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August 11, 2003

MEMORANDUM FOR: F/NWR5 - Brian J. Brown

FROM: F/NWC3 - John W. Ferguson

SUBJECT: Preliminary Results of the 2003 Summer Spill  
Studies at Ice Harbor Dam

In 2000 and 2002, the Fish Ecology Division of the Northwest Fisheries Science Center conducted spillway passage survival studies at Ice Harbor Dam for subyearling chinook salmon (*Oncorhynchus tshawytscha*) using PIT-tag methodology. These studies resulted in spillway passage survival estimates of 0.885 (95% CI 0.855, 0.915) and 0.894 (95% CI 0.856, 0.932) in 2000 and 2002, respectively (Eppard et al. 2002, Eppard et al. *in prep*). In 2003, studies were funded by the U. S. Army Corps of Engineers to investigate the causal mechanisms of spillway mortality at Ice Harbor Dam. Based on preliminary results from research conducted in the spring, two operations at Ice Harbor Dam were developed for summer testing: a concentrated spill pattern and a no-spill condition. The concentrated spill pattern consisted of 2000 Federal Columbia River Power System Biological Opinion spill volumes (45 kcfs in the daytime, 100% of total river flow at night) in 2-3 spillbays rather than spreading it across all 10 spillbays. Testing of the concentrated spill and the no-spill conditions occurred in 2-day block intervals from 24 June to 13 July.

Run-of-river hatchery subyearling chinook salmon were collected and PIT tagged at Lower Monumental Dam and transported to Ice Harbor Dam 16-24 hours prior to release. During the spill condition, morning releases were made into each open spillbay, the collection channel, Turbine Unit 1 and a control release downstream from Ice Harbor Dam. Evening releases were made into each open spillbay and a control release downstream. During the no-spill condition, morning and evening releases were made into the bypass collection channel, Turbine Unit 1 and a downstream

control. Downstream control releases were made by transferring PIT-tagged fish through a hose into a tank on a release barge. Fish were then transported downstream and released at a time estimated to coincide with the passage of treatment fish. To mimic the handling that control fish received, all test groups were also transferred from the tagging tank into a holding tank before release. Bypass collection channel releases were made through a hose into the collection channel adjacent to Turbine Unit 6. Turbine releases were made through a hose attached to the trailing edge of the submerged traveling screen in the A slot of Turbine Unit 1 which terminated in the center of the lower cross member, releasing the fish in the center of the intake slot. Spillway releases were made by lowering the release tank to near water level with a crane. The release tank had a weighted section of hose attached which released the fish approximately 6 feet below the surface. The velocity present in the release location did not allow the weighted hose to release fish deeper in the water column. Approximately equal numbers of fish were released into each treatment location both morning and evening each release day.

Survival was estimated for daily groups of PIT-tagged fish released into the spillway, turbines, bypass collection channel, and tailrace of Ice Harbor Dam and detected in the juvenile bypass systems of McNary, John Day, and Bonneville Dams using the single-release Cormack-Jolly-Seber (CJS) model (Burnham et al. 1987, Iwamoto et al. 1994). The ratios of spillway, turbine, and collection channel CJS estimates to tailrace CJS estimates were calculated to obtain daily "relative" survival estimates. Weighted geometric mean estimates with 95% confidence intervals were then calculated. (Note: The process to make the calculations was to log-transform the estimates, calculate the weighted arithmetic mean where the weights were the inverse relative variances of the individual estimates [i.e., weight =  $\text{mean}^2/\text{variance}$ ], calculate symmetric 95% confidence intervals [ i.e.,  $\pm t(.05, \text{df}=\text{n}-1)*\text{SE}$ , where SE = standard error of the weighted mean], and then back-transform the estimates and confidence interval endpoints.)

Preliminary analyses for the 2003 Ice Harbor subyearling chinook salmon spillway evaluation indicate relative survival estimates of 0.964 (95% CI 0.909, 1.022), 0.997 (95% CI 0.959, 1.036), and 0.893 (95% CI 0.849, 0.940) for spillway, bypass collection channel, and turbine releases, respectively. These estimates do not separate turbine and bypass collection channel survival

between spill and no spill days.

We received a request from Jim Ruff for the preliminary results of the 2003 summer spill studies at Ice Harbor Dam on 7 August 2003. He said they were needed by 11 August for Federal Hydro Caucus discussions scheduled that week. While we were able to respond quickly in this instance, in the future, please provide more advance notice, when possible, of any deadlines you may have to give us as much time as possible to focus on the details and carry out the quality assurance steps we take associated with processing and analyzing important data sets such as these. Secondly, on 7 August 2003 I received an email from Mark Smith, U. S. Army Corps of Engineers Walla Walla District, in which he provided Fish Passage Center estimates of summer spill survival at Ice Harbor Dam. While many people and organizations have access to PITAGIS and can download the detection files, to report results of PIT-tag analyses without first contacting the researchers who conducted the work so the analyses can be performed with an understanding of the study design used to obtain the raw data and the actual conditions under which the study was conducted is scientifically unsound. I trust that you concur and your staff does not condone this approach to decision making. I understand these kinds of issues are best discussed in the context of the Fish Passage Center Oversight Board, and while I plan to do so, I wanted you to be aware of our concerns.

cc: F/NWC3 - Dey  
F/NWC3 - Eppard  
F/NWC3 - Williams



## REFERENCES

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- 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. 437p.
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