

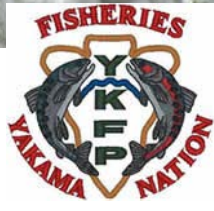
Reproductive Success of Artificially Reconditioned Kelt Steelhead in the Yakima River

Doug Hatch, Jeff Stephenson, Dave Fast, Bill Bosch, Joe Blodgett, Ryan Branstetter, and Andy Pierce



Outline

- Provide some background on the kelt reconditioning program.
- Research questions for this study.
- **Preliminary** results and some interpretation.



Yakima steelhead life history

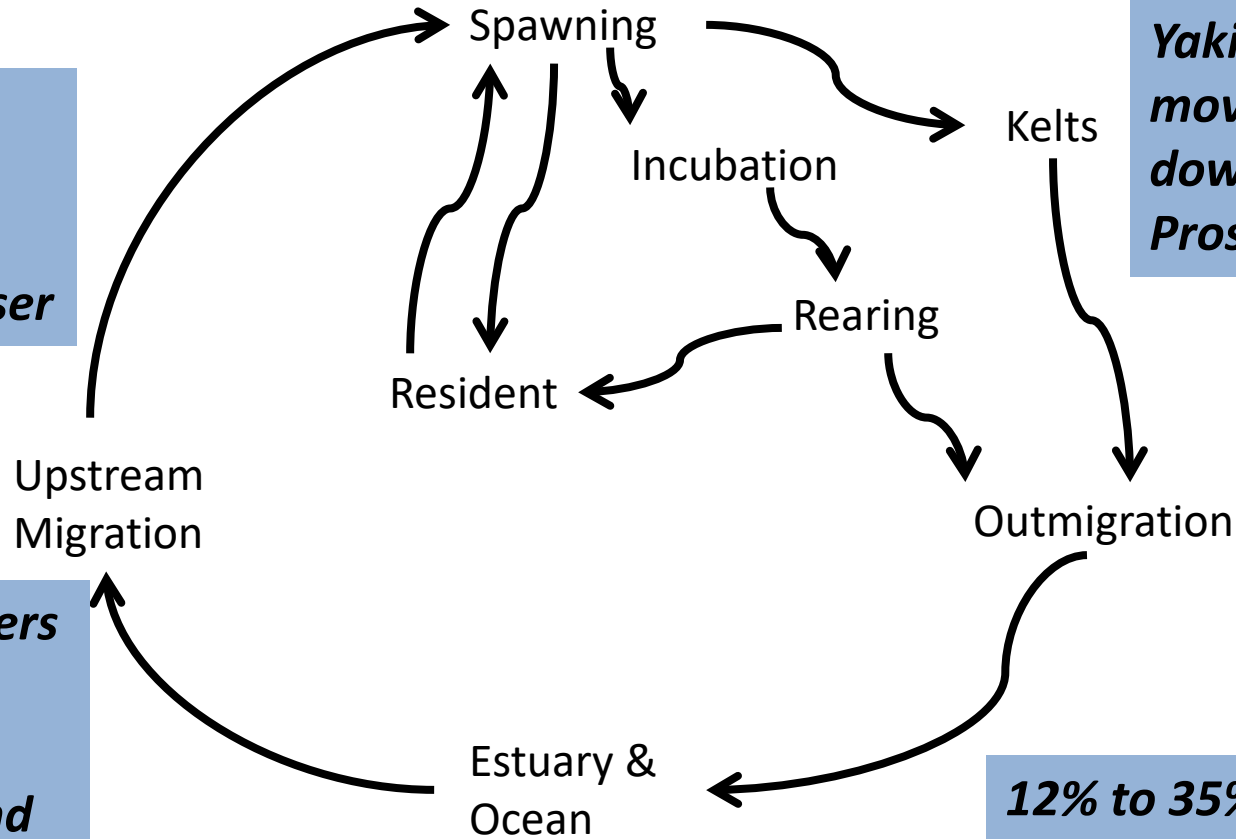
2.7% natural repeat spawners 10y mean at Prosser

Repeat spawners typically comprise 60% consecutive and 40% skips.

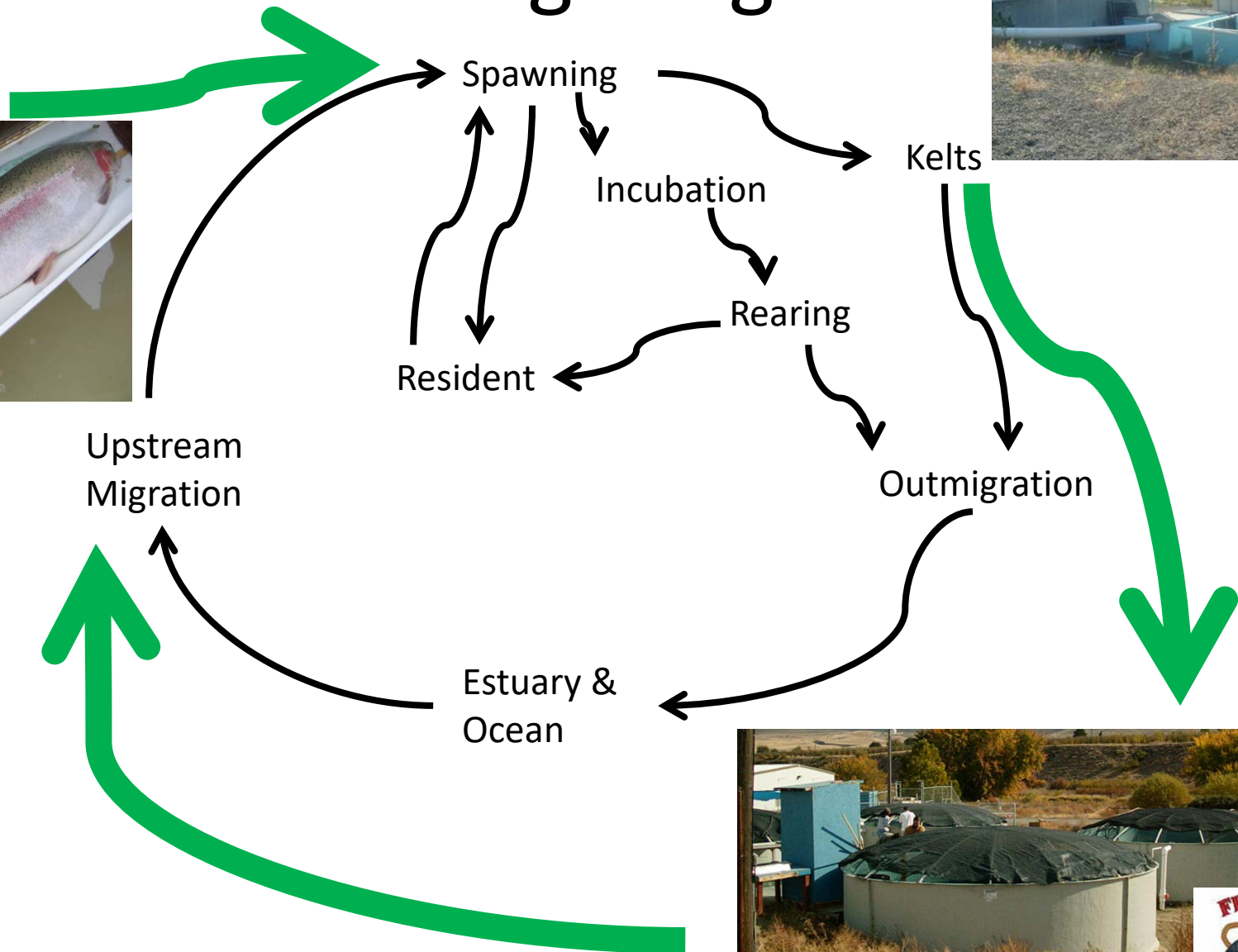
7.2% previous spawners in high seas samples

