STEVEN B ROBERTS

MACKENZIE GAVERY

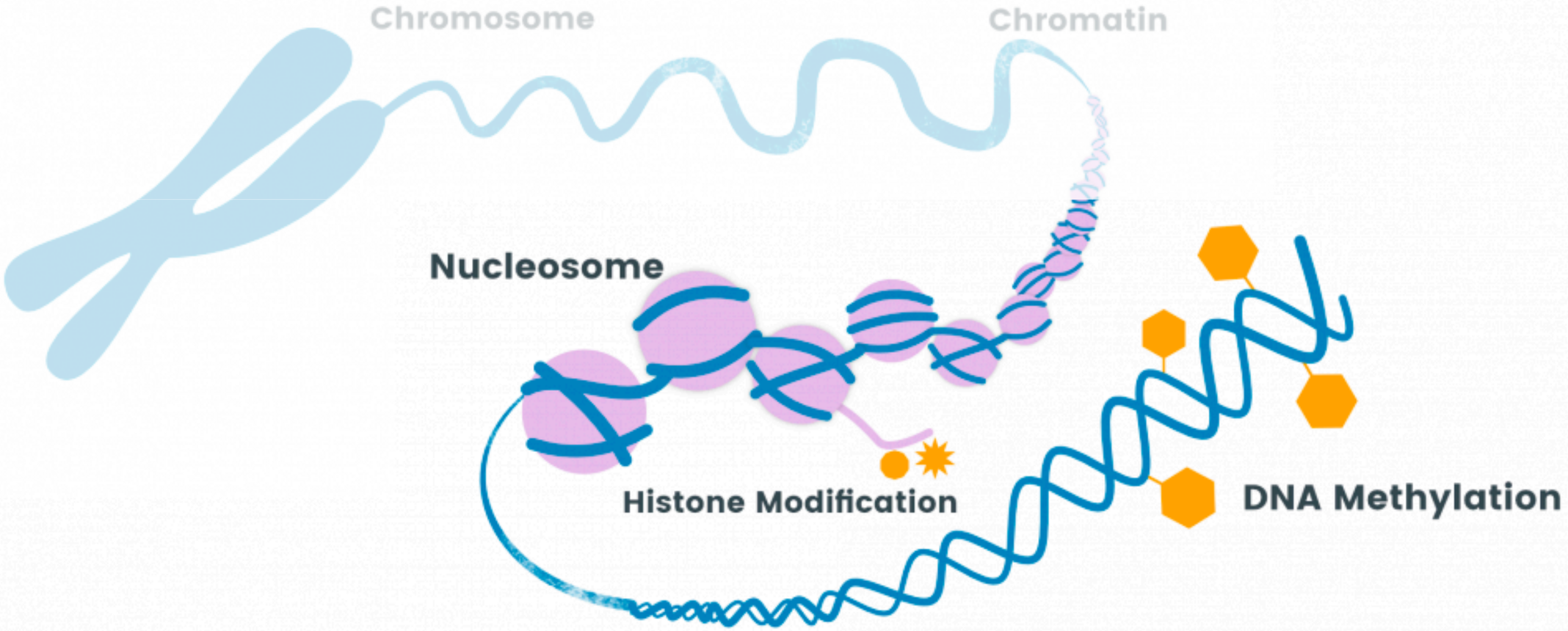
UNIVERSITY OF WASHINGTON

HOLLIE PUTNAM

UNIVERSITY OF RHODE ISLAND

# EPIGENETIC VARIATION IN SHELLFISH AND IMPLICATIONS FOR AQUACULTURE

# ALTERS THE PHENOTYPE (WITHOUT CHANGING DNA CODE); HERITABLE



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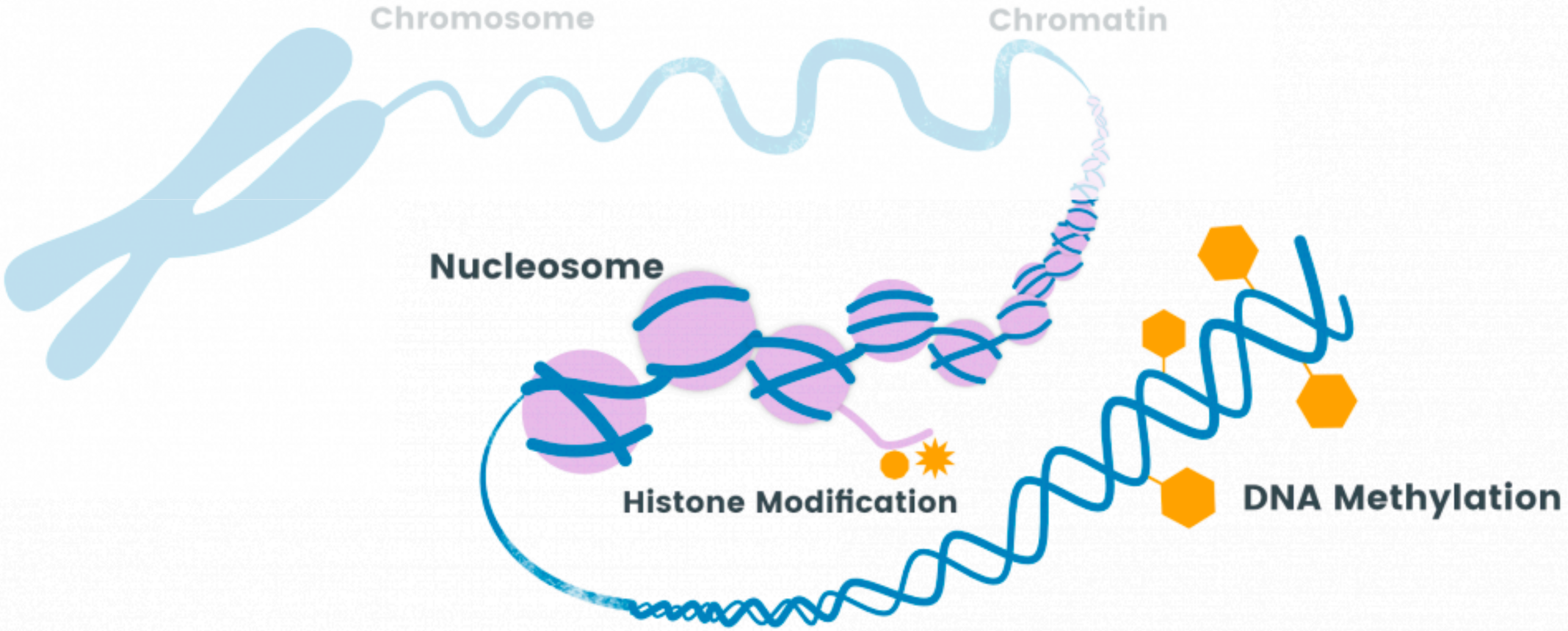


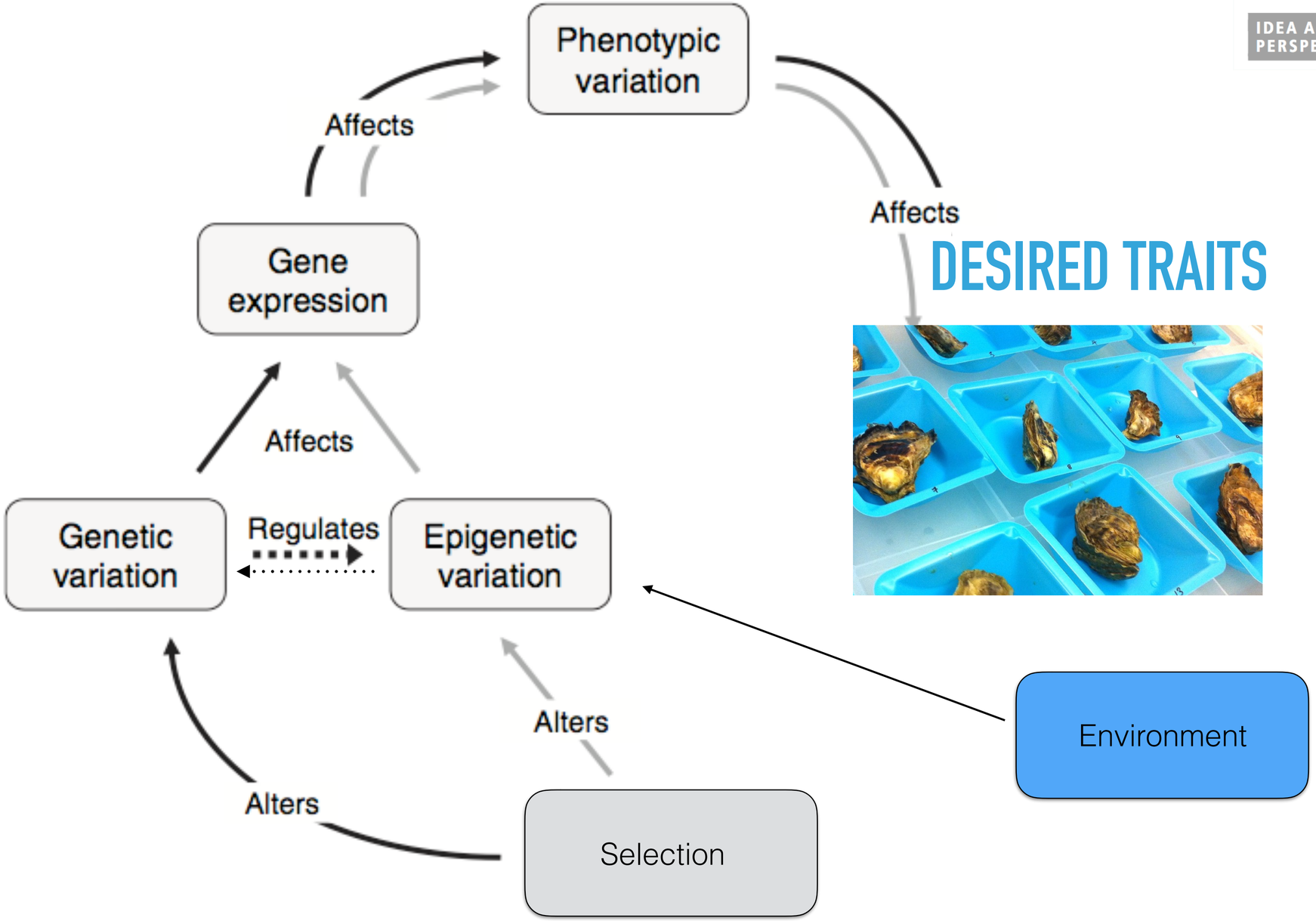

CAN BE INDUCED WITH ENVIRONMENTAL MANIPULATION

# ECOLOGICAL EPIGENETICS

*Ecology Letters*, (2008) **11**: 106–115 doi: 10.1111/j.1461-0248.2007.01130.x

IDEA AND PERSPECTIVE

Epigenetics for ecologists

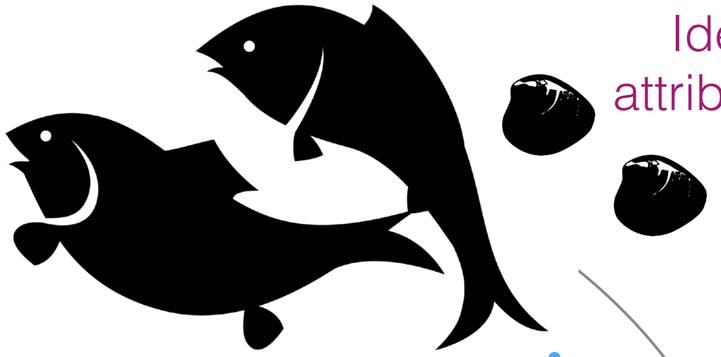



DESIRED TRAITS



**Epigenetic Selection**

Identifying individuals by attributing trait to epigenotype



Adults

Influencing adult phenotype by altering early life environment

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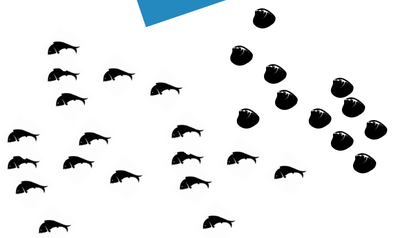


