Influence of ocean acidification on DNA methylation patterns in geoduck

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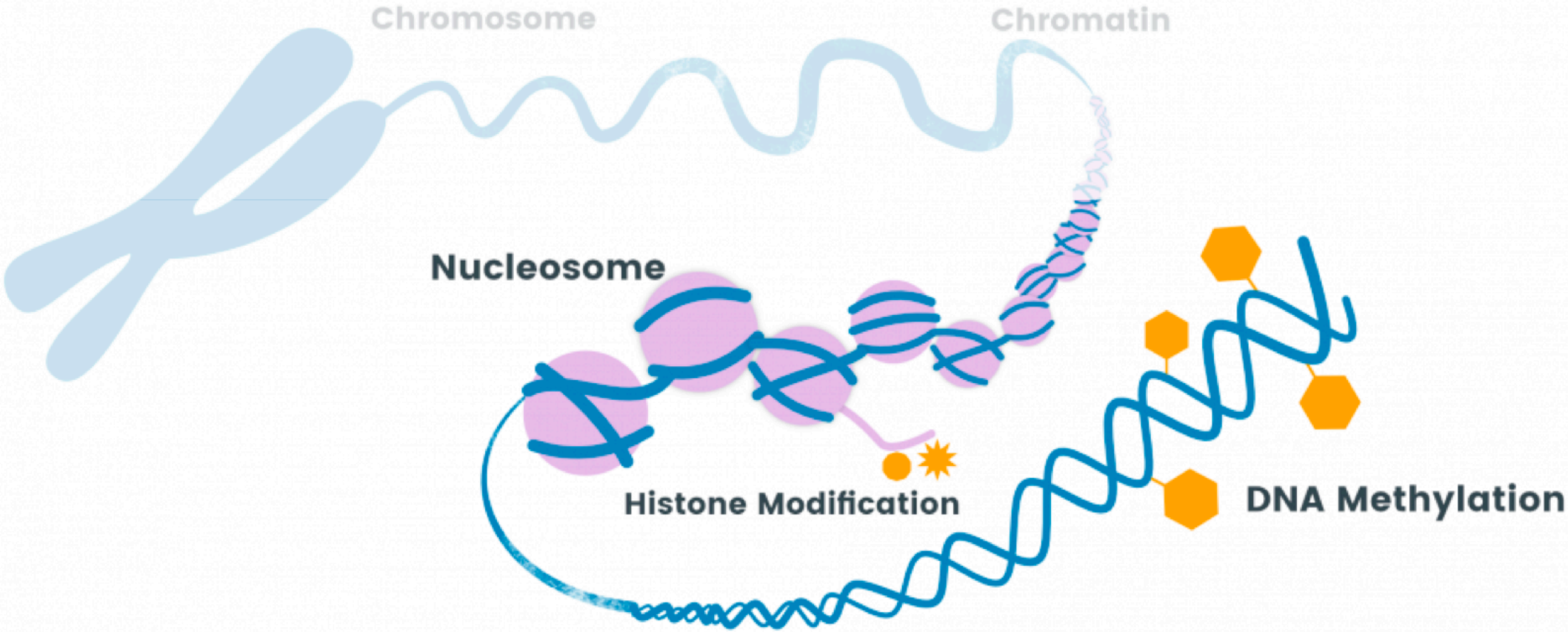
School of Aquatic and Fishery Sciences
University of Washington

Collaborators: Putnam HM, Liachko I, Lawley C, White SJ, Spencer L, Vadopalas B, Natarajan A, Hetzel J, Jaeger E, Soohoo J, Goetz FW, Gallardo-Escárate C, Roberts SB

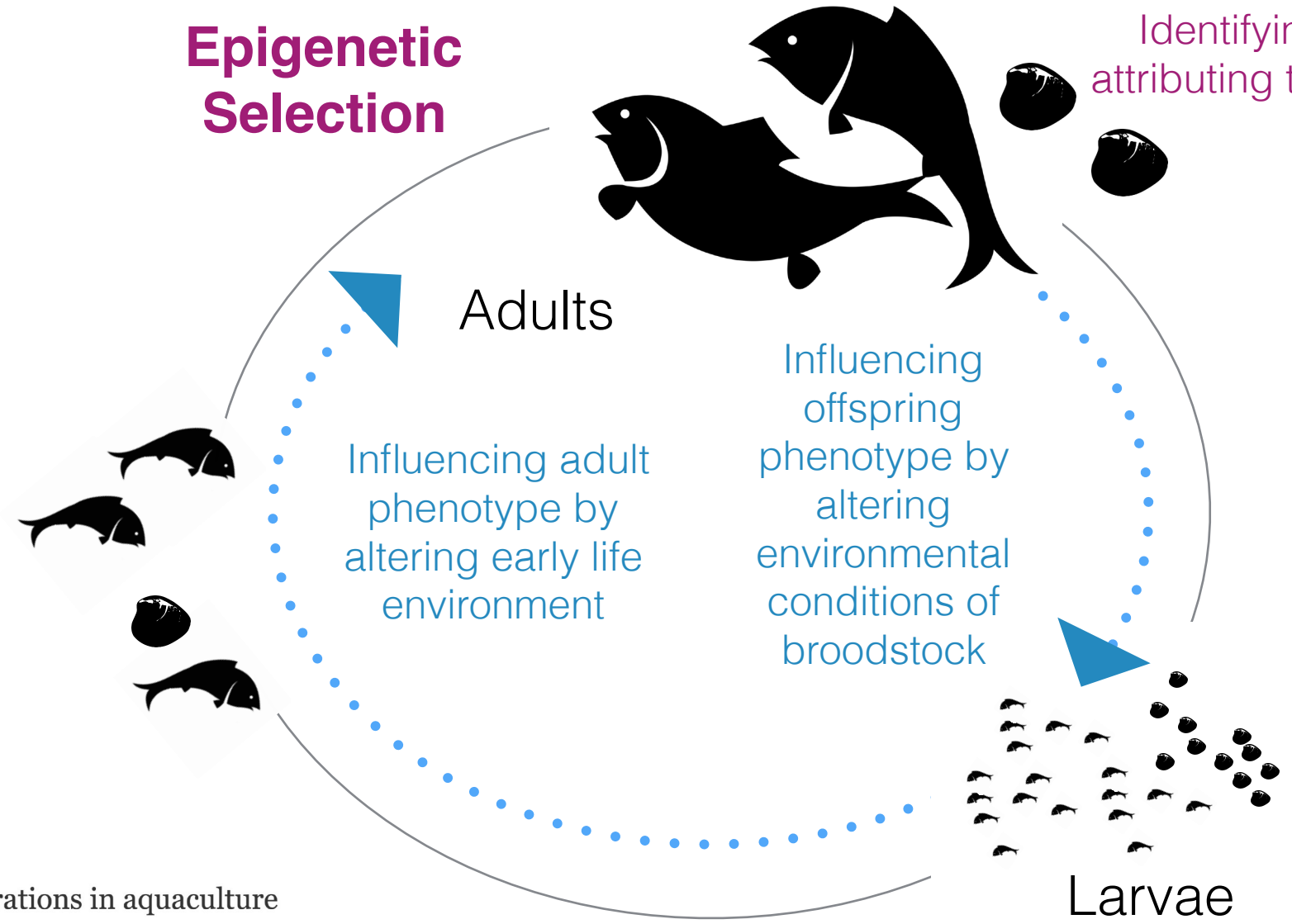
ALTERS THE PHENOTYPE (WITHOUT CHANGING DNA CODE); HERITABLE



CAN BE INDUCED WITH ENVIRONMENTAL MANIPULATION

Epigenetic Selection

Identifying individuals by attributing trait to epigenotype



Environmental Manipulation

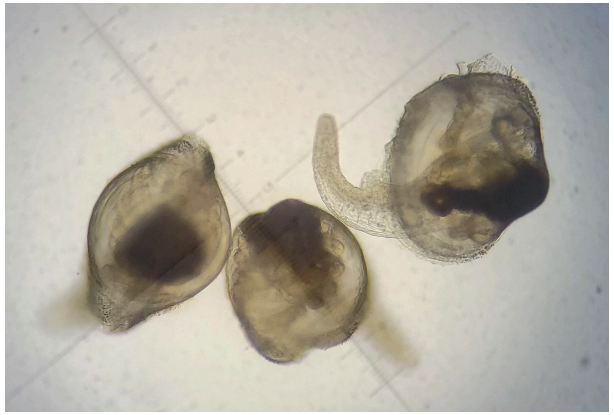
PEER-REVIEWED Aquatic Biology section ›

Epigenetic considerations in aquaculture

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

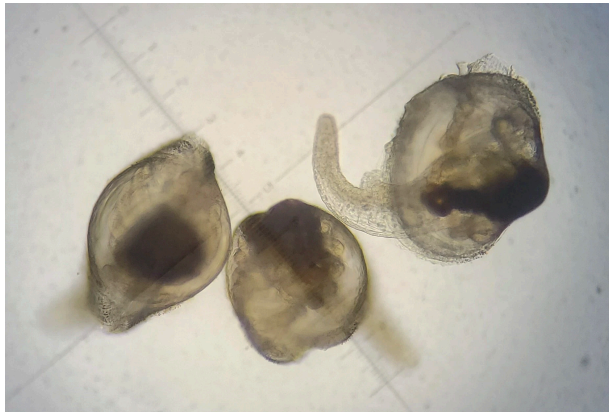
Mackenzie R. Gavery, Steven B. Roberts

Geoduck (*Panopea generosa*)