~70% of the Yakima run is moving downstream of Prosser

12% to 35% survival of Yakima kelts to the ocean



Kelt Reconditioning Program

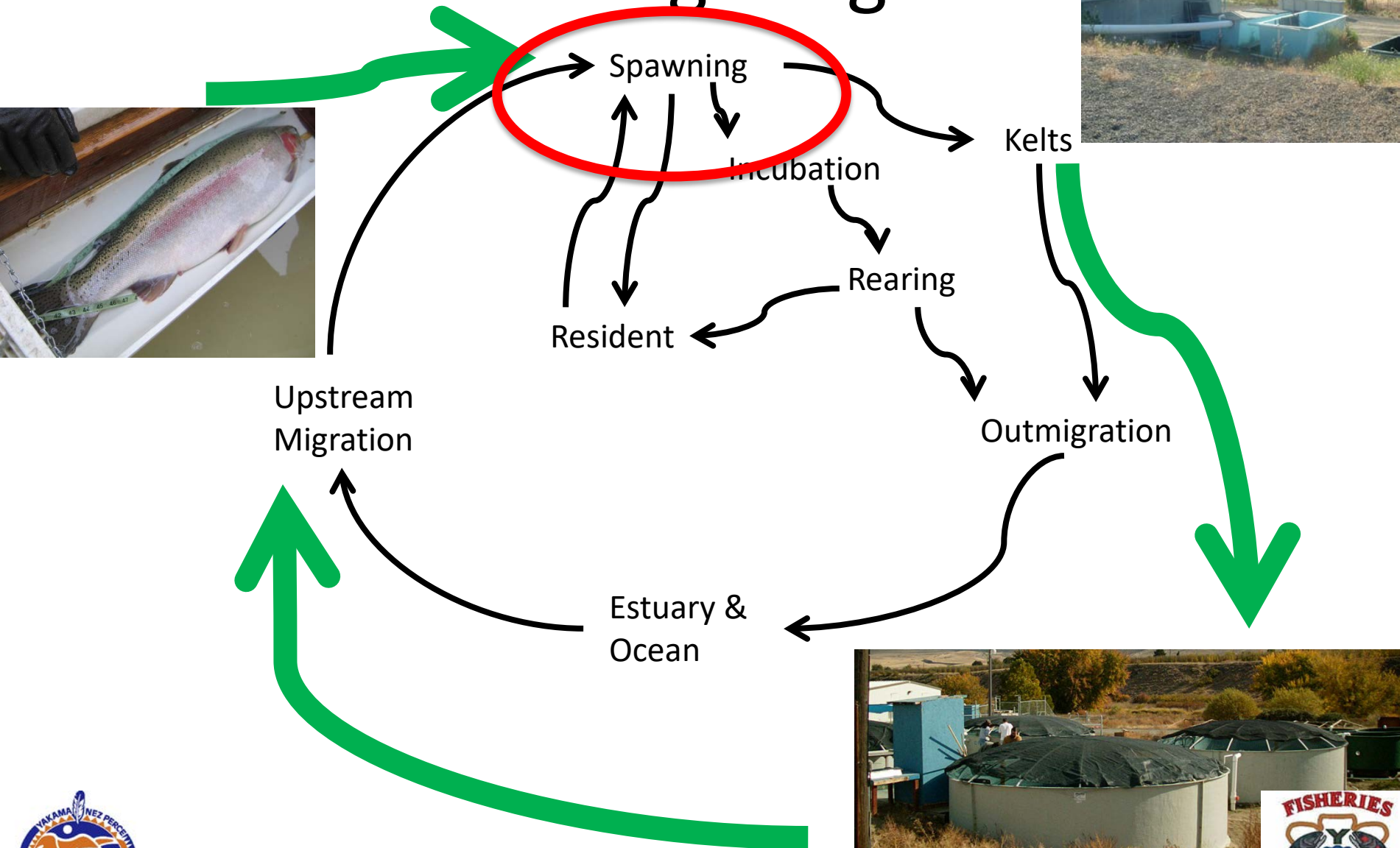


Artificial Reconditioning Findings

- Collected 7,629 kelt steelhead.
- Reconditioned and released 3,013 steelhead.
- Survival to release ~ 40%.
- Fish arriving in better condition tend to survive reconditioning better.
- Fish arriving in poor condition tend to die.
- *Hatch et al. 2013. NAJFM 33(3)*



Kelt Reconditioning Program



Background

- In the Yakima River natural repeat spawner rate is ~2.7%.
- Higher reproduction from repeat spawners than one-time spawners (Seamons & Quinn 2010)
- All things being equal, repeat spawners should have life time reproductive success 2x single spawners, we are missing the skip spawner component, which likely has much higher fecundity and reproductive success.



Research Questions

1. Do artificially reconditioned kelt steelhead reproduce in the wild?
2. What is the reproductive success of artificially reconditioned kelt steelhead?
3. What is the lifetime reproductive success of artificially reconditioned kelt steelhead relative to one-time spawners?