Larvae

**Environmental Manipulation**

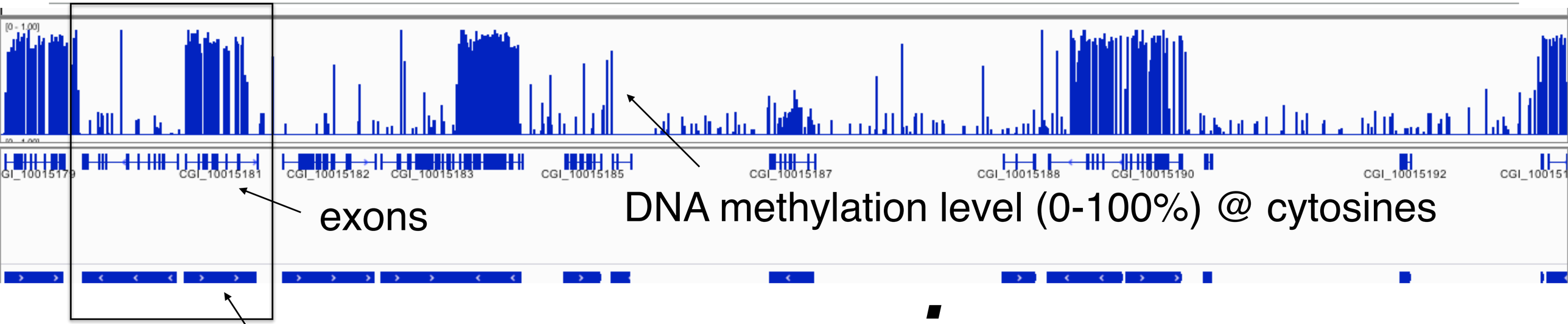
PEER-REVIEWED Aquatic Biology section ›

Epigenetic considerations in aquaculture

Literature review | Aquaculture, Fisheries and Fish Science | Molecular Biology

Mackenzie R. Gavery, Steven B. Roberts

# METHYLATION LANDSCAPE IN SHELLFISH




*mosaic*

associated with gene bodies

**Why are only a subset of genes methylated?**

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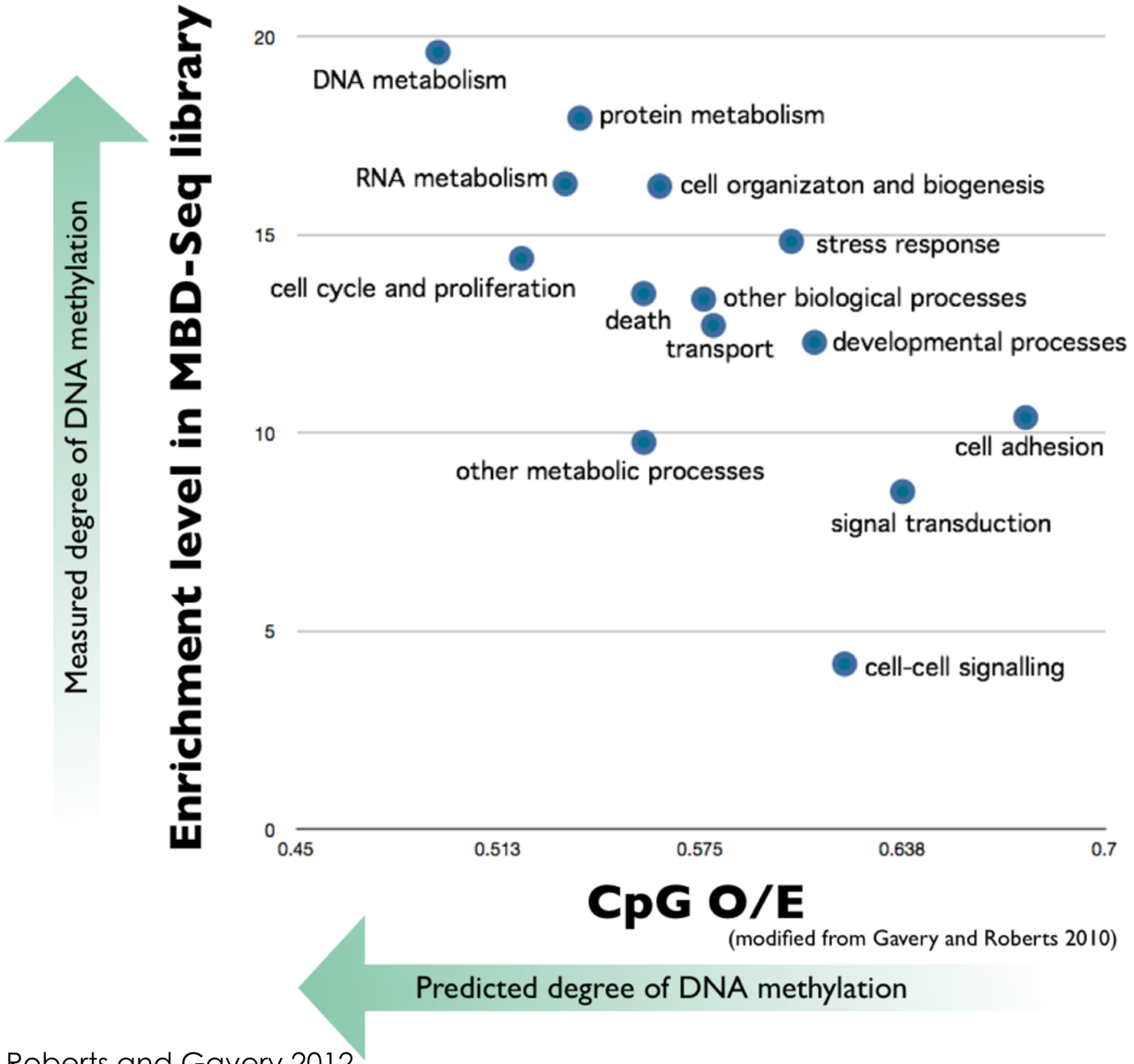


Roberts and Gavery 2012

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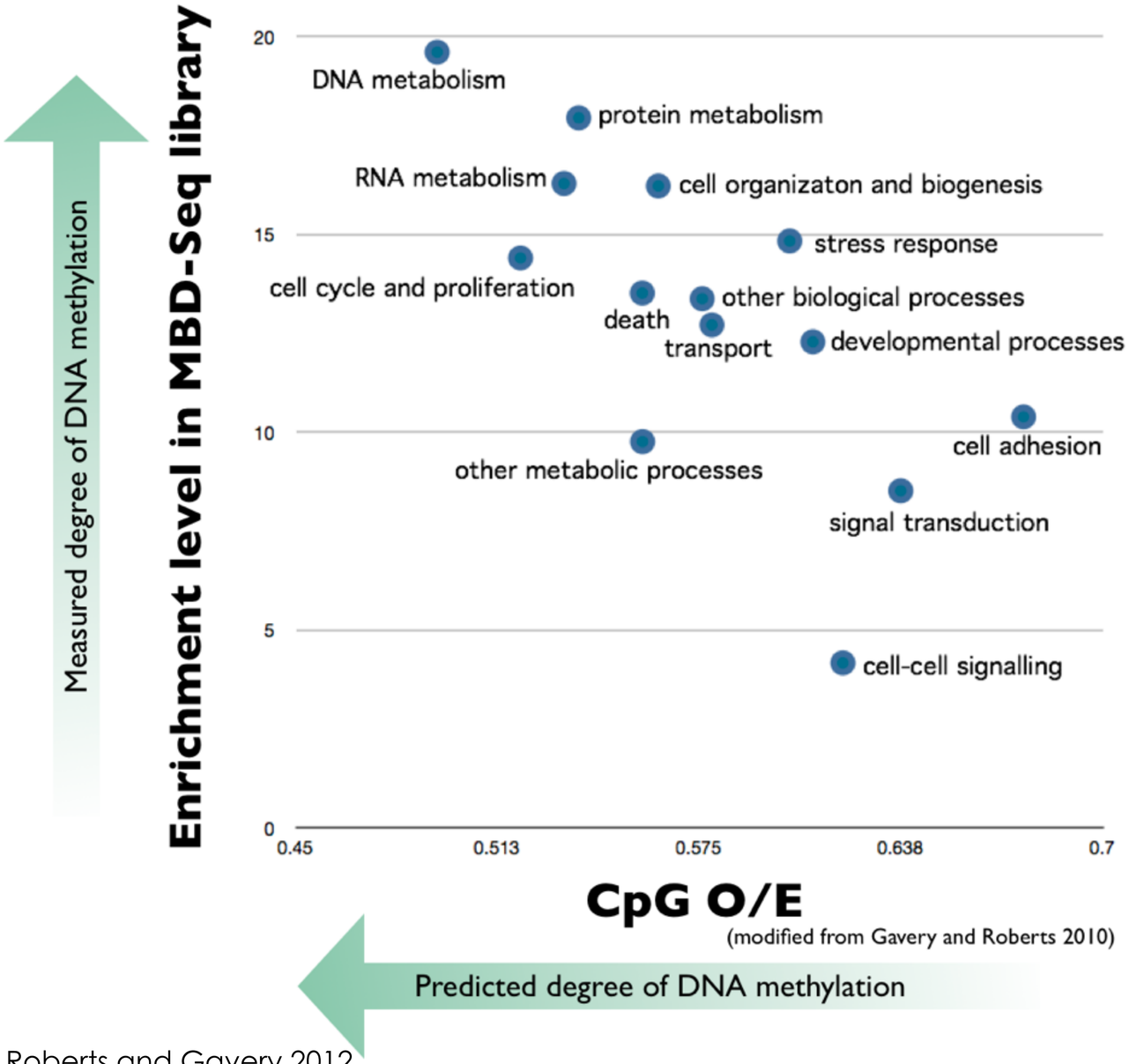
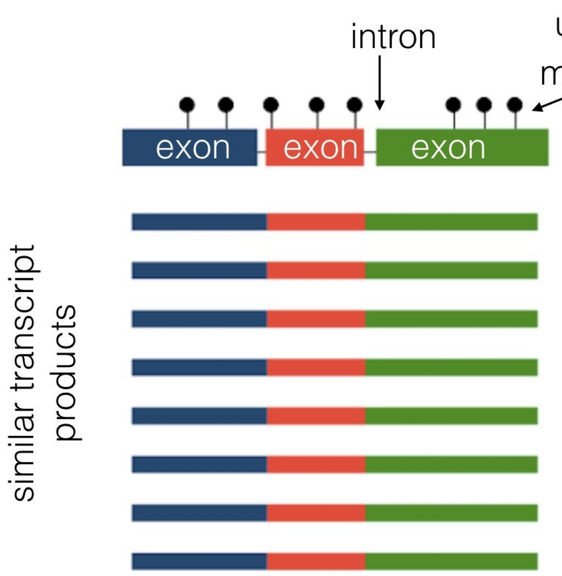
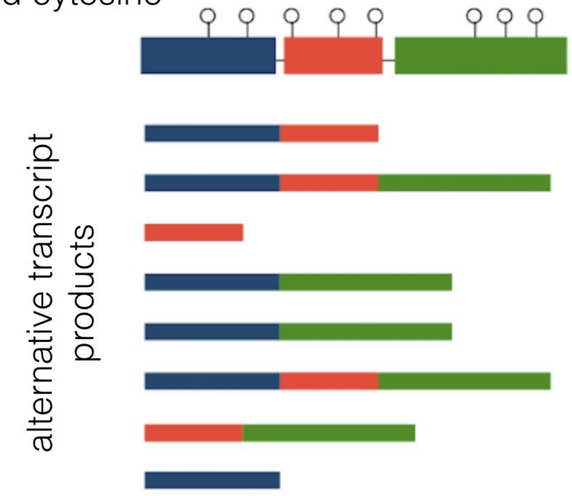



housekeeping




response to change

Roberts and Gavery 2012

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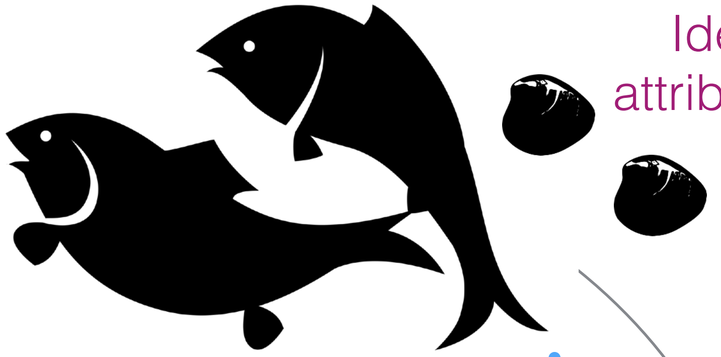
Identifying individuals by attributing trait to epigenotype



