



Independent Scientific Review Panel
for the Northwest Power & Conservation Council
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Memorandum (ISRP 2010-4)

January 19, 2010

To: Tony Grover, Director, Fish and Wildlife Division, Northwest Power and Conservation Council

From: Eric Loudenslager, ISRP Chair

Subject: Review of BiOp Proposal to Study Non-native Predator Impacts on Salmon - Revised Proposal Requested

At the Council's December 21, 2009 request, the ISRP reviewed a BiOp proposal titled *Understanding the influence of predation by introduced fishes on juvenile salmonids in the Columbia River Basin: closing some knowledge gaps* (#2008-719-00). This proposal is intended to meet research needs described in the 2008 Biological Opinion for the Federal Columbia River Power System (BiOp), specifically, Reasonable and Prudent Alternative (RPA) 44: develop strategies to reduce non-indigenous fish. In addition, the Obama Administration's Adaptive Management Implementation Plan (AMIP; page 18) calls for enhanced research on salmon predators and invasive species.

ISRP Recommendation

Does Not Meet Scientific Review Criteria (Response Requested)

The proposal should be re-submitted after the rationale for the study has been more thoroughly crafted; appropriate literature reviewed and used; study designs for the four objectives well defined; and methods explicitly described (including specific sample locations, sample sizes, and statistical methods used to test hypotheses and analyze data).

ISRP Overall Comments

In addition to being called for in the BiOp and AMIP, this proposal attempts to address several important research issues that the ISAB and others have recently recommended. However, as the proposal is currently written, it lacks the necessary documentation and detail (especially in the methods to be used and lack of detailed sample designs and sample sizes) to meet scientific review criteria. At this point it is written as mostly a research pre-proposal. The Technical Justification, Objectives, and Methods sections must be fully developed and significantly revised before the ISRP reviews it again.

The research questions and objectives are of interest in potentially shedding light onto food web relationships among key native and non-native species. Although the proponents made it clear

that the research questions and general approaches emanated from the recent non-native predation workshop, the proposal presents insufficient development of rationales for the research hypotheses, insufficient investigation of the optimal methods to be used (e.g., telemetry tag types, bioenergetics models), and inadequate description of how linkages among food habits studies, telemetry efforts, netting efforts, and other field actions will yield answers to the key questions of interest. In all of these areas, there is an insufficient review and use of the scientific literature. In addition, the methods utilized, in the few instances when they are identified, appear to be the same methods used in past studies. More consideration is needed to specifically identify how the data that are being collected will be useful in unambiguously clarifying food web relationships among juvenile salmonids, American shad, channel catfish, and other species. Little indication is provided on how newer technological methods, such as acoustic telemetry, may improve our knowledge base of this generation of predation/competition interactions.

ISRP Specific Comments

1. Technical Justification, Program Significance and Consistency, and Project Relationships (sections B-D)

Technical Justification - This is a proposal to investigate some potentially complex interactions among species, including juvenile salmonids, American shad, smallmouth bass, and channel catfish, yet the review of the existing fisheries literature related to these species is minimal—even for studies conducted in the Columbia River. A quick perusal of American Fisheries Society Journals (TAFS, NAJFM) with the key words “Columbia River” in the title yields numerous relevant references regarding these species that have not been identified or reviewed. Examples include Ward and Zimmerman (1999), Tabor et al. (1993), and Peterson and Ward (1999). Several other references are mentioned in this proposal, but there is an insufficient attempt to use this literature to construct plausible arguments supporting the testing of various hypotheses. For example, in paragraph 1 of the Technical Justification section, the proponents state that this proposal is a response to the recommendations of a predation workshop but don’t provide a reference to the proceedings of the workshop, which was issued in 2008 (Halton, 2008), or provide sufficient detail on specific action items that were recommended at the workshop. Additional recent publications have called for this type of research and should be cited; for example, Sanderson et al. (2009) and the ISAB Non-native Species Impacts report ([ISAB 2008-4](#)).

Program Significance – The proposal demonstrates a partial response to a sub-element of RPA #44 of the 2008 BiOp and the Obama Administration’s Adaptive Management Implementation Plan. The proposal was also generated to address recommendations from the Predation Workshop described above (Halton/DS Consulting 2008). They also should mention the Council’s call for increased research and control of invasive species as salmon predators and competitors as noted in the 2009 Amendments to the Fish and Wildlife Program (page 53).

