

Northwest Fisheries Science Center  
Resource Enhancement & Utilization Technologies  
Division  
2725 Montlake Boulevard East  
Seattle, Washington 98112-2097

21 August 2002

Northwest Power Planning Council  
Attention: Judi Hertz  
Response to ISRP  
851 SW 6<sup>th</sup> Avenue, Suite 1100  
Portland, OR 97204

Dear Ms. Hertz,

Enclosed are responses to the Independent Scientific Review Panel (ISRP) comments for Project 199305600 (Assessment of Captive Broodstock Technologies) under the Mainstem and Systemwide Province review process. The National Marine Fisheries Service (NMFS), Northwest Fisheries Science Center (NWFSC), Resource Enhancement and Utilization Technologies Division (REUT) has proposed continuation of this project because of the critical need to maximize productivity and minimize risks of captive broodstock programs for ESA-listed species. Please contact Barry Berejikian of my staff (360-871-8301) if you have any questions.

Sincerely,

Dr. Robert N. Iwamoto  
Director

cc: F/NWC2 - Flagg  
F/NWC2 - Swanson  
**F/NWC2 – Dittman**  
**F/NWC2 – Strom**  
**F/NWC2 – Hard**  
**F/NWC2 – Nash**

## **Response to the ISRP Preliminary Review of on-going BPA Project 199305600**

**Point #1:** The ISRP wrote, “We are concerned about the idea that adults produced through the captive brood program can be released to reproduce with wild fish in natural streams (Idaho stocks only). Our concern is that as a means to re-introduce these stocks to the natural environment, the approach is far too high risk given the value of these fish and perhaps inappropriate. Given the extent of assessments conducted-to-date and reported in this proposal, we would recommend an immediate stop to this activity (except on a small research scale) until it can be proven that the strategy has any merit. The only merit we can see to this approach is allowing the animals to participate in mate selection and hopefully to interbreed with other conspecifics. However, a much more responsible approach may have been to develop controlled flow environments (artificial or natural sections of streams) where the animals could be protected. Re-introduction of captive brood fish is a major issue associated with this rearing strategy but there should be some minimum standard of care taken given the importance of these fish and the investment made by the Basin!”

**Sponsor Response to #1:** We (the sponsors of project 199305600) do not decide which reintroduction strategies should be implemented. Reintroduction strategies for captive broodstocks are determined by the state and tribal agencies that operate captive broodstock programs for maintenance and recovery of ESA-listed populations. IDFG (1996) has described its rationale for adult-release as part of its “cohort replacement” program for Salmon River spring chinook salmon populations (BPA Project #199700100). Adult release is one of several reintroduction strategies proposed by the Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, and Washington Department of Fish and Wildlife for Tucannon River spring chinook salmon (BPA Project #200001900). The Stanley Basin sockeye salmon program also practices release of adults into Redfish Lake (BPA Project #199107200).

Research priorities (including research on adult releases) for Project 199305600 have been based on the needs of the agencies operating captive broodstock programs, so that the scientific results can be applied to improve captive broodstock technologies. In February 1999, we solicited advice from the regional state, tribal, and federal managers of captive broodstock programs through the Technical Oversight Committees for Stanley Basin sockeye salmon and Snake River spring chinook salmon. The TOC members rated research on problems associated with adult reproductive performance as one of their highest priorities. The need was re-emphasized in a workshop we recently convened on captive broodstocks for imperiled populations of Pacific salmon in June 2002.

The adult release strategy is specific to captive broodstock programs, and thus research on the topic is not being covered anywhere in the basin, except under this project. The research thus far conducted by NMFS indicates reproductive deficiencies in captive-reared adults (Berejikian et al. 1997, 2000, 2001ab), but has also begun to identify mechanisms by which performance might be improved (Berejikian et al. in review).

Without the research we have conducted thus far, there would be no published information on the natural reproductive capacity of captively reared Pacific salmon.

The adult release research is being conducted on a small (experimental) scale, as recommended by the ISRP.

**Point #2:** The ISRP wrote, “The other issue is minor and concerns the wording involved in the inbreeding study. The authors refer to “progeny of mates chosen at random – the control. However, our reading of the design would indicate that simply a random selection of returning adults (which would seem to ignore the use of the DNA pedigree data) would include some level of inbreeding accumulating in the control line. Is this correct or did the authors mean that their control would be composed of non-sibling relationships only? In these lines, these may be better described as an out-bred line, which would be an appropriate basis for comparison or control.

Another area where the authors could further contribute to resolving critical uncertainties in the use of captive broodstock and supplementation technology is in the modeling of the timeframe and scale of incurring inbreeding effects via supplementation and captive broodstock programs (decrease in fitness) versus the potentially counterbalancing “cleansing” effect of natural selection on hatchery-produced fish as they become part of a naturally spawning population. Fitness impacts on populations can occur quickly in the hatchery environment (as documented in the literature), however, little information is available on how quickly the accumulated genetic load can be shed by salmon populations as they spawn naturally and local adaptation occurs. The balance between these two processes, including the magnitude of genetic (fitness) change and the timeframes over which they occur, may be the fulcrum upon which the long-term success or failure of these programs hinges. Thus, a major uncertainty is on what timescale can this “readaptation” occur? Is it compatible with our goals for recovery / rebuilding or does the readaptation process occur so slowly that it represents a constraint on how captive brood and supplementation programs can be used?”

**Sponsor Response to #2:** The ISRP raise an issue that we failed to clarify adequately. It is our intent and has been our practice to compose the “control” line of individuals mated at random but excluding known full- or half-siblings. This is an appropriate basis for a comparison or control line, but we shall refer to it as an outbred line in future. Having said that, the utility of a randomly mated line with some degree of close inbreeding is not diminished so long as the degree of inbreeding is measured. It is the relationship between the rate of inbreeding and the expression of inbreeding that is important to characterize, and our analysis basically involves comparison of regression lines.

The issue of rate of readaptation is being addressed directly in an independent study, funded by the Hatchery Scientific Review Group, by Mike Ford and Jeff Hard of NMFS and Howard Fuss, Patrick Hulett, and Cameron Sharpe of WDFW on Minter Creek coho salmon (the proposal is attached). The inbreeding component of the captive broodstock project supported by BPA and reviewed here does not address this issue directly, but some of the data on inbreeding and inbreeding depression in the captive and released populations could be used to parameterize selection models during the process of

readaptation (genetic data from the study are already being used to seed selection models to look at harvest selection, as part of an independent inquiry).

**Point #3:** The ISRP wrote, “The budget description is again quite limited and includes two points for clarification: what is the 19% Leave surcharge and why are there costs under Other that again seem to be Indirect charges? The labor charges and cost sharing with NMFS needs clarification as this issue occurs in a few proposals.”

The leave surcharge covers holiday pay and vacation time. The Rents, Communications, and Utilities costs under the “Other category” include: 1) telecommunications for field stations (\$12.0K), 2) electricity for sea-water pumps, stream channel pumps, filter pumps, and chiller operation at Manchester Research Station (\$51.7), 3) site lease for Big Beef Creek (\$7.0K), and 4) printing, publication, and reprint charges (\$5.0K). The NMFS “in kind” labor contribution covers labor costs for NMFS personnel working on Project 199305600 that are not included in the proposal and therefore not covered by BPA.

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