Independent Scientific Review Panel
for the Northwest Power Planning Council
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April 17, 2001

Mr. Frank L. Cassidy Jr., Chair
Northwest Power Planning Council
851 S.W. 6th Avenue, Suite 1100
Portland, Oregon 97204-1348

Ref.: Review of NMFS Proposal "Evaluate Hatchery Reform Principles"

Dear Mr. Cassidy:

This letter constitutes the ISRP's review of the revised National Marine Fisheries Service's proposal "Evaluate Hatchery Reform Principles," which would test NATURES rearing techniques and release strategies at the Carson National Fish Hatchery. In the Fiscal Year 2001 Columbia River Gorge project selection process, the proposal received a "do not fund" recommendation from the ISRP after the response loop (Attachment 1). The Council's recommendation from the selection process was that Bonneville not fund the project. However, if the National Marine Fisheries Service (NMFS) required Bonneville to fund the study under the biological opinion for the federal hydropower system, the Council asked that Bonneville notify the Council and require:

1. The experimental design be again submitted to the ISRP and reviewed for a funding recommendation by the Council;

2. A comprehensive summary of NATURES research be presented to the Council, and;

3. NMFS should explain to the Council why this research need is not being addressed by the ongoing experimental design at the Cle Elum facility or the proposed design at the Nez Perce Tribal Hatchery.

Subsequently, NMFS revised the study design, and NMFS staff informed the Council staff that NMFS would shortly formally call for the study to be funded as a Biological Opinion measure. On March 22, 2001, Council staff requested the ISRP to review the revised study design with the intent that a prompt ISRP review would expedite implementation once a final determination is made by NMFS and Bonneville that the study does implement a Biological Opinion measure. The ISRP distributed the revised proposal to its Columbia River Gorge review team to determine whether the revised proposal addressed the ISRP's concerns and constituted a scientifically sound proposal that offers benefits to fish.

ISRP Final Recommendation
Fundable for 3 years of treatments; request additional clarifications before commencement of study.

ISRP Review Summary
The Columbia River Gorge review team (of the ISRP) continues to be mixed in their opinion on this proposal; but it is improved from previous presentations. After several reviews and discussions, however, we have narrowed our concerns to three issues:

(a) technical and scientific background related to the proposal,
(b) design and execution of the program, and
(c) budget details.

Technical and Scientific Background
Much of the text in the revised NMFS proposal relates to the development and testing of "conservation hatcheries" for the "restoration of wild stocks of fish" (page 2). The proposal continues to describe these hatcheries as having "a full complement of culture strategies *to produce very specific stocks* of fish in meaningful numbers" and/or to "produce a fish with *the equivalent genetic resources* of local native stock". These statements imply much more than proposed in this research and generate concerns about the appropriateness of the stock selected (Carson spring chinook) and design proposed.

For example, a potential problem with the project concerns selection of the Carson stock as the test basis for NATURES enhanced rearing in hatcheries. The Carson stock has a long history of use in Columbia Basin artificial production, and one can assume that it has been influenced by artificial selection within the hatchery environment and undergone some degree of domestication. Thus, the effects of a NATURES enhanced rearing environment on the Carson stock could be damped relative to the possible response of a wild stock, such are currently being used in the basin's supplementation studies. Further, one of the difficulties in the project's design has been its power for detecting differences between treatment and control groups. Potentially, the use of the Carson stock would reduce that power of detection as compared to a wild stock.

Second, the pressing application for this experiment is with regard to ESA listed stocks within the region's supplementation programs, such as those in the Grande Ronde, Clearwater, and Yakima systems. In the supplementation programs, progeny of wild returning adults are reared in a hatchery environment. For these fish, a NATURES enhanced rearing environment may reduce the selection effect of the artificial environment. Again, however, use of wild fish in the experiment, rather than a long-term cultured stock, could increase the likelihood of observing a positive response.

The Panel's assessment is that the proposal will examine our ability to alter the phenotype of Carson spring chinook through rearing in more complex and 'Nature-like" environments as a means to increase the post-release survival of these fish. In terms of hatchery reform the goal of this research seems most accurately stated on page 8:

> "A major goal of hatchery reform is development of culture methods that can be retrofitted to existing hatcheries with stocks that may be the product of generations of domestication as well as directed selection. …"

We agree that if benefits to survival can be demonstrated using the Carson stock then improvements may also be gained in production efficiency and allowable catches from other established hatcheries. We are less certain, however, about the applicability of these results to restoration of "wild" populations temporarily taken into a conservation hatchery for increased egg-fry survival. The authors of this proposal do note that this study will be complementary to other NATURES-type studies in the Basin.

