

Effects of early sorting behavior on growth in hatchery reared steelhead

Neil Thompson, Carlos Garza and
Michael Blouin



1. Steelhead adapt to hatcheries

2. Vertical sorting

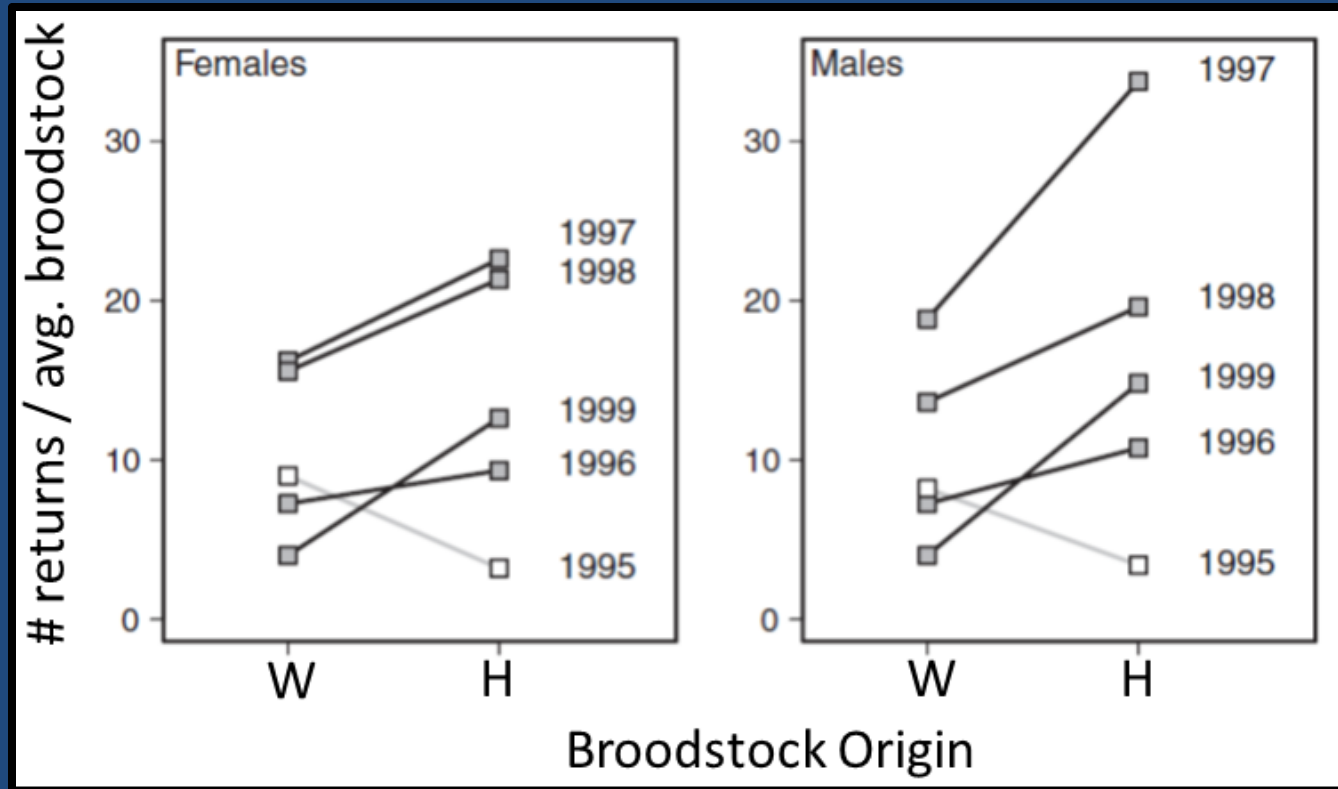
- Hypothesis
- Experiment

3. Growth experiment

- Correlation with vertical sorting?