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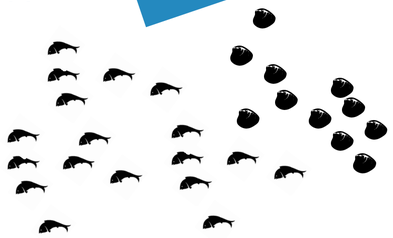

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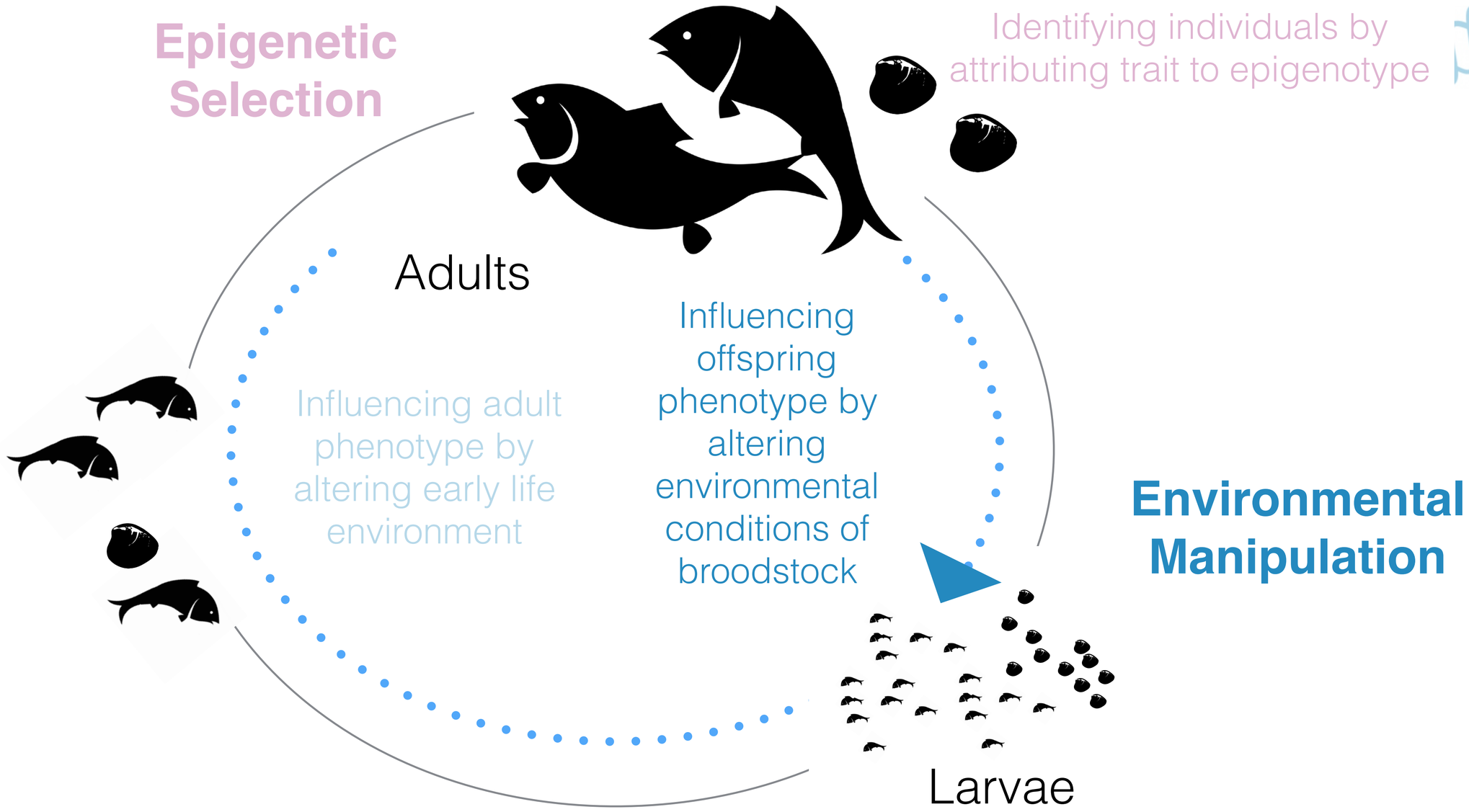
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Larvae

# EFFECTS OF TEMPERATURE AND OA IN OLYMPIA OYSTER POPULATIONS

- Broodstock were held at ambient pCO2 (841 µatm) or high pCO2 (3045 µatm) for 52 days, during the Winter.
- **Juveniles of parents exposed to elevated $pCO_2$ had higher survival rates in the natural environment**

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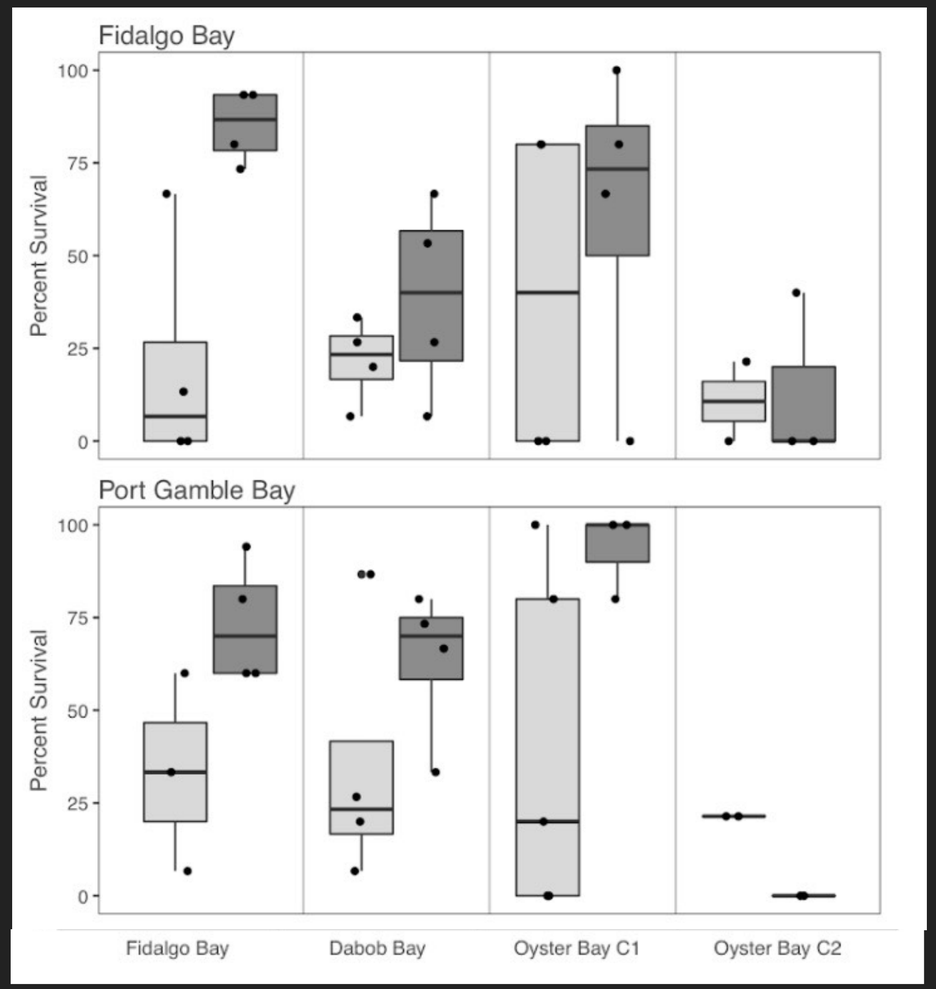


