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Independent Scientific Review Panel
C/o Judi Hertz via email to mailto:jhertz@nwppc.org
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Dear ISRP members,

Thank you for your thorough review of the proposal for the *Determination of post-release survival of spring chinook salmon in a mark-selective sport fishery* (35040). I believe your comments will increase the utility of this effort to ensure that this project meets the desired objective; protecting fish. I will address each set of comments by first listing the comment and then providing my response.

General response; regarding the funding for out-years; the language in the original proposal regarding including additional gear-types and/or species in out-years was our attempt to be responsive to some of the comments we received from the Yakama Nation. They are interested in a very comprehensive evaluation of hooking mortality in mark-selective fisheries for many species. We acknowledge that our reference to the out-years was relatively vague. This is a result of not knowing what our results on spring chinook salmon will show as well as what other species, gear-types, or locations will be deemed to be important in the out-years. We are willing to propose this study as a one-year effort. If managers (WDFW and YN) would like follow-on work in the future, we will work with them to initiate new proposals that could follow this work.

We believe that this study would provide clear results of the impact of a typical catch-and-release event on a spring chinook salmon's ability to survive through spawning. This impact assessment could be used by managers to set regulations capable of protecting unmarked fish in mark-selective fisheries. These data will apply specifically to the Yakima River but would also provide a very good guideline for other areas where there are listed stocks of spring chinook salmon (e.g., Snake River, upper Columbia River). Spring chinook salmon in lower river fisheries (e.g., below Bonneville) may be in a different bioenergetic state than those in the Yakima River. However, determining the effects of these different energy reserves and different stocks of fish on survival of a catch-and release event (to spawning) would be problematic. Data from a more controlled study in a basin like the Yakima would serve as a very good guideline for harvest managers to use in setting regulations throughout the Columbia River and its tributaries.

1. **Given the multiple studies that have been conducted on hooking mortality, discuss the potential for estimating losses in terms of existing mortality data rather than collecting more field data. For example, the proposal references a study on hooking mortality of recreationally caught fish on the Willamette. Why is this study not sufficient to answer the question about the effect of catch-and-release on spawning success? Using existing data and literature, suggest you establish best and worst case scenarios (for example pre-spawn mortality is twice as high as worst hooking mortality and equivalent to best survival rates). Then estimate the acceptability of hooking losses on different run sizes. This would enable some a priori hypotheses about the impacts of hooking mortality. The proposal does not address the fact that in low run years, sport harvest of wild and even hatchery fish may have far greater impact than on high run years. Thus, harvest should be keyed to a worst-case scenario and limited such that sufficient escapements occur, especially in low run years. Comments?**

Response: You are correct; many studies have been conducted on hooking mortality. However, most have focused on short-term mortality and are not adequate to address the question of what effect catch-and-release has on spawning success in spring chinook salmon. While it is true that a dead (short-term mortality) fish cannot spawn, the question remains regarding the possible effects of the catch-and-release event(s) on the ability of fish that survive the initial catch-and-release experience (living fish) to spawn. The Willamette study did a very good job of assessing relatively short-term mortality resulting from catch-and-release. The majority of their anchor-tag recoveries (they did not use radio telemetry) came from hatcheries well before the onset of spawning. This Willamette study did not, however, provide any real indication of how the catch-and-release affected survival to spawning in the natural environment because they recovered only 13 of 1694 (0.76%) of their tagged fish on the spawning grounds. With the very low sample sizes recovered from the spawning grounds in this study, the relative importance (weight) of each sample is greatly magnified. The statistical power of their analyses were not reported, but was likely very low for the spawning ground recovery group.

I think the idea of using existing mortality data to develop best and worst case scenarios is a very good one. We will include that within the study development phase of this project if it receives funding. We also acknowledge that potential impacts of mark-selective (or any) fisheries could be much greater during years of low returns. We could develop a simple model bounded by the best and worst case scenarios and run numbers to use as a tool for formulating the *a priori* hypotheses to be tested in this project.

