Reproductive Success of Yakima Spring Chinook

MOLECULAR GENETICS WORKSHOP
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Acknowledgements

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Restoration of High Risk Fish Populations

- Controlling harvest
- Habitat protection & rehabilitation
- Artificial propagation
  - Risks associated with hatchery rearing
Waters et al. 2015: Integrated lines exhibit reduced genetic divergence from wild population.

Can integrated hatchery programs be used to increase long-term natural production?
CERSF

- Cle Elum Supplementation & Research Facility (CERSF)
- **Goal**: developed in 1997 to assess integrated population enhancement strategies for spring Chinook Salmon.
  - Fully integrated hatchery program.
    - Broodstock collected at Roza Dam.
  - All returning hatchery-origin adults are allowed to spawn in the wild.
Yakima River Basin, Washington
Methods

Use DNA to reconstruct genetic pedigrees from 3 types of matings:

- Wild x Wild (WxW)
- Hatchery x Wild (HxW)
- Hatchery x Hatchery (HxH)
Using Parentage Analysis, to test:

- Are there differences in reproductive success between wild and hatchery-reared fish spawning in nature?
- Do hatchery-reared fish spawning in nature reduce the fitness of the wild population?
- **Schroder et al. 2008; 2010**: Breeding success is equivalent for wild & hatchery-origin males & females when spawning in a controlled environment (first generation F1s from the CERF program).
Preliminary Results

Precocious Male Maturation

- **Larsen et al (2013):** Large proportion of hatchery-origin males are maturing as Age 2 minijacks or Age 3 jacks.
- Integrated programs produce ~30-70% minijacks.
- Why is this a problem?
  - Ecological impacts
  - Genetic impacts
  - Loss of adult production
  - Alter accuracy of Smolt-to-adult (SAR) return rates
  - Potential source of domestication

Minijacks have been implicated in the low RRS of Wenatchee Basin hatchery fish spawning in the wild (Ford et al. 2012).
Conclusions & Future Directions

- Slight decrease (although not statistically significant) in reproductive success of hatchery-origin fish compared to wild-origin.
- Hatchery-reared fish spawning in the wild do not seem to reduce the fitness of the wild population.
- Cle Elum Mini Jack Study:
  - Various age crosses were made for Cle Elum broodstock in (BY) 2014, 2015 and 2016.
  - **Objective:** test for an effect of male and/or female parent age on the proportion of minjacks among their male progeny.
  - **Prediction:** parents that have matured at a younger age will have higher numbers of minjacks among their male progeny (i.e. genetic effects).