

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.

Friday, May 6, 2011

**Tenue à :**

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

le vendredi 6 mai 2011

## **APPEARANCES / COMPARUTIONS**

Brian Wallace, Q.C. Lara Tessaro	Senior Commission Counsel Junior Commission Counsel
Tim Timberg Geneva Grande-McNeil	Government of Canada ("CAN")
Tara Callan	Province of British Columbia ("BCPROV")
No appearance	Pacific Salmon Commission ("PSC")
No appearance	B.C. Public Service Alliance of Canada Union of Environment Workers B.C. ("BCPSAC")
No appearance	Rio Tinto Alcan Inc. ("RTAI")
No appearance	B.C. Salmon Farmers Association ("BCSFA")
No appearance	Seafood Producers Association of B.C. ("SPABC")
No appearance	Aquaculture Coalition: Alexandra Morton; Raincoast Research Society; Pacific Coast Wild Salmon Society ("AQUA")
Tim Leadem, Q.C.	Conservation Coalition: Coastal Alliance for Aquaculture Reform Fraser Riverkeeper Society; Georgia Strait Alliance; Raincoast Conservation Foundation; Watershed Watch Salmon Society; Mr. Otto Langer; David Suzuki Foundation ("CONSERV")
No appearance	Area D Salmon Gillnet Association; Area B Harvest Committee (Seine) ("GILLFSC")

**APPEARANCES / COMPARUTIONS, cont'd.**

No appearance	Southern Area E Gillnetters Assn. B.C. Fisheries Survival Coalition ("SGAHC")
Christopher Harvey, Q.C.	West Coast Trollers Area G Association; United Fishermen and Allied Workers' Union ("TWCTUFA")
No appearance	B.C. Wildlife Federation; B.C. Federation of Drift Fishers ("WFFDF")
No appearance	Maa-nulth Treaty Society; Tsawwassen First Nation; Musqueam First Nation ("MTM")
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 Crystal Reeves	First Nations Coalition: First Nations Fisheries Council; Aboriginal Caucus of the Fraser River; Aboriginal Fisheries Secretariat; Fraser Valley Aboriginal Fisheries Society; Northern Shuswap Tribal Council; Chehalis Indian Band; Secwepemc Fisheries Commission of the Shuswap Nation Tribal Council; Upper Fraser Fisheries Conservation Alliance; Other Douglas Treaty First Nations who applied together (the Snuneymuxw, Tsartlip and Tsawout); Adams Lake Indian Band; Carrier Sekani Tribal Council; Council of Haida Nation ("FNC")
No appearance	Métis Nation British Columbia ("MNBC")

**APPEARANCES / COMPARUTIONS, cont'd.**

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

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1 Vancouver, B.C. /Vancouver  
2 (C.-B.)  
3 May 6, 2011/le 6 mai 2011  
4

5 THE REGISTRAR: Order. The hearing is now resumed.  
6

7 JEREMY HUME, recalled.  
8

9 GORDON McFARLANE, recalled.  
10

11 VILLY CHRISTENSEN, recalled.  
12

13 MR. WALLACE: Good morning, Mr. Commissioner, Brian  
14 Wallace, Commission Counsel, and Lara Tessaro is  
15 with me. By my reckoning we have another 30  
16 minutes from Mr. Harvey, followed by Ms. Gaertner  
17 with a 60-minute estimate. Thank you.

18 MR. HARVEY: Thank you, Mr. Commissioner. Chris  
19 Harvey, for the Area G and UFAWU.  
20

21 CROSS-EXAMINATION BY MR. HARVEY, continuing:  
22

23 Q Dr. McFarlane, you mentioned yesterday that the  
24 trophic level in the Strait of Georgia was  
25 diminished in 2007, I think was your reference,  
26 the reference you gave. Is that part of a  
27 declining trend?

28 MR. McFARLANE: No, I -- yes, I did mention 2007 as the  
29 year in question because 2007, of course, is the  
30 ocean entry year of the 2009 return year.  
31 However, 2007 is the low point of the years just  
32 prior to it, the few years that I looked at and  
33 the 2008 and 2009 ocean entry years were both much  
34 better. So 2007 was definitely lower. Is it part  
35 of a trend in terms of all those species? I would  
36 suggest not. It's, you know, herring did very  
37 well in many years up until the early 2000s, chum  
38 and pink are doing well, so...

39 Q You have some means of measuring the trophic level  
40 in the Strait of Georgia, do you?

41 MR. McFARLANE: Well, yes. But what I was referring to  
42 was the condition factor of the fish, the smolts  
43 of the five salmon species, and of the young-of-  
44 the-year herring. So that when you measure  
45 condition, you're measuring their ability to how  
46 they responded to the food sources available to  
47 them at the time.

- 1 Q But when you're measuring salmon smolts, you no  
2 doubt have difficulty distinguishing between  
3 freshwater trophic impacts, and saltwater trophic  
4 impacts, would that be correct? Because the  
5 salmon are recently emerging from freshwater by  
6 the time you see them in the Strait of Georgia.
- 7 MR. McFARLANE: Correct.
- 8 Q Yes. So if you see them fat one year and skinny  
9 the next year, it may be due to freshwater or it  
10 may be due to their first week or so in saltwater.
- 11 MR. McFARLANE: That's probably a fair statement, but I  
12 don't look at freshwater. I would put that  
13 question to the freshwater people. But certainly  
14 herring don't go into freshwater.
- 15 Q No.
- 16 MR. McFARLANE: Other species I look at in other areas  
17 don't go into freshwater. It's a pretty reliable  
18 indicator of the first few weeks in saltwater.
- 19 Q But insofar as you rely on herring, herring  
20 abundance, of course, changes from year to year  
21 quite dramatically, too, does it not?
- 22 MR. McFARLANE: Sure, everything changes dramatically  
23 from year to year. But you look at overall  
24 abundance of all those species in concert, and you  
25 look at condition factor of specific species in  
26 that specific year. And you can then from that  
27 make some observations on what you believe they're  
28 responding to.
- 29 Q So you believe there's an upward trend from 2007  
30 through 2008, 2009 and 2010?
- 31 MR. McFARLANE: An upward trend in condition factor?
- 32 Q Yes.
- 33 MR. McFARLANE: No.
- 34 Q Well, trophic level of the Strait of Georgia.
- 35 MR. McFARLANE: No, that's not what I said. I said  
36 that the condition factor of the smolts in the  
37 years following 2007 was better.
- 38 Q Oh, I see. But can you give us any indication of  
39 the trophic level in the Strait of Georgia in  
40 terms of trends?
- 41 MR. McFARLANE: Sorry, I can. What trophic level would  
42 you like?
- 43 Q Well, the --
- 44 MR. McFARLANE: Do you mean the primary levels of food  
45 production?
- 46 Q Yes.
- 47 MR. McFARLANE: Yes, that is available through other



- 1 people's work who study the lower trophic level,  
2 which is basically the copepod euphausiid  
3 biomasses.
- 4 Q Yes. And how is it trending?
- 5 MR. McFARLANE: How is it...
- 6 Q What does the trend line look like?
- 7 MR. McFARLANE: I don't know. I haven't looked at that  
8 in recent years. My understanding is certainly  
9 the physics of the Strait changed in -- or it was  
10 different in early 2007. The physics is usually  
11 related to the productivity, the timing of the  
12 spring bloom. So I suspect that that's where the  
13 connection is right now.
- 14 MR. WALLACE: And, Mr. Commissioner, there is a whole  
15 topic on marine habitat conditions which will come  
16 up later in the hearing schedule.
- 17 MR. HARVEY: All right, thank you.
- 18 Q Mr. Hume, following your question yesterday from  
19 the Commissioner, you gave a description of how  
20 the fry move, emerging from the gravel along the  
21 shores of the lake out into the deepwater in the  
22 summer. What happens in the fall and through the  
23 following winter?
- 24 MR. HUME: Most of the fry are out in deepwater at that  
25 stage of their life. Again, they spend the  
26 daytime down deep, and quite deep down, say in  
27 Quesnel Lake, down 70, 80 metres of water.
- 28 Q Yes.
- 29 MR. HUME: They'll come up towards the surface as it  
30 gets dark.
- 31 Q Do they continue feeding through the winter?
- 32 MR. HUME: Feeding rates are certainly very much lower.  
33 They probably don't feed all that much throughout  
34 the winter, no.
- 35 Q But it's not --
- 36 MR. HUME: Again, it depends on the lake system you're  
37 talking about. In the interior lakes like  
38 Quesnel, Shuswap, there probably is very little  
39 feeding going on in the winter, as coastal lakes,  
40 Harrison, Pitt, Cultus, there's still production  
41 going on.
- 42 Q So in the Quesnel, for example, is it similar to a  
43 form of hibernation like the bears go through in  
44 the wintertime?
- 45 MR. HUME: No, it's not hibernation, it's more the fish  
46 are just dormant, I guess, the water's cold, the  
47 metabolism is slower, it's slowed down.

1 Q And when do they go into that dormant phase?

2 MR. HUME: I can't really say. I believe anything less  
3 than about five degrees centigrade, the fish tend  
4 not to be very active.

5 Q Do they rely on their fat or energy reserves that  
6 they've accumulated during the summer to get them  
7 through the winter?

8 MR. HUME: That would certainly be a major portion of  
9 their metabolic usage, yes.

10 Q Yes. The graphs we looked at yesterday, with the  
11 -- perhaps we could bring it up again at Tab 11,  
12 the one that shows the difference in the dominant  
13 and the subdominant cycles for various years. And  
14 I recognize that you're not comfortable with this  
15 because you didn't plot the numbers, and haven't  
16 checked them. But assuming they're correct, the  
17 top graph seems to show that the daphnia biomass  
18 is depleted shortly after the fall equinox.

19 MR. HUME: The final samples in that would be October,  
20 actually, is the final data points.

21 Q Early October?

22 MR. HUME: Yeah, early to mid-October.

23 Q Yes. The fry would still be feeding at that time,  
24 though.

25 MR. HUME: They would still be feeding. The water  
26 temperatures would still be around ten degrees or  
27 so.

28 Q That is if there's any food around to feed on, of  
29 course.

30 MR. HUME: Yes. Daphnia are not the only food that  
31 they -- it's their preferred prey item, but they  
32 also will feed on other planktons that are in the  
33 water column at the time, so...

34 Q The other graph you gave yesterday showed a  
35 levelling off of the -- I'm sorry.

36 MR. WALLACE: Just for the record, Mr. Commissioner,  
37 this is Exhibit 814.

38 MR. HARVEY: Thank you.

39 Q The other graph you showed yesterday, going from  
40 recollection, but it may have been 804, but it  
41 showed as sort of a levelling-off phenomenon, and  
42 I think you've studied that, and in a moment I'm  
43 going to take you to your 1996 paper. But you've  
44 determined that there is a levelling-off that  
45 occurs in a number of different lakes, is that  
46 correct, in fry numbers, or (indiscernible -  
47 overlapping speakers).

- 1 MR. HUME: That's correct, there appears to be a  
2 maximum abundance of fry that the lake can support  
3 or will support.
- 4 Q Now, a levelling-off like that would have to be  
5 caused by available food supply, would it not,  
6 because predators wouldn't be able to effect a  
7 levelling-off of that nature, would they, in any  
8 population?
- 9 MR. HUME: Presumably the smaller fry are weakened by  
10 lack of food, and the dying off is for whatever  
11 reason, presumably more susceptible, one reason  
12 would be, a major reason, is they would be more  
13 susceptible to predation.
- 14 Q Yes. Dr. Christensen, do you have a comment on  
15 that phenomenon?
- 16 DR. CHRISTENSEN: Predators can impact the situation.  
17 The curve you showed us yesterday indicates a  
18 Beverton and Holt curve, and there are once again,  
19 when you get over a certain number of spawners,  
20 you don't see any more recruits.
- 21 Q Yes.
- 22 DR. CHRISTENSEN: Now, the reason for that can be a  
23 question of food supply, but it can also be that  
24 there is a certain number of places where these  
25 smolts can hide. And those that are not able to  
26 be in these optimal places are more susceptible to  
27 predation.
- 28 Q Yes.
- 29 DR. CHRISTENSEN: So it can be a combination. Very  
30 often these things are a combination of predators  
31 and food.
- 32 Q Yes.
- 33 DR. CHRISTENSEN: But certainly indicates the carrying  
34 capacity.
- 35 Q Yes, all right.
- 36 DR. CHRISTENSEN: That it's being exceeded with the  
37 high-spawning stocks.
- 38 Q And by carrying capacity -- well, I see, by  
39 carrying capacity you have to take into account  
40 both. But, Mr. Hume, you've determined that there  
41 is definitely a certain carrying capacity in  
42 Quesnel and certain other lakes.
- 43 MR. HUME: That's correct.
- 44 Q That's correct. Insofar as that is determined by  
45 food supply, all the young fry would be equally  
46 affected by the lack of food, correct?
- 47 MR. HUME: Yes. In the case of sockeye fry, as Dr.

1 Christensen said, the fry are -- what probably is  
2 happening is that they're actually feeding more.  
3 They're not getting enough food, and so they  
4 actually spend more time feeding up in the upper  
5 water column where they are more vulnerable to --

6 Q Yes.

7 MR. HUME: -- to predation.

8 Q Yes. And they'd also be more vulnerable to warm  
9 water-caused mortality in the upper levels of the  
10 lakes, wouldn't they.

11 MR. HUME: During the peak of the summer, that's a  
12 problem in some lakes, yes.

13 Q Yes. All right. Well, one more question. I  
14 accept that what you say about there being two  
15 causes, and that's abundantly plain, but insofar  
16 as you determined, for example, in the 2002 brood  
17 year in the Quesnel, the smolts were a smaller  
18 size, a record small size.

19 MR. HUME: That's right.

20 Q That would indicate that the lack of food is  
21 having a significant effect?

22 MR. HUME: Yes, it would.

23 Q Yes. All right. And in any population, where a  
24 population is controlled by lack of food, some  
25 people will die of some -- whether it's humans or  
26 animals, will die of starvation, others will cope  
27 with that starvation, but will be less robust and  
28 less fat, correct?

29 MR. HUME: Yes, that would be correct.

30 Q At Tab 2 of my binder, there is your 1996 paper,  
31 Mr. Hume, along with Messrs. Shortreed and Morton.  
32 This paper has been often cited, I've noticed.  
33 It's still valid generally in its conclusions; is  
34 that fair to say?

35 MR. HUME: Yes, it is.

36 Q At page 720, that's 002 on the Ringtail numbers.

37 MR. WALLACE: I believe that's Exhibit 575.

38 MR. HARVEY: Yes, thank you, it is, 575.

39 Q There's a chart "B" for "Quesnel Lake", that shows  
40 the escapement increases in recent years, and in  
41 the right-hand column near the top passage I'd  
42 like to read and ask you about, starting four  
43 lines down:

44

45 During the rebuilding period, when  
46 escapements were relatively low, rearing  
47 capacity of the lakes was not a concern.

1           Rather, optimum escapement estimates were  
2           based on estimates of spawning ground  
3           capacity... Since the 1980s in Shuswap and  
4           Quesnel Lakes and 1990 in Chilko, dominant  
5           and subdominant brood year returns and  
6           escapements have been very high.

7  
8           And you mention that:

9  
10           (Fig. 1, the 1958 return to Shuswap Lakes was  
11           also high, but subsequent returns dropped  
12           considerably and have been building ever  
13           since). Determination of escapement levels  
14           that will maximize subsequent adult returns  
15           is now crucial to the efficient management of  
16           Fraser sockeye stocks. Escapements lower  
17           than the optimum will result in reduced adult  
18           returns. In any brood year, escapements  
19           higher than the optimum entail foregoing  
20           harvestable sockeye and will produce (at  
21           best) no increases in harvestable sockeye in  
22           subsequent brood years. If high escapements  
23           result in excessive fry recruitment and if  
24           the high escapements are consecutive,  
25           substantial and long-term declines in total  
26           stock size...may occur, resulting in  
27           considerable economic loss.

28  
29           Since the mid 1980s we have been conducting  
30           studies on these three lakes. Our studies  
31           are the first that have included detailed  
32           investigations of every major lake trophic  
33           level (from the microbial community to  
34           planktivorous fish) as well as measurement of  
35           salient physical and chemical variables.  
36           This ecosystem approach has enabled us to  
37           produce the first estimates of optimum  
38           spawning escapements based on a lake's  
39           productivity and on its ability to rear  
40           juvenile sockeye.

41  
42           Now, first I wanted to ask Dr. Christensen whether  
43           that is an example of an ecosystem-based approach,  
44           because in the sense that it takes into account  
45           not just the sockeye, but the carrying capacity  
46           and, in other words, the other ecosystem  
47           creatures, and also takes into account

1           socioeconomic matters.

2 DR. CHRISTENSEN: Yes, that's a fair statement that you  
3           made.

4 Q       Mr. Hume, you said yesterday in answer to a  
5           question that Mr. Timberg put to you that your  
6           research data has been incorporated into  
7           forecasting models. Do you mean forecasts of run  
8           size?

9 MR. HUME: Yes, I do.

10 Q       All right. Do you know if your carrying capacity  
11           data has been incorporated into the setting of  
12           upper benchmarks in the FRSSI model?

13 MR. HUME: I haven't been involved with the FRSSI model  
14           at all, myself.

15 Q       All right.

16 MR. HUME: But it has been incorporated into the recent  
17           stock status report for CSAS just last year.

18 Q       Oh, yes. Before that, was there any similar  
19           program or study or model that incorporated your  
20           carrying capacity data into escapement?

21 MR. HUME: Not that I'm aware of.

22 Q       All right. At page 007 towards the bottom, just  
23           the bottom right-hand column, there's just the  
24           last two lines, then I'll go over to the next  
25           page. It reads that "Escapements", this is of  
26           course in this paper you study the Shuswap, the  
27           Quesnel and the Chilko Lake; is that correct?

28 MR. HUME: That's correct.

29 Q       You say:

30  
31           Escapements greater than 25 EFS/ha [effective  
32           female spawners per hectare] (total adult  
33           escapements of 1.5 million) to Shuswap  
34           Lake...

35  
36           Sorry, we have to go down to the bottom, Mr. Lunn,  
37           at the left-hand column there to pick up the text.

38  
39           ...to Shuswap Lake did not produce any more  
40           fall fry, peaking at 4900 fry/ha. Similarly,  
41           escapements to Quesnel Lake of 15 EFS/ha  
42           (total adult escapements of 0.8 million) also  
43           did not produce any more fry, peaking at 2600  
44           fry/ha.

45  
46           Yes, those, you give both the effective female  
47           spawners and total adult escapement. So the

1 Quesnel Lake figure for total adult escapement is  
2 0.8 million or 800,000, is that -- am I  
3 interpreting this correctly?

4 MR. HUME: That's right, yes.

5 Q In the right-hand column on the same page there's  
6 reference to an Alaskan study. Just up, yes, go  
7 down just before the heading. Yes. And then  
8 Alaska is mentioned, yes, right there. Those  
9 eight or so lines at the bottom of that long  
10 paragraph:

11 In Leisure Lake --

12 - it says -

13 -- a much smaller...lake in Alaska, Koenings  
14 and Burkett...found that smolt numbers did  
15 not increase after spring fry numbers  
16 exceeded 10 000/ha. At densities >10 000  
17 fry/ha...smolt numbers did not increase  
18 further, with smolt number declining at the  
19 highest fry densities. These results are  
20 very similar to the curvilinear relationship  
21 we found between EFS and subsequent summer  
22 and fall fry numbers in Shuswap and Quesnel  
23 lakes (Fig. 4).

24 So you mention an Alaska study. There has been  
25 some good work done in Alaska and you've found  
26 that reliable, Mr. Hume, insofar as --

27 MR. HUME: How do you mean, "reliable"?

28 Q Well, you haven't any reason to say that they've  
29 misapplied their --

30 MR. HUME: Not for the lakes that they were working on,  
31 no.

32 Q Yes, all right. In the next paragraph under  
33 "Juvenile sockeye size" you're discussing:

34 Summer fry size in Quesnel and Shuswap lakes  
35 did not vary with spawner density...

36 Et cetera. And then you drop in the next, and  
37 then it says, "Fall fry", I'm beginning the next  
38 paragraph:

39 Fall fry and smolt size in all three lakes  
40 declined rapidly as EFS density increased to  
41

1                   about 10 EFS/ha. At escapements 10EFS/ha  
2                   fall fry size did not significantly decline  
3                   in either Shuswap or Quesnel lakes (Fig. 5).  
4

5                   So am I interpreting this correctly that there's a  
6                   decrease in size in fall fry at levels greater  
7                   than -- or actually why don't you interpret that  
8                   for me. It seems at some point you have a  
9                   decrease and then you have no more decrease.

