

CARRYOVER EFFECTS OF WINTER WARMING IN THE OLYMPIA OYSTER

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<https://laurahspencer.github.io/LabNotebook/>



THE OLYMPIA OYSTER, *OSTREA LURIDA*



IMPACTS OF OCEAN WARMING?

IMPACTS OF WARMING ON OLYMPIA OYSTERS WILL LIKELY VARY BY SEASON IN PNW

Some
dominant
activities by
season

Spring

Gametogenesis, spawning,
fertilization, recruitment,
growth

Summer & Fall

Spawning,
gametogenesis,
recovery, growth

Winter

Metabolic
depression,
dormancy (?)

Effect of
warming

↑ fertilization,
gametogenesis, larval
development, & feeding
rates

*(Parker, Ross & O'Connor 2009,
Rico-Villa, Pouvreau & Robert 2009;
Gray & Langdon 2018; Lawlor &
Arellano 2020)*

↓ larval duration / dispersal

(O'Connor et al. 2007)

↑ heat stress,
infection/disease,
mortality

↑ or ↓ growth rates

*(Li, Abbott, Li & Benkendorff
2007; Green et al. 2019; Lawlor &
Arellano 2020)*

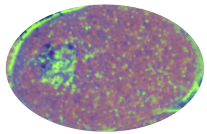
Early
spawning in
spring,
↑ sperm
development

(Spencer et al. 2020)

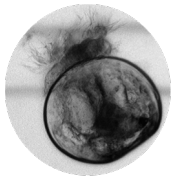
Offspring?

How will warmer winters impact Oly offspring?

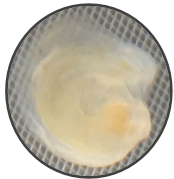
Metrics:



Egg size (Maternal investment, endogenous energy)



Larval size when released (Larval growth rate, quality)



Larval survival to post-set (Larval viability)



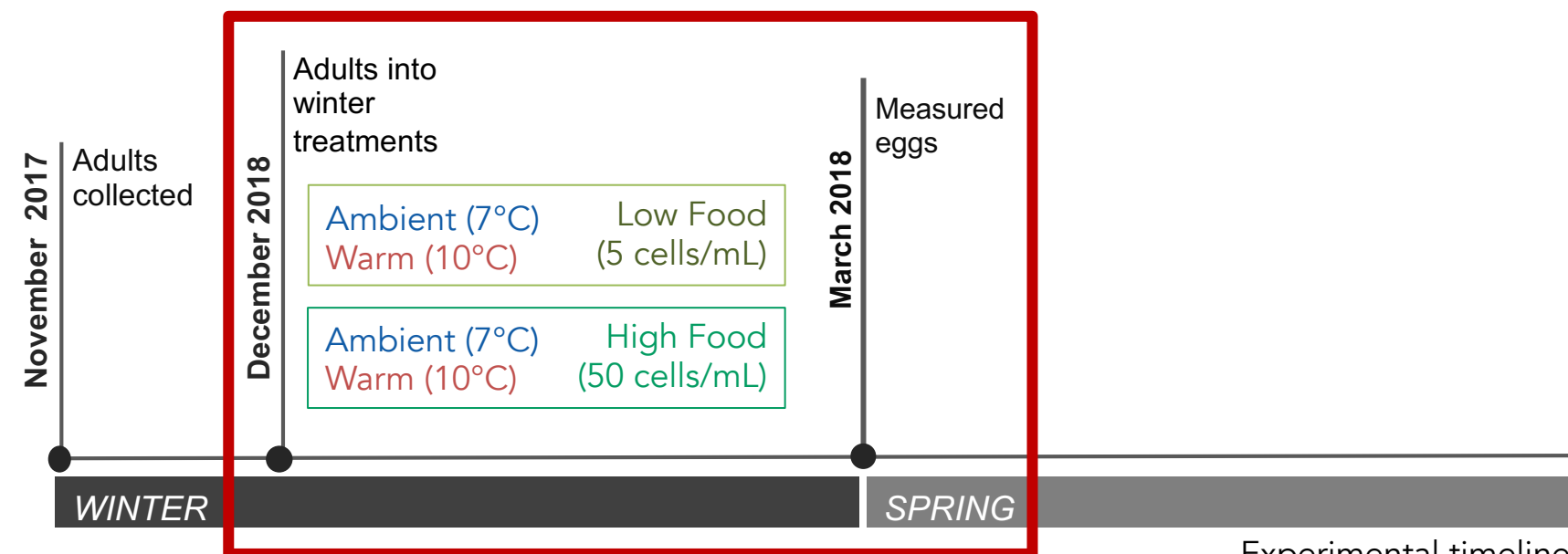
Adult temperature & food treatments for 13 weeks



