FISH PASSAGE CENTER

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MEMORANDUM

TO: Jeff Fryer, CRITFC

FROM: Michele DeHart

DATE: March 7, 2014

RE: Results from 2012 PIT-tagging of Okanogan River sockeye

In response to your request, the Fish Passage Center staff has estimated juvenile survival, migration timing, and travel times of PIT-tagged Okanogan River sockeye from the joint PIT-tagging efforts in 2012. Below are the results from our analyses, followed by more specific details.

- In 2012, a total of 534 sockeye juveniles were PIT-tagged and released under the coordinator ID of JKF into the Okanogan River from the release site SKA.
- With these tags, we were able to estimate survival from release to Rocky Reach Dam. Survival from release to Rocky Reach Dam was 0.56 (s.e. 0.08).
- As with the 2013 tagging efforts, estimates of survival beyond Rocky Reach dam were questionable. This was again partially due to the low survival from release to Rocky Reach Dam which contributed to a low number of detections of PIT-tagged fish below McNary Dam.

Methods

Timing and Travel Time

Timing and fish travel times were estimated for this group based on PIT-tag detections at various dams within the Rocky Reach to Bonneville reach. We estimated cumulative passage timing based on PIT-tag detections at Rocky Reach (RRH), McNary (MCN), John Day (JDA),

and Bonneville (BON). Daily PIT-tag detections at each of these projects were summed and adjusted based on the average proportion of flows that passed through the turbines. Minimum, median, and maximum fish travel time were estimated from release to detection at each dam in the reach with detection capabilities.

Survival

We attempted to estimate smolt survival and their associated variance estimates for these juvenile sockeye from their release at SKA to BON. PIT-tagged smolts can be detected at RRH, MCN, JDA, and BON dams, as well as downstream of Bonneville Dam using specialized trawl equipment for PIT-tag detection. Using recapture data from fish detected at these sites, single-release mark-recapture survival estimates were generated using the Cormack-Jolly-Seber methodology as described by Burnham et al. (1987) with the Mark program (software available free from Colorado State University: White and Burnham 1999). If possible, survivals from multiple reaches were combined (e.g., Release to MCN combines 2 reaches; Release to RRH and RRH to MCN) and variance estimates for the overall reach (Release to MCN) were generated using the delta method (Burnham et al. 1987).

Results

Timing and Travel Time

In 2012, a total of 534 juvenile sockeye were tagged and released from the release site SKA under the coordinator ID of JKF. Sockeye tagging occurred on three days: April 24th, April 30th, and May 2nd. For the most part, these PIT-tagged sockeye juveniles passed through the Upper and Lower Columbia rivers from early May to mid-May. In fact, the estimated 90% passage date at BON was May 18th (Table 1). Figure 1 (below) is provided to illustrate the passage timing of these PIT-tagged juvenile sockeye as they were detected at RRH, MCN, JDA, and BON.

Table 1. Migration timing of PIT-tagged juvenile sockeye from the Okanogan River detected at RRH, MCN, JDA, and BON dams in 2012.

	Estimated Passage Date		
Project	**10%**	**50%**	**90%**
RRH	4-May	8-May	12-May
MCN	8-May	11-May	15-May
JDA	8-May	15-May	18-May
BON	9-May	15-May	18-May

