Committee on Resources

Statement

Testimony of James J. Anderson
Associate Professor, School of Fisheries, University of Washington
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Committee on Resources
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This testimony considers the recent analyses of juvenile Snake River endangered salmon in terms of the new information on ocean conditions and fish returns. Also discussed are possible recovery actions reflecting these new conditions.

My name is James Anderson; I am an Associate Professor in the School of Fisheries at the University of Washington. My research over the past two decades has involved Columbia River salmon and the influence of the hydrosystem and climate on the survival and productivity of the stocks. I wish to thank the Resource Committee for this opportunity to testify on the issue of Snake River salmon recovery.

Today our efforts to restore declining salmon runs are at a cusp. We are poised to make major decisions that will affect the future of the Pacific Northwest, its people, its economy, and the state and health of the environment. In the Columbia River Basin there has always been conflict between economic development and the health of the fish and wildlife. Science itself has been in conflict, as well as the personal beliefs of those who wish to use the abundant resources of the Basin, and those who wish to preserve them. These debates provide the evidence and arguments from which we seek guidance for the future.

The salmon runs have decline over the past two decades to levels never seen in recorded history. We have seen the National Marine Fisheries Service, empowered with the force of the Endanger Species Act, assume a level of control and influence over the Pacific Northwest probably unparalleled since World War Two. And we now face a decision that may set in motion a reversal of the very way we inhabit our environment, changing the balance between a resource-extracting economy to a resource-preserving economy.

It is not my concern to suggest how these forces balance; my concern is how we use the science upon which this balance must be based. In this respect I believe were are at a critical moment. The science that projects the fate of Snake River salmon is contradictory; more important, it is significantly at odds with the state of the fish runs today.

After five years the regional analysis of the status of the runs, the Plan for Analyzing and Testing Hypotheses (PATH), has concluded that breaching the lower Snake River dams is required to insure recovery of the Snake River chinook. This conclusion is contradicted by the NMFS Cumulative Risk Initiative (CRI April 2000), which concludes that salmon are in a *dire condition* and breaching alone will not recover them.

The PATH conclusions are based on salmon returns up through brood year 1990; the CRI conclusions are based on runs up through 1994. These analyses are based on data that is not representative of the current conditions, and their predictions forecast a future that is substantially different from what has occurred and what is likely to occur.

Most significantly, the CRI and PATH analyses do not reflect the possibility that the ocean can shift quickly into a regime favorable to Columbia River salmon. In contrast the North Pacific marine science community's recent findings show that large-scale fundamental changes in the North Pacific have occurred. Although scientists are cautious in making predictions, there is widespread speculation that these changes indicate a regime shift in the ocean.

Finally, and most compelling, are the returns of fish to the Columbia River. The data, succeeding the data used in PATH and CRI analyses, show substantial returns of fish. The returns of jack salmon this year are well on their way to record levels, which, if continued, will produce a record return of salmon in 2001.

In simple terms, society has been presented with three very discordant possible futures: breaching dams will recover the runs, breaching dams will not recover the runs and finally, the runs are poised to reach record levels right now. Before I discuss the possibilities and pitfalls of this unusual situation I will discuss in a little more detail the basis of each of these predictions.

The contradictory conclusions of PATH, CRI, and the actual current fish runs occur because the analyses must to rely on information up to a specific point in time. But since studies are updated each year, and the ocean itself is changing, the analyses are always historical snapshots of the system. In particular, the spawner-recruit information used in these models is especially out of date. The offspring from a brood year return two to five years after the parents spawn, so information on the relationship of spawners to the recruits that make up the next generation is only available well after the brood year. Besides the spawner-recruit information, new information on the survival of fish through the hydrosystem suggests new interpretations of the sources and levels of mortality over the fish life cycle. These factors are important to the stories evolving from the analyses, and are discussed below.