4 replicates per treatment

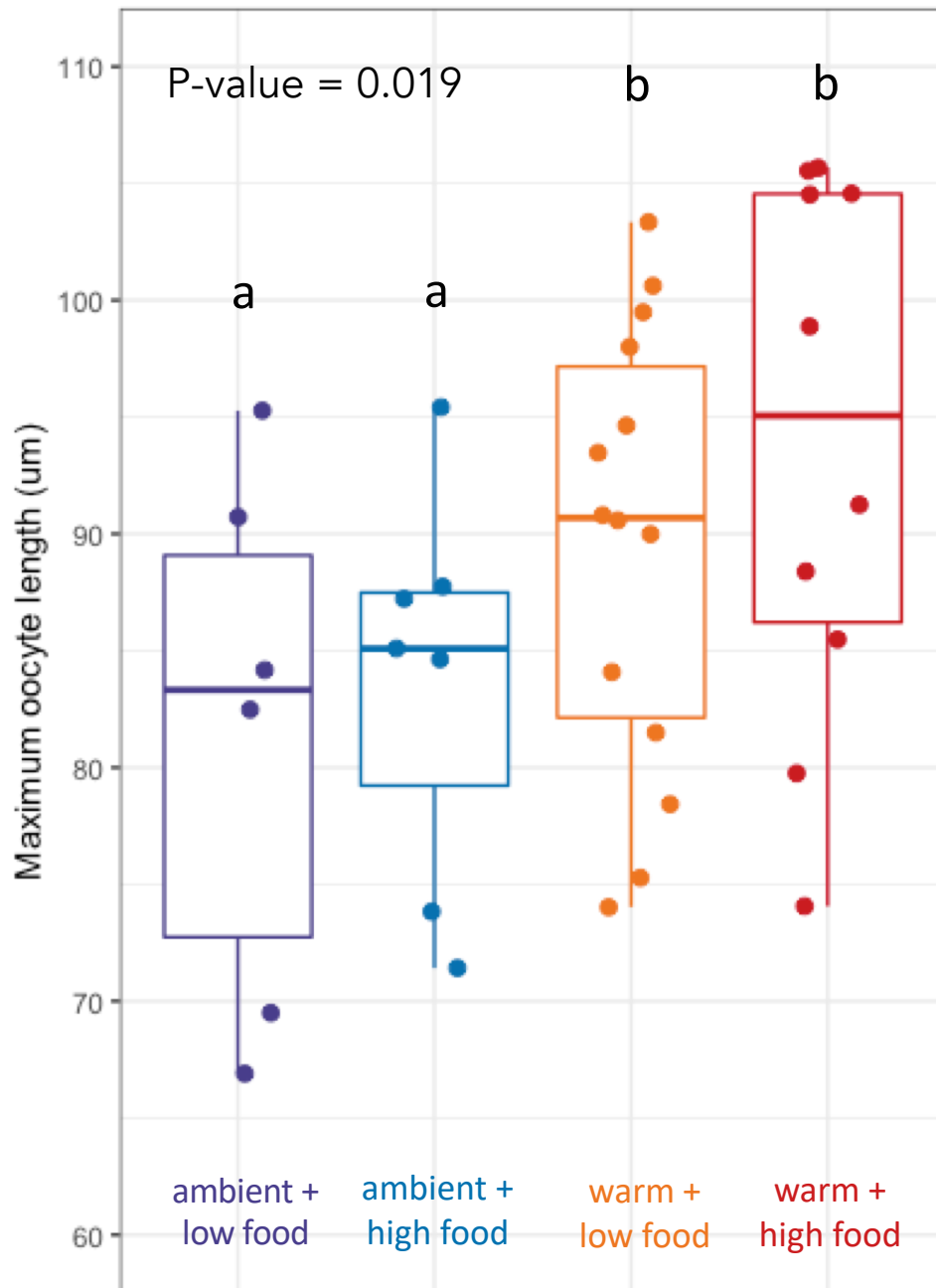


Gonad tissue sampled

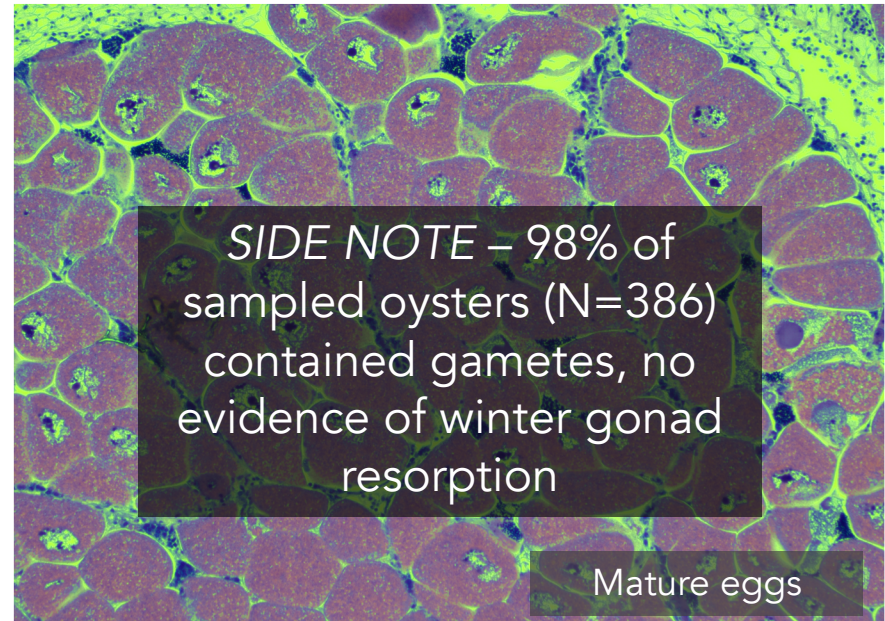


Experimental timeline

Ripe oocyte size

