

Quantification of genetic and environmental factors on variation among early life history traits in lake sturgeon.

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Acknowledgements

Collaborators

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Outline

- Objectives
- Environmental effects
- Genetic effects
- Experimental examination
- Conclusions
& Further Research

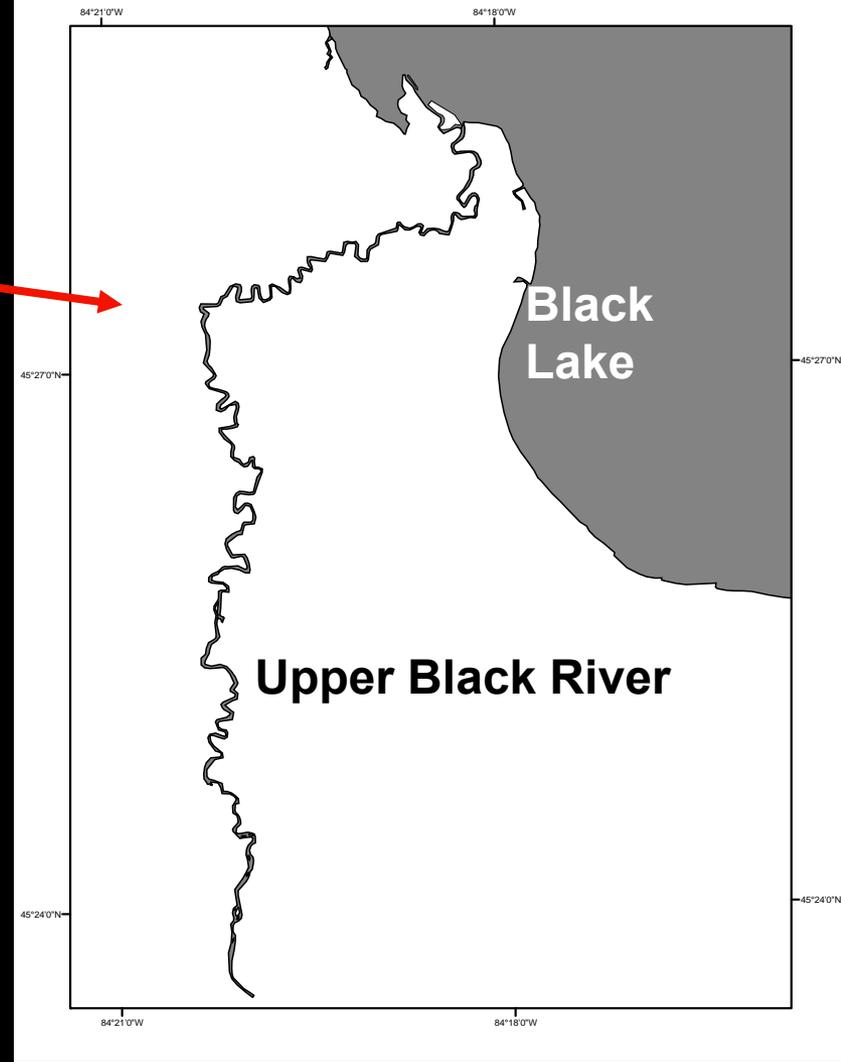
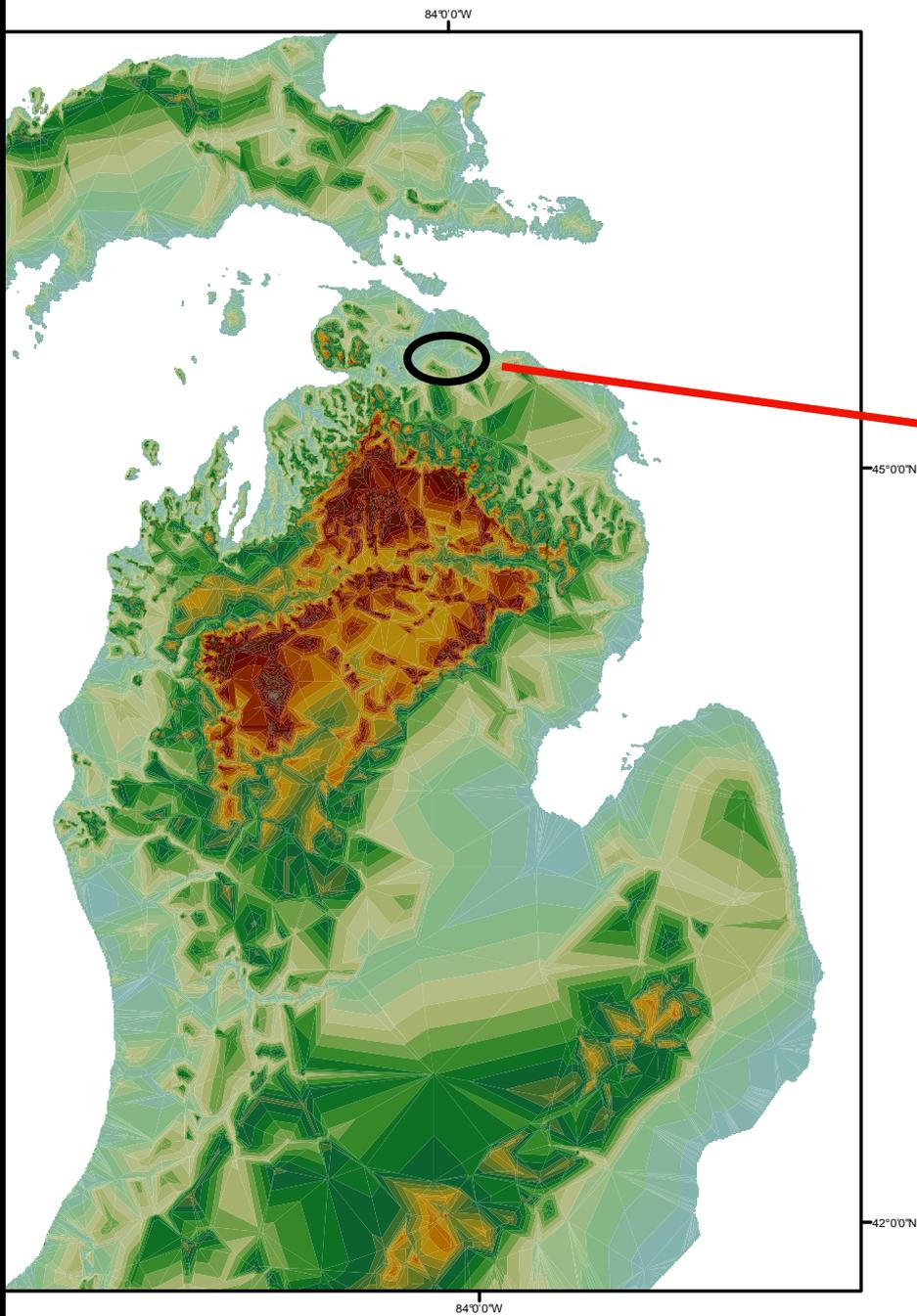




