

Reproductive performance in reconditioned female steelhead kelts

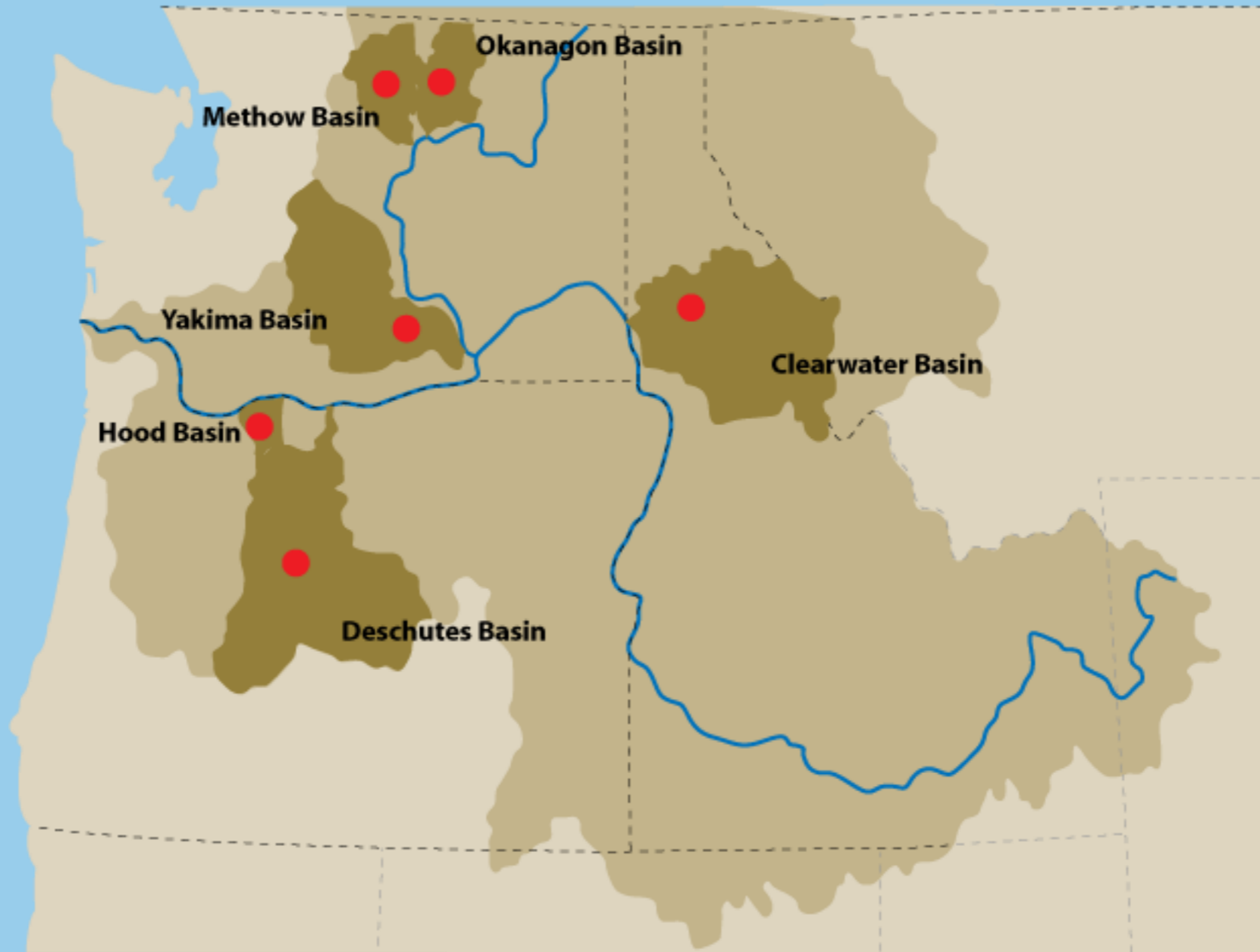
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Introduction - Kelt Reconditioning

- A recovery tool addressing ESA-listed Columbia Basin steelhead populations
- Capitalizes on:
 - *iteroparity* - ability to repeat spawn
 - *natural selection* that occurs prior to initial spawning