1. Do artificially reconditioned kelt steelhead reproduce in the wild?

- Parent populations (Collections represent the entire Yakima River)
 - 347 reconditioned kelts processed for released in 2012
 - 308 Detected moving across Prosser Dam
 - 451 pre-spawn maidens at Prosser Dam Denil in 2012-13
 - 306 Females
 - 330 post-spawn maidens collected at Chandler in 2013
 - 307 Females
- Juvenile populations (Collections represent Satus and Toppenish Creeks only)
 - Electrofished in August 2013 collecting 549 Age-0 *O. mykiss*
 - Age 0 prevented confusing with previous spawning events
 - Could and probably does include some resident fish



1. Do artificially reconditioned kelt steelhead reproduce in the wild?

Parentage Analysis

- 192 Loci Genotyped (CRITFC PBT and GSI)
 - 188 used for parentage analysis
 - 1 Sex marker
 - 3 cutthroat hybrid markers
- The Program CERVUS was used
 - Simulations ran to determine confidence intervals for LOD scores (natural log of overall likelihood ratio).
 - Conservative LOD scores were used to account for the inability to do a true simulation for a large metapopulation
 - LOD of 7 = 99.9% Confidence interval
 - Progeny assignments were used if
 - LOD greater than 7 and zero mismatching loci
 - LOD greater than 156 and 1 mismatching loci. Allows for minor genotyping error
 - 100 control parents were simulated using juveniles from tributaries in the Naches River. None of these assigned as a potential parent to any of the potential progeny.

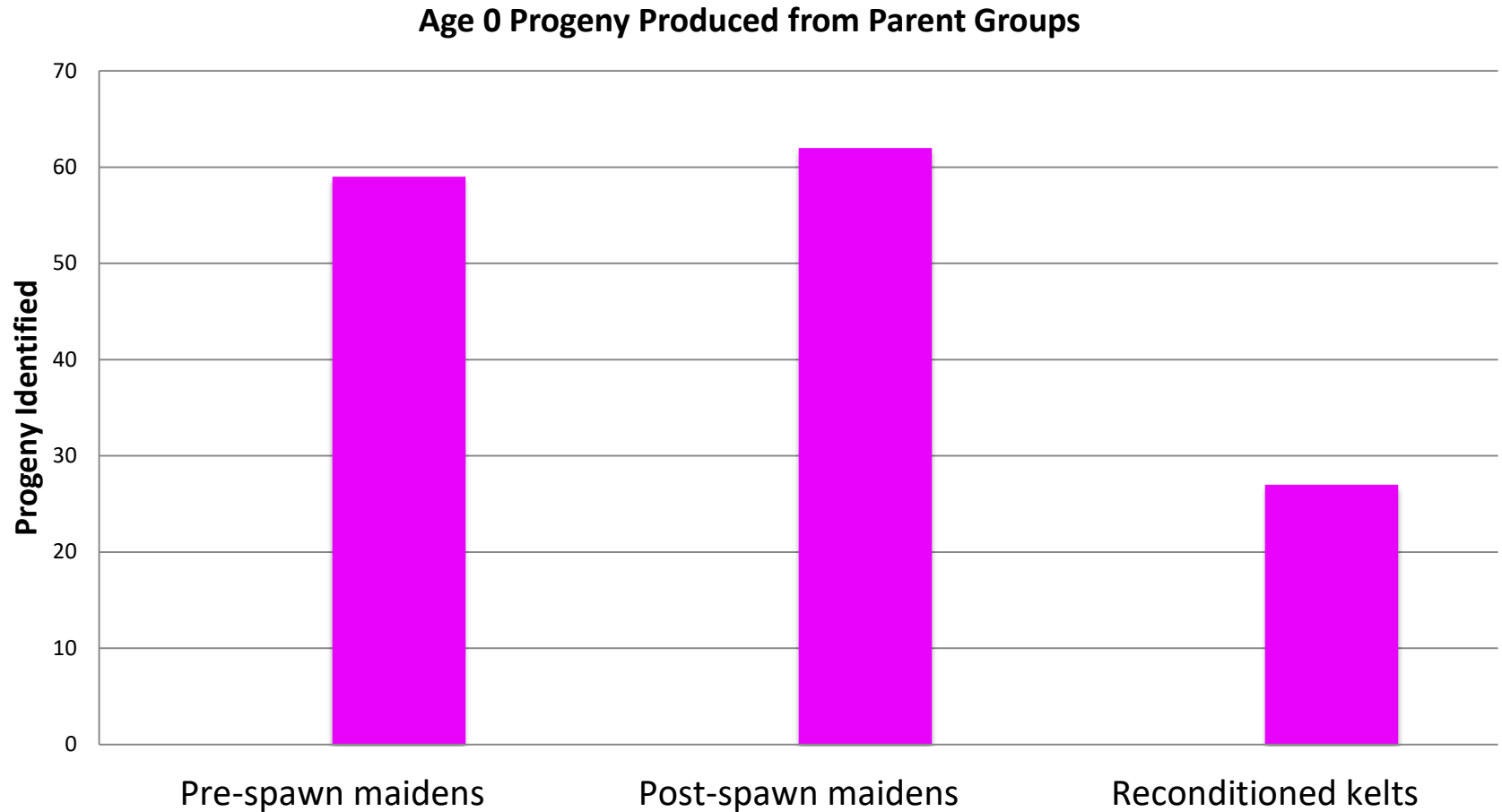


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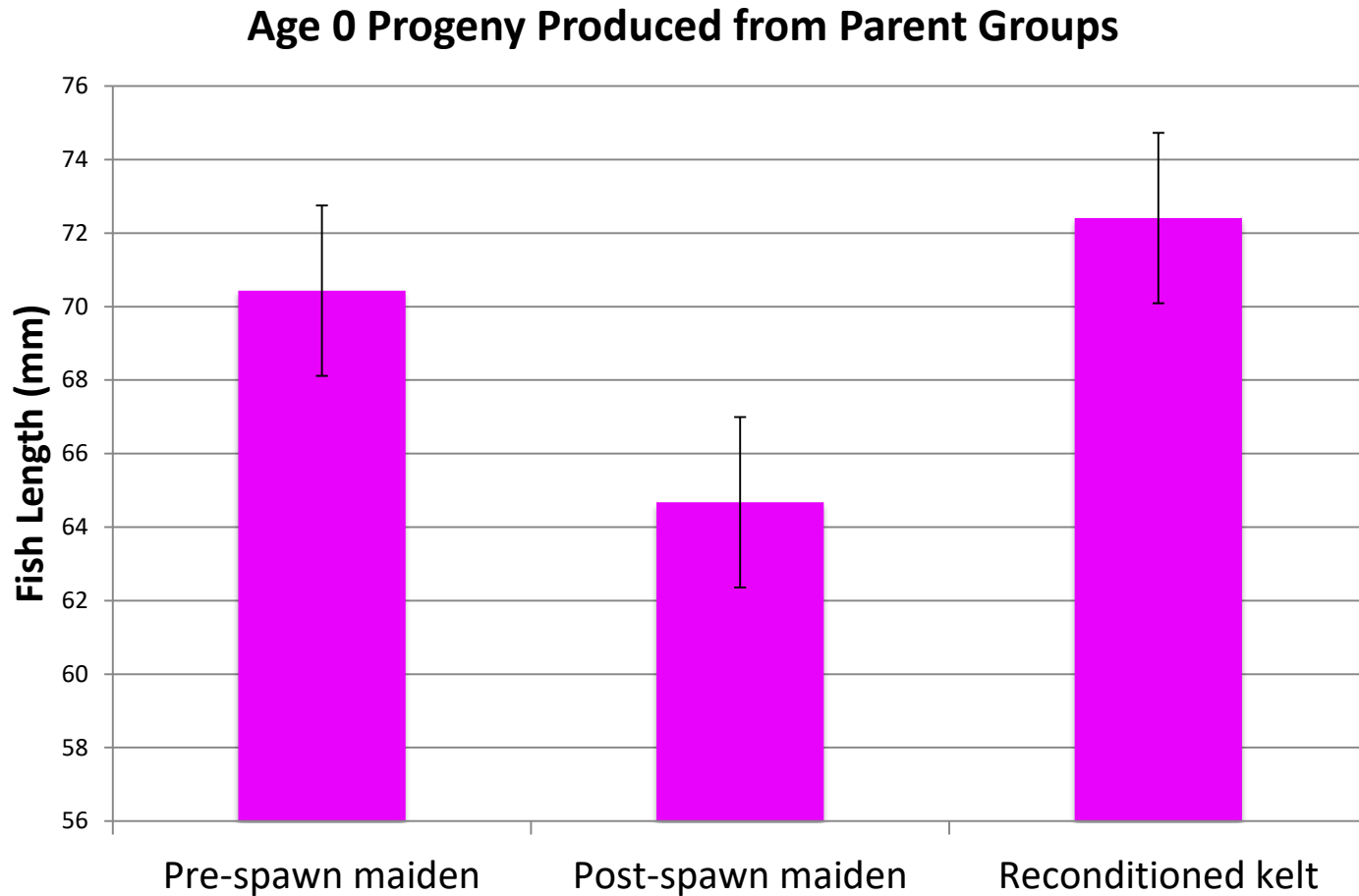
- Percentage of genotyped fish that had at least one progeny assignment.
 - 3.5% of reconditioned kelts released in 2012
 - 5.3% of pre spawn maidens collected in 2013
 - 8.5% of post spawn maidens collected in 2013
- Low detection rates are the result of the low proportions of parents and progeny sampled throughout the Yakima Basin.