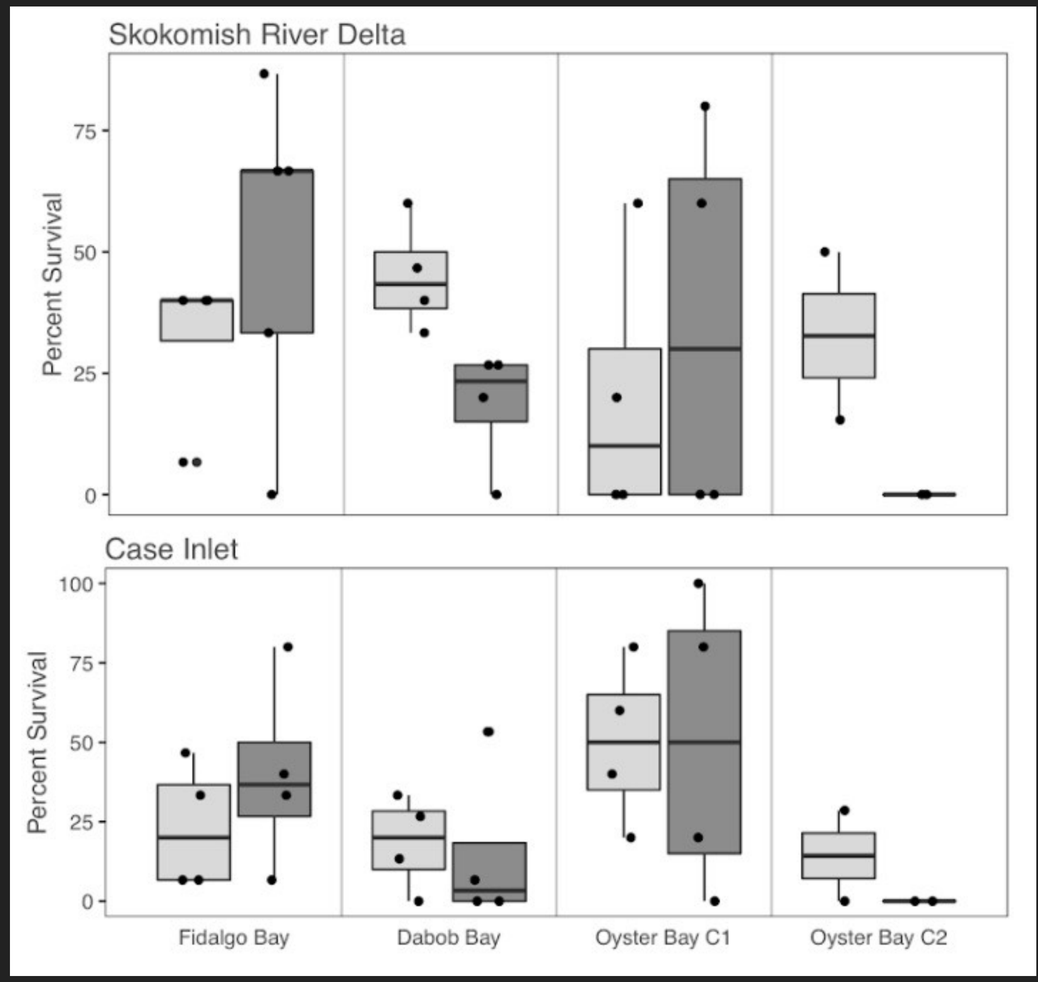

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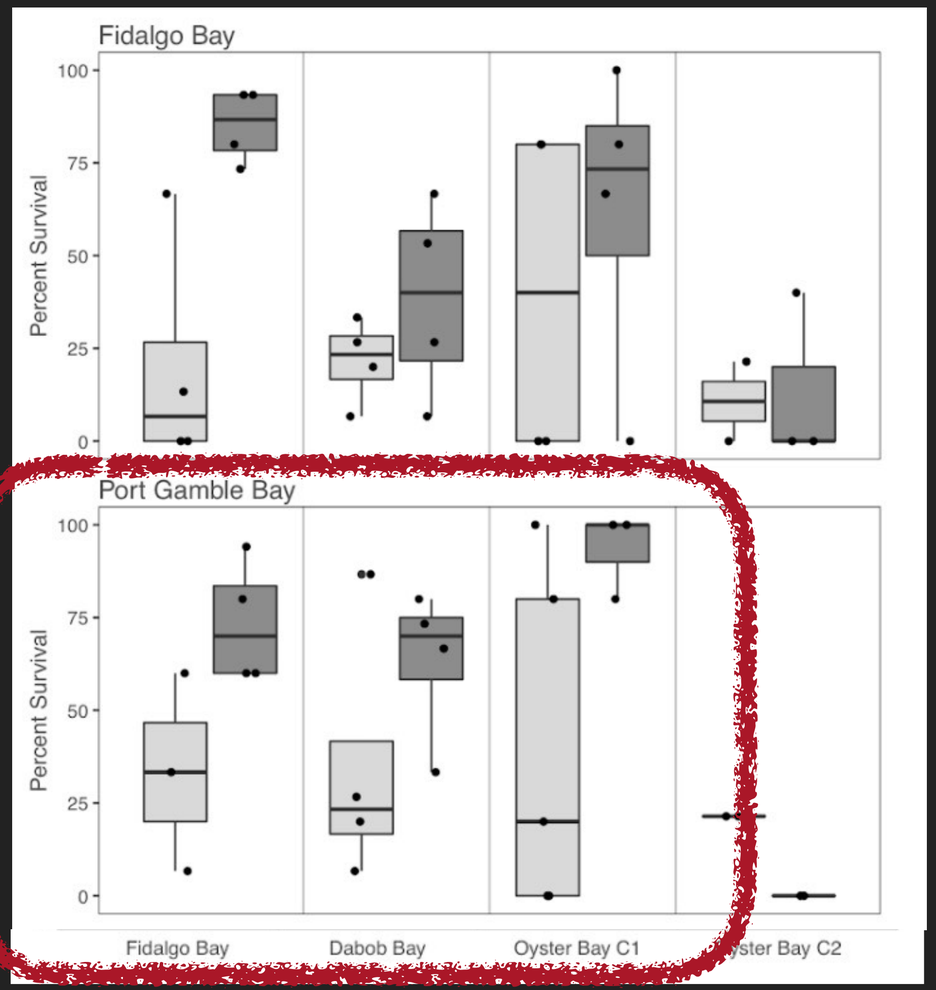


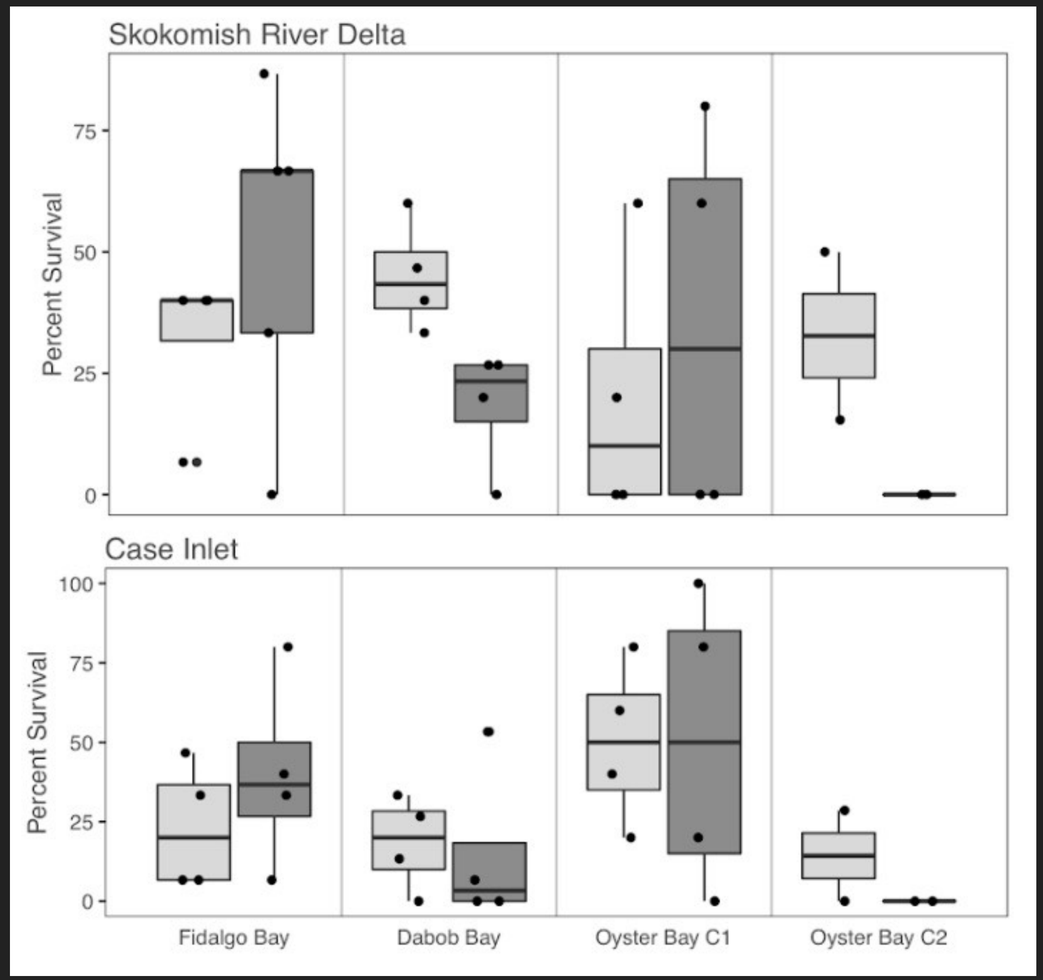

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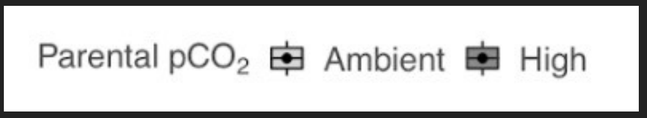


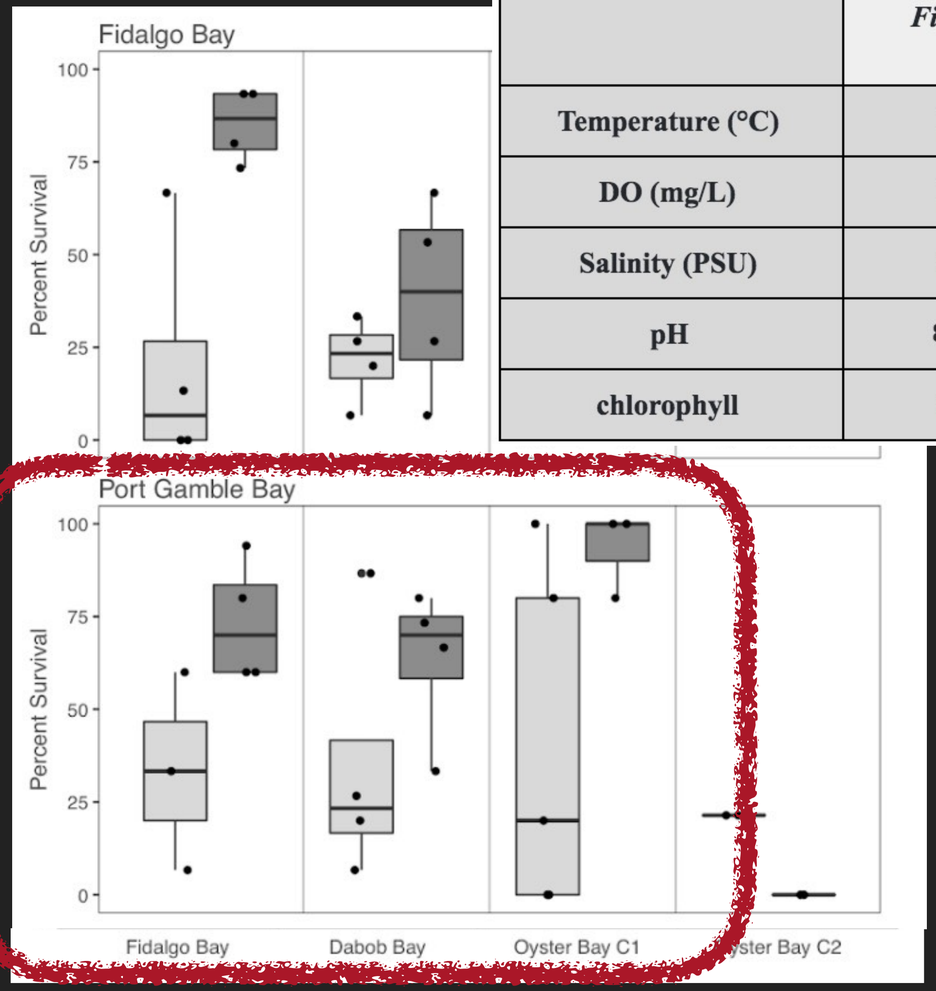


| | *Fidalgo Bay* | *Port Gamble Bay* | *Skokomish River Delta* | *Case Inlet* |
|---|---|---|---|---|
| **Temperature (°C)** | **15.4±1.5** | **15.0±1.0** | **16.2±2.7** | **16.8±1.7** |
| **DO (mg/L)** | **10.6±2.4** | **10.5±1.9** | **10.2±3.9** | **11.2±2.8** |
| **Salinity (PSU)** | **28.5±3.9** | **31.9±2.0** | **29.6±1.3** | **24.6±1.7** |
| **pH** | **8.07±0.15** | **7.86±0.17** | **8.01±0.20** | **8.01.±0.16** |
| **chlorophyll** | **227±409** | **225±145** | **572±1536** | **331±613** |