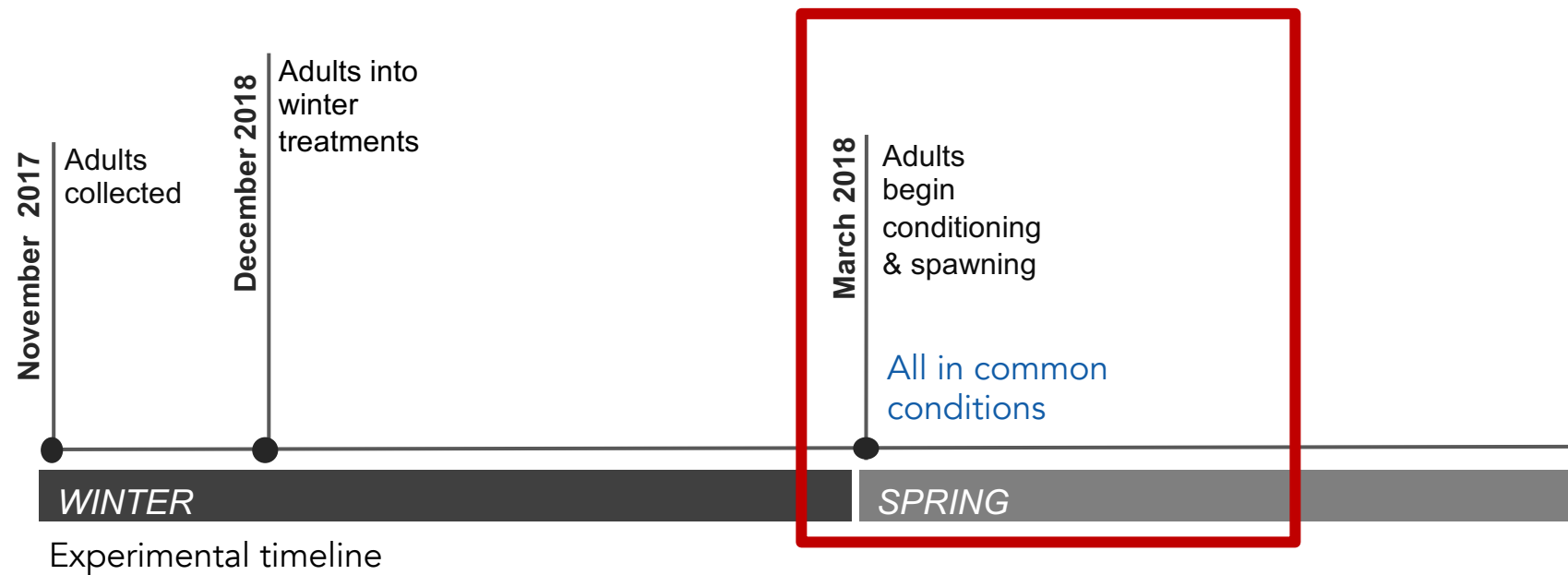
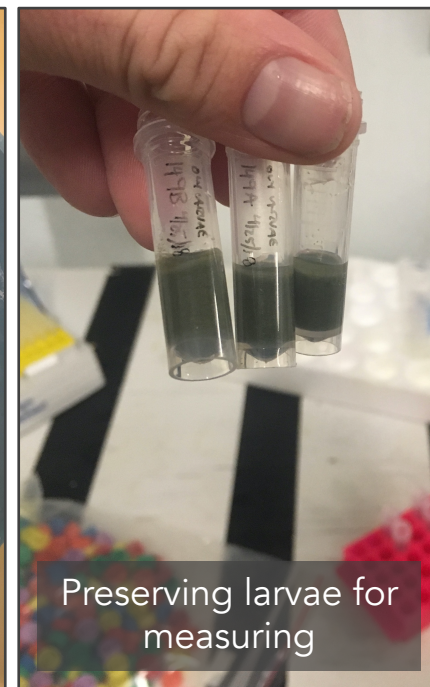


MATURE EGGS WERE LARGER FOLLOWING WINTER WARMING

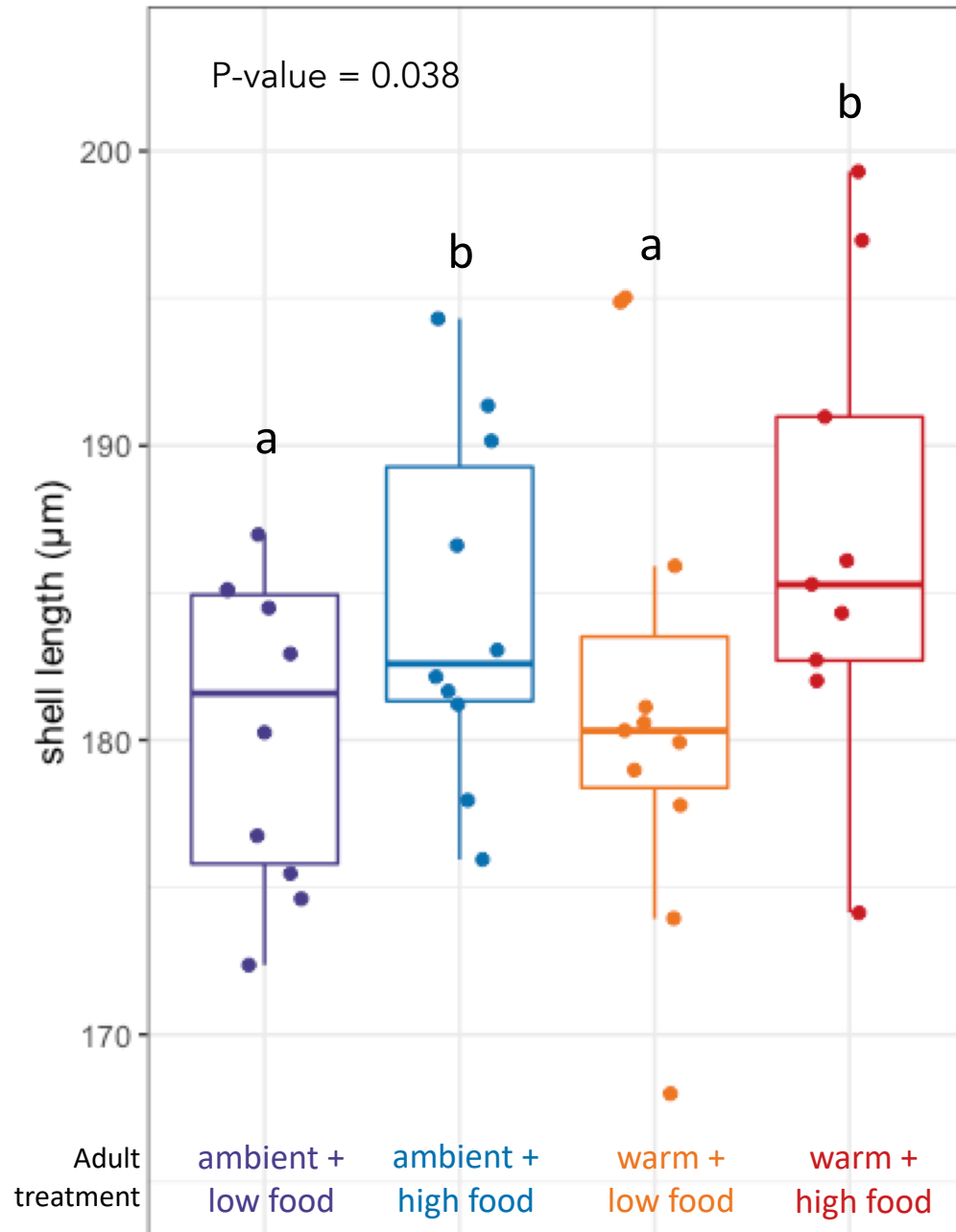


Larger eggs could mean ...