What juvenile survival studies say about the efficacy of fish barging

Currently, the vast majority of Snake River fish that enter the estuary arrive via fish barging. Since fish survive the barging trip, the choice to barge fish or breach the dams comes down to which is greater, the delayed mortality associated with barging or the mortality of in-river migrating fish that must pass four breached Snake River dams and four lower Columbia River dams. Ultimately, the comparison of these two passage routes depends on estimating the delayed mortality, and this is not easy. It requires us to know the survival of juveniles passing through the eight dams of the current hydrosystem, the ratio of the adult survivals of transported fish to in-river passing juveniles (called D in the analyses), and an assumption about the cause of the extra mortality fish experienced after 1976. This final assumption is key in deciding the effectiveness of barging vs. dm breaching, because the life cycle analysis indicates that after 1976 fish experienced an extra mortality that may be attributed to an ocean regime shift or to the completion of the Snake River hydrosystem.

PATH favored assumptions that ascribed high delayed mortality to transportation. First, PATH assumed that in-river survival was low, about 25%. This resulted in a low survival of transported fish relative to in-river passing fish (D about 0.3) and low extra mortality. With these assumptions, the transported fish survival, before ocean mortality is taken, is about 30%. Estimating survival through the breached hydrosystem is relatively straightforward, and PATH concluded that the survivals would be about 60%. Thus, breaching was assumed to be significantly better than transportation.

The CRI analysis used the most updated smolt survivals obtained from studies in 1995 through 1999 plus the transportation studies from 1995. The in-river survival was about 50% and the resulting D value was about 0.8. In this case, survival of transported smolts, excluding the ocean mortality, is about 80%. Therefore, transportation is better than breaching, with its 60% passage survival. But since CRI concluded the transportation survival was high, the extra mortality fish experienced post-1976 was attributed to extra mortality outside the hydrosystem. Furthermore, they suggested that extra mortality was likely uncontrollable, so that only a concerted effort on many fronts could recover the salmon, and that without this effort many Snake River index stocks were at a high risk of extinction.

What the recent fish returns say about the ocean conditions

Spawner-recruit data through 1994 presents bleak picture for the salmon. Fortunately, the newest information on the status of the runs and the ocean suggest a very different situation. Data from 1997 through 1999 show dramatic improvements in ocean survival and adult returns.

Ocean survival was good in 1997: Survival of wild Snake River spring/summer chinook has improved by a factor of three or more over the returns of the early 1990s. Based on returns of the 2-ocean fish, smolts migrating in 1997 have a smolt to adult ratio (SAR) of 1.55% (Williams personal communication). The return of the 3-ocean fish should increase the SAR to 3 or possibly 4%. In comparison, SARs in the early 90s were about 0.5%. Further evidence comes from the ratio of early returning males (jacks). The percent of jack returns from the 1997 smolt outmigration is twice the 1992-1996 average. (DART 2000)

Ocean survival in 1998 should be better: The percent of jack returns from the 1998 smolt migration is twelve times the1992 -1996 average. (DART 2000)

Ocean survival in 1999 may be the best yet: For this year, jack returns through April 20 are 925% of the ten-year average.

Good survivals in the ocean for the smolts migrating in 1997and 1998 equate to good returns this year. This is, in fact, the case: the adult spring chinook passage at Bonneville dam through April 20 is already greater than the average run over the entire season for the 10-year average. Further, the one-day maximum of 8635 adults is nearly equal to the entire 12,000 spring chinook return in 1995. The returns from 1995 came from the 1992 and 1993 out-migrations, which figured significantly in the estimations of conditions in both the PATH and CRI analyses.

