Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Memorandum (ISRP 2013-6) **July 10, 2013**

To: Bill Bradbury, Chair, Northwest Power and Conservation Council

From: Greg Ruggerone, ISRP Chair

Subject: Review of the Washington Department of Fish and Wildlife and Nez Perce Tribes' proposal Snake River Fall Chinook Monitoring and Evaluation (#2012-013-00)

Background

At the Northwest Power and Conservation Council's June 13, 2013 request, the ISRP reviewed the Washington Department of Fish and Wildlife and Nez Perce Tribes' proposal Snake River Fall Chinook Monitoring and Evaluation (#2012-013-00). This study proposes to 1) determine fidelity to release location of returning adult fall Chinook released as subyearling smolts from acclimation ponds or directly released without an acclimation period; and to 2) quantify fallback behavior of adult fall Chinook at Lower Granite Dam. The proposal states that distribution of hatchery-origin spawners is important for understanding the potential effects of the supplementation program on natural Chinook salmon. The proposal also notes that determining Chinook fallback at Lower Granite Dam is important when constructing escapement and productivity estimates.

ISRP members reviewed the "MS Word" version, as recommended by the authors.

Recommendation

Meets Scientific Criteria (Qualified)

Qualification: The proponents should consider the ISRP's comments below while planning, implementing, and reporting the findings of this investigation.

The proponents developed a good proposal that addresses an important issue while cost-effectively building upon previous and ongoing efforts. The ISRP provides a number of constructive comments below that stem from unclear explanation of complex issues rather

than a flaw in the study design. To fully benefit from the relatively large number of returning PIT-tagged fall Chinook in 2013, the study should begin as soon as possible, so that additional planning and radio-tagging of the adults may begin without delay.

The proponents note that the cost of tags could be reduced by $55,000 if the tags were directly purchased by BPA.

Comments

1. Purpose, Significance to Regional Programs, Technical Background, and Objectives

This is an important, well-designed investigation that has significant management implications for fall Chinook hatcheries in the Snake River basin. The investigation builds upon knowledge gained from an earlier published study in the Snake River watershed (Garcia et al. 2004). It takes advantage of many fall Chinook that were previously PIT-tagged for other purposes and some radio-receivers that will be already deployed. Methods are very similar to Garcia et al. (2004) with returning adults from 9 different release groups radio-tagged and followed to their spawning reaches.

The proponents provide strong justification for this project, which examines the degree of hatchery fall Chinook straying into wild Chinook spawning areas and tests for factors associated with the level of straying. The technical background is good, the objectives are well-founded and, commendably, the objectives are stated as hypotheses to be tested.

However, the wording in 1b is unclear: what is meant by “reach specific hatchery origin spawner composition is greater than 5% from outside reach release groups”? If the intent is to develop a locally adapted broodstock, then the influence from outside release groups should be low, i.e., perhaps less than 5%. The origin of the 5% criterion is not obvious and not explained. If the intention is to develop local broodstock for supplementation, then reference to the PNI index would be especially relevant.

Objectives 2a and 2b would be improved if stated quantitatively. As stated, they do not indicate the magnitude of differences among release groups or release years that would be considered biologically meaningful and which determine the sample sizes required to detect such differences.

It is also unclear how the study results will provide information about the hypotheses of interest. For example, the analysis of fidelity in the data analysis will investigate the hypothesis of equal fidelity rates among the 9 assessment groups x return year x sex. But how does this inform the hypothesis that pHOS is 10% or less? It also does not clearly answer the second

hypothesis about the spawner composition in each reach having less than 5% from outside release groups. The proposal has a paragraph indicating that based on a sensitivity analysis about 340 strays could be detected in a spawning population of 4000 fish, but insufficient details were provided to know for which spawning population infiltrated by which release groups this refers to.

While the results from the analysis on the number of reaches traversed will be interesting, it is not clear how this will provide information about the 4 hypotheses in the proposal. The proposal would be strengthened with an example of how the results from this study could be used to answer the hypotheses, especially the first hypothesis about pHOS <10%. The example should also include a measure of precision of the estimate of pHOS in the scenario.

2. History: Accomplishments, Results, and Adaptive Management

This study builds on an earlier published study (Garcia et al. 2004), which only examined yearling fall Chinook. The new study will examine straying of adults released as subyearlings. This is important because subyearling Chinook are known to have higher stray rates in other regions (lower Columbia).

The replication and extension of the earlier work are strengths of this proposal. The proposal also takes advantage of a window of opportunity to compare the behavior of different release groups that have already been PIT-tagged and that will continue to return as adults (available for radio-tagging) until 2017.

The study design has a contingency plan that can be implemented if too few PIT-tagged adults return for a given tagging group.

3. Project Relationships, Emerging Limiting Factors, and Tailored Questions

The study is well-integrated with previous fall Chinook efforts in the Snake River basin. It will investigate critical gaps in recovery planning identified by NOAA Fisheries staff and will be conducted collaboratively by WDFW and NPT staff. The information to be gained is needed for management of fall Chinook hatcheries and could be used to protect wild fall Chinook salmon from excessive stray hatchery Chinook salmon.