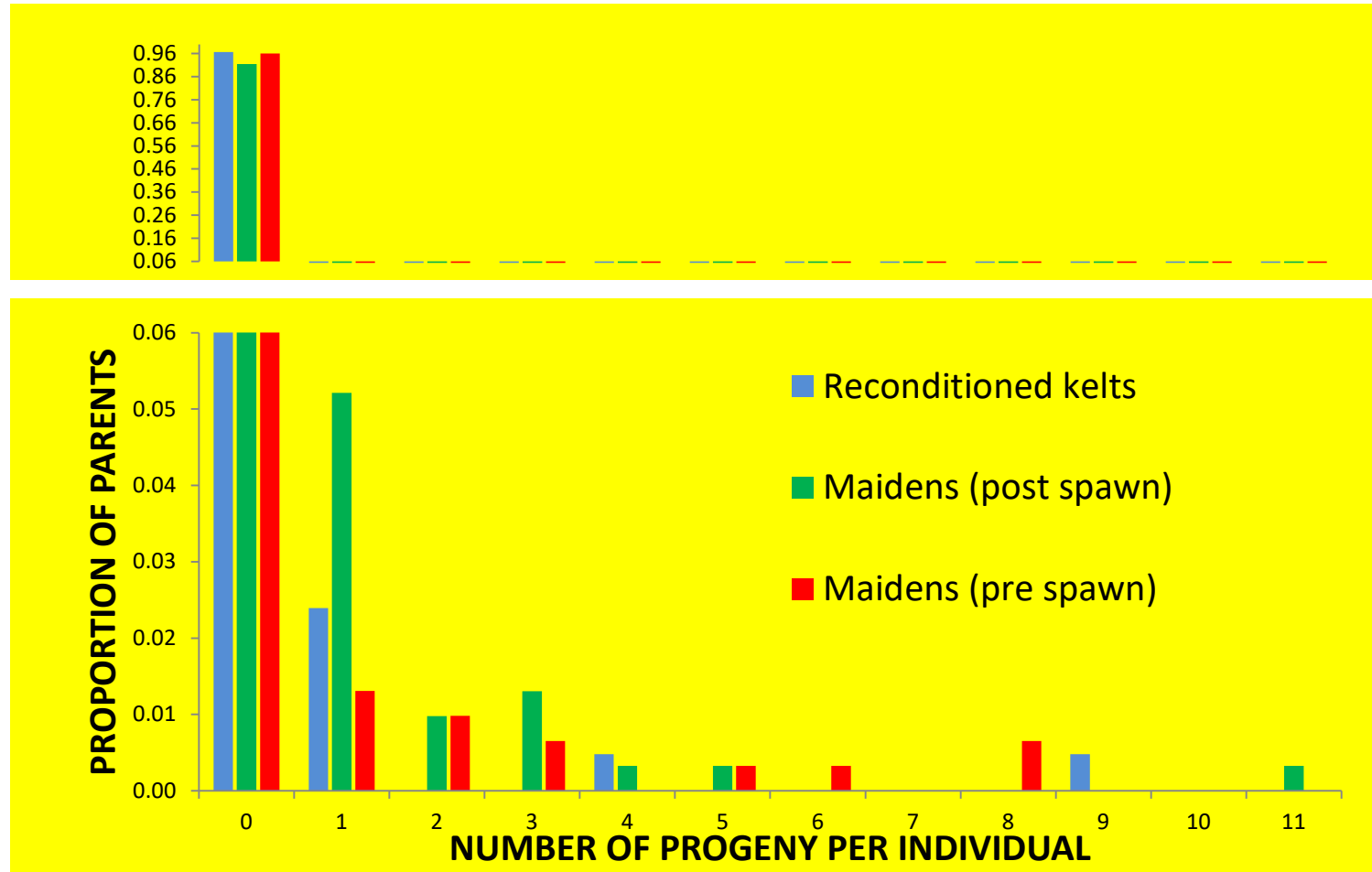
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2. What is the reproductive success of artificially reconditioned kelt steelhead?