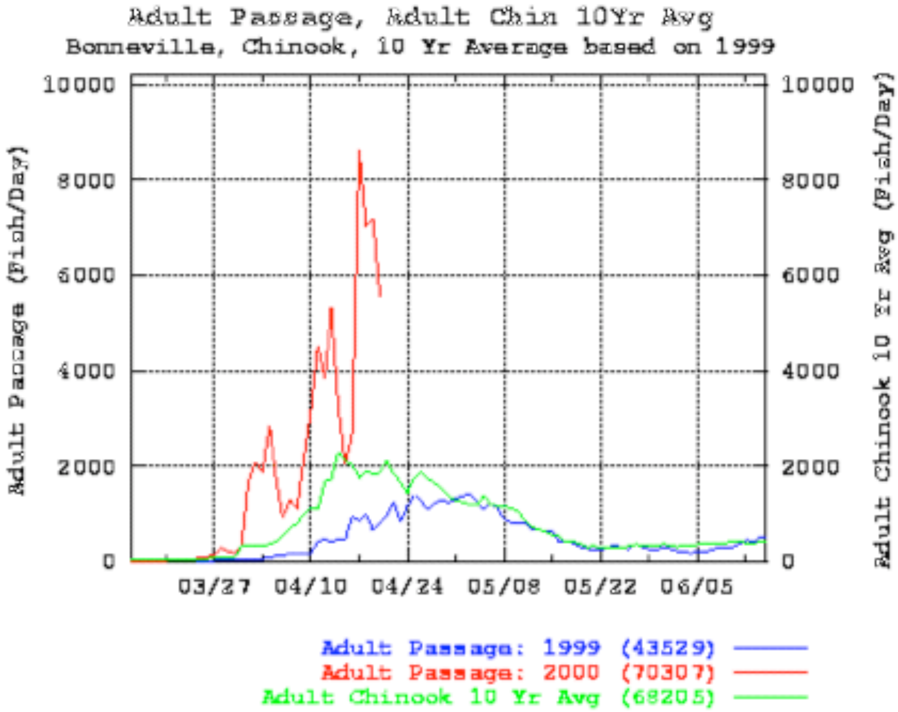

Figure 1. Spring chinook adult passage at Bonneville Dam. Through April 20 the returns for 2000 are about 10 times the 1999 returns, while the 1999 returns through June 15 are about twice the 10-yr average (From DART).

Finally, the record returns of jacks last year and returns this year, that through April 20 are ten times the 1999 returns at this date, we expect the adult returns for 2001 and 2002 will be very large, if not near record.

Corroborating evidence from the ocean

The ongoing hypothesis is that these returns are the result of the Eastern North Pacific returning to the cool surface water regime favorable to Columbia River salmon (Anderson 2000, Hare and Mantua 1999). There is evidence for this.

Zooplankton species changed: Off Oregon "warm water" zooplankton species common year-round throughout most of the 1990s were consistent with weak, but persistent, El Niño conditions throughout this period. However, in May 1999 "cold water" species dominated solely. The switch may be ephemeral, due entirely to the present La Niña, or it could be a harbinger of another climate shift in the northern California Current (Peterson 2000).

The ocean is cooler: The Pacific Decadal Oscillation index (PDO), which is an indicator of ocean regime shifts (Hare, Mantua and Francis1999), exhibited a major shift into the negative condition favorable to west coast salmon production. The reversal in 1998 is representative of cooler coastal waters off the Columbia River.