- Among most valuable farmed shellfish on a per acre basis
- **>$20 M** in annual sales in Washington alone

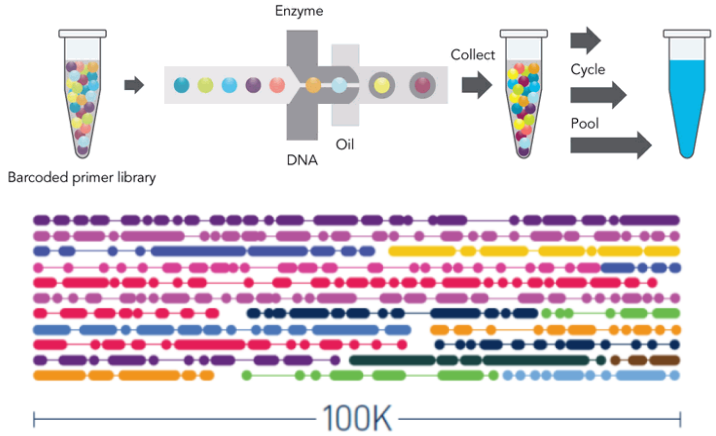
Geoduck (*Panopea generosa*)



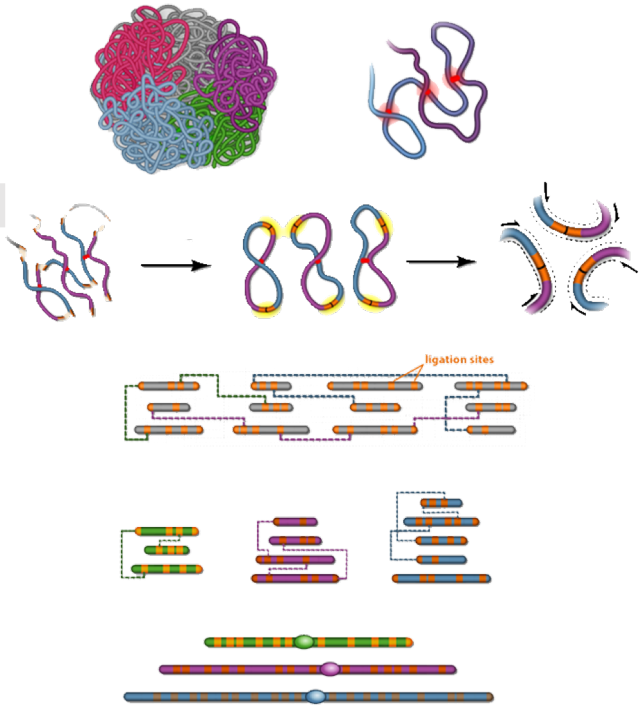
1. Genomic Resources
2. Identification of potential epigenetic markers underlying beneficial traits