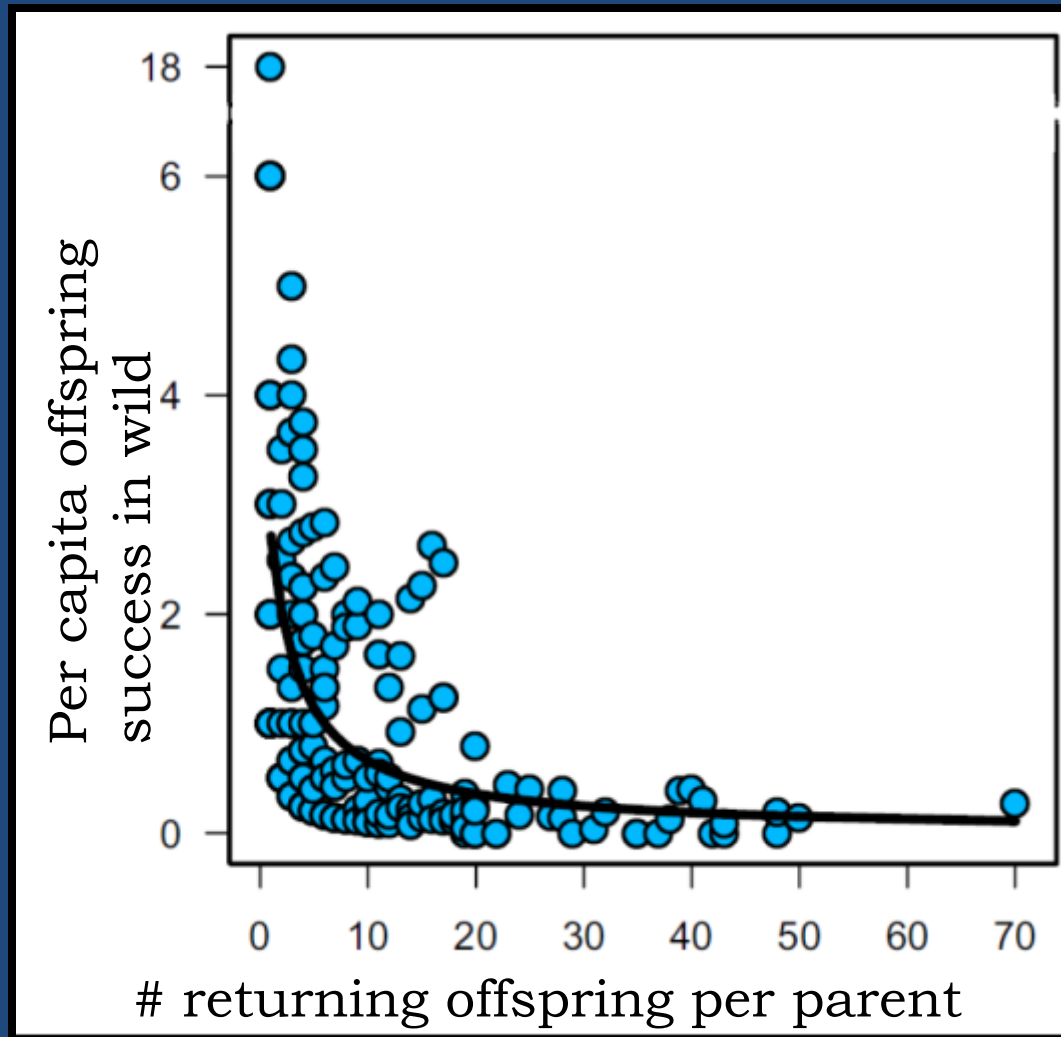
4. Conclusions/future work

Steelhead adapt to captivity



Christie *et al.* 2012 *PNAS*
steelhead, Hood River

Steelhead adapt to captivity



Christie *et al.* 2012 *PNAS*
Hood River steelhead

Adaptation to hatcheries:

Differences in fitness between genotypes (families) before release from the hatchery

Adaptation to hatcheries:

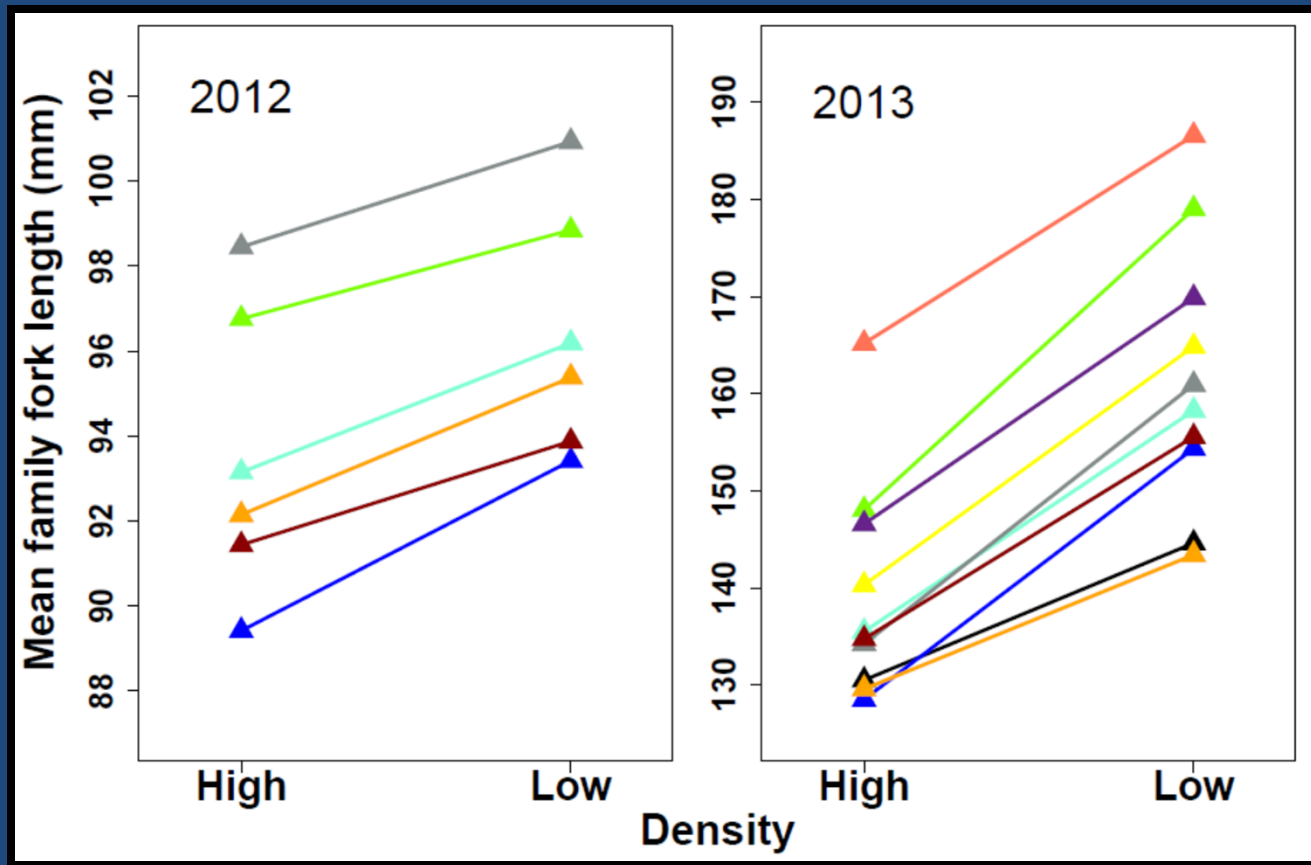
Differences in fitness between genotypes (families) before release from the hatchery