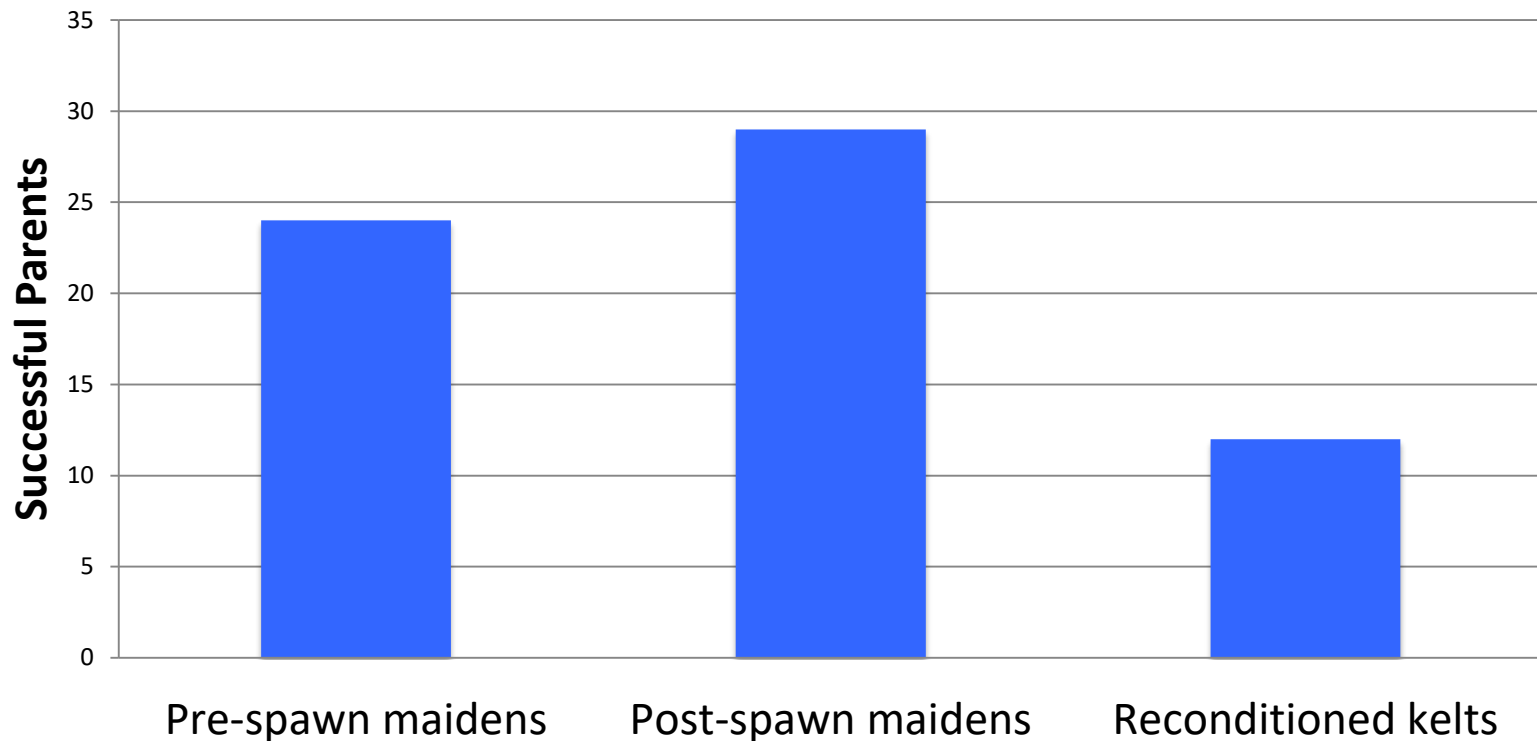


Variation in reproductive success for parent groups



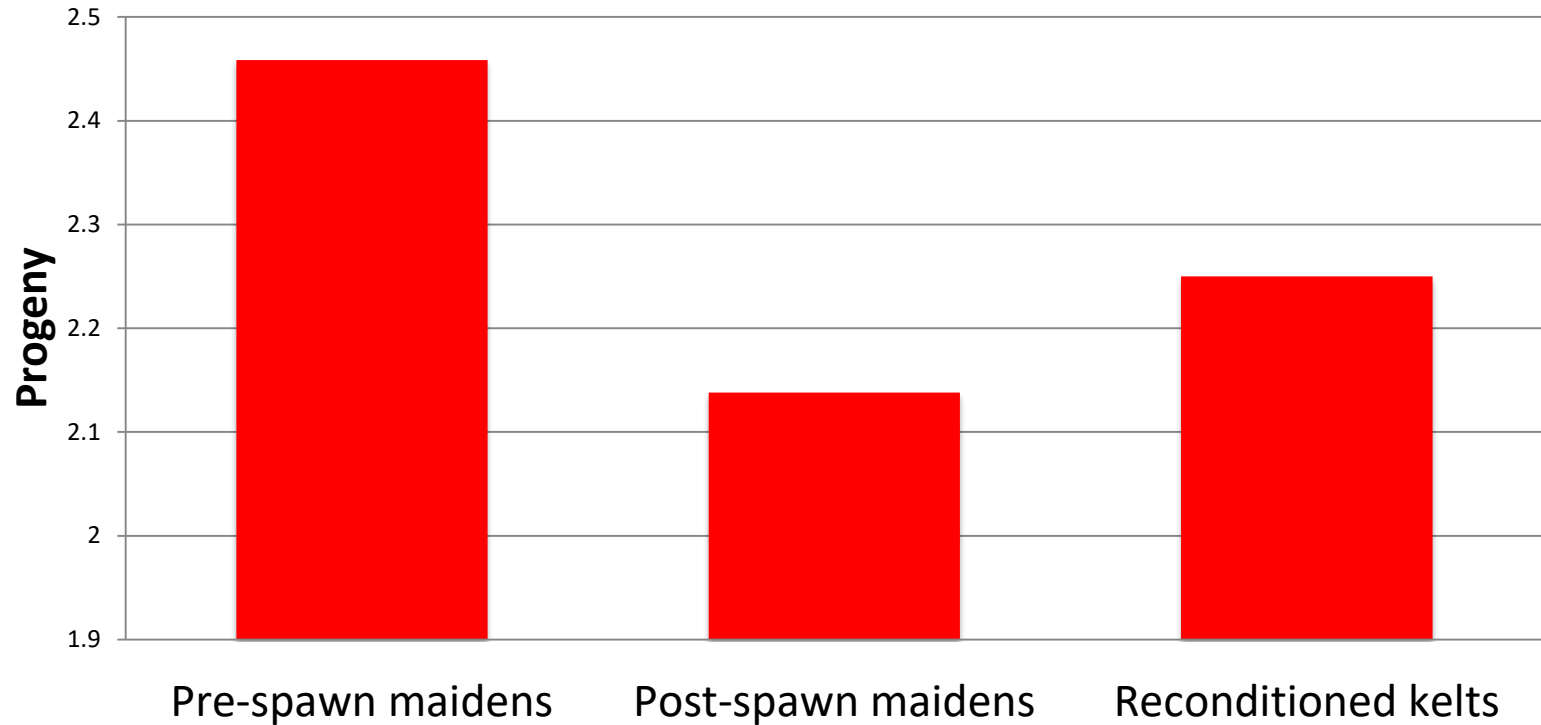
2. What is the reproductive success of artificially reconditioned kelt steelhead?