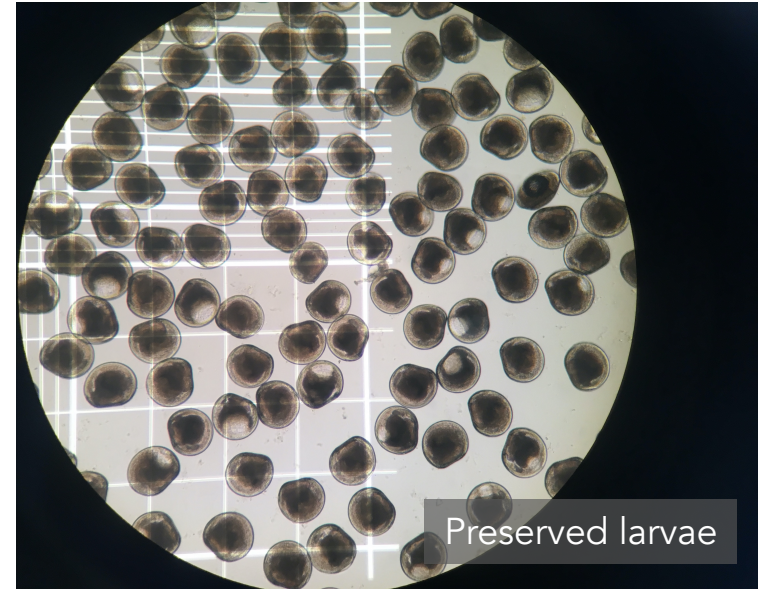
- *Better provisioned eggs because warming triggered or increased yolk deposition?*