Fitness in hatcheries

> length = higher survival

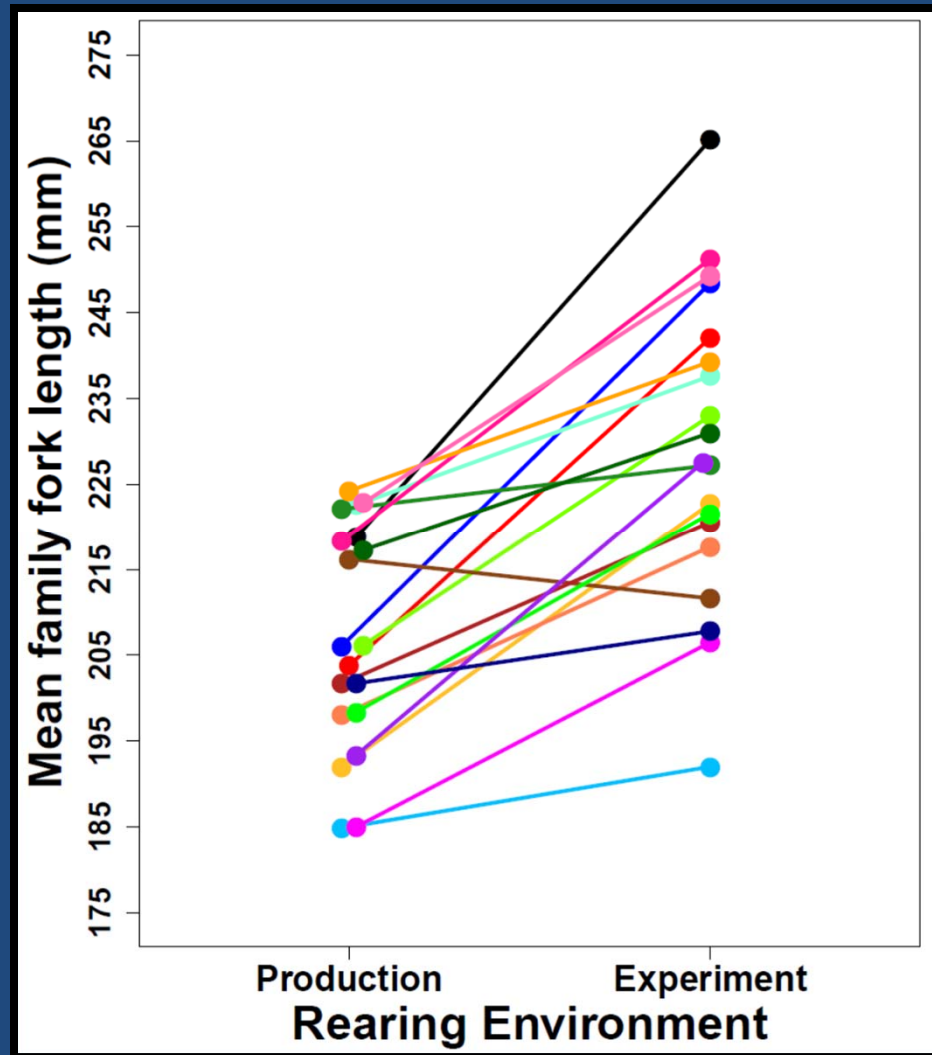
(Tipping 1997; Reisenbichler *et al.* 2004; Bond *et al.* 2008; Clarke *et al.* 2014; Osterback *et al.* 2014; Kavanagh & Olson 2014)

