



# FISH PASSAGE CENTER

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## MEMORANDUM

TO: Curtis Knudsen

FROM: Michele DeHart

DATE: November 17, 2010

RE: Response to review comments on CSS DRAFT 2010 Annual Status Report

Thank you for your review comments on the CSS DRAFT Annual Status Report for 2010. We have received and considered your markup version of the Comparative Survival Study DRAFT Annual Status Report for 2010. The Comparative Survival Study Oversight Committee (CSS-OC) appreciates your comments on the 2010 draft Annual Report Chapter 6, addressing effects of PIT tags on SAR estimates. The CSS-OC has reviewed and considered your comments, and incorporated several of your suggested edits. Because your comments were sent via track changes on a MS word document, for clarity we've transcribed these below as accurately as possible below and inserted our responses immediately following each of your specific comments.

However, it appears that most of your remarks relate to a Fish Passage Center memorandum, dated November 18, 2009, prepared in response to specific questions from Tom Karrier and Tony Grover of the Northwest Power and Conservation Council staff. After carefully reviewing and considering your remarks, we do not see any basis for modifying our conclusions or responses to questions in the November, 18, 2009 memorandum regarding PIT tag effects.

## **Response to C. Knudsen comments on Draft CSS 2010 Annual Report**

Comment: CMK1 (p. 129, line31 top. 130 line 1): “This is quite close to the average PIT tag effect (loss plus tag induced mortality) reported by Knudsen et al. (2009) of 25%.”

### **Response:**

**No edit needed; this survival differential reported in Knudsen et al. (2009) study was addressed later in same paragraph.**

Edit (p. 130, lines 2-6): “It was unclear whether a bias existed in either the run reconstruction, or PIT tag SARs, or both due, in part, to uncertainties and assumptions in ~~the run reconstruction~~ both methods. Knudsen et al. (2009) reported that hatchery Chinook from the Yakima River that were PIT-tagged, ~~and coded-wire-tagged, elastomer marked and ad-clipped~~ returned at a 25% lower rate fish that were only coded-wire-tagged, elastomer marked and ad-clipped than fish that were only coded-wire-tagged, elastomer marked and ad-clipped.”

### **Response:**

**Suggested edit incorporated.**

Edit and comments (p. 129, lines6-9): “The Knudsen study illustrated ~~the potential that for~~ PIT tags can cause significantly underestimates in SARs due to both PIT tag loss and PIT tag induced mortality effects, however, its applicability to other river reaches or populations of fish is unknown (Tuomikoski et al. 2009; DeHart 2009).” Comment CMK2: “These were not potential effects. They were significant effects repeated over 5 brood years. No need to down play them.” Comment CMK3: “This statement (line 7-8, pg 130) is not supported by the literature cited. Neither Tuomikoski et al. (2009) nor DeHart (2009) provides any evidence that the results in Knudsen et al. (2009) are not applicable to other Chinook populations, particularly populations in the Columbia River. They do not provide any citations or analyses that support that assertion. DeHart states, “Research conducted by NOAA showed that tag loss in juveniles occurs within a month of tagging, resulting in the recommendation that PIT-tagging be conducted a month before release.” Knudsen et al.’s PIT tagging did occur more than 1 month prior to release. Tuomikoski et al. (2009) state that additional analyses are being conducted to replicate Knudsen et al.’s results. We enthusiastically welcome others to replicate our study so that we all gain a more complete understanding of the effects of PIT tags across a broad spectrum of populations and life history types. However, until the new studies are completed, no comparisons can be made.”

### **Response:**

**Edits and comments not incorporated. The original language acknowledged that the Knudsen et al. (2009) study demonstrated that effects can occur. Given the state of the science, the CSS-OC cannot conclude the Knudsen et al. (2009) estimates of differential mortality are necessarily applicable to wild populations, other species and other regions of the Columbia River. The CSS-OC agrees with the commenter that more complete understanding of the effects of PIT tags across a broad spectrum of populations and life history types would be useful. Given the general lack of these studies, however, the CSS-OC concludes that the applicability of these**

**results is not known, with respect to other river reaches, different smolt and adult monitoring locations, and other populations of fish.**

Comment CMK4 (p. 129, lines 14-15): “Again, this is similar to the mean of 25% in Knudsen et al. 2009. Thus, there are two geographically independent run reconstruction estimates of SARs and the results of Knudsen et al. that found a bias of 16-35% in PIT tag SARs. This is strong evidence for bias in PIT tag SARs that is not confined to just the Yakima River population nor to a particular study design.”