Larval shell length by parental treatment



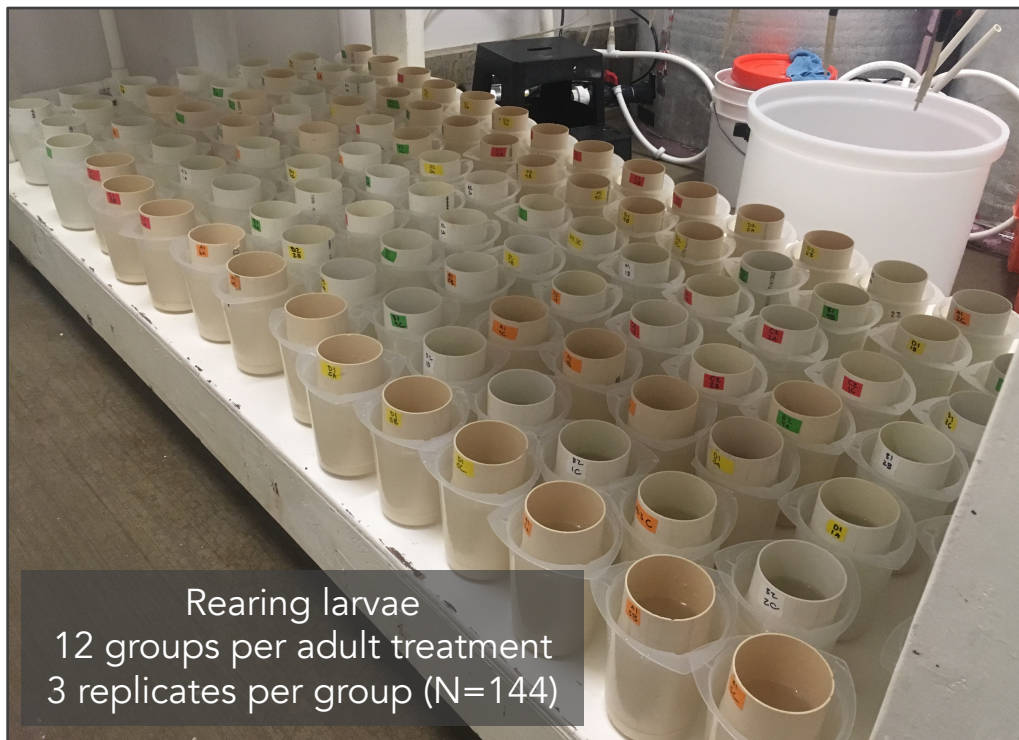
LARVAE WERE LARGER WHEN RELEASED FOLLOWING WINTER HIGH FOOD



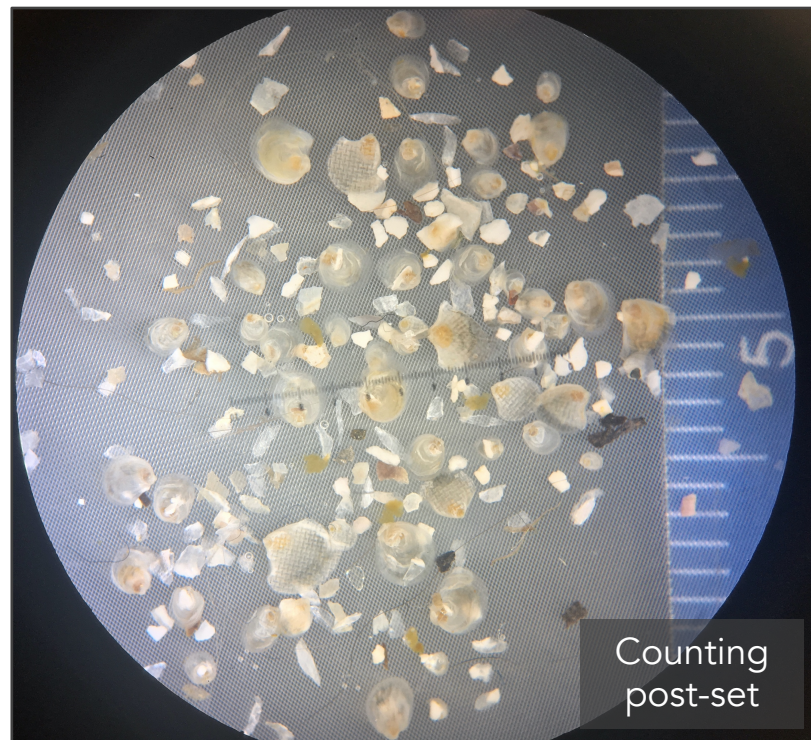
Larger larvae could mean ...

- Size / growth rate unaffected by winter temperature
- Impact of warming on egg size did not persist
- Faster larval growth due to higher quality eggs ?

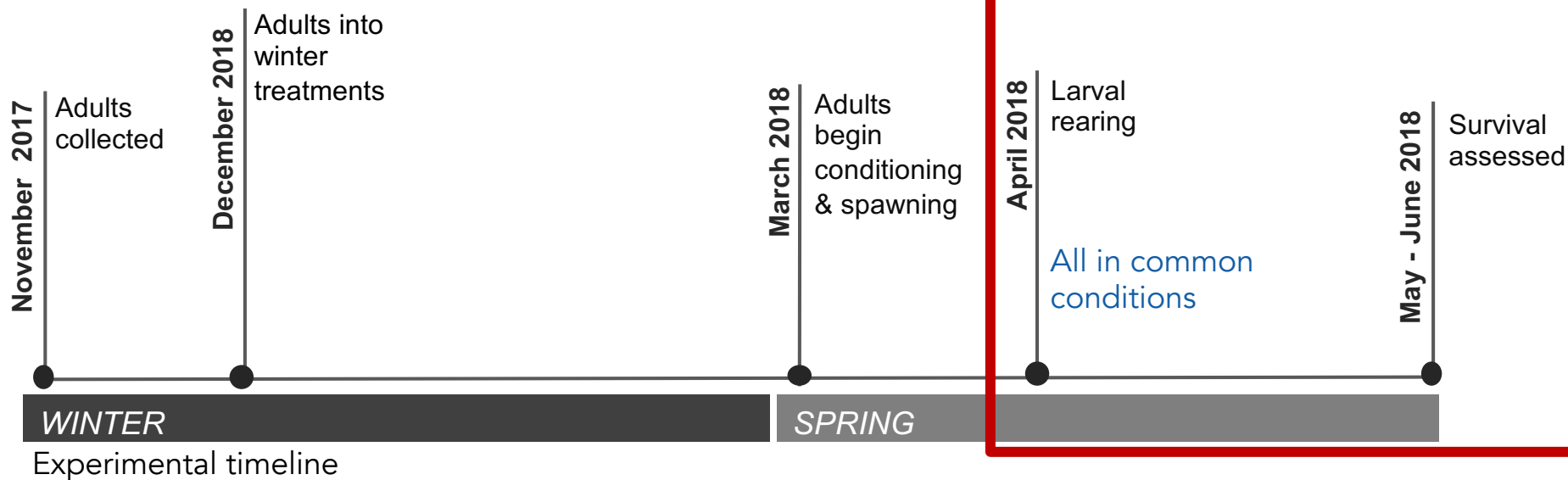
NOTE: At the time of this presentation the dataset and statistical analysis were incomplete, and did not include all larvae collected nor necessary random effect factors. Please do not reference this slide/result, but instead look for the associated paper, currently in development (Spencer, Horkan, Crim & Roberts 2021)