Number of unique parents with at least 1 progeny assigned



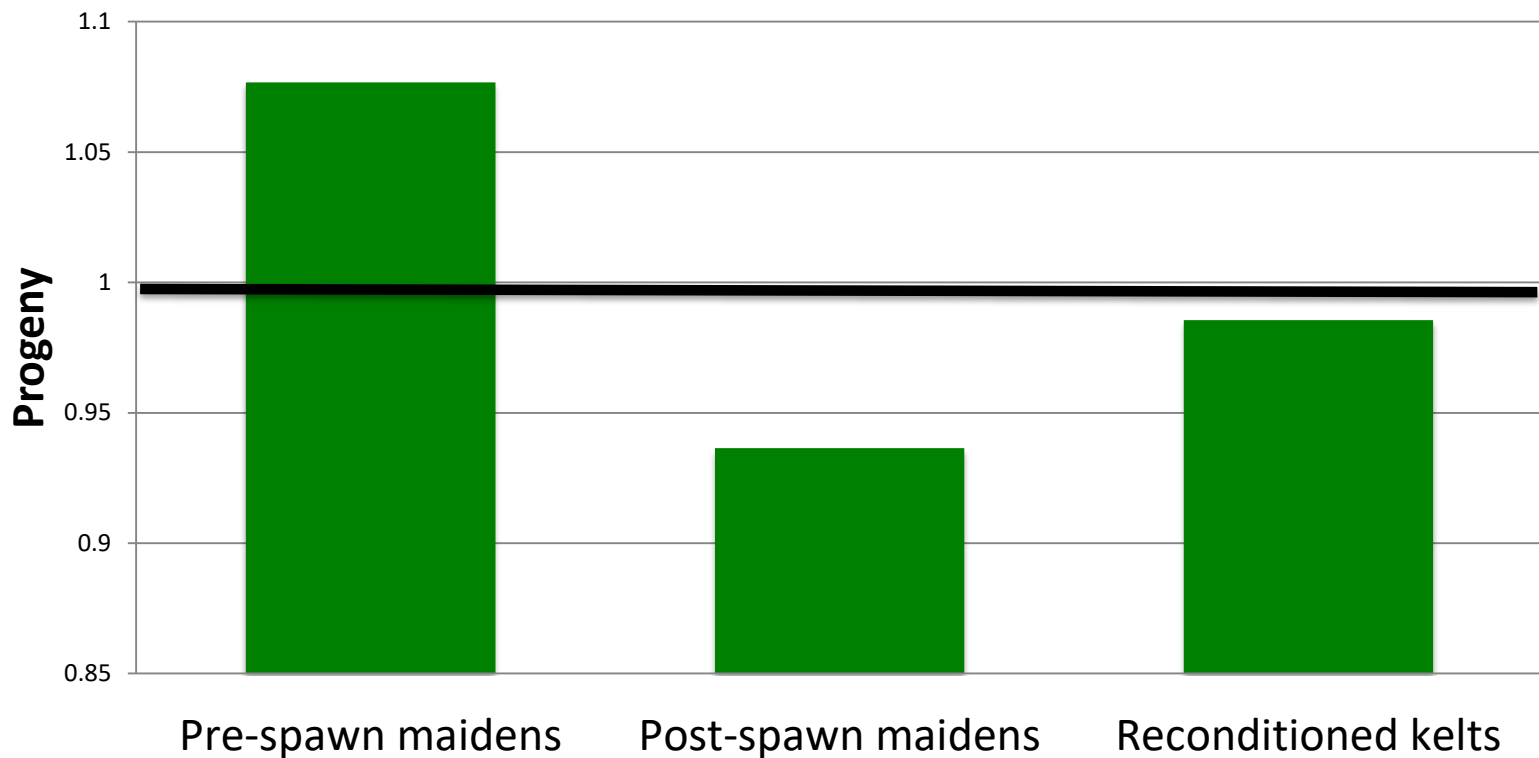
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Number of progeny per unique successful parent



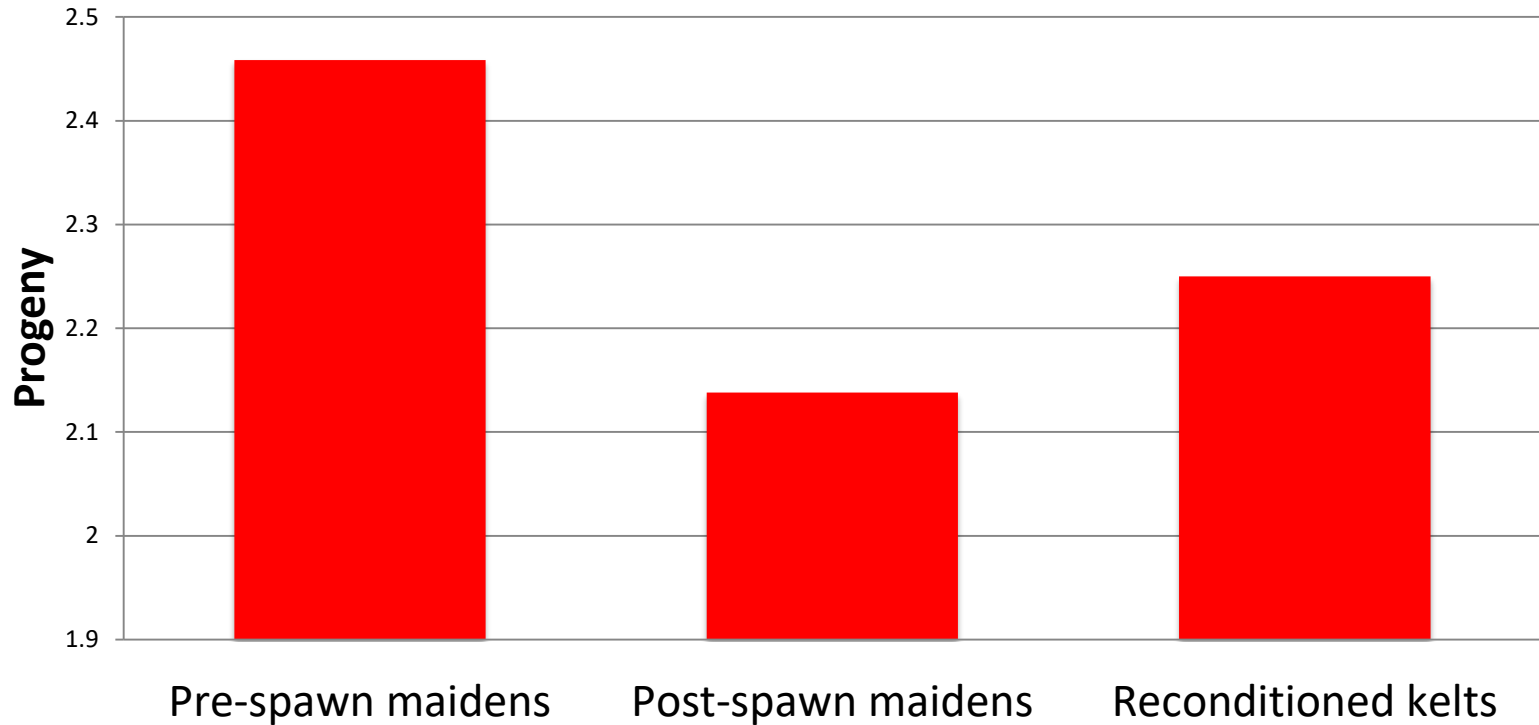
2. What is the reproductive success of artificially reconditioned kelt steelhead?

