



# FISH PASSAGE CENTER

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## MEMORANDUM

TO: FPAC

FROM: Brandon Chockley

DATE: January 19, 2017

RE: Inflated collection estimates at Lower Granite Dam for subyearling Chinook, due to resampling of PIT-tagged study fish.

In June of 2016, a study was conducted at Lower Granite Dam (LGR) to evaluate the detection efficiency of four different PIT-tag types (12-mm, 8-mm Biomark, 8-mm Oregon RFID, and 9-mm). This study involved PIT-tagging clipped and unclipped subyearling Chinook that were sampled as part of the Smolt Monitoring Program (SMP) sample at LGR. Approximately 300 subyearling Chinook from the June 6, 2016 sample were turned over to researchers for this study. Study fish were PIT-tagged on June 7, 2016 and released on June 8, 2016 into the upwell, above the separator. Of the approximately 300 PIT-tagged study fish released on June 8, 2016, four were later detected re-entering the sample tank, which resulted in these fish being resampled by the SMP crew. The resampling of these PIT-tagged study fish resulted in an inflated estimate of collection estimates and, therefore, inflated estimates of the passage and population indices for the June 9, 2016 sample. Due to these inflated estimates of collection and passage index, there is the potential for estimates of timing to be impacted by the resampling of study fish.

- It is important to note that data collected for the SMP are mostly used by the Fish Passage Advisory Committee (FPAC) to inform timing of run-at-large juvenile salmonids as they migrate through the FCRPS. Estimates of collection and the passage index are not intended to serve as population estimates.
- The resampling of PIT-tagged study fish had very little impact on the estimates of collection and passage index for subyearling Chinook. Overall, corrections to the daily collections and passage indices resulted in a 0.052% reduction from the “original” estimate of total collection and a 0.045% reduction from the “original” estimate of total passage index.

- Estimates of passage timing, based on estimates of collection or the passage index, were not impacted by the resampling of PIT-tagged study fish.
- ***Given the minimal impact that the resampling of study fish had on total estimates of collection and passage index, and no impact on timing estimates, we recommend that the 2016 SMP database for LGR be left intact as is, with no corrections applied.***

## **Methods:**

As mentioned above, the FPC staff has reviewed the PIT-tag detection data for PIT-tagged juvenile salmonids from the PIT-tag detection efficiency study conducted in 2016 to investigate to what degree the resampling of these PIT-tagged study fish may have had on estimates of collection and the passage index. In particular, we focused on those PIT-tagged study fish that were detected in the LGR sample tank. Data collected for the SMP are mostly used by the FPAC to inform timing of run-at-large juvenile salmonids as they migrate through the FCRPS. Estimates of collection and the passage index are not meant to serve as population estimates.

In all, this study PIT-tagged and released approximately 300 subyearling Chinook on June 8, 2016. Of these, four were later detected in the LGR sample tank, which means they were resampled by SMP crews in the June 9, 2016 sample. To determine the impact of this resampling, we estimated the daily and overall collection counts for subyearling Chinook using two methods. The first was to use the collection counts as they were originally reported by SMP personnel, which include an overestimated collection on the day when PIT-tagged study fish were detected in the sample tank. Here-in, we refer to these estimates as the “original” estimates.

The second method was to estimate a new “corrected” daily collection count by reducing the daily sample count by the number of PIT-tagged study fish that were detected at the sample tank (i.e., four) for the June 9<sup>th</sup> sample. These “corrected” sample counts were then used to estimate a “corrected” collection count, based on the sample rate that was used for that day’s sample. Finally, a “corrected” passage index was calculated from the “corrected” collection estimate.

Finally, we used the “original” and “corrected” estimates of collection and passage indices to estimate timing of subyearling Chinook at LGR. Although the FPAC typically uses the passage index to estimate timing, we estimated timing from both the daily collections and daily passage indices, to illustrate the potential bias of resampling.

## **Results:**

### ***Estimates of Total Collection and Passage Indices***

The resampling of PIT-tagged study fish resulted in an overestimate of 400 total subyearling Chinook in the collection, all of which occurred in the sample on June 9<sup>th</sup>. The “original” estimate of collection for June 9<sup>th</sup> was 33,400 subyearling Chinook, whereas the “corrected” estimate was 33,000. The estimates of total collection for subyearling Chinook in 2016 were 774,258 for the “original” method and 773,858 for the “corrected” method (Table 1).

This equated to an estimated 0.052% reduction from the “original” estimate of total collection (Table 1).

The overestimate of 400 subyearling Chinook in the collection resulted in an overestimate of the passage index by approximately 545 subyearling Chinook juveniles. Again, this overestimate of the passage index occurred on one day, June 9<sup>th</sup>. The “original” estimate of passage index for June 9<sup>th</sup> was 45,529, whereas the “corrected” estimate was 44,984. The estimates of total passage index for subyearling Chinook in 2016 were 1,198,182 for the “original” method and 1,197,637 for the “corrected” method, which equated to an estimated 0.045% reduction from the “original” estimate of total passage index (Table 1).

**Table 1.** “Original” and “Corrected” estimates of total collection and passage index for subyearling Chinook at Lower Granite Dam in 2016.

“Original” Collection	“Corrected” Collection	Percent Reduction	“Original” Passage Index	“Corrected” Passage Index	Percent Reduction
774,258	773,858	0.052%	1,198,182	1,197,637	0.045%

### *Estimates of Timing*

For other analyses and reports on timing from the SMP, the FPC staff typically focuses on the estimated 10%, 50%, and 90% passage dates, based on the passage index. However, for illustrative purposes, we estimated timing based on both daily collections and the daily passage index. The resampling of PIT-tagged study fish in 2016 had no impact on estimates of timing. This is true for timing based on daily collection estimates or daily passage indices (Table 2).

**Table 2.** Estimated 10%, 50%, and 90% passage dates for subyearling Chinook based on “original” and “corrected” daily collections or passage index.

Collection or Passage Index	“Original”			“Corrected”		
	10%	50%	90%	10%	50%	90%
Collection	27-May	10-June	5-July	27-May	10-June	5-July
Passage Index	29-May	11-June	7-July	29-May	11-June	7-July

### **Conclusions:**

Overall, there was minimal impact from the resampling of PIT-tagged study fish on the daily and overall estimates of collection and passage index for subyearling Chinook in 2016. In addition, the resampling of PIT-tagged study fish had no impact on estimates of timing at LGR. Given these results, we recommend that the 2016 SMP database for LGR be left intact as-is, with no corrections applied.

To: Brandon Chockley

From: Paul Wagner – FPAC co chairman

Date: March 7, 2017

Subject: Significance of bias in collection estimates and passage indices at Lower Granite Dam due to the influence of recollecting study fish in 2016.

On March 7, the Fish Passage Advisory Committee (FPAC) met by way of a conference call. One of the agenda items for this meeting was to discuss a memo dated January 19, 2017 to FPAC from the FPC entitled: “Inflated collection estimates at Lower Granite Dam for clipped yearling Chinook, steelhead, and subyearling Chinook due to resampling of PIT-tagged study fish” (document #12-17). The memo discusses the impact of resampling PIT-tagged study fish at LGR on daily and total estimates of collection and passage indices as well as impacts on estimates of juvenile timing. Based on the analyses presented in the memo, the FPC staff recommended that the impact of resampling was not significant enough to warrant changing the SMP database for LGR in 2016. After discussion of the memo, the FPAC was in agreement with the FPC recommendation.