10                  MR. HUME: The initial decrease in growth is very rapid  
11                   as density increases, but it tends, it levels off  
12                   at higher densities, is basically all we're  
13                   saying.

14                  Q     All right. So at low densities you get a large  
15                   size smolt, as the escapement or spawning density  
16                   increases, the size reduces and then levels off.

17                  MR. HUME: Well, it's a curve, it's curvilinear, but,  
18                   yes.

19                  Q     Yes. And that would be, of course, reducing in  
20                   size because of a lack of food.

21                  MR. HUME: A decrease in food, yes.

22                  Q     Yes. Predators don't -- wouldn't have any effect  
23                   in that, or any significant effect in that?

24                  MR. HUME: Predators may be part of the reason why the  
25                   mean size levels off at higher densities, because  
26                   they'd be, the smaller fry would be more  
27                   susceptible to predation.

28                  Q     Yes. All right. At Tab 6, I have Exhibit 399...

29                  THE COMMISSIONER: Mr. Harvey, I wonder if just before  
30                   you move on, just so that I understand some of the  
31                   timeframes here. In chief, Dr. Hume mentioned  
32                   that his work was incorporated into forecasting  
33                   models but really didn't give any details around  
34                   that.

35                  MR. HARVEY: Yes.

36                  THE COMMISSIONER: And then you've just raised that  
37                   with him based on Exhibit 575, but I don't have  
38                   any timeframe sense here. In other words, over  
39                   what period of time was his work incorporated into  
40                   the forecasting models. Is that still the case,  
41                   or was it just the case at the time that this  
42                   study that you referred him to around that time.  
43                   I just have no sense of timeframe here.

44                  MR. HARVEY: Yes, that's useful.

45                  Q     Mr. Hume, there are two things. Your work, to  
46                   your knowledge, has been utilized for the purpose  
47                   of forecasting run size; that's returning run



1 size.  
2 MR. HUME: Yes.  
3 Q Over what time period are you aware that that's  
4 been used?  
5 MR. HUME: Almost from the -- for Quesnel and Shuswap  
6 Lake we have data going back to 1975, and the time  
7 when I joined the Department in 1986 -- '87, the  
8 forecast relationship between fall fry and  
9 returning adults was being used as one of the  
10 forecast elements.  
11 Q Yes.  
12 MR. HUME: And it continues to this day to be one of  
13 the items that they ask for in conducting their  
14 forecasts.  
15 Q Yes. so the basically ask you for the numbers of  
16 fall fry and then they use that in their  
17 forecasts?  
18 MR. HUME: That's correct.  
19 Q And that's been ongoing, as you say, for a number  
20 of years.  
21 MR. HUME: We usually only do our -- collect our data  
22 for the dominant and subdominant runs --  
23 Q Yes.  
24 MR. HUME: -- into the two lakes, and so it's used in  
25 those two years, but not in the other non-dominant  
26 years.  
27 Q Okay. And then the other matter you discussed was  
28 the use of your data in terms of escapement  
29 determinations or benchmarks, and to your  
30 knowledge your data has only been used very  
31 recently for that purpose; is that correct?  
32 MR. HUME: That's correct. That was based on our lower  
33 trophic level primary production model.  
34 Q Yes. And by "very recently" in the last year do  
35 you mean, or when?  
36 MR. HUME: Well, for the Fraser River, yes, just the  
37 last year.  
38 Q All right.  
39 MR. HUME: But in other -- other systems within the  
40 province it's been used since early 200s.  
41 Q I see. So I'd like to refer you to Tab 6, if I  
42 may, and page 99 of Tab 6. This is Exhibit 399,  
43 Pestal and Cass 2010. Page 99 has the Quesnel  
44 numbers. And if we look at the 2001 near the  
45 bottom, just the last decade I'm interested in.  
46 2001 the escapement, total escapement in the  
47 Quesnel system was 3,510,000-odd, according to

1           this. That compares with your optimum escapement  
2           estimate that you mentioned a moment ago of  
3           800,000; is that correct?

4       MR. HUME: Yes.

5       Q     So it would -- well, I'll leave that comment for  
6           argument. And that would be certainly  
7           significantly beyond the carrying capacity of the  
8           lake as you estimated it, correct?

9       MR. HUME: That's correct.

10      Q     And then the same happened -- sorry.

11      MR. HUME: I would say, I believe, I'd prefer to call  
12           it the optimum capacity of the lake to produce  
13           smolts.

14      Q     Optimum capacity, yes. Thank you. In 2002, well,  
15           dealing in 2001, if we look at the results of  
16           that, the total recruits, which is mostly four  
17           years and some, five years later, but straight  
18           across in the right-hand column, 3,700,000, so  
19           that's as you would expect, a very low  
20           productivity level, correct?

21      MR. HUME: I'm not sure what you mean by...

22      Q     Yes, all right, well --

23      MR. HUME: Yeah, okay. Well, it's approximately a one-  
24           to-one relationship, yes.

25      Q     All right. Now, 2002, again there is an  
26           escapement, this time 3,062,151, escapement that's  
27           significantly over your optimum carrying capacity  
28           level, correct?

29      MR. HUME: That's correct.

30      Q     and this time the recruits are much reduced,  
31           640,000.

32      MR. HUME: Yes.

33      Q     So it looks as though there's a carryover effect  
34           of some sort going on here. In other words, or  
35           can we -- do these numbers tells us that what's  
36           likely happened is that the food, the daphnia and  
37           the other food web sources for the sockeye fry  
38           from the 2001 brood year were seriously depleted  
39           and there was some carryover of that depletion in  
40           the following year?

41      MR. HUME: That's certainly -- certainly the freshwater  
42           conditions were one of the components of this.

43           The fall fry were very -- were the smallest we'd  
44           observed that year.

45      Q     Yes.

46      MR. HUME: And we did some subsequent smolt sampling,  
47           as well, and they had shown no indication of

1           overwinter growth in that year, as well.  
2           Q     Yes.  
3           MR. HUME: Well, overwinter and early spring growth.  
4           Q     Yes. The 2002 brood year, I think, is the year  
5           you found that record low 1.9 gram, correct?  
6           MR. HUME: That's correct, yes.  
7           Q     Fry size. Dr. McFarlane, is there anything  
8           happening in the Strait of Georgia that might have  
9           accounted or contributed to the low recruitment  
10          from the 2002 brood year? That would be 2004  
11          conditions in the Strait of Georgia, I think.  
12          MR. McFARLANE: 2004 there was a flip between cooler  
13          temperatures to slightly warmer temperatures  
14          coast-wide, which lasted for a couple of years,  
15          three years, actually. So you could say that --  
16          off the top of my head I could say that there was  
17          indications of some change in the physical  
18          environment, but I haven't looked in detail at the  
19          biological thing relating to that particular  
20          species.  
21          Q     And I'm sorry, I forgot that I was reminded by Mr.  
22          Wallace that that's coming later. At any rate,  
23          yes, let me move on if I may.  
24          MR. WALLACE: Mr. Harvey, my clock says you're at about  
25          the end of your time. How are you doing?  
26          MR. HARVEY: Well, unfortunately I've got a little bit  
27          to go. I do consider it quite important, and we  
28          are really trying to solve the mystery of the  
29          *Murder on the Orient Express*, and it's hard to do  
30          that in the space of this time. Would I be  
31          permitted to have another 20 minutes?  
32          MR. WALLACE: That's problematic. You've run more than  
33          an hour now.  
34          MR. HARVEY: Well, in that case, could I just close  
35          then by marking some exhibits.  
36          THE COMMISSIONER: Mr. Wallace, if we could just check  
37          with other counsel to see whether we can give Mr.  
38          Harvey another 15 minutes.  
39          MR. WALLACE: Ms. Gaertner is going to use her time, as  
40          I understand, for this panel but may have less for  
41          squid. So perhaps, Mr. Harvey, if you could try  
42          and wrap up in five, seven minutes, something like  
43          that.  
44          MR. HARVEY: Okay, thank you.  
45          Q     The Tab 1 of the documents that I submitted is  
46          Exhibit 726. This is the Koenings and Kyle paper  
47          in Alaska. I just wanted you to either agree, and

1           perhaps you've already done this, that this is a  
2           well-regarded paper in this field; is that  
3           correct, Mr. Hume?

4       MR. HUME: Yes, it's certainly known. Yes.

5       Q     All right. At Tab 4, a paper co-authored by  
6           yourself, Mr. Hume, James Woodey and Michael  
7           Lapointe, this is a paper that you participated  
8           in; is that correct?

9       MR. HUME: That's correct.

10      Q     The abstract makes note of examinations of  
11           interactions among cycle lines, sockeye foraging  
12           appears responsible, et cetera, et cetera. Are  
13           these findings still valid, in your opinion?

14      MR. HUME: Yes, they are.

15      MR. HARVEY: I wonder if that could be marked as the  
16           next exhibit, please.

17      THE REGISTRAR: Exhibit 815.

18

19                   EXHIBIT 815: Woodey, Lapointe, Hume,  
20                   Evidence for Cycle-line Interaction as a  
21                   Mechanism for Cyclic Dominance in Fraser  
22                   River Sockeye Salmon (*Oncorhynchus nerka*)  
23

24      MR. HARVEY:

25      Q     At Tab 5 is Exhibit 576. This is a paper that I  
26           think we have to -- yes. We have to turn over to  
27           the next page. Yes. A paper co-authored by you,  
28           John Stockner and Ken Shortreed; is that right?

29      MR. HUME: That's right.

30      Q     Still valid, insofar as you're aware?

31      MR. HUME: Yes, it is.

32      Q     Okay. Exhibit 802 we looked at earlier. This is  
33           your paper, a paper you co-authored on Predation  
34           by Rainbow Trout. You found that the rainbow  
35           trout in some of these studies had 95 percent  
36           sockeye fry in their stomach?

37      MR. HUME: Yes, we did.

38      Q     So rainbow trout are a significant predator of  
39           sockeye fry, obviously?

40      MR. HUME: Yes. Depending on their abundance, which we  
41           didn't measure.

42      Q     Yes. At Tab 10, Tab 10 is a 2011 paper by a  
43           German scientist by the name of Guill, an English  
44           person by the name of Drossel, and certain others.  
45           You're familiar with this paper?

46      MR. HUME: I've skimmed through the paper, yes.

47      Q     Yes. And the authors set out to compare the

1 population dynamics for sockeye fry in British  
2 Columbia in the Fraser, sockeye fry, their  
3 predators and their zooplankton food; is that  
4 right?

5 MR. HUME: Sorry, what was the question?

6 Q Well, as the title indicates, "A three-species  
7 model explaining cyclic dominance of Pacific  
8 salmon", the three species that are studied are  
9 sockeye fry, the predators of the fry and the  
10 zooplankton, I think; is that right?

11 MR. HUME: Well, they didn't actually study any of  
12 them, but they used those as explanatory variables  
13 in their model.

14 Q Yes. And they based a lot of their work on your  
15 data, I think; is that correct?

16 MR. HUME: I don't believe they actually used any of my  
17 data in their paper.

18 Q All right. At any rate, is this -- I don't know  
19 if Dr. Christensen has had a chance to read this.  
20 Is this an example of an ecosystem-based approach,  
21 in that not only the sockeye fry are being looked  
22 at, but their predators and the food web?

23 DR. CHRISTENSEN: It's "ecosystem analysis light", I  
24 would call it, so considering a small part of the  
25 ecosystem.

26 Q Yes, all right. Are any of you aware of anything  
27 similar that's been done by DFO, or been done by  
28 British Columbia scientists? I'm just curious as  
29 to why it takes a German and an English scientist  
30 to put this together.

31 MR. HUME: Well, first of all, the last author on this  
32 paper is a DFO scientist.

33 Q Oh, yes.

34 MR. HUME: And certainly we've been looking at cyclic  
35 dominance work for a number of years.

36 Q Yes. But I think the funding for this came from  
37 overseas, did it not?

38 MR. HUME: Yes, I don't expect there was a lot of  
39 expenses involved with this paper.

40 MR. HARVEY: Could that be marked, please, as the next  
41 exhibit.

42 THE REGISTRAR: Exhibit 816.

43

44 EXHIBIT 816: Guill et al, A three-species  
45 model explaining cyclic dominance of Pacific  
46 Salmon

47

1 MR. HARVEY: Yes, I think I've probably exhausted my  
2 time. Thank you.

3 MR. WALLACE: Thank you, Mr. Harvey.

4 THE COMMISSIONER: Thank you, Mr. Harvey.

5 MR. WALLACE: Ms. Gaertner.

6 MS. GAERTNER: Good morning, Mr. Commissioner. Brenda  
7 Gaertner for the First Nations Coalition, and with  
8 me Crystal Reeves.

9 I'm going to take the time this morning, I  
10 have an hour allotted to me, I want to do a number  
11 of things. First I want to do some clarifications  
12 on the reports and use the report. I'm going to  
13 have to ask Mr. Hume a couple of clarifying  
14 questions, given the work of Mr. Harvey.

15 And then I want to use the time to use the  
16 report, Mr. Commissioner, as a springboard to  
17 having a fairly -- a broader level discussion on  
18 ecosystem-based management. You'll recall at the  
19 beginning of this inquiry that we had Dr. David  
20 Close and Dr. Reynolds come and give you some  
21 definitional introductions to this notion of  
22 ecosystem-based management, and in my experience  
23 and my clients' experience, it's a word that's  
24 often used, but difficult to implement.

25 And so I want to use this panel, which  
26 includes an expert, an academic and some  
27 practitioners to explore some of the challenges  
28 associated with operationalizing ecosystem-based  
29 management. And so I'm going to use the report as  
30 a lifting-off place, more than a drilling-down  
31 place, and I have some documents to help us in  
32 that work, and that will help the panel get a  
33 sense of where I'm going to go.

34

35 CROSS-EXAMINATION BY MS. GAERTNER:

36

37 Q And I apologize, I wasn't able to speak to the  
38 panel or all of the panel ahead of time, so I just  
39 want to let you know who I'm representing. First  
40 Nations Fisheries Council, which is a provincial  
41 organization some of you will be familiar with,  
42 and then from the perspective of the First  
43 Nations, my client base includes the Haida, three  
44 of the Saanich First Nations, so the Strait of  
45 Georgia is of course an important component of  
46 their territory, and then the tribes on the  
47 Fraser, beginning in Chehalis and then going all

1 the way up to the headwaters of the Fraser. And  
2 so the lakes that you've spent a lot of time with,  
3 Mr. Hume, sit in the heart of some of those  
4 territories.

5 And I'm going to begin by asking a general  
6 question. We posed it for the earlier panel on  
7 marine mammals, and I would like to have your  
8 expertise on this. At page 11 of the report, and  
9 I don't think I need to take you there, but you  
10 can go there if you want, there's a statement that  
11 says if warmer climate conditions did lead to the  
12 -- talks about the impact of warmer climate  
13 conditions. You'll see it at the paragraph just  
14 above the title "Predator satiation and  
15 depensation":

16  
17 Another aspect of environmental conditions  
18 relates to the impact of water temperature.

19  
20 And then the last sentence is:

21  
22 This is illustrated by Petersen and Kitchell  
23 (2001), who used oceanic, coastal and  
24 freshwater climate indices and simulations of  
25 bioenergetics of key predators...and  
26 predicted that warmer climatic conditions can  
27 lead to an increase in predation rates in the  
28 range of 26-31%.

29  
30 If warmer climate conditions did lead to an  
31 increase in predator rates in the range of 26 to  
32 31 percent, which of the predators considered and  
33 those that you have expertise with could become  
34 immediate or significant concerns to the long-term  
35 sustainability of the Fraser River sockeye salmon.  
36 And in addition to the predators, I'd also like  
37 you to comment on competitors. I think that's an  
38 extremely important component of climate change.  
39 And I'll begin with you, Dr. Christensen, and then  
40 turn to you, Dr. McFarlane, and then Mr. Hume.

41 DR. CHRISTENSEN: We would expect that the impact of  
42 climate change would be most pronounced in  
43 freshwater and in coastal waters. So you would  
44 look for those predators as being the key  
45 predators. With regard to climate change, the  
46 river especially.

47 Q That pretty well takes the full migration route of

1 the Fraser River sockeye salmon.  
2 DR. CHRISTENSEN: I didn't mention the open ocean.  
3 Q Oh, I see.  
4 DR. CHRISTENSEN: (Indiscernible - overlapping  
5 speakers) the migration route. They continue  
6 migrations out there in a big circle, so it's  
7 especially in freshwater and coastal waters you  
8 would see this effect.  
9 Q All right. Maybe I'll just go to each of the DFO  
10 experts who have expertise in both of those. Dr.  
11 McFarlane, can we start with you, and then I'll go  
12 to Mr. Hume.  
13 MR. McFARLANE: I suspect that the first place I think  
14 would be worth looking would be at the large  
15 migratory pelagics. Warmer waters generally  
16 indicate a change in distribution of many of these  
17 species. Both distribution in terms of oceanic to  
18 more coastal waters, and in southern predators, in  
19 a northward movement pattern. Things like hake,  
20 some of the shark species, those would be where I  
21 would consider the places to look. Now, having  
22 said that, I am not -- I don't believe that those  
23 particular aspects of the whole system are  
24 controlling what is happening with these species,  
25 prey species.  
26 Q Sorry, don't believe they're controlling...?  
27 MR. McFARLANE: I don't believe that this is a result  
28 of top-down forcing of predator control on any of  
29 the species, let alone Fraser River sockeye. I  
30 haven't seen information that would lead me to  
31 indicate, or that would indicate to me that any of  
32 these predators would selectively choose a  
33 specific stock of fish or stocks of fish to and  
34 above all others. Biologically and ecologically  
35 to me it does not make sense.  
36 Q Okay, thank you. That's helpful. Mr. Hume.  
37 MR. HUME: It's very difficult to choose one or two or  
38 any to determine which predators would be affected  
39 by climate, warmer climate in cases. Again as Dr.  
40 McFarlane said, I would probably look at some of  
41 the bigger predators, such as the rainbow trout  
42 and pikeminnow. But it's quite possible that near  
43 shore predators, such as sculpins, may have a  
44 major effect, as well. But I really can't comment  
45 on what the effects would be.  
46 Q So it's fair to say that although we're beginning  
47 to identify warming climate changes, that the



1 science is at its infancy in understanding what  
2 implications that will have for the Fraser River  
3 sockeye salmon, and that we're going to have to  
4 develop models and look very closely as these  
5 climatic changes begin to show up more clearly.

6 MR. HUME: I think that would be a reasonable  
7 statement.

8 Q Mr. McFarlane?

9 MR. McFARLANE: Yeah, as far as that goes, that's a  
10 reasonable statement. I think what you need, it's  
11 always nice to develop models, but you might want  
12 to actually have some data to put into them, so  
13 you want to ensure that you're directing some  
14 targeted programs at the issues that you think, or  
15 the timeframes that you think may be most  
16 appropriate.

17 Q Okay. We're going to get into the relationship  
18 between data and models quite a bit, so let's --  
19 and Dr. Christensen?

20 DR. CHRISTENSEN: Just that it's probably fair to say  
21 we have quite limited experience in regards to the  
22 Fraser River. But overall in the scientific  
23 community, there's a lot of work being aimed at  
24 developing models with the underlying data to  
25 predict the impact of climate change. But that's  
26 a broader scale, it's not at the scale of the  
27 Fraser River. And that is there is really very  
28 intensive research going on there. So lots of  
29 things are happening there.

30 But you also asked the question of  
31 alternative prey, or prey, implications of prey.  
32 And one aspect that we have not even talked about  
33 in this hearing, or this panel, has been the  
34 potential that there might be alternative prey and  
35 what happens to the alternative prey. That's  
36 where you wanted to go?

37 Q Yes, we can go there.

38 DR. CHRISTENSEN: If we look at the amount of Fraser  
39 River in the -- when they're out in the ocean, we  
40 may be talking of something of the order of giving  
41 -- depending on the years, anywhere from, say, 20  
42 to 60,000 tonnes of prey. If we look at what else  
43 is out in the ocean, and how the biomasses of  
44 those other potential prey have changed in recent  
45 years, we've seen stocks that are measured more  
46 with a million tonnes disappearing. So much  
47 larger amounts of alternative prey has

1 disappeared. And that's one area where predators  
2 may have an increased impact on the sockeye  
3 because of the lack of the alternative prey.

