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MEMORANDUM

To: Curtis Knudsen, Oncorh Consulting

Michele DeHart

From: Michele DeHart

Date: November 30, 2015

Re: Response to comments on the Draft CSS 2015 Annual Report

Attached, please find the Comparative Survival Study Oversight Committee responses to your comments on the draft 2015 Comparative Survival Study Annual Report. Thank you for reviewing our report and providing comments. Your comments help to keep us on track and aid in clarifying the details of our report. Please note that in the following pages, your original comments are presented in italic font followed by the responses in standard font.

Comments from Curtis Knudsen, Oncorh Consulting

From: Curt Knudsen [<mailto:cmknudsen@q.com>]
Sent: Wednesday, October 14, 2015 3:41 PM
To: Michele Dehart; Steve Schroder
Subject: Comments on DRAFT 2015 CSS Annual Report

Thank you for the opportunity to make comments on the Draft 2015 CSS Annual Report. If there are any questions regarding my comments or editorial changes, please not hesitate to contact me.

*Curtis Knudsen
Oncorh Consulting*

Review of the Comparative Survival Study (CSS) Draft 2015 Annual Report

1) Chapter 6 from the 2014 CSS Report is not included in this year's report. Given the need expressed by the FPC for this type of information and citation of this study in past CSS Annual Reports (Tuomikoski et al. (2009, 2010, 2011, 2012, 2013, 2014)) as a study that will answer many of the outstanding questions remaining regarding PIT effects such as long term PIT loss, PIT tag loss in mature adults during the period they are held at a hatchery, and long term PIT tag-induced mortality effects, its exclusion from the 2015 CSS Report seems like a serious oversight. If results are preliminary, as they were in the last year's CSS Annual Report (Tuomikoski et al. 2015), then simply state this and describe what the status of the study is at this time with the appropriate caveats.

CSS Response: The PIT-tag effects study is a multi-year undertaking which will not have complete tag returns until 2017. The purpose of Chapter 6 in the 2014 Annual Report was to comprehensively describe the study design, the power analyses that were used to determine sample sizes prior to the study's implementation, the methods for analysis, and to present the very preliminary results of the study to date. In view of the fact that the study is still ongoing with several years remaining until the critical study design elements will be fully satisfied, the CSS Oversight Committee concluded that updating the preliminary results with additional preliminary results would be premature and inappropriate, along with adding to the considerable analytical work load required for all of the other components of the CSS. For these reasons, the CSS Oversight Committee decided to exclude this topic from the 2015 report. This was not an oversight, but a rational project management decision.

2) From DRAFT 2015 CSS Report:

page 102, 1st paragraph

1 Comparison of PIT-tag and Run Reconstruction SARs

2 The ISAB/ISRP (2008) review of the CSS Ten-Year Retrospective Report (Schaller et al.

3 2007), encouraged the CSS to investigate differences, and reasons for any differences, between

4 SARs based on PIT-tags and those based on run reconstruction (RR) methods. Schaller et al.

5 (2007) found that the NOAA RR SAR point estimates (Williams et al. 2005) were about 19%
6 higher (geometric mean) than those produced by CSS using PIT-tags. It was unclear whether a
7 bias existed in the RR SARs, PIT-tag SARs, or both, due, in part, to uncertainties and
8 assumptions in both methods. Knudsen et al. (2009) reported that hatchery spring Chinook from
9 the Yakima River that were coded-wire-tagged, elastomer marked, and ad-clipped returned at a
10 33% higher rate than fish that were PIT-tagged, coded-wire-tagged, elastomer marked, and ad
11 clipped. The Knudsen study illustrated the potential for PIT-tag effects, however, its
12 applicability to other river reaches or populations of fish is unknown (Tuomikoski et al. 2009;
13 DeHart 2009).

