STATE OF THE SALMON

KNOWLEDGE ACROSS BORDERS ЗНАНИЕ СКВОЗЬ ГРАНИЦЫ 国境を超えた知識

To: The Marine Stewardship Council (MSC) and Scientific Certifications Systems, Inc.
Date: July 29, 2005
Re: Submission of Comments on MSC's Evaluation of Alaska Salmon Fisheries with emphasis on hatchery effects on wild stocks

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The State of the Salmon Consortium (www.stateofthesalmon.org) is a joint program of Ecotrust and the Wild Salmon Center. Our mission is to support a knowledge network across the countries of the North Pacific that will help people understand the condition of salmon and contribute to attempts to sustain salmon biodiversity in perpetuity.

In response to the opportunity for public comment, State of the Salmon is submitting comments on the Marine Stewardship Council evaluation of commercially harvested Alaska salmon. The first stage of this assessment— the draft units of certification and scoring guidelines— is available for public viewing and comment at www.msc.org.

SUMMARY OF FINDINGS AND RECOMMENDATIONS:

1. We recommend a comprehensive, statewide review of existing information on hatchery production, mixed stock catch, and impacts on wild fish, expanding on the analysis done for Southeast coho salmon by Stopha (2000).
2. We recommend a long-term study on homing and genetic structure of pink salmon populations in southeast Alaska. For example, Auke Creek could be examined as a case study to determine the possible effects of hatchery straying on wild stocks of salmon in southeast Alaska.
3. The source of uncertainty in many recent studies focusing on hatchery impacts is lack of understanding of the root causes of population dynamics. We feel it is critical to develop meaningful dialogue between scientists working on these ecosystem scale studies and ADF&G biologists and managers.
4. We recommend an in-depth analysis of cases where harvest operations targeted on hatchery fish have over harvested mixed wild populations.

Alaska Salmon MSC certification: Comments regarding evaluation of hatchery effects on wild stocks

While it is clear that intensive sea ranching of Pacific salmon can have both direct and indirect effects on wild fisheries and ecosystem dynamics, the explicit mechanisms that allow us to resolve cause and effect as well as the magnitude of the effect is a matter of substantial uncertainty among scientists and managers. The historic dialogue on the effects of hatchery Prince William Sound pink salmon on wild stocks demonstrates how difficult it is for the scientific community to achieve consensus on issues that have great implications on how we manage fisheries (Hilborn and Eggers 2000, Wertheimer et al. 2001). Our interest in commenting on the issue of assessing hatchery impacts in the context of the ongoing AK

MSC certification is not to take a position on whether sea ranching may have impacts on wild fish stocks, but rather to help guide the process in a way that sheds light on the issue in a constructive manner. The State of the Salmon program is an independent organization with a mission to develop a knowledge system that will help draw more rigorous conclusions regarding the status of wild salmon populations throughout the North Pacific. The inability to resolve the issues surrounding hatchery impacts on native salmon is due to lack of data appropriate to evaluating the available hypotheses, therefore a constructive approach is to identify the information necessary to make progress.

As outlined in our first correspondence, we remain assured that the criteria and scoring guidelines applied to the issue of hatchery impacts are explicit, comprehensive and fair, and that the scoring and review will be conducted in the most objective manner possible by ADF&G and SCS. We see the process as an opportunity to improve critical aspects of current monitoring practices. Better information will inform debate, and provide a means to voice our concerns about the way data and information are organized and analyzed to help guide salmon management in this region in the future.

Below we outline five main issues that we feel are not currently addressed adequately by ADF&G. We present these issues and highlight some key points for the review panel to consider. We hope our comments will be used constructively during the evaluation process.

Issue #1: Better data on wild and hatchery stocks. (Relates to Indicators 1.1.1.5, 2.2.5, and 3.1.10)

There is very little definitive data that can be used for determining the degree of impact of Alaskan hatchery programs on wild fish. First, since many hatchery fish are unmarked, or marked fish go unidentified in natural spawning areas, the criteria of identifying hatchery fish is often unmet (indicator 1.1.1.5). It is therefore difficult to manage their harvest to avoid adversely impacting the diversity, ecological function, or viability of wild stocks that are mixed with hatchery fish (Indicator 1.1.1.5).