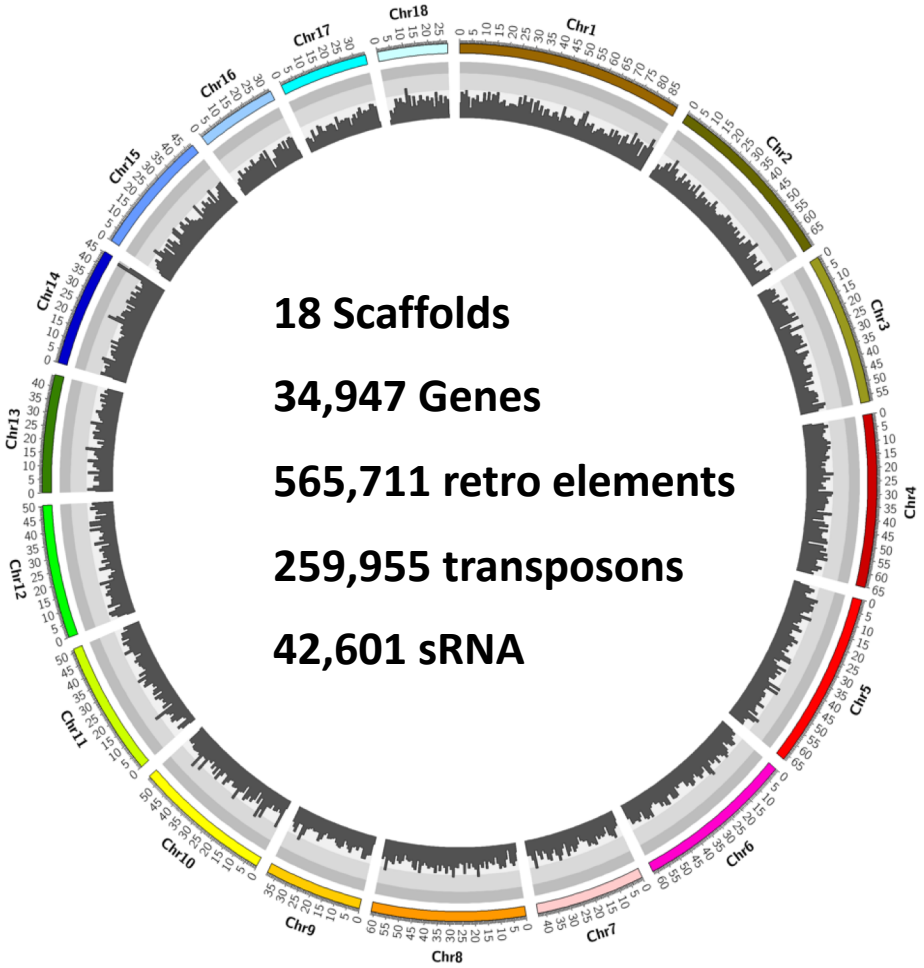
Draft Genome Assembly

10x Genomics
Linked-reads sequencing

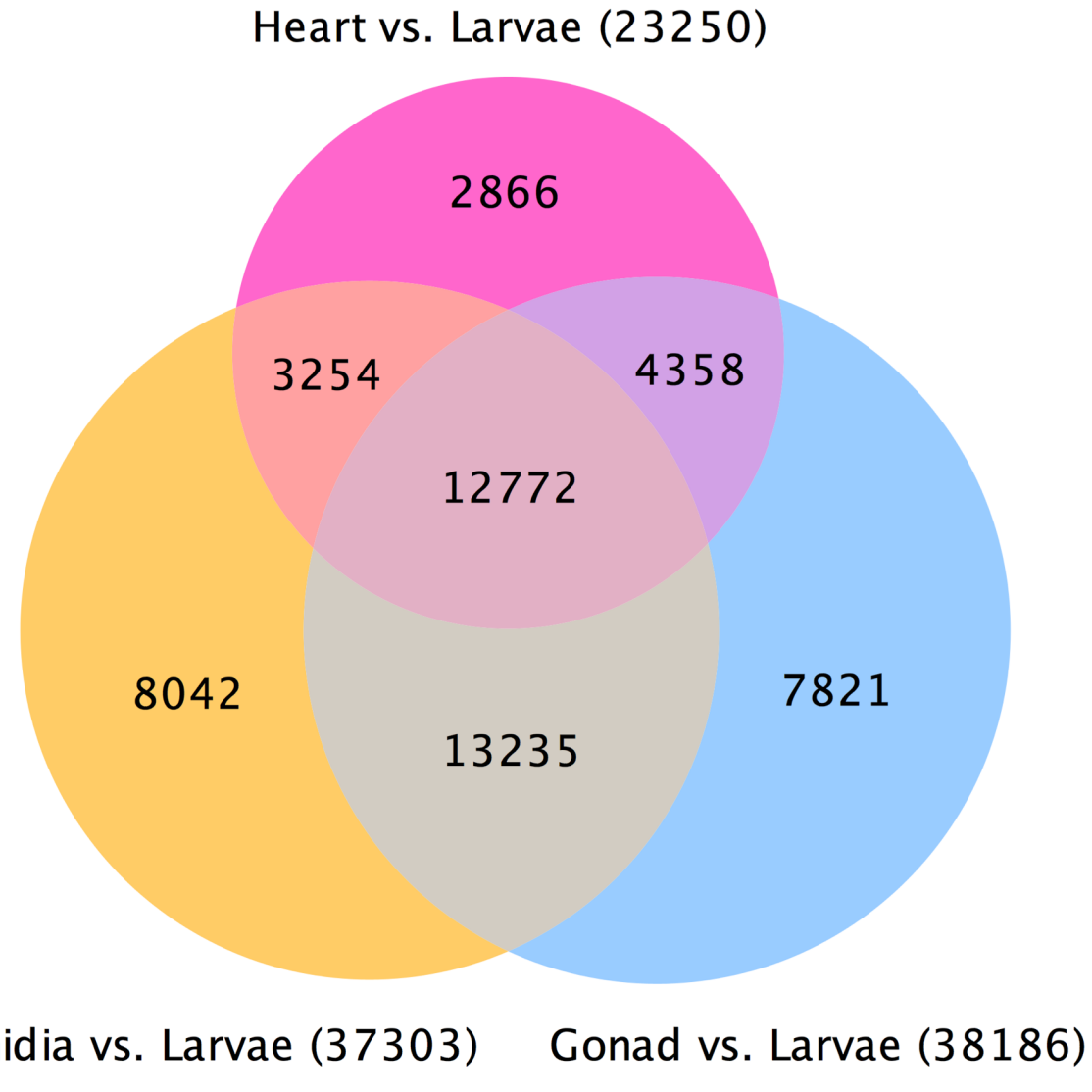


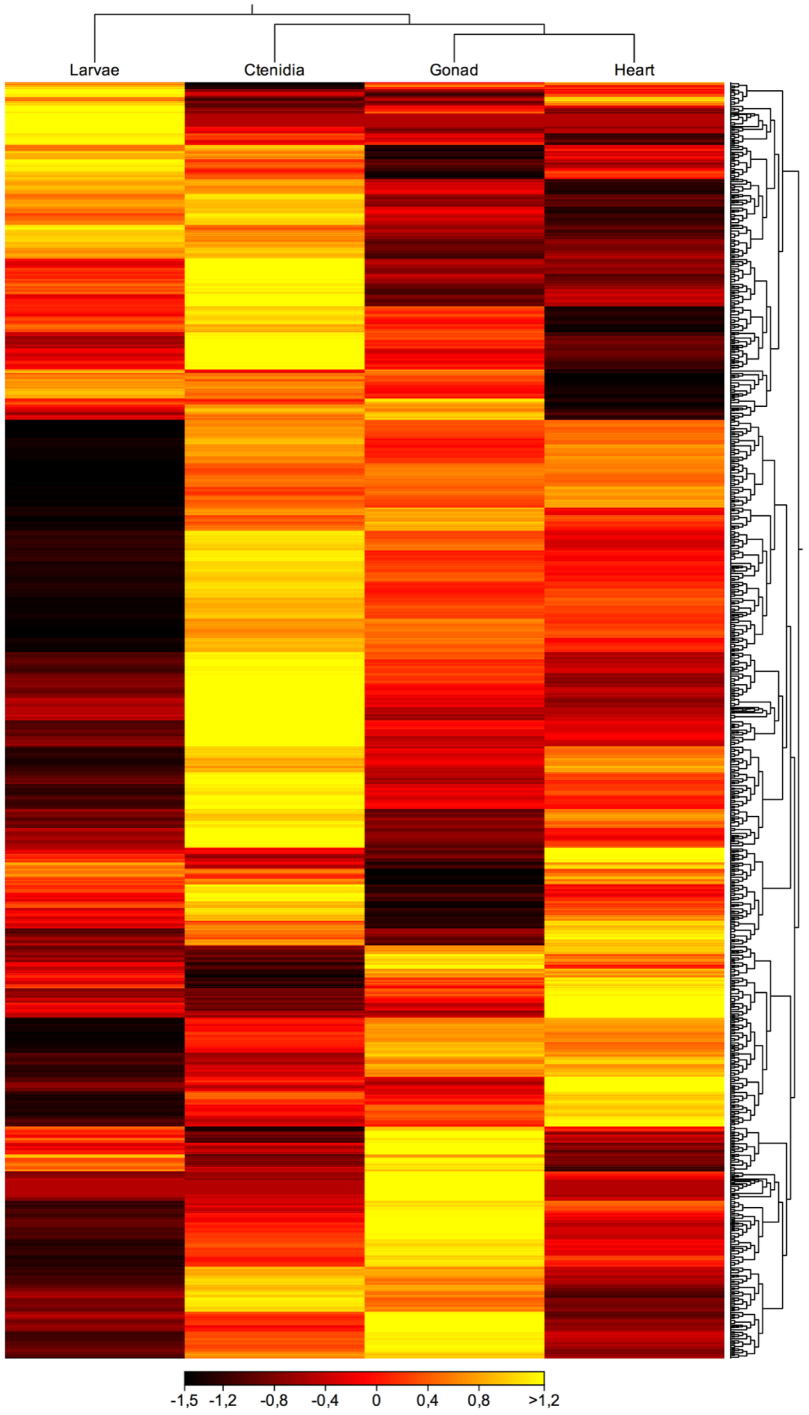
Phase Genomics
Proximo Hi-C



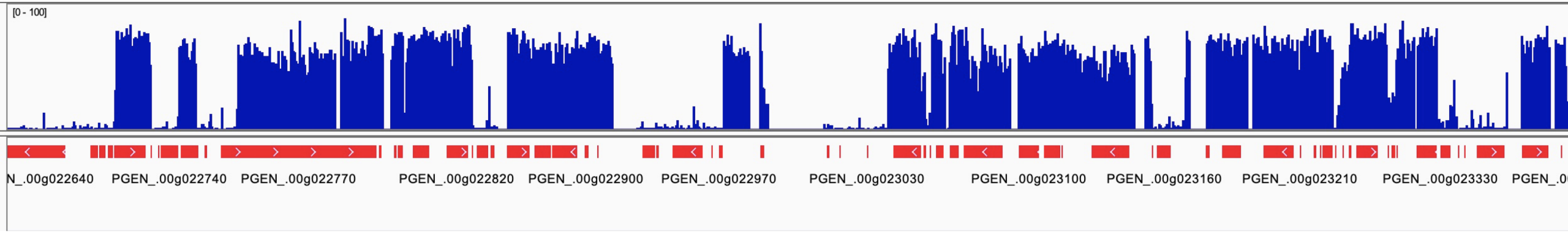


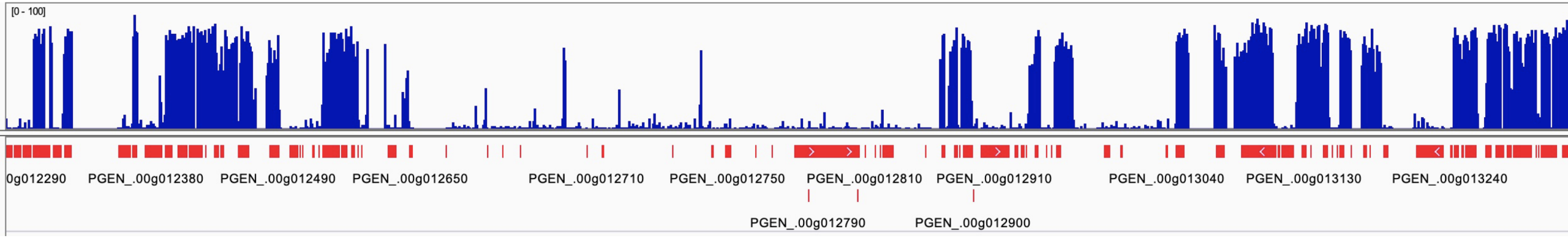
Long non-coding RNA





DNA Methylation Landscape





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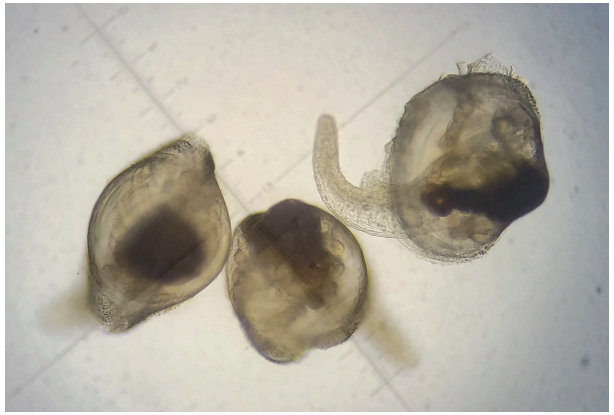

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2. **Identification of potential epigenetic markers underlying beneficial traits**