Objectives

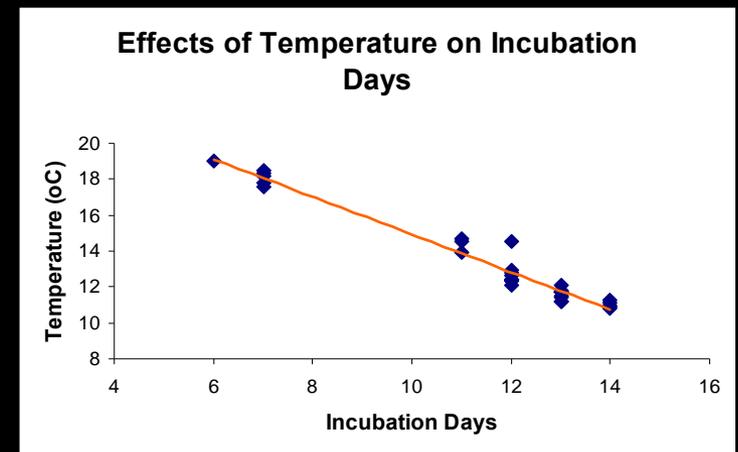
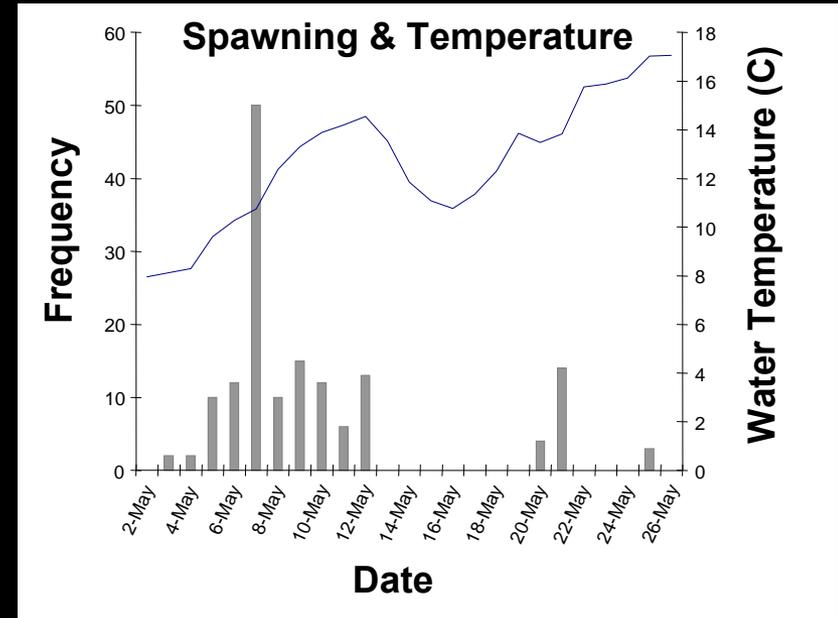
- (1) Determine the influence of individual family groupings on variability in early life history traits.
 - Egg and larval size at hatch
 - Yolk-sac volume at hatch
 - Yolk-sac absorption rate
 - Egg and larval mortality
- (2) Determine the effects of refuge and resource availability on yolk-sac absorption and growth within and among half-sib family groups.

Study Site



Environmental Effects

- Temperature
- Stream Discharge
- Stream Position
- Predation and Fungal Infection



Genetic Effects

- Periodicity
 - Different years, Different mates (differing environment)
- Run Time
 - Different environments
- Site Selection
 - Different environments
- Variation from Female to Female
 - Bigger females – bigger eggs, bigger larvae

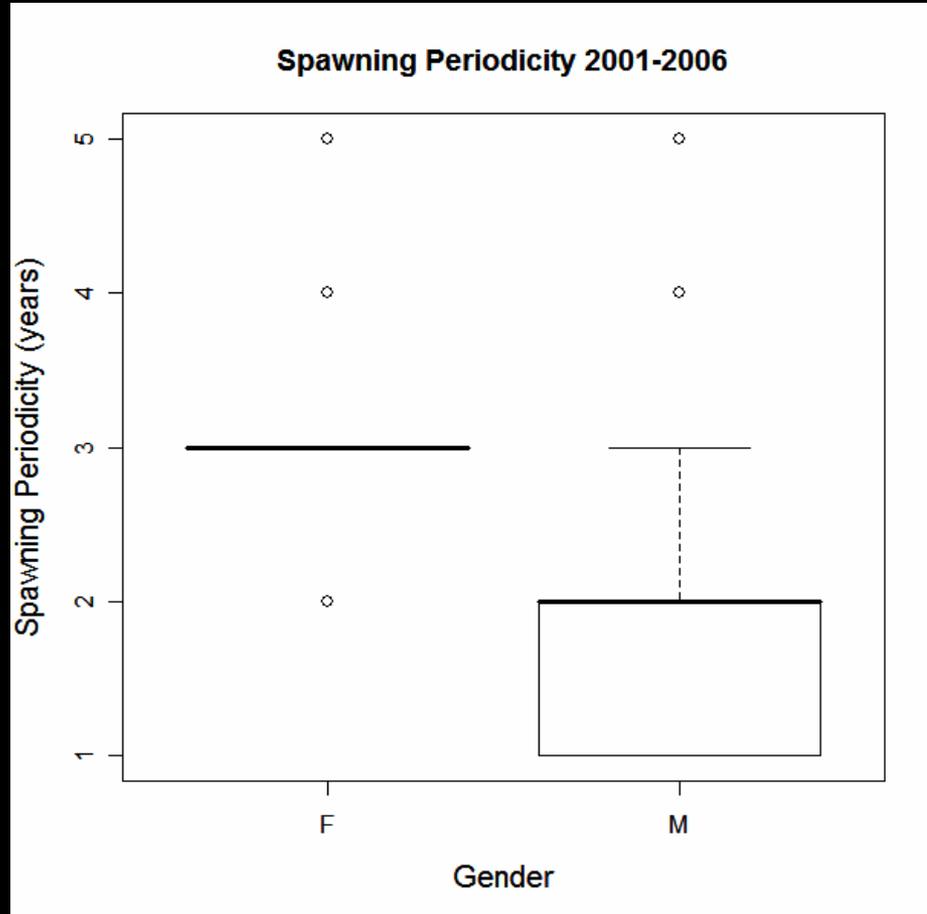


Genetic Effects

- Periodicity?



Genetic Effects - Periodicity



Females:

N = 42 Observations

N = 40 Individuals

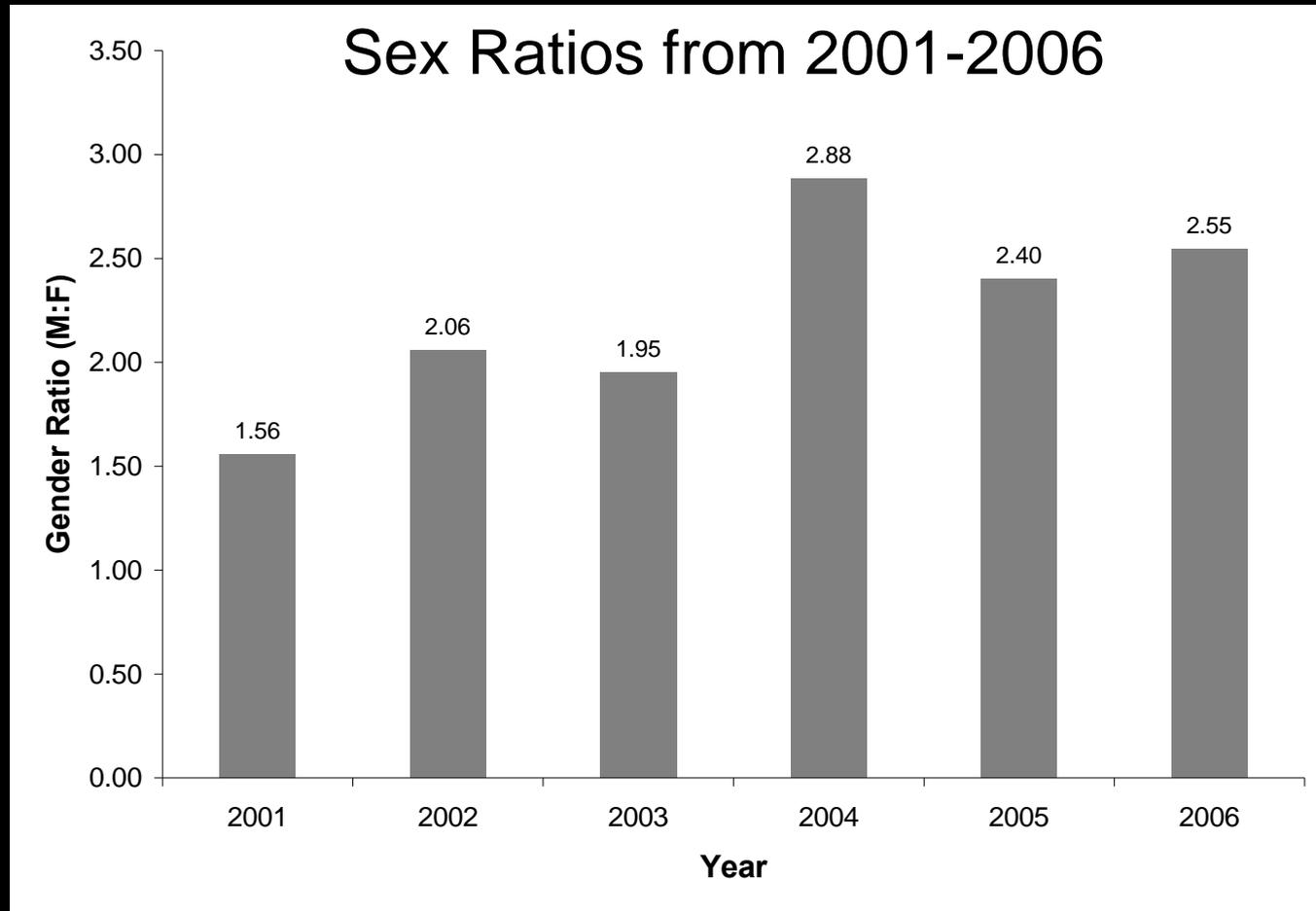
Males:

N = 229 Observations

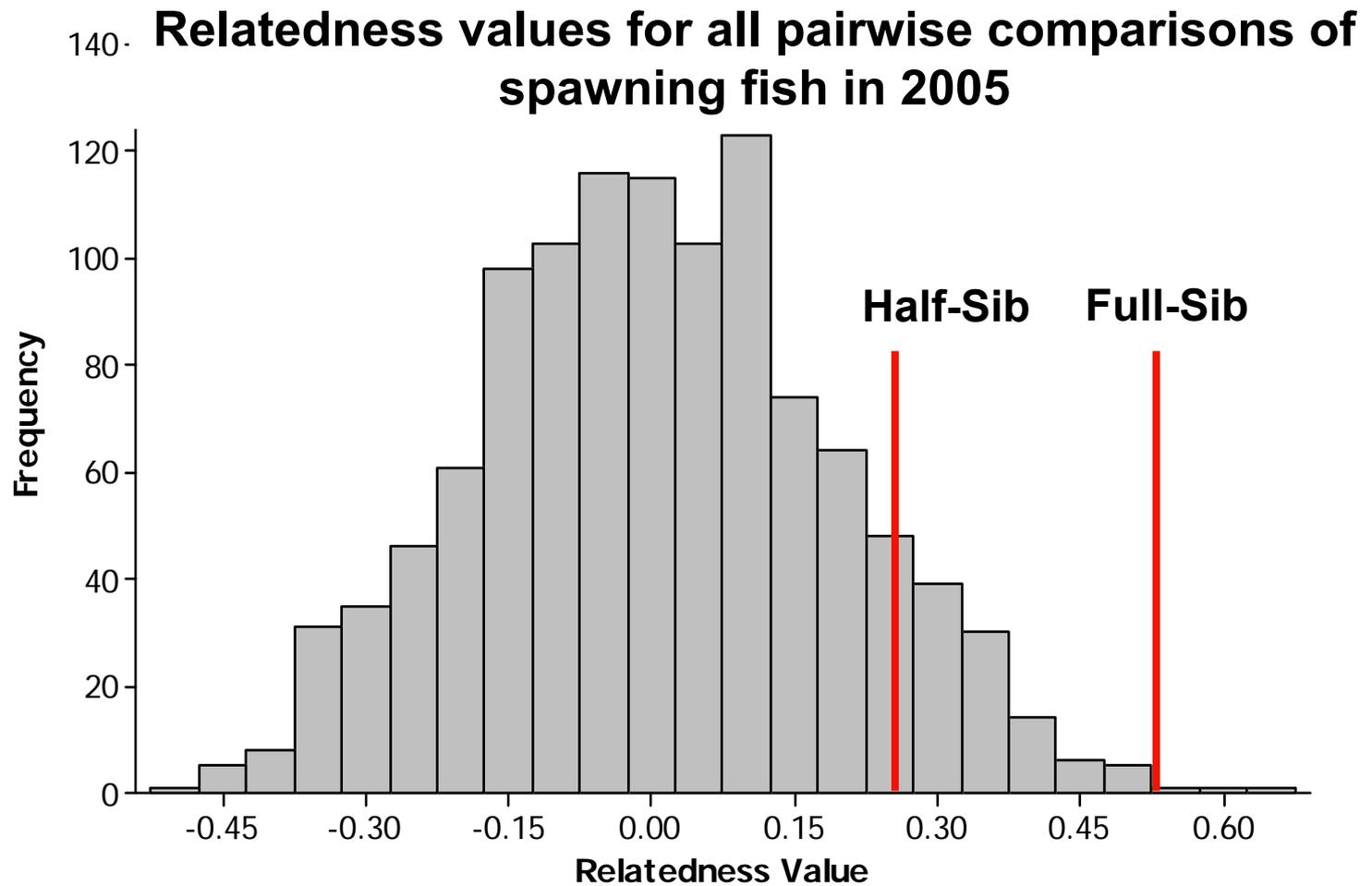
N = 142 Individuals

| | Estimate | Std. Error | t value | Pr(> t) |
|--------|----------|------------|---------|---------------|
| Female | 2.9762 | 0.1451 | 20.52 | $< 2e^{-16}$ |
| Male | -1.0068 | 0.1578 | -6.38 | $7.72e^{-10}$ |

