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TIPTOEING INTO SALMON RECOVERY. In February 2008 the National Marine Fisheries Service issued what they call a "Guidance" for salmon harvest management to the Pacific Fishery Management Council. The purpose is to execute commercial fisheries in a benign way so that at risk populations, especially those listed as threatened or endangered, get some protection so they can get on the road to recovery. Guidance is a suggestion and is not enforceable.

Harvest eliminates adult fish that would spawn and produce the next generation, so it is important, in order to continue to harvest, for enough spawners to get back to the rivers and make babies. Until most salmonid populations were listed as ESA protected species, the states ran the show on the ocean and in the river and we enjoyed harvest rates of 70 to 90 percent. Overharvesting wild fish was a concern but not a constraint. Wild fish did not matter much because the fisheries were managed to maximize the harvest of hatchery fish. Then the feds moved in and spoiled the game by listing the wild salmon, and took management authority away from the states. The states blustered and used some bad words, but had to follow federal laws.

Ocean salmon fisheries are managed by the Pacific Fishery Management Council with the approval of the U.S. Department of Commerce. In order to provide more protection for lower Columbia River tule fall chinook, ocean harvest has to be cut back.

In 2007 the NMFS guidance called for a 42% harvest rate on lower Columbia fall chinook (reduced from 49% in 2006). This was based on the health of some indicator stocks, but further checking turned up some other rivers that had less healthy fall chinook runs. The Grays River in SW Washington has a wild fall chinook run that is not very healthy. It is tiny, and in order for it to grow more abundant the harvest rate on fall chinook will have to be cut back even more. The Grays is not the only river with unhealthy fall chinook populations, so doing what is good for the Grays may improve the health of other fall chinook populations. After all, the purpose is to recover these fish.

The NMFS had a team of scientists evaluate the health of the Grays River fall chinook and they concluded that it was in such poor condition that no harvest would be better than just a little bit of harvest. The NMFS said in its letter to the PFMC "Results for the Grays River population were more pessimistic. With very low or even no harvest, the analysis suggested that the population would continue to be at risk." That's right: even without harvest the wild fall chinook would be at risk. The scientists ran some models to see how much harvest impact these fish could take. They come up with a "range of 0% to 20% with a subset of the preferred models suggesting a range of 0% to 8%.

Taking all this into account the NMFS, with its federal mandate to protect ESA-listed species, determined that the exploitation rate should be 41%. This is not a typo in their letter of guidance to the PFMC. Let's see, last year the exploitation rate was 42% - down from 49% in 2006 – and since last year they have found a bunch of wild fall chinook populations that would be at risk without any harvest, but decide to drop the harvest rate by only a measly 1% in 2008. What is the scientific justification for their decision?

NMFS is certain that over the "long-term" recovery of endangered salmon runs will actually take place, but in their guidance letter to the PFMC they assure all of us that "NOAA Fisheries expects that further reductions in the harvest of naturally-spawning fish may be required," but not in 2008. It's a long-term process.

HATCHERY REARING CHANGES CHINOOK. Three published studies zero in on changes in hatchery reared chinook and compare them to wild chinook. They found that hatchery chinook are changed by hatchery rearing; they diverge from the wild form in ways that affect their physical form, behavior, and survival.

Wild salmon and steelhead home to specific spawning streams, their home stream, and the resulting genetic isolation make them different from fish spawning in other streams. This results in genetic and life history divergence among populations.

Hatchery rearing exposes salmonids to novel environmental conditions that are very different from rivers. As one scientist put it, the only thing wild and hatchery salmon have in common is water. Even their mates are selected for them and they do not have to go through courtship to get their eggs laid. So the hatchery experience changes the salmon and they diverge in important ways from the wild salmon.

In a published paper by Wessel et al. (2006), hatchery chinook that have experienced five generations of hatchery culture were compared to wild chinook. The results showed a change in body form. The hatchery fish had a more streamlined body while the wild fish had deeper girth. In order to successfully breed a hatchery swims to the hatchery, so the streamlined form is very important. A wild salmon body is built for burst speed, mate selection, fighting, and nest building in rocks, so the girth and length are important.

The hatchery and the river select for traits that allow the salmon to perform successfully in each environment, but they are not interchangeable without further modification. It's like putting a Chevy engine into a Toyota, they are both cars but for the engine to work effectively, modification becomes a huge requirement. It can be a lot of work and it is not always worth it.

The second paper also published in 2006 by Knudsen et al. takes a close look at the first generation changes in hatchery chinook when compared to the wild form in the Yakima River. Using hatchery fish to supplement wild salmon has not been fully tested and the Yakima spring chinook hatchery was approved to test this theory.

