

**Testimony of**  
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**before the**

**U.S. House of Representatives Committee on Resources**  
**Subcommittee on Water and Power and Subcommittee on Fisheries, Conservation, Wildlife**  
**and Oceans**

**held in the**

**Longworth House Office Building Washington D.C.**

**May 27, 1999**

My name is James J. Anderson; I am an Associate Professor in the School of Fisheries at the University of Washington. I have studied Columbia and Snake River salmon for fifteen years, and my research group, Columbia Basin Research, is engaged in quantitative analyses of factors affecting the decline of salmon and the actions being taken to recover the runs. I am a member of the Plan for Analyzing and Testing Hypotheses (PATH) Group. In my testimony I discuss my personal experiences and observations as a member of the scientific community assessing the effectiveness of dam breaching as an action to recover endangered Snake River salmon. My remarks reference and supplement the last three statements of House Concurrent Resolution 63.

**Hydrosystem survival**

HCR 63 states:

Whereas recent studies by the National Marine Fisheries Service indicate that the survival rates of salmon and steelhead migrating down the Columbia and Snake River system have stayed the same or increased since 1961, even as four dams were added to the Snake River:

The level of juvenile salmon survival migrating through the hydrosystem is a critical and direct indicator of the impact of the dams on the fish and the potential benefit of removing dams. If survival through the present day hydrosystem is high, then there is little direct benefit of dam removal, but if the survival is low then there is some benefit. In either case though, removing the lower Snake River dams is not enough, on its own, to recover the fish. Recent NMFS PIT tag studies, which represent the best and most accurate measurements of hydrosystem survival, indicate that juvenile spring chinook survival is high and comparable to passage survival prior to adding the lower Snake River dams. As the dams were added in the 1970s poor passage conditions and dam operations produced survivals below 10% in many years of the decade. By comparison, survival today is about 50%. The conclusion that can be draw from these observations is that serious passage problems associated with adding the Snake River dams have been remedied.

If the hydrosystem survival is now the same as it was prior to the construction of the dams the question arises why are the salmon not recovering? Irrespective of the complexity of this issue the answer comes down to two basic choices: either it's nature's fault and the stocks are low because of poor climate and ocean conditions, or it's our fault and the salmon runs are not recovering because fish are dying in the ocean because of something we have done to them in freshwater. If it's nature's fault then dam removal may be of little or no benefit, and it may ultimately be detrimental to the fish because it would divert valuable resources away from other salmon recovery efforts. If it's our fault, then dam removal is only of benefit if the major cause of the fish mortality in the ocean is a result of fish passing through the hydrosystem. If the ocean mortality results from other factors such as hatchery fish over production, over harvest, or poor rearing habitat then dam removal does not address the problem.

### **The uncertain PATH**

HCR 63 states:

Whereas the Federal interagency group known as the Plan for Analyzing and Testing Hypotheses Group [PATH] concluded that removing four dams on the lower Snake River could not guarantee meeting established fish recovery targets for fishery restoration;

Before dams are breached, there should be good evidence that the current operation of the hydrosystem is the problem, and there should be a good understanding of how breaching the dams will improve the survival of fish in the ocean. This has been the task of the PATH scientists, and as HCR 63 notes, PATH can not guarantee that dam breaching will meet the established fish recovery goals.

PATH itself is an experiment that is applying a number of analytical techniques relatively new to fisheries science in which complex fish passage and life-cycle models are combined in a formal Bayesian decision analysis framework. The work has been fast-paced in order to meet the 1999 deadline, and I am amazed at the amount of information and analyses that PATH scientists have assembled in a very short time. The work is extensive and a real contribution to the overall understanding of the system. The PATH facilitators and staff should be commended. At the same time I am also critical of the process for what I feel has been its inability to clarify fundamental issues and uncertainties (Anderson 1999). I believe the structure of PATH under-represents the uncertainty in the science. In the process, nearly 5000 hypotheses on survival over the salmon's life-cycle stages were combined into a single modeling system. Four scientists comprising a Scientific Review Panel (SRP) reviewed thousands of pages of documents and individually weighted the hypotheses. These weights were put into a decision analysis which then gave probabilities of recovering fish under two basic actions: dam breaching vs. transportation. In this extreme reduction of information the intuition and understanding of what the models do is difficult to extract. As a result there is a danger that readers of the PATH reports and summaries will mistakenly believe the analysis has high degree of certainty and interim documents are final conclusions.