Genetic Effects - Periodicity



Genetic Effects - Periodicity

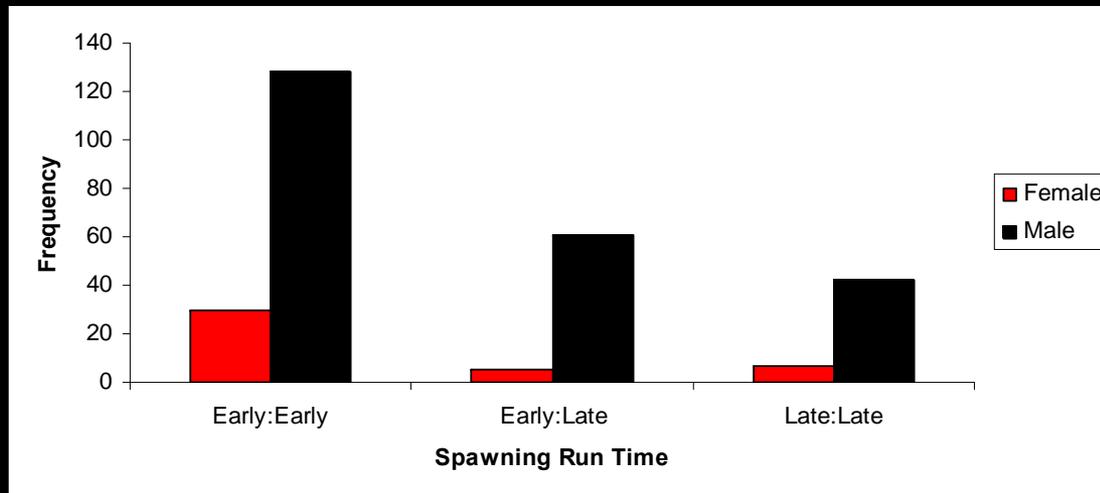
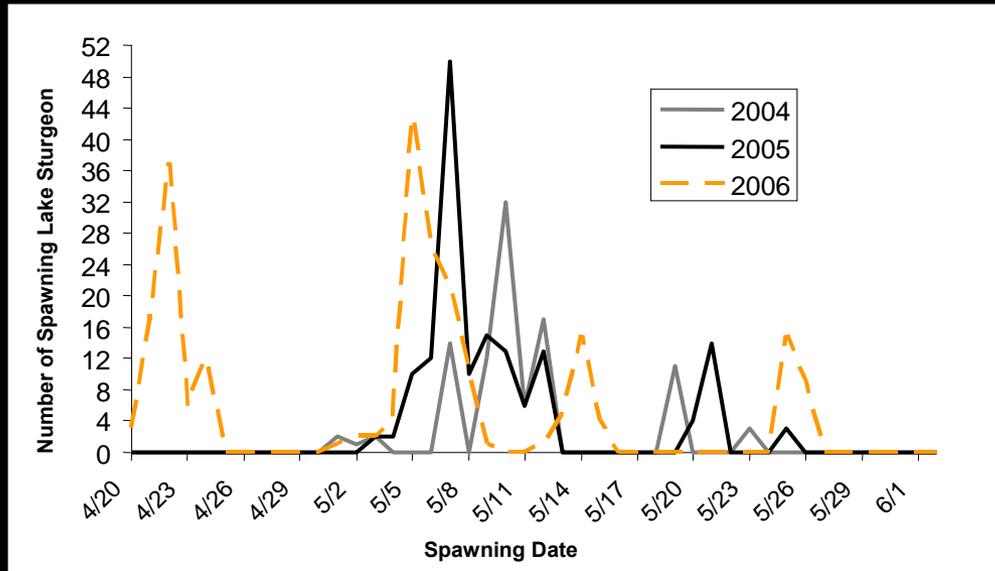


Genetic Effects

- Run Timing?