Relative reproductive success
(progeny/spawner) / (pooled maiden groups progeny)/spawner



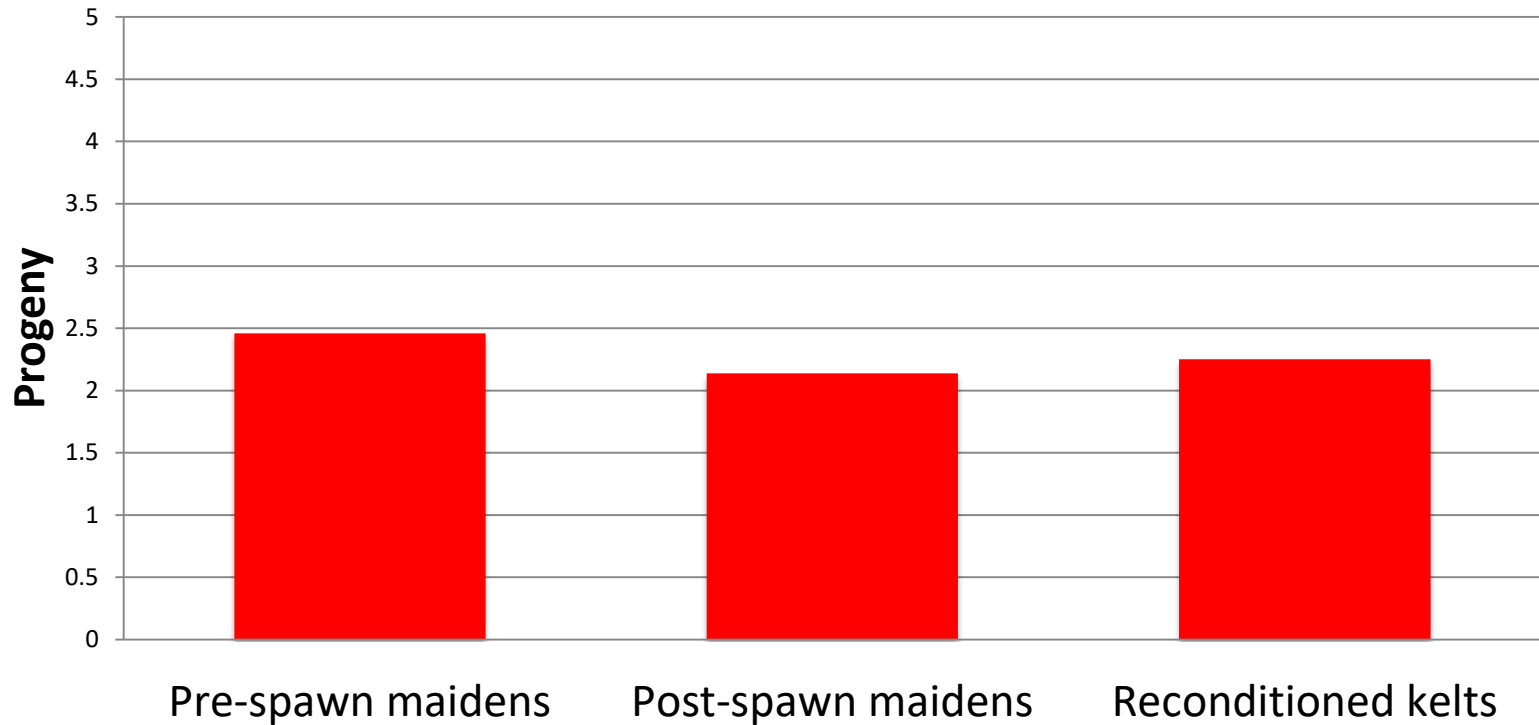
3. What is the lifetime reproductive success of artificially reconditioned kelt steelhead relative to first-time spawners?