Background

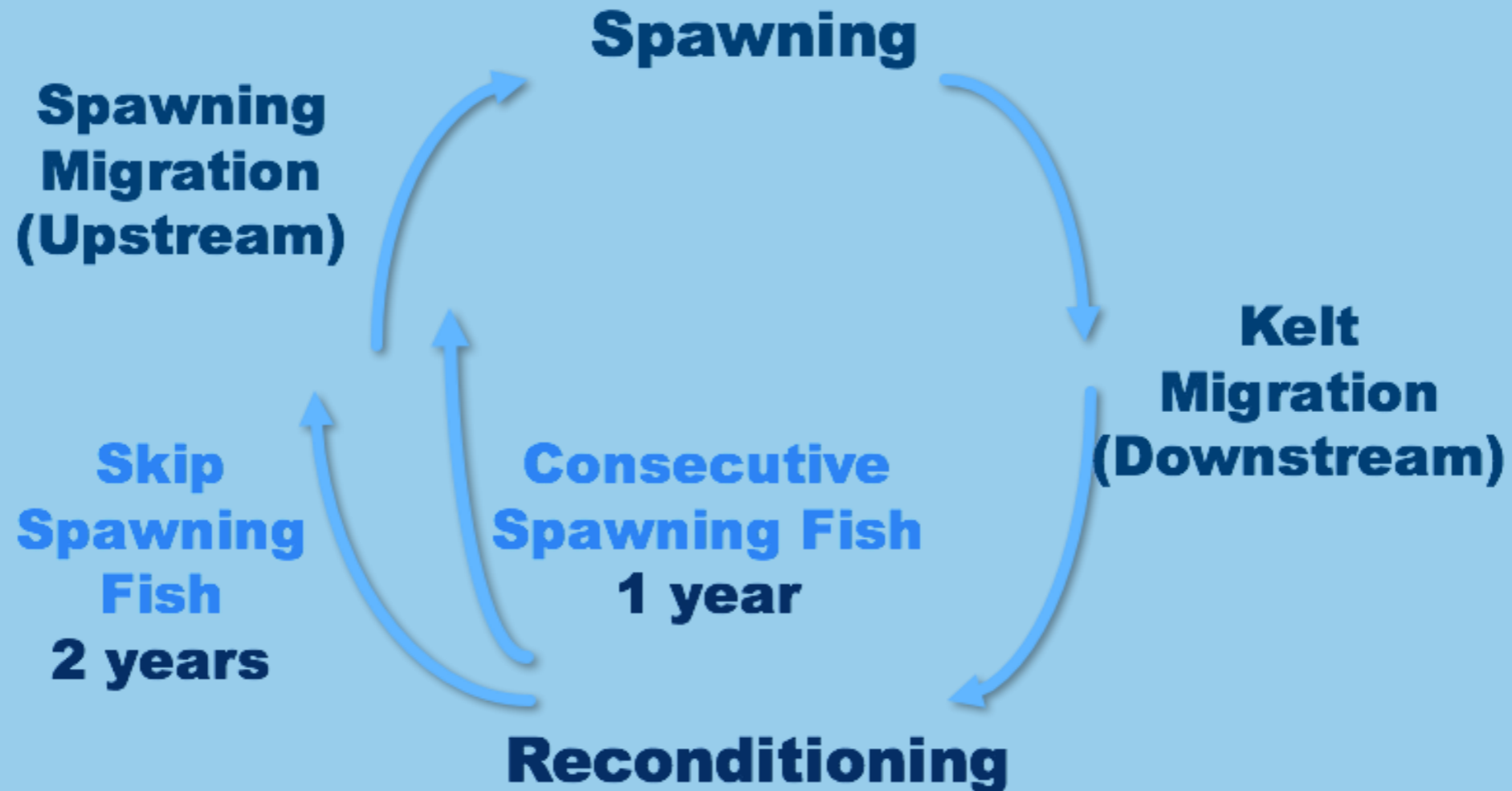


Background



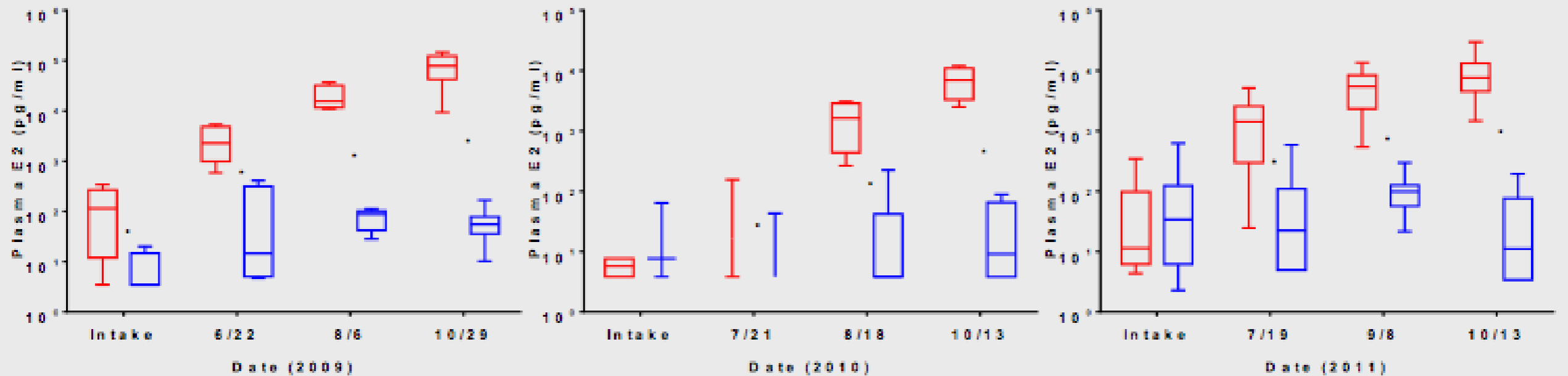
- Wild kelts are captured, fed, and survivors released to migrate upstream, spawn naturally without a return to the ocean
- Snake River - hatchery kelts are reconditioned as a research tool and survivors are spawned twice in captivity

Background



- Repeat spawners in the Columbia River Basin occur between 2.5-3% (McNary) to 0.5% (Lower Granite) Keefer 2008
- Skip spawning occurs ~ 50% of the time (McNary), ~ 60% (Lower Granite)

Background



Pierce, in review.

Re-maturing females can be identified by elevated plasma estradiol levels 6-9 months prior to spawning.

Snake River Project

- Out-migrating fish collected at Lower Granite Dam
- Selection criteria - female, wild, good condition, “b-run”
- Transported to reconditioning facilities



Intake

Reconditioning

Release

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

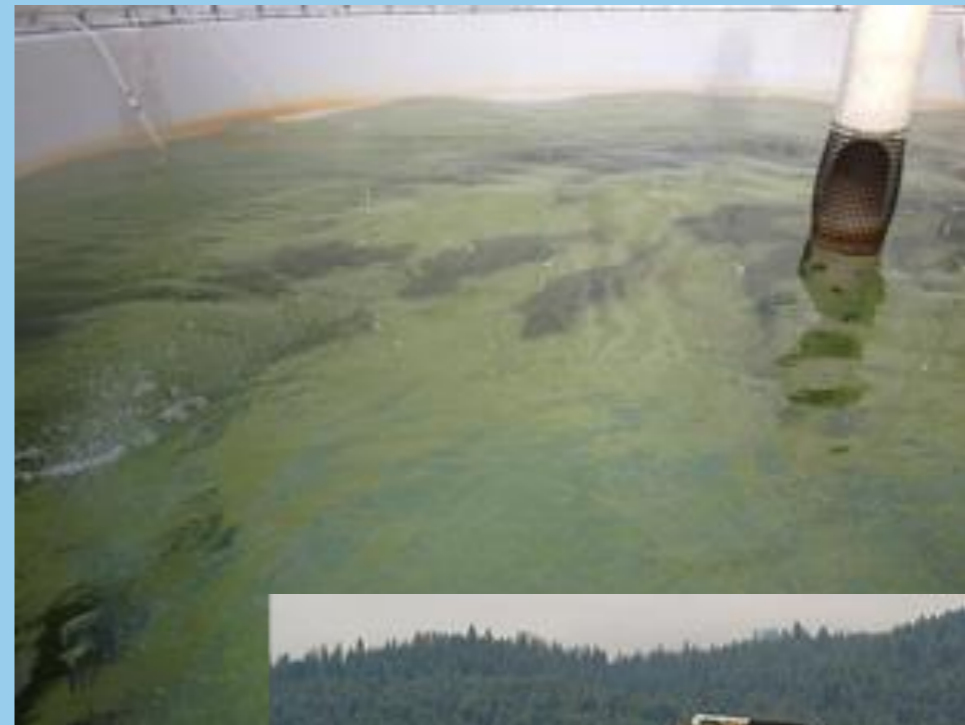
Oct

Nov



Snake River Project

- Fish are fed
- Treated for infection, fungus, parasites, & disease



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Snake River Project

- Surviving fish sampled for blood
- Maturation status determined by plasma estradiol level
- Surviving mature fish are released to migrate upstream and spawn



