

Consequences of egg size on growth of Hatchery and Wild steelhead trout

Camille Leblanc
David Noakes
Carl Schreck
Skúli Skúlason
Sigurður Snorrason



OREGON STATE UNIVERSITY
DEPARTMENT OF FISHERIES & WILDLIFE



HÁSKÓLI ÍSLANDS

General context

- Large Intra-specific diversity in salmonids
 - > 30 life history types in STH (Thorpe 2007)*
 - sympatric morphs of AC*
- What creates such diversity and how is it maintained?

Maternal effects?

Often serve an adaptive role in an organism's life history

a large role in rapid population differentiation, and speciation

In species with no parental care egg size, i.e. the **amount of yolk**, can be directly linked to maternal effects and may affect important traits in the offspring.

Maternal effects and fishes

- Offspring size
- Behavior
- Disease resistance
- Environmental contaminants
- mRNA
- Survival and mortality
- Embryonic levels of hormones

Questions: Predictions

- Can egg size influence growth and behavior early in life ? **Yes**
- Can egg size have long term consequences on growth and life history of Salmonids?

No

positive correlation between egg size and BW/FL of fish at first feeding, will disappear after several weeks.

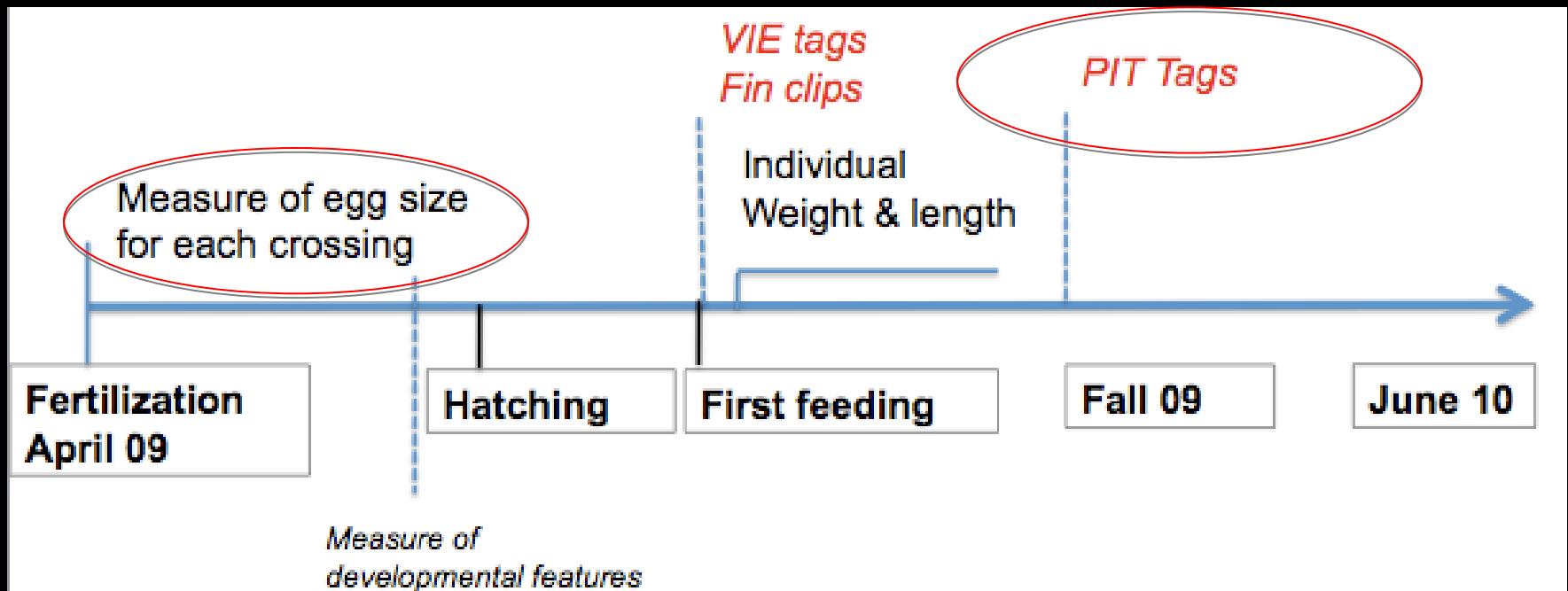
(e.g. Heath 1999)