Project Relationships – Relationships with three other projects (give project numbers) are mentioned (the northern pikeminnow management program, the Grant County PUD predation project, and the ODFW white sturgeon monitoring project) but insufficient detail is provided from any of these to understand how the coordination with other projects will be implemented, what logistical and technical needs will be met, and how information sharing will take place.

2. Objectives, Work Elements, and Methods (section F)

There are significant gaps in details in this proposal related to objectives, work elements, and methods, as described below.

Objective 1. Evaluate the influence of juvenile American shad on growth and condition of piscivorous predators in John Day Reservoir (JDR) during the fall and early winter.

This is an intriguing objective in that American shad are a largely ignored species in the Columbia River, and their effects on the food web, specifically related to their impacts on salmonids, need to be investigated and understood. However, the proposal does not yet contain a fully plausible, defensible argument as to how shad will affect juvenile salmon. In ecological terms, it seems equally plausible that the presence of young shad could either result in an increase in juvenile salmonid mortality (via fattening predators the previous fall and winter for their assault on salmon the next spring) or result in a decrease in predation of juvenile fall Chinook salmon (by serving as alternate prey) and thereby buffering late emigrating juvenile salmon from predation. A thorough review is needed of the literature from places where the species co-exist (or similar species such as alewives and salmon in the Great Lakes) to craft some logical arguments about what is hypothesized and why.

It is also necessary to try to adequately describe how the actual linkages among shad numbers, salmon numbers, predator numbers, predator condition, and food habits are going to be established. It is one thing to suggest that young shad may serve as enablers, improving the condition and survival of predators through winter and spring. It is another to scientifically show the linkages. It is notoriously difficult to “prove” such linkages, including competition, limitations in numbers via predation, etc., especially in community interactions in a large river ecosystem. This part of the proposal needs more careful development. Although all three of the proposal proponents have relevant specialized skills, none appear to have conducted much bioenergetics modeling research. Some of this research may require specialized capabilities, and it is not clear if that expertise exists in the listed participants. This point should be clarified in a revised proposal.

Objective 2. Evaluate the behavior of piscivorous fishes in John Day Reservoir and measure their growth during the fall and early winter.

We surmise that the “behavior of piscivorous fishes” is the study of seasonal movements and distribution, but the species for study are not listed. This objective is written so generally that it is difficult to understand what species are being studied, how many will be tagged, how the radio or acoustic monitoring will be done (no real details of the study design), or how the bioenergetics models will be applied.

Regarding the bioenergetics models, the proponents state, “We will use pre-existing bioenergetics models for northern pikeminnow, smallmouth bass, and walleye (and perhaps channel catfish, if a model is available) to provide a greater understanding of how diet and water temperature influence the fall growth rates of fish. We will vary the diet composition and water temperature, alone and in combination, to assess their relative influence on fish growth rates. In particular, we hope to describe the influence of juvenile American shad in the diet relative to other prey items...” The proposal does not clearly demonstrate how the modeling will allow the project proponents to meet the objectives of the proposal. It is also not clear why another,

different model should be required for channel catfish. Is an entirely different model required for channel catfish, or just different parameterization? Existing literature shows that bioenergetics models have been applied to channel catfish in various locations.

Objective 3. Evaluate the predatory impact of channel catfish in the John Day, McNary, Ice Harbor, and Little Goose reservoirs.

This objective is to assess the potential predatory impact of channel catfish, and a hypothesis is forwarded. Yet an adequate case has not been built for this hypothesis. Data are not presented from the Columbia River on the abundance, relative abundance, trends in abundance, or size distribution to indicate that channel catfish are even potentially a major predator of juvenile salmonids. Furthermore, only one reference (Poe et al. 1991) on channel catfish from inside or outside the basin is included in the literature. Poe et al. (1991) has relevance below McNary pool (catfish eating large numbers of juvenile salmonids), but this result was not discussed in this proposal other than to say the study was conducted 20 years ago. There is inadequate support in the proposal for the implications that the habitat use, swimming and predatory capabilities, and dietary preferences would make channel catfish significant predators on juvenile salmon. With the extensive literature available on channel catfish (including the Catfish 2000 Symposium Proceedings and this year's planned Catfish 2010 Symposium in St Louis), reviewing that literature should have been a high priority. There may even be some studies on relationships between channel catfish and small wild or stocked trout. It is acceptable and perhaps worthwhile to ask if channel catfish are preying on salmon. However, a scientific case must still be made in the proposal that their numbers, distribution, abundance, behavioral traits and tendencies and food habits make them a likely predator, and thus make the question worth investigating. What literature that is available needs to be used.