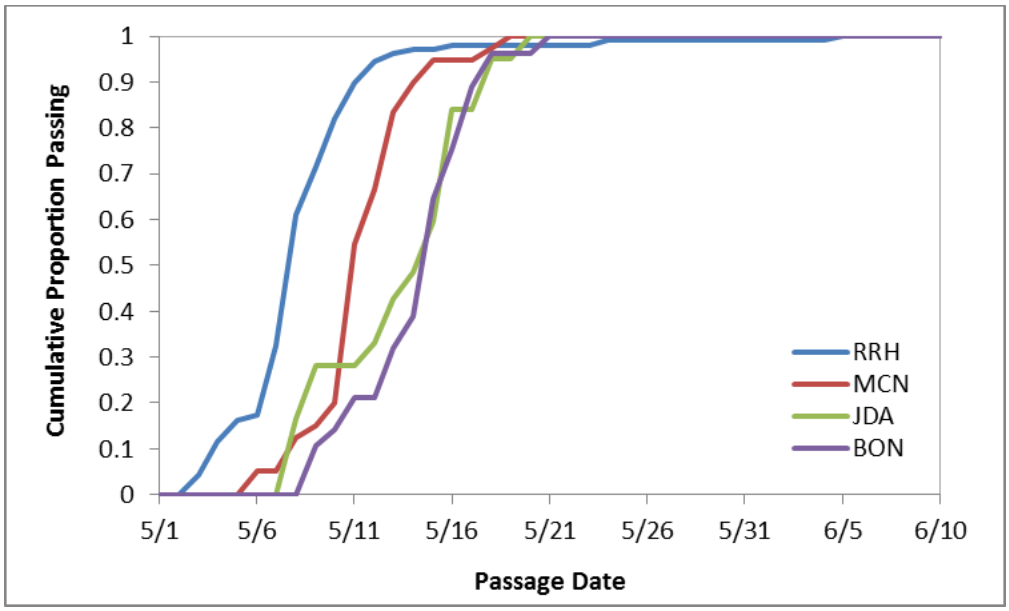

Figure 1. Cumulative passage timing at RRH, MCN, JDA, and BON dams of juvenile sockeye PIT-tagged and released from SKA in 2012.

Estimates of minimum, median, and maximum travel times from release to RRH, MCN, JDA, and BON dams are provided below (Table 2). Also provided are estimates of the 95% confidence limits around the estimated median travel time.

Table 2. Travel times (Release to Project) of juvenile sockeye PIT-tagged and released from SKA in 2012. Numbers in parentheses are total detections at each project.

	Release to Project Travel Time (days)			95% Confidence Limits	
Project	**Min**	**Med**	**Max**	**Lower**	**Upper**
RRH (92)	5.3	7.8	34.3	7.7	8.7
MCN (42)	8.7	11.3	18.5	10.8	12.2
JDA (19)	11.4	14.4	21.5	14.0	16.2
BON (48)	12.8	14.9	19.3	14.3	15.4

Survival

With the 534 PIT-tagged sockeye from 2012, we were able to estimate survival from release to RRH, which was 0.56 (s.e. 0.08). However, sample sizes were too low to get reliable estimates of survival below RRH. As with the 2013 marking, this was largely due to low numbers of subsequent downstream detections. For example, of the 42 PIT-tagged sockeye smolts that were detected at MCN, only 6 were subsequently detected downstream of MCN. This low number of downstream detections led to an estimated survival from RRH to MCN of 1.14 (s.e. 0.43).

To put into context the out-migration conditions that these sockeye juveniles may have experienced, Table 3 provides the average spring flow volume (April 15–June 30) for the Upper Columbia River (as measured at Priest Rapids Dam), along with the average spring spill proportions at each of Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids dams in 2012.

Table 3. Average spring (April 15–June 30) flow at Priest Rapids Dam (PRD) and average spill proportion at Wanapum (WAN), Priest Rapids (PRD), Rock Island (RIS), Rocky Reach (RRH), and Wells (WEL) dams in 2012.

PRD Flow Volume (Kcfs)	WAN Spill Prop.	PRD Spill Prop.	RIS Spill Prop.	RRH Spill Prop.	WELL Spill Prop.
35.9	0.48	0.47	0.20	0.21	0.24

Literature Cited

Burnham, K.P., D. R. Anderson, G.C. White, C. Brownie, and K.H. Pollock. 1987. Design and analysis methods for fish survival experiments based on release-recapture. American Fisheries Society Monograph 5. Bethesda, MD. 437 pp.