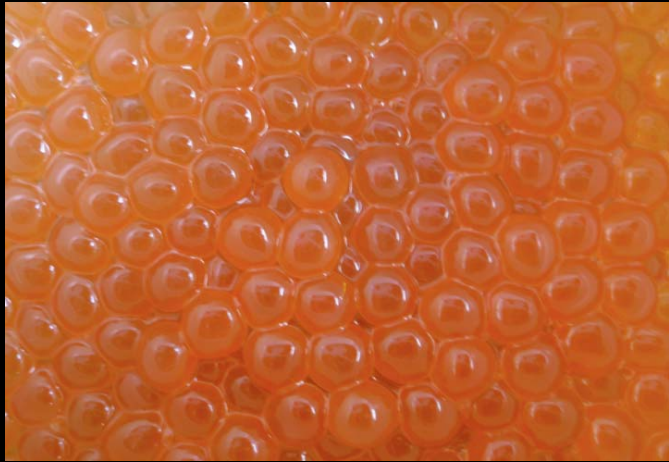
Objectives

- Assess egg size differences in steelhead trout
- Assess short term consequences:
 - development
 - growth before and after first feeding
- Assess potential long term consequences :
 - absolute growth/ growth rate
 - smolting

Methods

- 10 crosses of Wild fish and 10 crosses of F1 Hatchery (Siletz stock) in 2009/2010.
- Sorted egg size : small vs large from each crossing





