Wrap-Up Presentation Given at the Conclusion of the Workshop

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Let me start by thanking Dick Beamish and Nancy Davis for inviting me to participate in this workshop. I am humbled to be asked to summarize this great collection of papers and presentations by the world's leading experts on Pacific salmon. It's a daunting task, and I'm likely to miss many important points, but let me offer a few comments anyway.

The Workshop is on "Explanations for the High Abundance of Pink and Chum Salmon and Future Trends." Our very first speaker presents a reasonable explanation for the current high abundance of both pink and chum salmon that we are seeing in North America and also on the western side of the North Pacific Ocean and Bering Sea. To be really successful, a cohort needs both good conditions for near shore early growth and survival, and good winter feeding conditions. Dick Beamish noted that Bill Ricker himself fifty years ago had pointed out the futility of looking for that single unique cause that was a universal driver of salmon cohort success. Rather, we were instructed to look for the cause or causes that were affecting (maybe differently) each individual stock.

Dick Beamish had an interesting thought that perhaps pink salmon have a different energy strategy than other salmon species in that they use the energy they consume in the juvenile stages near shore to grow at the expense of storing energy for overwintering. I find this quite intriguing and note that he was among the presenters who gave us some idea of something new we might examine to increase our ability to predict future trends.

He also suggested that a possible venue for advancing the science would be for the scientific community to have an International Year of the Salmon and I would suggest that is worthy of consideration by the salmon user community.

I want to contrast the attention to tiny detail, every area is different, each stock has its own special need, with the idea brought up in several papers that basin-wide inputs such as regime shifts, or maybe even global-wide inputs such as global climate change might over a time scale of decades overwhelm the micro-ecosystem effects of the near shore juvenile rearing area. Kentaro Morita and other presenters noted that warming climate or increasing temperatures in a relatively long term warming cycle may have differential negative impacts on those species that spend more of their life history in fresh water. While it is difficult for us to accept a time will come when cold water will be unavailable to salmon in the ocean, it is easier to imagine that some salmon rearing rivers and lakes will lose cold water salmon habitat. Thus, those species, like coho and Chinook, with a relatively long fresh water stage may not do as well during warming trends as those species that have a relatively short fresh water stage, such as pink and chum salmon. And, while this workshop is for pink and chum, I think that research designed at monitoring fresh water success is necessary. Smolt production estimates are difficult and expensive, and so have often been discontinued. Technology may provide some innovative ways to monitor out–migrants. I suggest that this is a fruitful area for research.

Throughout the two days of the workshop, density dependency, or competition for food, or carrying capacity arose in many papers. The topic is treated rather gingerly in this polite collection of scientists. With six species of salmon, hundreds of wild stocks, and hundreds of hatcheries with nearly as many production protocols dictating time of release, size of release, and volume of release, it is very difficult to produce the definitive study on this question. One presenter even suggested that migration routes may be different dependent on the density of other stocks in what might be called the "normal" foraging area. Do chum really leave the Bering Sea if pink salmon show up in great abundance? We saw numerous papers here correlating growth and survival of one species with the abundance of some segment of some other species. The confounding circumstance that arises from the great variation in stocks on the commons has prevented a conclusion on whether there is likely an over-all expectation of decreased productivity in any run due to enhanced productivity of some other run. Part of the answer here lies in the ability to identify the hatchery or stream of origin of salmonids obtained by research vessels or observers aboard commercial vessels. Much work has been completed on this, but the expansion of base lines and the development of more precision in identification of stocks are important. I am particularly intrigued by the idea of parental based tagging brought up by Bill Templin. Using parent stock genome characteristics to identify offspring results in potentially free tag placement (but not, of course, tag reading.) A better understanding of spatial distribution seems key to answering the density dependent growth and survival questions. It also would allow a slightly different line of inquiry into examination of interaction with other species (groundfish) and, don't say this out loud, interaction with other fisheries.

Suam Kim suggested that we have enough indication of changes in productivity that it is incumbent on the scientific community to seek an audience with policy and managerial types. I looked around the audience to see who those people

might be and I suppose I am the only one that is so identified here, so maybe the message is for me. Randall Peterman went even further to suggest that we needed a new construct for international cooperation. I note that some in the audience warned of the potential downside of dealing with policy and mangers while there is still much uncertainty around the effects of climate change, or while there is still much uncertainty about a finite reachable carrying capacity. I would recommend that consideration be given to finding a way to begin a non-threatening dialogue with the managers towards the idea that strategic planning and strategic preparedness is a good thing. Policy types run models as well as the population scientists and for the same reasons. They allow the exploration of scenarios that might exist, or might never exist, or at all costs should be avoided. And without any suggestion for research, I would note that it is usually easier for managers to discuss allocations in time of good stock production, rather than when those stocks are in decline.

Dr. Radchenko (I think–though my notes are often not very clear, and my memory is clearly suspect) had a clever cartoon of a Duracell battery as he noted "it's all about the energy." Many of the presenters here had a focus on energy, and clearly that is the driver we are interested in. It would be interesting to see if, and at what stage, animals exhibit a prey preference. I know that if you use the wrong color hoochie, you aren't going to catch a Chinook salmon. So, at some stage a preference for prey can be made by salmon. Laboratory experiments might shed light on whether or to what extent young fish can avoid low energy plankton, seek high energy plankton, or if they really just eat what they encounter.

Finally, based on Michio Kishi's presentation, I make a strong recommendation to eat salmon.

This is what I have.

Thanks again to Dick and Nancy and the organizing committee for the invitation to attend. Thanks to all the presenters for the mental stimulation. Thanks to the staff for arranging this fine, fine venue for this workshop.