Intake

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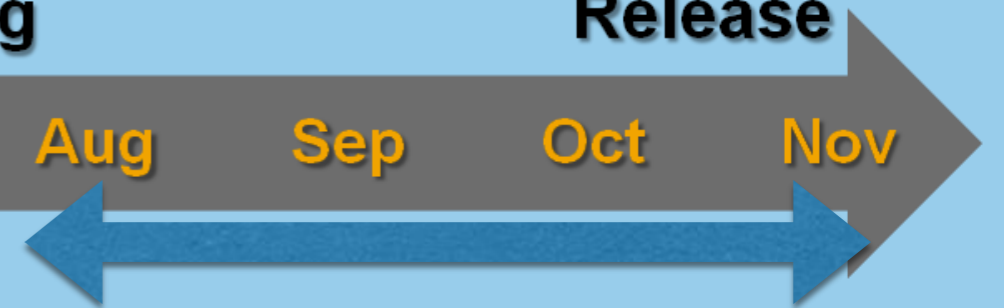
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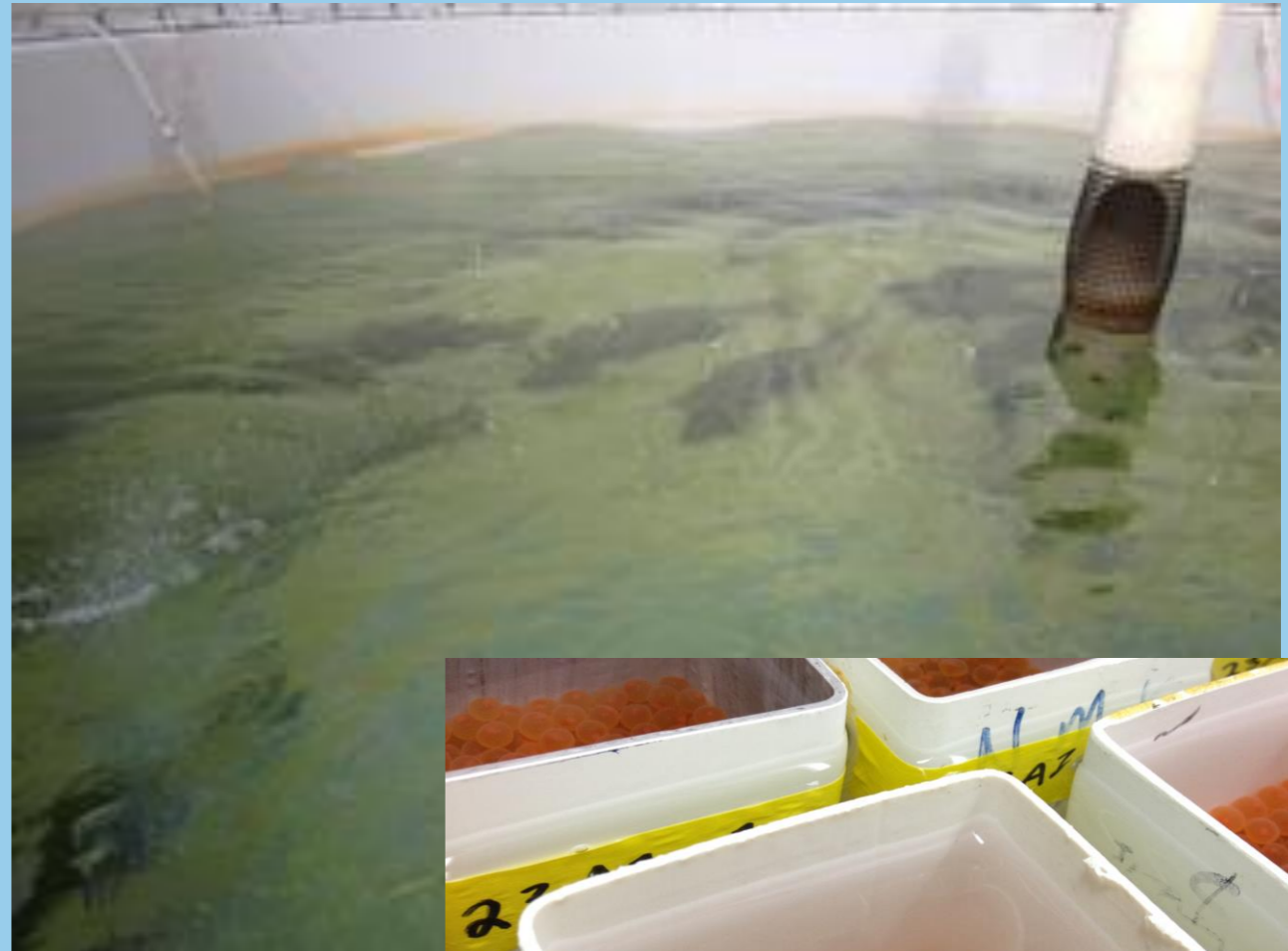
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Hatchery Fish Study