In the Columbia River Basin there are about 200 hatchery programs and a third of them are considered supplementation hatcheries. The effect of hatchery fish on wild fish is a primary issue, especially when the affected population is protected under the Endangered Species Act. Increasing the deliberate breeding between wild and hatchery origin salmonids as a conservation measure before it is evaluated can lead to some serious conservation problems. Some of those problems are reduced survival and reproductive success. The Knudsen et al. study "describes the integrated hatchery program targeted on the upper Yakima River and reports on differences between wild-origin and first-generation hatchery-origin fish at several adult life history traits: age and sex composition, size at age, and migration and spawning time."

The question is whether these first generation changes in hatchery fish are the result of hatchery rearing practices or genetic changes. Changes in life history of salmon can be due to environment and it can also include genetic changes. Both can cause reduced survival and reproductive success. In theory, it is easier to fix a response to environmental changes because the response has not changed the structure of the animal. A genetic change affects the structure and integrity of the salmon. Hatcheries can cause both kinds of changes. What is not known is whether the changes being described - changes affecting survival, fitness, and reproductive success – are a response to a novel environment or a more serious change in salmon genetic structure.

In this study the author's say "…the first-generation hatchery returns in this program differ from their wild counterparts at size at age, age and sex composition, and spawning timing. These differences are large enough to potentially have some effect on fitness…perhaps the most important observation to be derived from this study is that hatcheries do not produce fish that are identical to wild fish, even in a program designed to minimize the differences between the two production groups."

The third paper, published in 2007 (Busack et al.) looked at the changes in body form between adult wild and first generation hatchery chinook in the Yakima River. They found that "relative to wild fish, hatchery fish have longer (and possibly deeper) heads, longer anterior bodies, and shorter posterior bodies. They also appear to be more slender in the midbody region…and wider fins."

Compared to the study by Wessel (2006) where the chinook that were examined had been exposed to hatchery cultivation for four generations and the "wild" used for comparison were from naturally spawning hatchery fish, the Yakima study used chinook that were "free of hatchery influence." Because the hatchery fish in the Busack et al. study were first-generation fish and changes in these fish could be primarily phenotypic effects rather than genetic changes.

The authors did note that "Survival rates to adulthood for wild smolts are typically 1-3%, and for hatchery smolts less than 1%." This could mean that changes in first generation hatchery fish have an effect on fitness which means the fish had lower survival and consequently lower reproductive success compared to wild fish. The stated purpose for using hatcheries to supplement wild salmonids is to increase the number of naturally reproducing fish.

When hatchery fish survival is lower than wild fish yet the wild fish are used as an egg supply, the hatchery could be mining the wild run for eggs to produce juveniles that will not survive as well as the wild salmon. The usual response that the hatchery advocates make is that hatcheries can release more smolts because they are reared in a protected environment, so even though they have lower survival, the number of adult spawners is increased. The question still remains one of fitness and the effect of naturally spawning hatchery fish with wild salmonids.

The authors conclude by saying "The significance of these differences is unclear, but their implications for population productivity need to be better understood as we proceed with the use of conservation hatcheries to sustain anadromous salmonid production."

Sources:

Busack, Craig, Curtis M. Knudsen, Germaine Hart, and Paul Huffman. 2007. Morphological differences between adult wild and first-generation hatchery upper Yakima River spring Chinook salmon. Transactions of the American Fisheries Society 136:1076-1087.

Knudsen, C.M., S.L. Schroder, C. Busack, M.V. Johnson, T.N. Pearsons, W.J. Bosch, and D.E. Fast. 2006. Comparison of life history traits between first-generation hatchery and wild upper Yakima spring Chinook salmon. Transactions of the American Fisheries Society 135:1130-1144.

Wessel, M.L., W.W. Smoker, and J.E. Joyce. 2006. Variation of morphology among juvenile Chinook salmon of hatchery, hybrid, and wild origin. Transactions of the American Fisheries Society 135:333-340.

STEELHEAD GHOSTS OF THE SNAKE. Bill McMillan is doing some deep dig research on the history of Columbia River salmon and steelhead runs and the places where they use to be. This is article is not recommended for those that are not resistant to flashes of anger and malice.

I came on an interesting historic reference from Evermann (1896) from discussions he had with commercial fishermen on the Snake River system and tributaries in 1894. The report is in a U.S. Fish Commission Bulletin, Vol. XV, for 1895, by Marshall McDonald, Commissioner, from the Government Printing Office in 1896. 2.--A Preliminary Report Upon Salmon Investigations in Idaho in 1894.

From the information provided, it appears that Snake bound sockeye, spring chinook, and steelhead all began to collapse from 1878 onward. This was also documented from several sources at Kettle Falls and on the Spokane River for fish bound to the Upper Columbia. The collapse particularly plummeted from 1883 onward. Regarding magnitude of collapse, at Big Payette Lake sometime in the 1870s there was a harvest by one commercial fisherman at the lake of 75,000 sockeye. Other fishermen were salting down 30,000-40,000 pounds each year to feed the mining camps in the 1870s (avg. cleaned sockeye weighed 2.5 lbs so 12,000-16,000 sockeye per fisherman). One fisherman interviewed who had been there the entire time indicated repeatedly there were "millions" of sockeye that returned to the lake. There were minimally 100s of thousands and his claim of millions may not be much of an exaggeration. 1894 was the first return of any numbers of sockeye for several years, although only a few thousand were observed.