**Response:**

**Comment not incorporated. Without better definition of potential bias in the run reconstruction (RR) SARs, it is difficult to conclude that the SAR difference is due solely to PIT-tag effects (Schaller et al. 2007; Tuomikoski et al. 2009).**

Comments (p. 131, lines 5-23): Comment CMK5: “The discussion below of post-tagging mortality and tag loss are rather superficial. In general, 19 lines of text were allocated to discussion of bias in PIT tags, while 62 lines are devoted to a more thorough discussion of RR SARs bias. A more comprehensive discussion of PIT tag bias issues would greatly improve the document.” Comment CMK6: “Please summarize the supporting analyses or at least give some citations. Is this representative in time and space, migration timing/speed, growth trajectories, life history type, body size, cortisol levels, and condition factor?” Comment CMK7: “Citation?” Comment CMK8: “Two citations are Prentice et al. (1994) and Knudsen et al 2009. Post-release mortality due to PIT tags is documented in Knudsen et al. and is not attributed to tagging smaller fish.” Comment CMK9: “This looks like an excellent place to cite the results of Knudsen et al. on tag shedding as well as the Skagit coho study of Prentice et al. (1994). These are the only two studies I am aware of that assess PIT tag shedding to the adult stage under actual study conditions rather than short term in net pens.” Comment CMK10: “Contrary to the assertion in Dehart 2009 that tag detection efficiency was a problem in Knudsen et al. 2009, we found no such problem. We tested this by examining PIT tags recovered from in-river carcasses. The percentage of PIT tagged carcasses that were detected at our PIT tag recovery site is an estimate of the PIT tag recovery efficiency rate. Over the years in our study, we averaged 97% PIT tag recovery efficiency. This eliminates tag recovery efficiency as a potential problem in Knudsen et al. 2009”.

**Response:**

**Comments were addressed by adding references to some of the potential causes of PIT tag effects, including those suggested by the commenter (Knudsen et al. 2009; Prentice et al. 1994). Note that several of these additional references were described in more detail in the DeHart (2009) review memo (which had been cited in the draft Chapter 6). Regarding Comment CMK 10, the DeHart (2009) memo described an on-site detection efficiency of only 90% at one CSS hatchery facility study location (South Fork Salmon River) using single PIT tag readers for adults. The CSS-OC concludes that the draft report language was accurate that “adult detection efficiency ... can be an issue for SARs measured to tributary traps especially when using hand wand equipment (DeHart 2009).”**

Comment CMK11 (p. 132, lines 37-38): “See Murdoch et al. 2010. Estimating the spawning escapement of hatchery- and natural-origin spring Chinook salmon using redd and carcass data. North American Journal of Fisheries Management 30:361-375. They describe bias in carcass samples caused by body size and gender.”

**Response:**

**The Murdoch et al. (2010) reference was added, and the personal communication with Copeland & Kennedy (IDFG) was also retained specific to the Snake River RR SARs.**

Edit and Comment (p. 132, lines 41-42): “To date a definitive control group has been lacking to quantify the potential post-marking mortality and/or tag shedding bias in PIT tag SARs.”

Comment CMK12: “What is a “definitive control group”? Do you mean a definitive control for studies on Chinook salmon in the Columbia River? For steelhead in the Columbia River? Do you think one control could fit both species? For wild or hatchery populations? Spring or fall Chinook? Yearling or sub-yearling life histories? Post-marking tag loss and mortality from PIT tags must be measured in a variety of species, life history types and in hatchery and wild populations. This kind of research should continue to be encouraged and more vigorously supported by the FPC, BPA, ISRP and the ISAB in order to fully understand whether there are any significant violations of assumptions necessary in a study design.”

**Response:**

**Suggested edit was incorporated. Regarding CMK12, Snake River wild Chinook SARs were compared between specific RR and PIT SAR methodologies. It is not likely that a single control would be applicable for multiple species, and life history strategies, and wild and hatchery production. The CSS-OC agrees with the commenter that additional research is needed on the question of PIT tag effects, and has collaborated with USFWS and other entities for such research in the near future (see draft Chapter 6 Discussion, p. 134, lines 35-46).**

Edit and Comment (p. 134, lines 30-32): “~~To date a definitive control group has been lacking to quantify the potential bias from post-marking mortality or tag loss in PIT tag SARs.~~” Comment CMK13: “I question whether lack of a “definitive control group” should make it difficult to draw conclusions about whether there is bias in SARs due to post-marking mortality and tag loss. The studies noted on lines 35-46 will add significantly to our understanding of this issue and do not rely on a “definitive control group”.

**Response:**

**Suggested deletion was not incorporated. The CSS-OC concludes it is important define the potential bias in the RR SAR methodologies presently being employed to better quantify the PIT tag effect on SARs.**

Comment CMK14 (p. 134, lines39-40). “This is an excellent plan. Although DeHart (2009) disagrees and discourages the use of double-tag studies, noting that, “[i]n fact research has shown that double tagging with PIT tags and coded wire tags significantly lowered survival [of Skagit coho] when compared to PIT tagged or coded wire tagged fish alone.” citing Prentice et al. 1993. However, Prentice et al. 1994, referring to the same study group of fish notes that survival to adult for Skagit coho tagged with CWT and PIT tags as juveniles was greater than in fish tagged with just a PIT tag or CWT tag.”

**Response:**

**No edits incorporated.**