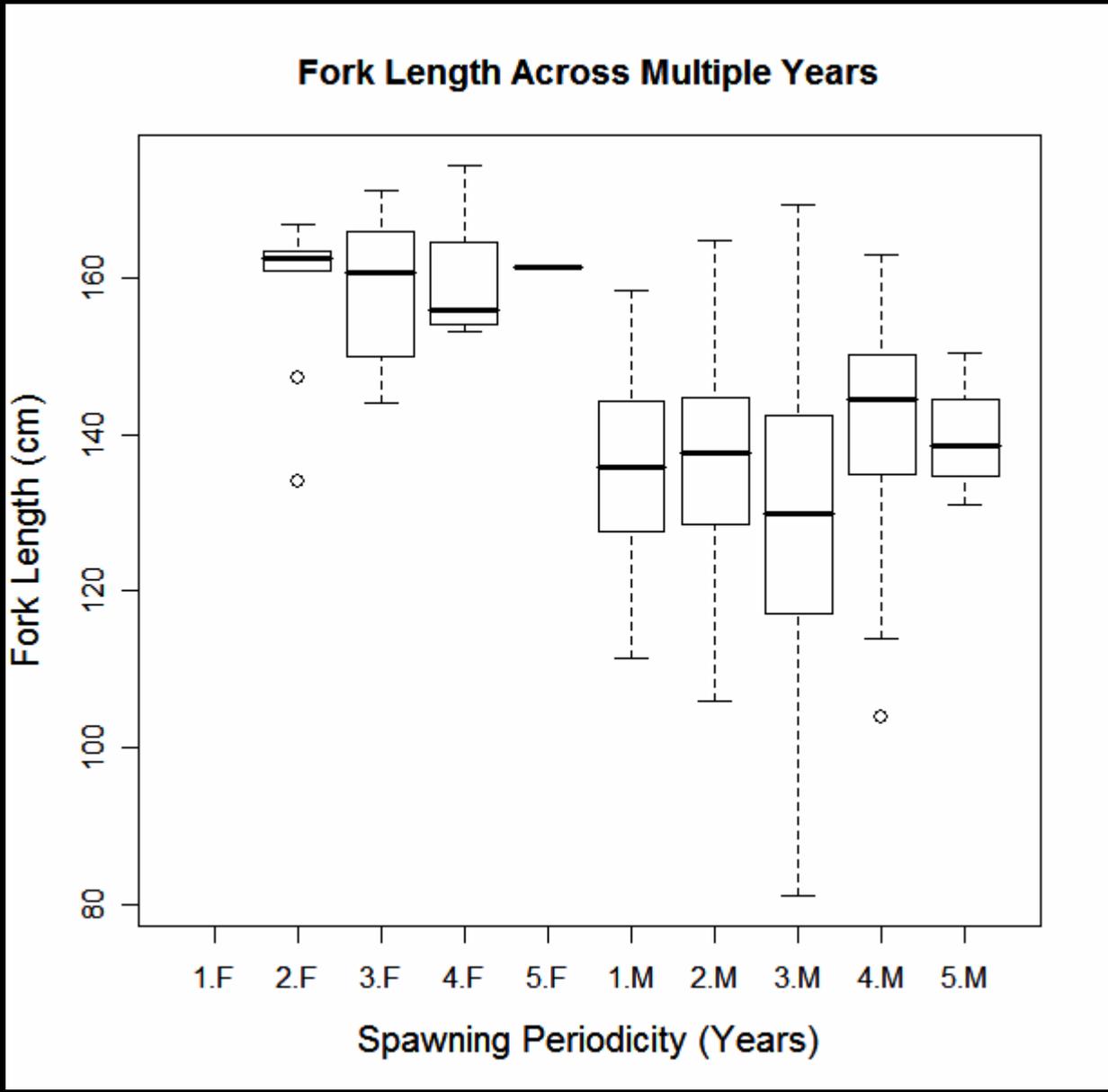
Genetic Effects – Run Timing



Male Run Time
 F-statistic: 4.202
 df: 1 and 371
 p-value: 0.04107

Female Run Time
 F-statistic: 13.23
 df: 1 and 80
 p-value: 0.0004865

Genetic Effects – Run Timing

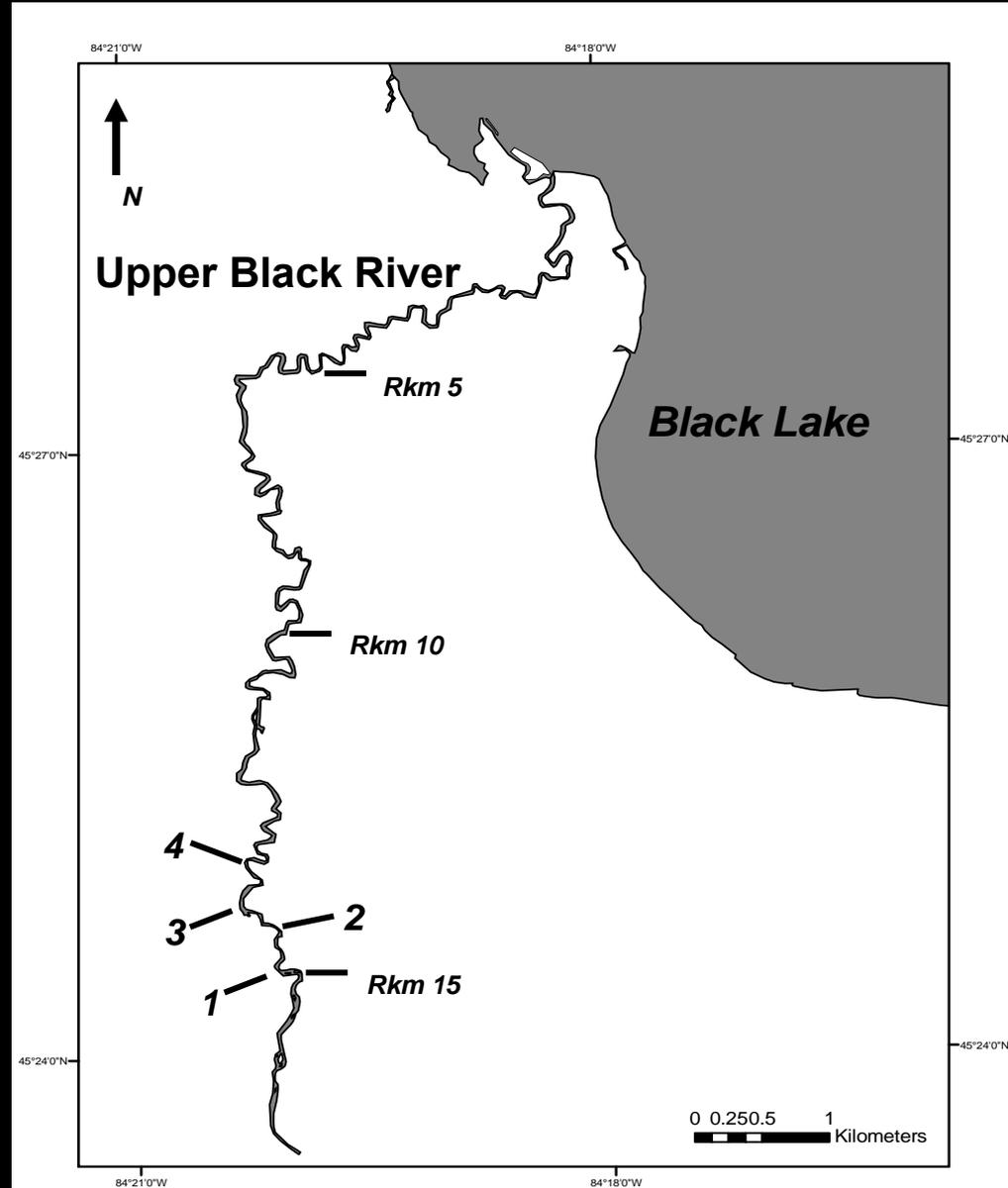
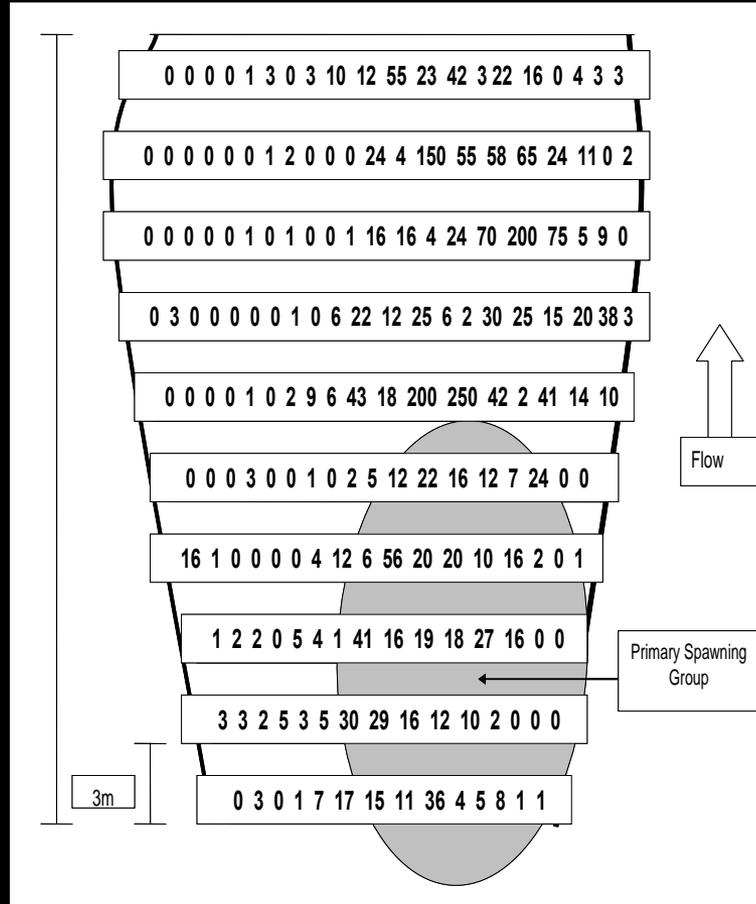


Genetic Effects

- Site Selection?



