to this, but is it the case
18 that in 2006 that the Larkin model was added into
19 the FRSSI modelling?

20 MR. CASS: Yeah, it had been considered previously in
21 not just the FRSSI process, it started, say, in
22 2002, but it was also considered in the so-called
23 '87 rebuilding plan as an alternative model.

24 Q All right.

25 MR. CASS: But in the FRSSI process, it gained
26 significant ground following that workshop which
27 there was some consensus there that we should be
28 using the Larkin model to account for the assumed
29 hypothesis that -- the biological explanation for
30 cycles.

31 Q All right. And the workshop you're referring to
32 is the 2006 one?

33 MR. CASS: Correct.

34 Q Mr. Wilson, is there anything you want to say
35 about Ricker and Larkin?

36 MR. WILSON: Well, I guess the fundamental issue with
37 the use of the Larkin model is that it allows us
38 to model situations in which cyclic dominance
39 appears to occur, but it doesn't really enlighten
40 us very much about why there's cyclic dominance,
41 when and how it might break down or re-establish,
42 or any of the other important factors that might
43 lead you to accept on particular kind of harvest
44 policy over another.

45 So it's a little -- it's descriptive, all
46 right? It fits historical data, but because we
47 don't understand the mechanism it's somewhat hard

1 to understand how cyclic dominance will change,
2 going forward, under particular harvest regimes.
3 Q All right. Mr. Staley, in terms of what is the
4 Ricker model and the Larkin model, did you want to
5 add anything?

6 MR. STALEY: Just that the formulation of the Ricker
7 model is a special case of the Larkin model, with
8 no cycle interactions. That's another way -- and
9 that's the reason it was chosen out of that
10 workshop, my recollection of the workshop, was
11 that it embraced both alternative views of the
12 world, that there were cycles that were there
13 because of the interaction behaviour between cycle
14 lines, and there were cycles there for which there
15 were perhaps no interaction. So the Larkin model
16 is a -- or the Ricker model is a special case of
17 the Larkin model, so we didn't need the Ricker
18 model, we just used the Larkin model with zero
19 interaction terms.

20 Q All right. And Mr. Morley, am I right that by
21 reason of your background, you would not be
22 considered or feeling qualified to speak to the
23 models, or are you?

24 MR. MORLEY: I don't feel a need to speak to the
25 models.

26 MR. TAYLOR: Thank you. All right. Mr. Commissioner,
27 this is an appropriate time to break.

28 THE COMMISSIONER: Thank you.

29 MS. BAKER: Mr. Commissioner, we'll begin, tomorrow,
30 with David Patterson, on management adjustments,
31 at nine o'clock.

32 THE COMMISSIONER: (Inaudible - microphone off).

33 MS. BAKER: That's correct.

34 THE COMMISSIONER: Thank you.

35 THE REGISTRAR: The hearing is now adjourned until nine
36 o'clock in the morning, and the elevators will not
37 be open until 8:30.

38
39 (PROCEEDINGS ADJOURNED AT 4:08 P.M. TO
40 TUESDAY, FEBRUARY 8, 2010, AT 9:00 A.M.)
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1 I HEREBY CERTIFY the foregoing to be a
2 true and accurate transcript of the
3 evidence recorded on a sound recording
4 apparatus, transcribed to the best of my
5 skill and ability, and in accordance
6 with applicable standards.
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11 Susan Osborne
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13 I HEREBY CERTIFY the foregoing to be a
14 true and accurate transcript of the
15 evidence recorded on a sound recording
16 apparatus, transcribed to the best of my
17 skill and ability, and in accordance
18 with applicable standards.
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23 Irene Lim
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25 I HEREBY CERTIFY the foregoing to be a
26 true and accurate transcript of the
27 evidence recorded on a sound recording
28 apparatus, transcribed to the best of my
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30 with applicable standards.
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35 Karen Acaster
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37 I HEREBY CERTIFY the foregoing to be a
38 true and accurate transcript of the
39 evidence recorded on a sound recording
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41 skill and ability, and in accordance
42 with applicable standards.
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47 Karen Hefferland