

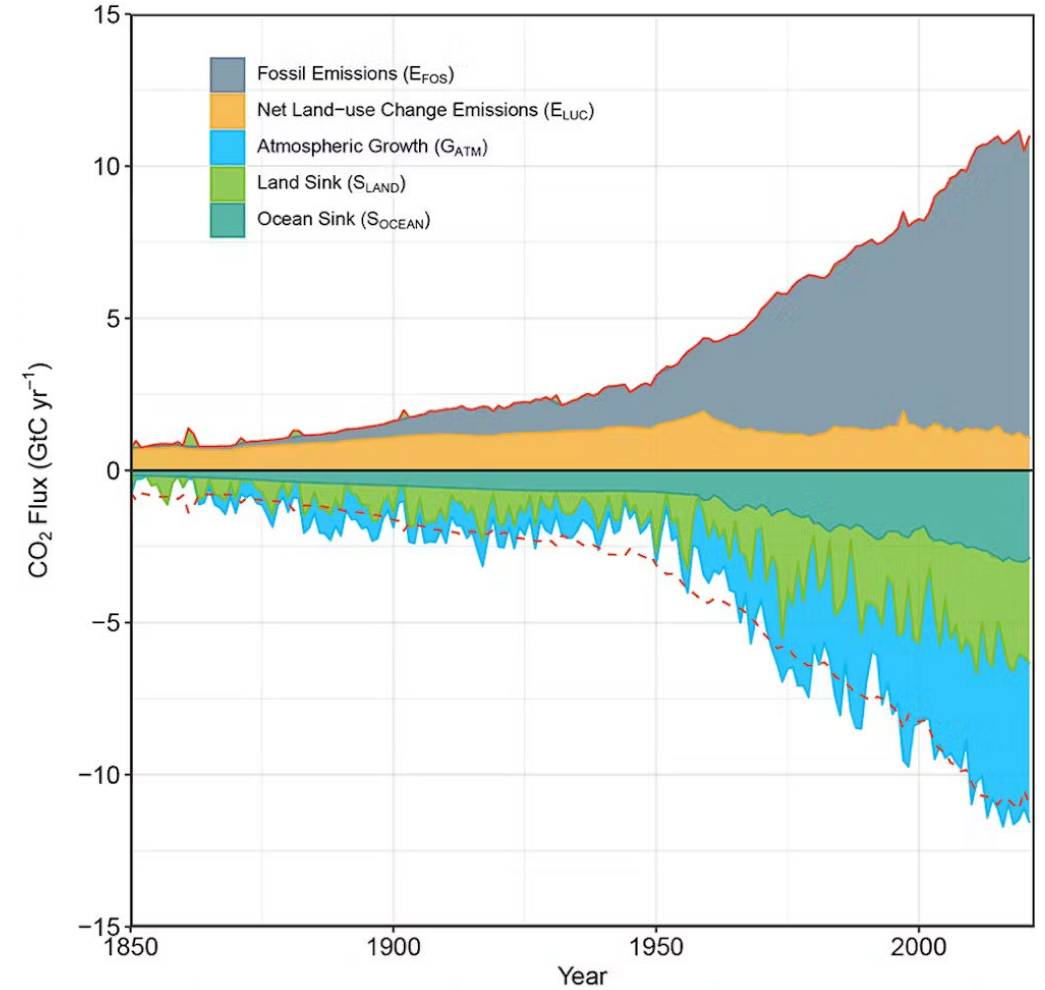
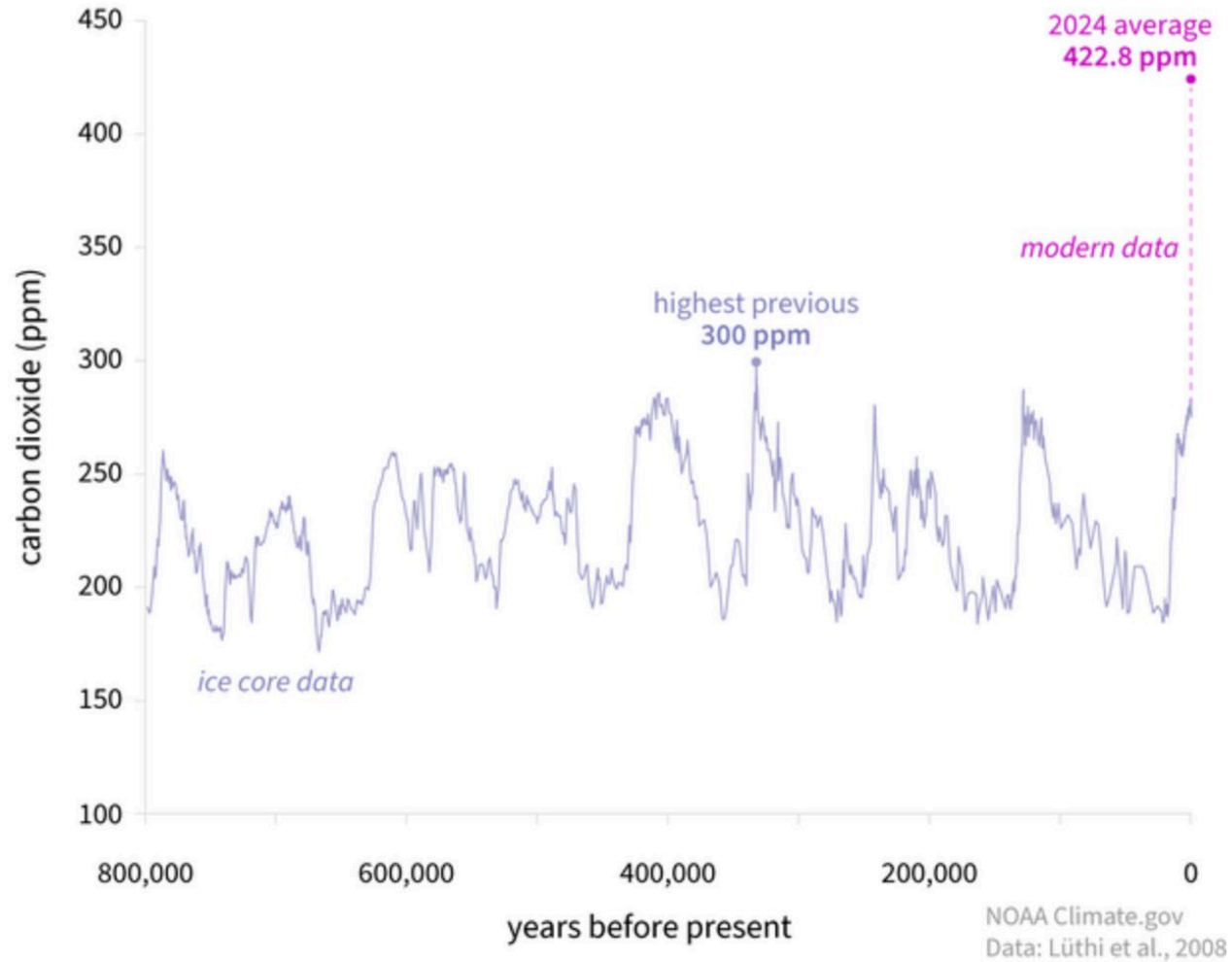
Marker Assisted Selection for Growth in OA – Pacific Oysters