Objective 4. Evaluate the response of smallmouth bass to localized removal.

This objective, as indicated in the proposal, may be difficult to implement due to positions of the sport fisheries organizations and state fish and wildlife managers. More information describing the non-lethal approach for removal from localized areas is needed. The rationale for this objective also needs to be more thoroughly developed using some of the smallmouth bass literature available (see references included below).

Methods - Methods are, in general, not adequately described. For example, the proposal states: "We will determine physiological correlates of condition, such as plasma triglycerides, percent body fat, or other metrics, and compare values to fish sampled in the spring or summer. We will review the literature for metrics of interest and assay for products in the laboratory. Our intent is estimate the contribution of shad in the diet of fish in the fall to their overall condition."

Similarly, the proposal states: "Fish will be collected by boat electrofishing as part of Task 1.1. A subset of fish will be surgically implanted with either a depth-sensitive radio or acoustic tag. We will decide on the tag type to be used after a literature review and discussions with colleagues."

Detailed methods are not described for either of these correlates of condition or for telemetry. The methods sound plausible, but, as the proponents implicitly acknowledge, more information is needed on the specific methods to be used. For example, what are the analytical methods to be used in determination of percent body fat? Standard analytical methods or the new Fat Meter, or

both? The same could be said for the telemetry methods. Adequate literature from inside and outside the basin needs to be reviewed and cited in the proposal to provide some evidence that the methods are suitable for the objectives. It is not clear how the project proponents will accomplish the objectives, or if the objectives can be accomplished. It seems far preferable that an evaluation and selection of the best methods should occur mainly at the proposal stage.

This appears to be a multi-year project. However, timelines for Objectives 1-3 are only generally given for specific seasons and appear to be for only one year. Experimental designs for Objectives 1-3 do not seem to have been worked out and are only generally described. The proposal needs to explicitly list species that will be sampled/tested, specific sample locations, and specify sample sizes. Similarly, for radio or acoustic tagging in Objective 4, no indications are given as to sample sizes, numbers of tags used by size group, and such. Expulsion of implanted tags from channel catfish has at times been an issue, and this point should also be addressed.

3. M&E (section G, and F)

A monitoring plan is not required, as this is a research study.

References

- Halton, E. 2008. Review, evaluate, and develop strategies to reduce non-native piscivorous predation on juvenile salmonids. Workshop sponsored by BPA and CBFWA, Sept. 24, 2008 at the Oregon Zoo, Portland, OR. Predation Workshop Proceedings by Erin Halton, DS Consulting, 23pp.
- ISAB. 2008. Non-native species impacts on native salmonids in the Columbia River Basin. ISAB 2008-4.
- Poe, T. P., R. S. Shively, and R. A. Tabor. 1994. Ecological consequences of introduced piscivorous fishes in the lower Columbia and Snake rivers. Pages 347-360 in D. J. Stouder, K. L. Fresh, and R. J. Feller, editors. Theory and Application in Fish Feeding Ecology, pp. 347-360. University of South Carolina Press, Columbia.
- Sanderson, B.L., K.A. Barnas, and M.W. Rub.2009. Non-indigenous species of the Pacific Northwest: An Overlooked risk to endangered salmon? *BioScience* 59(3): 245-256.
- Tabor, R. A., R. S. Shively, and T. P. Poe. 1993. Predation on juvenile salmonids by smallmouth bass and northern squawfish in the Columbia River near Richland, Washington. *North American Journal of Fisheries Management* 13:831-838.
- Tabor, R. A. , B. A. Footen, K. L. Fresh, M. T. Celedonia, F. Mejia, D. L. Low, and L. Park. 2008. Smallmouth bass and largemouth bass predation on juvenile Chinook salmon and other salmonids in the Lake Washington basin. *North American Journal of Fisheries Management* 27:1174-1188.

Ward, D.L., and M.P. Zimmerman. 1999. Response of smallmouth bass to sustained removals of northern pikeminnow in the lower Columbia and Snake rivers. *Transactions of the American Fisheries Society* 128:1020-1035.