

February 10, 2011
Cohen Inquiry Hearing
Cross-examination of Carl Walters & Jim Woodey by Keith Lowes
(B.C. Wildlife Federation and B.C. Federation of Drift Fishers)

MR. LOWES: It's J.K. Lowes, for the B.C. Wildlife Federation and B.C. Federation of Drift Fishers. Just a couple of questions.

CROSS-EXAMINATION BY MR. LOWES:

Q First of all, some fundamentals upon which most of the discussion about over-escapement over the last couple of days has taken place. Population dynamics is a discipline that is not confined to fish; it's a basic biological discipline and the principles are well known biologically; is that correct, Dr. Walters?

DR. WALTERS: Yes.

Q And in fact, the discipline goes back to, I believe, the 17th century, with Malthus?

DR. WALTERS: That's correct.

Q And so the discussion that's taken place over the last two days or so is really a discussion about the application of principles that have been studied for a couple of centuries?

DR. WALTERS: Yeah, Malthus pointed out that natural populations of people or anything else cannot continue to grow indefinitely, that they must exhibit what we nowadays call density-dependence. He had a view that things are very catastrophic, that things would build up and catastrophically over-harvest food supplies or wars and famine and pestilence, bad things would bring populations back down.

We now understand that it's generally the case that as natural populations increase there's a progressive decrease in reproductive success and productivity as animals become more crowded they're forced to use less suitable reproductive sites, they encounter less food and their juveniles need to spend more time feeding, and they get eaten more by predators. So it's a bit different picture than his, but not fundamentally.

Q And you've used the term, a couple of times, "violent cycles". Am I correct that "violent cycles", in nature, are not confined to salmon and not confined to Fraser River sockeye salmon?

DR. WALTERS: No, there are cyclic sockeye populations up in Alaska as well, like the Kvichak, historically, was the biggest of them all. There's lots of cyclic animal populations. I guess in Canada the most famous are lynx-and-hare cycles. There's also a wolf-moose cycle of much longer, 35 to 40-year period. Generally, the belief amongst

ecologists - so it hasn't been proven - is that these are associated with predator-prey relationships.

Q And am I correct, Dr. Walters, that the density dependent effects are primarily related to, or primarily impacts to survival rather than fecundity; in other words, the number of eggs that are laid are by and large the same amount from year to year; it's the survival of the eggs or the fry?

DR. WALTERS: Yeah, that's right. We see dependence of body size on abundance, and with that a small change in fecundity at very high densities. But salmon seem to insist on translating competitive effects that would normally impact their growth. They transfer much of that effect into changes in survival rate, by changing their behaviour so as to try to maintain growth.

As Jim Woodey's pointed out, juvenile sockeye certainly do show density related changes in growth as well as survival, but those get pretty much wiped out by compensatory feeding as the animals get older.

Q And at what stage of their lifecycle are the sockeye most vulnerable to density-dependent effects?

DR. WALTERS: There's a few examples where we see apparently strong density dependence in the egg to-fry stage, indicating probably limitations on the availability of good spawning habitat, but for the larger stocks most of the density-dependent mortality appears to occur early in the first summer of life in the lake. So by the time sampling of - acoustic sampling of fry that have been in the lake for about four or five months in late summer in Quesnel, by that time we're already seeing quite a strong density-dependent survival relationship. And we think that continues on, at least through until a smolt stage, and may even be occurring in the ocean as well.

Q *Does anyone on the panel have a challenge to that evidence, or would like to express agreement?*

DR. RIDDELL: Well, I wasn't sure what Carl meant. You asked about fecundity. There are significant effects on fecundity with very large population sizes. The animals can get quite small. That is one of the extraordinary events of 2010, where you have an extraordinarily large run and very big fish. That is definitely an exception. So the density effects can be carried through to fecundity. That definitely does occur.

DR. WALTERS: Yeah.

Q Dr. Woodey?

DR. WOODEY: Just to follow up on Dr. Walters' comments about the lake, it's become my judgment, if you will, that most of what we're seeing in cyclic dominance is

occurring in the lakes, and that's just from my personal perspective. It's where the resources are more limited, et cetera, and therefore, I believe, most of the density dependent issues become expressed there.

What we see for fecundity is that the ocean environment changes are probably much more effective in determining fecundity, the number of eggs that each female has. When we look at the regime shift in 1977, fish size declined, mature, adult sockeye fish size declined beginning at that point, after being fairly stable. And, in fact, in the late '40s and early '50s, quite high, quite large fish. And size dropped off and, thus, fecundity is dropping off. Fecundity is set fairly early, well, a combination -- maybe I shouldn't say this, because Brian will probably correct me on it, but the fish try to maintain an egg size, so if fecundity is going down in order to put the resources into fewer eggs and maintain egg size. But we've seen both very large runs with large size and very small runs with small size, so I think the expression of size and, thus, fecundity, is something that is a marine-derived issue, but not so much the density-dependent.