Steelhead adapt to captivity



Thompson and Blouin 2015
CJFAS, Siletz River steelhead

Steelhead adapt to captivity

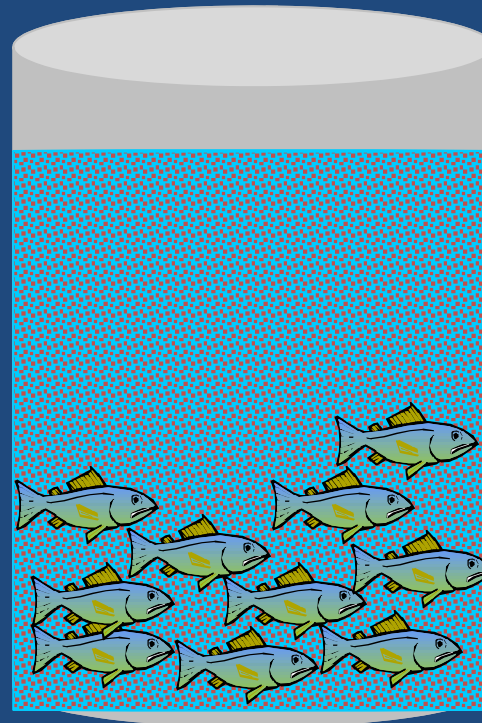


Thompson et al. unpublished
Hood River steelhead

Research question

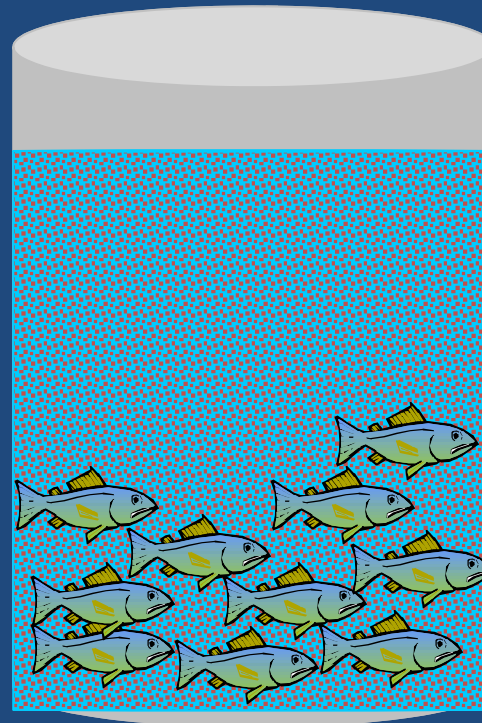
What traits correlate with large body size in hatchery reared steelhead?