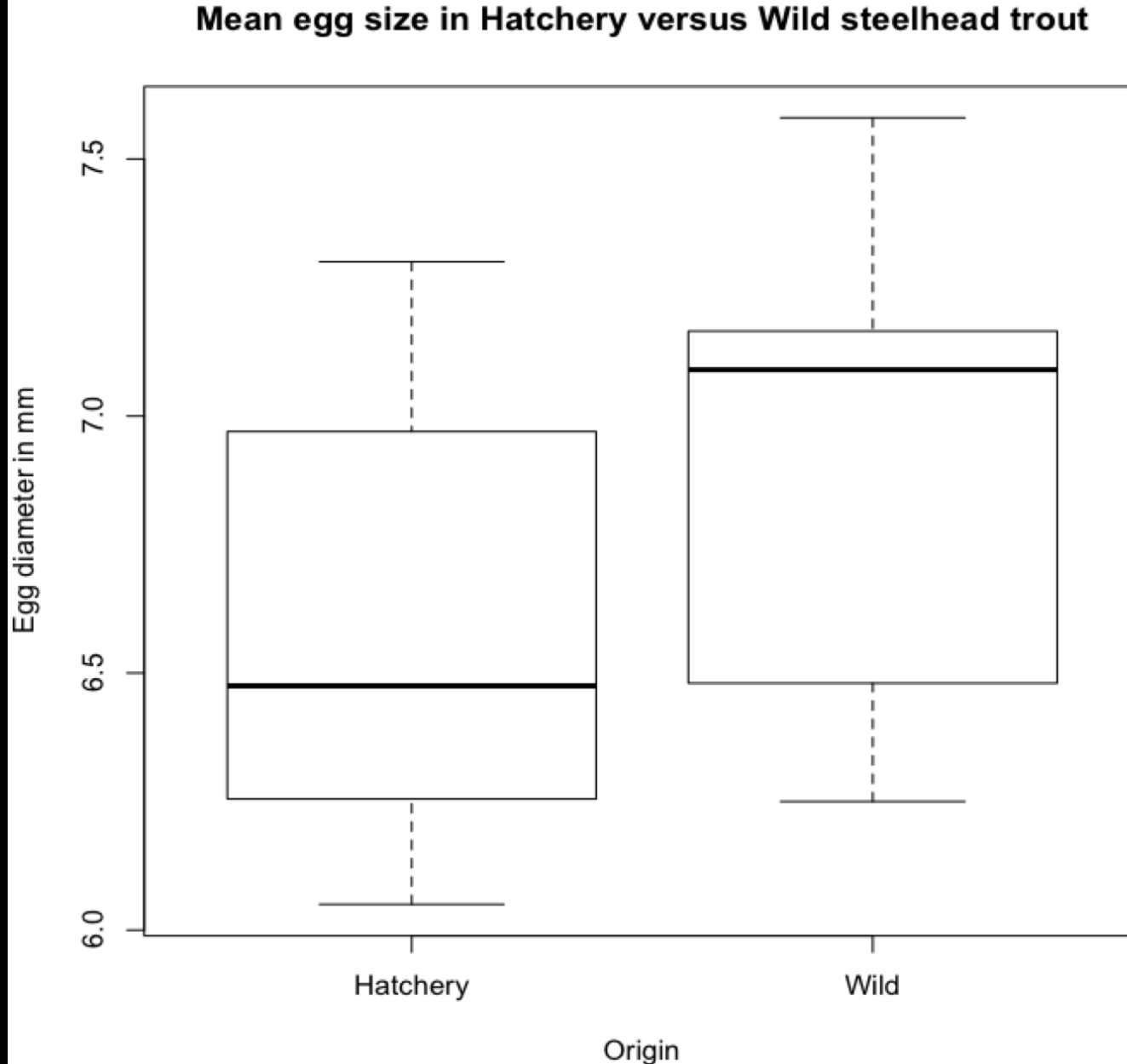


550 fish pit-tagged in October 2009



Oregon Hatchery Research Center 2009

Egg size differences



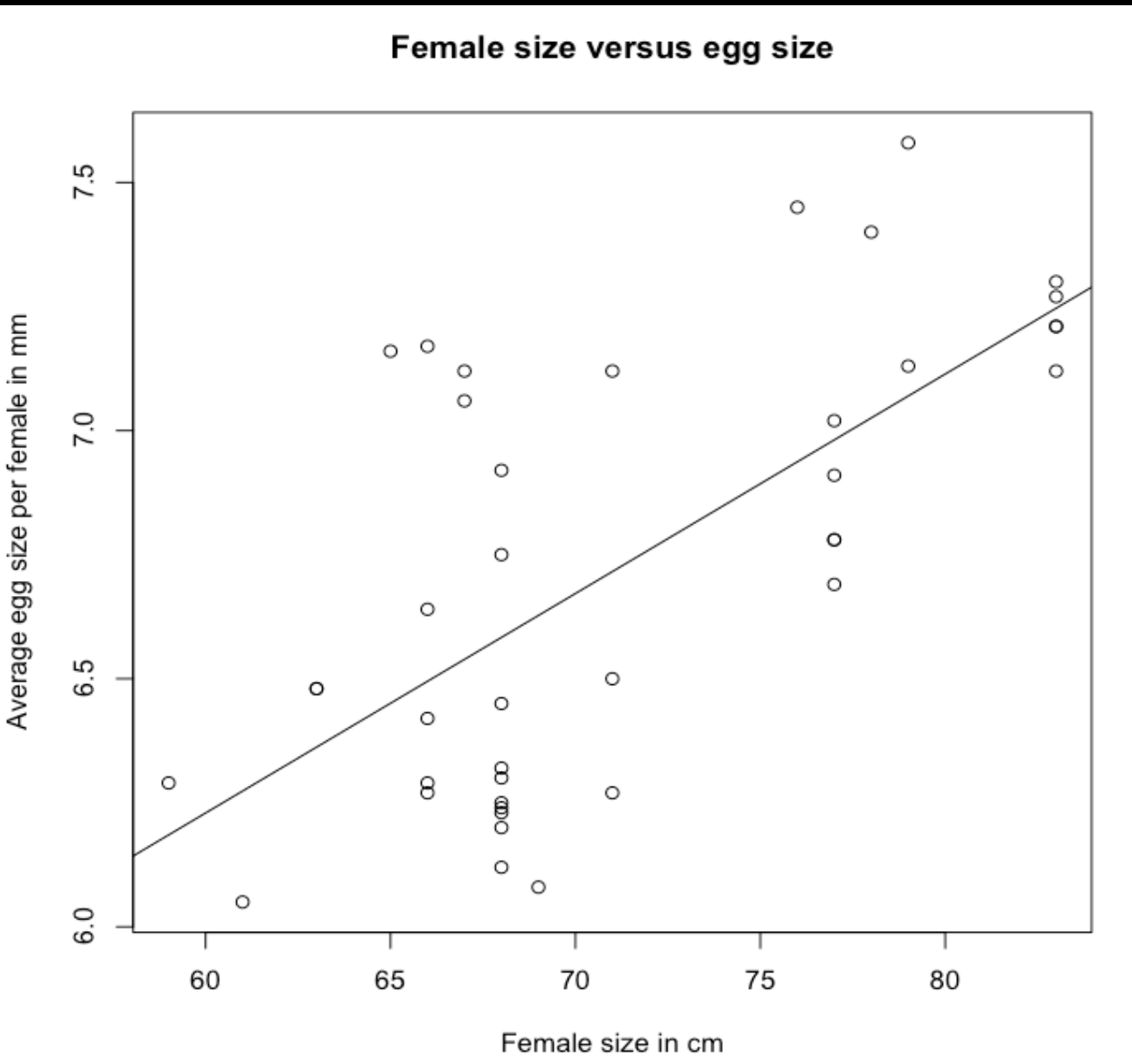
N=40

Df=1

P=0.000

After
accounting for
female body
size