Genetic Effects – Site Selection

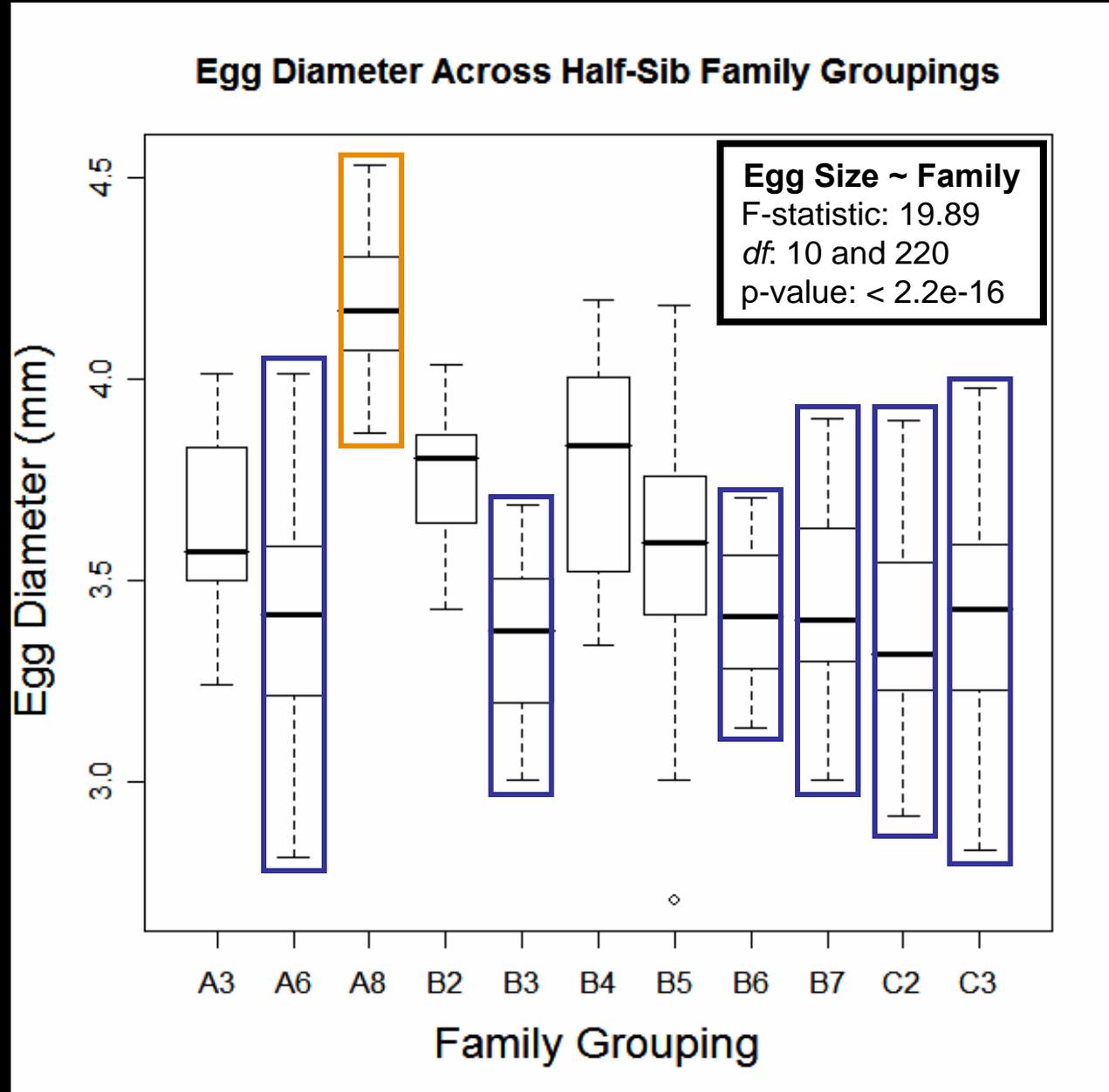


Genetic Effects

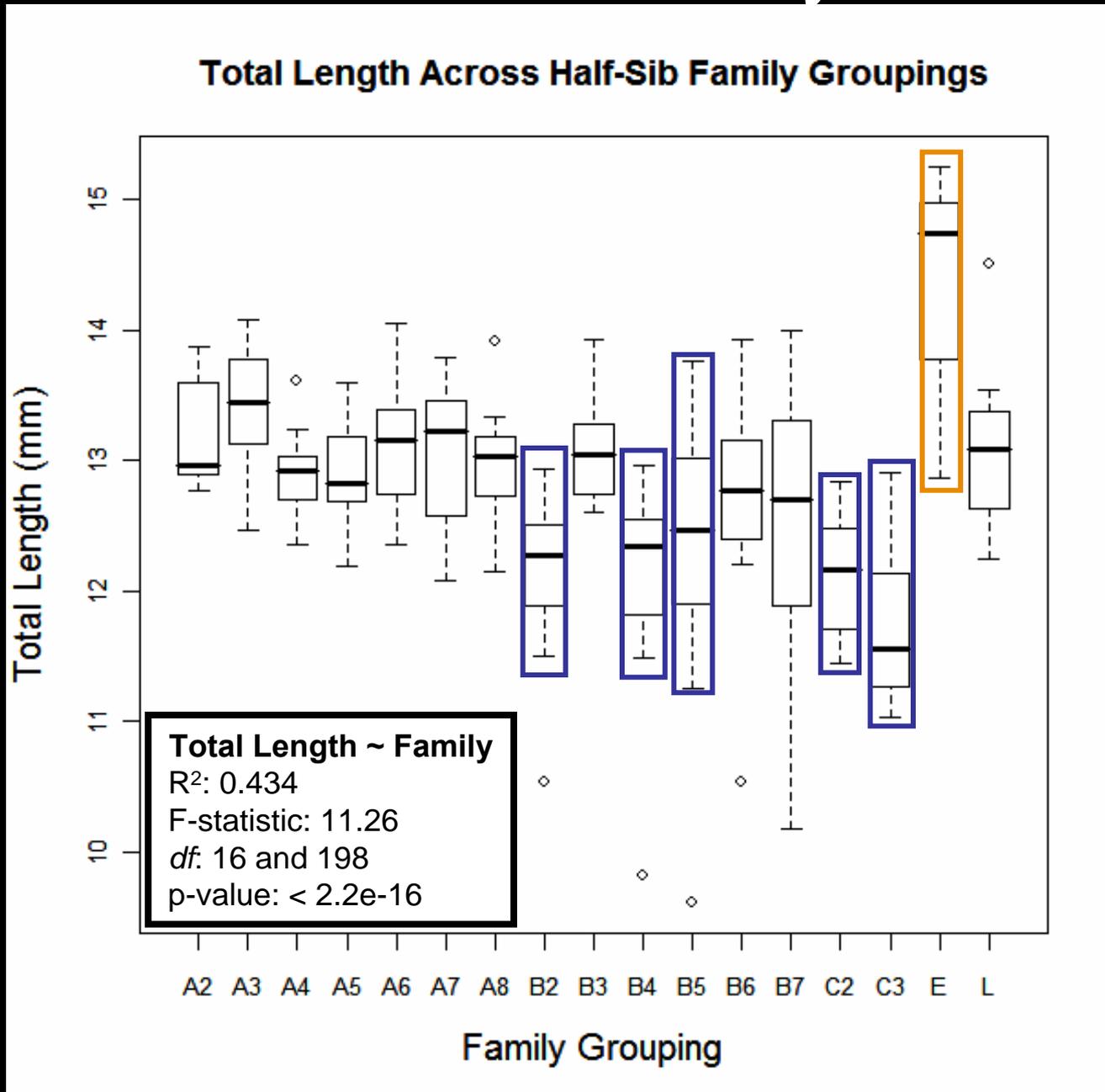
- Family Variation?