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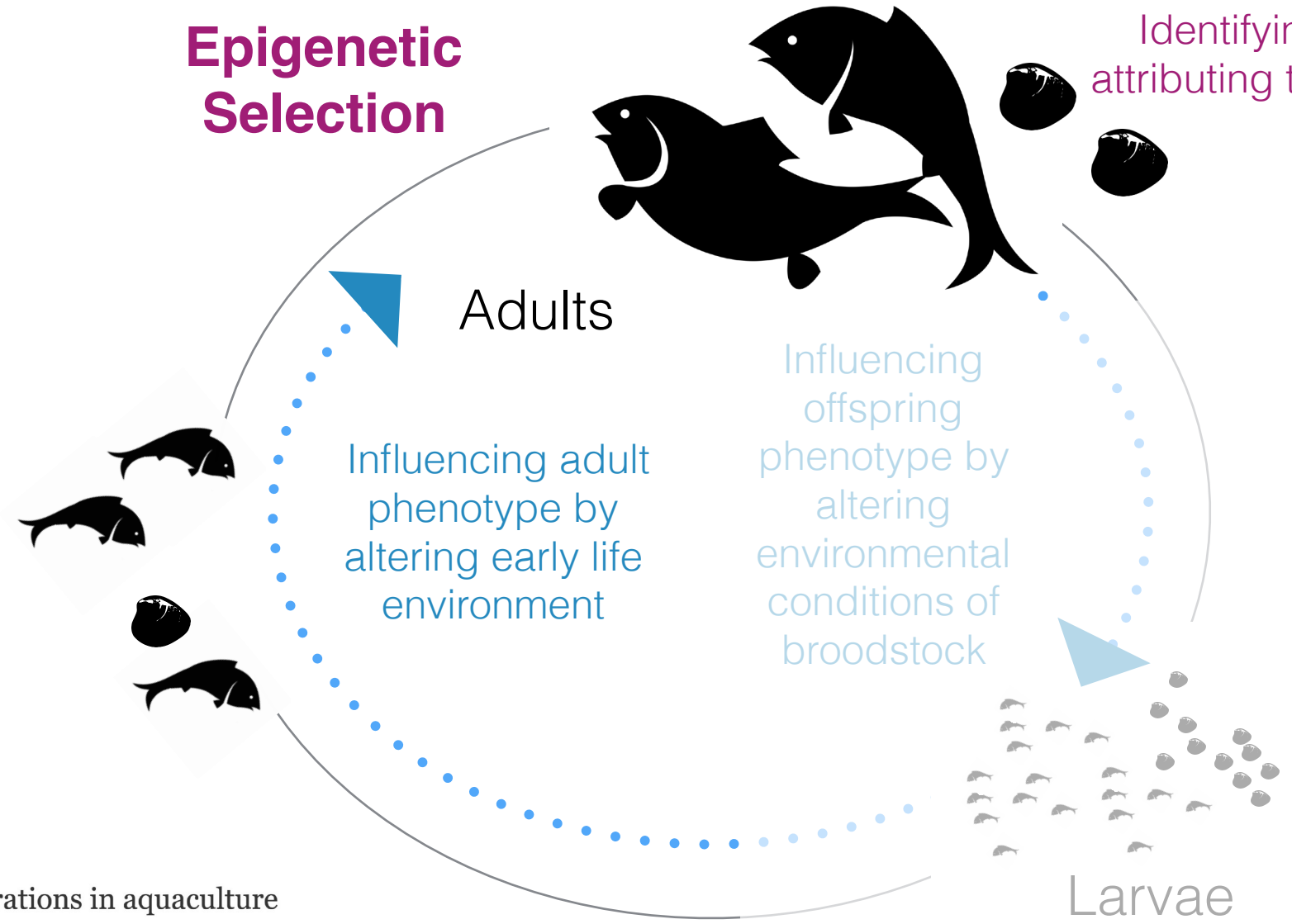