4 I think I made a really bad explanation of  
5 that.

6 Q Do you want to sum it up?

7 DR. CHRISTENSEN: Sum it up? There is a certain amount  
8 of prey out there. If we're losing, say, half of  
9 that prey, then the half that's left, which  
10 includes the sockeye, may be subject to much more  
11 intense predation pressure. We have probably not  
12 seen that the number of predators have decreased  
13 significantly, but what they can eat have likely  
14 decreased in the North Pacific in the last ten or  
15 15 years.

16 Q So if I understand that correctly, it may be that  
17 the sockeye salmon will become much more important  
18 in other animals' diets in the ocean conditions,  
19 as ocean conditions change. Is that, have I heard  
20 that right?

21 DR. CHRISTENSEN: If we look back, I think this may  
22 have happened. What will happen in the future, we  
23 still need better numbers for that.

24 Q All right. Okay. I want to turn, Mr. Hume, I've  
25 got a couple of very short questions arising from  
26 the discussions we've had about optimum  
27 capacities. And I want to take you to Exhibit 399  
28 for a moment. Sorry, Mr. Lunn, I hadn't warned  
29 you on that. And in particular the questions that  
30 have been asked around the two years in which  
31 there was a higher return to the Quesnel River, or  
32 Quesnel Lake, sorry, in 2001 and 2002. Have I got  
33 that exhibit wrong? Sorry, it's the - what page  
34 are the - page 99, thank you. And do you recall  
35 2001 and 2002, Mr. Hume?

36 MR. HUME: I'm getting on in years, you know.  
37 Sometimes I don't remember last year.

38 Q I know that's sometimes difficult, but perhaps  
39 I'll refresh your memory. Do you recall that in  
40 those years we were having -- we were struggling  
41 on the Fraser with understanding what was  
42 happening with the Late runs, and in particular  
43 the Late runs that co-migrate at the time with the  
44 Quesnel runs there?

45 MR. HUME: I have some recollection of that.

46 Q And if you'll recall, we weren't planning to have  
47 an escapement of over three million into the

1 Quesnel that year, were we?  
2 MR. HUME: I don't believe so, but I can't really speak  
3 to that authoritatively.  
4 Q All right. So if you look at the types of numbers  
5 that were going into the Quesnel, it's clearly a  
6 much higher number.  
7 MR. HUME: That's right. Yes.  
8 Q And if I suggest to you that we were not planning  
9 to have that kind of escapement go into Quesnel,  
10 and that was a result of decisions around co-  
11 migrations with the Lates, is that something that  
12 rings true to you?  
13 MR. HUME: Yes. Yes, it does.  
14 Q And in fact that reflects perhaps the result of  
15 having to take quite a bit of care with the Late  
16 runs and we had an abundant return into Quesnel,  
17 and that those are the types of tradeoffs or  
18 difficulties we're going to have when we begin to  
19 implement weak stock management; is that correct?  
20 MR. HUME: Well, I'm not a manager, so I can't really  
21 speak authoritatively to that. But my  
22 understanding is that the harvest is controlled by  
23 -- it's not controlled, but it takes weak stocks  
24 into account.  
25 Q For if I also were to suggest that we're still  
26 trying to see what implications, if any, that  
27 those two years will have in the longer term  
28 success of production out of the Quesnel system.  
29 MR. HUME: yes.  
30 Q And similarly, in Exhibit 810, which is the graph,  
31 if I could go to that for a moment. If I can go  
32 to the bar graph. I heard I your evidence  
33 yesterday, Mr. Hume, that the green bars are an  
34 example of perhaps a one year, so when we look at  
35 the Quesnel, that large green bar could in fact be  
36 the years that we just looked at, either 2001 or  
37 2001?  
38 MR. HUME: That's probably 2001, yes.  
39 Q And so in fact the more average would be quite a  
40 big significantly lower than that?  
41 MR. HUME: Yes, it would.  
42 Q And did I hear your evidence right, and this is  
43 just a clarification, I might have missed this  
44 wrong. How are the hatched bars created? Are  
45 they lake-specific, or are they a generalization?  
46 MR. HUME: No, they're lake-specific. They're based on  
47 limnological work we do on determining primary

1 productivity of each individual lake.  
2 Q Great. Thank you. One final question. Yesterday  
3 we heard a number of times about the words "low  
4 survival rates" were used. Can we say anything  
5 about the survival rates of Fraser River sockeye  
6 salmon fry to smolt stage in terms of population  
7 dynamic perspectives, increasing or decreasing  
8 over time? I mean, I heard the word "low" often  
9 used, and it's a low number, but that could  
10 actually be quite a normal number; is that  
11 correct?  
12 MR. HUME: Sorry, freshwater survival, or...?  
13 Q Yes.  
14 MR. HUME: Freshwater survival, in the data and the  
15 information that we have based on Quesnel and  
16 Shuswap fall fry estimates and Chilko smolt  
17 estimates is the freshwater survival. So from the  
18 egg deposition to smolts or fall fry has not  
19 changed. It's not changed, basically a flat line,  
20 there's no trend lines available showing them on  
21 that dataset.  
22 Q So they've been pretty constant for quite a few  
23 decades?  
24 MR. HUME: Well, constant was not the word I would use.  
25 I would say there's no overall trend with time.  
26 Q All right, thank you. Now, I'm going to now turn  
27 to that more general discussion I wanted to have  
28 with Dr. Christensen and Dr. McFarlane  
29 particularly. Obviously, Mr. Hume, if you'd like  
30 to add to it, please do, but I'm going to focus my  
31 questions there.  
32 Dr. Christensen, as an ecologist you'll agree  
33 with me that an important part of any system, food  
34 webs are just one part of the ecosystem approach.  
35 They're not -- we've got to deal with disease,  
36 we've got to deal with parasites, we've got to  
37 deal with changing environmental conditions. It's  
38 a much broader look when we're looking at  
39 ecosystem-based management. Do you agree with me  
40 on that?  
41 DR. CHRISTENSEN: I will. The entry point for  
42 ecosystem-based management is that we are looking  
43 at an area, so that's where we start. We don't  
44 start with the food web.  
45 Q So when it comes to Fraser River sockeye salmon,  
46 we've got quite a large area to deal with in a  
47 ecosystem-based management, in fact, it's arguable

1 that we've got a number of ecosystems.

2 DR. CHRISTENSEN: Yes, and that's very typical. We  
3 often have to be quite pragmatic about how we go  
4 about ecosystem analysis. That's one part of  
5 ecosystem-based management. And we may well in  
6 this case look differently at the freshwater, the  
7 coastal zones and the open ocean. But it's  
8 necessary to try to integrate all of that  
9 information to get a full understanding of what  
10 happens to the Fraser River sockeye salmon.

11 Q And I don't know if, Dr. McFarlane, if this is a  
12 more appropriate question for you, because you're  
13 a little bit closer to the management decisions  
14 than Dr. Christensen. But it's my observation, my  
15 clients' observation that it's quite a bit of a  
16 significant quantum leap or change from an  
17 individual species looking at, you know, like an  
18 individual Fraser sockeye stock, salmon stock  
19 even, and going to ecosystem-based management. A  
20 one-species approach is not an ecosystem-based  
21 approach. Would you agree with me on that?

22 MR. McFARLANE: I would agree with you on that with a  
23 number of caveats, and before we get to that, if I  
24 may, I would like to have a comment on the  
25 alternate species approach, or alternate species  
26 discussion that Dr. Christensen brought up.

27 Q Sure.

28 MR. McFARLANE: Okay. I mean, that's alternate species  
29 in diets is looked at routinely in a number of  
30 places, including on the West Coast of Canada, in  
31 a number of species. And the comment on that  
32 there has been major shifts in some of the other  
33 prey species, forage species, with huge reductions  
34 is true. But there has also been over the last 20  
35 years huge increases in forage species off our  
36 West Coast, ranging from the most obvious one is  
37 Pacific sardine, which entered our waters in the  
38 early 1990s, and in the 2000s has been estimated  
39 to be there minimally at in the neighbourhood of  
40 300,000 to 400,000 tonnes, which is a huge  
41 increase in prey, considering that from 1947 to  
42 1992 there was zero fish, not tonnes of fish, zero  
43 fish off our coast.

44 So it's a highly nutritious food for many of  
45 these species, and in the diet work I've done,  
46 there has definitely been a switch of major  
47 predators, but not to salmon, they've been -- the

1 switch has been to sardine. So that was just my  
2 comment on that.

3 Now, to get to your other question, that  
4 focusing in on Fraser River sockeye is just a  
5 minor component of an ecosystem-type management  
6 approach --

7 Q Single component, I want to say.

8 MR. McFARLANE: A single component, I would absolutely  
9 agree. And I think Dr. Christensen actually  
10 mentioned that indeed you have to look at many,  
11 many other factors than just that. So but it is  
12 an important component if your question in that  
13 particular ecosystem management discussion that  
14 you're having with all interested parties is  
15 focusing on the Fraser River system, the Fraser  
16 River sockeye. You, for example, may not be too  
17 interested in developing a marine protected area  
18 in the northern part of the Strait if your concern  
19 is Fraser River sockeye. But the ecosystem  
20 management approach looks at many, many things,  
21 and having a marine protected area, or whatever  
22 type of area you're looking at where you want to  
23 change up something, whether it's building or not  
24 building, log boom areas, or any of those types of  
25 things, that has to be considered in those  
26 context. But all of them together form the  
27 ecosystem management approach.

28 Q And you'll agree with me that that shift from a  
29 single-species approach to a geographical  
30 multispecies is a complex shift for the Department  
31 of Fisheries and Oceans.

32 MR. McFARLANE: I would agree it's a complex shift for  
33 mankind, not just the Department of Fisheries and  
34 Oceans. There's many, many other departments that  
35 build management strategies for parts of  
36 terrestrial and marine ecosystems, including the  
37 Strait of Georgia, which don't consider fisheries,  
38 or fish concern. So everybody is having a quantum  
39 leap forward in starting to consider this, and  
40 it's a good thing. I agree entirely with it.

41 Q Perhaps I'll just use your comment on everything  
42 in mankind as a stepping-off place to suggest, as  
43 Commissioner Cohen has heard many times from my  
44 clients, that an ecosystem approach is not a huge  
45 shift for First Nations. It is in fact how  
46 they've looked at their territories for a long  
47 time, and it is in that -- that approach is

1 something that will be well worth science  
2 collaborating with. Would you agree with me on  
3 that?

4 MR. McFARLANE: I would agree certainly that Fisheries  
5 and Oceans and people in other organizations,  
6 let's say, in general, should collaborate with all  
7 interested parties, including First Nations,  
8 absolutely.

9 Q All right. I'd like to take you to Tab 1 of our  
10 documents, and that's a report done by the Western  
11 - sorry - WWF, and I'm using this report,  
12 Commissioner, particularly for pages 12 and 13.  
13 And I'd like to take the witnesses to that because  
14 it provides a useful list, in my suggestion, for  
15 some of the strengths and weaknesses and  
16 challenges associated with ecosystem management.  
17 And I'd like you to particularly go to some of the  
18 strengths of it, and just have you review those,  
19 and provide any comments you might have with  
20 respect to the authors' identification of some of  
21 the benefits associated with ecosystem-based  
22 management. You'll see things like improved  
23 habitat conditions. You'll see the movement from  
24 single species to multispecies approaches. You'll  
25 see the benefits of adaptive management. Those  
26 are all things that they speak about. You'll see  
27 that it gets more stakeholders involved. And if  
28 effectively carried out, it can improve cost-  
29 effectiveness over a longer time period. Are  
30 those all kinds of comments that from your own  
31 experience you would agree with?

32 DR. CHRISTENSEN: Yes.

33 Q And some of the weaknesses associated with it, in  
34 particular the first one is that:

35  
36 Multi-species planning can be...complex,  
37 time-consuming, and expensive undertaking.

38  
39 Would you also agree with that?

40 DR. CHRISTENSEN: The statement is so general that it's  
41 impossible to disagree.

42 Q Perhaps from a management perspective, Mr.  
43 McFarlane, we're going to get into a little bit of  
44 the work you've done in the Strait of Georgia, of  
45 course, but to do ecosystem-based management, it  
46 does require a significant shift, and it's going  
47 to require some time consuming efforts, if done

1 properly with stakeholders, and it's going to  
2 require budgets to do that. Would you agree with  
3 me on that?

4 MR. McFARLANE: I would agree with you on that, and I  
5 would also like to point out I am not a manager.

6 Q No.

7 MR. McFARLANE: My work was in science.

8 Q Yes. I appreciate that. But you'll agree with me  
9 that your work is to inform managers, be they  
10 First Nations managers or DFO managers, or  
11 otherwise, you're not just doing science for  
12 science sake.

13 MR. McFARLANE: It was always my hope that it would  
14 inform managers, yes.

15 Q And that transition is still a work in progress?

16 MR. McFARLANE: Well, yeah, and that's a good thing,  
17 too. I think everybody should --

18 Q Yes.

19 MR. McFARLANE: -- progress.

20 MS. GAERTNER: Absolutely. Now, I want to take you to  
21 Tab 16 of our -- oh, could I mark this exhibit as  
22 the next exhibit, please.

23 THE REGISTRAR: Exhibit 817.

24

25 EXHIBIT 817: An Assessment of Multi-Species  
26 Recovery Strategies and Ecosystem-Based  
27 Approaches for Management of Marine Species  
28 at Risk in Canada, WWF-Canada  
29

30 MR. WALLACE: Mr. Commissioner, I note it's ten after  
31 11:00. Perhaps this seems like we're moving on to  
32 something else, this might be an appropriate time.

33 THE COMMISSIONER: Thank you.

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

36

37 (PROCEEDINGS ADJOURNED FOR MORNING RECESS)

38 (PROCEEDINGS RECONVENED)

39

40 THE REGISTRAR: Hearing is now resumed.

41

42 CROSS-EXAMINATION BY MS. GAERTNER, continuing:

43

44 Q Thank you, Mr. Commissioner. I'm now going to  
45 turn the witnesses' attention to the document at  
46 Tab 16 of my list of documents and it's a  
47 proceeding of the National Workshop on Objectives



1           and Indicators for Ecosystem-Based Management that  
2           occurred in Sidney, B.C. in February into March of  
3           2001 and it appears by my review of the  
4           participants that they are primarily DFO  
5           scientists. That's correct?

6       MR. McFARLANE: Yes, that is correct.

7       Q     Mr. McFarlane?

8       MR. McFARLANE: Yes.

9       Q     And if I could turn you to page 11 of that  
10           document to begin with, there is a list of issues  
11           that these scientists have developed as a --  
12           associated with ecosystem-based management and I  
13           want to turn you to the very first one to begin  
14           with.

15  
16                   Science must be able to provide indicators  
17                   and reference points at regionally-relevant  
18                   scales.

19  
20           And I just -- and then it goes on to:

21  
22                   Social and economic objectives and indicators  
23                   need to be addressed in concert with the  
24                   biological ones also being considered.

25  
26           My question for you is why is it that science  
27           feels that they have to provide the indicators?  
28           Isn't that somewhat dependent on the management  
29           questions and the stakeholders and First Nations  
30           interests and how this information is going to be  
31           used? And wouldn't it be more useful to ensure  
32           that there is a collaborative group of people that  
33           are coming to some kind of agreement as it's  
34           associated with indicators and reference points?

35       MR. McFARLANE: Yeah, I think that's a fair statement  
36           as far as it goes. The -- this particular group  
37           met in 2001 and made a conscious decision to only  
38           look at what they called the environment,  
39           environmental part of the question, not the  
40           cultural or social or anything else.

41                   They then moved forward, trying to build a  
42                   framework which would be useful, remembering that  
43                   this was early on in these discussions. We're  
44                   going back ten years. The indicators and  
45                   reference points that they are referring to that  
46                   they think science should provide are basically in  
47                   the context of what they're talking about are

1 things that science would look at and measure in  
2 some way, either directly or indirectly through  
3 outputs from models. Whether they're physical,  
4 biological in terms of lower trophic level  
5 biological or upper scale biological.

6 So I don't think they were suggesting in any  
7 way that when it came to the actual development of  
8 ecosystem objectives and how you would use -- they  
9 actually in more recent work talk about setting  
10 out -- I forget the actual term, but it would be  
11 management indicators as opposed to biological or  
12 science indicators. So I think this is more a  
13 reflection of when they wrote this paper, as  
14 opposed to their thoughts on it.

15 Q All right. And then if you go to the fifth bullet  
16 down, they talk about funding challenges and, in  
17 fact, they say that:

18  
19 Funding opportunities within DFO for terms  
20 longer than the existing two to three-year  
21 maximum window needs to be created.  
22

23 So I am assuming there that they're talking about  
24 the necessity for having longer-term budgets, so  
25 that you could actually plan for three, five, ten-  
26 year projects; is that correct?

27 MR. McFARLANE: I think that's a fair statement.

28 Q And would you agree with me that when looking at  
29 something as challenging as the Strait of Georgia  
30 and as challenging as other coastal waters and, in  
31 particular, any kind of ecosystem-based management  
32 for sockeye salmon, we're going to look at those  
33 kinds of longer windows in order to be able to do  
34 the work we need?

35 MR. McFARLANE: I certainly hope we are.

36 Q And so one of the suggestions or recommendations  
37 that you might want to give to the commissioner is  
38 to look closely at how science budgets are looked  
39 at in this circumstance and he is looking at  
40 budgets and you have experienced this, Dr.  
41 McFarlane and --

42 MR. McFARLANE: Yes.

43 Q -- it's useful, but in order to actually implement  
44 these types of objectives, not only do we need to  
45 shift in thinking, but we need a shift in how we  
46 budget them?

47 MR. McFARLANE: At this point in my career, I will

1           agree entirely with what you just said. I think  
2           we really need to ensure that science, since we're  
3           talking science right now, has funding on a  
4           timeframe that will allow them to complete some of  
5           these longer-term projects, absolutely.  
6        Q     All right. And then I want to go to two more  
7           bullets down from that. They list the importance  
8           of there needs to involve stakeholders and I'm  
9           assuming when science uses the word "stakeholders"  
10          they're at least talking including First Nations  
11          in that sentence; is that correct?  
12   MR. McFARLANE: I believe they are.  
13   Q  
14                   ... in the development of an ecosystem-based  
15                   management process as soon as possible.  
16  
17          Now, I just want to drill down on that. I was  
18          going to wait for awhile, but let's just get right  
19          into this. A management process requires an  
20          understanding of what you're assessing? I mean,  
21          an assessment doesn't start before management.  
22          You've got to have an iterative relationship; is  
23          that correct?  
24   MR. McFARLANE: Yes.  
25   Q     And so when you're developing your models and  
26          you're looking at all of that you need to know  
27          who's going to use those models and for what  
28          purpose and what are the issues; is that correct?  
29   MR. McFARLANE: I think that's a fair statement.  
30   Q     And that in the development of those models there  
31          is going to be policy decisions that are going to  
32          have to be made in terms of priorities, in terms  
33          of funding, in terms of all of those kinds of  
34          things; would you agree with me on that?  
35   MR. McFARLANE: Absolutely.  
36   Q     Dr. Christensen, would you also agree with me on  
37          that?  
38   DR. CHRISTENSEN: Absolutely.  
39   Q     All right. And so if we're looking to make these  
40          models useful for First Nations and stakeholders,  
41          they need to be involved from what I call the get-  
42          go, right from the beginning; is that correct?  
43   MR. McFARLANE: I think that's a fair statement, in  
44          terms of particularly when we're talking  
45          ecosystem-based management research type  
46          approaches, yes.  
47   Q     And right now, that's also going to require a bit

1 of a shift in how DFO operates within your  
2 organization because science, if science is doing  
3 some of these, tends to rely on managers for that;  
4 is that correct?

5 MR. McFARLANE: Tends to rely on managers for what?

6 Q Managers for discussing policy issues with First  
7 Nations.

8 MR. McFARLANE: Oh, I think that's fair too, yes.

9 Q All right. So you're not having discussions with  
10 First Nations about the kinds of data or the kinds  
11 of indicators that they would say is important as  
12 part of an ecosystem-based management, are you?

13 MR. McFARLANE: I think some of the groups work and  
14 have meetings with First Nations that would lead  
15 to that type of thing, some of the pelagics, the  
16 herring groups, meet routinely with First Nations  
17 groups to look at proposed herring issues within  
18 their zones, plus -- or within their traditional  
19 grounds, plus where perhaps where research should  
20 be directed. Other groups also do that. Some of  
21 the -- I think it's fair and you can question the  
22 next panel member on that, but I think there  
23 probably is some contact with -- in the  
24 invertebrate groups, the shellfish groups, that  
25 are the same.