Vertical Sorting behavior



Unrein

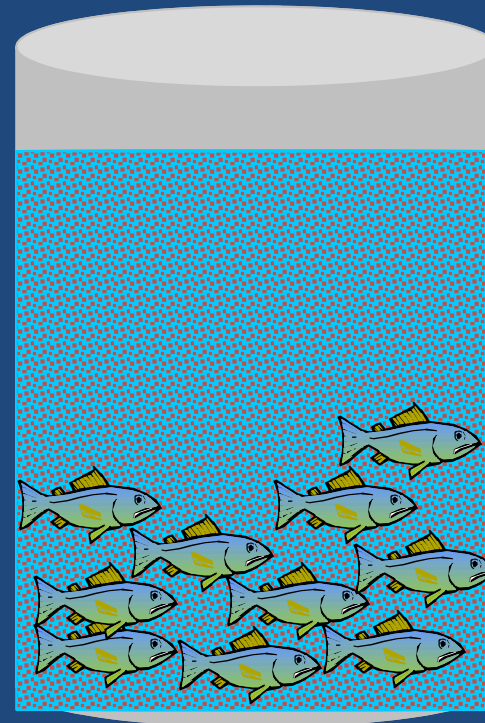
Vertical Sorting behavior



Unrein

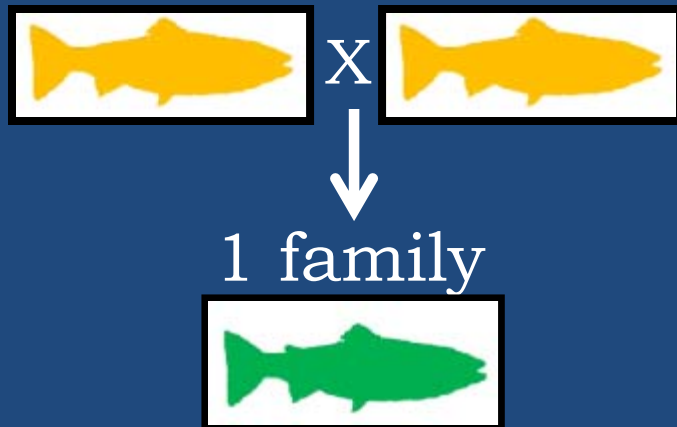
Vertical Sorting behavior

1. Family effect on vertical position?
2. Are surface families larger than bottom families?

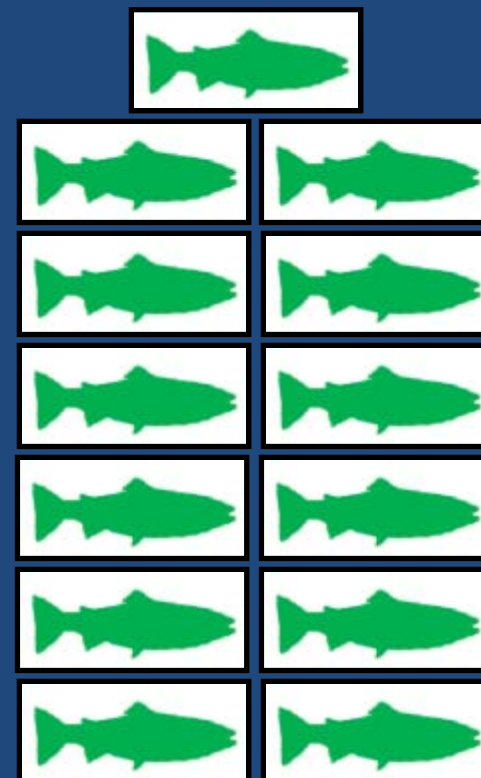


Unrein

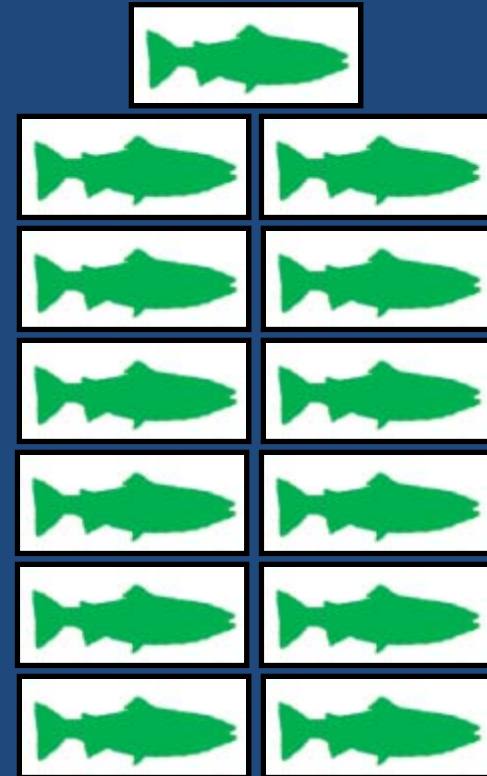
Experimental design



Vertical sorting and growth experiments



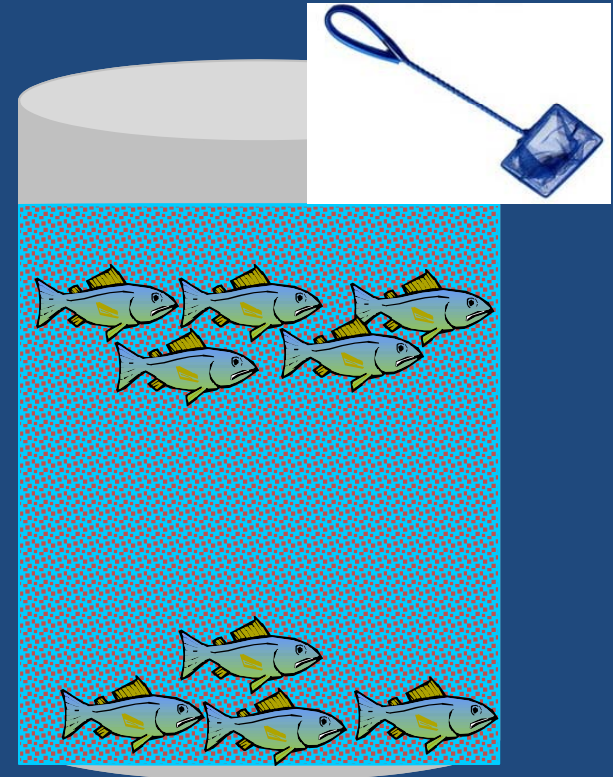
Vertical sorting and growth experiments



Vertical sorting sampling

Fish fed for 10 days