Egg size –Female body size



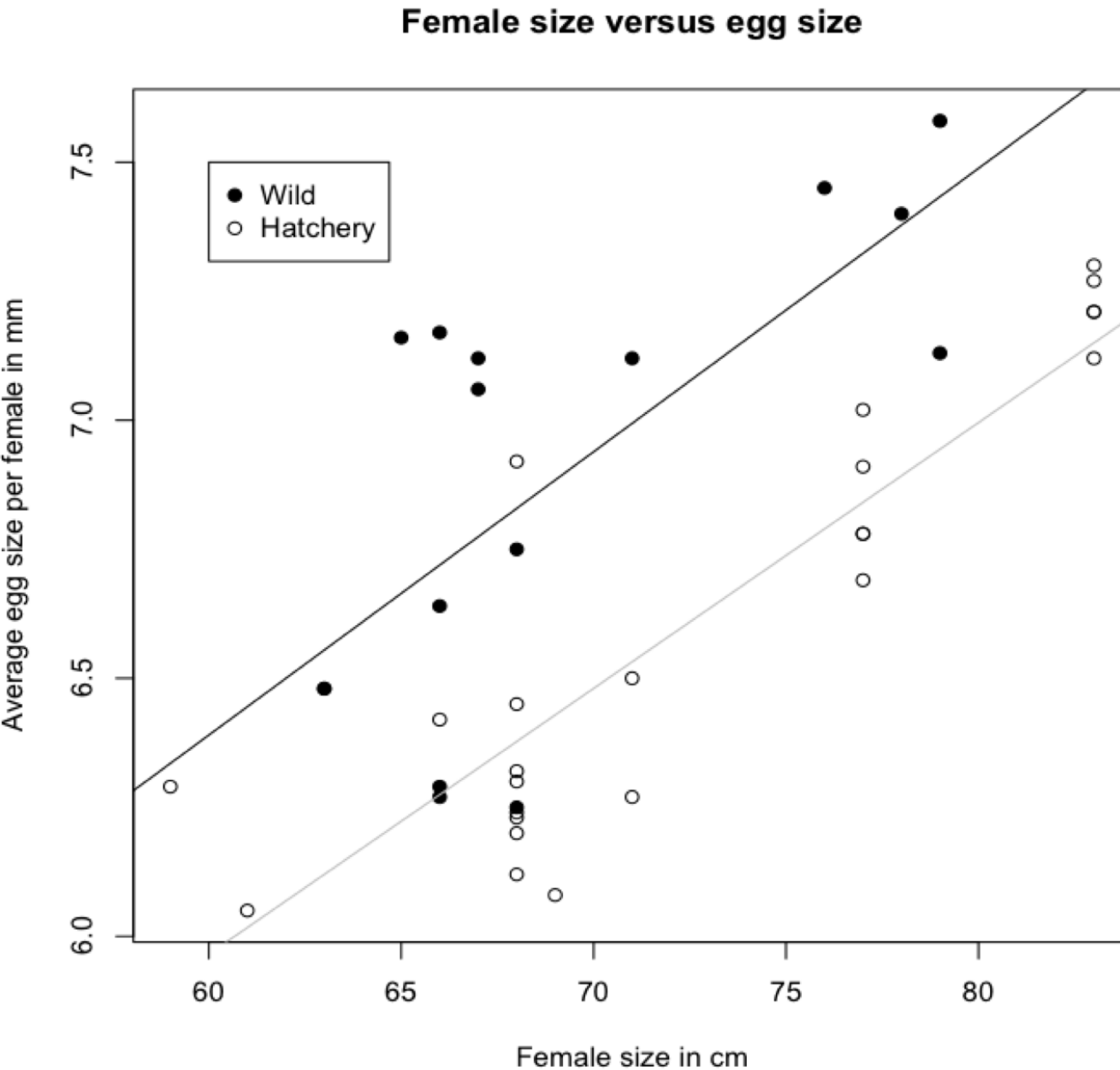
N=40

Df=37

P=0.000

$R^2=0.441$

Egg size –Female body size

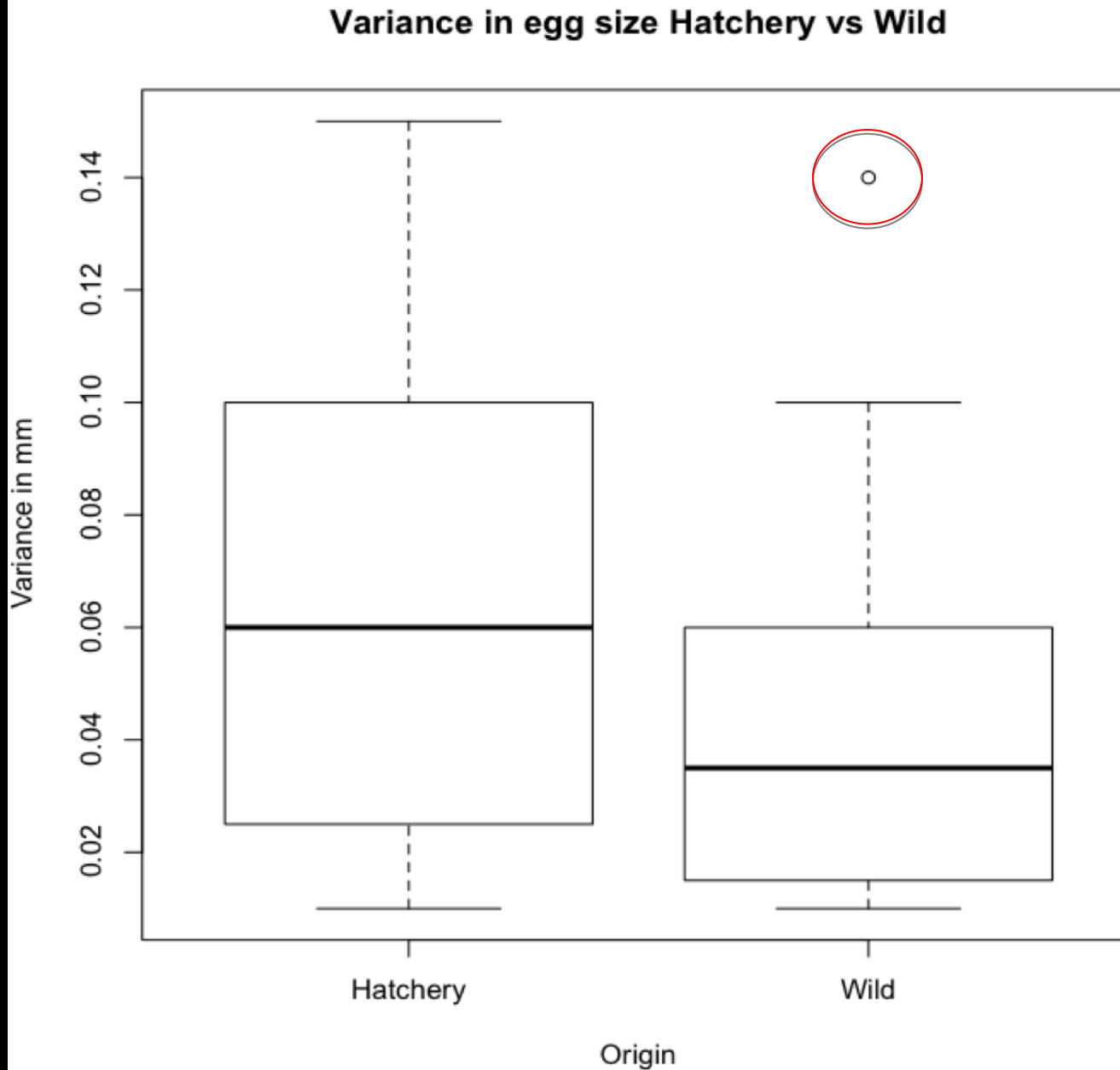


N=40

Df=36

P=0.828

Variance in egg size



N=40

Df=1

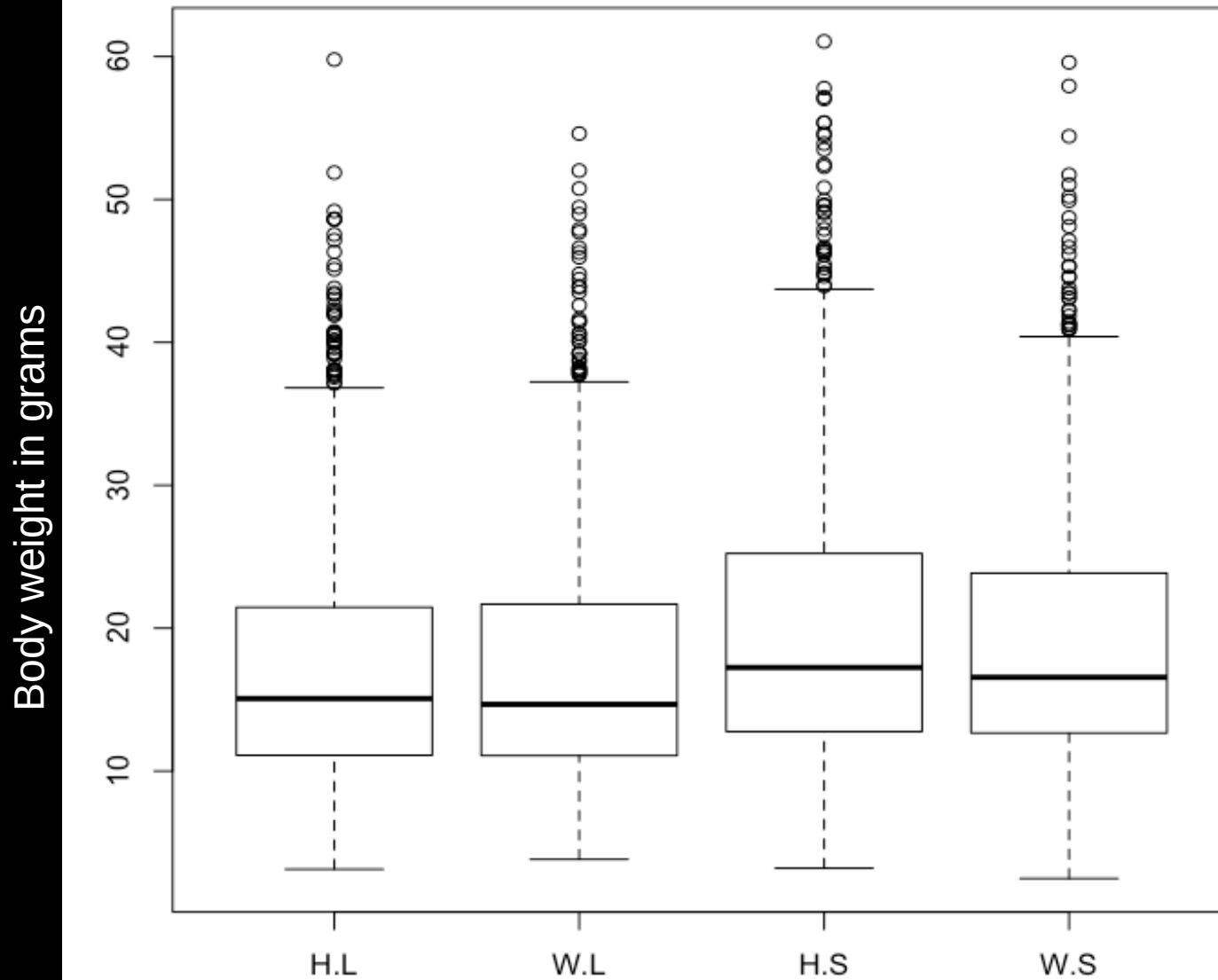