For example, an important point of contention and uncertainty in recent years is the issue about reliable data on productivity of wild stocks of salmon, particularly pink salmon in PWS, where wild stocks are known to intermingle with hatchery stocks. It is our understanding that ADF&G monitors 209 index rivers in the greater PWS region. The majority of this monitoring is based on aerial surveys that are known to provide qualitative data on stock status. Further, it is unclear whether this monitoring program provides representative data on the status of wild stocks throughout the region. Likewise, there is uneven monitoring of both wild and hatchery stocks for other species and regions. We feel these are important issues that need to be evaluated with regard to certification.

In southeast Alaska, it is our understanding that little progress has been made since 1996 in addressing the lack of quantitative salmon stock assessment data noted by Baker et al. (1996) and by Wertheimer (1996), except in transboundary rivers covered by the Pacific Salmon Treaty. Although salmon stock definitions are somewhat arbitrary, we believe it is fair to say that statistically bounded estimates of

annual salmon abundance do not exist for the majority of identifiable salmon spawning populations in southeast Alaska. Without statistically bounded estimates of annual abundance, status and trends of these wild populations cannot be determined in relation to hatchery practices or other human activities. Similarly, the degree to which these salmon populations may be reasonably aggregated into stocks for the purposes of harvest management is difficult to evaluate without quantifiable status and trends information. While otolith mass marking of hatchery production provides the means to understand the proportions of wild salmon harvested in all harvest areas where samples are taken, it does not provide the critically important estimates of the numbers of wild salmon escaping these fishing areas to spawn. Only quantitative stock assessment projects can provide such estimates, and the number of these projects for populations outside transboundary rivers appears to be declining. As a basis for discussion, we ask what proportion of identifiable wild salmon spawning populations have statistically bounded estimates of a) escapement and b) total annual production. It is critical that information on both hatchery and wild populations be available for assessment of the impacts of hatchery operations on wild fish (Indicators 2.2.5 and 3.1.10). We recommend a comprehensive, state-wide review of existing information on hatchery production, mixed stock catch, and impacts on wild fish, expanding on the analysis done for Southeast coho salmon by Stopha (2000).

Baker, T. T., A. C. Wertheimer, et al. (1996). "Status of Pacific salmon and steelhead escapements in southeastern Alaska." Fisheries (Bethesda) 21(10): 6-18.
Wertheimer, A. J. (1996). Status of Alaska salmon. Pacific Salmon and Their Ecosystems: Status and Future Options. R. J. Naiman and D. Stouder. New York, USA, Chapman Hall: 179-198.

Issue #2: Extent and potential impact of hatchery introgression (Indicators 2.2.5 and 3.1.10).

Very little research has been conducted on hatchery straying and introgression in Alaska. Some recent studies have documented significant straying of hatchery salmon into rivers in close proximity to hatchery locations (Joyce and Evans 2002). While this is known to occur, we are not aware of any published studies on whether this straying has resulted in significant introgression that could result in loss of genetic diversity and fitness in wild populations. We feel it is imperative to conduct studies to determine the extent and magnitude of hatchery introgression. There are a variety of approaches that can be taken to address this issue, including direct observations of spawning behavior among fish of known origin, tagging and telemetry studies, and genetic parentage analyses. Other laboratory-based studies could be focused on loss of fitness resulting from wild*hatchery crosses. These types of studies are critical for evaluating the real impacts of intensive hatchery operations conducted in close proximity to wild populations.

Some studies conducted for other purposes might be re-analyzed to infer the potential rates of introgression in southeast Alaska, using pink salmon as a model. For example, in a study of the effects of oil exposure on straying rates in pink salmon conducted in southeast Alaska Wertheimer et al. (1999)

measured straying rates as a function of distance from the Little Port Walter hatchery facility. Straying rates to streams were found to be inversely proportional to the distance of the stream to the hatchery, as might be expected. The magnitude of these straying rates combined with annual return figures for hatcheries might be investigated as a means to infer annual levels of putative introgression.

Similarly, ongoing investigations in southeast Alaska at Little Port Walter hatchery into the genetic changes in domesticated chinook salmon and steelhead relative to wild donor stocks (Thrower et al. unpublished) may be able to provide information on the potential magnitude of hatchery effects for other salmon species by inference. Other long term studies on homing and genetic structure of pink salmon populations in south east at Auke Creek (Gharrett, Smoker, et al.) should be examined for applicability to questions of determining the possible effects of hatchery straying on wild stocks of salmon in southeast Alaska.