2. **The proposal does not address whether mortality might vary by timing of the run. It assumes that mortality will be constant over time. Is this reasonable? Will the timing of tags allocated to the control fish be matched to the tagging of the angled fish? How will the tags be allocated through the season? In Task 1a, Methods states that fish length would be estimated to the nearest 10 cm. Is this correct and if so, what is the value of such a broad size range?**

Response: The mortality may not be independent of the date of capture/tagging. We will attempt to allocate the tags throughout the run timing to the greatest extent possible. It is possible that the river conditions may dictate when we can capture sufficient numbers of fish by angling. We will analyze the tag date as a covariate in the analyses to determine whether time of tagging was important. However, the timing of the placement of the control and treatment tags will be matched

as close as logistically possible in an attempt to reduce any temporal variation and to minimize any unintended differences between our control and treatment groups. The majority of the run passes through the area where fish will be captured in a relatively brief time period (typically during the first three weeks of May). Spring chinook salmon do not spawn in the area where the fish would be tagged, thus the fish in this area are not expected to be spending more than a few days in the tagging area. These rapid migration rates and low residence times are supported by telemetry data reported by Hockersmith et al. (1994). Regarding fish lengths, we will measure fish to the nearest cm. The original 10 cm length estimate figure was intended to reduce handling time.

3. **There will be concerns expressed about the use of selected anglers as opposed to the use of public anglers that may not handle the fish as carefully, etc. How will the anglers used be instructed to fish and what gear would be used? The length of time a fish is played and handled by experts and science techs may be less of an impact than inexperienced fisherman that take longer to handle and may grab fish by gills and flop it on the bank. How can the study control for differences between experiment and reality? How do you separate effect of tagging from angler handling when assessing post-release survival? It is not clear in the methods whether every sport caught fish would be tagged, or how the tagged fish would be chosen? Will this be a random selection process or will certain wounds be eliminated from the study?**

Response: All anglers who participate in the study will be instructed to handle fish in the same manner. This standardized fish handling will be intended to mimic a moderately educated/skilled angler. The saying that 10% of the anglers catch 90% of the fish is not far from the truth in these types of fisheries. Study anglers (project staff, volunteers from the public and agencies) will land all fish with a net and lift the fish from the water and into a water-filled cooler (filled when the fish is hooked to control water temperature). The handling/tagging protocols will then follow those outlined in the original proposal. The equipment used will be standardized and intended to represent the equipment used by many of the successful anglers. We will follow the existing regulations of using single barbless hooks with a point to shank gap distance not exceeding 0.75 inches. Anglers will use salmon roe and plugs to capture fish. The time fish are played will vary depending on fish size and water conditions, but we will try to play fish until they are showing some signs of exhaustion (i.e., they appear 'ready' to net). As indicated in the original proposal, hooking location (on the fish), time from hooking to landing, hook/bait type, etc…. will be recorded for all fish and these types of data will be analyzed as covariates. To separate handling from angling mortality, we will tag (and, necessarily, handle) control fish captured in the fishway trap at Prosser Dam. This is intended to isolate the effect of being captured on angling gear and netted ('the catch-and-release experience'). We intend to tag all fish captured by angling. Even fish with obvious bleeding will be tagged (line will be cut and hooks will be left in fish that are hooked in the gills or esophagus, as instructed in the WDFW regulations under the tips for catch and release).

4. **The study has potential for coordination and cooperation from Law Enforcement perspectives and studies. For example, public outreach programs, publicity, tracking ultimate fate of fish. And catch and release of wild fish. Could you integrate efforts with Law Enforcement proposals?**

Response: We will devote a significant effort to incorporate relevant law enforcement and public outreach/education entities. We are familiar with the local law enforcement agents who patrol the study area and will be working in close coordination with the WDFW and Yakama Nation fisheries

staffs. We will work with the media staffs at PNNL and WDFW to contact local media to discuss the study and use those spots as a means for educating the public about what the study objectives, management importance, and conservation issues are. In addition, we may give presentations to local angling groups to provide them with information from the study. This study would provide an excellent opportunity to increase awareness of how fisheries regulations and compliance affect individual's opportunities to participate in these fisheries.

5. **Existing PIT tags from smolts may provide additional information upon return as adults. Discuss the potential value of this information.**

Response: This is a good point that we overlooked. The YKFP PIT tags approximately 10% of their fish at the hatcheries, as well as smaller groups - tagged as smolts- for entrainment and survival estimates. We will scan all fish captured (controls and treatments) for PIT tags. We could use PIT tag detections from adults at downstream dams (e.g., Bonneville and McNary) to determine the migration history of fish that we capture. These migration histories could be analyzed as an additional covariate to determine whether 'fast' fish and 'slower' fish (or early and late fish) respond to catch-and-release differently.