26 In terms of are they brought -- you know,  
27 have we brought everybody together to try and  
28 develop a conceptual ecosystem-based list of  
29 indicators which include both science-type  
30 indicators and social or economic or any other  
31 type of indicator, I think it's fair to say no, we  
32 haven't done that.

33 Q That work hasn't been done. But I don't want to  
34 make the distinction between science and social  
35 here, because from a traditional ecological  
36 knowledge perspective, it's very ecological.  
37 First Nations have a lot to offer, I would  
38 suggest --

39 MR. McFARLANE: Yes.

40 Q -- to science; would you agree --

41 MR. McFARLANE: Yes.

42 Q -- with me from an ecological perspective?

43 MR. McFARLANE: Yes.

44 Q So we don't want to just separate them out --

45 MR. McFARLANE: Yes. No.

46 Q -- in the culture and -- you agree?

47 MR. McFARLANE: Yeah. And I -- you know, I'm used to

1 talking science, so I'm suggesting that the  
2 science indicator -- I'm trying to separate the  
3 ecological management type indicators which would  
4 include exactly the types of things you're talking  
5 about, from the kind of the pure science  
6 indicators which are measurements of wind patterns  
7 and that may -- that's just where I come from. I  
8 may be wrong on that.

9 Q You may -- I'm just going to ask you to be more  
10 inclusive. That's a little bit more challenging  
11 for science right now, but from a traditional  
12 ecological knowledge perspective --

13 MR. McFARLANE: Yes.

14 Q -- one of the challenges for scientists in how  
15 they operate is to include that knowledge early  
16 into the process; would you agree with that?

17 MR. McFARLANE: I think that's a fair statement.

18 Q And that that's something we're going to need to  
19 improve on?

20 MR. McFARLANE: Yes. I -- I think that's a fair  
21 statement and I think it applies to not only First  
22 Nations, it applies to other user groups where we  
23 possibly should open those discussions a little  
24 earlier in the process.

25 Q And I wonder if I could go to page 83 of this  
26 document now and Mr. Commissioner, at page 83  
27 you'll see a Canadian case study and witnesses  
28 arising from the Arctic and I'm wondering, Mr.  
29 McFarlane, if you'll review that, you'll agree  
30 with me that that looks like a case study in which  
31 community members who are relying on fishing for  
32 subsistence in their daily lives were actively  
33 involved in the development of the models and in  
34 the monitoring; is that correct? Have I read that  
35 right?

36 MR. McFARLANE: I don't know. I haven't read it in  
37 detail yet. I assume you've read it right, yes.

38 Q Are you familiar with the work that's been done in  
39 the Arctic, working with First Nations and  
40 otherwise to actively partner with them, not as  
41 clients but as partners in a high level -- with a  
42 high level of consultation, so that the work can  
43 be implemented on the ground in a useful way?

44 MR. McFARLANE: I am familiar that this type of thing  
45 has -- work has gone on, joint and partnerships  
46 have gone on in the Arctic, yes. I know both of  
47 the authors of this report and I've worked with

1           them for years. Now, it was 30 years ago, but...  
2 MS. GAERTNER: All right. I want to now take you to --  
3           let's just see if I'm finished. Have I marked  
4           this as an exhibit? May I mark this as the next  
5           exhibit please?

6 THE REGISTRAR: Exhibit 818.

7  
8                   EXHIBIT 818: CSAS Proceedings of the  
9                   National Workshop on Objectives and  
10                  Indicators for Ecosystem-based Management -  
11                  February 2001  
12

13 MS. GAERTNER:

14 Q       Now, I think I'll now go to your work more  
15       locally, Mr. McFarlane, and Exhibit 812 and 811  
16       are the two exhibits we'll go back to. Now, as I  
17       introduced myself today, I introduced the fact  
18       that I work for three of the Saanich tribes and  
19       when I reviewed this material, and it's my  
20       understanding this really is work that's now being  
21       done from a science perspective in the Department  
22       of Fisheries and Oceans; is that correct, that  
23       this has been a science initiative that was  
24       completed within the Department of Fisheries and  
25       Oceans?

26 MR. McFARLANE: I think that's correct.

27 Q       And I didn't see anywhere in which you were able  
28       to - I'm not saying that it suggested you didn't  
29       want to - but that you were able to actually  
30       engage the Saanich tribes or any of the First  
31       Nations who care very much about the Strait of  
32       Georgia in the development of your indicators; is  
33       that correct?

34 MR. McFARLANE: Well, first off, these aren't my  
35       indicators. This is a report that's been done by  
36       the people working on the framework for managing  
37       the Strait of Georgia. I'm not involved in this  
38       particular thing, other than early on I was there.  
39       However, I think that's fair to say that this is  
40       mainly a science initiative at this point and that  
41       I don't think there was an awful lot of  
42       consultation prior to it. It's a pilot study that  
43       was set up in order to basically to determine  
44       whether or not that this was a reasonable approach  
45       to take and try and work out some of the  
46       techniques that would be used for future ecosystem  
47       frameworks.

1 Q All right. And at page 2 of Exhibit 812 there is  
2 a clear acknowledgement, as I read it, that the  
3 development of a comprehensive ecosystem approach  
4 requires collaboration among other DFO sectors and  
5 with external partners and interested parties.  
6 Again, I don't see First Nations listed there, but  
7 is that who you mean when you refer to external  
8 partners or when the authors would have referred  
9 to external partners and interested parties?

10 MR. McFARLANE: I think so. Yes, absolutely. It would  
11 -- I think at the stage that they develop the  
12 actual ecosystem approach, particularly as we're  
13 talking defining the objectives and ecosystem  
14 management objectives, you would be looking at all  
15 interested parties and First Nations would be a  
16 major component of that, I think.

17 Q I guess - and you'll hear a bit of a struggle in  
18 my voice perhaps, but I struggle with this notion  
19 that once you've done stuff, you're going to  
20 figure out -- that at the time of the assessment  
21 or later, you're going to ask First Nations. How  
22 do you know what to assess if you haven't figured  
23 out what people are interested in?

24 MR. McFARLANE: This particular program is trying to  
25 set up a - if you want to call it a snapshot of  
26 what we know and the structure of the Strait of  
27 Georgia ecosystem now and where it might go in the  
28 future under certain types of perturbations  
29 perhaps. The -- and I mean, you're correct in  
30 saying you can -- you know, you can suggest  
31 bringing in people earlier in the process, that  
32 could be a good thing at -- from the science  
33 perspective though, we're trying to get at the  
34 actual structure of the system and make it  
35 operational, in this case develop the monitoring  
36 tools that are appropriate from a physical and  
37 including physical oceanographic climate and  
38 biological oceanographic indices, set up long-term  
39 monitoring programs, make sure they can become  
40 operational, that the funding is there to continue  
41 this work, and then to pull together all the  
42 information we can in the biological system, link  
43 it to the physical system and develop models that  
44 give us a reasonable approximation of how the  
45 system might work.

46 At that point, you then can start using this  
47 type of information. It becomes one of the inputs

1 to an ecosystem-based approach of -- to  
2 management, as opposed to the assessment of the  
3 system.

4 Q Okay. I'm going to go one step further with you  
5 and then I'm going to turn to you, Dr.  
6 Christensen, for a moment. But if we could now go  
7 to Exhibit 811 and go to page -- on the hard copy,  
8 page 3. Sorry, Mr. Lunn, I don't know what the  
9 .pdf number is.

10 MR. LUNN: That's okay.

11 MS. GAERTNER:

12 Q And it's in a section called "Why the Need for an  
13 Ecosystem-based Approach to the Strait of Georgia"  
14 and it looks like there is a to-do list on page 3  
15 for science. If you could just review that, Mr.  
16 -- or Dr. McFarlane, again, you'll see my  
17 concerns. It appears that science is going to set  
18 the objectives and develop the indicators and  
19 develop the risk-based frameworks. Why is it that  
20 science is doing all of this work by themselves?

21 MR. McFARLANE: Science is identifying the priorities  
22 for science alone in support of the ecosystem-  
23 based management. I don't believe that science  
24 ever intends or ever intended to develop the  
25 priority areas for the ecosystem-based management  
26 objectives. So science can, you know -- are  
27 setting themselves internally some objectives that  
28 they think will provide the best information for a  
29 large group of clients or stakeholders or  
30 interested parties or, you know, the public in  
31 general that will help them to identify management  
32 objectives.

33 Q Right.

34 MR. McFARLANE: And help them to develop a management  
35 strategy.

36 Q Dr. Christensen from a more academic perspective  
37 and perhaps from a more broader-based, rather than  
38 just the Department of Fisheries and Oceans here,  
39 have you found that when developing models for  
40 managers it's useful for the managers to be  
41 involved in choosing the objectives and the  
42 indicators with you, working collaboratively with  
43 you in the development of the model?

44 DR. CHRISTENSEN: We have often done so and found it  
45 very useful. It is -- yes, it is a -- let's just  
46 say it's a requirement. But it certainly  
47 facilitates it, it makes it much more relevant if



1 that happens.

2 Q And, in fact, in the application of the model and  
3 the collection of the data and the follow-up  
4 questions it is extremely useful for those that  
5 are going to use it to be involved in the  
6 development of it; is that correct?

7 DR. CHRISTENSEN: Yes. And this also goes with regards  
8 to indicators which I presume you -- did you just  
9 step by that or are we still talking about  
10 indicators?

11 Q Sure. We can talk about indicators included in  
12 that list.

13 DR. CHRISTENSEN: That would be another area. What  
14 we've seen here is an internal DFO activity, as  
15 you have pointed out. There was parallel  
16 activities to this that involved academia and the  
17 global environment and the DFO activities related  
18 to that but what we've seen here is really very  
19 specific on the science part. It totally lacks  
20 the other aspects of what goes into ecosystem-  
21 based management and that's an area where DFO  
22 really needs to make progress. This was pointed  
23 out in the PICES 2010 report that was -- that we  
24 talked about yesterday. Very little is happening  
25 on implementation of integrated management here,  
26 including on identification of indicators. Much  
27 more consultation is needed there, as well. I  
28 totally agree with that.

29 Q And is it your experience that those that carry  
30 from time immemorial local information around the  
31 -- about the ecological state of affairs could be  
32 very useful when developing indicators?

33 DR. CHRISTENSEN: The people who know about the  
34 ecosystem management issues certainly needs to be  
35 involved in this process.

36 Q And Dr. McFarlane, I hope you don't take from my  
37 questions a faulting. I'm not intending to  
38 communicate that, but rather that that is not  
39 typically how science and Department of Fisheries  
40 and Oceans have developed their work and that this  
41 is a new challenge for you; is that correct?

42 MR. McFARLANE: Incorporating non-DFO --

43 Q Traditional ecological knowledge from the base  
44 from when you begin to do your work, so when you  
45 begin to look at the indicators, when you begin to  
46 identify where in the environment you want to  
47 create data. I mean, here you are with the Strait

1 of Georgia, you've gone quite a bit far, you're  
2 leading the edge. We're getting reports. And  
3 there's no indication that you've taken the first  
4 step towards communicating with the Saanich tribes  
5 on how to bring that -- how to ground truth that  
6 work from the get-go.

7 MR. McFARLANE: The -- I think that's fair, that at  
8 this stage that type of dialogue has not taken  
9 place. As I say, this is a pilot study to try and  
10 determine the best way of moving forward. I'd  
11 presume that the people leading this work will  
12 learn from this, from their -- the process, and  
13 will modify future strategies or development of  
14 future strategies to incorporate the concerns of  
15 numbers of people.

16 Q And then, if I may, can I take you to page 28 of  
17 the same document and over to page 29 when we're  
18 talking about governance issues for ecosystem-  
19 based management? In particular, there is an  
20 example from Australia in the Great Barrier Reef -  
21 I'm not sure, Dr. McFarlane, whether you're  
22 familiar with that, but it appears that they were  
23 working closely with the communities.

24  
25 This transformation has necessitated for  
26 increased pressures on the Great Barrier  
27 system from terrestrial run-off, over-  
28 harvesting, global warming and the  
29 recognition of a new sense of urgency. The  
30 new strategies involved internal  
31 reorganization and management innovation.

32  
33 MR. McFARLANE: Yes.

34 Q Carrying on from there and would you agree that  
35 that's the type of thing that DFO is going to need  
36 to look at when collaborating and trying to  
37 develop ecosystem-based management approaches and  
38 operationalizing them on the ground?

39 MR. McFARLANE: I would certainly agree that that is  
40 one of the ways of moving forward with this type  
41 of approach and at the present time, DFO is  
42 structured in such a way that it's more along  
43 species or lines as opposed to area or issue  
44 lines. And there's been talk back and forth about  
45 how best to overcome that. One of the ways to try  
46 and do that was to bring together  
47 multidisciplinary types of programs that would

1 include a number of different disciplines to  
2 address these things, but it's in its infancy, no  
3 question.

4 Q All right. Another place that I wonder if you'd  
5 like to comment on, Dr. McFarlane, is that my  
6 clients often experience a challenge when working  
7 with DFO and DFO scientists when trying to push  
8 them into looking at things broader and --

9 MR. McFARLANE: Me too.

10 Q -- more ecosystem-based is DFO's attachment to  
11 historical time series data, and in particular,  
12 the scientific comfort that you get from  
13 historical time series data. Would you agree with  
14 me that when moving into ecosystem-based  
15 management we're going to have to prioritize the  
16 collection of other data than what we have  
17 historically been collecting, particularly as it  
18 relates to sockeye abundance data is what we've  
19 been collecting over the longest term; is that  
20 correct?

21 MR. McFARLANE: Well, I certainly agree that we have to  
22 look at -- I mean, there's nothing wrong with  
23 having --

24 Q No, I'm not suggesting --

25 MR. McFARLANE: -- historical data to deal with --

26 Q -- it's -- but --

27 MR. McFARLANE: But to move to other types of data  
28 support, yes, absolutely. There's no question.  
29 But, you know, long-term data series are very  
30 useful, as are any other type of data that you can  
31 use to ground truth any of the things you're  
32 looking at.

33 Q And prioritizing the collection of other data that  
34 is necessary will also be important?

35 MR. McFARLANE: I think so.

36 Q Now, I want to briefly turn to the recommendations  
37 in this report and ask you, Dr. Christensen, you  
38 begin in your recommendations with the collection  
39 of data and then you go to food habits and diet  
40 database and concerted efforts in the marine and  
41 then end with the ecosystem model. Were you  
42 suggesting that this is a linear approach or would  
43 you agree with me that this is completely  
44 iterative and needs to be done in -- implemented  
45 in an iterative manner?

46 DR. CHRISTENSEN: Yes. You would probably start with  
47 the last one, because that one will influence what

1 kind of data you need to collect.  
2 Q And in that last one, and in order to be -- move  
3 it out of academic and into operationalizing,  
4 would you also agree with me that to develop an  
5 ecosystem model, it would be very useful to ensure  
6 that all of those that will be relying on that  
7 model are involved in it and would you like to add  
8 that to the recommendations that you've put  
9 forward?  
10 DR. CHRISTENSEN: This is Exhibit 783 we're talking  
11 about now?  
12 MR. LUNN: I'm sorry, I wasn't there. Sorry.  
13 MS. GAERTNER: Sorry. Yes. I didn't think I needed to  
14 take you to the page.  
15 DR. CHRISTENSEN: Well, he was finding it.  
16 MS. GAERTNER: It's okay.  
17 DR. CHRISTENSEN: Sorry. I lost the train there. Could  
18 you just repeat?  
19 MS. GAERTNER:  
20 Q Yes. Will you agree with me that if in your view  
21 we should begin by conceptualizing an ecosystem  
22 model for the Fraser River sockeye salmon or its  
23 habitats or -- that to be useful, to make sure  
24 that we're using public money wisely, we should  
25 develop that model in a very collaborative way,  
26 including making sure that those that are going to  
27 rely on the model, including First Nations, are  
28 involved in the development of that model?  
29 DR. CHRISTENSEN: As a principle, yes.  
30 Q Would you like to make sure that that's a -- is  
31 that something you'd like to add to your report?  
32 That's not something you mention in your report.  
33 DR. CHRISTENSEN: Our report, no, because our report  
34 deals with predation and the scientific aspects of  
35 that and that's really what we focus on in the  
36 report.  
37 Q No, but you go much farther in your  
38 recommendations.  
39 DR. CHRISTENSEN: We can and you mentioned before --  
40 well, I've advised a number of governments on  
41 implementation of ecosystem-based management and  
42 what you are asking for certainly belongs in that  
43 context - implementation of ecosystem-based  
44 management. It does not belong in a report about  
45 predation. We are just -- I'd just -- we were  
46 just sneaking in there what we're saying about  
47 ecosystem-based management because we thought it's

1           important.

2           Q     But it flows from --

3           DR. CHRISTENSEN: But it's not the focus of the report.

4           Q     But will you agree with me that when looking at  
5                 predator/prey relationships in a modern context,  
6                 you're pretty quickly going to go into an  
7                 ecosystem-based approach?

8           DR. CHRISTENSEN: The two are very tightly connected,  
9                 yes.

10          Q     Yes. So it's not that you were throwing it in.  
11                 It's inevitable when looking at long-term  
12                 predator/prey relationships in a modern context  
13                 that you're going to look at it in an ecosystem-  
14                 based approach?

15          DR. CHRISTENSEN: Yes.

16          Q     And, in fact, it's my understanding from your work  
17                 that it's actually the development of these types  
18                 of tools can be extremely useful on a go-forward  
19                 basis to not only build consensus amongst those  
20                 that are trying to manage these fisheries, but  
21                 also looking to adapt and change over time with  
22                 the changing environments.

23          DR. CHRISTENSEN: Yes. And when we develop these  
24                 tools, our starting point is normally a number of  
25                 policy questions and those policy questions need  
26                 to be developed in consultation with all  
27                 interested parties.

28          Q     All right. I -- sorry, Mr. Hume. I think you  
29                 thought you might be finished and I forgot to ask  
30                 you a few questions earlier and I want to pick up  
31                 on those. In particular, I want to talk about  
32                 yellow perch in the Interior lakes. Page 22 of  
33                 the report, it talks about yellow perch being a  
34                 competitor with salmon in the freshwater lake  
35                 systems and have spread into the lakes in the  
36                 Okanagan and the Thompson/Shuswap, which are  
37                 territories of my clients. And at the bottom of  
38                 page 22 it states that:

39

40                         The available information provides little  
41                         support for the hypothesis that yellow perch  
42                         were a major factor for sockeye survival  
43                         trends over the last three decades.

44

45                 Mr. Hume, would you agree with that conclusion?

46          MR. HUME: Yellow perch have only been found very  
47                 recently in part of Adams Lake near shore and I

1 don't believe in any great numbers. So, yes, as  
2 far as we know, the yellow perch are not a factor  
3 in the current regime.  
4 Q I wonder if I could go to commission Tab 29 at  
5 page 10. And if I've -- if we've read this  
6 correctly at page 10 of this report, it appears  
7 that yellow perch has been introduced in lakes in  
8 the Lower Mainland, the Fraser and the Thompson.  
9 Have I read that correctly?  
10 MR. HUME: Sorry? Whereabouts are we on here?  
11 Q So if we look at the chart at the bottom.  
12 MR. HUME: Chart at the bottom. I believe that's  
13 correct. I'm not really totally familiar -- I'm  
14 not really familiar with this report, but as far  
15 as I know, they're not -- none of these lakes are  
16 sockeye-rearing lakes.  
17 Q As far as you know. Okay. And then at page 13 of  
18 this report, a model has been constructed which  
19 sets out the probability of the arrival, survival,  
20 reproduction and spread establishment of yellow  
21 perch in different regions and if you look at the  
22 Fraser River, Thompson and Lower Mainland, it's  
23 high to very high. Now, I take it you weren't  
24 involved in these assessments?  
25 MR. HUME: No, I wasn't.  
26 Q Are you confident, having seen these, that they're  
27 not in Fraser sockeye-spawning lakes?  
28 MR. HUME: All the information that I have available to  
29 me says they're not there, other than as I  
30 mentioned, Adams Lake.  
31 Q I wonder if we could go to Tab -- is that our Tab  
32 7 or Tab 2? Our Tab 7. And perhaps you can just  
33 help me. It may be that these again are not in  
34 any way sockeye salmon-rearing lakes. At the top  
35 of page 2, three particular lakes of concern and  
36 the Thompson River drainage. Because it seems to  
37 conclude there that if the yellow perch enter the  
38 Thompson River drainage, the Shuswap Lake, there  
39 is considerable risk to the world-famous Adams  
40 River sockeye run to a sizeable Interior chinook  
41 population and to the COSEWIC-listed endangered  
42 coho salmon.  
43 MR. HUME: If they do get into these lakes, yes, it  
44 would be -- I --  
45 Q And so they're already in the Lower Shuswap River,  
46 it appears, and so this is something that we  
47 should be taking care with?