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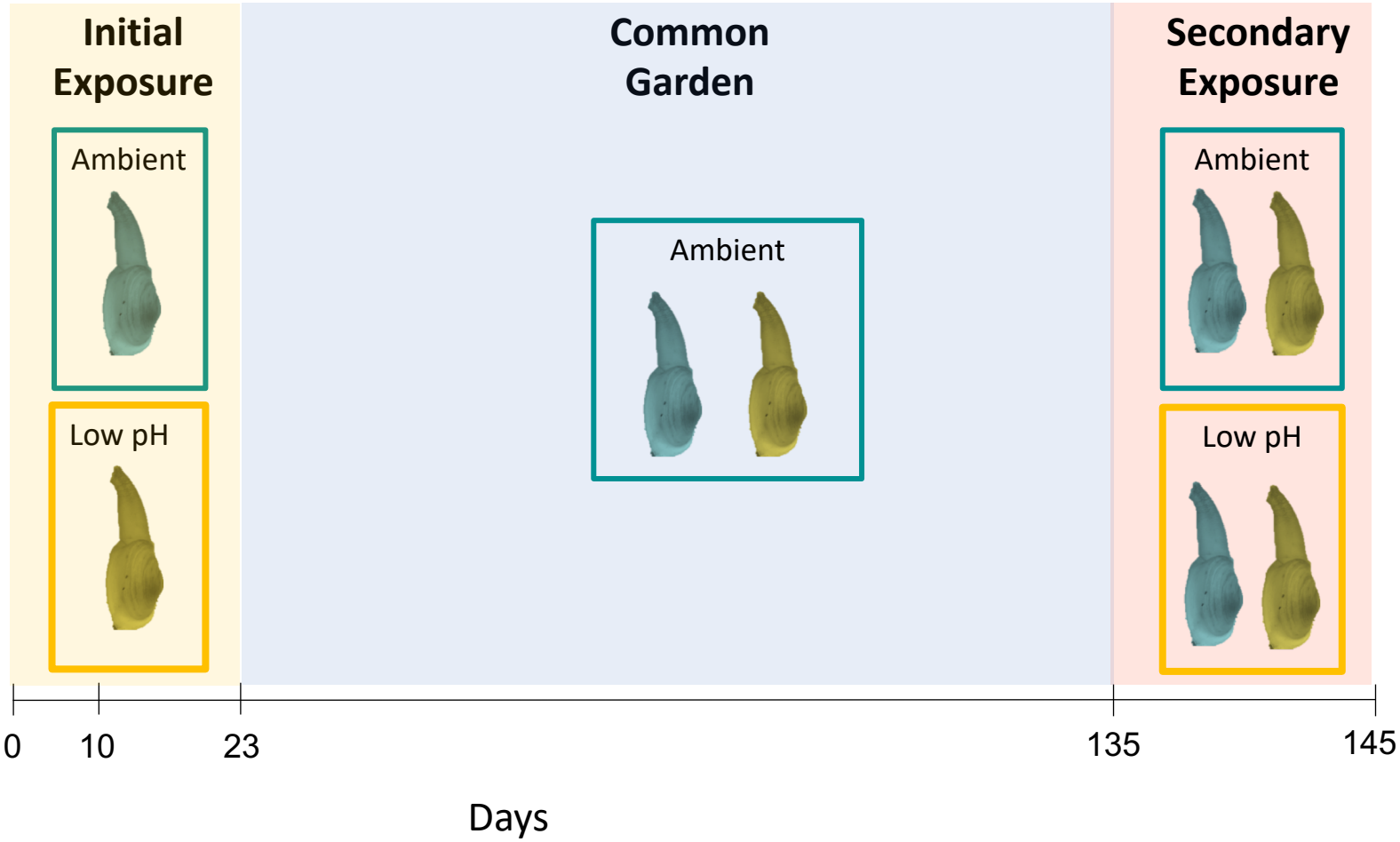
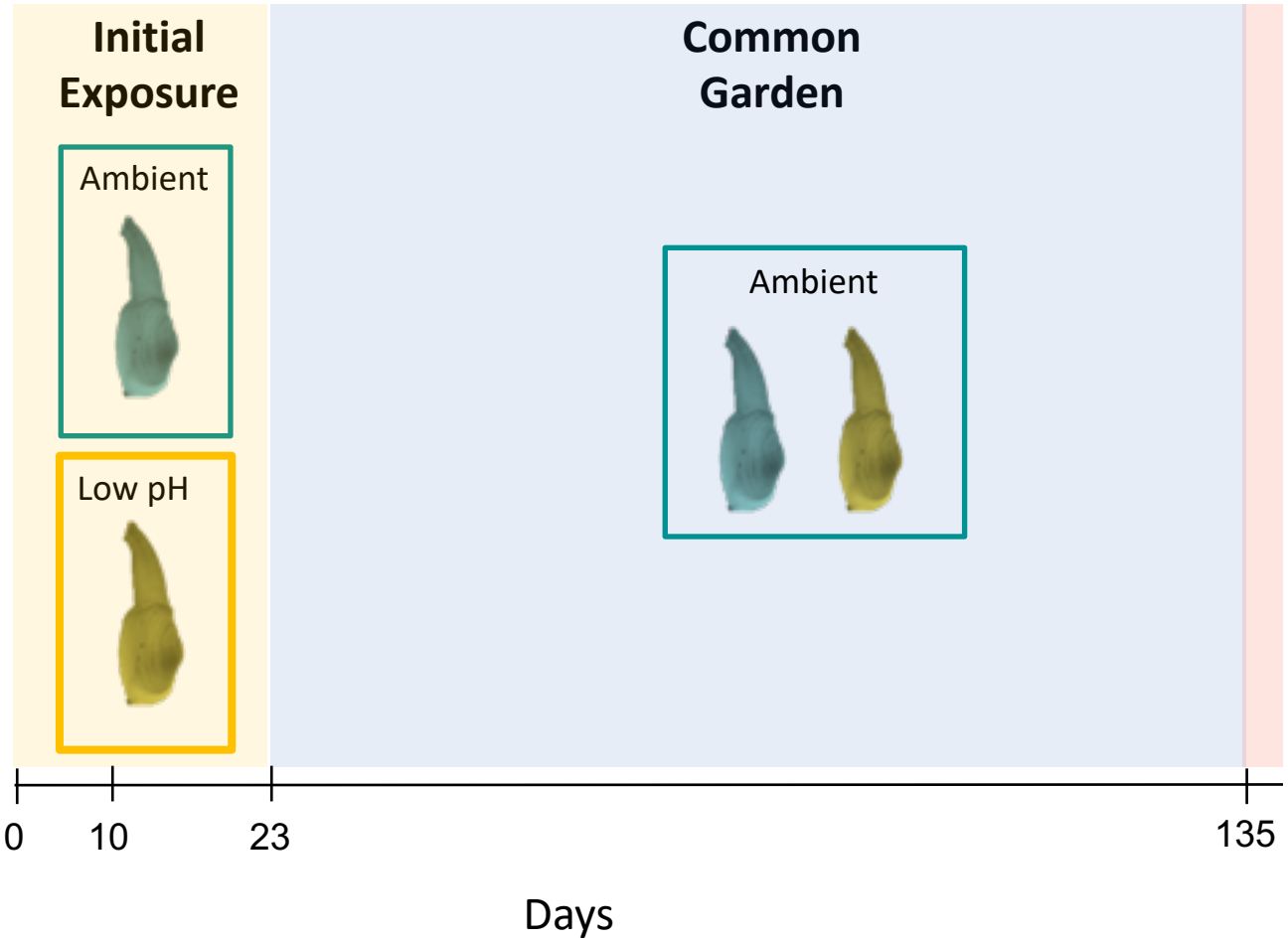
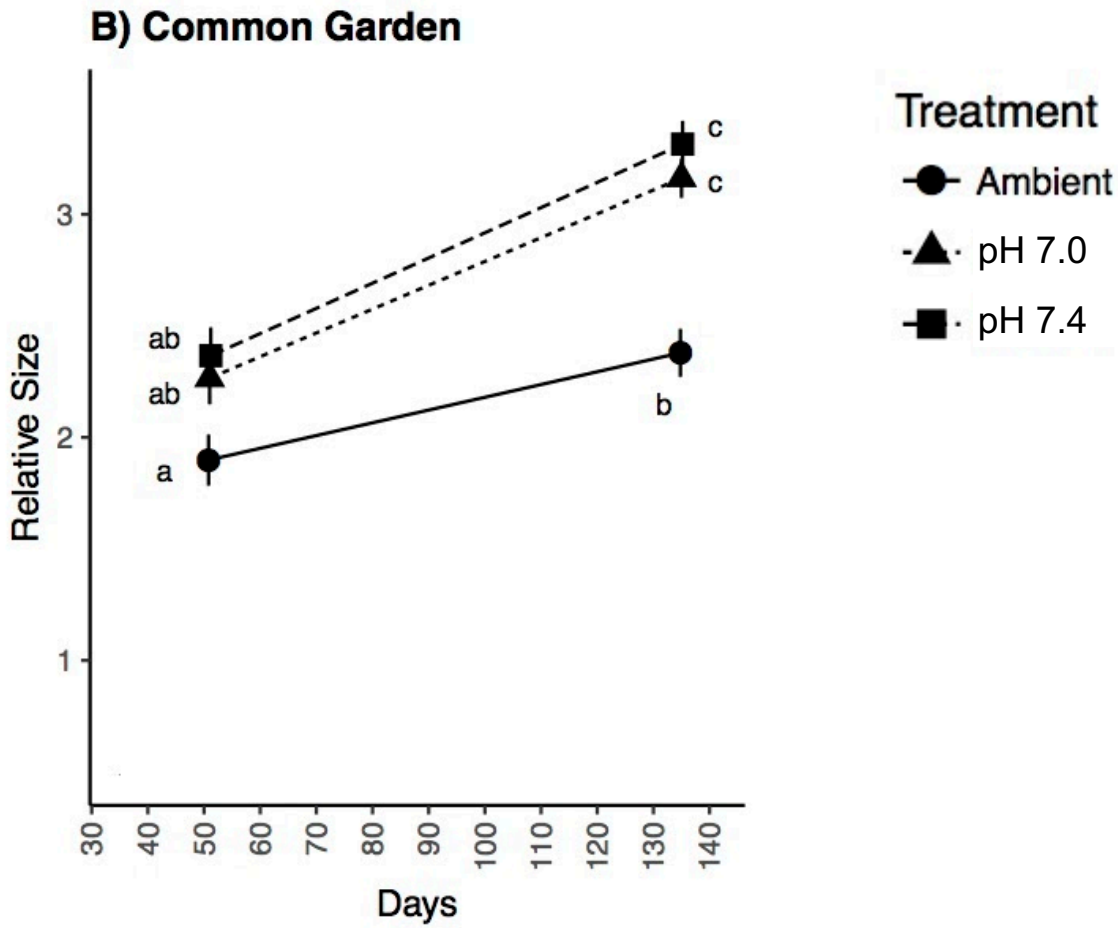
Altering early life environment pH

3 month old juveniles



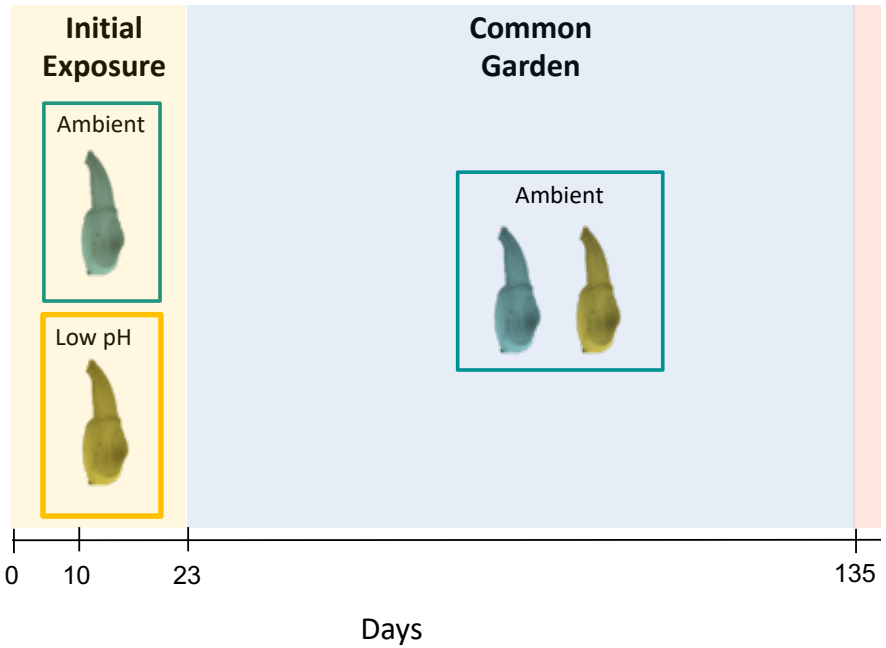
Initial low pH exposure leads to compensatory growth