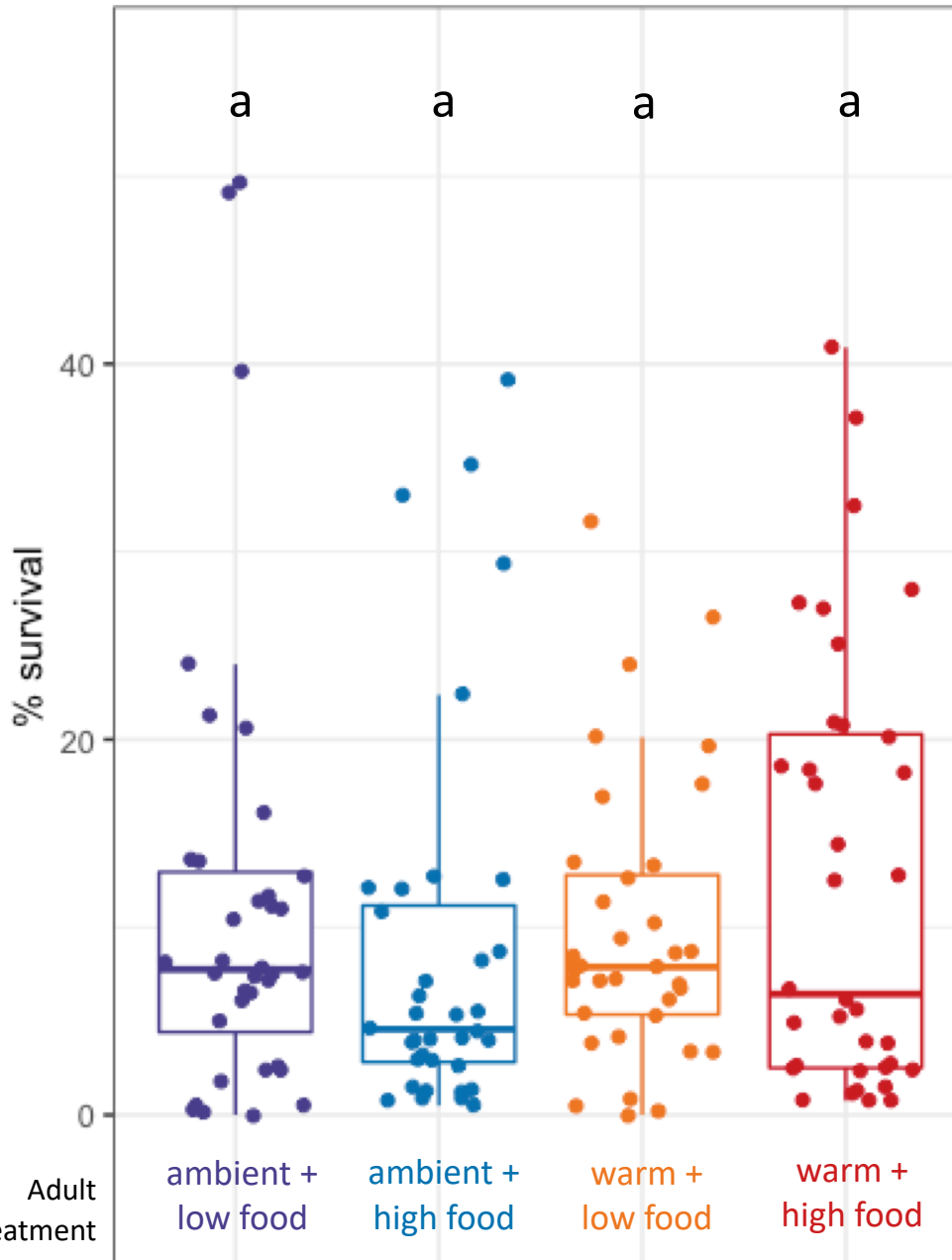
Rearing larvae
12 groups per adult treatment
3 replicates per group (N=144)