James Dennis-Orr

Dr. Timothy Green

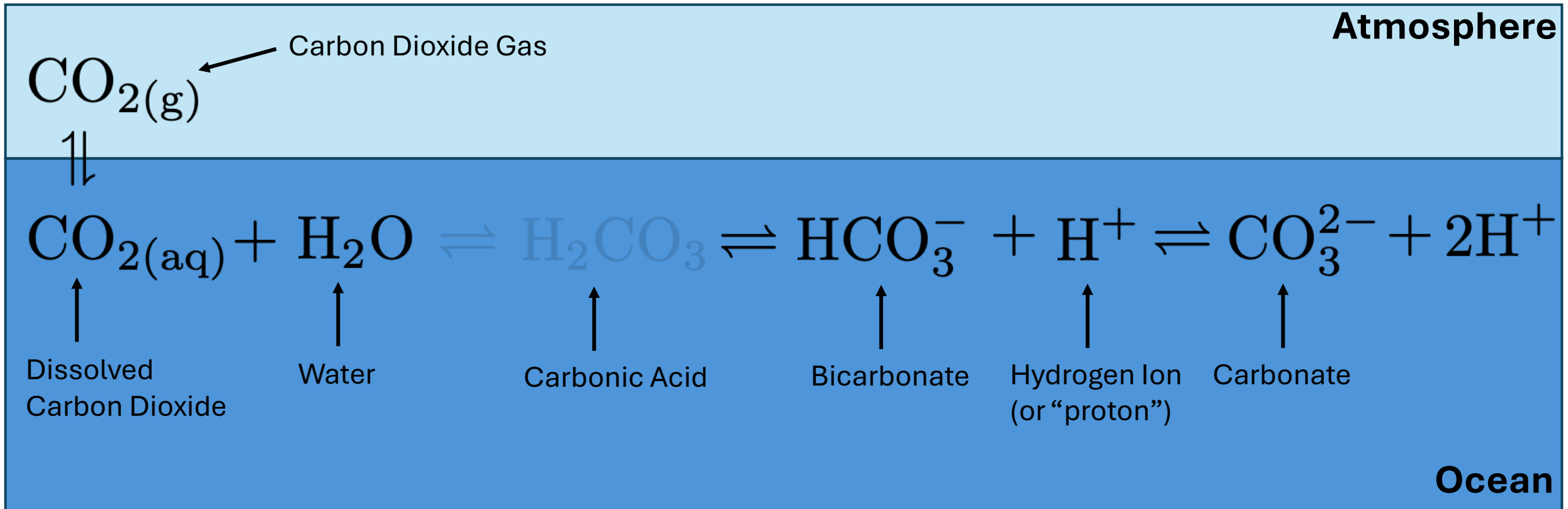
October 31st, 2025

CARBON DIOXIDE OVER 800,000 YEARS

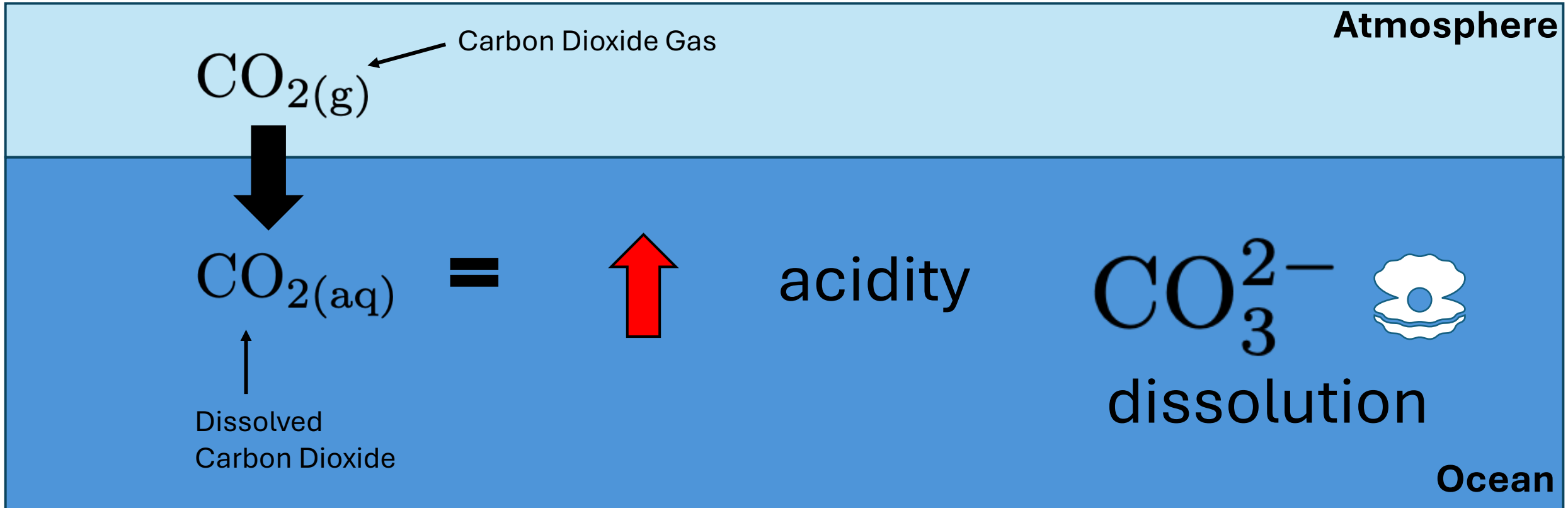