Experimental design and execution

The Panel recognized that the experimental design had been revised and that two separate studies are now proposed: a fully factorial study of "enriched" environments (8 treatments x 3 replicates, 24 raceways) plus an anti-predator conditioning study (2 treatments x 6 replicates, 12 raceways independent of the other 24 raceways). A significant strength of this proposal is the ability to assess individual treatment effects (substrate, structure, and cover) plus all interactions between effects. The design is substantially clearer than previous drafts of the proposal.

The panel does however have continuing concerns about the power analysis presented in this proposal. Although the design has changed substantially from previous proposals, the outcome of the power analysis is exactly as presented in each of the past drafts. We **recommend** therefore that the authors document how the power analysis was conducted and what exactly is being compared in this analysis. This documentation need not delay proceeding on the proposal but should be reviewed to ensure that appropriate numbers of tags are being applied, etc. A further concern that is not discussed in the proposal is how the tags will be recovered in the spawning escapement. All fish will be coded-wire tagged to identify treatments … but how comprehensive will the sampling of escapement be? This is an important issue since fishery recoveries of spring chinook will be very limited and the vast majority of data recovered will be from the spawning escapement. Does the hatchery conduct extensive spawning ground surveys for tags or are chinook that enter the hatchery the only fish sampled from the escapement? If the latter, then significant numbers of tags will likely remain in the river and be lost to the study. Have additional resources been included in the budget for collection of coded-wire tagged spawners and the de-coding of these data?

Budget Details

The basic concern for the budget is the total cost and duration of the proposed study. We note that the budget associated with this revised proposal is slightly less than originally proposed but there is no detail for the basis of the change. Further, our understanding of

the cost are that NMFS is recovering approximately $450,000 in salaries, benefits and overhead, and that $250,000 will be directed to unspecified "subcontract" costs. This project would be one of the most expensive biological studies in the Basin and, in our opinion, merits substantially greater detail in this budget. A technical review committee is unable to assess value without explicit detail to justify these costs. Further, we recommend reducing the duration of these detailed studies (from 5 to 3 years) unless a stronger justification can be presented. We would expect however that results will be monitored annually and duration could be adjusted if necessary. Also, following the treatment years, we would expect to see a substantially decrease in the budget unless a justification can be presented.

Summary and Recommendation

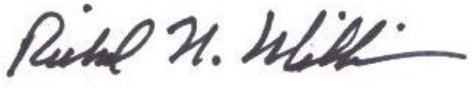
This panel believes that managers in the Basin will learn from the experiment and that it merits support. The study will be conducted at a production scale, addresses the issue of hatchery reform, and provides the most detailed investigation of effects yet undertaken of NATURES treatments. For these reasons, we recommend support of this revised proposal but only for three treatment years duration unless strong justifications can be presented for five years. We also recommend that further clarifications be presented to this Panel on:

i) the basis of the power analysis and plans for escapement recoveries; and
ii) a detailed description of the budget by activities and project through 8 years of the program.

This research should provide important insights into hatchery reforms. Many hatcheries may adopt NATURES techniques, and thus it would be good to test whether investments in these techniques are justified. However, completion of this research will require several years. Consequently, we would also recommend brief annual summaries be provided to the Council and NMFS to assist in future decisions on reform.

The Panel also wishes to express concern about the review process required for this proposal. We acknowledge the merit of conducting research at a production scale and the logistical difficulties of the design at this scale. However, given the proposing agency, the expertise of the principals, and the budget requested, we expected a higher quality of presentation. The principals in the NMFS proposal should be made fully aware that the Panel's response reflects our concerns for this presentation, as much as the merits of the research. We look forward to a higher level of leadership and presentation in future proposals.

Sincerely,



Dr. Richard Williams, Chair
Independent Scientific Review Panel

Attachment 1: ISRP Recommendation from the Columbia River Gorge Provincial Review (ISRP 2000-9; December 1, 2000).