Number of progeny per unique successful parent



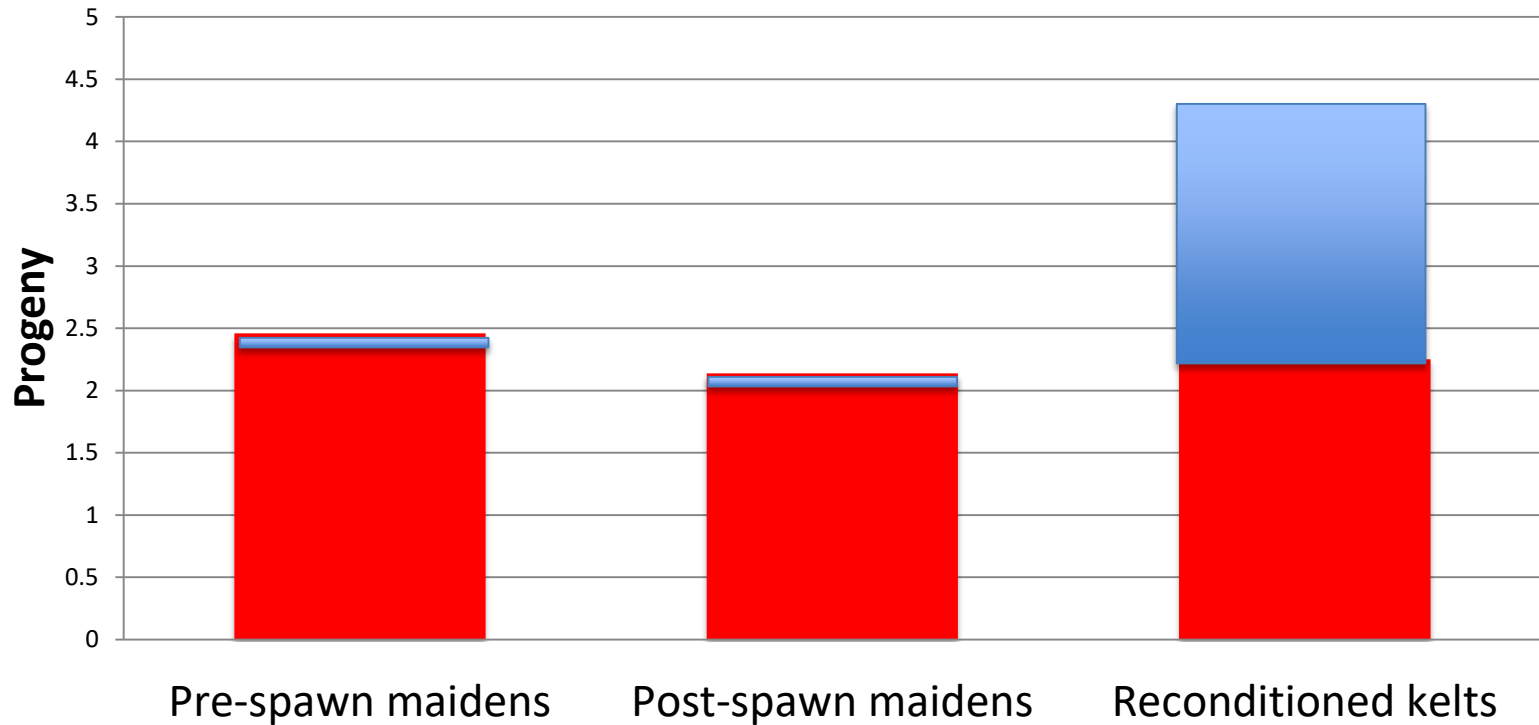
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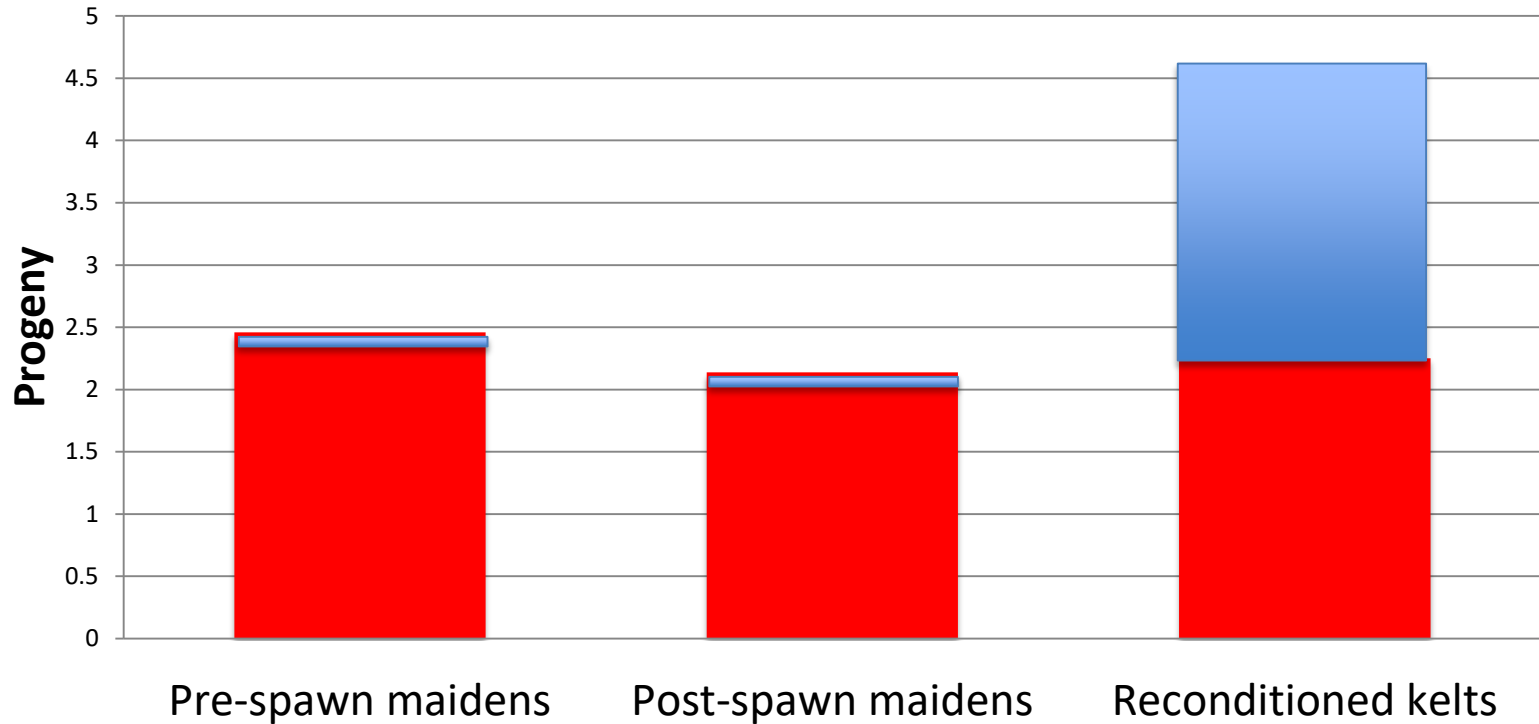
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Preliminary Conclusions

- Kelts represent an important life history for steelhead
- Reconditioned kelts reproduce in the wild
- We have confirmed reproduction whenever we are able to identify areas with returning reconditioned kelts and sample non resident age zero juveniles.
- Reconditioned kelts have the potential to increase productivity of natural populations



Preliminary Conclusions II

- Still have some logistical issues to resolve
 - True maiden comparison (Prosser Denil collections are prespawn fish that may include natural repeat spawners).
 - Spawning event identification and age zero identification.
 - Resident rainbow sampling
 - Limited power due to sampling a small proportion of the population
 - Parentage /NRS for skip spawners



Acknowledgements

- Tracy Hauser (BPA)
- Chris Frederickson (YN)
- Jeff Trammell (YN)
- Tim Resseguie (YN)
- Ryan Deknikker (YN)
- Bill Fiander (YN)
- Prosser Hatchery Crew (YN)
- Jeremiah Newell Technician (CRITFC)
- Bobby Begay Technician (CRITFC)
- CRITFC Genetics Crew



Research Questions

- Can we capture post spawn kelts? Yes
- Can we recondition and release kelts? Yes
- Are fish reproductively viable? Yes...mention Andy /Ryan research/presentations
- Do reconditioned kelts migrate upstream? Yes...reference PIT tag detections and Ryans radio tracking presentation
- Do reconditioned kelts exhibit spawning behavior? Yes, by observation
- Do reconditioned kelts produce progeny in the wild? Yes, has been verified in both Omak Creek, Satus Creek, and Toppenish Creek.
- What is the RRS of the post reconditioning event compared to the maiden event for individual fish? We can hint at this with Ryans research, but I don't think we will be able to do so with the Yakima data.
- What is the Relative Reproductive Success (RRS) of reconditioned kelts compared to maiden spawners within the same year?
- What is the Lifetime Reproductive Success (LRS) of reconditioned kelts compared to maiden spawners?