Because neither Tuomikoski et al. (2009) nor DeHart (2009) raise any substantial arguments, provide any analyses or cite any documents that pertain to the statement that the results of Knudsen et al. (2009) “cannot be applied to other tagging areas in other reaches”, then lines 11-13 beginning with “..., however” on page 102 should be deleted. My justification for this is laid out below. I examined both Tuomikoski et al. (2009) and DeHart (2009) and provide all text where Knudsen et al. (2009) was cited, in order to show the lack of any specific analyses, arguments or citations presented in those two manuscripts that support this assertion.

CSS Response: We have revised the sentence to read: “While the Knudsen et al. (2009) study concluded that PIT tags caused an effect, several concerns have been raised on the methods and analyses that were used in the study, along with questions on the applicability of the study results to other tributaries, species, rear types, and research questions such as comparisons between similarly tagged individuals (DeHart 2009, Tuomikoski et al. 2009).” We believe that this revision better supports the overall intent of the paragraph, which is to briefly summarize the research work that has been done, along with recognizing that there are substantial questions and uncertainties on the effect of tagging on the estimation of demographic rates, along with questions over the applicability of previous tagging-effects studies across the range of fish species, rear types, and reaches that could be impacted.

Sections in Tuomikoski et al. (2009) and DeHart (2009) citing Knudsen et al. (2009):

From Tuomikoski et al. (2009), page 154, paragraph 3

“Recently, Knudsen et al. (2009) reported that SARs estimated utilizing PIT-tags could be biased low due to a combination of PIT-tag loss and tag-induced mortality compared to SARs utilizing coded-wire tags (CWTs). Many of the analyses in the CSS focus on comparisons between similarly tagged groups. The potential bias reported by Knudsen et al. (2009) should not affect those comparisons because both groups would presumably express any bias equally. However, the potential bias could play a role when comparing CSS SARs with run-reconstruction SARs. Because the results of Knudsen et al. (2009) are of interest to a wide variety of researchers employing PIT-tags across the Columbia and Snake River basins, the USFWS is working towards implementing a basin-wide independent PIT-tag bias study in an effort to evaluate and test the repeatability of the Knudsen et al. (2009) results.”

This is the only citation of Knudsen et al. (2009) in Tuomikoski et al. (2009) and it makes no mention of whether the results of Knudsen et al. are applicable to other river reaches or populations. Thus, there is no reason to cite Tuomikoski et al. (2009) in the first paragraph, lines 11-13, page 102 of the 2015 DRAFT CSS Report, as it has no relevance.

CSS Response: As described above, we have revised the sentence to include “research questions such as comparisons between similarly tagged individuals.” The referenced section of Tuomikoski et al. (2009) addresses the research question of comparing similarly tagged groups, where tagging effects are unlikely to affect the validity of those comparisons. It is therefore appropriate to include this citation.

The following are all sections of text in DeHart (2009) citing Knudsen et al. (2009):

DeHart (2009), page 1, paragraph 1

“Our overall conclusions are:

- *Effects of PIT-tagging were extensively studied and documented by the NOAA Science Center during development of PIT-tag methodology. Prentice et al documented the loss of tags in adult females near spawning, and mortality and tag loss in juveniles directly after marking.*
- *The Knudsen article illustrates the potential for PIT tag effects, which has been documented in previous NOAA research;*
- *The results of the Knudsen study can not be applied to other river reaches or other populations of fish.*
- *We have some concerns about inconsistencies in the analysis that may have influenced the results; these should be resolved with the researchers.*
- *PIT tag detection efficiency **may** be less than 100% efficiency when hand wand readers are used (as was in the Knudsen study) to detect PIT tags in adult salmon or steelhead. Failure to account for detection inefficiency **may** have lead to bias in study results or incorrect conclusions. [emphasis mine cmk]*
- *An important point from the study is that all researchers utilizing PIT tags (as well as any other marking method) should be aware of potential PIT tag effects and should address these effects in their analysis and conclusions.*
- *Handling and marking effects are recognized with all tagging methods. These cover a broad range of potential effects including, tag loss and effects on behavior and survival. The severity of effects can be expected to vary depending on tagging technique and handling environment.”*

*This is simply a list of the conclusions reached in DeHart’s memo and are not, in and of themselves, presented as arguments or evidence of anything. However, there is a vague mention that PIT tag detection efficiency **may** be low and **may** lead to bias. This statement is never actually addressed in the remainder of the memo or backed up with any analysis, data, or*

citations and so should be dismissed, particularly in light of the July 2012 presentation made to the NW Council's Fish Tagging Forum (<https://www.nwcouncil.org/media/134642/knudsen.pdf>) where PIT tag recapture efficiency estimates averaged 99% over 9 years of PIT tag recaptures for the recapture site used by Knudsen et al. (2009) refuting this unsupported assertion made by DeHart.