ProjectID: 21024

Evaluate Hatchery Reform Principles
Sponsor: NMFS
Province: Gorge
Subbasin: Wind
Short Description: Investigate implementation potential of conservation hatchery principles at production hatchery scale using NATURES raceway habitat rearing, anti-predator conditioning, and growth modulation in a statistical design allowing partitioning of effects.
Sponsor Request FY01: $1,063,200
Sponsor Request FY01-03: $3,351,307
CBFWA Recommendation: Recommended Action
ISRP Recommendation Compared with CBFWA's: Disagree, Do Not Fund
ISRP Final Recommendation and Comments:
Do not fund until an experimental design is adequately presented. The reviewers current understanding is that the revised design (point number 2 in the response) replaces the design described in point 1. The proposal appears to still be evolving as the response contains errors. The original proposal, the presentation, and the response each offer a somewhat different approach to the project and its research objectives. The reviewers found the iteration in the response to be promising. The project would provide useful information, albeit in the long-term, on hatchery reform with basinwide applicability. The experimental design is carelessly presented, although it contains many of the basic elements of a sound experimental design. The proposed new experimental design involves more treatment types; thus the power analysis as presented needs to be modified to reflect the new design.

CBFWA Comments from DAIWP: *More definitive results from NATUREs studies should be available prior to initiating a large-scale production investigation. Fund after a rigorous summary of all applied NATUREs studies has been presented to CBFWA AFC to provide a better justification for work. This project potentially meets a RPA of the 2000 Draft Biological Opinion (9.6.4.3 Actions to Implement Recommendations in the NWPPC's Artificial Production Review).*

ISRP Preliminary Recommendation and Comments:
Fundable only if the response adequately addresses the ISRP's concerns. Clarify and resubmit in response review.

The uncertainty about the project design and the power analysis precludes us from currently recommending funds for this proposal. The basin should consider what evaluation standard should be applied to these comparative studies. For example, past studies have examined survival for a short period or migration distance downstream. However, the ultimate measure of success must be the return rate of adults. Modest

increases in juvenile survival won't be a major gain in the Basin unless they lead to substantially greater increases in SARs … (e.g., a 25% increase in a 1% SAR is still only 1.25%; not enough to resolve our problems). Before any major changes in procedures are endorsed, we need to be realistic about our expectations from these tools.

The design of the intended 'experiment' needs to be clarified, as the presentation of the experimental design during the site visit was quite different than that described in the proposal. Interactions were dropped (a mistake we think) and the power analysis was not completely explained. The proposal (but not the presentation!) described a 2X2 treatment experimental design that seems appropriate to examine the treatment effects of bottom substrate and predator avoidance. The approach is also used to examine the effects of controlled temperatures and water source (spring water) versus ambient temperatures and river water. In many cases preliminary data support survival advantages by smolts reared under one of the NATUREs environmental conditions. It will be most interesting to see if those trends continue with a larger scale study and to try to quantify any survival advantage of multiple factors and their interactions. There is a lot of interest in the region to determine if NATUREs is a viable tool. The methods do not describe where detections are to occur.

A long history of this project is described. Why has there been so little peer review of primary results? Most publications seem to be reviews of the good ideas of NATUREs, not publications of results. Why isn't this group involved with Beckman and his colleagues who have published pertinent results on growth patterns and SARs? Why aren't they part of this study's design team? Elements of NATUREs haven't been studied in designs that isolate effects and interactions. To date, NATUREs has been a potpourri of gravel bottom, christmas trees, arbitrarily chosen culture densities, diets, etc. Apparently, the only benefit has been darker coloration's protection immediately (hours) after release in clear streams where birds are present. None of the rest of it has been tested in isolation or interaction with other elements. So the design here is to test the potpourri. We still won't know which element is significant.

Despite the concerns expressed above, this research proposal addresses timely and important questions central to hatchery reform in the Columbia River Basin. The project sponsors collectively have an impressive research and publication background - and have been diligent about publishing results from many of their previous studies. The efficacy of hatchery reform and the potential for reform that exists in many older production facilities are critical questions in the basin. The sponsor's commitment to rigorous research and their willingness to seek peer-review scrutiny of this work is commendable. One of the reviewers questioned whether Carson Hatchery is the best situation to test the NATUREs theory; perhaps the new Nez Perce tribal hatchery, under construction, will be a more appropriate facility.