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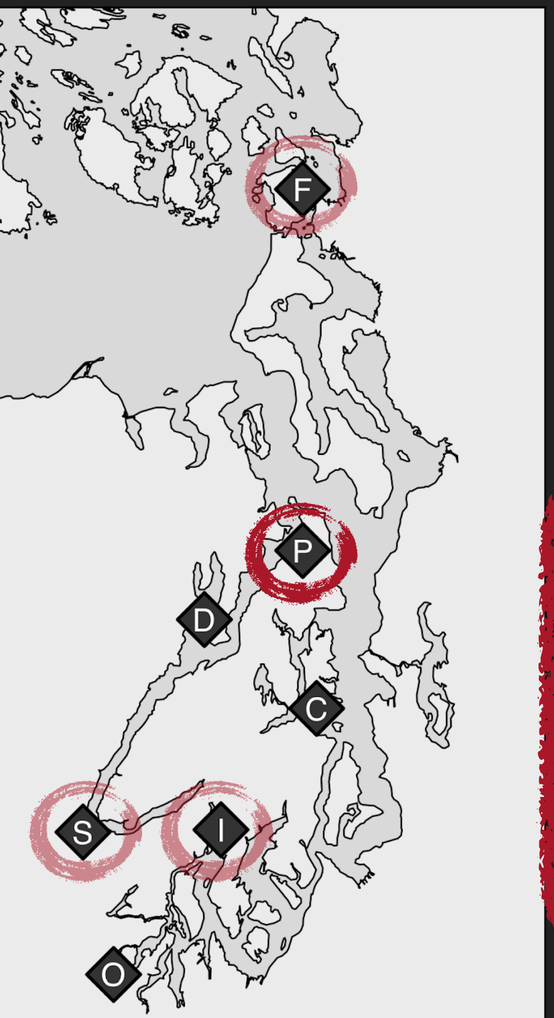
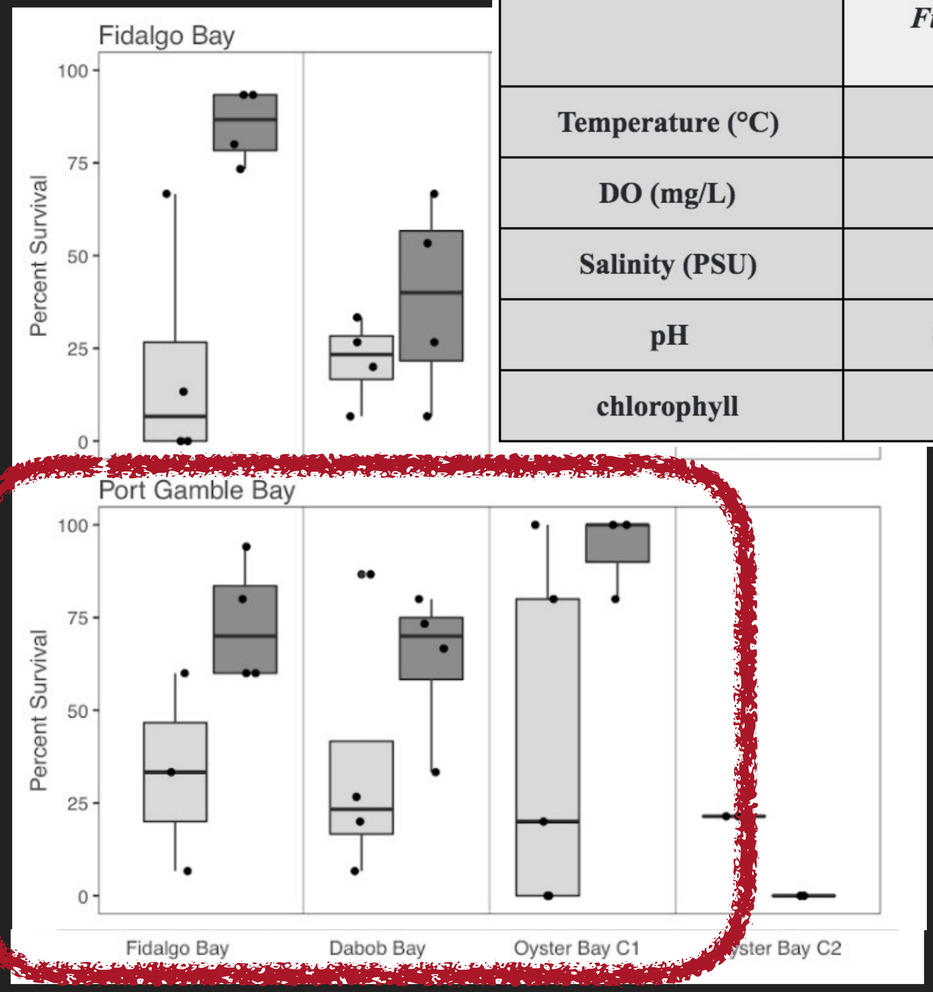
Parental $pCO_2$ Ambient High

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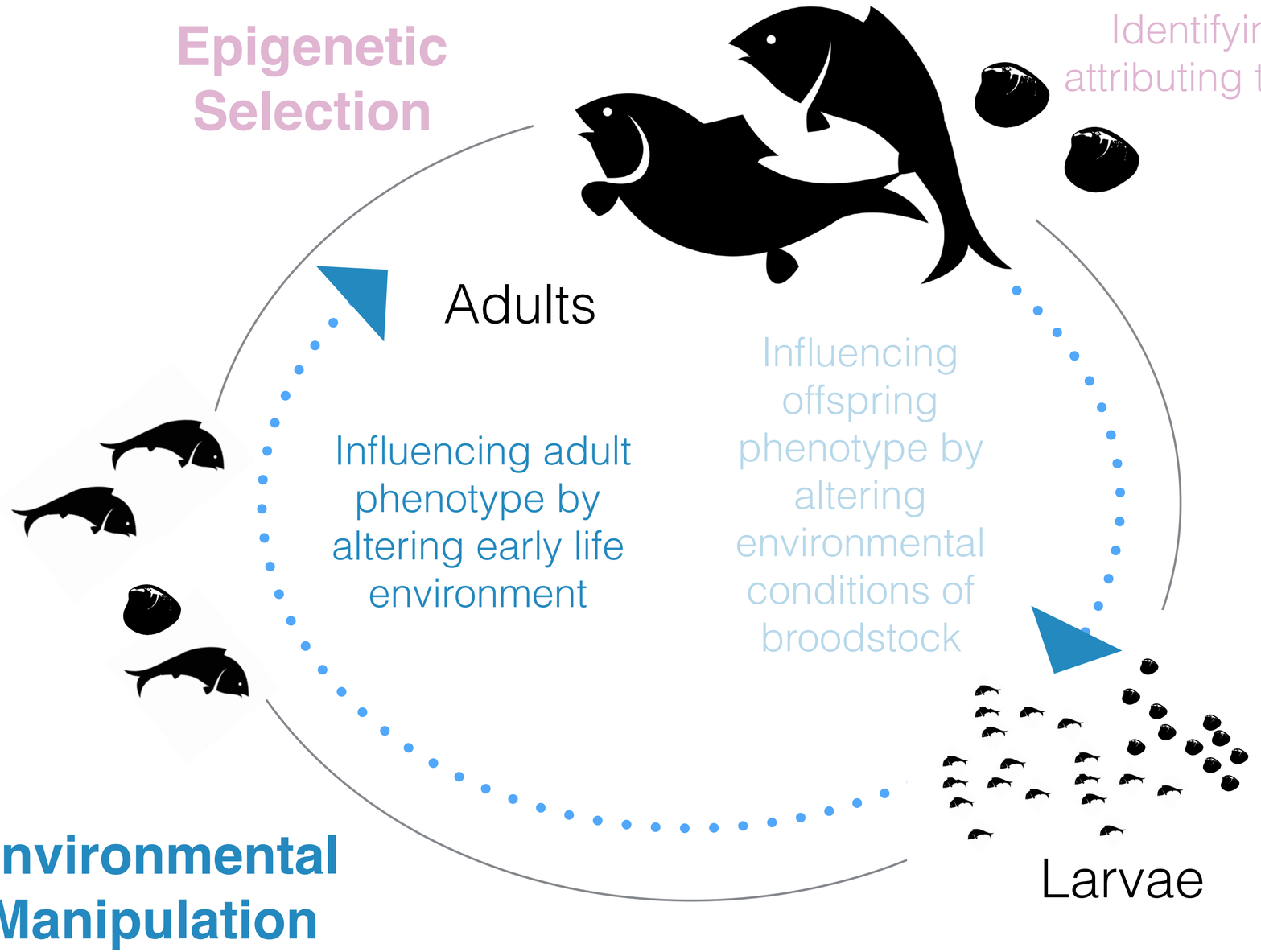
- ENVIRONMENTAL MEMORY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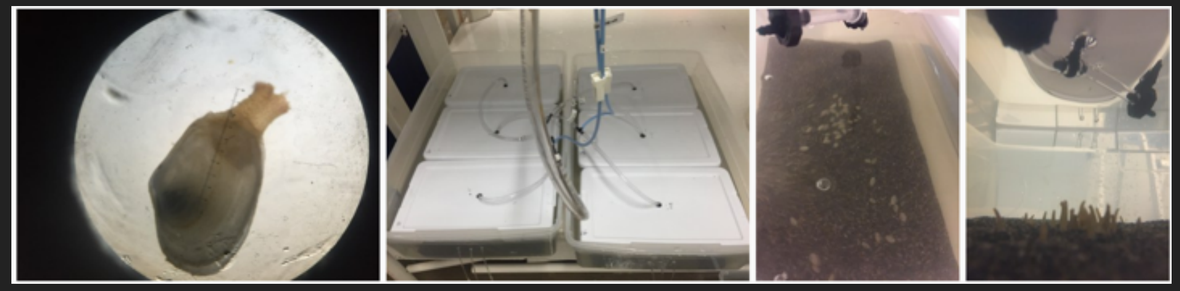
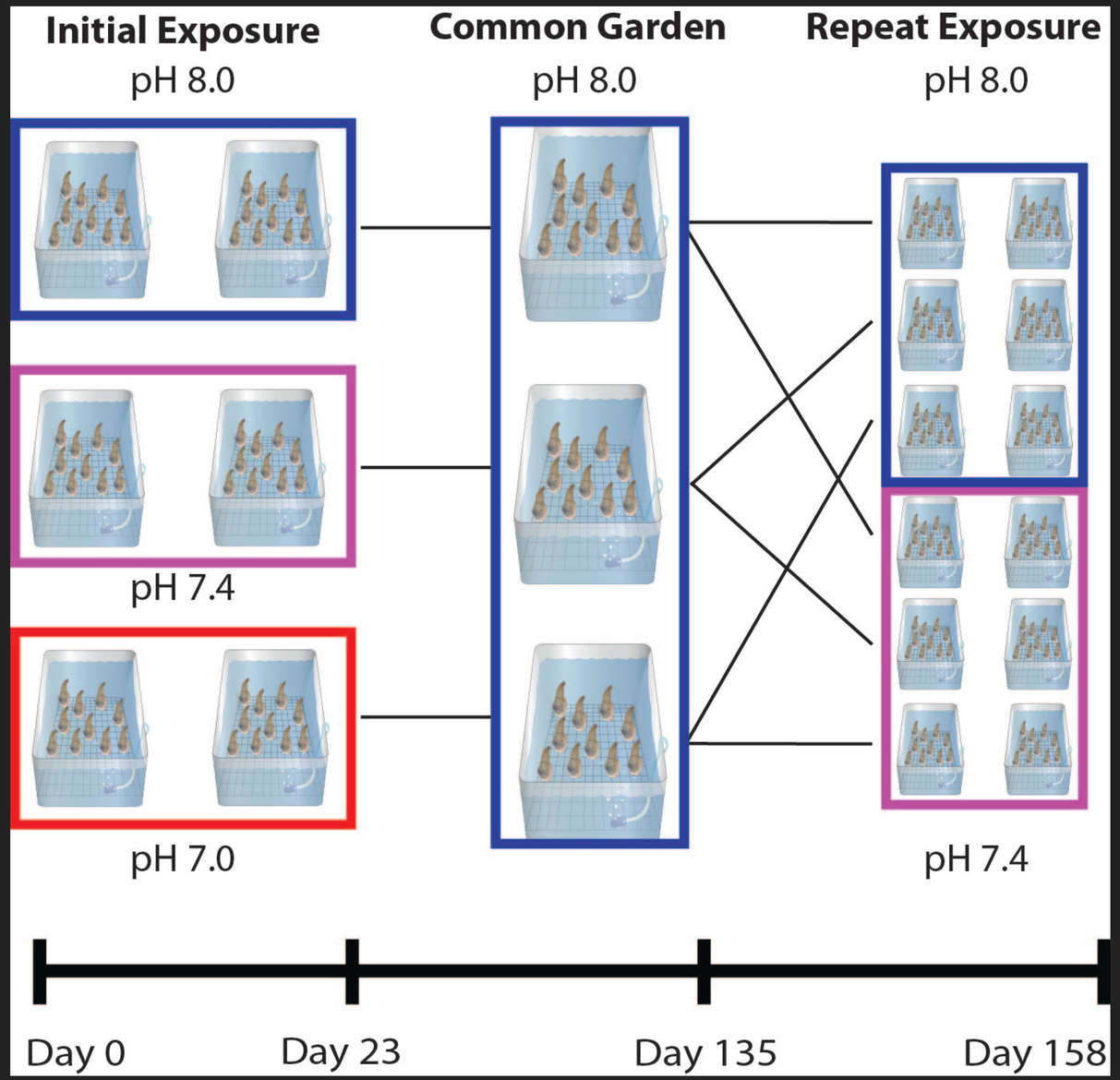


- Does conditioning to low pH confer tolerance within a generation?