This problem is readily illustrated by the reaction to the 1998 PATH annual report. A number of groups and individuals stated publicly that PATH concluded that dam removal was the best option. Others went further by assuming that the scientific review was complete and it was time

to get on with dam removal. It is important to realize that the public documents of PATH are not final reports, do not represent a consensus of opinion by PATH scientists, and do not represent a complete analysis of the important factors contributing to salmon decline and recovery.

Furthermore, PATH is not the only group evaluating Columbia River salmon recovery. Prior to PATH there were reports from the Snake River Recovery Team, the National Academy of Sciences, the Independent Scientific Advisory Group, and the soon to be released NMFS Appendix to the US Army Corps of Engineers Lower Snake River Juvenile Salmon Migration Feasibility Study. There are also formal processes in addition to PATH including: the Framework process by the Northwest Power Planning Council and the Federal Caucus which is responsible for the development of a Biological Assessment and a Biological Opinion on the operation of the Federal hydrosystem. The point is that other analyses are being conducted inside and outside PATH. PATH is conducting an extensive analysis, but it was never intended to be the only analysis.

The uncertainty of the PATH results are illustrated by the evolving views expressed by the SRP. In the weighting of the hypotheses in 1998 the SRP concluded that the hydrosystem, not climate, deserved higher weight as an explanation for the stock decline. Having continued to follow the scientific literature (about 20 scientific papers on the climate regime shift have been published since the 1998 PATH report) one of the members (S. Saila 1999) stated:

I wonder whether the article in Fisheries Vol. 24 No. 1, 1999 by Soltare et al. entitled *Inverse Production Regimes: Alaska and West Coast Pacific Salmon* would have influenced the SRP position on climate forcing of some aspects of salmonid production in the Columbia system.

Dr. Saila also expressed additional concerns of the PATH analysis stating:

Finally I still wish to express some personal reservations regarding the Bayesian simulation model and the inferences drawn from it. These are related to the structural uncertainty introduced by the complexity of the BSM model,....

A second SRP member expressed a concerns for PATH's prediction of a high recovery probability under dam removal. C. Walters (1999a) stated:

What this concern means is that I no longer trust your assessments about the range of uncertainty in recovery predictions under alternative policies, in particular I do not trust your findings that there is a very high long term recovery probability under the dam removal options (where passage models become the dominant factor causing differences among policies in predicted performance). I suspect that after some reflection, you are going to have to admit considerably greater uncertainty about whether even these extreme measures will do the job.

When several PATH members asked for a clarification of this Walters (1999b) replied:

I don't trust any of the recovery predictions at all, under either option. This arises from seeing that none of the mean trajectory predictions would be for continuation of historical decline, meaning there is a basic (and quite possibly wrong) optimism somewhere in the survival calculation chain independent of passage models.

These remarks echo what I and some other PATH scientists have concluded. There is no clear linkage between hydrosystem passage routes and ocean mortality for spring chinook, and the prediction that any action, dam removal or increased transportation will insure recovery is unrealistically optimistic. The PATH reports and presentations unfortunately give the impression that dam breaching is a simple fix for salmon recovery. I suggest that the public and congress should also consider the possibility that salmon recovery is a long process in which a multitude of actions will have to be addressed and only a few will incrementally contribute to the major determinants of stock fluctuations, which are the complex yearly to decadal scale patterns in climate.

### **Good News?**

HCR 63 states:

Whereas improved fish hatchery processes, including fish acclimation processes, have resulted in the first successful run of coho salmon on the Yakima River in 3 decades:

Finally, following the Resolution's note on the success of the Yakima River coho run, note that a number of indicators suggest that a shift into a cool/wet climate regime may be occurring. These include: a series of above average precipitation years including this year, the wettest year on record; a Gulf of Alaska current pattern typical of a cool/wet regime; declines in Alaska salmon catches, which historically correspond with an increase in west coast catches; and a record return of Columbia River jack salmon this year.

If a regime shift is in fact occurring it is possible that the salmon stocks could begin increasing irrespective of any human actions. This would not mean that recovery efforts should be stopped though, but I suggest it allows the region time to act with reasoned consideration instead of being forced into desperate actions that may ultimately limit and diminish the future ability to recover salmon.

### **References**

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