- Use Dworshak Hatchery female steelhead as a model



Objectives

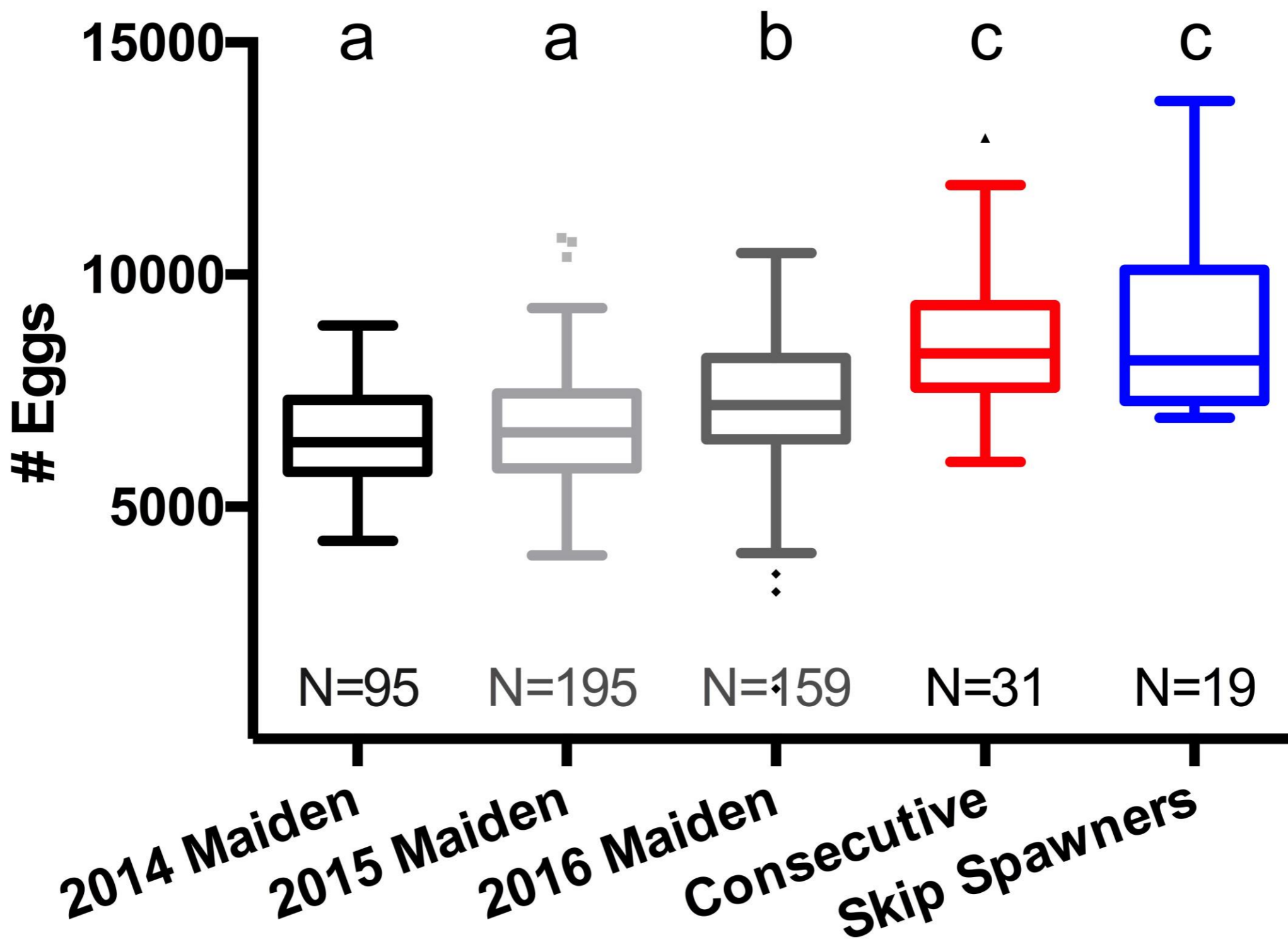
- Quantify the potential benefit of kelt reconditioning
- Assess reproductive performance in maiden, consecutive, & skip spawners
- Determine how physiological factors are involved in maturation and reproductive performance

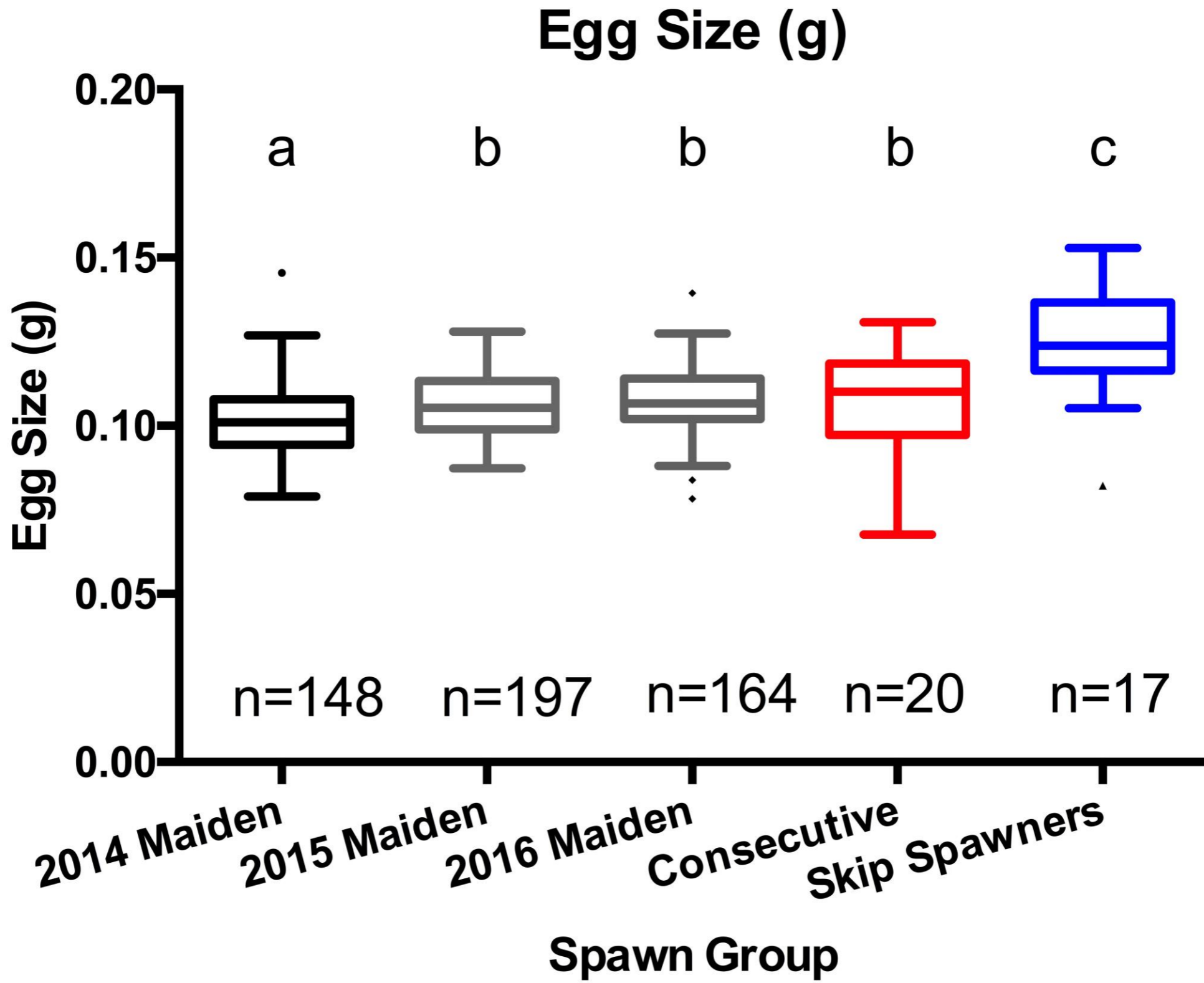
Methods

- Long-term:
 - Compare individual fish at 1st and 2nd spawning events:
 - fecundity
 - egg size
 - fertilization success
 - spawn timing
 - egg quality metric (in progress)
 - Track physiological metrics over time:
 - growth & energy reserves
 - estradiol and other plasma metrics (in progress)
- At present: Analyze results to date by comparing spawning categories: maiden, consecutive, skip