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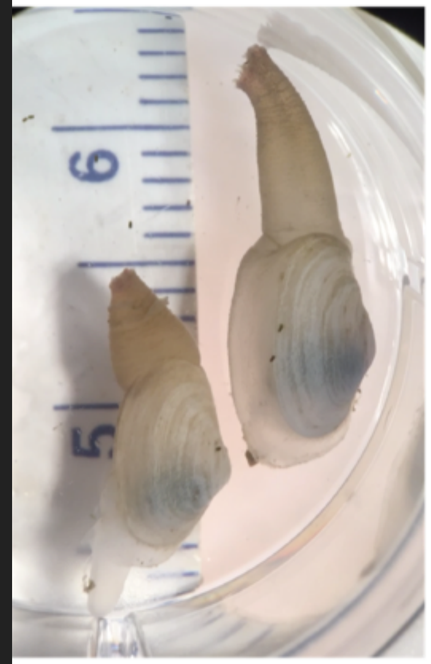

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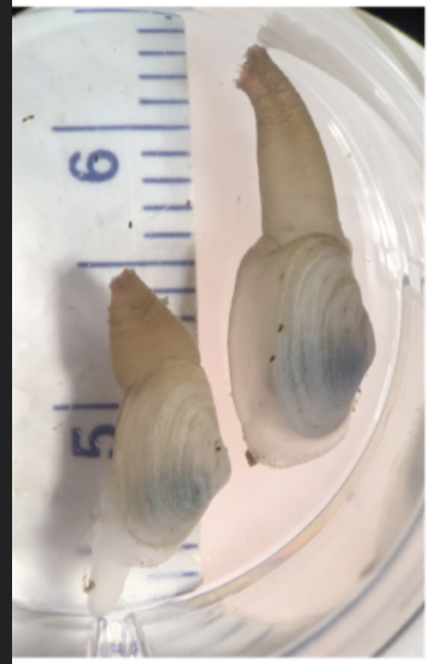

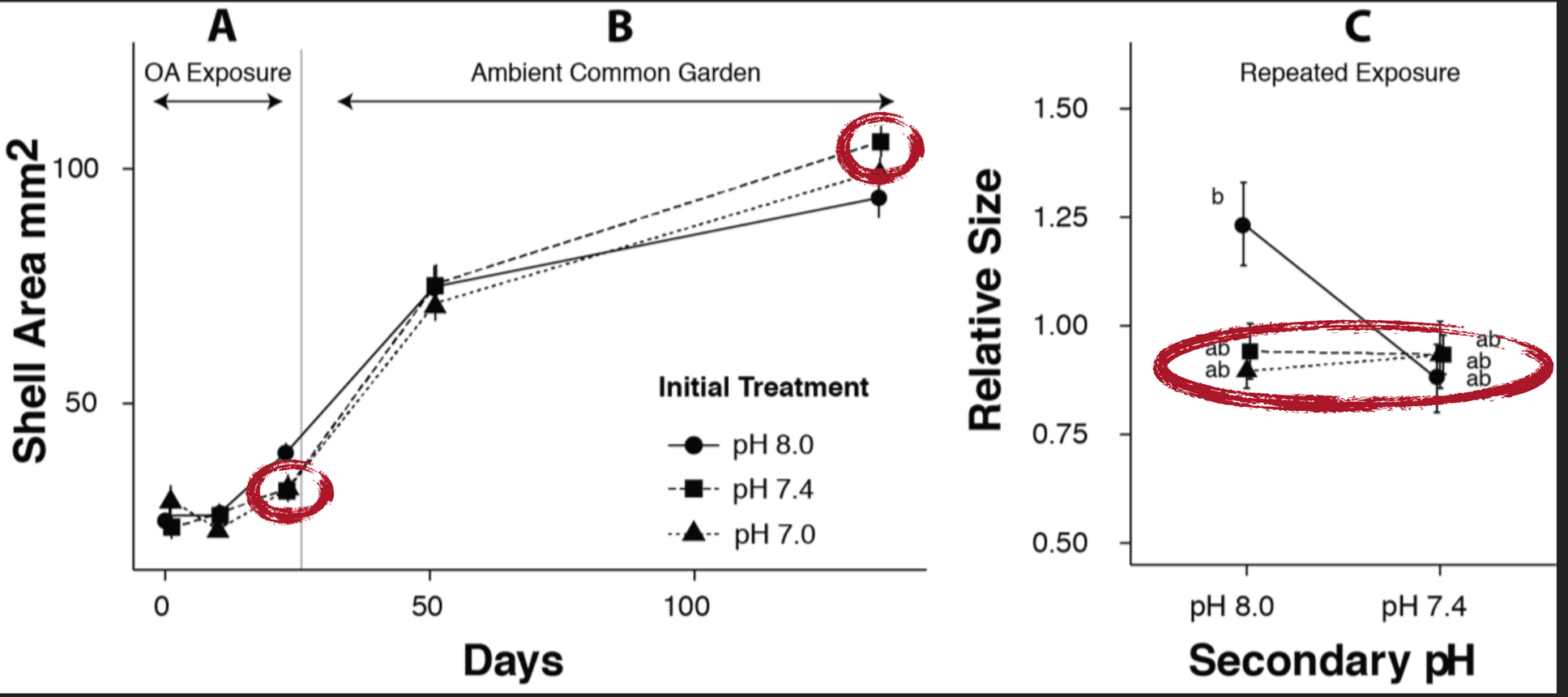

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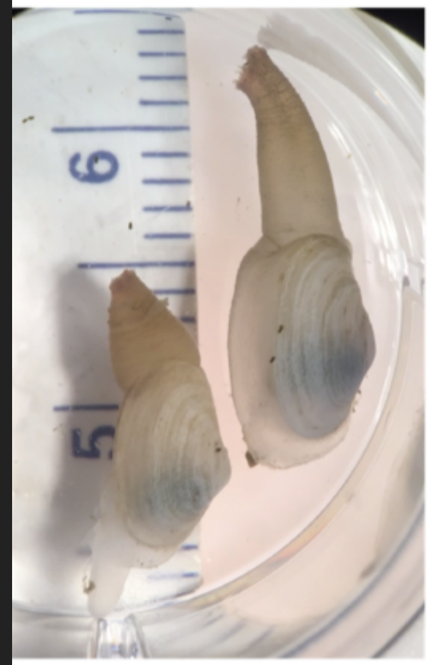
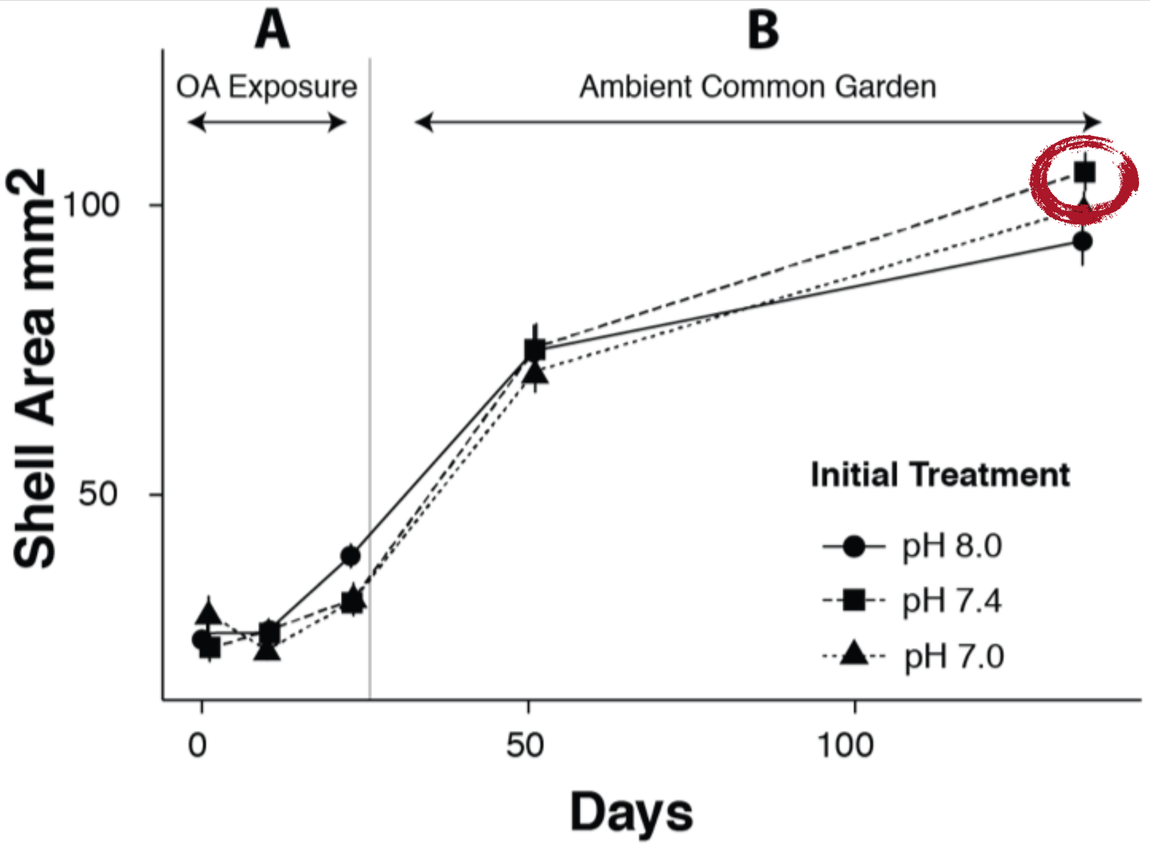
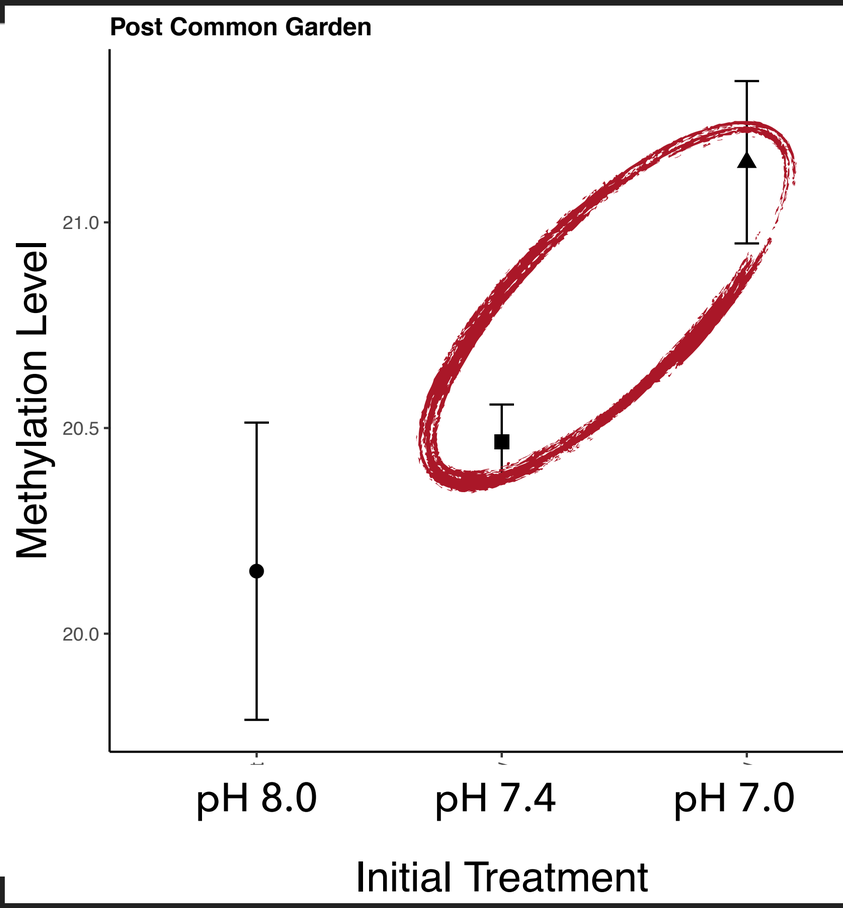
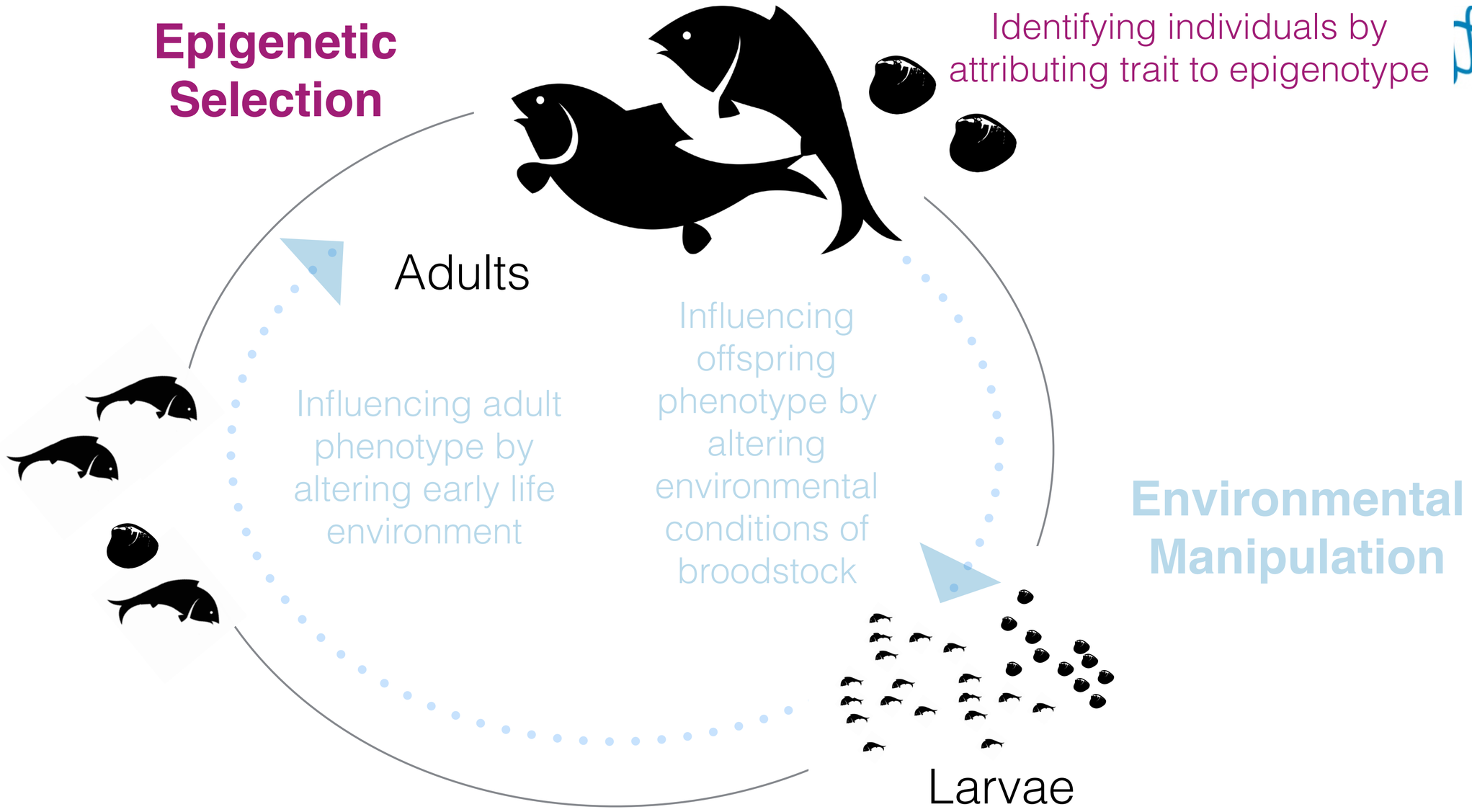