1 MR. HUME: Sorry? Where does it say Lower Shuswap?

2 Q

3 A second lake, Forest, drains --

4

5 MR. HUME: Gardom Lake, which flows into the Lower  
6 Shuswap River.

7 Q Right. So they're getting close; is that correct?

8 MR. HUME: They appear to be getting close, yes.

9 Q So would you agree with us that we need to begin  
10 to take steps to develop management plans for  
11 develop -- dealing with this invasive species as  
12 it relates to the -- at least the Adams River  
13 sockeye run?

14 MR. HUME: I think it relates to all native fish  
15 species, certainly we need to take steps.

16 Q And so to your knowledge, has DFO moved forward in  
17 a management plan for invasive species such as  
18 yellow perch in these areas?

19 MR. HUME: I really can't speak to that. I understand  
20 that they're doing work such as this paper here.  
21 I don't know what they've done in terms of  
22 management plans.

23 Q You agree with me that given this -- the concerns  
24 I've raised with you here, that that's something  
25 that's important to be looking at?

26 MR. HUME: Yes, I do.

27 Q One final question -- oh, can I have those marked  
28 as an exhibit?

29 THE REGISTRAR: Thank you.

30 MS. GAERTNER: Thank you.

31 THE REGISTRAR: Which one first?

32 MS. GAERTNER: Oh, both. The commission document  
33 first.

34 THE REGISTRAR: Okay. That's at Tab 29?

35 MS. GAERTNER: Yes.

36 THE REGISTRAR: That will be 819.

37

38 EXHIBIT 819: CSAS - Biological Risk  
39 Assessment for Yellow Perch in British  
40 Columbia - 2008

41

42 THE REGISTRAR: And your documentation at Tab number 7  
43 will be 820.

44

45

46

47

1 EXHIBIT 820: Risk Analysis, Fisheries  
2 Impacts and Management Options for the  
3 Control and Management of Introduced Fish  
4 Species in BC Freshwater Lakes and Rivers  
5

6 MS. GAERTNER:

7 Q I just have one final question for you, Dr.  
8 Christensen, and this arose out of a comment you  
9 make at page 79 of your report and I think it  
10 would be useful to go to there now. Now, did I  
11 hear your evidence yesterday correctly that you  
12 aren't actively involved and haven't been actively  
13 involved and don't have a lot of information about  
14 the Wild Salmon Policy; did I hear that right,  
15 or...?

16 DR. CHRISTENSEN: That's correct.

17 Q All right. Perhaps you can explain to me what you  
18 meant in the sentences that begins:

19  
20 The focus of fisheries management on short-  
21 term tactical advice...

22  
23 And we spent a little bit of time yesterday on  
24 that. I want to go further.

25  
26 EBM calls for evaluating trade-offs which may  
27 be severe and which, in turn, have  
28 socioeconomic consequences.

29  
30 You suggest that such trade-offs are seemingly  
31 ignored in the Wild Salmon Policy. I was  
32 concerned about that. If we can go to the Wild  
33 Salmon Policy and perhaps it's Exhibit 8, you go  
34 to page 14 of the Wild Salmon Policy there's lists  
35 of objectives and that includes maintaining  
36 habitats and ecosystem integrity and those all  
37 require trade-offs, doesn't it? Don't they?

38 DR. CHRISTENSEN: They do. One thing is the paper  
39 describing the Wild Salmon Policy, another is the  
40 actual implementation of it.

41 Q But, Dr. Christensen, you're not actively involved  
42 in that work. This is a very strong opinion.  
43 Where did your opinion -- how did you develop that  
44 opinion?

45 DR. CHRISTENSEN: That's a very good point. Maybe this  
46 is academic, again going off on a limb on  
47 something that I'm not a specialist on. It is my



1 impression and I should probably have been more  
2 careful in what I wrote there.  
3 Q All right. So it may be that there are trade-offs  
4 implicit all throughout the Wild Salmon Policy and  
5 what we're doing is being challenged by their  
6 implementation; is that perhaps a more accurate  
7 way of looking at it?  
8 DR. CHRISTENSEN: That is possible. As you point out,  
9 I am not an expert on the Wild Salmon Policy.  
10 Q So I notice that at the beginning of your  
11 acknowledgements that you've acknowledged quite a  
12 lot of conversations with Dr. Karl Walters; is  
13 that correct?  
14 DR. CHRISTENSEN: That is correct, yes, but I do not  
15 recall any discussions about the Wild Salmon  
16 Policy.  
17 Q Oh, so this isn't Dr. Walters' concerns about the  
18 Wild Salmon Policy that we're reading here?  
19 DR. CHRISTENSEN: I do not know Professor Walters'  
20 concern about the Wild Salmon Policy.  
21 Q All right. So these are your concerns?  
22 DR. CHRISTENSEN: This was -- it also relates to how  
23 DFO has been moving on implementation and  
24 incorporation of social and economical aspects of  
25 integrated management. And what I have read there  
26 from -- for instance, from the PICES report, is  
27 that this work is at a standstill so I have, as an  
28 outside observer seen little progress.  
29 Q All right. So let me just conclude with this  
30 question or suggestion to you is that implicit in  
31 the Wild Salmon Policy are many trade-offs and  
32 that in the work of creating the Wild Salmon  
33 Policy, trade-offs were already determined and  
34 that the challenge is implementing the Wild Salmon  
35 Policy, not working out all the trade-offs.  
36 DR. CHRISTENSEN: Was that a question?  
37 Q Yeah. I'm asking you -- you've suggested that  
38 there's no trade-offs in the Wild Salmon Policy  
39 and I find that suggestion and my clients find  
40 that suggestion troubling. The Wild Salmon Policy  
41 reflected a shift in approaches of the management  
42 of wild salmon, and implicit in things like  
43 habitat integrity and making that an -- and many  
44 of the objectives that are set out are trade-offs.  
45 You'll agree with me on that?  
46 DR. CHRISTENSEN: Oh, yes.  
47 MS. GAERTNER: All right. Those are all my questions,

1 Mr. Commissioner.

2 THE COMMISSIONER: Okay. Thank you, Ms. Gaertner. Mr.  
3 Timberg, any re-examination?

4 MR. TIMBERG: Mr. Commissioner, I have five questions,  
5 five topics for re-examination.

6  
7 CROSS-EXAMINATION BY MR. TIMBERG, continuing:  
8

9 Q Mr. McFarlane, you were just asked about -- or Mr.  
10 Hume, sorry, you were just asked about invasive  
11 species. Who at DFO is knowledgeable or is  
12 responsible for the invasive species in the B.C.  
13 Interior?

14 MR. HUME: Barry Rosenberg would be one person who  
15 would be knowledgeable and Mike Bradford.

16 Q Okay. And can you just describe for the  
17 assistance of the commissioner a bit more about  
18 the work that they do? Do you have -- can you  
19 provide a summary of their work, just as an  
20 overview?

21 MR. HUME: I can't really speak to Mr. Rosenberg's  
22 expertise in -- he's area manager or area chief  
23 and so therefore responsible. Dr. Bradford  
24 authored a number of the -- it's obviously not  
25 **SARA**, a number of the -- has done a number of  
26 reports on --

27 Q COSEWIC?

28 MR. HUME: -- reports on various invasive species in  
29 B.C.

30 Q And Dr. Bradford's watching today, isn't he?

31 MR. HUME: Yes, he is.

32 Q Okay.

33 MR. HUME: Was.

34 Q Mr. Hume, earlier Mr. Harvey was asking you some  
35 questions about over-escapement and about the size  
36 of smolt that result from years with a large --  
37 large brood years, and he suggested that the  
38 resulting smolts were weak or less robust. So my  
39 question for you is is there any evidence that  
40 smolts migrating from large broods are inherently  
41 weaker or less robust than in years where the runs  
42 are smaller?

43 MR. HUME: There's certainly -- there is a size density  
44 relationship, so that's larger -- the larger  
45 escapements, the smolts tend to be somewhat  
46 smaller than the big escapements. Certainly in  
47 this 2002 brood year from Quesnel Lake, the Fall

1 fry that we measured were definitely smaller than  
2 anything we'd seen in the previous years,  
3 indicating that they were not as healthy.

4 Q Okay. And so would you -- so -- and that's the  
5 evidence you have with respect to whether they're  
6 inherently weaker or less robust?

7 MR. HUME: That's correct. We haven't actually looked  
8 at energy content as -- I mean, any smolts in any  
9 system.

10 Q Sorry? I didn't hear that.

11 MR. HUME: We haven't examined energy content of  
12 smolts. All the information, basic information we  
13 have on smolt robustness or condition is size and  
14 -- is size data.

15 Q Okay. So that's all of the information we have.  
16 And Mr. McFarlane, Chris Harvey was -- or Mr.  
17 Harvey was asking you about a question as to  
18 whether or not scientists -- whether or not there  
19 should be a scientist in chief to draw all science  
20 information together. And so I guess my question  
21 is -- and I think this question was posed to Dr.  
22 Christensen, so my question for you is in your  
23 opinion, would it be of assistance to have a  
24 scientist in chief?

25 MR. McFARLANE: I guess in theory we do have a  
26 scientist in chief. Our Regional Director of  
27 Science would fill that role. The --

28 Q And that's Dr. Laura Richards?

29 MR. McFARLANE: Yes. There are -- you know, when  
30 you're trying to develop programs that -- and  
31 prioritize them in some way, I find it useful to  
32 bring in much like we talked about in this --  
33 previously in the ecosystem-based approach, is to  
34 bring in the groups of people who would be most  
35 knowledgeable and most able to help us develop a  
36 science program. Based on whatever long-term  
37 requirements are needed to keep some of these  
38 programs going and also the short-term needs which  
39 would be based on things that could come from  
40 industry or First Nations or that they have  
41 specific questions about specific stocks or  
42 specific areas for various species that you might  
43 want to address. That would -- they would be  
44 brought forward through management groups or  
45 through advisory processes and then prioritized  
46 within some sort of committee that would look at  
47 that and that's generally the way marine fish has

- 1 progressed and operated. I'm not familiar -- I  
2 don't deal with salmon, so I don't -- I'm not  
3 involved in that.
- 4 Q All right. Thank you. And Dr. Christensen, you  
5 stated that in general, large -- that when two  
6 fish meet, that the smaller one tends to become  
7 prey of the larger one. You made a statement  
8 about large fish generally eat smaller fish in  
9 your examination, in your earlier testimony. But  
10 will you agree that predator/prey interactions are  
11 not determined by size? Instead, their  
12 interaction is determined by their morphology,  
13 which is their shape, form and structure, and  
14 their behaviour?
- 15 DR. CHRISTENSEN: No. I don't know any cases where  
16 smaller fish -- okay. With fish, yes, I don't  
17 know any cases. It's true that you can have  
18 marine mammals where the prey is bigger than the  
19 predator, so in that point I have to say yes,  
20 you're correct. There are a number of -- there's  
21 a number of factors that influence this.
- 22 Q Right. And you'll agree that many large fish are  
23 planktivorous and do not eat other fish?
- 24 DR. CHRISTENSEN: Oh, absolutely.
- 25 Q And so --
- 26 DR. CHRISTENSEN: The biggest ones are only  
27 planktivorous.
- 28 Q Right. So I just wanted to -- we just need to be  
29 a bit careful that we -- it's not always the case  
30 that when a large fish runs into a smaller fish,  
31 the smaller fish becomes prey? You'll agree with  
32 that?
- 33 DR. CHRISTENSEN: Yes. A very important detail.
- 34 Q And I'd like to take you, following up on the  
35 question with respect to the Wild Salmon Policy,  
36 if we could turn to Exhibit 8, Mr. Registrar, and  
37 page Roman Numeral VI, I think that's page -- at  
38 the beginning. If we could go back one page.  
39 Thank you. And then if we could go to -- with  
40 respect to this issue, Ms. Gaertner just stated  
41 that the -- it was implicit within the Wild Salmon  
42 Policy that there are trade-offs in the decision-  
43 making and I'll suggest to you that it's actually  
44 explicit in the Wild Salmon Policy that trade-offs  
45 are to be made. And if we -- I'll just read the  
46 fifth bullet down:  
47

1           Implementation of this policy will involve an  
2           open and inclusive process aimed at making  
3           decisions about salmon stewardship that  
4           consider social, economic, and biological  
5           consequences. People throughout B.C. and  
6           Yukon will contribute to decisions that  
7           reflect society's values for wild salmon.  
8

9           And then I'll read the tenth bullet down, the  
10          second-last one:

11  
12          The policy aimed to maintain CUs but  
13          recognizes there will be exceptional  
14          circumstances where it is not feasible or  
15          reasonable to fully address all risks. Where  
16          an assessment concludes that conservation  
17          measures will be ineffective or the social or  
18          economic costs to rebuild a CU are extreme,  
19          the Minister of Fisheries and Oceans may  
20          decided to limit the range of measures taken.  
21          Such a decision will be made openly and  
22          transparently.  
23

24          So will you agree with me that it's explicit  
25          within the Wild Salmon Policy that trade-offs are  
26          to be made?

27       DR. CHRISTENSEN: Yes. And meanwhile, I've had the  
28       challenge actually to read the statements that  
29       Counsel Gaertner was referring to before and just  
30       for the record, what I'm talking about there is  
31       socioeconomic consequences and that form for  
32       trade-offs and my implicit critique for that is  
33       that I do not see -- especially in connection with  
34       weak stock any clear numbers for what the  
35       consequences are of the weak stock consequence --  
36       weak stock management decisions. That's what I  
37       was referring to in the report when describing the  
38       trade-off were not fully considered there. But,  
39       yes, there are words about this. They are  
40       mentioning about trade-offs and trade-offs are  
41       important in the Wild Salmon Policy, that's  
42       correct.

43       MR. TIMBERG: Thank you. Those are my only questions.

44       MR. WALLACE: Thank you, Mr. Timberg. I have three  
45       questions that will just take a few moments, I  
46       think.  
47

1 RE-EXAMINATION BY MR. WALLACE:  
2

3 Q Mr. McFarlane, if I may start by addressing a  
4 question to you arising out of the questions that  
5 Mr. Timberg asked you yesterday, you were  
6 commenting on the expert report for Project 8 and  
7 you indicated that you would add to the species to  
8 be considered, hake, dogfish and pollock. You  
9 then addressed why the why for dogfish, but not  
10 for hake and pollock, as possible sockeye  
11 predators. Could you just fill us in then on what  
12 aspects of hake and pollock would cause you to  
13 include them in the list?

14 MR. McFARLANE: I think I was referring to if we -- Mr.  
15 Timberg asked me about where would I develop a  
16 program to address potential impacts on Fraser  
17 River sockeye. If we -- so I would look at the  
18 timing is crucial, which would be the Spring  
19 period, Spring to early summer period, and the  
20 types of information is crucial, which would  
21 include physical all the way up to higher trophic  
22 level information. Of that higher trophic level  
23 information, the species that were identified were  
24 things like hake, dogfish and pollock and I think  
25 those are reasonable species to continue getting  
26 work on because they are not only potential  
27 predators and although at this point in history, I  
28 don't believe that Pacific hake is a predator of  
29 sockeye.

30 It's -- in the Strait of Georgia there's been  
31 a tremendous decrease in size at age over time  
32 since 1992 and they are well below the limit that  
33 we ever find fish in the diet, but that can change  
34 again, as it did in the early 1990s, so I would  
35 think that you would want to have a program that  
36 was at least able to examine the future changes in  
37 size at age and other biological parameters for  
38 that species.

39 There's very little known about pollock.  
40 It's known it is a fish predator, but it's not a  
41 major predator of salmon, at least historically,  
42 either in Canadian waters or U.S. waters where the  
43 major stocks are. The Strait of Georgia fish are  
44 much smaller than, say, Gulf of Alaska or Bering  
45 Sea fishes or some of the other stocks in Canadian  
46 waters. But, again, it's good to have a -- some  
47 of that information available for people.

1           We don't have abundance -- recent abundance  
2 information for either of those species and you  
3 would want abundance information, both as a  
4 potential predator, if you truly believed that  
5 they were impacting, and as a competitor in order  
6 to assess the impacts of their competition with  
7 salmon. So those -- that was the reason for those  
8 species.

9           I added other species to the list as  
10 potential competitors. They are important species  
11 in the Strait of Georgia. There's virtually  
12 nothing -- no research going on on them and  
13 everything that we know about them, it comes from  
14 incidental information that we collect during  
15 other surveys. And the two I mentioned  
16 specifically were leurreoglossus and myctophids.

17 Q       Thank you. Dr. Christensen, having heard those  
18 comments, do you have any observations on those  
19 issues?

20 DR. CHRISTENSEN: No. These are usual comments.

21 Q       Thank you. Mr. Hume, in discussing the  
22 relationship between pikeminnow and sockeye and in  
23 Cultus Lake, is there any data on the actual  
24 amounts of sockeye consumed by pikeminnow in  
25 Cultus Lake?

26 MR. HUME: Not in recent years, no. We've had very --  
27 quite a bit of difficulty getting that reliable  
28 diet data. However, Dr. Ricker back in the 1940s  
29 did collect a considerable amount of diet data for  
30 Northern pikeminnow.

31 Q       Would you agree with the judgment in the report  
32 that's been filed that updating diet data would be  
33 a very good thing?

34 MR. HUME: It would be useful. It's difficult, given  
35 the low numbers of sockeye in the lake, it's  
36 difficult to get the information on what their  
37 predatory rate would be but, yes, it would be  
38 useful.

39 Q       Thank you. And finally, Mr. Hume, I wonder -- Mr.  
40 Lunn, I'm going to take you by surprise. I  
41 apologize. If you could look at -- pull Exhibit  
42 748 which is the expert report on Project 10 and  
43 at page 4, I just want to read a brief quote.  
44 It's the last full sentence above the  
45 recommendations:

46  
47           Thus --

1 Or the last few sentences:  
2

3 Thus, the recent decline in productivity for  
4 Quesnel sockeye might be more attributable to  
5 increased spawner abundance than to broad-  
6 scale environmental factors that affect other  
7 sockeye stocks in the Fraser and other  
8 regions. However, other Fraser sockeye  
9 populations do not show such evidence. Our  
10 data do not support the hypothesis that large  
11 spawner abundances are responsible for  
12 widespread declines.  
13

14 We've -- you were asked in questions by Mr. Harvey  
15 about these issues and critically with respect to  
16 Quesnel Lake and the suggestion from, as I read  
17 the report of Peterman and Dorner is that this may  
18 be limited to Quesnel and not something where  
19 there's similar evidence from other Fraser River  
20 sockeye lakes; would you agree with that?

21 MR. HUME: I guess the short answer is yes. Quesnel  
22 Lake, we -- the lower trophic level productivity  
23 of the lake has not decreased, according to the  
24 sampling that we have done on the lake; however,  
25 the returns from since 2002 on the dominant and  
26 sub-dominant years have been lower than expected,  
27 given -- or lower than -- the return rates are  
28 lower than what we've observed in past years.  
29 That appears to be -- I'm not sure that we can  
30 attribute that to freshwater production or marine  
31 survival problems.

32 Q And has the same phenomenon been observed in other  
33 Fraser River lakes?

34 MR. HUME: No, it hasn't today.

35 MR. WALLACE: Thank you. I have no further questions,  
36 Mr. Commissioner. It's now 12:25. Perhaps this  
37 would be a convenient time to break and we start a  
38 moment or two -- a bit early, two o'clock or...?

39 THE COMMISSIONER: No, we'll start at two o'clock and  
40 we'll have the two hours this afternoon for the  
41 final witness, Mr. Wallace.

42 Before we break, I wanted to thank the panel  
43 members very much for your attendance at this  
44 commission and for answering the questions of  
45 counsel and for your cooperation in that respect.  
46 Thank you all very much.

47 MR. LUNN: Mr. Wallace, did you want to mark those



51  
Graham Gillespie  
In chief on qualifications by Ms. Tessaro

1 redacted c.v.s before we --  
2 MR. WALLACE: Yes. Yes, please. This is simply -- can  
3 you just provide us with the numbers of those for  
4 the record?  
5 THE COMMISSIONER: Well, just exchange them and that  
6 would --  
7 MR. WALLACE: Simply exchanging the c.v.s for, I think,  
8 all four DFO witnesses. Oh, it's simply Mr. Hume  
9 and Mr. McFarlane's c.v.s.  
10 MR. LUNN: Right.  
11 MR. WALLACE: Those numbers...?  
12 MR. LUNN: One moment.  
13 MR. WALLACE: Numbers 800 and 801, I believe.  
14 MR. LUNN: Thank you. Yes.  
15 MR. WALLACE: Thank you.  
16 THE COMMISSIONER: Thank you.  
17 THE REGISTRAR: The hearing is now adjourned until 2:00  
18 p.m.