Q *Dr. Walters, in another conversation with me, you expressed the issue about reducing fishing or increasing fishing in terms of the precautionary approach; do you recall that discussion?*

DR. WALTERS: Yes.

Q Could you perhaps put the debate or the issue that we've heard about over the last two days in terms of the precautionary approach?

DR. WALTERS: Well, the precautionary approach, it appears in our management systems in two ways; the original definition of it involves the avoidance of irreversible harm. And in that traditional definition, irreversibility refers primarily to avoiding extinction in stocks. But we used the term, also, to refer to adjustments we make in management to reflect the uncertainties we have, so there are adjustments to escapement goals on the Fraser, routinely, that I don't think anybody argues aren't needed, especially in recent years.

There's an escapement add-on to allow for the possibility of pre-spawning mortality. So the escapement goal would be set above what we think the fish will actually reach the grounds to allow for that. Those risk adjustments, or precautionary adjustments, are felt by the fishermen directly as a reduction in harvest. So you can think of them as essentially a risk premium, a loss catch risk premium that is imposed on the fishery.

I think one problem we have in our management systems is that we did not pay enough attention to whether the risk premiums that our fishermen must bear are reasonable and fair and necessary. They have been very large, in recent years.

Q I was referring, Dr. Walters, to a question about the precautionary principle as it applies to the return to the historical levels of the production of the Fraser River.

DR. WALTERS: You came to a seminar of mine, and you heard me say this, I believe, that I don't know what is precautionary right now in the Fraser.

The simple fisheries idea of precautionary management is when you're not sure, reduce the harvest, try to increase the spawning stock size. But in the presence of possibly strong delayed density dependent effects, that may do more harm than good.

And in Jim Woodey's world of cyclic dominance, precautionary management is not to increase escapement, it's to prevent the breakdown on the cycle. That's what he would call the risky decision option. I don't think we even know, anymore, what it means to be precautionary in the Fraser sockeye management system.

Q *Dr. Woodey, would you agree with Dr. Walters' description of what your description of the precautionary principle in these terms would be?*

DR. WOODEY: Mr. Commissioner, from my perspective, the attempt to so-called rebuild stocks, off-cycle stocks, and so on, that carries, then, the precautionary line idea, is probably not well, at least, if not -- not wrong.

There are certainly issues that need to be looked at seriously by good scientists as to whether or not risks are increased by not being precautionary in actuality. And as Dr. Walters is pointing out the protection -- well, I'll point out that the protection of the dominant line escapement should be the principle goal for any individual stock, and that attempting to modify fishing regulations in order to build up offline, particularly the lower lines of Shuswap and Quesnel, can backfire by the fact that you've got this delayed density dependence issue, and it can then feed back on us on affecting the dominant line production.

Just on that issue, evening out the four lines, which was part of the original strategy that DFO undertook several years ago, to our thinking would mean that you would simply be causing the predator populations to become more stable and larger and thus increase the overall predation rate and reduce the productivity of the stocks overall, compared to what we get with the cyclic dominance pattern.

MR. LOWES: Thank you. Those are my questions. And may I say to the whole panel, it's been a privilege and a pleasure to listen to you over the last day and a half.

MS. GAERTNER: Mr. Commissioner, would you like to take the afternoon break before I get started? I'm totally in your hands on that.

THE COMMISSIONER: I don't mind you starting, if you're comfortable with that.

MS. GAERTNER: All right.

MR. TAYLOR: Mr. Commissioner, Ms. Gaertner's kindly let me just mention and refer to you an exhibit. A number of the panellists have, this morning, and elsewhere in these hearings, referred to Sue Grant's paper, and I just wanted to have one of the witnesses - I think Dr. Riddell might be the easiest - to see the cover of Exhibit 184 and see if he can identify that as what's been spoken of, just so you've got a reference to what they were referring to when they speak of Sue Grant's paper. Now, I appreciate that's only the cover. Is there something that we can take you to, Dr. Riddell, that would allow you to pick out whether that's what you and others have been referring to?

DR. RIDDELL: No, the cover's fine. That's the paper.

MR. TAYLOR: All right. So that's Exhibit 184, Mr. Commissioner.

DR. WALTERS: That's the WSP CSAP doc?

MR. TAYLOR: Yes.