

Future of the CWT Program: Challenges and Options

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Workshop Background and Charge to the Panel

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Introduction: why are we here?

This workshop is happening because our ability to properly manage salmon fisheries and the salmon resource is rapidly deteriorating, and it's all the fault of mass marking and mark selective fisheries.

OK, that was an intentionally provocative statement, and it's probably wrong. However, I can say that this workshop would not be happening if everything was moving along just fine. The fact is, we undertook the time and expense of organizing this workshop and assembling this distinguished panel of scientists to address some very serious issues in the world of salmon management. We prepared and/or gathered together an impressive number of background papers and presentations to inform the deliberations of the panel. We have enlisted the help of many scientists to take time from their busy schedules to come to the workshop, listen to presentations, consider the various issues, and recommend solutions. With luck and hard work, this might work.

My assigned task is not to get into the scientific issues; others will do that in great detail. The purpose of this paper [talk] is to provide some background information to set the context for the workshop and help it be successful. Also, according to the agenda, I'm supposed to provide a "charge to the panel." Because that seems more interesting, I'll attempt to do it first. The background information will then follow.

Defining success: charge to the panel

I've given a lot of thought to defining "success" for this effort. To some degree, the fact that this workshop is occurring at all is one important indicator of success. Some of us have tried for the last few years to sound an alarm over the perceived deteriorating state of what I call our "fishery management infrastructure." It's sometimes not easy to get high level attention to things like data systems, tag recovery rates, cohort analysis problems, sampling program deficiencies, inter-jurisdictional data coordination, and those sorts of topics. They just are not the kind of issues that tend to grab the attention of policy makers. So, the fact that we were able to get the resources to have this workshop, and have a lot of attention focused on the issues that are the subject of this workshop is one form of success.

Another indicator of success is the caliber of the people we have brought together for this workshop. The scientists we now have focused on this problem bring a variety of perspectives

and expertise, yet as a collective they are different from certain other scientific panels we have seen lately. This group includes expert practitioners involved in the application of coded wire tag (CWT) data to real-world salmon management challenges. Others are geneticists working on the cutting edge of applying the latest DNA-based techniques for stock identification. Still others are experts in statistics and population dynamics. Some are experts in more than one of these fields – two-fers and three-fers (maybe even some four-fers). But none of them is interested in ivory-tower pronouncements criticizing salmon management practitioners. All of them are here, I believe, because they have a genuine professional interest in helping to make the workshop successful. (It surely wasn't the money!)

But as satisfying as these two indicators of success might be for some of us, they will not be the ultimate measure of our contribution. So, what is? What will success look like? We did not have a paper prepared on this particular topic (don't know how that one got by us). The fact is, we might have very different opinions about the matter. But since I have the podium, let me take a few moments to outline what I define as "success" in this context. Later, I'll provide some of the obligatory background information.

At the end of this process (which extends well beyond this week's workshop), our hope is that the expert panel will produce a report, one that will have very real and significant impacts on the current CWT program that is implemented by agencies coastwide. Predictably, the report will have several sections. Perhaps one will contain a history and overview of the CWT program, a description of how it has been implemented, and how the data are used for fishery management and stock assessment purposes, particularly in the Pacific Salmon Treaty context. Another section might describe the specific scientific problems or issues that have arisen in recent years, probably with a specific focus on the consequences of mass marking and mark selective fisheries. As interesting as those sections might be, we did not go through the trouble of organizing this initiative simply to document events, or just to establish that we have some difficult problems to solve. Rather, we undertook this initiative, which only begins with this workshop, to help define the coastwide fishery management and stock assessment infrastructure of the future, and the steps needed to put it in place.

From my perspective, then, the success or failure of this workshop and subsequent follow-up efforts will be defined by two primary criteria: (1) the extent to which the report produced by the panel contains practical recommendations for effective solutions to the perceived shortcomings of the CWT program as it exists today; and (2) the extent to which the recommendations actually are implemented by the management agencies in a coastwide, coordinated manner. My hope is that the deliberations of the expert panel ultimately will result in a set of consensus recommendations addressing the first criterion. To the extent those recommendations are scientifically sound and practical, it will be up to us in the salmon management community to develop a coordinated plan to implement them.