Wertheimer, A.C., R.A. Heintz, J.F. Thedinga, J.M. Maselko, A.G. Celewycz, R.F. Bradshaw, and S.D. Rice. 1999. Effects of oiled incubation substrate on survival and straying of wild pink salmon, Exxon Valdez Oil Spill Restoration 11 Project Final Report (Restoration Project 98076), National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Auke Bay Laboratory, Juneau, Alaska. (NTIS No. PB2000-108560)

Issue #3: Partitioning sources of variability driving wild and hatchery stock dynamics and appreciation of ecosystem processes (Indicators 2.2.5 and 3.1.10).

The source of uncertainty in many recent studies focusing on hatchery impacts is lack of understanding of the root causes of population dynamics. Interpretation of data on stock and population dynamics is often confounded by the existence of environmental variability (i.e. density independent variables) that can serve as key drivers, yet are not explicitly addressed in analyses. More rigorous analyses can be conducted when stock dynamics are placed in a broader ecosystem context. More recent analyses that draw on a broader array of biological and environmental data are improving our understanding of what drives population dynamics (e.g. Pyper et al. 2001; Werthheimer et al. 2004). Other approaches involving studies focusing on species interactions in the marine evironment may also provide more insight into population dynamics (e.g. Ruggerone et al. 2003). The suite of drivers includes basic physical processes (e.g. sea surface temperature, upwelling), biological patterns (e.g. plankton dynamics, predator populations) and fishery dynamics (e.g. catch, by-catch, gear impacts). Much work has been conducted recently in Alaska through NPRB and GLOBEC initiatives, particularly work by Haldorsen (UAF), Beauchamp (UW) and their colleagues. We feel it is critical to develop meaningful dialogue between scientists working on these ecosystem scale studies and ADF&G biologists and managers.

Issue #4: Marine competition between hatchery and wild fish (Indicators 2.2.5 and 3.1.10).

Evidence is increasing that the huge additions of hatchery fish, especially pink and chum salmon, to the North Pacific, from both Alaska and other jurisdictions, may be resulting in reduced survival and average fish sizes in both hatchery and wild fish (e.g., Cooney and Brodeur 1998, as cited in Boldt and Haldorsen 2004). The competition may occur within species or across species. For example, Hilborn and Eggers (2000) inferred that observed reductions of wild pink salmon recruits per spawner resulted from competition with hatchery pink salmon. Boldt and Haldorson (2004) found that both wild and hatchery pink salmon fry were subjected to the same feeding conditions in Prince William Sound. Ruggerone et al. (2003) found that massive releases of Asian pink salmon are likely to be causing reduced survival of Alaskan sockeye – the same effect may be manifesting from the huge numbers of pink salmon released into Alaskan waters. Additional circumstantial evidence that hatchery releases may be compromising the survival of wild Alaskan salmon includes the reduced average size of all five species of salmon in 45 out 47 stocks examined by Bigler et al. (1996). They speculated that the effects were due to increased enhancement and suggested that, if these smaller size trends continue, the productivity of salmon populations may decrease as fecundity, egg size, and age at maturity change in response.

Issue #5: Harvest of hatchery fish sometimes overharvests mixed wild populations

There have been numerous cases over the years where harvest operations targeted on hatchery fish have overharvested mixed wild populations throughout the range of Pacific salmon (e.g., Flagg et al. 1994). Althouh clear warnings of the impacts of high hatchery harvests on mixed stocks of wild fish were given early on (e.g., Helle 1981), some Alaskan fisheries have been persecuted to the detriment of wild fish, such as pink salmon in Prince William Sound (Geiger 1994). In-depth analyses, such as the one by Stopha (2000), should be conducted for all species, in all areas where hatchery production might influence wild populations.

In summary, there are a number of data and research needs for addressing the impacts hatchery production on wild Alaskan salmon populations. Wertheimer et al (2001) eloquently summarized the needs:

> "How can we determine if declines in wild stock productivity in PWS [and other regions of Alaska] are due to hatchery interactions or to some other ecosystem change? Both retrospective and empirical studies are needed. The retrospective population dynamics model of Hilborn and Eggers should be expanded to include a broad array of environmental variables. We are currently compiling historical data sets for such factors as temperature during different life history phases, spring zooplankton abundance, and predator populations in PWS to examine their effects relative to the magnitude of hatchery smolt releases on the productivity of the PWS wild stock…… Policy makers and managers need good information on the interactions of hatchery and wild fish to define better the impacts on wild populations, so that they can develop management policies that minimize the impacts while gaining the substantial benefits."

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