Testing Delayed Mortality of Snake River Chinook Salmon in the Coastal Ocean

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Fish transportation barge
Completion of the Snake River dams in the 1970s

* Data from the Fish Passage Center Comparative Survival Reports
Delayed Mortality Hypothesis

Index of Return Rates

* Petrosky et al. 2013. CJFAS

Mid-Columbia River
Snake River
Hypothesis Tests

Spring Chinook from the mid-Columbia R have 3-4x higher return rates

❖ Does passage through the Snake River dams result in delayed mortality (hydro DM) in the estuary and ocean?

Snake River spring Chinook transported around the dams have marginally better return rates

❖ Does transportation via barge result in delayed mortality (transport DM)?
How can we test delayed mortality hypotheses?

1. Deploy a strategically placed large-scale tracking array
2. Release acoustic tagged smolts
3. Recover data from the array
4. Use detections to estimate survival (CJS)
5. Compare survival estimates in the estuary and ocean

- Snake River spring Chinook vs. mid-Columbia River
- Snake River spring Chinook vs. transported Snake River spring Chinook
800-1600 fish/year
(6,600 total)
Study Design

Release Group 1
- Snake R In-river: 20
- Mid-Col In-river: 20
- Snake R Transport: 10

Release Group 2
- 0
- 0
- 0
- 0

Similar Ocean Entry Time
Visualizations of Juvenile Migration in 2008 & 2009
Cormack-Jolly-Seber Survival Estimation

Sub-array 1
Sub-array 2
Sub-array 3

release

\[75 = \frac{100 \times 75\%}{100}\]

\[SE = \sqrt{\frac{p(1-p)}{n}} = 4\%\]
Results: Test of hydro DM 2006-2009*
(Snake & Mid-Columbia spring Chinook)

Results: Test of transport DM 2006-2009*
(Snake and mid-Columbia Spring Chinook)

Relative survival

Results: Test of transport DM 2010-2011*
(Snake & Columbia yearling Chinook collected at dams)

*Rechisky et al. 2014. Marine Ecology Progress Series
Conclusions

- Purpose built, large-scale array to address critical uncertainties
- No evidence of delayed mortality for smolts migrating through 8 dams
- No transportation delayed mortality in 4 of 5 years
- Early marine mortality is high
- Differences in adult return rates may develop far from the Columbia River...
Ocean Conditions

Anomaly of number of adults returning to Spawn
Thank You!

- Dworshak and Kooskia NFH staff
- Yakama Nation, Prosser Hatchery and Chandler Juvenile Fish Monitoring Facility staff
- Smolt Monitoring Facility staff at Lower Granite, John Day and Bonneville dams
- Columbia River Inter-Tribal Fish Commission- Jon Hess, Shawn Narum

**Funding:** Dept. of Energy, Bonneville Power Administration
Visualization of Juvenile Migration in 2011
Results: Test of hydro DM 2010-2011*
(Snake & Columbia yearling Chinook collected at dams)

*Rechisky et al. 2014. Marine Ecology Progress Series