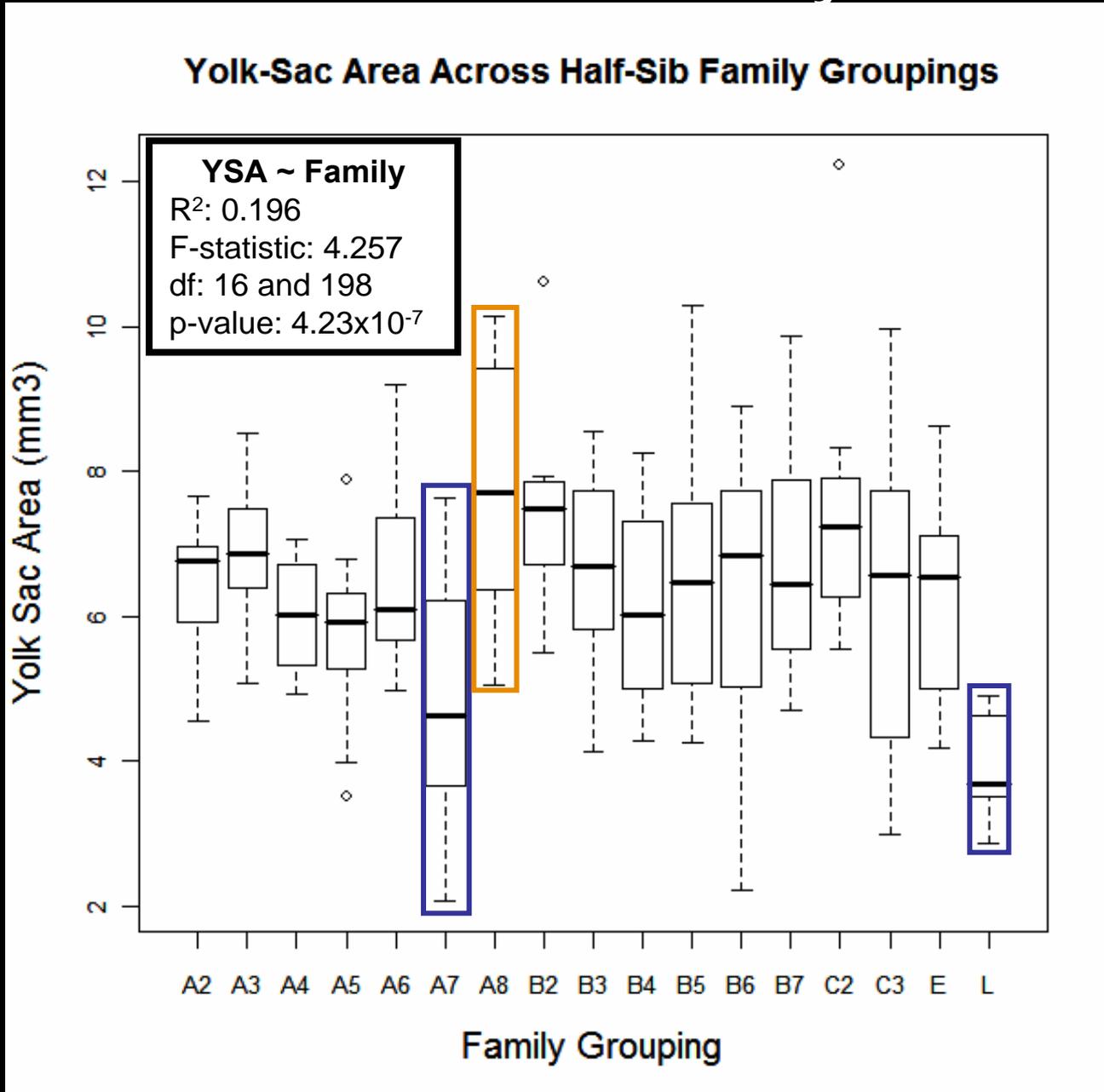
Genetic Effects – Family Variation



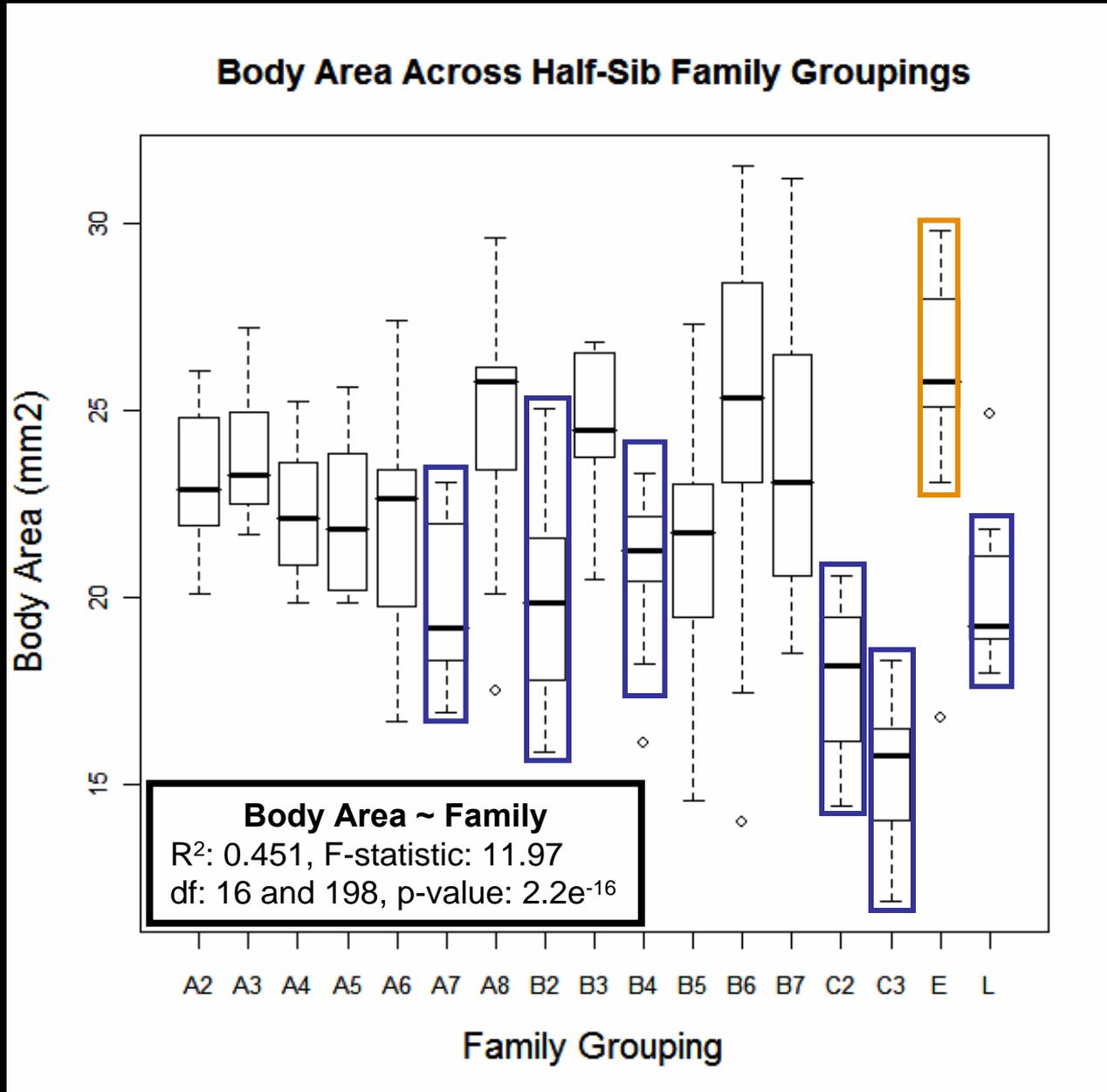
Genetic Effects – Family Variation



Genetic Effects – Family Variation



Genetic Effects – Family Variation



Conclusions

- Document differences among family groups
- Different Families are subject to differing environments
- How can we tease apart variation attributed to both environmental and genetic effects??



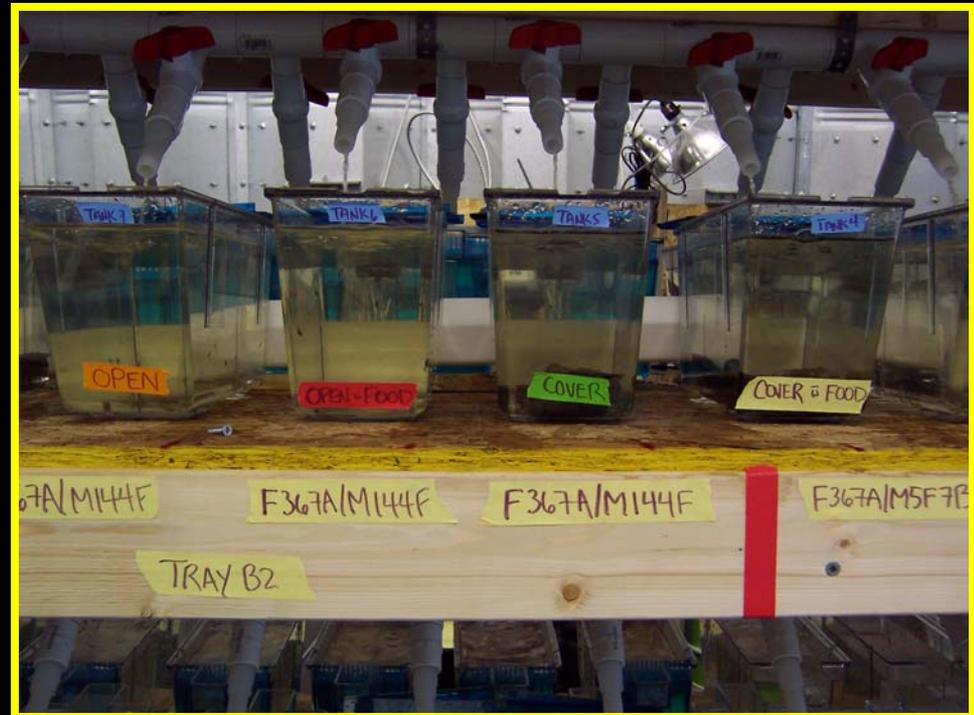
Experimental Assessment

- Objective:

- Determine the effects of refuge and resource availability on yolk-sac absorption and growth within and among half-sib family groups.