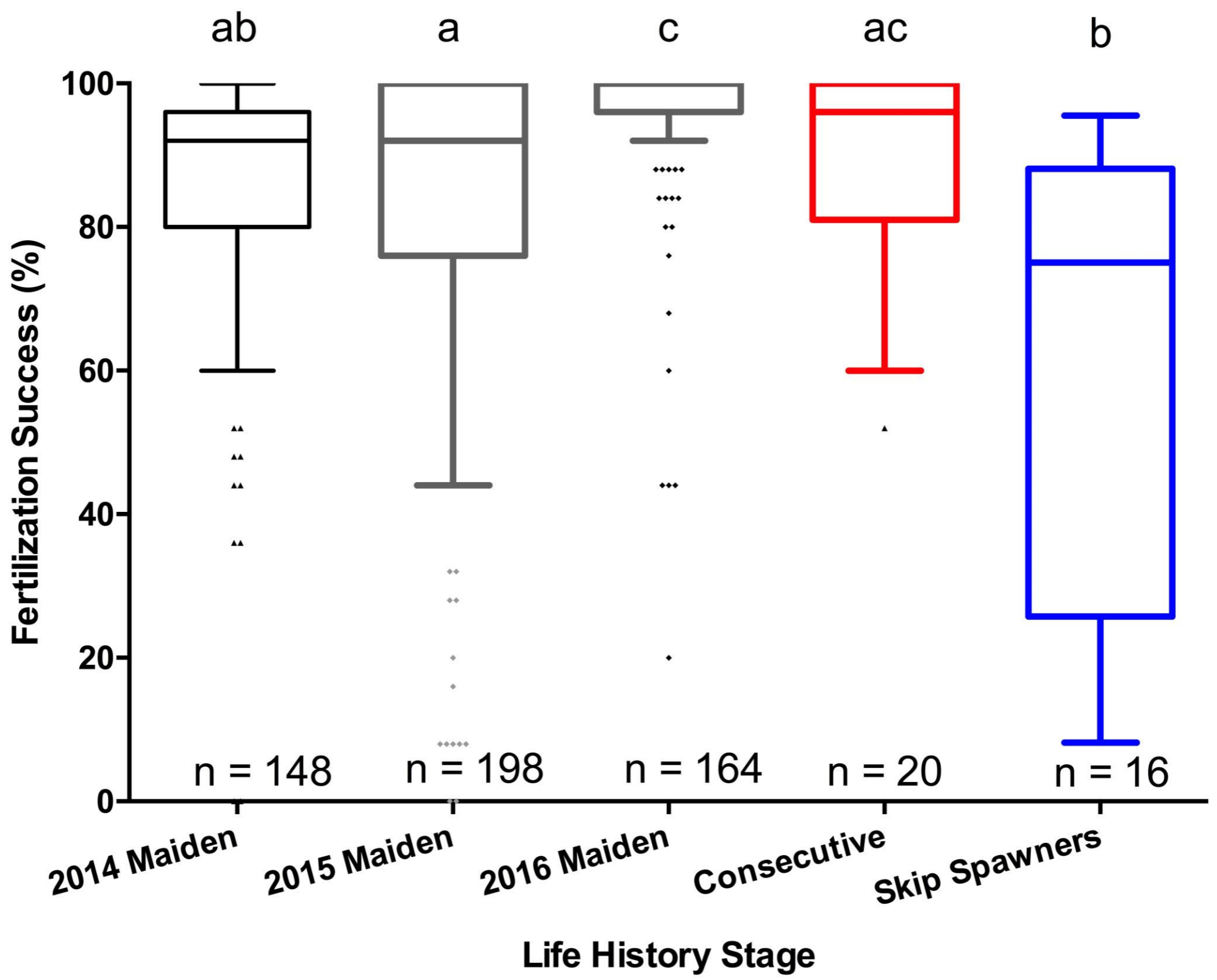
Results

Absolute Fecundity

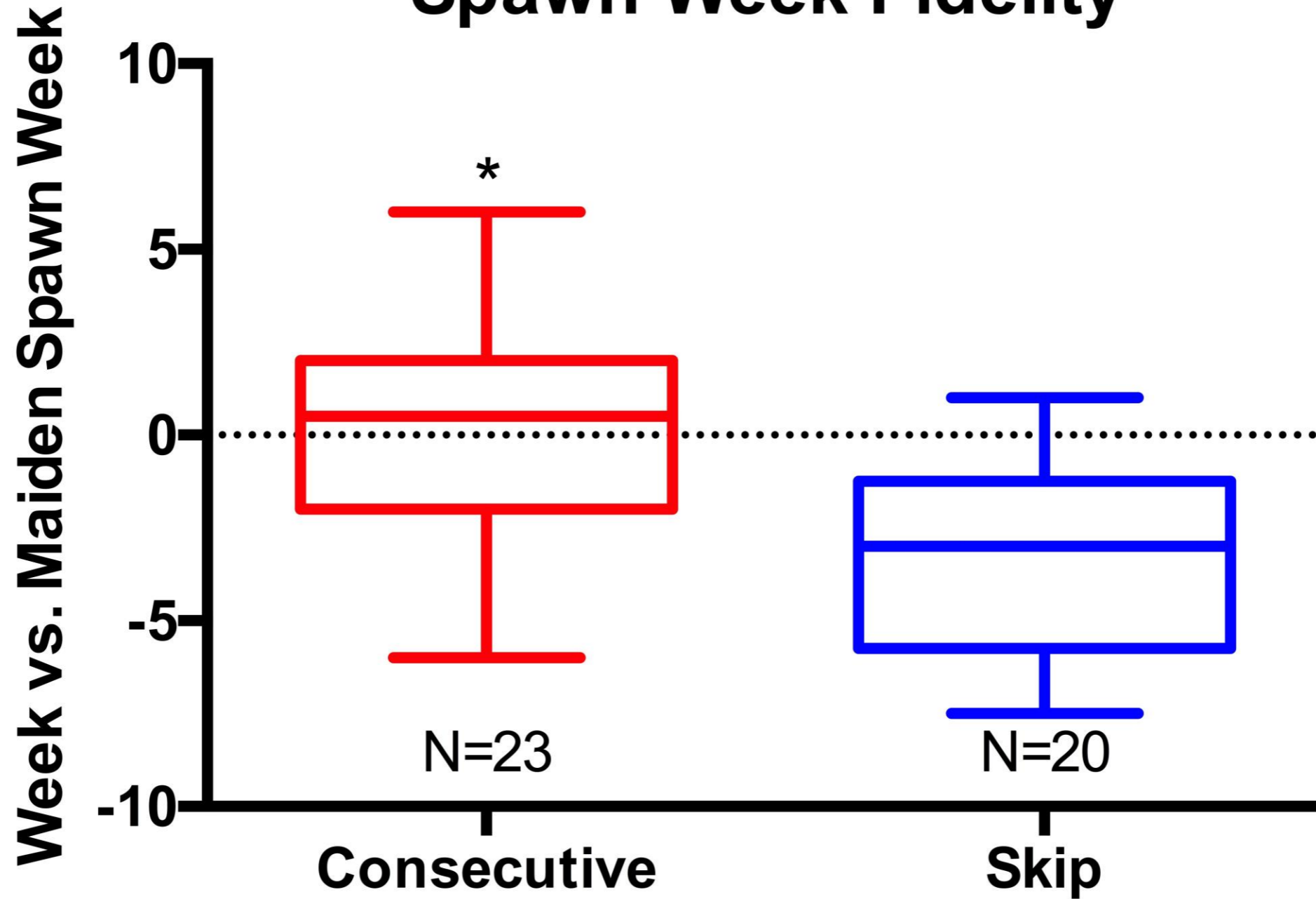


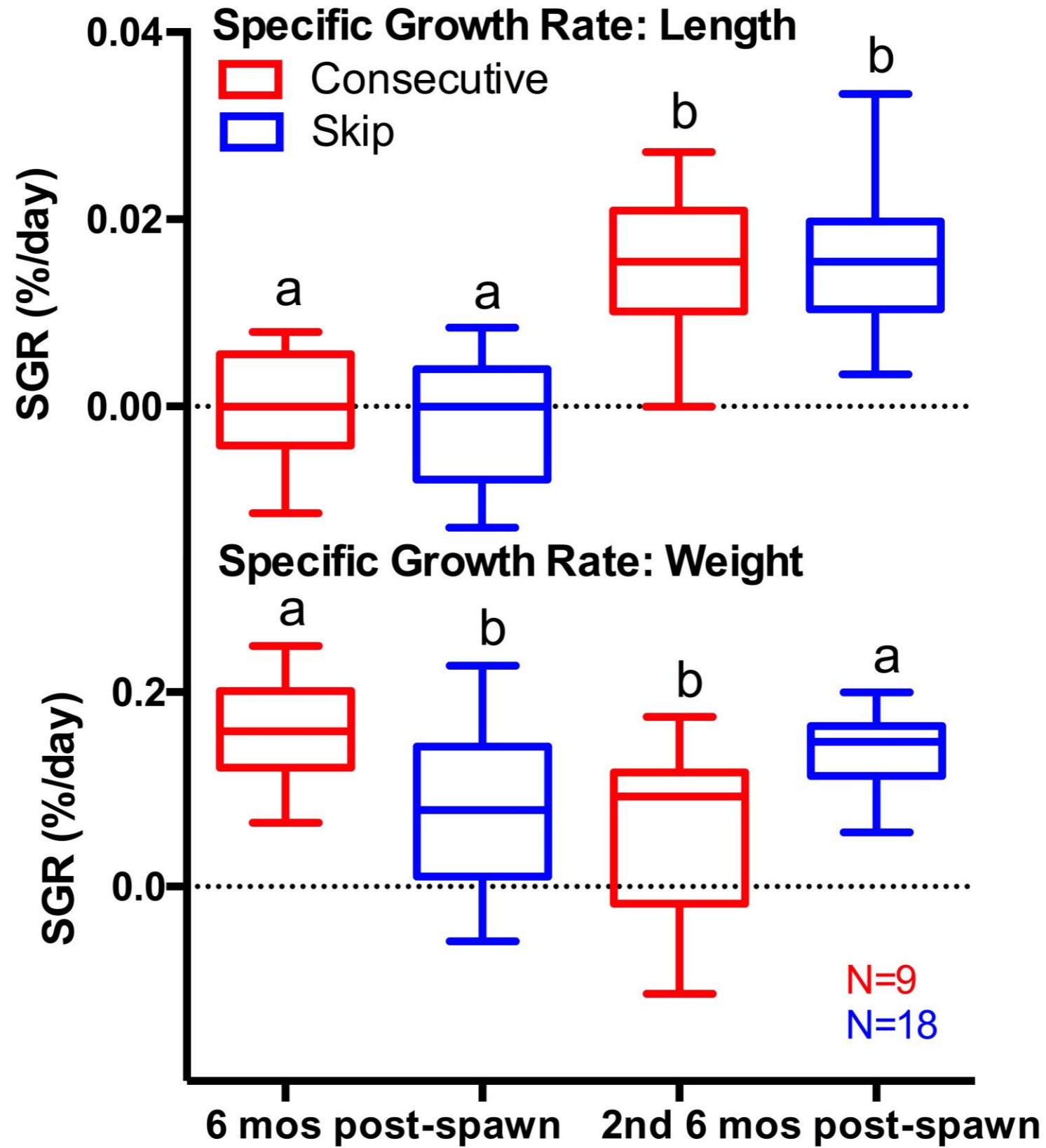


Fertilization Success

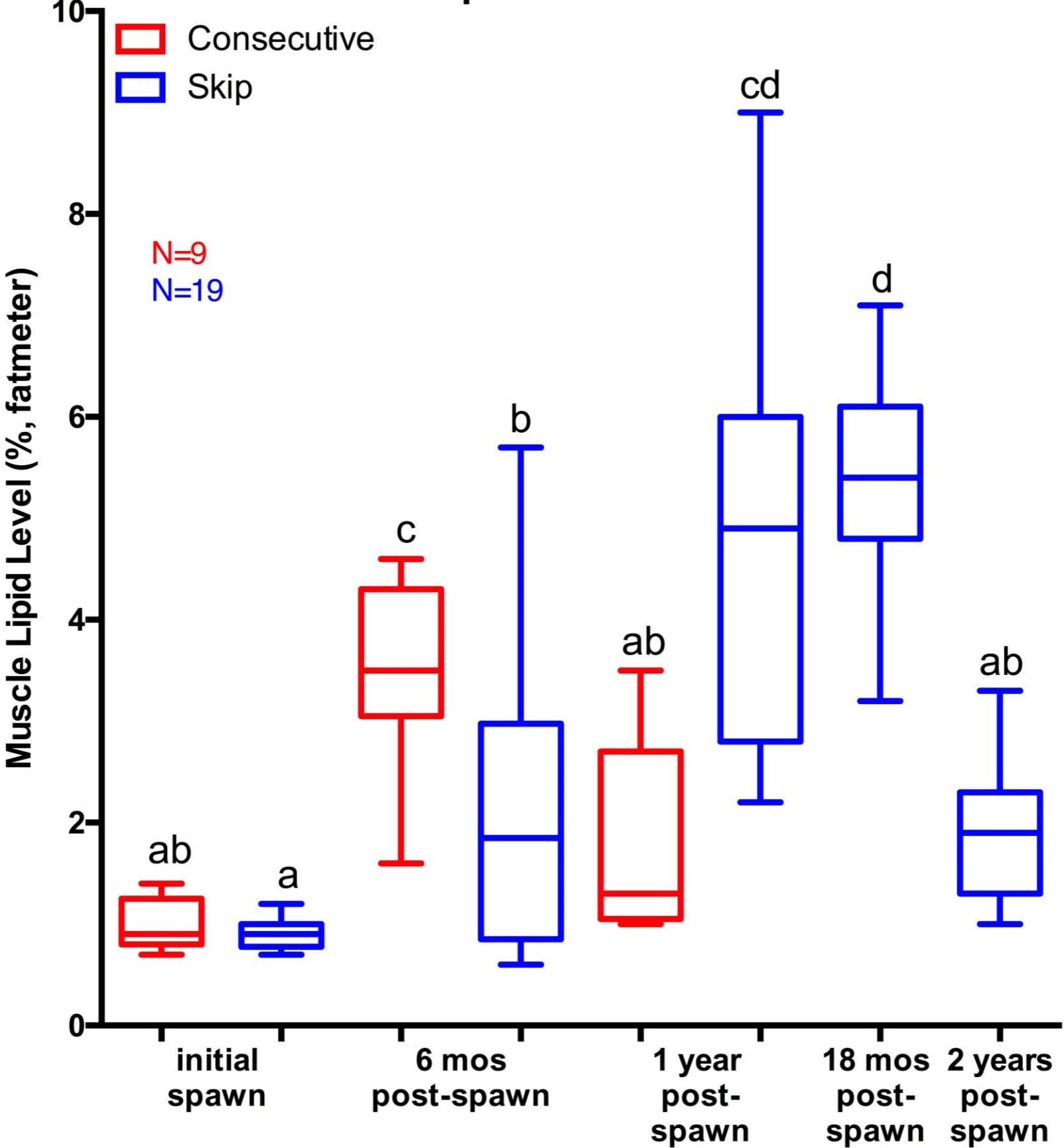


Spawn Week Fidelity





Muscle Lipid % over time



Conclusions

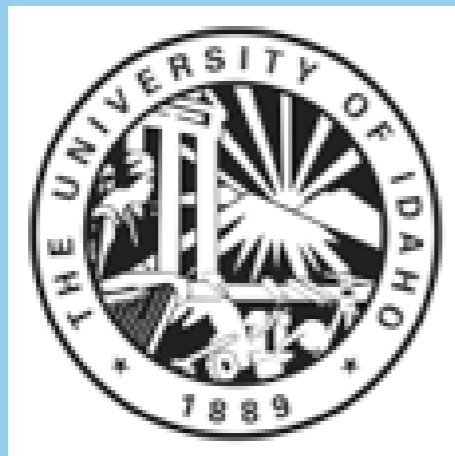
- Fecundity greater in kelts than in maiden spawners.
- Egg size greater in skip spawners than maidens & consecutives.
- Fertilization success reduced in skip spawners.
 - Potential reasons - infections, feeding
- Skip spawners spawn earlier.
- Consecutive spawners increased in weight and muscle lipids more rapidly than skip spawners during the first 6 months.
- Growth rate (weight) and muscle lipid levels decreased during the 6 months prior to spawning.
- Fish did not grow in length until the second 6 months of reconditioning.

Implications

- With greater fecundity than maiden spawners, kelts may be able to contribute more offspring to future generations
- Larger eggs may allow greater survival of offspring
- Issues with fertilization success with skip spawners need to be resolved
- Life history diversity (iteroparity, consecutive & skip spawning) may increase population stability via portfolio effect
- Despite the 500+ mile inland migration, Snake River “b-run” kelts are can survive beyond initial spawning, re-mature, and build an ovary and eggs
- Re-mature wild fish have been tracked migrating upstream after release
- Results should be applicable to the Prosser kelt project