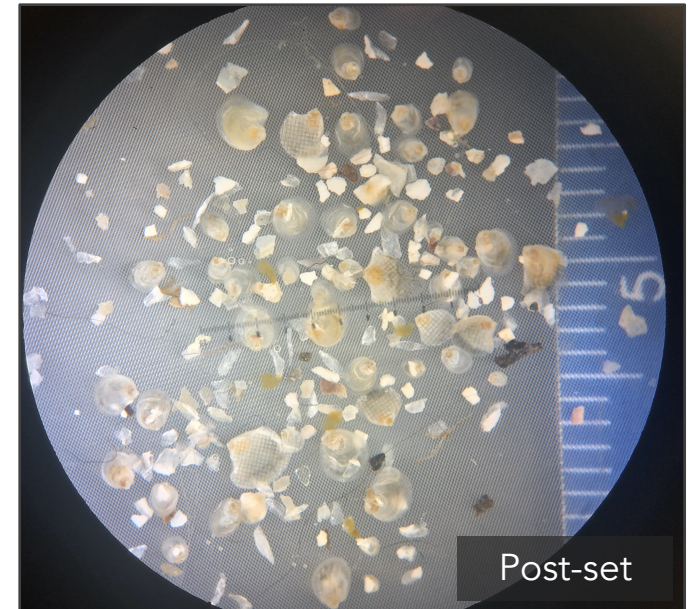
Counting post-set



% survival to post-set
by parental treatment



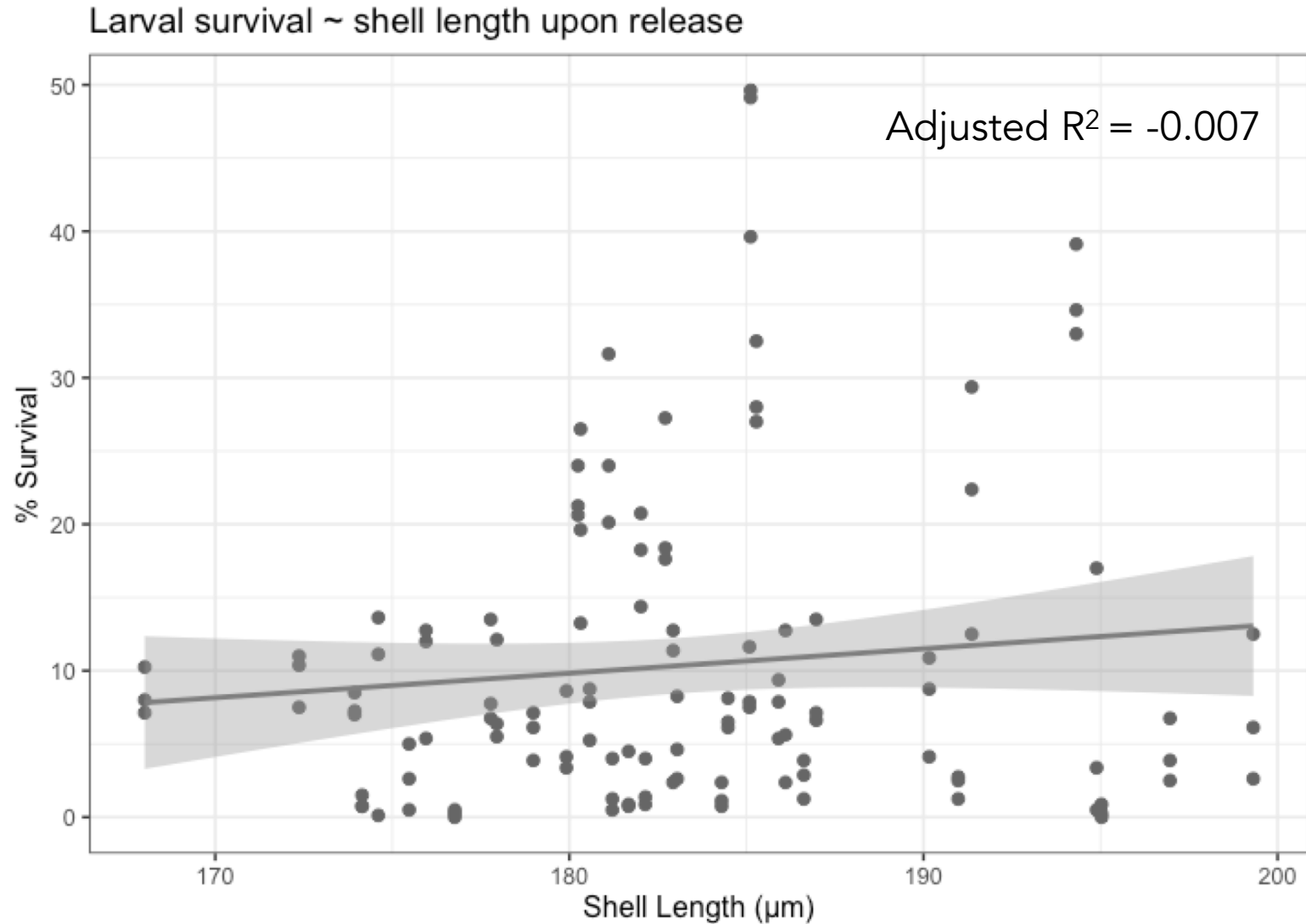
LARVAL SURVIVAL UNAFFECTED BY PARENTAL WINTER TEMPERATURE OR FOOD LEVEL



No effect could mean ...

- *Egg & larvae size upon release does not correlate with survival*
- *Good hatchery conditions masked any effects*

SIDE NOTE – IN HATCHERY, LARVAL SIZE AT RELEASE DID NOT PREDICT SURVIVAL



RESULTS SUMMARY

- Mature eggs were larger following winter warming
- Larval survival unaffected by adult winter conditions, egg size or larval size at release

WHAT COULD THIS MEAN?

- More evidence that *O. lurida* tolerates climate/ocean stressors, could be a future “winner” (Lawlor & Arellano 2020; Waldbusser et al. 2016; Spencer et al. 2020)
 - Good sign for restoration activities, hatchery production
- Hatchery managers needn’t worry about broodstock holding temp & food levels during winter – could reduce costs!
- In the wild, larger oocytes could mean ...
 - Improved oocyte provisioning – more endogenous energy, higher recruitment

THANK YOU

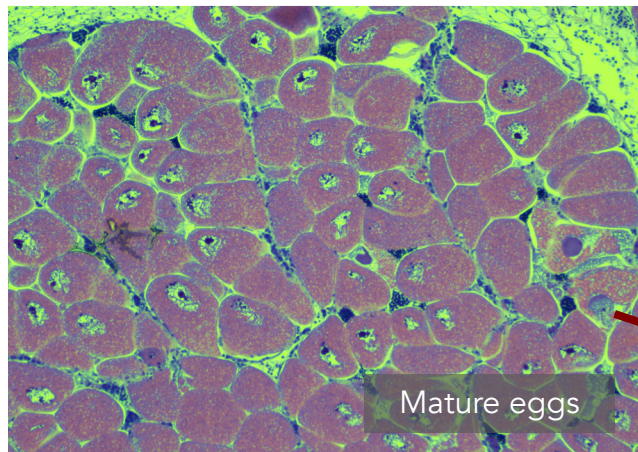
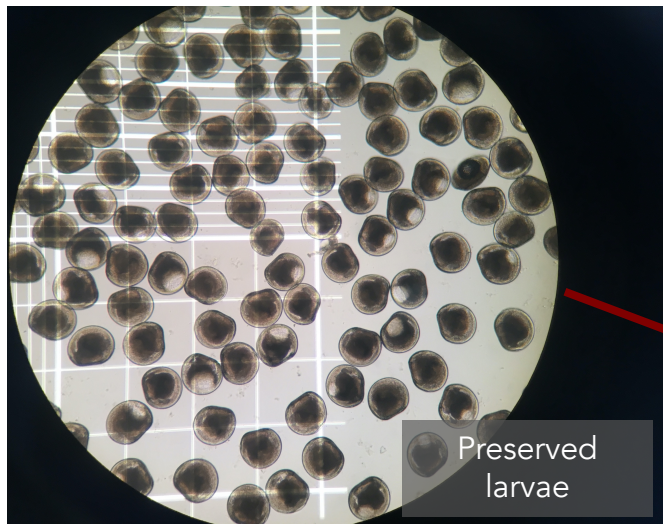
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Hire me when I graduate in March 2021!