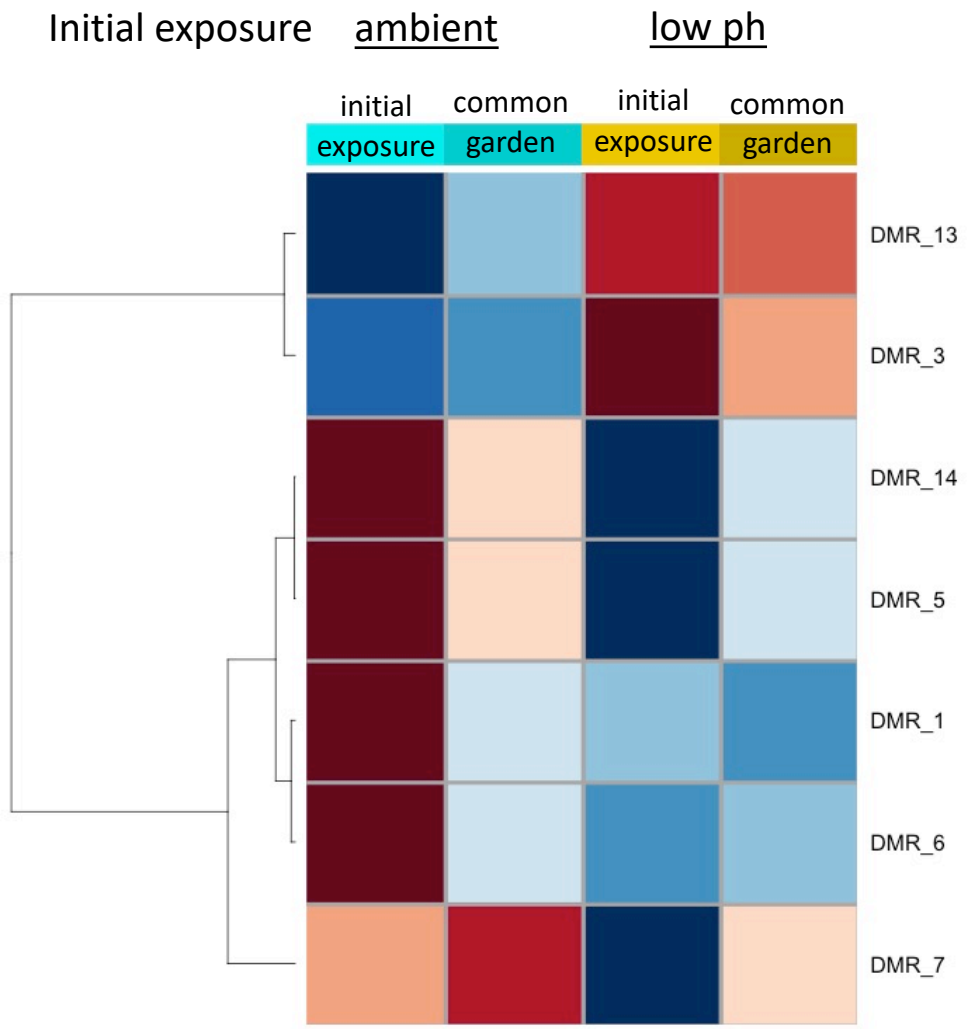




Does early pH exposure influence epigenetic marks that underlie compensatory growth phenotype?

Initial low pH methylation marks persist

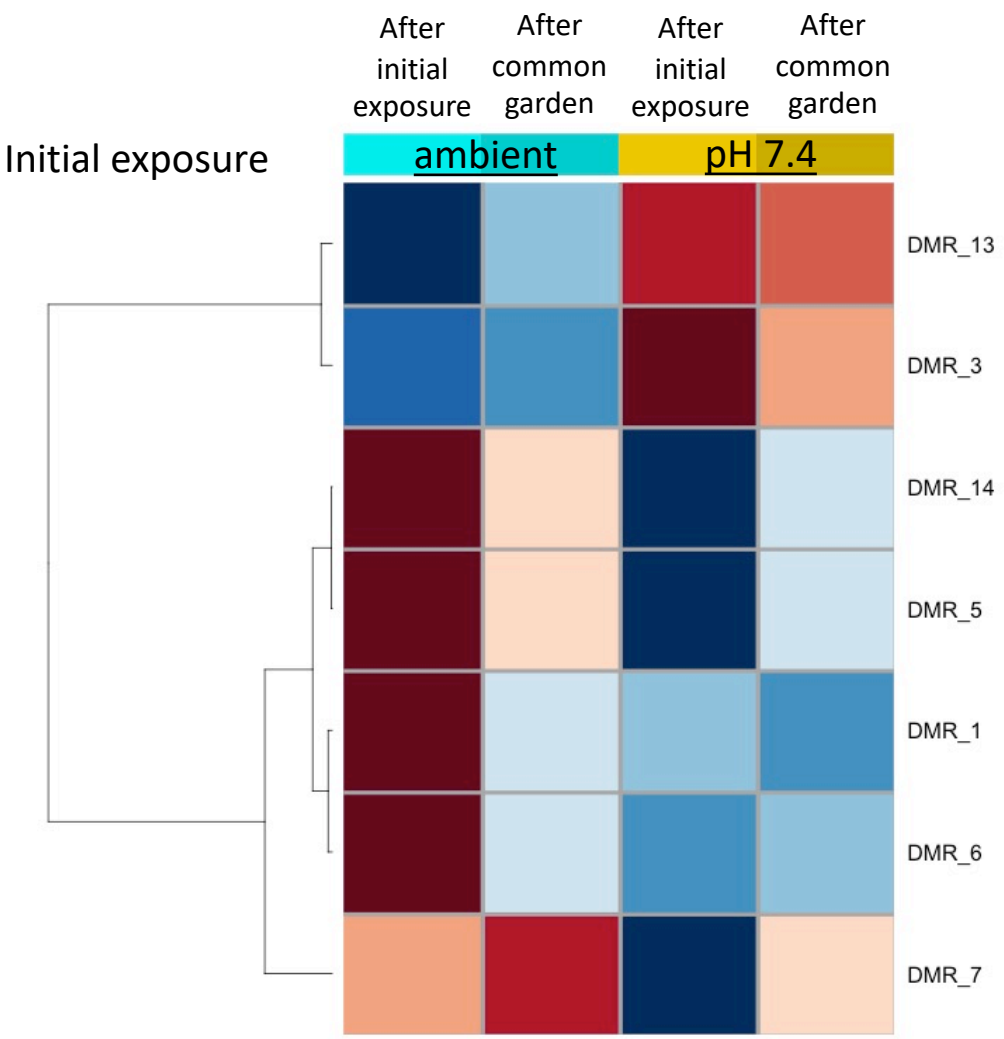




Increased methylation persists

Decreased methylation persists

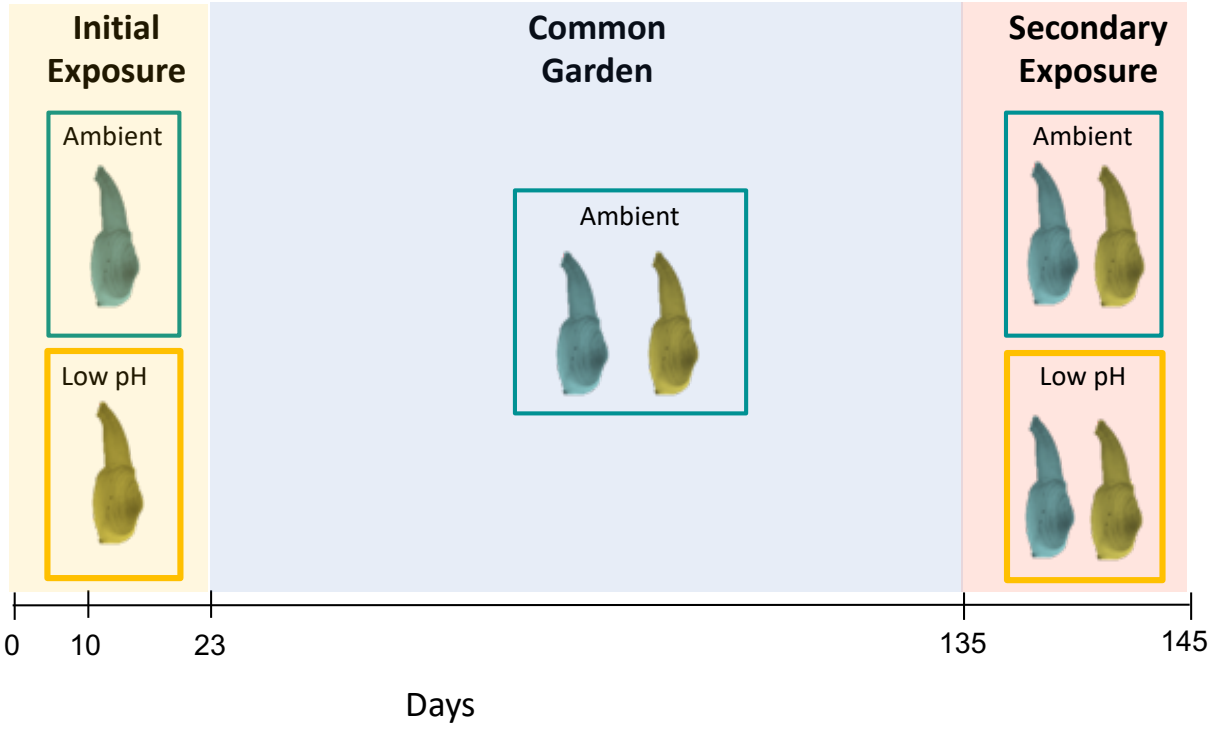
Initial low pH methylation marks persist