Fin snip + surface response



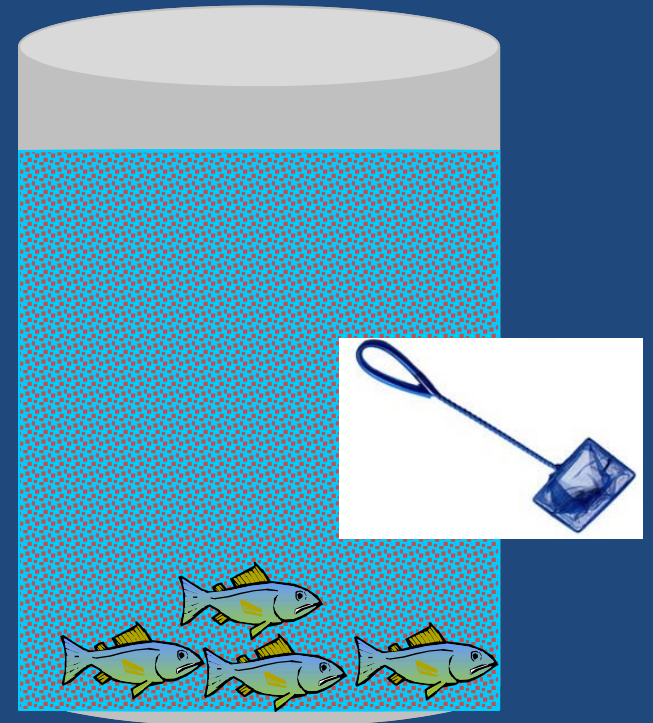
Vertical sorting sampling

Fish fed for 10 days

Fin snip + surface response

Fed 4 more days

Fin snip + bottom response



Vertical sorting experiment

Fin clip - genetic parentage analysis
SNPPIT and SOLOMON

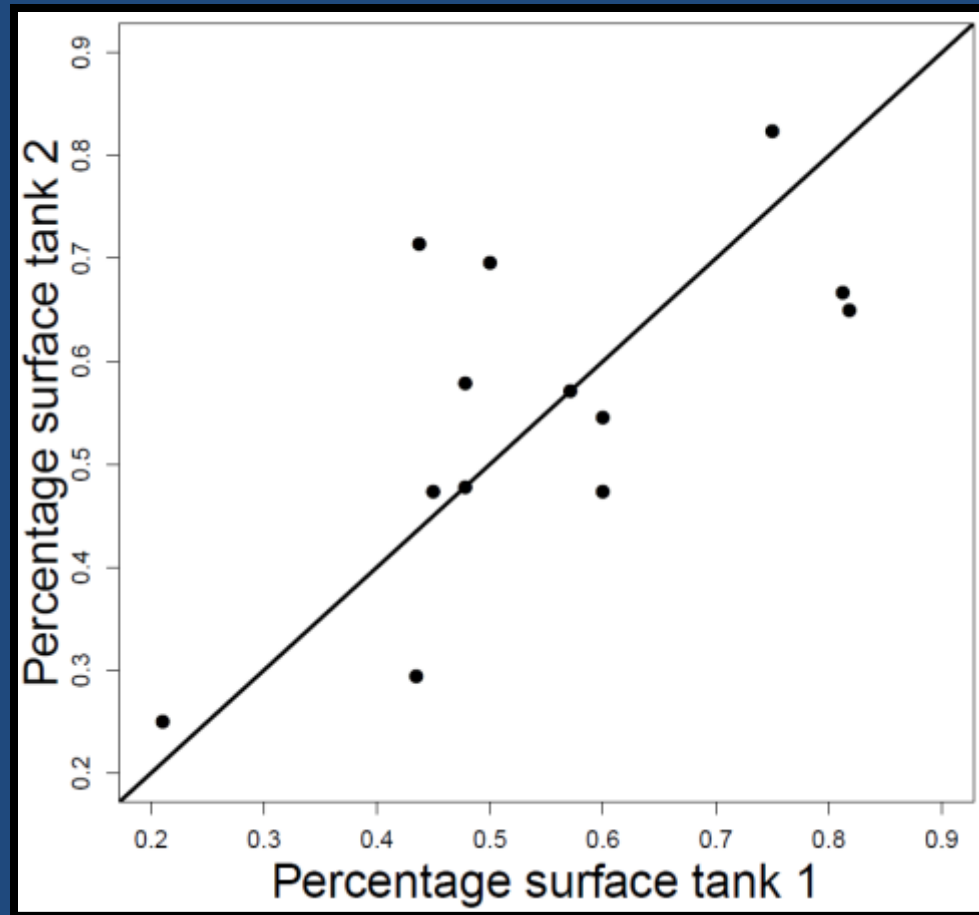


Q1: Is there a family effect on vertical sorting?

Logistic regression

Surface/Bottom $\sim$ family + tank + family*tank

Q1: Is there a family effect on vertical sorting?



Q2: Are surface families larger than bottom families?