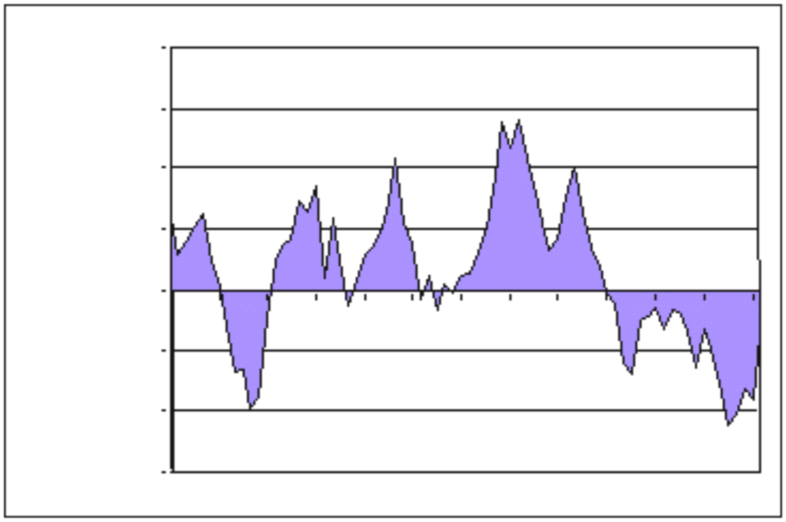

Figure 2. Monthly PDO pattern showing a reversal in the ocean conditions. This reversal may possibly indicate an ocean regime shift.

The cool ocean should persist: The eastern North Pacific region is under the influence of cold surface temperature anomalies that will persist beyond the current La Niña. These conditions will result in the fertilization of surface layers (Freeland 2000).

A regime shift: Scientists at the Jet Propulsion Laboratory in Pasadena, studying the satellite observations of Pacific sea-surface data, have observed a multiple-year trend that may represent an ocean regime shift (JPL 2000). Many reports from the March 2000 conference of the North Pacific marine community (PICES 2000) support this suggestion.

What to do next?

The CRI analysis suggests that the stocks are in a dire condition requiring immediate and extensive measures to keep them from going extinct. The fish returns themselves suggest that over the next few years, and possibly longer, the stocks will be abundant. These divergent predictions challenge NMFS and the region to carefully reevaluate their recovery strategies. While the region has been actively debating dam removal, additional flow augmentation, and moratoriums on water withdrawals in the Pacific Northwest, this new information presents a very different set of challenges and considerations. Below are three actions that warrant further consideration under the possibility of increased returns.

Separate Harvest

First and foremost NMFS must be prepared for the increasing demand for harvest of these returning stocks. Although it is good that this year's returns are strong and even larger returns are possible in next year, this does not necessarily bode well for the wild stocks. The runs may reach the levels of the runs of the 1960s and 70s, but whereas before they were mostly of wild fish, today about 90% of the run is of hatchery fish. Increasing harvest on the abundant hatchery runs can overharvest the weaker wild runs. If this happens, the benefits of good ocean conditions may be lost and we will have missed a valuable opportunity to improve the endangered stocks.

But it is not simply enough to restrict all harvest, because with improved ocean conditions the hatchery capacities can be exceeded, forcing the hatchery fish to spawn in the streams. Under some circumstances, this spawning might weaken the wild fish through interbreeding and competition for stream resources. Thus, ideally, the hatchery fish need to be selectively harvested, leaving the wild fish to spawn.

Effective selective harvest of hatchery fish requires two factors: all hatchery fish need to be marked, and live capture harvest techniques need to be used on the fisheries. Currently neither of these conditions is possible. A substantial number of hatchery fish are not marked and few of the fisheries use live capture techniques.

Reduce flow augmentation

To improve runs, other secondary actions can be taken immediately. One of the most straightforward actions is to terminate the Hells Canyon flow augmentation for fall chinook. This augmentation increases water temperature and increases the predation rate on the smolts (Anderson, Hinrichsen and Van Holmes 2000). Eliminating it should improve the survival of this run.

Improve hatchery practices

Increased ocean survival presents a special problem for hatcheries. Over the last two decades, hatchery returns have declined and so the hatchery managers have increased the production of smolts. Under better ocean conditions high smolt production can result in returns exceeding hatchery capacity, causing the adults to spawn in the river with the wild stocks. Although this may be beneficial for hatcheries with brood stocks that closely match their associated native stocks, it can be detrimental if the hatchery and native stocks are different. To deal with these problems, hatchery managers may need to reduce smolt output in the next few years and begin to aggressively improve hatchery management with the goal of producing smolts that are genetically and behaviorally compatible with the native stocks.

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