In addition, the “concerns about inconsistencies in the analysis that may have influenced the results” were actually never discussed with the authors of Knudsen et al. as suggested by DeHart. Such a discussion might have cleared up many of the problems noted here and below.

CSS Response: As described above, we have revised the sentence to state that concerns have been raised about the methods and analyses that were used, and that there are questions about the applicability of the results to other species, tributaries, rear types, and research questions. These concerns were documented in DeHart (2009).

DeHart (2009), page 5, paragraph 3

“Review of the Knudsen article

Our conclusions regarding the Knudsen article are that the article does not raise any new questions regarding PIT-tag effects that have not been documented in the literature. There are several study design and analytical factors that seriously limit the management applications of these results.”

The first sentence does not seem like a statement regarding a publication that has “serious limitations”, but is rather an admission that the results of Knudsen et al. were not novel or out of the ordinary. While the second sentence would seem to be a strong critical statement, there is never any follow up in the remainder of the memo documenting what these limiting factors are and thus it rings hollow and is never supported by argument or facts.

DeHart (2009), page 5, paragraph 4

“Is it reasonable to assume that mortality and tag loss also occurs in different fish in different reaches, even if the magnitude of the impact varies?”

*Mortality due to tagging and handling, and tag loss occurs with any tagging activity, with all types of tags at all life stages. The best example of this is the acoustic tag POST array studies in which tagging effects were not addressed in the study yet the study results primarily reflected the tag effects. Studies conducted by Battelle Northwest Laboratories have shown that the JSAT acoustic tags being used in Corps of Engineers studies at dams effect survival and behavior of juvenile fall Chinook. It is reasonable to assume that all tagging methods in all areas at all life stages have some potential for tagging and handling effects. **The Knudsen study results however can not be applied specifically to other tagging areas in other reaches. We discussed the reasons for caution, in management application of the Knudsen study in previous discussion.** Potential for tagging effects, regardless of the tagging method, should be addressed in each specific research study.” [my emphasis cmk]*

Since the “reasons for caution” were discussed in a “previous discussion”, it must be in some earlier occurring text. However, prior to page 5, paragraph 4 the only specific discussion of Knudsen’s results is the opening bulleted summary of DeHart’s conclusions (page 1, paragraph 1) and the summary of DeHart’s review on page 5, paragraph 4 all presented above. No discussion of specific reasons is presented, analysis made, or document cited that supports the claim that the Knudsen study results “cannot be applied specifically to other tagging areas in other reaches”.

CSS Response: We disagree. Similar to DeHart (2009), we do not believe that it is appropriate to blindly extrapolate and apply the results of Knudsen et al. (2009) results to all other species, reaches, rear types, and research questions where PIT tags are used.

DeHart (2009), page 6, 2nd paragraph

“Does this research mean that some of our results in the past are not accurate and either need to be revised or discounted?”

No, the Knudsen study and analysis has serious limitations for management applications. The status and utility of past results of other studies depends upon the specific study and the specific application of results. In studies in which PIT tagged groups are compared to other PIT tagged groups, such as the CSS study, any PIT tag mortality or tag loss would presumably affect both groups so the study results and conclusions would not be affected.”

As can be seen from the above, previous to this text there is no specific identification of what the “...serious limitations for management applications” are in Knudsen et al. There are speculative statements made, as well as statements regarding other studies, but nothing specific to Knudsen et al. (2009).