Acknowledgements

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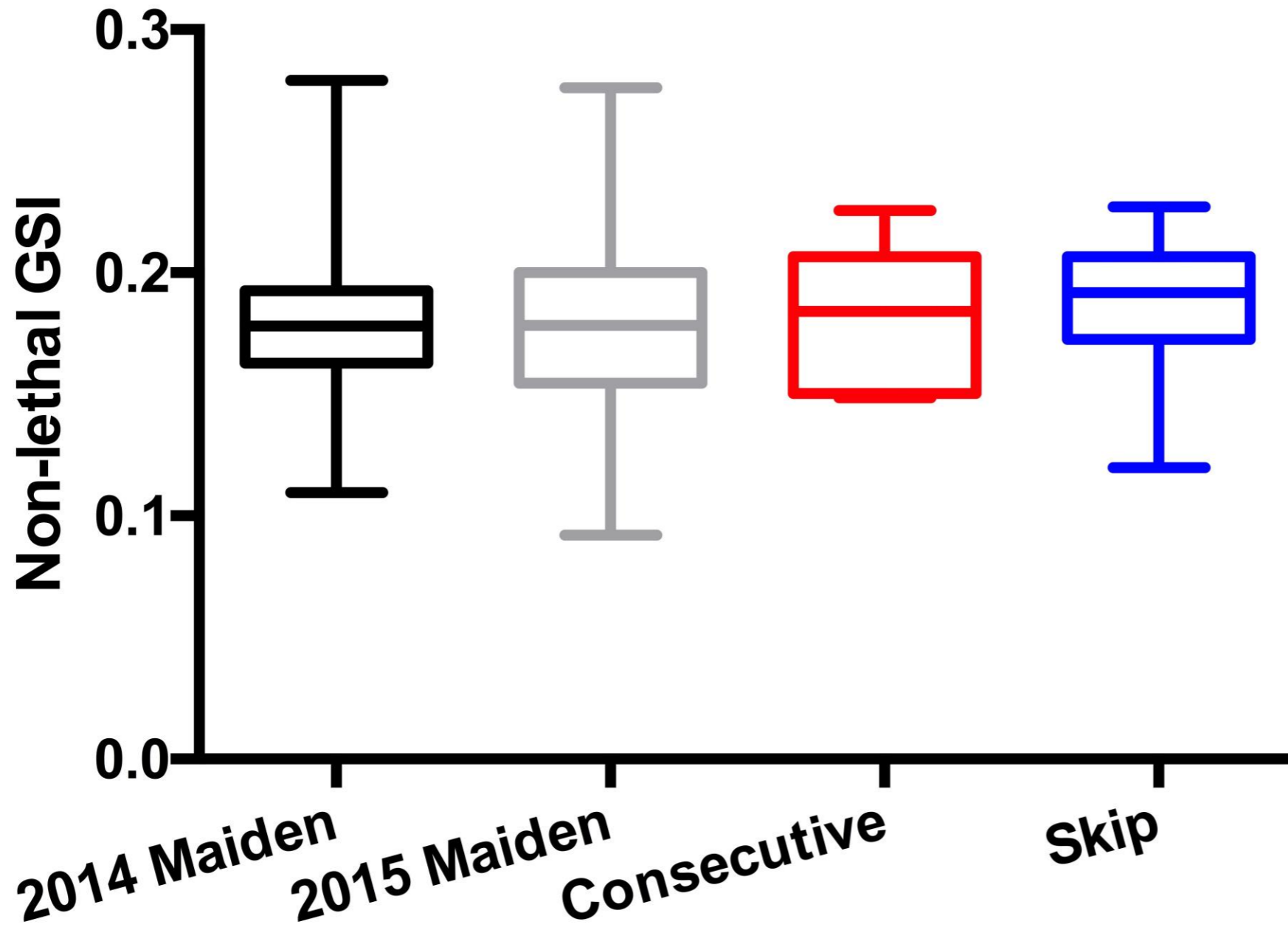
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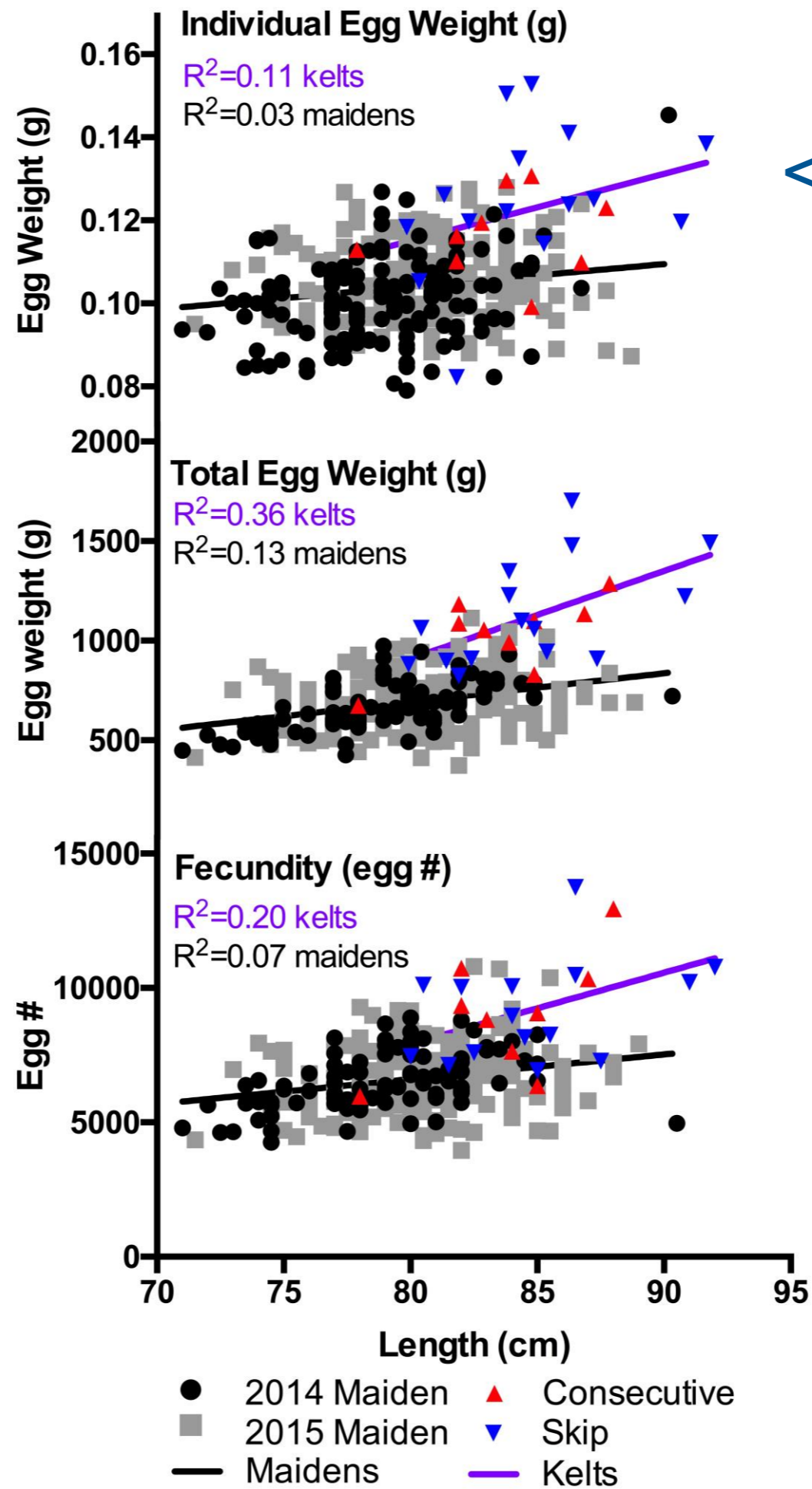
NOAA Fisheries
Army COE
Idaho Dept. Fish
& Game



Ratio egg weight to body weight



No differences detected.



← not significant