P=0.115

Long term effect of egg size on steelhead trout



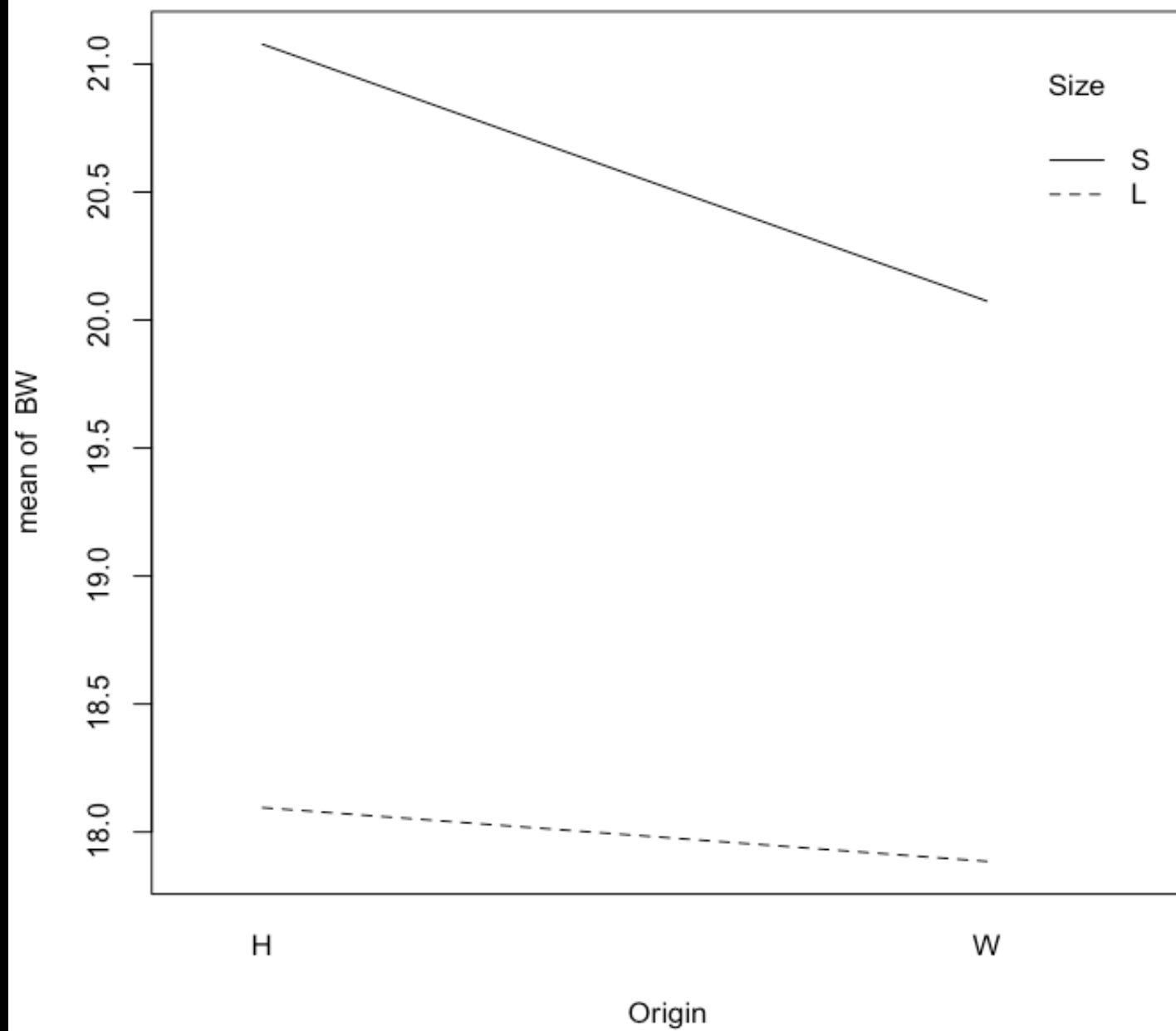
Wild steelhead smolt Fall Creek

Consequences of egg size on growth Fall 09 till March 10



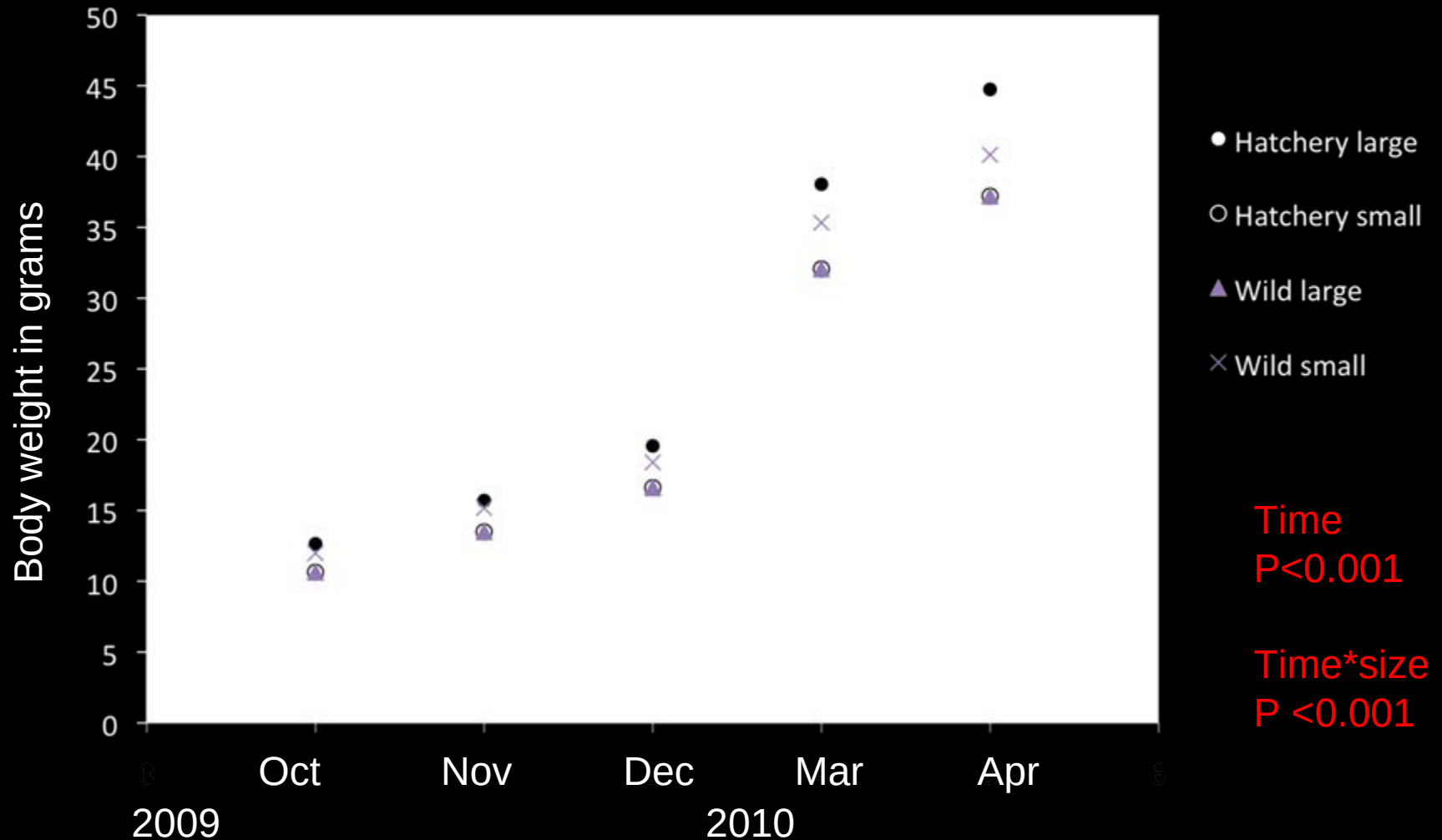
Origin
 $P < 0.05$

Size
 $P < 0.001$



Origin*size
P < 0.05

Consequences of egg size on growth



Conclusions:

- ✓ Clear differences in egg size between W fish and F1 H fish.
 - ✓ Smaller egg size and increased variance in H fish.
 - ✓ Positive correlation egg size/female size for both H and W.
 - ✓ BUT Negative relationship between egg size and growth after a year for both H and W.
-
- *Environment / growth early in life can have long term consequences in steelhead trout with potential implications in life history and evolution.*

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Eyjafjallajökull, April 2010

... to come :

- Differences in specific growth rate?
- Effect of egg size on smolting
- Family effect
- Sex ratio ?
- Early development
- Behavior
- ...