CSS Response: We disagree. Similar to DeHart (2009), we do not believe that it is appropriate to blindly extrapolate and apply the results of Knudsen et al. (2009) results to all other species, reaches, rear types, and research questions where PIT tags are used.

DeHart (2009), page 6, paragraph 4

“What management decisions are made based on information from pit tags that could be affected by this work?”

We have previously discussed several issues related to the Knudsen article which seriously limit application of results of this work to management decisions. The Knudsen analysis and conclusions only addressed one group of hatchery fish that along with other concerns limit application of results. We are unaware of any management decisions that are based upon PIT tag results alone. Passage management and fishery management decisions are based upon PIT tag results and acoustic tag results as well as Smolt Monitoring Program passage timing and passage duration data as well as historical data analysis and mathematical modeling. Decision

frameworks for management decisions have several components and take into account the limitations of each set of data for each component.”

As can be seen from the excerpted text from DeHart above, there is no discussion of any specific issues that relate to whether Knudsen et al.’s results are seriously limited in application. Because of this, DeHart (2009) should not be considered a serious critique of Knudsen et al. (2009) and should no longer be cited as such in future CSS Reports.

There is only one issue clearly relevant to Knudsen et al. discussed in the DeHart memo and it is brought up in the paragraph above. “The Knudsen analysis and conclusions only addressed one group of hatchery fish that along with other concerns limit application of results.” Using this logic, the PIT tag Effects Study at Carson NFH is also of significantly limited application. Yet, there was no such criticism made by DeHart or Tuomikoski in last year’s PIT Tag Effects chapter of the Annual Report. Perhaps this shows maturity on this issue.

And again, in the second sentence, paragraph 4, page 6 of DeHart (2009) there is reference to vague, unidentified “other concerns [that] limit application of results”. These are undocumented concerns that are never clearly laid out along with the evidence and citations backing them up or they should be deleted from this report.

For the reasons laid out above, it is not appropriate to cite DeHart (2009) as having any relevance to the statement that the Knudsen study results “cannot be applied specifically to other tagging areas in other reaches”. Thus, lines 11-13 beginning with “...however” on page 102 of the 2015 CSS Annual Report should be deleted because neither Tuomikoski et al. (2009) nor DeHart (2009) raise any specific arguments or provide any analyses or citations that support their statement.

CSS Response: We disagree. As described above, we have revised the sentence to state that concerns have been raised about the methods and analyses that were used, and that there are substantial questions and concerns about the applicability of the results to other species, tributaries, rear types, and research questions. These concerns were documented in DeHart (2009) and the applicability of the results to comparisons between similarly tagged fish was an issue discussed in Tuomikoski et al. (2009). Therefore these citations are appropriate.

*3) From DRAFT 2015 CSS Report:
page 102, line 15. “...(Stiefel et al. 2015 in review)”*

There is no citation for this article in the bibliography.

CSS Response: Noted. This citation has been added to the references.

Literature cited

DeHart, M. 2009. PIT tag effects Memo to Tom Karrier and Tony Grover. Date: November 18, 2009. Fish Passage Center Memo 186-09.

Knudsen, C. M., M. V. Johnston, S. L. Schroder, W. J. Bosch, D. E. Fast, and C. R. Strom. 2009. Effects of Passive Integrated Transponder tags on smolt-to-adult recruit survival, growth, and behavior of hatchery spring Chinook salmon. North American Journal of Fisheries Management 29(3):658-669.

Tuomikoski, J., J. McCann, T. Berggren, H. Schaller, P. Wilson, S. Haeseker, C. Petrosky, E. Tinus, T. Dalton, and R. Ehlke). 2009. COMPARATIVE SURVIVAL STUDY (CSS) of PIT-tagged Spring/Summer Chinook and Summer Steelhead 2009 Annual Report, BPA Contract #19960200. Fish Passage Center.

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Tuomikoski et al. 2015. DRAFT COMPARATIVE SURVIVAL STUDY (CSS) of PIT-tagged Spring/Summer Chinook and Summer Steelhead 2015 Annual Report.