6. **Discuss the alternative value of live capture and spawning of some wild fish in the hatchery as opposed to release of wild fish. Are there some highly concentrated sport areas where wild caught fish could be taken live from anglers and transferred to hatchery? These anglers could be rewarded with money or receive two hatchery fish for one wild fish. This also could reap benefits in publicizing recovery and having the public actually have hands on support of such actions. It would also benefit some of the goals of the Law Enforcement programs of CRITFE.**

Response: I think this might work in a basin where there is more a 'standard' production hatchery that has a need (production or experimental) for wild brood. This would not work in the Yakima basin where the YKFP Supplementation Facility has a rigorous collection protocol for their brood fish (at Roza Dam). I do, however, agree with you that any PR efforts that could involve the public in a 'hands on' effort with actual salmon would go a long ways towards educating and involving the public in a way that would grow support for fish recovery efforts.

7. There was no number 7 in the comments.

8. **If passage is an issue at the dams, receivers upstream and downstream could provide valuable information on time to pass, fall back etc. and potentially provide data as to whether fish delay passing ladders/dams after hooking. Cost for additional equipment and analysis might be very cost effective and could be coordinated via passage studies by U of Idaho.**

Response: We will coordinate with Chris Peery and his staff at U. of Idaho. We will place our receiver stations in areas that will compliment the data we get from the U. of Idaho stations to get the maximum amount of data from the investment of resources in this project. An additional study that may serve as a source for additional data is the Army Corps-funded proximate analysis study that

was initiated in 2002 by the USGS and PNNL. We will coordinate with Matt Mesa to ensure tag codes and receiver stations are compatible and optimized. There are a total of nine receiver stations placed throughout the Yakima basin (3 U. of Idaho, 4 USGS, 2 USBR). We will coordinate tag coding with these other researchers so all tags can be scanned by all receivers.

9. **Why are agencies using a variety of hook types in their regulations? Rationale? No analysis of different hook types was suggested. Are there no potential differences? Has this been studied?**

Response: I do not have first-hand knowledge about why the WDFW has different gear restrictions in their regulations. I believe the regulations are proposed by the local regional or area biologists and then reviewed in Olympia. It is possible that the differences are based on the individual biologist's opinions about what gear would allow some harvest while minimizing impact on non-target (unmarked) fish. It is likely that different hook types (e.g., larger barbed hooks versus smaller barbless hooks) might produce different results. This has been evaluated to some extent in trout fisheries and saltwater fisheries (see papers referenced in the original proposal). Most of these studies, however, suffer from small sample sizes when they include multiple gear types in the experimental design. In addition, most of these studies did not use a control group (not hooked). In an effort to maximize the statistical power of our results (by only evaluating one type of hook) and to conform to the existing regulations, we elected to propose to use single barbless hooks with a point to shank gap of 0.75 inches or less. Personal experience has shown us that hooking and landing percentages were impacted very little by the requirement to use single barbless hooks in the Yakima River fishery (multiple barbed hooks were allowed in 2001 but not in 2002).

10. **Harvest can be selective if more fish are caught early or late in the run. Additionally, since run size is not confirmed until mid to late in the season, it seems that harvest should be more restrictive early in the run to assure escapement goals will be met, then allow more fishing mid run. If the runs follow bell shaped curves, harvest in the middle of the run will create "stabilizing selection" rather than "directional selection" of run-timing.**

Response: You are correct. This past year provided a good example of this, with high run predictions and late returns. WDFW had to adjust (open and close) seasons during the return in an attempt not to exceed the harvest guideline. However, this is not something that would be directly assessed by the proposed study. It may work out that most fish are captured and tagged near the peak of the run, but as you state, it is difficult to determine this 'real-time'. We will include an analysis of this issue in the report however, so that the timing of the tag placements and the run timing will be apparent.

11. **Water temperature is a key component of stress mortality. What temperature variations occur over the proposed time of the experiment? Should the experiment be restricted to conditions at or below 10 C or some comparable standard?**

Response: In 2002, a fairly 'average' water year with respect to spring flows in the Yakima River, water temperature in the study area (where fish would be tagged) averaged 10.8 C during May (min = 8.6, max= 12.4, SD = 1.1). We do not expect these temperatures to be exceptionally stressful on these fish. In addition, we are attempting to mimic the experience of the fish that are captured in the sport fishery, which occurs during a fixed period of time, regardless of water temperature. Water temperature at the time of capture/tagging will be recorded for every fish and these data will be analyzed as a covariate. In extreme instances where low water and/or hot weather produced water temperatures that were expected to compromise these fish and would likely not produce results representative of this type of fishery, we would restrict our efforts to minimize the collection of irrelevant data. In 2001, a drought year, the water temperatures in the study reach were still within what we consider to be acceptable limits for handling these fish. In May of 2001 the mean temperature in the study area was 12.7 C (min = 10.5, max = 15.2, SD = 1.4).