Treatments:

- Refuge
- Refuge + Resource
- No Refuge
- No Refuge + Resource



Experimental Assessment

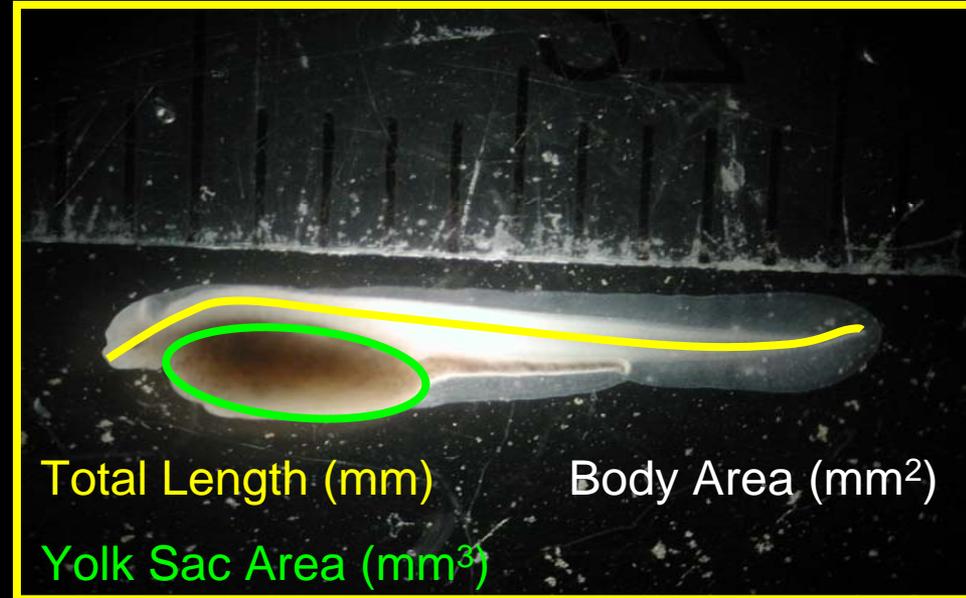


- MSU Streamside Rearing Facility
- Upper Black River



Experimental Assessment

- Methods
 - 100 larvae into each treatment (By Family)
 - Sample of 10 per day (Removed)
 - Imaged
 - Measured using ImageJ
 - Analyzed using a linear model
 - AIC for model choice



Models – Total Length

Model

Parameters

R²

AIC

ΔAIC

7

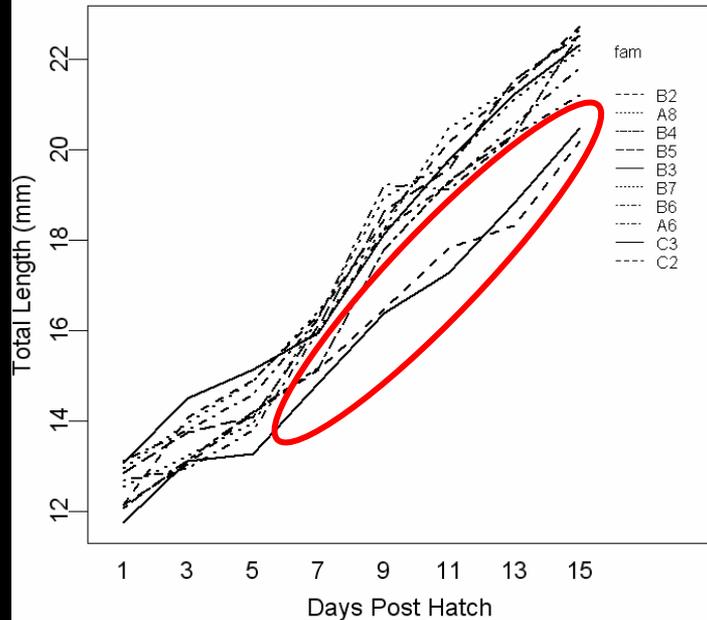
TL~Day

0.8956

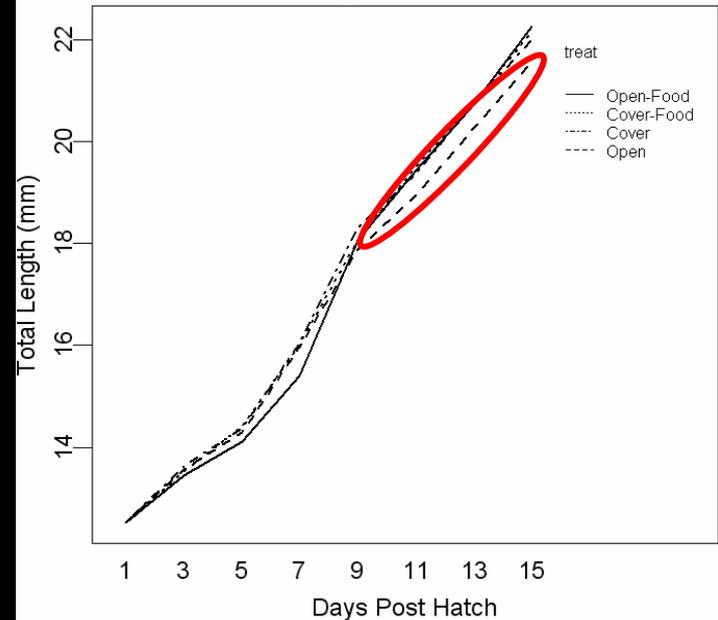
9374.04

1654.05

Total Length:Time:Family

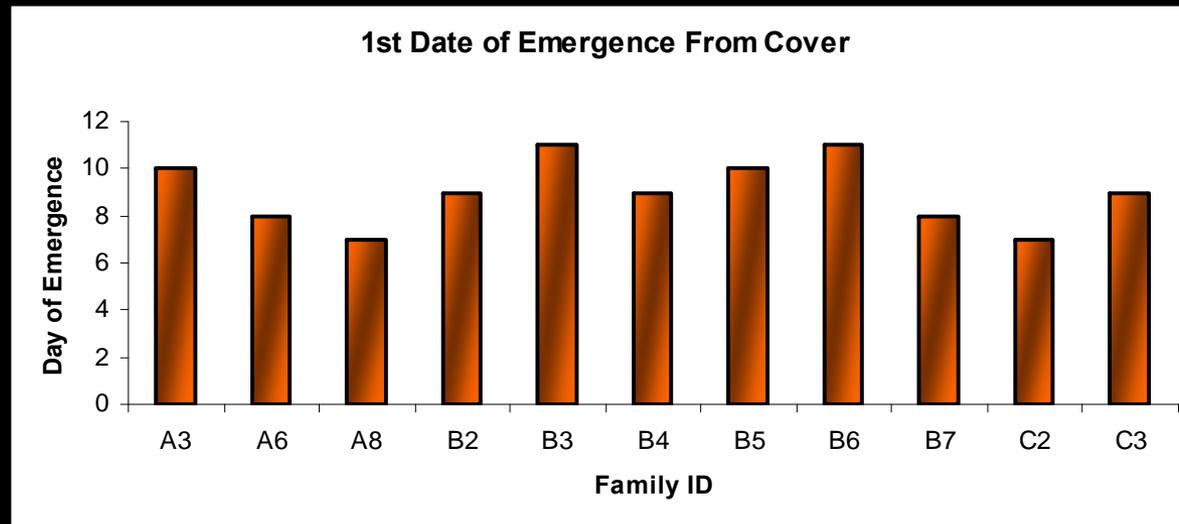


Total Length:Time:Treat



Further information of management concern

- Higher survival in treatments with cover
- Timing of emergence





Further Research

- Examine the effects of temperature and dissolved oxygen on incubation time, size at hatch, and growth.
 - Within and across family groupings
- Examine the effects of rearing environment
 - Streamside vs Traditional Environments

Questions?