19  
20 (PROCEEDINGS ADJOURNED FOR NOON RECESS)  
21 (PROCEEDINGS RECONVENED)  
22

23 THE REGISTRAR: Hearing is now resumed.  
24 MS. TESSARO: Good afternoon, Mr. Commissioner. For  
25 the record, it's Lara Tessaro, commission counsel.  
26 And for the remainder of the day or possibly less,  
27 we are hearing from Mr. Graham Gillespie and I'd  
28 ask that he be affirmed.

29  
30 GRAHAM GILLESPIE, affirmed.  
31

32 THE REGISTRAR: Would you state your name, please?  
33 A Graham Gillespie.  
34 THE REGISTRAR: Thank you. Counsel?  
35 MS. TESSARO: Mr. Lunn, could I ask that you pull up  
36 Tab 37 of our documents?  
37  
38

39 EXAMINATION IN CHIEF ON QUALIFICATIONS BY MS. TESSARO:  
40

41 Q Mr. Gillespie, is this your c.v.?

42 A Yes, it is.

43 MS. TESSARO: Could I ask that this be marked as the  
44 next exhibit?

45 THE REGISTRAR: Exhibit number 821.  
46  
47

May 6, 2011

1                   EXHIBIT 821: *Curriculum vitae* of Graham  
2                   Gillespie  
3

4       MS. TESSARO: I should actually note before I qualify  
5                   or seek to qualify Mr. Gillespie that with me  
6                   today is Mr. John Major, who has been assisting  
7                   with the squid evidence, and Mr. Brian Wallace, at  
8                   the back of the classroom.

9       Q       So Mr. Gillespie, since July 1994 you have been  
10               employed as an invertebrate research biologist at  
11               DFO Pacific Biological Station; is that right?

12       A       That is correct.

13       Q       And you're also currently the head of the  
14               Shellfish Section at PBS?

15       A       Correct.

16       Q       And in this role -- in these roles, you are  
17               responsible for planning, organizing and  
18               participating in research into the biology,  
19               ecology and population dynamics of commercially  
20               and/or ecologically important invertebrate stocks  
21               or species at risk in the Northeast Pacific Ocean?

22       A       That is correct.

23       Q       And you have a particular emphasis on bivalves,  
24               crustaceans, cephalopods and non-indigenous  
25               invertebrates?

26       A       Correct.

27       Q       From the mid-1990s to the early 2000s you've  
28               published a number of peer-reviewed reports on the  
29               assessment, biology and fisheries of cephalopods,  
30               particularly various octopod and squid species,  
31               correct?

32       A       That's correct.

33       Q       You've designed and participated in surveys of  
34               squid species in B.C. waters, including a survey  
35               of the Humboldt squid in 2009?

36       A       Yes.

37       Q       You participate in the PICES working group on non-  
38               indigenous species?

39       A       Yes, I do.

40       Q       And you have a Bachelor of Science degree in  
41               biology from the University of Victoria obtained  
42               in 1985?

43       A       That's correct.

44       MS. TESSARO: I would submit that Mr. Gillespie should  
45               be qualified as an expert in the assessment and  
46               biology of squid species in the Northeast Pacific  
47               Ocean, including the Humboldt squid.

1 THE COMMISSIONER: Thank you.

2

3 EXAMINATION IN CHIEF BY MS. TESSARO:

4

5 Q Mr. Gillespie, could you briefly describe your  
6 general duties and activities as an invertebrate  
7 research biologist at PBS?

8 A Generally what we do is develop science  
9 information and science advice that is then  
10 brought forward through a review process and  
11 delivered to managers to help inform and influence  
12 their management of fisheries or other management  
13 actions.

14 Q And what percentage of your time would you  
15 estimate do you spend in relation to work on  
16 cephalopods?

17 A Fairly small proportion. I would say on average  
18 about ten percent of my time.

19 Q And perhaps for the benefit of everyone in the  
20 room, as a matter of taxonomy, what is a  
21 cephalopod?

22 A Cephalopods are squid, octopi or cuttlefish.

23 Q Thank you. And how many employees of DFO Science  
24 in the Pacific Region have specific duties that  
25 include working on cephalopods?

26 A Just myself.

27 Q I'm going to ask you a few questions about the  
28 general biology of the Humboldt squid, life  
29 history, distribution, abundance, before we turn  
30 specifically to look at its diet. And perhaps you  
31 could start by just describing for the  
32 commissioner the basic life history of the  
33 Humboldt squid, including its migrations into B.C.  
34 waters.

35 A Okay. Humboldt squid are a large migratory  
36 offshore species of squid. Their life begins  
37 after -- as paralarvae when eggs hatch in tropical  
38 waters of the Eastern Pacific and as the squid  
39 grow, they take a feeding migration that carries  
40 them both north and south from those waters. In  
41 most years, that migration has ceased at about the  
42 U.S./Mexican border in the north, but more  
43 recently we've found them as far north as  
44 Southeastern Alaska in the late summer and Fall.  
45 They moved north to feed. They grow at a  
46 prodigious rate, grow quite quickly, therefore  
47 they need a lot of food to fuel not only the

1 metabolic demands of growth but also undertaking  
2 this long-range migration. They generally leave  
3 our waters in September/October and return back to  
4 the tropics to spawn.

5 Q And you said that it was only more recently that  
6 they began appearing in waters basically north of  
7 Mexico. I'm wondering if you could put some years  
8 to that?

9 A There's some evidence of an extension of that  
10 range in the 1930s, at least as far as the mouth  
11 of the Columbia River. There's pictures of Edmund  
12 Ricketts, who ran the biological supply company in  
13 Monterey, California, with a Humboldt squid from  
14 sometime in the 1930s. The information that I  
15 have is they appeared for a few years and then  
16 their range shrank back to where it had been  
17 before.

18 We started to get anecdotal reports of large  
19 squid in offshore waters from our oceanographers  
20 who were undertaking surveys out to Weather  
21 Station Papa and those squid were not formally  
22 identified as Humboldt squid at the time because  
23 they were merely observed. They weren't  
24 collected.

25 Q And that was in the late '90s?

26 A I'm sorry, that would be in the -- yes, the late  
27 1990s. Yeah. The first confirmed specimens that  
28 we had from B.C. waters were in 2004 and then we  
29 had increasing abundance from 2004 forward to a  
30 peak of abundance in 2009. We don't formally  
31 measure abundance. We don't have quantitative  
32 estimates. We work from qualitative information  
33 like evidence from animals being stranded on the  
34 beach, public reports and then catches in  
35 commercial and surveys. So we saw a few in 2005,  
36 some more in 2007 and then a large abundance in  
37 2009.

38 Q When you say some more in 2007, are you able to  
39 even roughly guesstimate what the abundance might  
40 have been or qualitatively characterize it?

41 A Relatively? Nothing quantitative, but in 2007 we  
42 had a few reports from recreational fishers and we  
43 had one stranding event at Nootka Island. I belie  
44 we also had one squid that was trapped in a  
45 predator net in a salmon farm in Nootka Sound, so  
46 that's relatively few reports.

47 In 2009 we had 11 reported strandings,

1 another seven public reports, a number of reports  
2 of catches in commercial fisheries and then our  
3 survey in 2009 provided a lot of information on  
4 distribution on relative abundance.  
5 Q Would it be fair to characterize 2009 as  
6 relatively very abundant in contrast to previous  
7 years?  
8 A Yes, it would.  
9 Q And what about 2010?  
10 A In 2010 they did not extend north of Southern  
11 Oregon. The northernmost stranding report that I  
12 heard of was in Southern Oregon. They didn't  
13 appear in Washington or B.C. waters at all.  
14 Q Do we have any predictions from people who are out  
15 on the water now, say in California, about whether  
16 the squid are going to materialize in B.C. waters  
17 in 2011?  
18 A I've been in contact with Dr. John Field, who  
19 works with NOAA out of Santa Cruz. He indicated  
20 that they hadn't seen any off California as of  
21 April. He also indicated that a colleague, Dr.  
22 Bill Gilly, who does work on Humboldt squid off  
23 Mexico indicated that abundances there were low  
24 this year, and his opinion, which I agree with,  
25 was that we're not likely to see them in B.C.  
26 waters again this year.  
27 MS. TESSARO: Just to finish up on the issue of  
28 distribution, perhaps, Mr. Lunn, you could pull up  
29 Tab 42 of the commission's list of documents.  
30 Q Do you recognize this document that's on the  
31 screen?  
32 A Yes, I do.  
33 Q And what is it?  
34 A This is a presentation that I prepared using  
35 information provided by John Field and that I had  
36 collected through our own programs that was made  
37 to a workshop on the possible causes of decline of  
38 Fraser sockeye in 2011.  
39 Q That was a workshop in April of 2011?  
40 A That's correct.  
41 Q And it's -- is it right to think that that's  
42 what's sometimes referred to as a synthesis  
43 workshop?  
44 A Yes, I believe that's accurate.  
45 Q Just for a handy reference, if we could turn to  
46 page 7 of this document. Did you create this  
47 slide at page 7?

- 1 A Yes, I did.  
2 Q And in terms of the distribution of squid in  
3 Georgia Strait, am I right to read that one  
4 square --  
5 A Yes.  
6 Q -- that red square that looks close to Campbell  
7 River, does that represent just one -- one  
8 sighting of Humboldt squid in the strait?  
9 A Yes. It's a single squid that washed up in  
10 Campbell River in December of 2009, I believe, so  
11 this is an animal that somehow got lost or strayed  
12 on the southward migration and took a wrong turn  
13 at the north end of Vancouver Island and ended up  
14 in the strait.  
15 Q And what about the Strait of Juan de Fuca, can you  
16 interpret the map for us there?  
17 A It's the same year, the same month, it's another  
18 squid that was found on Vashon Island in Puget  
19 Sound.  
20 Q Just stepping back a minute, I should ask you,  
21 what generally does this map reflect? Sightings,  
22 you referenced one -- the same year.  
23 A Oh, the green dots are research catches from 2009.  
24 The blue squares are sightings from 2009. The red  
25 squares are strandings from 2009, which -- oh, the  
26 red one is commercial bycatch again in 2009.  
27 Q And this would have all been from data collected  
28 on your 2009 survey?  
29 A My survey and also surveys that were undertaken to  
30 look at high sea salmon distribution, sardines and  
31 herring.  
32 Q The final question before we turn specifically to  
33 the diet of the squid, could you identify for us  
34 -- I've been reminded that I should mark this as  
35 the next exhibit.  
36 THE REGISTRAR: Exhibit 822.  
37  
38 EXHIBIT 822: Humboldt squid in B.C. - 2011  
39 Update  
40  
41 MS. TESSARO:  
42 Q Mr. Gillespie, could you remind us or could you  
43 identify for us the various hypotheses that have  
44 been posited by people for what is causing the  
45 squid, the Humboldt squid, to begin its travels  
46 north?  
47 A It's -- there's no clear single hypothesis that's

1 agreed upon at the time. Amongst the candidates  
2 are increased abundance of Humboldt squid in their  
3 native range and one hypothesis there is that  
4 decreased levels of predation because of decreased  
5 numbers of predators on juvenile Humboldt squid  
6 might lead to an explosion in population and  
7 therefore, their range would need to expand to  
8 meet their feeding needs.

9 There are a couple of oceanographic  
10 hypotheses. The simplest is just general  
11 increased water temperatures and a warming trend.  
12 Another is a shallowing of the oxygen minimum  
13 layer, a deep water layer that's the boundary  
14 between well-oxygenated surface waters and the  
15 colder, deeper waters that lack oxygen below.  
16 Squid take refuge in this layer, probably as both  
17 physiological cooling mechanism and to avoid  
18 predators and that oxygen minimum layer has been  
19 decreasing in depth, that is, getting shallower  
20 and closer to the surface.

21 And then there's the influence of large-scale  
22 oceanographic events like the El Niño southern  
23 oscillation which may drive Humboldt squid further  
24 north because the surface waters in their southern  
25 part of their normal range might be too warm for  
26 them and they're avoiding the hot water and moving  
27 up into a thermal range that's more appropriate  
28 for them.

29 Q Turning to the diet, I'm going to begin by taking  
30 you back to September 2009. And proceeding  
31 chronologically, we -- the commission has heard  
32 evidence from Dr. Laura Richards about a DFO  
33 science workshop that happened on September 30th,  
34 2009. Did you participate in that workshop?

35 A Yes, I did.

36 Q And what was the nature of your participation?

37 A My role at that workshop was to bring forward  
38 information on Humboldt squid, their distribution,  
39 their diet and the specific question of whether  
40 they might prey on salmon.

41 Q And I believe we have your presentation. I'll get  
42 you to confirm that.

43 MS. TESSARO: It's Tab 40 of the Commission's binder.  
44 I'm sorry, this is also, for the record, Exhibit  
45 613F -- oh. Maybe we should just try Exhibit  
46 613F. Is that possible, Mr. Lunn?

47 MR. LUNN: Sure.

1 MS. TESSARO: Sorry.  
2 MR. LUNN: That was marked as Exhibit -- oh, Tab 40,  
3 I'm sorry. I have the wrong one. That's Tab 40,  
4 which is -- appears to be...  
5 MS. TESSARO:  
6 Q And I'm not sure if you need to scroll through  
7 this, Mr. Gillespie, to identify whether this is  
8 the presentation that you made.  
9 A This is the presentation I made.  
10 Q Thank you. You'll agree with me that as of  
11 September 2009 at the time you made this  
12 presentation, there wasn't any evidence, to your  
13 knowledge, that a Humboldt squid had ever actually  
14 eaten a salmonid?  
15 A That's correct, no direct evidence.  
16 Q And your PowerPoint here at Exhibit 613F states  
17 that?  
18 A Yes, I believe it does.  
19 Q Do you need to double-check that?  
20 A No. It's the final set of bullets in the summary  
21 slide.  
22 Q So we're in the world of -- a world where there is  
23 no direct evidence, so perhaps I'll ask you what  
24 generally are the limits that determine what a  
25 Humboldt squid can or cannot prey upon?  
26 A Well, as pointed out by the authors of the report,  
27 you need overlap in time and space between the  
28 predator and the prey, so they need the  
29 opportunity to determine whether something is prey  
30 or not. They need to -- they generally eat  
31 animals within a given size range, and then there  
32 are possibly considerations around the ability of  
33 a particular animal to avoid being preyed upon,  
34 its metabolism and its ability to escape an  
35 attempted predation.  
36 Q Is that its evasive capabilities?  
37 A Yes, exactly.  
38 Q And when you said there -- as noted in the report,  
39 there needs to be an overlap in time and space, do  
40 you mean the Project 8 report that was provided by  
41 Dr. Christensen and --  
42 A Yes. I'm sorry. I wasn't clear about that.  
43 Q Thanks. That's okay.  
44 A Mm-hmm.  
45 Q Was there any particular literature that informed  
46 -- any absence of direct evidence, your -- this  
47 presentation that you made in September 2009, what



1 did you draw upon to be able to present on the  
2 biology, diet, habits, et cetera, of the Humboldt  
3 squid?

4 A The primary piece of literature that I used was a  
5 CalCOFI paper presented by Dr. John Field in which  
6 he had summarized distribution, biology and diet  
7 of Humboldt squid in the waters off the U.S., in  
8 particular California and Baja California.

9 Q I think we have that, if we could, Mr. Lunn, pull  
10 up Tab 38, please? Mr. Gillespie, is this the  
11 article that you just mentioned?

12 A Yes, it is.

13 Q For the benefit of everybody here what is the  
14 California current?

15 A The California current is a large oceanographic  
16 feature. There's a trans-oceanic current that  
17 hits the Western Coast of North America and splits  
18 into two directions, the Alaskan gyre which goes  
19 north, and the California current, which goes  
20 south.

21 Q And in terms of the continental shelf off British  
22 Columbia --

23 A Mm-hmm.

24 Q -- are British Columbian waters part of the  
25 California current?

26 A Yes. To a greater or lesser extent, depending on  
27 the year, because the -- where that current  
28 strikes North America moves north and south  
29 depending on conditions in the ocean.

30 MS. TESSARO: Thanks. Perhaps we could mark Tab 38 as  
31 our next exhibit?

32 THE REGISTRAR: Exhibit 823.

33

34 EXHIBIT 823: Range Expansion and Trophic  
35 Interactions of the Jumbo Squid, *Dosidicus*  
36 *Gigas*, in the California Current  
37

38

38 MS. TESSARO:

39 Q I don't know if you're able to just very briefly  
40 summarize this particular study and what this  
41 report -- what the results of this report were.

42 A My particular interest in this report was  
43 surrounding the diet of Humboldt squid in Eastern  
44 Pacific waters and closer to British Columbia. It  
45 summarizes that they feed largely on small pelagic  
46 species, myctophids, juvenile or small schooling  
47 rockfish, hake and various pelagic invertebrates,

1 as well, including other species of squid and  
2 pteropods.  
3 Q And the study, you'll agree, did not identify any  
4 salmon in the Humboldt squid's diet in the area  
5 studied?  
6 A That's correct.  
7 MS. TESSARO: Could we turn to page 141 of this  
8 document? I don't know the .pdf number. And  
9 perhaps we could highlight out that top graph  
10 number "A".  
11 Q Mr. Gillespie, I'm not sure if you've looked at  
12 this graph recently and if you haven't, please  
13 feel free to explain that, but my reading of this  
14 graph is that jumbo squid and salmon generally  
15 identified as salmon, are at the same trophic  
16 level; am I reading that right?  
17 A Yes, I believe you are, trophic level 4, 4.1, yes.  
18 Q In terms of this particular model that's being  
19 used in this particular paper.  
20 A Yes.  
21 Q And what does that mean to a lay person in terms  
22 of the likelihood of species at the same trophic  
23 level to prey upon each other? Is there anything  
24 we should understand from that?  
25 A I don't think there's any impediment between  
26 species at the same trophic level feeding upon  
27 each other. The trophic level is generally  
28 determined by what level -- whether they're  
29 feeding on primary production, secondary grazers,  
30 intermediate predators and then the top level  
31 would be an apex predator upon which nothing  
32 preys.  
33 Q Okay. Thank you. Perhaps we'll leave this aside  
34 and just ask you to summarize the results -- or,  
35 sorry, not the results, the activities of your  
36 survey in 2009, what you surveyed, your  
37 techniques, what was collected, what was measured.  
38 A Okay.  
39 Q Where and when.  
40 A Yeah. In 2009 we were in talks with people from  
41 the U.S. We realized that we were going to very  
42 likely have large amounts of Humboldt squid in  
43 Canadian waters, so we set out to join a survey  
44 that had already been planned. This was a survey  
45 of Pacific hake. This is a collaborative survey  
46 between the U.S. and Canada and they had been  
47 encountering hake on the U.S. leg which precedes

1 the Canadian leg. So on short notice, we were  
2 able to bring together equipment to fish for  
3 squid. We were fully intending to sample any  
4 squid we got in the trawls that were used to  
5 sample hake. We borrowed an automated jigging  
6 machine from a commercial fisher in Vancouver and  
7 secured squid two-rod reel arrangements and a  
8 number of giant squid jigs to hand line for the  
9 squid, as well.

10 Q DFO had to borrow the jigging equipment?

11 A Yes, we did. Yeah. This was a result of a  
12 previous collaboration under new and emerging  
13 fisheries where these fishers had attempted to  
14 start a fishery for neon flying squid off British  
15 Columbia and we have a particularly good  
16 relationship with this fisher and knew that he had  
17 jigging machines in storage that he wasn't using.  
18 We just asked if we could borrow one.

19 Q And then if you could continue on and tell us what  
20 you -- what data you collected, what parameters  
21 you measured?

22 A Okay. We had conferred with Dr. Field to see what  
23 information they were collecting in the south  
24 because we wanted the data sets to be consistent,  
25 so we took his sampling protocol, we collect  
26 morphometric information, which is measures of  
27 various -- the size of the various body parts. We  
28 collected some tissues for genetic analysis. We  
29 collected the stomachs. We collected the heads  
30 because the heads contain structures called  
31 statoliths which are similar to the otoliths in a  
32 fish and can be used to determine the age of the  
33 animal. I believe that pretty much covers it.