12. **Run sizes are anticipated to be ade quate for experiment, but no data are provided for comparison (top of page 7). What are the expected run sizes for 2000 outmigrants versus 1998-99?**

Response: Table 1 below shows the number of spring chinook salmon smolts estimated to have migrated downstream past Prosser Dam between 1999 and 2002. Adult spring chinook salmon in the Yakima are typically 3 and 4 year-old fish (i.e., smolts return as adults 2 and 3 years later). Using the adult return data for 2001 and 2002, it appears survival from smolts at Prosser to adults at Prosser was between 4 and 6%. If we assume a 5% survival for the 2001 and 2002 smolt years, we could expect to see well over 20,000 adult spring chinook per year returning to the Yakima River in 2003 and 2004. Even if survival was reduced by half due to low flows during the outmigration period in 2001, we should still see an adult return in 2003 close in size to that of 2002. Based on this simplified model, we anticipate the adult returns to the Yakima River to be high enough to provide sufficient numbers of fish to tag in 2003.

Table 1. Estimated spring chinook salmon smolt passage numbers at Prosser Dam for brood years 1997 through 2000. Also shown is the number of adult spring chinook salmon counted at Prosser Dam 2 years after the smolts were counted (age 3 adults). [Data from the YKFP web site: http://ykfp.org/]

Brood Year	Smolt Year	Total SPC smolts	% hatchery (smolts)	Total Adult Return	% hatchery (adults)
1997	1999	313,299	32.4	19,702 (2001)	39.4
1998	2000	286,638	78.5	13,296 (2002)	52.2
1999	2001	548,483	82.3	(will return 2003)	-
2000	2002	692,756	47.0	(will return 2004)	-

13. **Is the number of radio-tags sufficient? The sample sizes seemed small. The proposal refers to several classes of fish that would be considered in the analysis: marked vs. unmarked, size classes, sex and environmental conditions. There will be 100 sport tags allocated per year and only 50 controls. Given the number of categories potentially used in these analyses, how was a sample size of 100 tags determined? If there are widely distributed spawners, will there be no behavioral information for the time between catch and spawning.**

Response: We conducted a power analysis based on suspected mortality rates and using survival to spawning as the primary response variable. We limited ourselves to the evaluation of one hook type in an effort to maximize our statistical power. Logistical, financial, and conservation reasons prevented us from proposing to tag much larger numbers of fish. We feel that 100 treatment fish and 50 controls are attainable sample sizes that will produce meaningful results. All of the variables that we cannot control (e.g., sex of the fish, marked v. unmarked, etc…) will be analyzed as covariates in the analyses, but they are not critical to the primary objective of the study- which is to determine whether capture and release by angling affects a spring chinook salmon's ability to survive through the completion of spawning in the natural environment. The reason why the number of control fish is smaller is because we expect the mortality rate of the control group to be lower than that of the treatment group. One primary reason for selecting the Yakima River (over the lower Columbia River, for example) was that the size of the basin will allow us to collect data on the vast majority of fish we tag, thereby maintaining a good return on our (BPA's) investment of resources and optimizing statistical power. To obtain meaningful results from a much more diverse mixed-stock fishery such as below Bonneville Dam would require tagging thousands of sport caught fish and many hundreds of control fish to be able to determine the effects of angling capture on their ultimate ability to reach the spawning grounds. The logistics (and cost) of attempting to tag that many sport-caught fish would be very challenging if not impossible. It might be possible to PIT tag large numbers of fish captured by angling below Bonneville and then use the upstream detections as an indication of short-term survival, but it would not provide much data relevant to the primary question of whether being caught and released affects a salmon's ability to spawn.

We will collect behavioral data on all fish between the time they are tagged and the time they spawn. We will focus a concerted effort on obtaining detailed post-release behavior data and will also get migration data between the tagging area and potential spawning/holding areas. Finally, we will monitor fish through the holding period and spawning. Please see the original proposal for more detail on this.

The utility of conducting this study in the Yakima basin, where fish runs are relatively strong and being increased by supplementation, is that we can produce statistically valid results that will be applicable to other areas throughout the Columbia basin without impacting depressed or listed runs to obtain the data. Results from this work will go a long ways toward satisfying the RPAs that address harvest reform in the Columbia basin and will assist managers in setting seasons and regulations that will allow sport anglers to participate in mark-selective fisheries without placing the wild stocks of fish in jeopardy.

Please feel free to contact me if you have any further comments/questions. We are committed to making this project as effective, efficient, and accountable as possible.

Sincerely,

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