4. Deliverables, Work Elements, Metrics, and Methods

The study will rely on a variety of other organizations to help collect information on the location of radio-tagged Chinook. The approach says it will “possibly” use air, boat, and ground tracking methods. The investigators should have a more definite idea of methods that will be used to track the fish. Given the large area of the watershed, the project should have access to an airplane to quickly and cost-effectively cover a large amount of streams.

Will the results be integrated with additional sampling of the spawning grounds? If all hatchery fall Chinook are adipose-clipped, then ratios of hatchery and wild Chinook can be calculated and used as an independent estimate of pHOS. Additionally, the distribution of hatchery versus wild-origin spawners in the watersheds could be examined. For example, do hatchery Chinook stray closer to the release location, do hatchery fish occupy the same spawning areas as natural origin salmon, or do hatchery fish spawn in suboptimal habitats? How many wild-origin fall Chinook fall back through the dams?

The proponents recognize the variety of factors that may affect stray rates, and we encourage them to examine additional factors. For example, the plan is to PIT-tag Chinook spending various years at sea. Older Chinook are known to have higher stray rates; therefore, analyses should also consider ocean-age as a factor, as well as gender. Some Chinook will be released from acclimation ponds, but the proposal did not mention whether these fish will emigrate volitionally or will be forced to leave the pond. Why will the tagging of jacks be deemphasized in this study? Ideally, to calculate pHOS, all fish should be represented in proportion to their probability of mating once they have been counted as having entered the population of spawning fish. Is there evidence that jacks have lower odds of mating than older males? This information could have been used to justify the reduced emphasis on jacks. See Berejikian et al. 2010, Schroder et al. 2012.

This proposal (and the public document linked within this proposal) provides details about the experimental design and sample size requirements. Apparently, proposed sample sizes are based on detection rates in the Garcia et al. (2004) study that is deemed to have had adequate statistical power. This consideration of statistical power is reassuring. However, the explanation of sample sizes by release group is not clear enough to evaluate independently here. For example, it is not clear how the target sample sizes of 110, 125 and 192 for different assessment groups were determined. Table 2 shows the allocation of tags across the returning adults by assessment group with between 7 and 15 radio tags applied to each assessment group, release year, return year combination. Table 2 needs to be clarified, as it is not clear how the 9 assessment groups listed in Table 2 match the 9 tagging groups listed in the first paragraph under Data Collection. It appears that PIT-tagged fish from only a single release year (2012) will be available to compare migration behavior of off-station and on-station release groups of subyearling Chinook. With luck, sufficient adults from both release groups might return at different ages allowing comparisons in more than one return year.

It is not clear if the sample size requirement can be met in each combination of assessment group, year of release, year of return and sex. Based on historical returns, what numbers of released fish in each of these cells are likely to return to Lower Granite Dam and do current hatchery releases provide sufficient fish? The proposal indicates a priority of tagging, but how

will this be implemented in real time? For example, if there is a quota of 15 radio tagged fish for a particular group and you want to spread these over the entire season, how do you decide if you will have enough "future" fish to meet targets?

The proposal indicates that the analysis method of Garcia et al. (2004) will be used (indeed, much of the text is verbatim from that paper). However, in the 10 years since Garcia et al. (2004), more sophisticated models can be readily fit with much more powerful and easy to use statistical software that do not require pooling over several years of data.

For example, the multivariate analysis assumes a factorial structure (i.e., all combinations of assessment group, return year, and sex) will be present so that the largest model can be fit, but Garcia et al (2004) shows that not all combinations are actually present. The analysis will have to be modified accordingly. The analysis will pool over calendar years so calendar year effects are included in the noise. More advanced methods can account for these effects.

In the analysis of spawner-fidelity, the proposal will follow Garcia (2004) and proposes to use a log-linear analysis. The method in Garcia (2004) may have been mislabeled – the response variable for each fish is simply yes (returned to spawn in release area) or no (did not return) and so a variant of logistic regression will be used. Some care will be needed in the analysis because not all combinations of an assessment group (a.k.a. release group), return year, and sex may appear in the study, and so not all interactions can be fit. The current method of choice for model selection will be a variant of AIC rather than the methods in Garcia (2004). Finally, more sophisticated models can also include the calendar year effects rather than simply pooling over this factor or releases groups as proposed when comparing LFH on-station vs. off-station.

Annual (interim) reports will be delivered. When preparing the reports, it would be beneficial for the authors to review the literature and discuss additional ideas for reducing stray rates of hatchery fall Chinook and salmon in general. Overall, a key goal is to minimize unintended straying of hatchery fall Chinook to the spawning grounds.

5. Editorial

The proposal uses the terms "acclimation group", "assessment group", "release group" interchangeably in the proposal. A single descriptor should be used.

Activity 1.3 says tagging will occur from Sept 1 to early November, whereas Activity 2.1 says fish will be tracked beginning on 18 August. This discrepancy should be fixed.

Note that given 4000 natural spawners, pHOS would be 10% when the hatchery spawners = 444 (rather than 400 as stated because 10% = 444/(444+4000); this correction will serve to increase statistical power in the experiment).

References

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