34 We sampled anything that came up in the  
35 trawl. We also did our jigging at night when the  
36 trawl machinery was shut down and we weren't  
37 fishing and secured the same samples from those  
38 squid.

39 Q On the morphometric data --

40 A Mm-hmm.

41 Q -- what were the range of squid lengths? Are you  
42 able to explain the general range of lengths of  
43 squid and maybe, perhaps, the average length of  
44 squid?

45 A I don't know that I could actually cite the  
46 average. The range of squid in terms of total  
47 length, I believe, was from around 79 or 80

- 1 centimetres to about 137 centimetres, so total  
2 length would be measured from the tip of the  
3 mantle to the tip of the arms.
- 4 Q And compared to squid that are full-grown, fully-  
5 grown --
- 6 A Mm-hmm.
- 7 Q -- are these as big as Humboldt squid get or are  
8 they...?
- 9 A No. Humboldt squid should get to around 200  
10 centimetres in total length and up to 50  
11 kilograms.
- 12 Q So you attended a presentation. You made this  
13 PowerPoint presentation. After that, what  
14 happened? Were you consulted on -- in relation to  
15 giving any advice? Was that the end of your  
16 involvement with DFO science managers on that  
17 issue?
- 18 A I would say yes, I came to provide information to  
19 the meeting and did so and after that, I was not  
20 required.
- 21 Q Were you asked to provide any input on a briefing  
22 note?
- 23 A No, not directly.
- 24 Q Were you asked to provide any input on speaking  
25 notes for Members of Parliament?
- 26 A No.
- 27 Q We're going to ask you about the briefing note to  
28 the minister and which Mr. Lunn is both Tab 39 of  
29 our materials and also Exhibit 616A. Mr.  
30 Gillespie, have you seen this before?
- 31 A Yes, I have.
- 32 Q Could I ask you to look at the third bullet of the  
33 summary box? Does that bullet, and I'll read it.  
34 It reads:  
35
- 36 Sea lice from fish farms, Humboldt squid  
37 predation and U.S. fisheries could have  
38 contributed to the sockeye mortality but are  
39 likely insufficient in themselves to explain  
40 the poor return.
- 41
- 42 Does that assessment reflect the discussions at  
43 the September 30th, 2009 workshop?
- 44 A For the period that I was there, yes, it does.
- 45 Q Were you not there for the entire meeting?
- 46 A No, I was not.
- 47 Q Were you there for the majority of the meeting or

1 simply...?

2 A I was there for the first day of a two-day  
3 meeting.

4 Q And if you could turn to page 2 of this document,  
5 this memo. Under the heading "Analysis/DFO  
6 Comment" there is a bullet number 3 which reads:

7  
8 Predation on juvenile salmon in Strait of  
9 Georgia. There are no known shifts in  
10 predator abundance that could explain  
11 increased predation in 2007.  
12

13 My only question here is that were Humboldt squid  
14 implicated in any way by this particular bullet?

15 A No. Humboldt squid did not regularly occur on the  
16 Strait of Georgia.

17 Q Thanks. And then finally, the third bullet on  
18 page 2 that isn't a number, but a bullet reads:

19  
20 The following factors may have contributed to  
21 sockeye mortality, but not at a magnitude  
22 sufficient to explain the poor return in  
23 2009:  
24

25 Number 1 under that bullet relates to the squid  
26 and says:

27  
28 Humboldt squid is a voracious predator that  
29 has increased dramatically in abundance in  
30 Canadian waters since 2007. Salmon have not  
31 been identified in their diet. Surveys in  
32 2009 will be analyzed to assess any possible  
33 link to salmon.  
34

35 Since 2007, does that mean that increase has  
36 happened from 2008 onwards? Is that your  
37 understanding of when abundance increases  
38 happened?

39 A I believe the key word there is "dramatically", so  
40 there was evidence of increasing abundance from  
41 2004 to 2007, but the change from 2007 and 2009  
42 could be characterized as dramatic.

43 Q Thank you. And do you think that this is  
44 reasonable advice? Do you think that absent any  
45 direct evidence, it's reasonable to advise the  
46 minister that predation by Humboldt squid may have  
47 contributed to sockeye mortality?

1 A I believe so in that we still had work to be done.  
2 We had samples that were yet to be analyzed. So  
3 we could not say definitively they were not  
4 implicated.

5 Q How does that differ from the majority of species  
6 we've heard about over the last few days? Salmon  
7 shark and lack of information on salmon shark  
8 abundance, arrowtooth flounder and the lack of  
9 information about its biology? Couldn't any  
10 number of species have equally had that advice?  
11 Why was the Humboldt squid singled out? That's a  
12 lot of questions, but...

13 A No, I agree with the point that you're making.  
14 That's true. As to why the Humboldt squid was  
15 singled out, I didn't author the briefing notes,  
16 so I couldn't say for certain. My impression  
17 would be that Humboldt squid were being discussed  
18 quite openly in the media at the time, so they  
19 were, for lack of a better term, a hot topic and  
20 someone perhaps anticipated that the minister  
21 might ask.

22 Q So this briefing note, this advice to the  
23 minister, may have been driven -- your view is it  
24 may have been driven as much by what was high-  
25 profile as what the scientists may have been  
26 discussing?

27 A Perhaps in the case of Humboldt squid, yes.

28 Q Thanks. Knowing what you know now, looking back  
29 to this briefing note, do you think that this was  
30 a bit of a false alarm?

31 A I wouldn't say so because I don't think we know so  
32 much more now that we can still exclude them.

33 Q And we're going to get to that now. After  
34 September 2009 I take it you learned of some  
35 direct evidence. Could you tell us what you  
36 learned and when you learned it?

37 A In February of 2010 there were two additional  
38 pieces of information. The first was that I was  
39 delivered a copy of a presentation made at the  
40 Pacific Salmon Commission that showed photographs  
41 of a chinook jack from the mouth of the Columbia  
42 River that had were typical of a squid bite or a  
43 squid attack.

44 The second piece of evidence was an email  
45 from Dr. John Field saying that they had  
46 morphologic -- sorry, the second piece of  
47 information was from Dr. John Field who said that

1           they had found a salmon otolith in a squid stomach  
2           in the mouth of Juan de Fuca Strait.

3 MS. TESSARO: Could we please turn to Exhibit 573,  
4           which is Tab 41?

5 Q       Very briefly, Mr. Gillespie, I'm going to seek  
6       your views on the presentation that DFO scientists  
7       made to the Pacific Salmon Commission workshop in  
8       June of 2010. And I probably -- if we could go to  
9       page 42, I believe. Are you familiar with this  
10       presentation?

11 A       Yes, I am.

12 Q       Did you contribute to it?

13 A       Yes, I did.

14 Q       Could we turn to page 48? 47? Under the heading  
15       "6.0 Predation", not the first paragraph but the  
16       second paragraph that begins with:

17                               Humboldt squid appeared in B.C. and Southeast  
18                               Alaska in 2004.

19                               I take it that you'd disagree with that statement?

20  
21 A       We have categorical evidence that it was Humboldt  
22       squid that appeared in 2004. We have anecdotal  
23       evidence that they were present before that.

24 Q       Moving further along in this paragraph, it reads:

25                               To date only a few Humboldt squid have been  
26                               recovered in the Strait of Georgia. Thus, it  
27                               is unlikely that they are responsible for  
28                               eating a large number of sockeye smolts, and  
29                               that even if they do consume sockeye, that  
30                               they would have a greater impact on Barkley  
31                               Sound and Columbia River sockeye stocks than  
32                               to be able to focus on Fraser R. sockeye.  
33  
34

35                               Leaving aside the somewhat confusing grammar of  
36                               that sentence, do you agree with that reasoning?

37 A       Yes, I do. The squid that were found in the  
38       strait were found in December, which would  
39       decrease the probability of any overlap with out-  
40       migrating smolts. There were only a couple of  
41       individuals found in the strait over that time  
42       period and at least up to 2007 Humboldt squid had  
43       not been seen north of the West Coast of Vancouver  
44       Island; therefore, they would have had more  
45       interaction with West Coast Vancouver Island  
46       stocks than those leaving through Johnstone  
47

1 Strait.

2 Q I'd like to read just one sentence fragment there  
3 apart from the information related to Georgia  
4 Strait and that's again:

5  
6 Thus it is unlikely that they are responsible  
7 for eating a large number of sockeye smolts.

8  
9 With that -- insofar as that statement is read by  
10 itself, would you agree with that?

11 A If you mean is the argument restrained to Fraser  
12 River sockeye or sockeye in general, I think they  
13 had the opportunity to eat sockeye smolts on the  
14 West Coast of Vancouver Island up to that point  
15 certainly. The term "a large amount" is relative.

16 Q I take it that it's your view that it was -- well,  
17 let me ask in a fairer way. Is it your view that  
18 it's possible that --

19 A Yes. Yes, it is possible that Humboldt squid ate  
20 sockeye smolts.

21 Q Is it possible that Humboldt squid are responsible  
22 for eating a large number of Fraser River sockeye  
23 smolts in 2007?

24 A No, I don't think so.

25 Q So as of June 2010 when we have this presentation,  
26 and you and presumably the author, the lead  
27 author, Mr. Trudel, thought that it was unlikely  
28 that Fraser River sockeye smolts were being eaten  
29 up in large numbers by Humboldt squid. Are you  
30 aware of any further advice to the minister on  
31 that issue?

32 A No, I'm not.

33 Q Between September 2009 when you made your  
34 presentation and June 2010 were you consulted by  
35 DFO or PSC fishery managers who were planning for  
36 the 2010 sockeye fishery?

37 A I had some interactions with the PSC in terms of  
38 talking about opportunities to potentially sample  
39 Humboldt squid in their test fisheries should they  
40 turn up again, but in terms of developing  
41 management plans for sockeye, no, I wasn't.

42 Q As it turns out, there were very -- relatively  
43 very high returns of sockeye, Fraser River  
44 sockeye, in 2010. I'm wondering if there's any  
45 reasonable inference about the role of Humboldt  
46 squid given the high returns in 2010? Should one  
47 draw anything from that?



- 1 A I don't draw too much from it. Let's just say  
2 that the coming year will be a better indicator.  
3 I would hate to infer anything on two years data.
- 4 Q Fair enough. And now if you could describe for us  
5 the results of the 2009 survey that you and your  
6 colleagues did.
- 7 A We collected around 200 stomachs from squid and  
8 all of these were sent to Dr. Field in California  
9 because he had offered in collaboration with  
10 processing of his samples from south of the border  
11 to process ours, as well, so that they were all  
12 processed in a consistent manner. Of the 200 we  
13 sent, we did not process any of the samples that  
14 had been taken from trawl-caught squid because we  
15 were concerned about bias in the diet information  
16 due to a process called net predation. So when a  
17 predator is confined in a net with a number of  
18 species, you can bias any information about their  
19 diet because they will attack other animals in the  
20 net and you end up with tissue in their stomachs  
21 that may either be species that they would not  
22 normally prey upon in a natural setting, or it may  
23 skew the ratios of the various species that were  
24 present in the stomachs. So we decided not to  
25 process the trawl-caught stomachs.
- 26 We processed about 160 jig-caught stomachs  
27 and of those two presented positive evidence of  
28 predation on salmon. The first was one that had  
29 otoliths in it that were attributed to salmonids,  
30 so either salmon or osmeridae, smelt, and the  
31 second -- and subsequent genetic analysis of the  
32 bones in that stomach showed that I believe they  
33 were chum and pink salmon remains.
- 34 Q And maybe we, for your assistance, if we pull up  
35 Tab 44 now, it has an email in relation to this.  
36 Sorry to interrupt you, but I think this might  
37 assist.
- 38 A No, no problem. Thank you.
- 39 Q Do you recognize this email?
- 40 A Yes, I do.
- 41 Q And could we turn to page 2 of this email? Or  
42 perhaps enlarge as much as we can before the date  
43 break. Perhaps with reference to this email, you  
44 can continue describing in general the results of  
45 the survey with respect to salmon --
- 46 A Okay.
- 47 Q -- identifies.

1 A Yes. We had two samples that contained salmon  
2 remains. One was initially thought to be coho  
3 salmon, based on the otolith morphology, but the  
4 otoliths were too eroded to be conclusive. Tissue  
5 samples from that indicated that they were four of  
6 the 16 bones tested were chum salmon and one of  
7 the 16 bones tested was a pink salmon, and the  
8 rest of that sample was Pacific herring. The  
9 second sample had no identifiable otoliths, but we  
10 tested -- the bones were tested from it and all  
11 eight of the bones tested were pink salmon. So  
12 that basically summarizes the results in terms of  
13 salmon predation.

14 The definitive statement at the end is there  
15 were no sockeye in any of these.

16 Q I'm just wondering about the American --

17 A Oh, sorry.

18 Q -- about the American samples, as well. Were  
19 there any salmon found in the U.S. samples that  
20 form part of Dr. Field's assessment or analysis?

21 A Yes, there were 20 squid collected at Sekiu,  
22 Washington, which is just inside the mouth of Juan  
23 de Fuca Strait. Of those 20 squid, three of them  
24 contained salmon remains and the total remains  
25 from those three squid were three chinook and two  
26 coho encountered in those stomachs.

27 Q And what was that as a relative proportion of the  
28 types and volume of prey found in American squid  
29 generally?

30 A Very small proportion.

31 MS. TESSARO: Could we mark this as the next exhibit,  
32 please?

33 THE REGISTRAR: Exhibit 824.

34  
35 EXHIBIT 824: Emails between Dr. Field and  
36 Graham Gillespie re squid tummies  
37

38 MS. TESSARO:

39 Q I realize that I've only asked you about the PSC  
40 presentation in relation to juveniles, in relation  
41 to smolts and there's a line in this email that we  
42 might have a discussion about adults, about --  
43 there's -- so halfway through the second  
44 paragraph, the size range of all the salmon  
45 encountered based on otolith length, fish length  
46 relationships was about ten to 15 centimetres.  
47 Does that suggest to you anything about the

- 1 capacity of Humboldt squid to prey on adult  
2 sockeye or adult salmon?
- 3 A This information indicates that the salmon that  
4 were taken were juveniles and there is other  
5 information in the literature that talks about the  
6 range of size that Humboldt squid prey usually  
7 fall within.
- 8 Q I believe you may be referring to page 32 of the  
9 Project 8 report, which is Exhibit 783.
- 10 A Yes, that's correct.
- 11 Q Could we go back one page? In that first  
12 paragraph the authors of Project 8 state in the  
13 last sentence that the prey sizes throughout the  
14 life cycle ranges between five percent and 15  
15 percent of the squid total length.
- 16 A Yes.
- 17 Q You've told us that the squid sampled in 2009  
18 ranged from on the small end from 79 centimetres  
19 to on the large end to about 137 centimetres?
- 20 A Yes.
- 21 Q Five to 15 percent. Can you help me with the  
22 math?
- 23 A Okay. If you use the lower end of the size range  
24 and a five percent ratio, you're talking about  
25 four centimetres, a prey item that would be four  
26 centimetres in length. And if you use the upper  
27 end of the size range and the 15 percent ratio,  
28 you're looking at something that would be 21  
29 centimetres, so certainly the results of the  
30 stomach sampling where we have indication of size  
31 fall within that range.
- 32 Q And what about Fraser River returning adults, do  
33 they fall within that range?
- 34 A I would defer more to others who have stronger  
35 knowledge of the size of returning adults, but I  
36 had discussions with Timber Whitehouse of DFO  
37 about what the size range of returns might be. He  
38 indicated to me that returning jacks are in the 30  
39 to 45 centimetre range and returning adults are 55  
40 to 75 centimetres in length, which would rule --  
41 using this model, would rule them out as potential  
42 prey for Humboldt squid.
- 43 Q Thank you. Do you have any other views on this  
44 page and the next page of the Project 8 report  
45 about the Humboldt squid? Maybe we could expand  
46 it out to be the whole page. Did anything strike  
47 you as incorrect?

1 A Not glaringly incorrect. There's one line that  
2 says that Humboldt squid did not appear to spawn  
3 in the northern part of their range. It's fairly  
4 clear from the literature and also from the  
5 maturity stages of the squid that we sampled, that  
6 they do not spawn in the northern part of their  
7 range. But it in no way affects the conclusions  
8 of this section.

9 Q And the last paragraph -- or the first paragraph  
10 on the next page.

11 A Mm-hmm.

12 Q The last sentence of this paragraph reads:

13

14 If, however, the smolts have had to pass  
15 through an accumulation of jumbo squid, it is  
16 entirely possible that they could have a  
17 strong predation impact on the sockeye.

18

19 Now, my understanding, and correct me if I'm  
20 wrong, from your reaction to the PSC report  
21 authored by yourself and Dr. Trudel, is that your  
22 view is that, in fact, it's unlikely that Humboldt  
23 squid are having a -- had a strong predation  
24 effect on Fraser River sockeye smolts in 2007.

25 A Yeah. I think that that conclusion is drawn  
26 mainly from the lack of information we have on  
27 overlap in time and space. Certainly given the  
28 behaviour of the squid, the size of the smolts, if  
29 there were encounters, there would be predation,  
30 but the likelihood -- I don't speak in terms of  
31 likelihood. Dr. Trudel does. I say it's  
32 certainly possible that if they were encountered,  
33 there would be predation and I believe -- I don't  
34 want to put words in his mouth, but I believe the  
35 unlikely conclusion was drawn from our lack of  
36 information on overlap in time and space.

37 Q It seems to me that a lack of data on one hand has  
38 led Dr. Christensen and Dr. Trites to conclude  
39 that it's entirely possible that there could be a  
40 strong predation effect. But the same lack of  
41 data on the other hand has led Dr. Trudel to  
42 conclude that it's unlikely that there could be a  
43 strong -- that there was, in 2007, a strong  
44 predation effect.

45 A Mm-hmm.

46 Q What should we make of this?

47 A If we're speaking about 2007 in particular, we

1           have no evidence that Humboldt squid were in  
2           migratory pathways of sockeye smolts. We found  
3           them off the West Coast of Vancouver Island and  
4           did not find them further north in British  
5           Columbia, which would lead me to support for that  
6           year, at least, in 2007 that it was unlikely that  
7           they had an impact on out-migrating Fraser River  
8           sockeye smolts.

9           Q     Thank you. My final short line of questions - I  
10           think I'll only be three or four more minutes - is  
11           on research opportunity and funding issues.  
12           What's the source of your funding for research and  
13           monitoring activities?

14          A     For cephalopods?

15          Q     For cephalopods.

16          A     For cephalopods, is just the regular A-base  
17               allocation that comes into my program that focuses  
18               on molluscs in general, so bivalves and  
19               cephalopods.

20          Q     Is there anything -- is there any funding that you  
21               have in your budget specifically devoted towards  
22               cephalopods?

23          A     No. I get a small budget for the program and the  
24               use of that budget is discretionary.

25          Q     And perhaps we could pull up at this point Tab 43?  
26               Are you familiar with this document?

27          A     Yes, I am.

28          Q     Did you prepare it?

29          A     Yes, I did.

30          Q     And could you describe it for us?

31          A     This describes the research and -- oops.

32          MR. LUNN: So sorry.

33          A     It's okay. This describes research and monitoring  
34               projects that were under my supervision and the  
35               budgets associated with them, so my regular A-base  
36               budget for intertidal bivalves, which would  
37               include cephalopods, that's the mollusc budget,  
38               was pretty static at about \$11,000 a year over  
39               that period. And I started to receive some  
40               invasive species funding in 2006/2007 which  
41               started at about \$40,000 and was decreased in 2009  
42               and '10 to thirty-three-six. And then in 2009 and  
43               '10 I got directed funding to support surveys for  
44               the **SARA**-listed Olympia oyster that amounted to  
45               about 45.8 thousand dollars.

46          MS. TESSARO:

47          Q     The note at the bottom of this funding summary

1 notes that no funding directly allocated to  
2 Humboldt squid spent \$1,000 discretionary in  
3 2009/10 for survey gear and expenses. Is that a  
4 sufficient amount of money to do meaningful  
5 research into Humboldt squid predation?

6 A I would hazard it probably is not. We did the  
7 best we could in terms of providing gear and using  
8 the ship of opportunity to provide sampling  
9 opportunities. There's always more or less  
10 expensive ways to conduct research and to go out  
11 and do a targeted Humboldt squid survey would be  
12 very expensive and very difficult to organize  
13 because we don't know which years they're going to  
14 be in Canadian waters and our cycle for scheduling  
15 vessels and everything else is a year in advance.

16 Q Right.

17 A So this was largely responsive to the opportunity  
18 to sample them in a year when they were going to  
19 be in B.C. in large numbers.