1 yr smolt program

Fork length

Fin clip

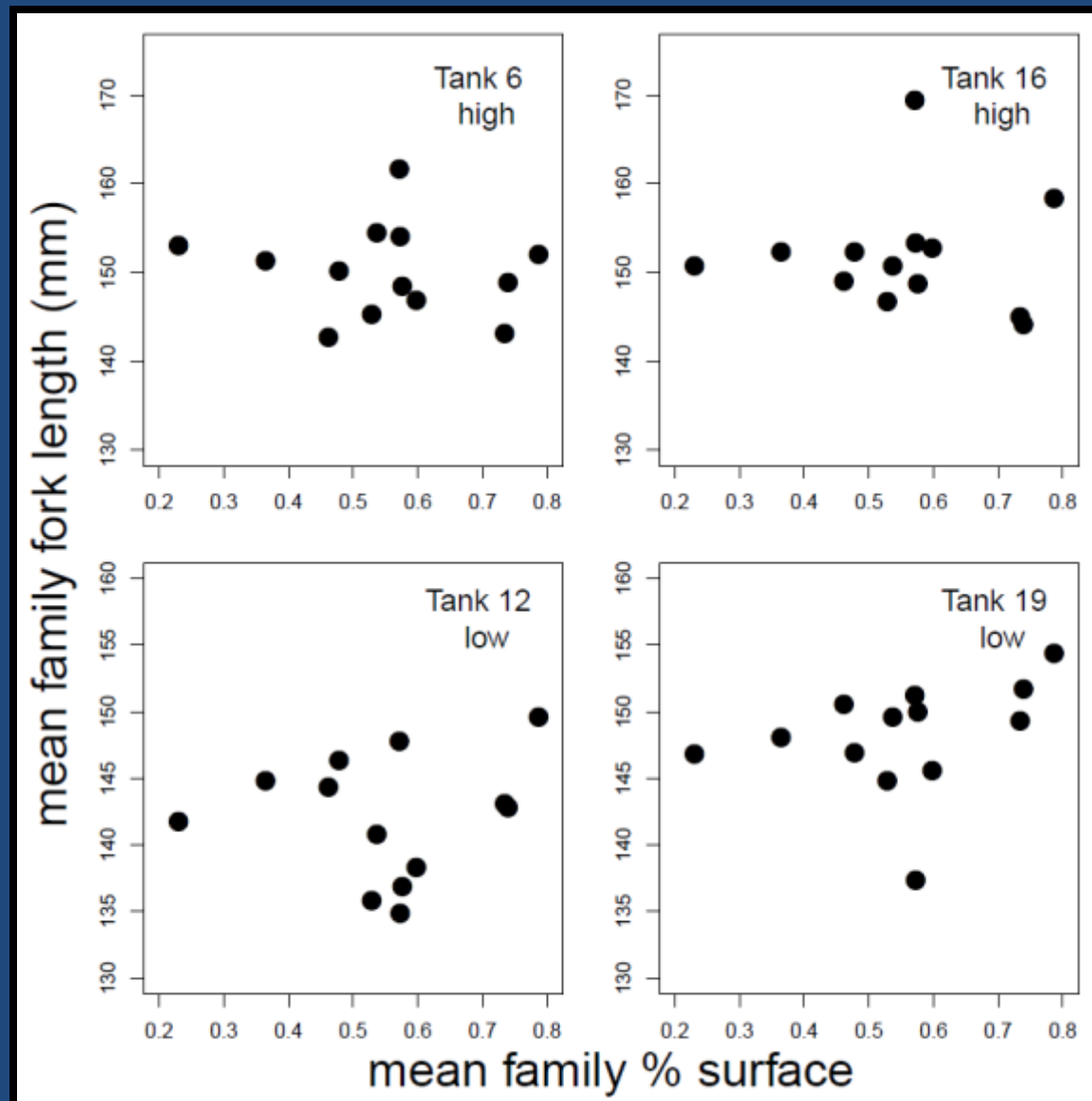


Q2: Are surface families larger than
bottom families?

Linear mixed effects model

mean family fork length = density + vertical
sorting + density*vertical sorting
+ tank (random)

Growth results



Where to go from here?

Second growth sample

April 2016

Second year of experiments

If vertical sorting correlates with avg. FL
Morphometrics

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Morphometrics

Management

Acknowledgments

- ODFW
- Joseph O'Neil, Ryan Couture, Joyce Mahr, Alex Powell, OHRC
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- Blouin lab + samplers
- NOAA SWFSC – genetics group