As to the substance of the expert panel's recommendations, nothing is presumed, and several different outcomes are possible. We are not here necessarily to replace the CWT program; in fact, I think that is a very unlikely outcome, at least in the near term. We do not have to define success by the extent to which we make a total paradigm shift away from reliance on CWT data. In fact, the panel's advice may focus entirely on ways to tune up or enhance the current CWT program, perhaps as a way to mitigate the problems that will be discussed here, such as those caused by mass marking and mark selective fisheries.

Or, the panel may conclude that we should replace, over time, all or specific major parts of the current CWI program with alternative technologies. Perhaps a scaled-back version of the current CWI program will be maintained, and only for more limited purposes like hatchery studies, rather than as a coastwide indicator program to represent other stocks or stock groups.

Or, the panel may land on a combination of these outcomes. It could recommend steps to bring new technologies online and incorporate new analytical approaches over time while phasing out all or parts of the CWI program. Or that we enhance implementation of components of the existing CWI program, such as tagging or sampling rates, during a defined transition period.

Whatever the advice turns out to be, the report will have to make a compelling case. The logic behind recommended changes and their benefits must be clear, particularly if they involve new fiscal resources. If we are to succeed in implementing the report – of meeting my second criterion of success – then the recommendations must enjoy a high degree of acceptance by the agencies that are responsible for their implementation. As you know, it's difficult to effectuate changes to long-entrenched programs. One of the follow-up steps to this workshop will be to vet a draft report with the agencies who ultimately must implement it, to get their comments and gauge their reactions. In the end, the final litmus test for success will be the degree to which any recommendations coming out of this process are implemented in a coordinated, coastwide manner by the salmon managers.

So that's what success would look like to me. It's a tall order, to be sure, and whether or not we can pull it off remains to be seen. But I hope that everyone agrees that the basic measures of success encompass these objectives. Now, for the obligatory background information...

Background: developments affecting the CWI program

Over the past thirty years or so we have constructed an elaborate and interdependent fishery management and stock assessment scheme that is heavily reliant upon data comprised of CWI recoveries. Billions of CWTs have been placed in salmon over the years, mostly in chinook and coho salmon. And, through an elaborate, coastwide sampling program that sifts through escapements and catch in fisheries far and wide, millions of CWTs have been recovered. Over time, we have accumulated what surely must be one of the most extensive fishery management data sets found anywhere in the world. This data set is analyzed and manipulated with increasingly complex models and algorithms; the results of these analyses provide the backbone of our system for managing chinook and coho salmon fisheries coastwide. The data and models have become so inextricably intertwined with our regulatory and management regimes that I sometimes wonder whether the models inform our decisions, or whether some of our decisions are made to conform to the models.

Mass marking and mark selective fisheries are not the only causes of problems with the CWI program. In the early 1990s, a number of factors converged and began to negatively affect the program. These included a general decline in survival rates for many stocks, particularly natural stocks. This led to management actions that reduced fishery exploitation rates in mixed stock fisheries to maintain escapements of naturally spawning chinook and coho stocks. With less fishing comes less sampling; why invest limited resources in fishery sampling programs when the fisheries are small or closed? As a consequence of these factors, fewer numbers of CWTs were being recovered in many mixed stock fisheries, resulting in increased uncertainty over the

quality of CWT data and the reliability of inferences that could be drawn from CWT-based analyses.

Unfortunately, these trends were occurring just when greater demands were being placed on the CWT system for even more detailed information and greater precision in its estimates. These demands stemmed from the need to use CWT-based statistics to establish management objectives and monitor fishery impacts on natural stocks that were listed under the U.S. Endangered Species Act (ESA).