20 Q In the vein of recommendations, is there an  
21 alternative between doing a -- your own targeted,  
22 as you've said, very expensive survey that is only  
23 a Humboldt squid survey, and on the other hand,  
24 opportunistically tagging along with the hake  
25 survey? Is there some middle ground whereby you  
26 have the ability to design your research questions  
27 and structure your research without spending money  
28 that you don't have?

29 A I think the middle ground, the tagging along on  
30 the hake survey and having people collect samples  
31 for us in other surveys is the cheapest  
32 alternative and going out and directing a survey  
33 of Humboldt squid would be very expensive.  
34 Alternatives are to continue looking for other  
35 ships of opportunity that might afford sampling  
36 opportunities.

37 If one wanted to focus in on the question of  
38 whether or not Humboldt squid ate sockeye smolts,  
39 you need overlap in time and space between  
40 Humboldt squid, sockeye smolts and someone  
41 sampling Humboldt squid. So if we were to focus  
42 exclusively on this question, we would be looking  
43 for opportunities where that overlap would occur.

44 Q Are you currently looking into that opportunity at  
45 all?

46 A Given that they didn't show up last year and  
47 aren't predicted to this year, not actively, no.

1 MS. TESSARO: Okay. I'll let Canada get its turn now,  
2 but thank you for your time. I'm sorry, I should  
3 actually mark Exhibit 822 -- as Exhibit 822 this  
4 funding summary. I'm sorry.

5 THE REGISTRAR: It would be 825.

6 MS. TESSARO: Thank you.

7 THE REGISTRAR: Tab 43, is that...?

8 MS. TESSARO: Thank you, yes.

9

10 EXHIBIT 825: Document entitled "Funding  
11 Summary (SK), G. Gillespie  
12 Research/Monitoring Projects"  
13

14 MS. GRANDE-McNEILL: Geneva Grande-McNeill for Canada  
15 with Tim Timberg. I might be able to  
16 significantly cut back my questions if we take the  
17 break now, Mr. Commissioner.

18 THE COMMISSIONER: Let's do that then.

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

21 THE COMMISSIONER: Ten I think.

22 THE REGISTRAR: Ten, ten minutes.

23

24 (PROCEEDINGS ADJOURNED FOR AFTERNOON RECESS)  
25 (PROCEEDINGS RECONVENED)  
26

27 THE REGISTRAR: The hearing is now resumed.

28 MS. GRANDE-McNEILL: Mr. Lunn, if we could have Exhibit  
29 613F, please.

30 THE REGISTRAR: Could you announce your name, please?

31 MS. GRANDE-McNEILL: Yes, it's Geneva Grande-McNeill  
32 for Canada with Tim Timberg.

33

34 CROSS-EXAMINATION BY MS. GRANDE-McNEILL:  
35

36 Q Now, Mr. Gillespie, you've talked briefly about  
37 this presentation already and noted that it was  
38 from the 2009 Causes of the Decline Workshop. I  
39 know we've heard evidence from Dr. Richards  
40 previously in these hearings on that workshop.  
41 Can you just describe for us what the purpose of  
42 that workshop was?

43 A The purpose of that workshop was to bring together  
44 species experts, oceanographers, ecologists,  
45 modellers, senior management, to basically  
46 brainstorm or scope out the potential impacts that  
47 could have caused declines, either long-term or in

- 1 the 2009 return year of Fraser River sockeye.
- 2 Q And who was invited to attend that workshop?
- 3 A As I said, species experts, oceanographers,
- 4 modellers, ecologists, senior management.
- 5 Q And at this workshop, were any conclusions as to
- 6 the role of Humboldt squid in the decline drawn?
- 7 A Just that they were included in a suite of
- 8 potential causes.
- 9 Q And I just want to see if I can summarize what I
- 10 understand from your earlier evidence. Do
- 11 Humboldt squid overlap in time and space with
- 12 Fraser River sockeye smolts?
- 13 A We believe that the potential is there. We have
- 14 no direct evidence of it.
- 15 Q And do they overlap in time and space with Fraser
- 16 River sockeye adults?
- 17 A Yes, they do.
- 18 Q And could a Humboldt squid eat an adult Fraser
- 19 sockeye?
- 20 A Given the information provided by Dr.
- 21 Nigmatullin's paper in terms of size, that would
- 22 tend to preclude them. The other consideration is
- 23 that the prey that Dr. Nigmatullin refers to in
- 24 his paper are Myctophids which are a very soft-
- 25 bodied and slow-moving fish. I would postulate
- 26 that an adult sockeye salmon has a much greater
- 27 evasive capacity than a Myctophid does.
- 28 Q And are Humboldt squid specialized predators?
- 29 A No, they're generalists.
- 30 MS. GRANDE-MCNEILL: Thank you. And if we could have
- 31 the Commission's Tab 41. Thank you.
- 32 Q Now, you briefly discussed this document earlier
- 33 in your evidence. I understand it's a summary of
- 34 a presentation that Dr. Marc Trudel made at the
- 35 PSC Causes of Decline Workshop.
- 36 A Yes.
- 37 Q And did you contribute information to this
- 38 presentation?
- 39 A Yes, I did, yeah.
- 40 Q And what information did you contribute?
- 41 A I contributed the chart, Figure 3, within the
- 42 document and also had conversed with Dr. Trudel
- 43 about what evidence we had that Humboldt squid may
- 44 or may not prey on salmon.
- 45 Q And if we could turn to page -- I think it's 47.
- 46 That would be in the section 6.0; is that right?
- 47 A Yes. He may have been aware of the previous PSE



- 1 presentation that indicated the wound on the  
2 chinook jack, but since the otolith information  
3 came through Dr. John Field, I would have conveyed  
4 that to him.
- 5 MS. GRANDE-McNEILL: Thank you. Now, the PSC final  
6 report -- well, perhaps we can just pull that up.  
7 That's Exhibit 73, Mr. Lunn.
- 8 MS. TESSARO: Just for the record, Tab 41 is Exhibit  
9 573.
- 10 MS. GRANDE-McNEILL: Thank you.
- 11 Q And this document notes that predation by Humboldt  
12 squid is unlikely to have impacted the long-term  
13 decline of Fraser sockeye as the squid are recent  
14 arrivals to B.C. Do you agree with that  
15 assessment?
- 16 A Yes, I do.
- 17 Q And why is that?
- 18 A As I said, we had no definitive proof that  
19 Humboldt squid were in B.C. coastal waters until  
20 2004. The only anecdotal evidence we had that  
21 they were even moving northward was in the mid-  
22 '90s and the period of decline was started  
23 considerably before that.
- 24 Q I note that this document doesn't reach any  
25 conclusion as to the likelihood of squid effects  
26 on the 2009 Fraser sockeye returns. What's your  
27 view on that likelihood?
- 28 A As previously stated, there's a fairly low  
29 likelihood of overlap without migrating smolts  
30 which would be the life stage that would probably  
31 be most affected by Humboldt squid predation. So  
32 I would agree that they were not likely to have  
33 contributed to the low returns in that year.
- 34 MS. GRANDE-McNEILL: Thank you. And if we could have  
35 Exhibit 822.
- 36 Q Now, this is your more recent presentation on  
37 Humboldt squid. When did you give this  
38 presentation?
- 39 A That was in the workshop earlier this year.
- 40 Q And where did you give this presentation?
- 41 A The presentation was in Nanaimo, Vancouver Island  
42 Conference Centre.
- 43 Q And I guess what was the forum in which you  
44 presented this?
- 45 A The forum was largely a reconvening of the  
46 previous workshop to return with more information,  
47 update any information that had been gathered

1 since the previous scoping workshop.

2 Q What was the new information contained in this  
3 presentation?

4 A The new information was the definitive evidence of  
5 predation on salmon by Humboldt squid, but the  
6 lack of definitive evidence of predation on  
7 sockeye.

8 Q And did these results change your previous  
9 conclusion about the likelihood of contribution to  
10 the long-term decline or the 2009 returns?

11 A I would say no in both cases.

12 Q And what do you understand are going to be the  
13 next steps coming out of this workshop?

14 A My involvement in these workshops has been fairly  
15 limited, mainly as a provider of information. I'm  
16 not sure what the next steps are, but probably  
17 Mark Saunders or Laura Richards would be the  
18 people to talk to about next steps in this  
19 process.

20 Q Thank you. Now, you were asked earlier about  
21 possible hypotheses on why squid are moving  
22 further north, why Humboldt squid are moving  
23 further north and you mentioned something called  
24 the oxygen minimum layer that the squid like to  
25 use.

26 A Mm-hmm.

27 Q Is there anyone at DFO doing work on the oxygen  
28 minimum layer?

29 A The oxygen minimum layer is certainly being  
30 examined as part of the regular oceanographic work  
31 that's carried on at the Institute of Ocean  
32 Science. The person that I've had the most  
33 discussion with there, or the person who's been  
34 the most engaged in terms of the relationship to  
35 the oxygen minimum layer in Humboldt squid is Dr.  
36 Frank Whitney who's recently retired, but is still  
37 active in research at that station and he has  
38 colleagues there that would continue to work on  
39 that project.

40 Q Thank you. And I guess the squid are moving  
41 farther north. Are they an invasive species?

42 A The term "invasive species" has a lot of policy  
43 implications. I know that the squid arriving in  
44 the north has been characterized both in the open  
45 literature and the media as an invasion, but we in  
46 DFO have a policy definition of what an invasive  
47 species is that includes either demonstrated harm

1 or the potential to cause harm, on either an  
2 environmental, economic, social scale. And to  
3 qualify as an invasive species, the species has to  
4 be non-indigenous which means that it has to have  
5 overcome some natural barrier to distribution  
6 through human intervention, through anthropogenic  
7 means.

8 In this case, Humboldt squid were already  
9 present in the eastern Pacific and had just  
10 expanded their range, so under the policy  
11 framework, they don't qualify as an invasive  
12 species.

13 Q And were there any human influences on that range  
14 expansion?

15 A It's been pointed out that there's a -- if you  
16 follow a certain line of belief that there are  
17 tenuous links that human activities have caused  
18 climate change that may have influenced the  
19 distribution of these animals, but it's not a  
20 direct human intervention as an introduction would  
21 be in moving it from one place to another.

22 Q And are you aware of any marine aquatic invasive  
23 species that could affect Fraser River sockeye?

24 A With the exception of possibly some harmful algae  
25 that I don't know very much about, no, I'm not  
26 aware of any.

27 Q Thank you. Now, you've mentioned that the squid  
28 didn't arrive in 2010 and thus you didn't do any  
29 sampling in 2010. Were you prepared to sample in  
30 2010?

31 A Yes, we were. I had had a commitment of  
32 additional funding potential from Mark Saunders  
33 and Laura Brown, the two division heads at PBS. I  
34 had also made inroads with the PSC sampling teams  
35 to see if we could do some sampling in concert  
36 with their test fishing. I had made contacts with  
37 the service providers that provide at-sea observer  
38 coverage and also dockside coverage of ground fish  
39 landings for opportunities to sample squid that  
40 might have been encountered in either of those  
41 fisheries.

42 Q Thank you. And how much funding were you able to  
43 secure?

44 A I was told that I could spend up to \$25,000 to  
45 support the survey program if the need arose.

46 Q Thank you. I want to turn now to ecosystem-based  
47 management which -- I know you've been watching

1           these hearings for the last two days. You've  
2           probably heard that conversation unfolding.

3           When we talk about ecosystem-based  
4           management, what does the "management" portion of  
5           that word mean?

6           A    Ecosystem-based management -- can I tack it from  
7           the other end?

8           Q    Yeah.

9           A    I mean, I'm a science person so I'm more familiar  
10           with ecosystem assessments. So ecosystem  
11           assessments, as we've heard, is a selection of  
12           indicators and looking at the state of those  
13           indicators to reflect the health of the ecosystem  
14           that we're trying to manage within.

15           The next step in that progression is  
16           basically what we've been talking about here for  
17           the last couple of days, is ecosystem-based  
18           fisheries management. So you have a single  
19           species like a sockeye salmon that's your focal  
20           point, somewhere to hang your hat on to begin the  
21           conversation, and you try to bring in all of the  
22           aspects of the ecosystem that influence that  
23           species. I think the ecosystem-based management  
24           that Dr. Christensen refers to is a more holistic  
25           approach where you don't have that focal point.  
26           You're just trying to manage the entire ecosystem  
27           to some ideal state that gives you certain  
28           benefits.

29           To be clear, ecosystem-based management is  
30           not managing the ecosystem. The only thing you  
31           can manage are the human activities within that  
32           ecosystem and assess their impacts on a broader  
33           scale throughout the ecosystem.

34           Q    And within DFO's sphere, what are the human  
35           activities that can affect Fraser River sockeye?

36           A    For Fraser River sockeye, there's a fairly broad  
37           suite of human activities that involve upland land  
38           use, pollution contaminants, fisheries on all  
39           levels, indirect effects through removals or  
40           bolstering of other species that might influence  
41           them, things like eutrophication that might affect  
42           productivity in certain parts of the system.

43           Q    And can you explain for us the policy context for  
44           ecosystem-based management at DFO?

45           MR. LEADEM: With all due respect, Mr. Commissioner, I  
46           think I am going to object to this line of  
47           questioning. We weren't given notice specifically

1           that this particular witness would be commenting  
2           upon ecosystem-based management.

3           Moreover, when he was qualified, we heard no  
4           evidence or no background to justify the  
5           foundation for this particular line of  
6           questioning.

7   MS. TESSARO: If I could speak to this very briefly.  
8           In contrast to Sandy McFarlane, Dr. Ford and the  
9           other four DFO witnesses, whose summaries all did  
10          reference ecosystem considerations and ecosystem-  
11          based management, Mr. Gillespie's does not. So in  
12          terms of putting participants on notice, I think  
13          Mr. Leadem's comment is a fair one.

14   THE COMMISSIONER: I was waiting for somebody to  
15          object, Mr. Leadem, but seeing as you now have, I  
16          think the objection is entirely reasonable. I  
17          don't know why Canada is going down the path of  
18          questioning this witness about a topic for which  
19          he was not qualified to speak, nor was I to  
20          understand this evidence such that notice was  
21          given to the participants that he would be giving  
22          opinions regarding this area. So perhaps you can  
23          give me some sense of why you're going down this  
24          path?

25   MS. GRANDE-McNEILL: I'm hoping to bring some clarity  
26          to the conversation that's gone on for the past  
27          two days. I'm not expecting Mr. Gillespie to be  
28          giving an opinion as an expert on ecosystem-based  
29          management, but merely as a scientist and someone  
30          who works at DFO. The particular question is  
31          about the policy context for ecosystem-based  
32          management and, as a scientist at DFO, he would be  
33          aware of that context.

34   MR. GAERTNER: Mr. Commissioner, I'm going to have to  
35          wade in on this for obvious reasons, given the  
36          day. It's Brenda Gaertner speaking. I, too,  
37          object to this very strongly. The distinction she  
38          is making was alive in the questions that I  
39          raised, and could have been discussed with the  
40          previous witnesses if we needed to. I would have  
41          had further documents and we could have gone  
42          forward. I do not think it's appropriate at this  
43          point in time.

44   THE COMMISSIONER: Well, again, the concern raised is  
45          reasonable. (A), not qualified as an expert in  
46          this field, and secondly, no notice given that  
47          this witness was going to be speaking on behalf of

1 the DFO with respect to the area you're now  
2 covering. So I would respectfully suggest that  
3 the objection should be sustained.

4 MS. GRANDE-McNEILL: Thank you. Mr. Lunn, if we could  
5 have Project 8, please. If we could turn to page  
6 13, and I'm not sure what the pdf number is.

7 Q Page 13, as we've already heard, Mr. Gillespie,  
8 was the criteria the authors used in determining  
9 which predators may be contributing to the long-  
10 term Fraser River sockeye declines and the 2009  
11 return. The first criterion listed here is that  
12 the prey and the predator must overlap in time and  
13 space. Do you have any comment on the application  
14 of that criterion in this report?

15 A As a reviewer or a reader of the report, I  
16 struggled a bit in that to determine whether  
17 there's overlap in time and space, one needs to  
18 understand the spatial and temporal distribution  
19 of sockeye salmon. As someone who's not expert in  
20 that, I expected more information about that in  
21 the report so that I could judge their conclusions  
22 in terms of where that overlap in time and space  
23 occurred.

24 Q And can a lack of data on a given predator lead  
25 one to conclude that there is no predation impact  
26 on Fraser sockeye?

27 A No, I would say not.

28 Q And can you comment on the authors' use of data or  
29 lack of data to exclude predators from  
30 consideration for further research, and in that  
31 context, I'm thinking of the six species they've  
32 listed at the end of the report.

33 A I think as we've heard earlier in the hearings, a  
34 number of species were excluded from that list  
35 because they did not have recent dietary  
36 information which, if I was prioritizing (sic)  
37 species for a research program, I would tend to  
38 prioritize towards filling information gaps. So  
39 species like Pacific white-sided dolphins that had  
40 all of the other requisite criteria met in terms  
41 of abundance, distribution and opportunity, but a  
42 lack of dietary information would have flagged  
43 that for me as a species for further  
44 consideration, and similarly for harbour seals  
45 where the dietary information is somewhat dated  
46 and the suite of prey that is available to harbour  
47 seals is not static. There are changes in

Graham Gillespie

Cross-exam by Ms. Grande-McNeill (CAN)

Re-exam by Ms. Tessaro

1 abundance. There could have been shifting  
2 preference at that point. So those two species in  
3 particular I felt deserved more consideration for  
4 their work.

5 Q And so if the aim is to determine predation impact  
6 on Fraser sockeye, what species not included by  
7 the authors in those six would you recommend for  
8 further research?

9 A Those two in particular that I just mentioned.  
10 The only other observation I have was I was a bit  
11 surprised that more fish-eating birds were not  
12 included, not so much in the final selection but  
13 in the initial scoping exercise. Things like  
14 dipper, kingfisher, herons in fresh water, and  
15 diving birds and some other alcids in the  
16 saltwater environment.

17 MS. GRANDE-McNEILL: Thank you. Those are my  
18 questions.

19 THE COMMISSIONER: Thank you.

20 MS. TESSARO: Mr. Leadem is shaking his head, so that  
21 would leave questions for Ms. Gaertner.

22 MR. LEADEM: Mr. Commissioner, I'm delighted to say I  
23 have no questions of this witness. I was going to  
24 ask him about how much calamari we could get from  
25 a Humboldt squid, but I think I'll refrain.

26 A We can talk after.

27 MS. GAERTNER: And actually on the same vein as Mr.  
28 Leadem, I'd like to pleasantly say to you,  
29 Commissioner Cohen, that I unusually have no  
30 further questions today and that hopefully that  
31 neither of us fall prey to further work this  
32 afternoon.

33

34 RE-EXAMINATION BY MS. TESSARO:

35

36 Q I have only one question and that is that Ms.  
37 Grande-McNeill asked you if you had -- how much  
38 money you had secured from Mark Saunders and Dr.  
39 Laura Brown, and you said \$25,000. For clarity,  
40 that money was never actually allocated to you,  
41 was it?

42 A That's correct. I was given discretionary power  
43 to spend up to a certain amount, and that money  
44 would be found in slippage and other projects if  
45 required.

46 Q And that was just a verbal conversation or did you  
47 have that in writing?

1 A That was a verbal assurance.

2 MS. TESSARO: Thank you. Mr. Commissioner, I have no  
3 further questions of this witness. I'd like to  
4 thank him for staying here to the very end of a  
5 Friday afternoon.

6 THE COMMISSIONER: Yes. Thank you very much for your  
7 attendance, for being in the courtroom during the  
8 hearing today and for your attendance here and for  
9 answering questions. We're most grateful for  
10 that. Thank you so much.

11 Ms. Tessaro, I was just, on the record, going  
12 to ask you Monday is bringing us what?

13 MS. TESSARO: On Monday it is Project 2, our  
14 contaminants report with our expert Don MacDonald,  
15 and Ms. Baker and I will be here.

16 THE COMMISSIONER: Right. Thank you very much.

17 MS. TESSARO: Thank you.

18 THE COMMISSIONER: And we're adjourned until 10:00  
19 Monday morning. Thank you all, have a pleasant  
20 weekend. Thank you very much.

21 THE REGISTRAR: The hearing is now adjourned until  
22 Monday at ten o'clock.

23

24 (PROCEEDINGS ADJOURNED TO MAY 9, 2011 AT  
25 10:00 A.M.)

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I HEREBY CERTIFY the foregoing to be a  
true and accurate transcript of the  
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Pat Neumann



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Susan Osborne

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Diane Rochfort