# DNA METHYLATION

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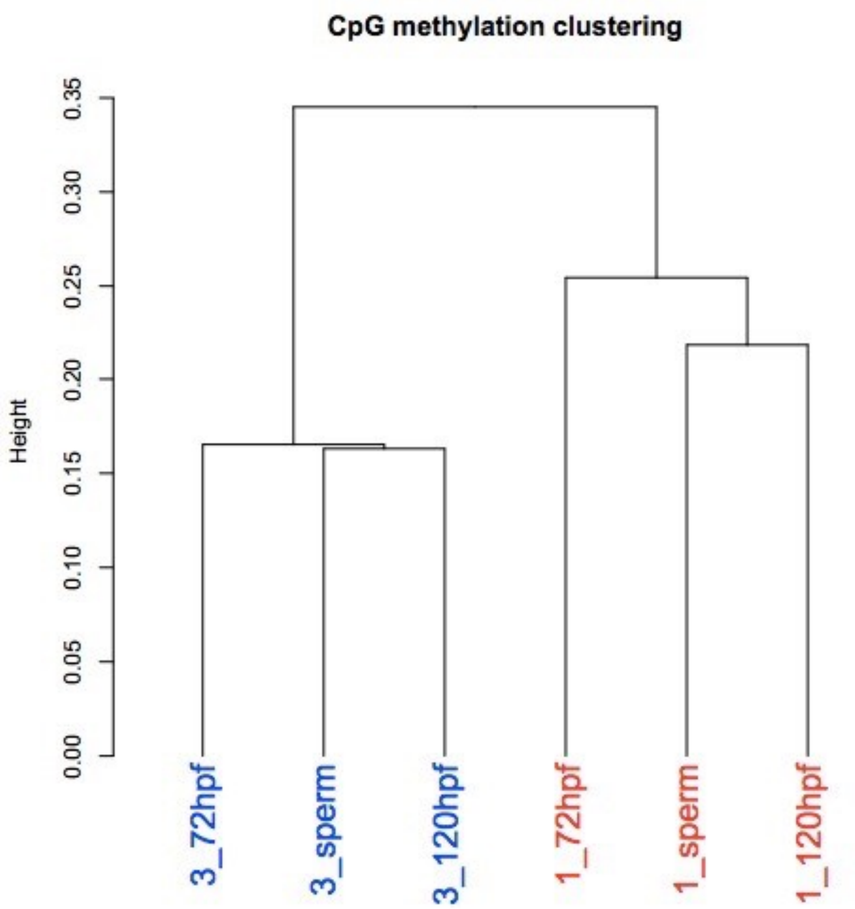


New Results

**Indication of family-specific DNA methylation patterns in developing oysters**

Claire E. Olson , Steven B. Roberts
**doi:** http://dx.doi.org/10.1101/012831

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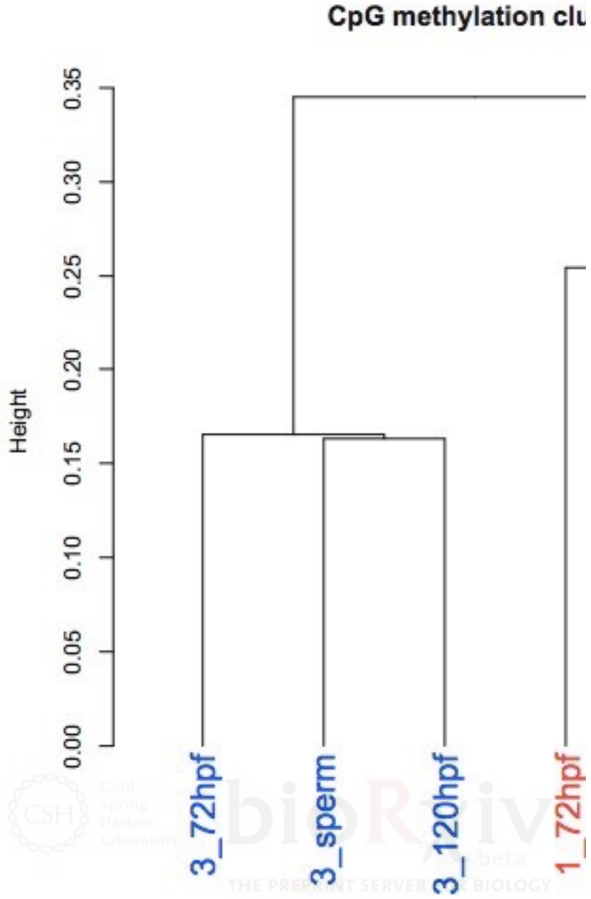


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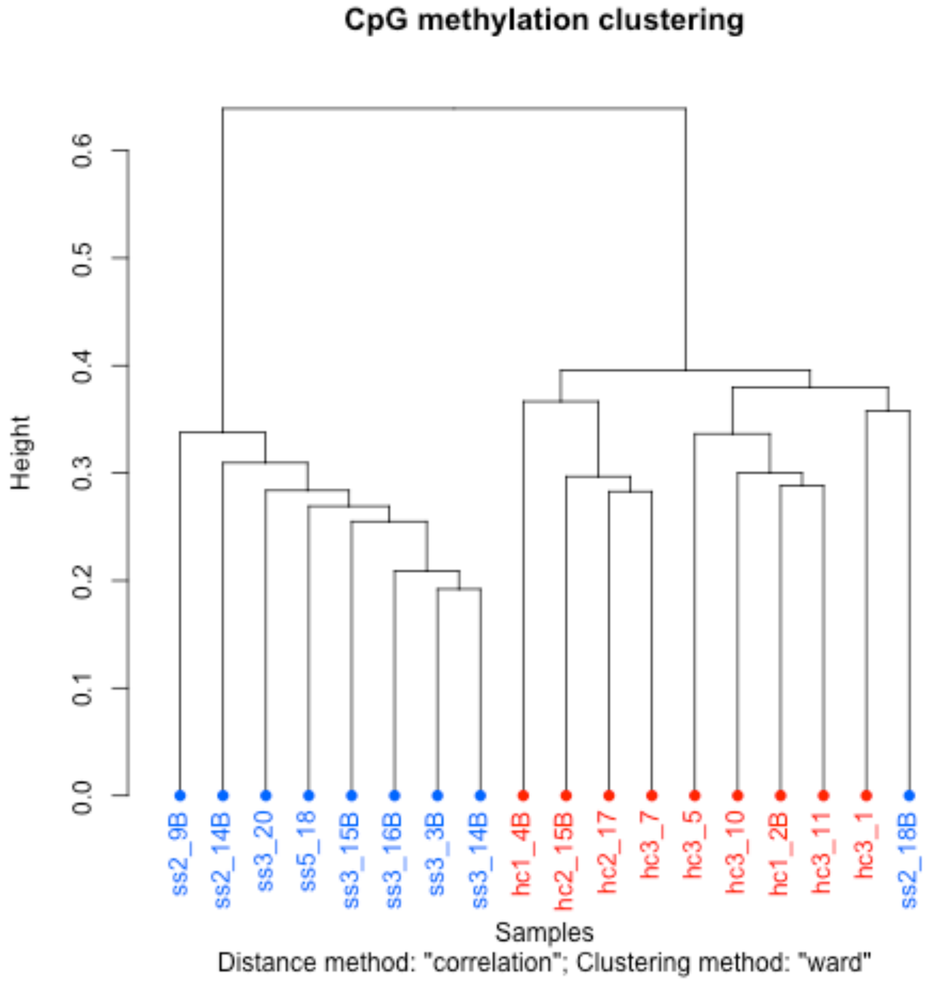