The emergence of mass marking and mark selective fisheries in the mid to late 1990's served to exacerbate concerns over the CWT system which had already attracted the attention of CWT analysts, but had not yet reached crisis proportions. The ad-fin clip had long been sequestered to enable samplers and fishers to clearly and efficiently identify fish which contained a CWT. However, for the purpose of enabling mark selective fisheries, the preferred method of mass marking also is to remove the adipose fin. It's an easy and inexpensive mark to apply, has a relatively small and consistent impact on survival rates, and provides a readily identifiable visual cue that allows people to easily distinguish between hatchery and wild origin fish without killing the fish. New technology has been developed to automate the process of mass marking and/or inserting CWTs into large numbers of hatchery-produced chinook and coho. Because the adipose fin clip no longer signifies whether a CWT is present, it is no longer possible to rely on it to identify which fish carry a CWT. This effectively ended the stream of CWT recoveries that relied upon voluntary recoveries by fishers. By necessity, the system of visual recovery of tags had to be replaced with something else. Thus, the technology was developed to detect CWTs electronically. The technology, which must be used by trained samplers, has been deployed throughout many, but not all of the coastal sampling programs. Electronic detection technology is expensive, and has its own set of problems that will be touched on at this workshop.

Mass marking with the adipose fin clip does have the added benefit of facilitating the identification of hatchery fish in spawning escapements. By addressing the "masking" problem caused by the presence of an unknown proportion of wild-spawning hatchery fish in naturally spawning populations, mass marking can improve our ability to assess and monitor the status of natural populations. This assumes, of course that people are actually out there surveying the spawning populations to see how many hatchery fish are there.

Interest in mass marking and mark selective fisheries really came to the forefront when constraints imposed for conservation of natural stocks, particularly listed stocks, reduced the ability to catch otherwise-harvestable hatchery fish in many mixed stock fisheries. The diminished capacity to harvest hatchery fish increased political pressure on the budgets for many hatchery programs at a time of increasing fiscal austerity. "Why produce the fish if they cannot be harvested?" became both a legitimate question and a compelling argument for change in our fishery management regimes. Not surprisingly, several management agencies increasingly began to turn to mass marking and mark selective fisheries, if not as an answer to the conservation problems of weak natural stocks, at least as a valuable tool for sustaining important fisheries in the face of wild fish constraints.

When a sufficient proportion of mass marked hatchery fish are present in a fishery, regulations that allow only marked fish to be retained by fishers become effective. The unmarked, presumably natural origin fish must be released. Although some of the unmarked fish that are released will die because of the experience, or in subsequent fisheries, the approach is premised

on the expectation that most of the released fish will survive and contribute to spawning escapements.

This notion of using mass marking and mark selective fishin to sustain fisheries is so appealing to some that it recently found its way into federal legislation in the United States in the form of an appropriation bill for the U.S. Fish and Wildlife Service. This legislation directs the Service to "...implement a system of mass marking of salmonid stocks, intended for harvest, that are released from Federally operated or Federally financed hatcheries including, but not limited to fish releases of coho, chinook, and steelhead species. Marked fish must have a visible mark that can be readily identified by commercial and recreational fisheries." As a consequence of this legislation, many millions more chinook and coho salmon originating in the Pacific Northwest will be mass marked, almost certainly using the adipose fin clip. The train of mass marking and mark selective fisheries is moving rapidly down the tracks, and doesn't look like it will be stopped anytime soon.

Focus: primary concerns of the Pacific Salmon Commission

So this is where we find ourselves today. Mass marking of salmon is mandated by law or policy. Mark selective fisheries are rapidly expanding, presumably applying harvest rates on hatchery fish that, by design, are different than unmarked natural fish. Sampling rates in many fisheries are diminished due to insufficient funding and/or changed priorities at the management agencies. The de-sequestering of the adipose fin clip means that the recovery of CWTs now depends on expensive, sometimes problematic electronic detection technology, yet that technology is not deployed throughout the range of fisheries (e.g., Southeast Alaska). Taken together, these factors have resulted in questions regarding the continuing utility of the CWT and associated sampling regimes and analytical tools.