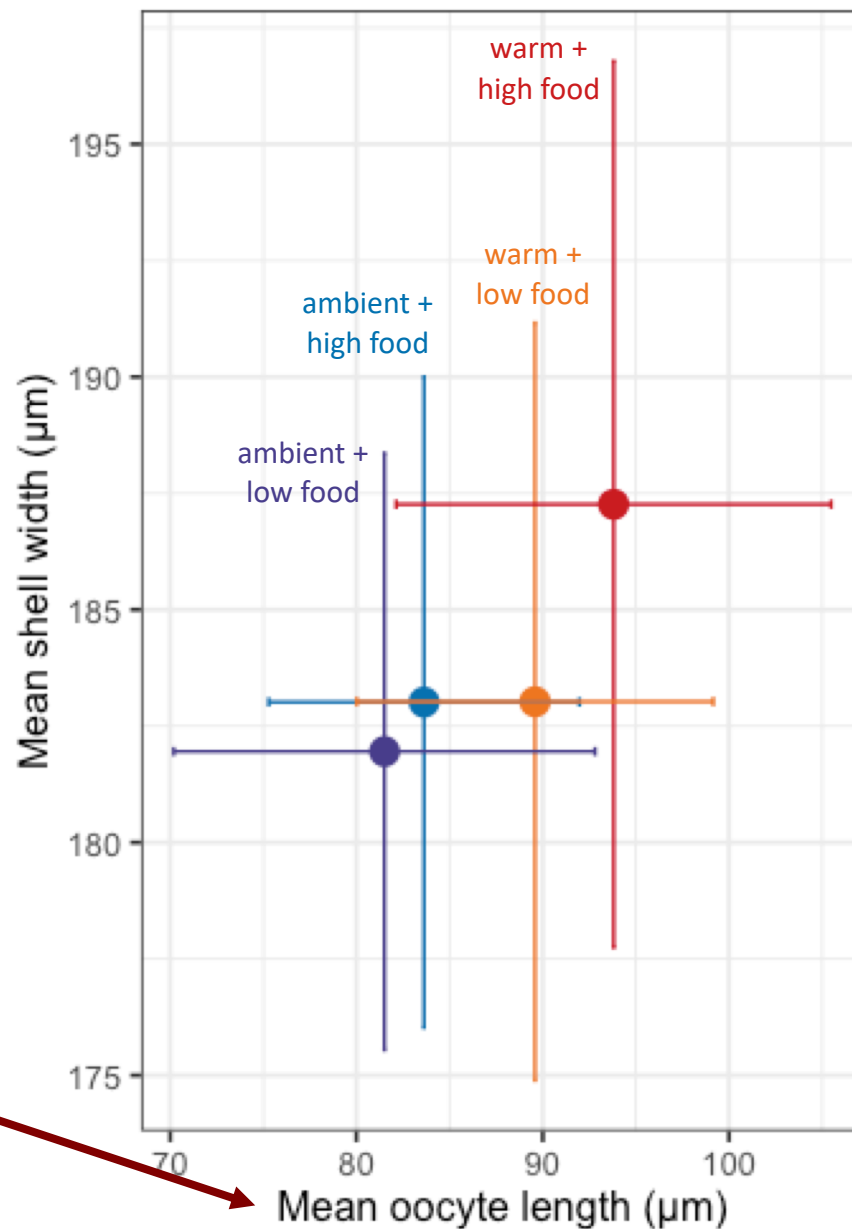


EXTRA SLIDES

+ RELATIONSHIP BETWEEN EGG SIZE & LARVAL SIZE

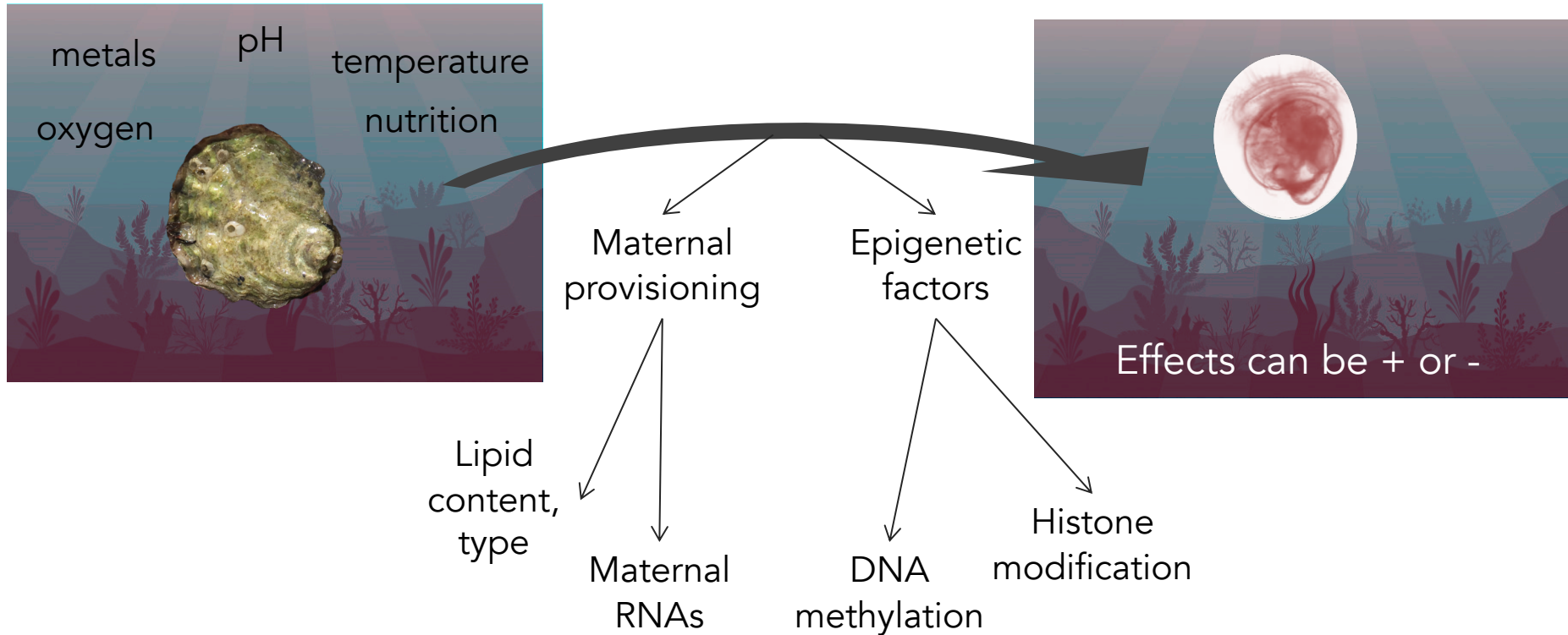


Mean larval size ~ Mean egg size



CARRYOVER EFFECTS

Signals of adults' environmental conditions can be detected in offspring



CARRYOVER EFFECTS OF WINTER WARMING?