In the same Payette system, steelhead also returned and were harvested primarily in Payette River but also many spawned at outlets of the several Payette Lakes. Of particular interest was the size of the Payette steelhead. From the report of Mr. W.C. Jennings who lived in the headwaters of Payette River and was a commercial fisherman, he described its steelhead:

"The salmon trout come up Payette River about April when the water is high. Never saw any above the lake. They will bite a hook occasionally. They will weigh from 5 to 30 pounds; have heard of them weighing as much as 40 pounds, but they probably do not average more than 10 pounds. I think they come up from the sea and that they do not die, but return to the sea or at least go down stream when the water gets low."

These would most certainly be B-run type steelhead typically identified with the North Fork Clearwater River historically. The Payette is entirely a different system from the Clearwater.

In other areas of the Snake system:

Mr. F.C. Parks, Sawtooth, Idaho, describes more typical A-run type steelhead of upper Salmon River:

"The salmon trout come to the Alturas Lake region about May 5, and are seen up to about June 10. Some spawn in Salmon River and Alturas Lake outlet, while others go up into the inlets where they probably spawn on the same gravel bars used later by the redfish...Their noses get hooked and some sores appear later. Have seen some dead ones, but do not think many die. They are of various sizes, not in two sizes as the redfish are (he is referring to 10" kokanee compared to 4-5 lb sockeye). The largest I have seen would weigh about 14 pounds, the smallest about 2 pounds, while the average weight is probably nearly 8 pounds. They are becoming less abundant each year. The small ones are very scarce. We catch them with spears and grab hooks. They will sometimes take a hook baited with their own spawn tied up in mosquito bar. About one-third of those we get are females. Their eggs are about the size of those of redfish. Color: Along middle of side as red as the redfish; back, steel-color; the female has less red and is more silvery."

Mr. B.S. Brown of Bliss, Idaho in the headwaters of the Salmon River indicates the more typical A-run steelhead in the Redfish and Stanley Lake region:

"The salmon trout arrive April 1 or earlier. They spawn in April, going up into the outlets of the lakes and sometimes using the same spawning-beds which the dog salmon (local name for spawning chinook) use in the fall. They stay here at least until May 15. The largest I ever saw weighed perhaps 12 pounds, the smallest 4 or 5 pounds. I never saw many dead ones; they probably all go back to the sea."

Another fisherman, Mr. William O'Brien, of Weiser reported from the Weiser River and Snake River (northwest of Boise) where the steelhead were not so large:

"I first noticed these fish here about 18 years ago, but they are now more abundant than the chinook salmon (that had gone into severe decline). They come up early in September and remain in Snake River until about April 10, when they run up into the smaller streams to spawn. Do not think they spawn in Snake River. I think they spawn from April 15 to about May 10. Never caught any ripe salmon trout in the river. Six years ago my catch of salmon trout was about 18,000 pounds, or about 2,250 fish, the average weight being about 8 pounds. Since then they have decreased, so that last year I got only about 8,000 pounds, or 1,000 fish. But there are more fisheries now than there were a few years ago, so that the decrease in salmon trout is more apparent than real. We get them in the river from September 1 to December 1, and again in April..."

There are many more interviews in this interesting paper that provides a pretty good picture of the Snake River situation and the chinook, sockeye, and steelhead that once returned to areas where they are now extinct. The rapidity of the decline from the 1870s to the 1890s is phenomenal.

It would appear from the descriptions that the steelhead were particularly abundant near the areas of sockeye productivity (Weiser River had some reports of river sockeye, but none otherwise and seemed to have less steelhead than the Payette and upper Salmon). It is possible the steelhead declines were as much related to loss of sockeye as from harvest. The steelhead numbers, nevertheless, did not decline as dramatically as did sockeye and chinook in most areas of Idaho from what I gather from this early paper from Idaho. Bill McMillan

PROTECT DAMS FROM SALMON - BUY OFF THE TRIBES. The tribes have turned their back on stewardship of wild salmon recovery by agreeing to not legally enforce environmental laws associated with dam operations such as water temperature and gas bubble disease or dam removal as a necessary salmon recovery action. By joining the Bush administration salmon team, the tribes are getting $94 million for hatcheries that have already been scientifically discredited as a recovery tool, and $32 million for habitat that will not compensate for the salmon kill at the dams. This rate payer gift to the tribes can be added to the $9 billion already spent on salmon recovery with no measurable benefit. Thankfully, the Nez Perce Tribe has forbearance and not signed on to the salmon buy-out. At least not yet.