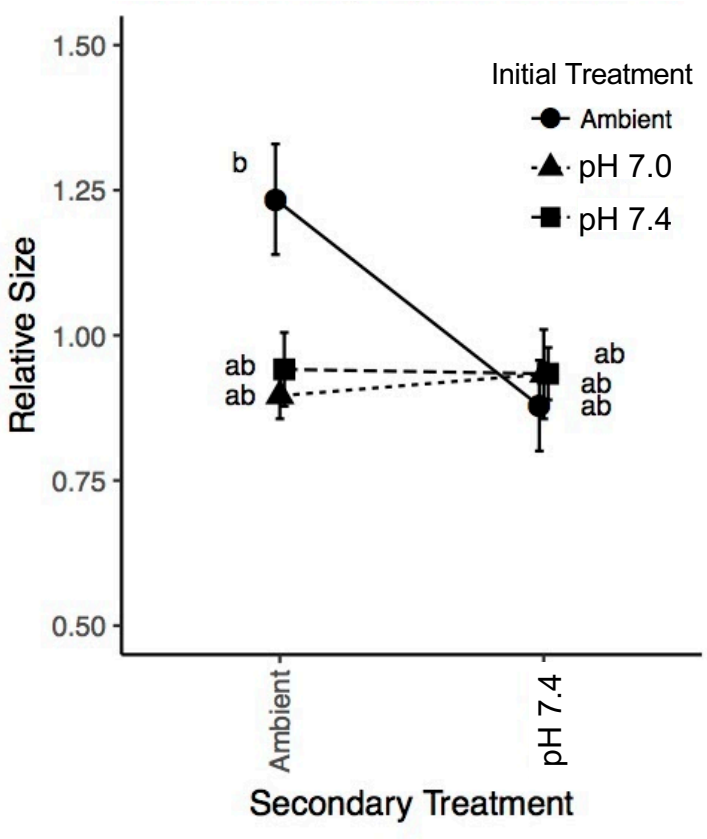
DMR_ID	Location	Methylation Change relative to ambient	Feature Type	Feature Name	distance	function
DMR_1	Scaffold_01:42796927-42796976	decrease	repeat	rnd-1_family-793	0	no uniprot annotations
DMR_3	Scaffold_01:59186898-59186958	increase	gene	PGEN_.00g021750	0	no uniprot annotations
DMR_5	Scaffold_02:10983130-10983176	decrease	repeat	rnd-1_family-826	0	no uniprot annotations
DMR_7	Scaffold_02:46872024-46872106	decrease	repeat	rnd-5_family-2058	0	no uniprot annotations
DMR_6	Scaffold_02:28519662-28519931	decrease	gene	PGEN_.00g043300	199 upstream	voltage sensitive calcium channel activity; large protein with multiple tissue specific isoforms (Annexin-7)
DMR_13	Scaffold_03:56511986-56512009	increase	repeat	rnd-6_family-1367	0	no uniprot annotations
DMR_14	Scaffold_04:40346615-40346636	decrease	gene	PGEN_.00g094120	0	no uniprot annotations

Does early pH exposure influence response to later stress?

Evidence for environmental hardening

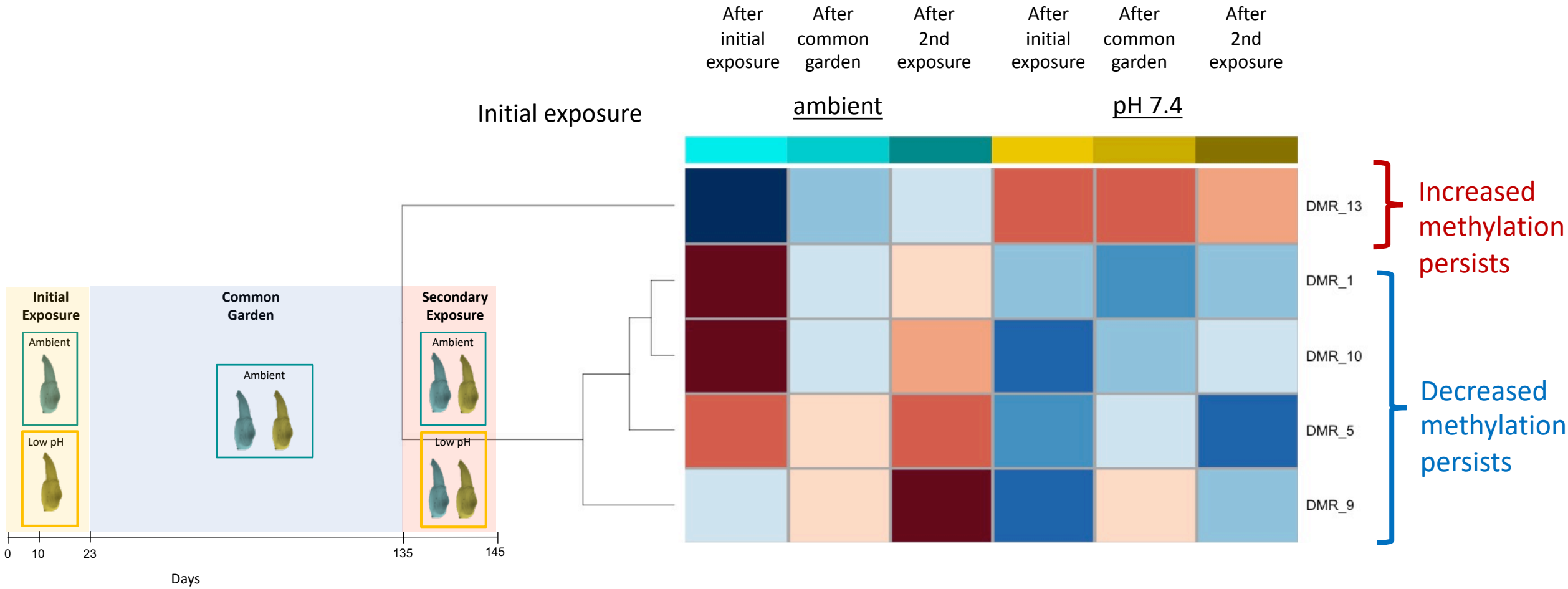


Secondary low pH exposure DOES NOT negatively affect size of juveniles initially exposed to low pH



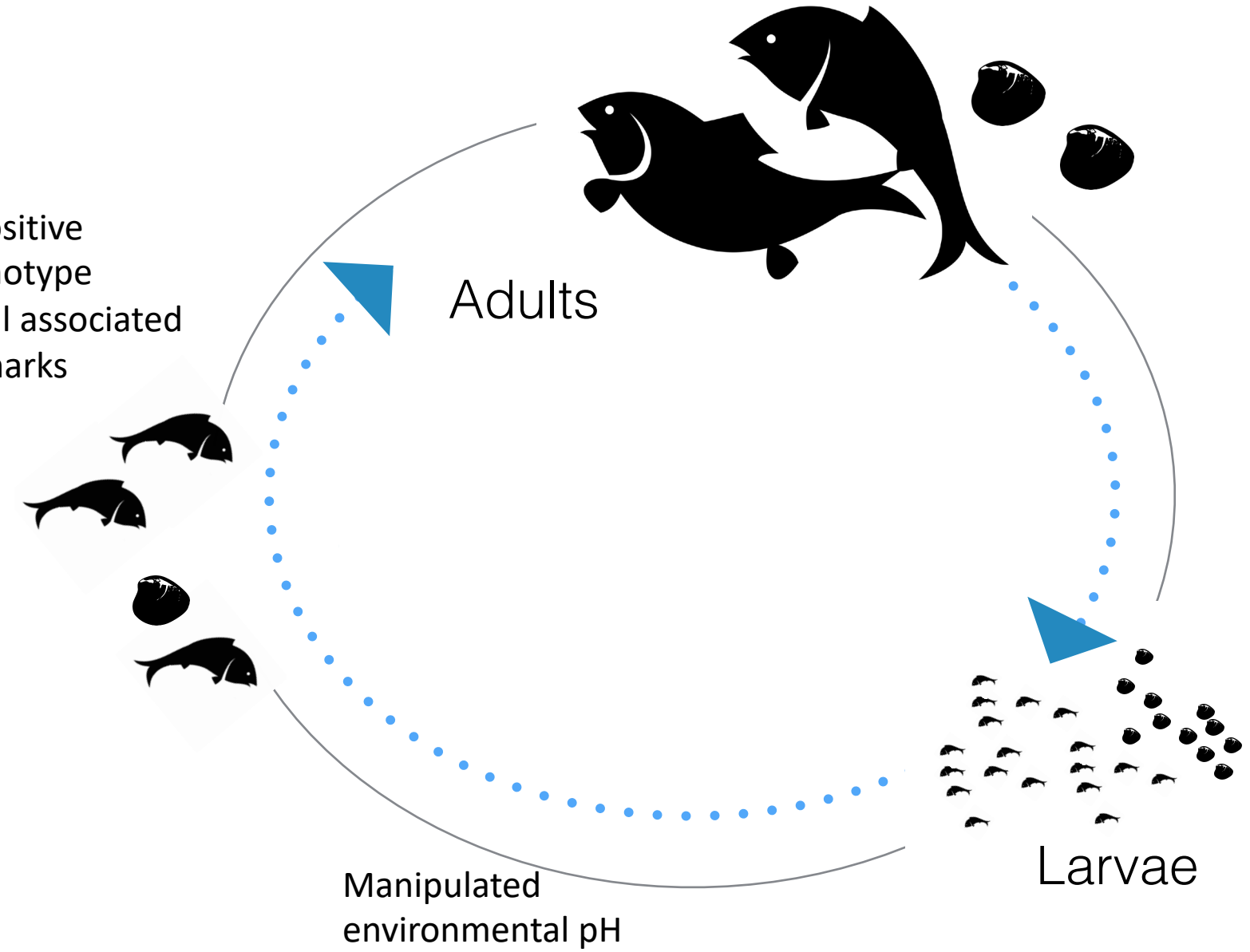
Does early pH exposure influence epigenetic marks that underlie stress resistance phenotype?