Of particular concern to the Pacific Salmon Treaty and to the Pacific Salmon Commission is the effect on the indicator stock program. Mass marking and mark selective fisheries have compromised our ability to rely on hatchery stocks to represent wild stocks. Because hatchery fish could be consistently and inexpensively tagged in large numbers every year, we have long relied on the indicator stock program to represent the migration and mortality patterns of wild stocks. Wild stocks and their associated hatchery indicator stocks were assumed to go to the same places in the ocean at about the same times, and suffer the same fishery-induced mortality rates.

So important was the CWT program that, when the Pacific Salmon Treaty was negotiated in 1985, a special MOU was prepared that obligates the United States and Canada "to maintain a coded-wire tagging and recapture program designed to provide statistically reliable data for stock assessments and fishery evaluations." In the early 1990s, when mass marking and mark selective fisheries were in their infancy, the Pacific Salmon Commission found itself at the center of heated policy and technical debates over these issues.

Some of the parties involved in the Commission process wanted from the beginning to preclude or greatly limit mass marking and mark selective fisheries for a variety of reasons. One of these was the belief that the policy would negatively affect the viability of the coastwide CWT program, and thus be inconsistent with the MOU. The opponents of mass marking and mark selective fisheries were not successful; the trend toward mass marking and mark selective fisheries has continued and accelerated. The proponents of mass marking and mark selective

fisheries have compelling arguments on their side as well, such as the desire to support fisheries even when natural stocks cannot withstand harvest, and the need to justify the costs of producing hatchery fish in the first place, particularly when budgets are so tight. They also point to the potential benefit of improving status assessments of natural stocks.

Fortunately, enough consensus had emerged among the entities involved in the Pacific Salmon Commission for it to take steps to get out in front of the issues, to help its membership identify the consequences of mass marking and mark selective fisheries and, hopefully, to develop workable solutions. In the mid 1990's, the Commission established an ad-hoc Selective Fishery Evaluation Committee, which later became the permanent Selective Fishery Evaluation Committee (SFEC). The SFEC was charged initially with investigating the potential consequences of mass marking and mark selective fisheries on the viability of the CWT system. One of its first contributions was to define CWT program viability in technical terms, i.e., it defined it as the ability to use the CWT system to draw inferences regarding fishery impacts on wild populations associated with CWT release groups. This means, specifically, the ability to rely upon the CWT system to generate estimates of fishery specific exploitation rates by stock and age class. These inferences rely heavily on cohort analysis based on recoveries of CWTs from tagged hatchery fish and, most importantly, on the assumption that the wild fish experience the same fishery mortality patterns as their associated hatchery indicator stocks.

Another contribution of the SFEC was the development of the double index tagging (DIT) approach, an attempt to preserve to some extent certain attributes of the original CWT program, specifically the ability to estimate total mortality attributable to mark selective fisheries. The SFEC also developed a process and protocol, adopted by the Commission for notifying affected parties about plans for mass marking and mark selective fisheries and facilitating bilateral evaluation of those plans. Though imperfect in its implementation to date, this process is hugely important for maintaining one of the key attributes of the coastwide CWT program: coordination among affected salmon managers and fishery analysts.

On the other hand, arguably the most disappointing aspect of the SFEC's work – and not coincidentally one of the main reasons this workshop is occurring – has been its inability to solve certain of the specific analytical problems caused by mass marking and mark selective fisheries. Most notably, this includes a procedure for estimating fishery mortality on wild unmarked fish in mark selective fisheries.

Conclusion

I have little doubt that other observers would bring a different emphasis to certain aspects of my description of the events that led us to this point. And, others may have different views on what we hope to get out of this effort. However, I hope my description is accurate enough to set the stage for this workshop, to establish context for the important work that we undertake for the next several days and the weeks and months to follow. There will be plenty of opportunity to elaborate, or even to correct, my descriptions of the problems or my statement of expectations. So, let's get on with it.