HOLLIE PUTNAM, SAM GURR, BRENT VADOPALAS, SHELLY TRIGG, JAMESTOWN S'KLALLAM TRIBE

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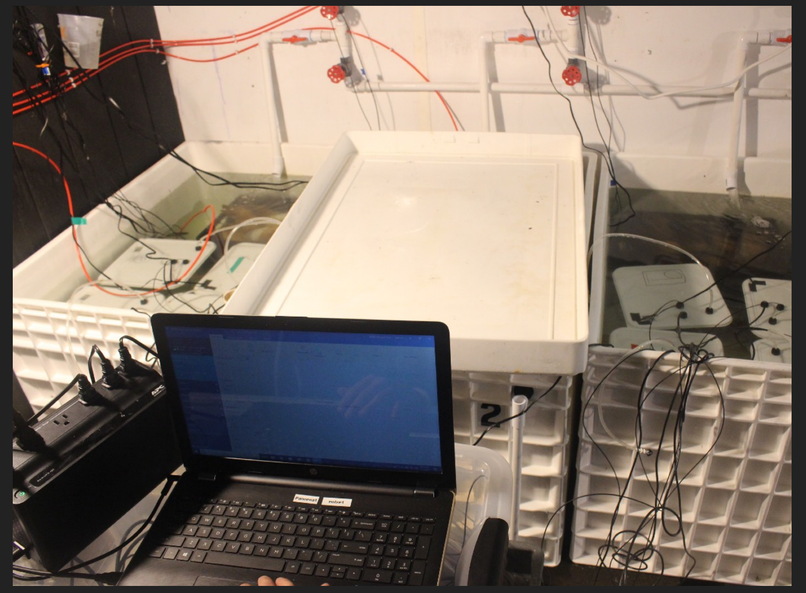

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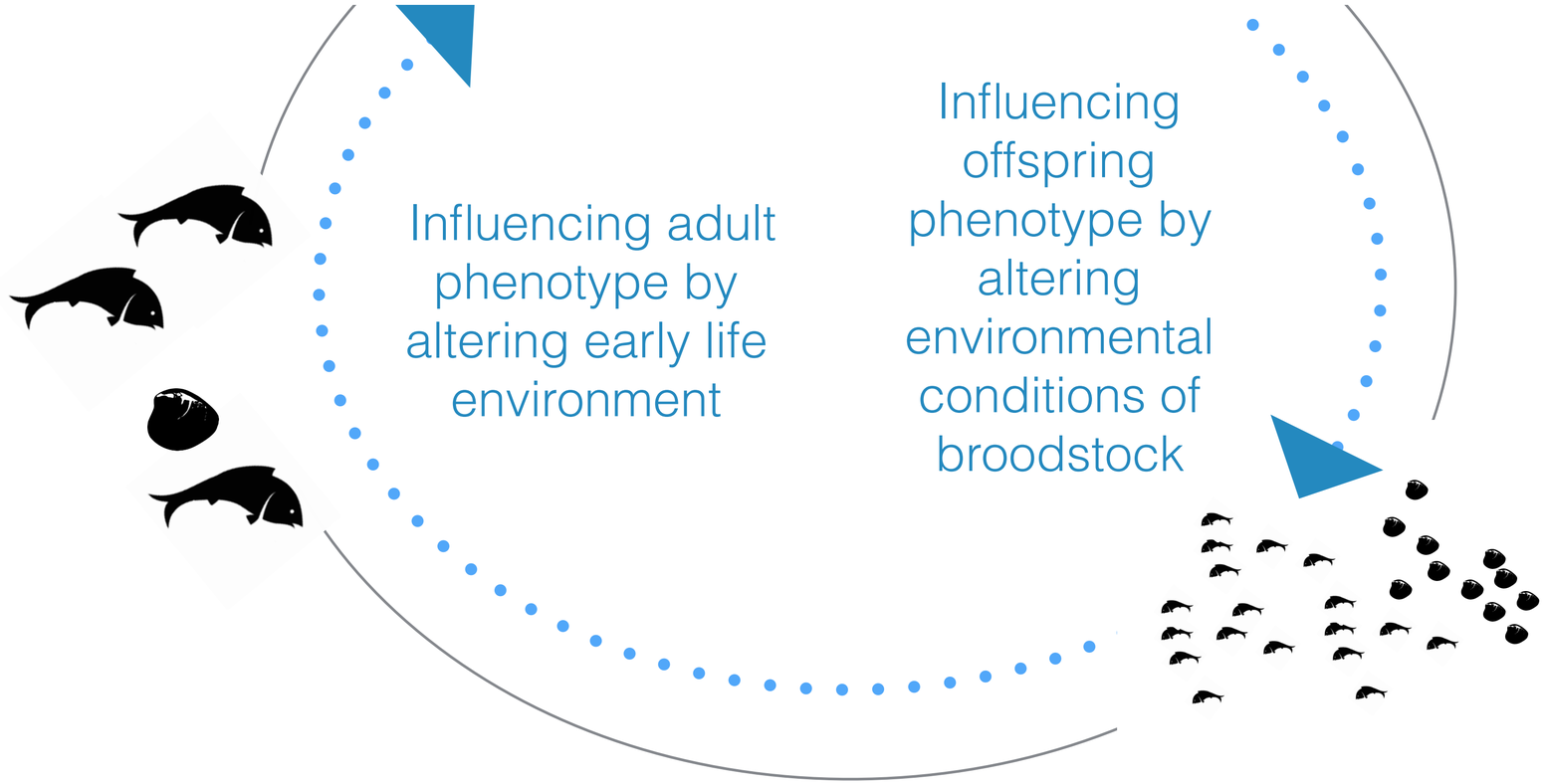

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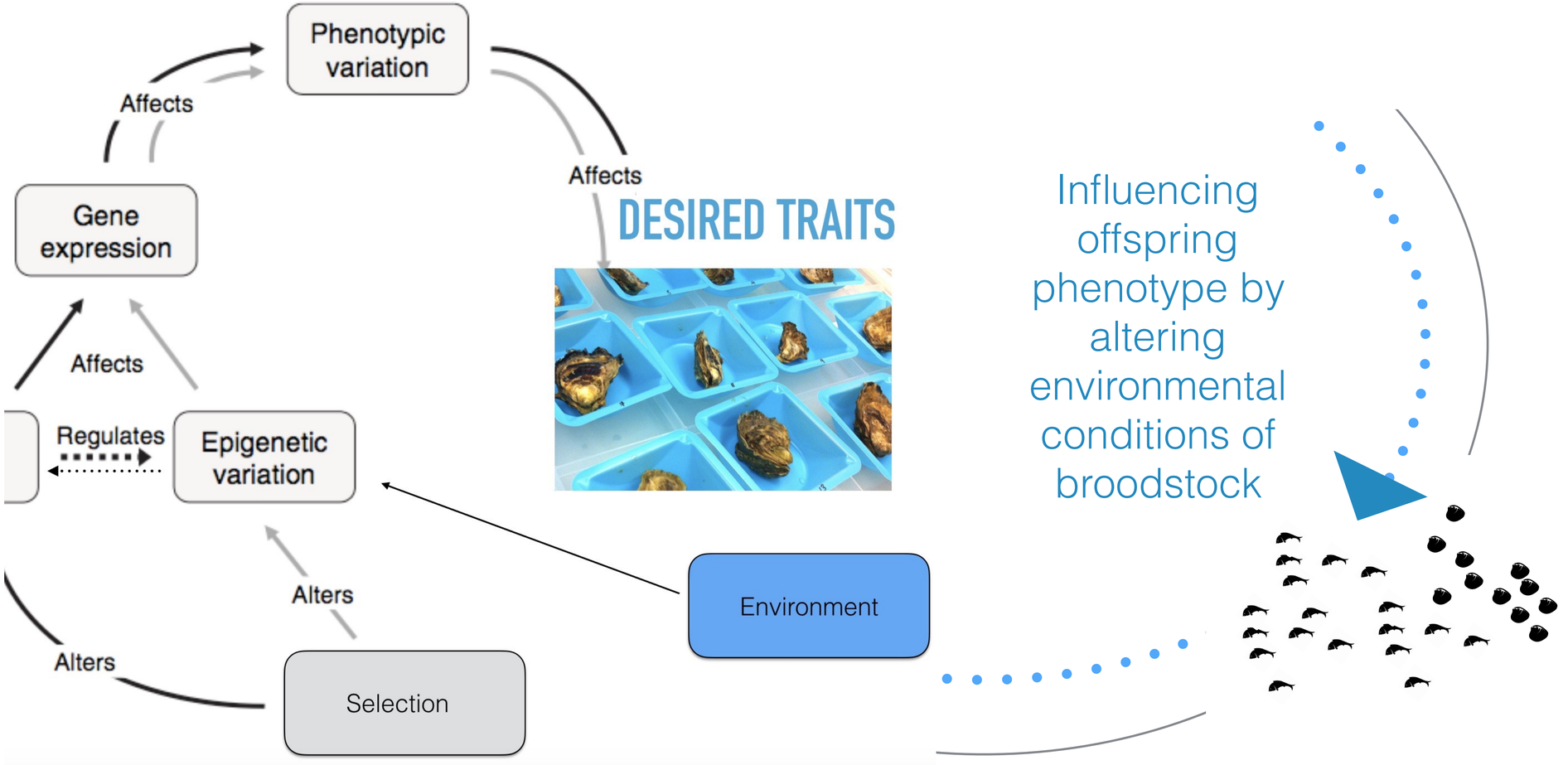

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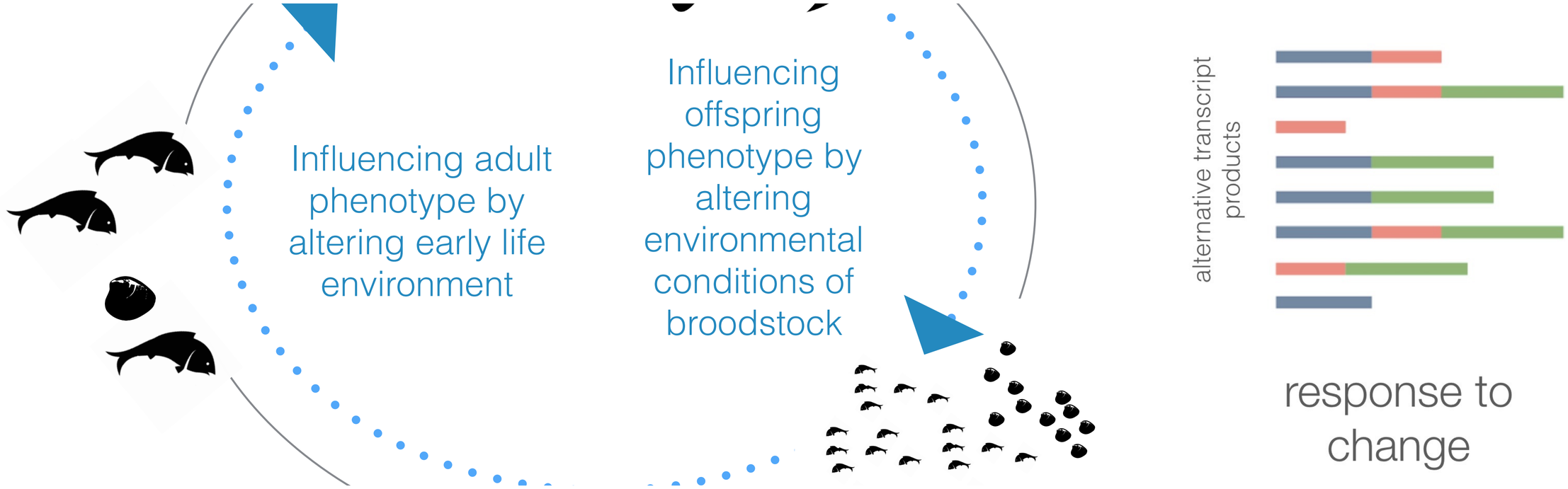


**Epigenetics may also function to disrupt predictable phenotypes through the creation of unexpected variation**

# ACKNOWLEDGEMENTS


- Sam White, Brent Vadopalas, Kaitlyn Mitchell, Sam Gurr, Shelly Trigg
- Kenneth K. Chew Center for Shellfish Research and Restoration
- Jamestown S'Klallam Tribe
- Puget Sound Restoration Fund


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