Potential epigenetic marks underlying environmental hardening



Summary

- Identified positive growth phenotype
- and potential associated epigenetic marks



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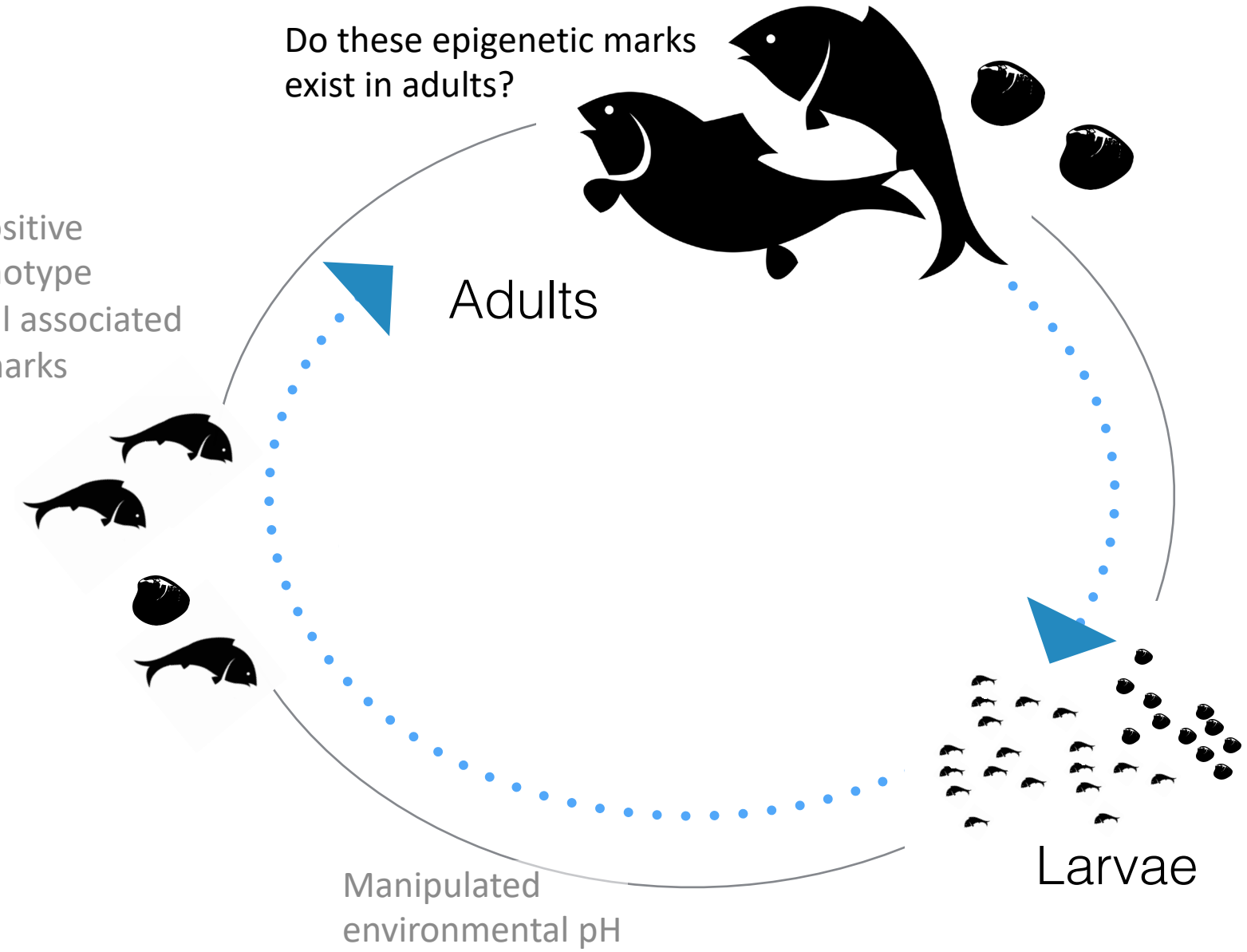

Summary

Presentation + Resources:
github.com/shellytrigg/talk-pag2020

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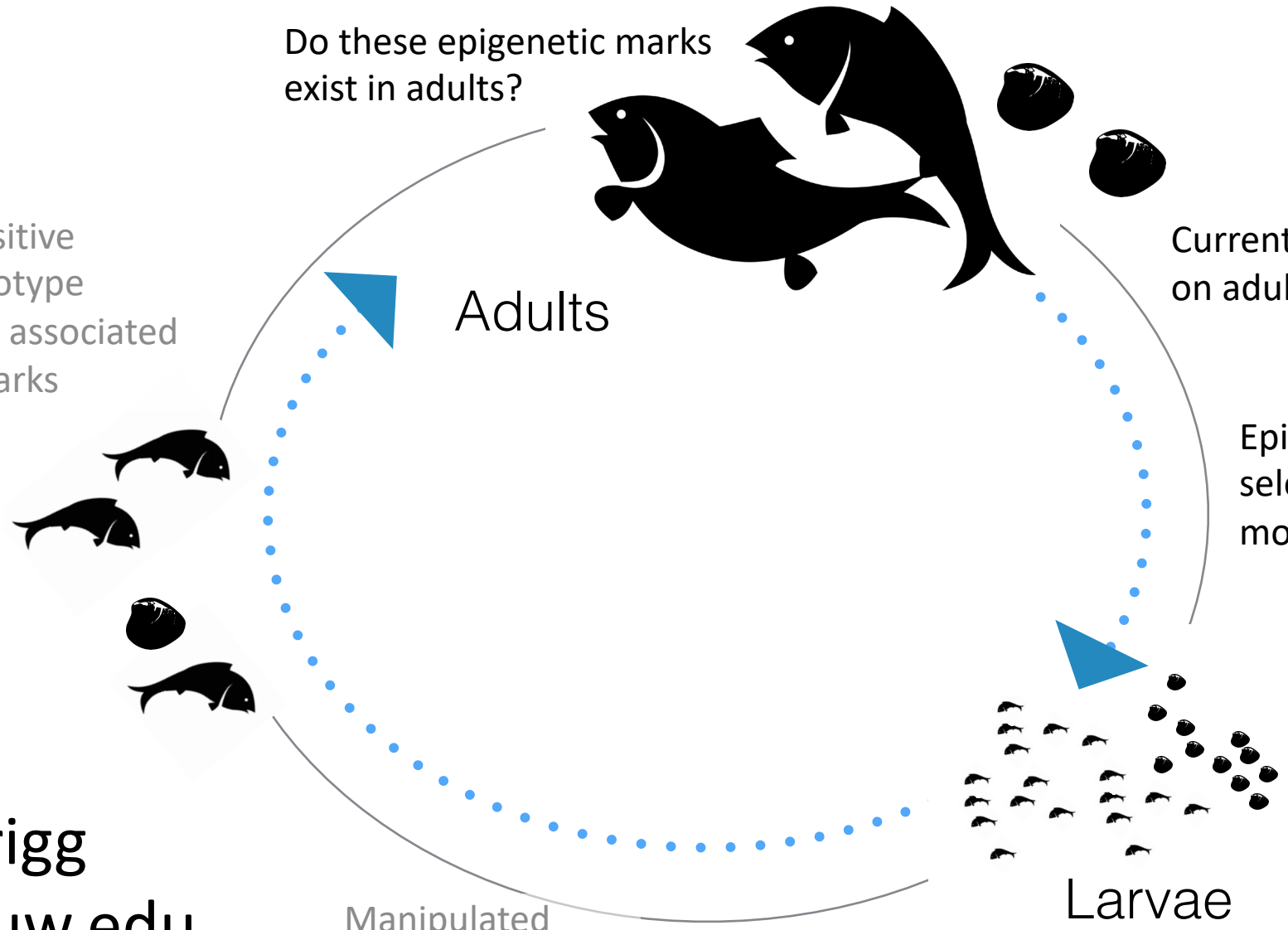
- and potential associated epigenetic marks



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