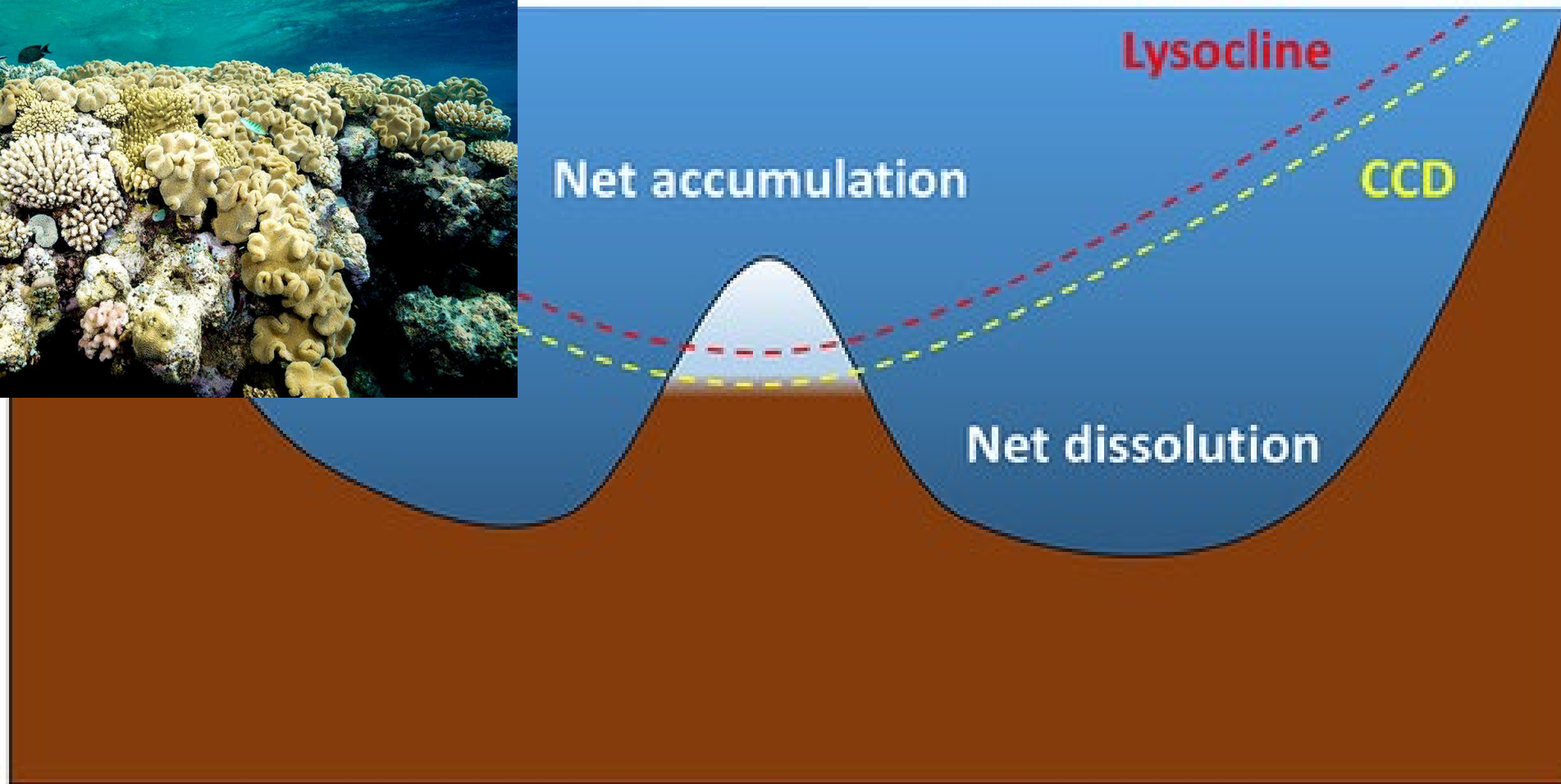
Global Carbon Budget 2021. Earth System Science Data
Friedlingstein, Pierre, et al. 2022,

The Issue

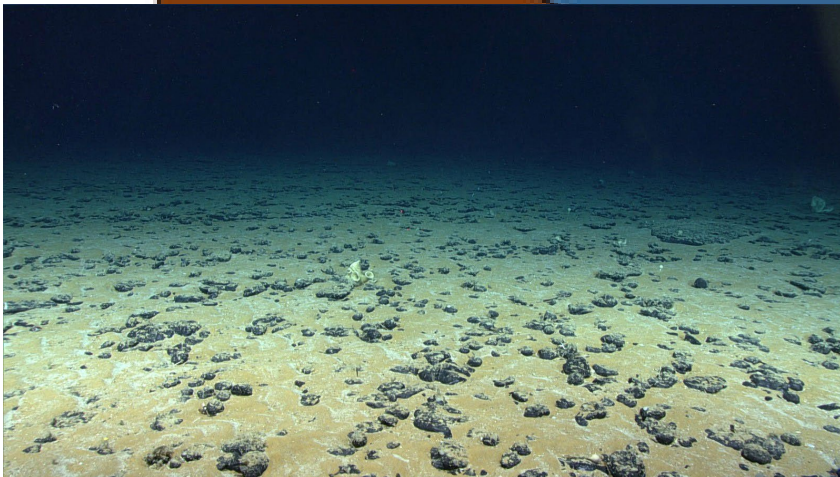
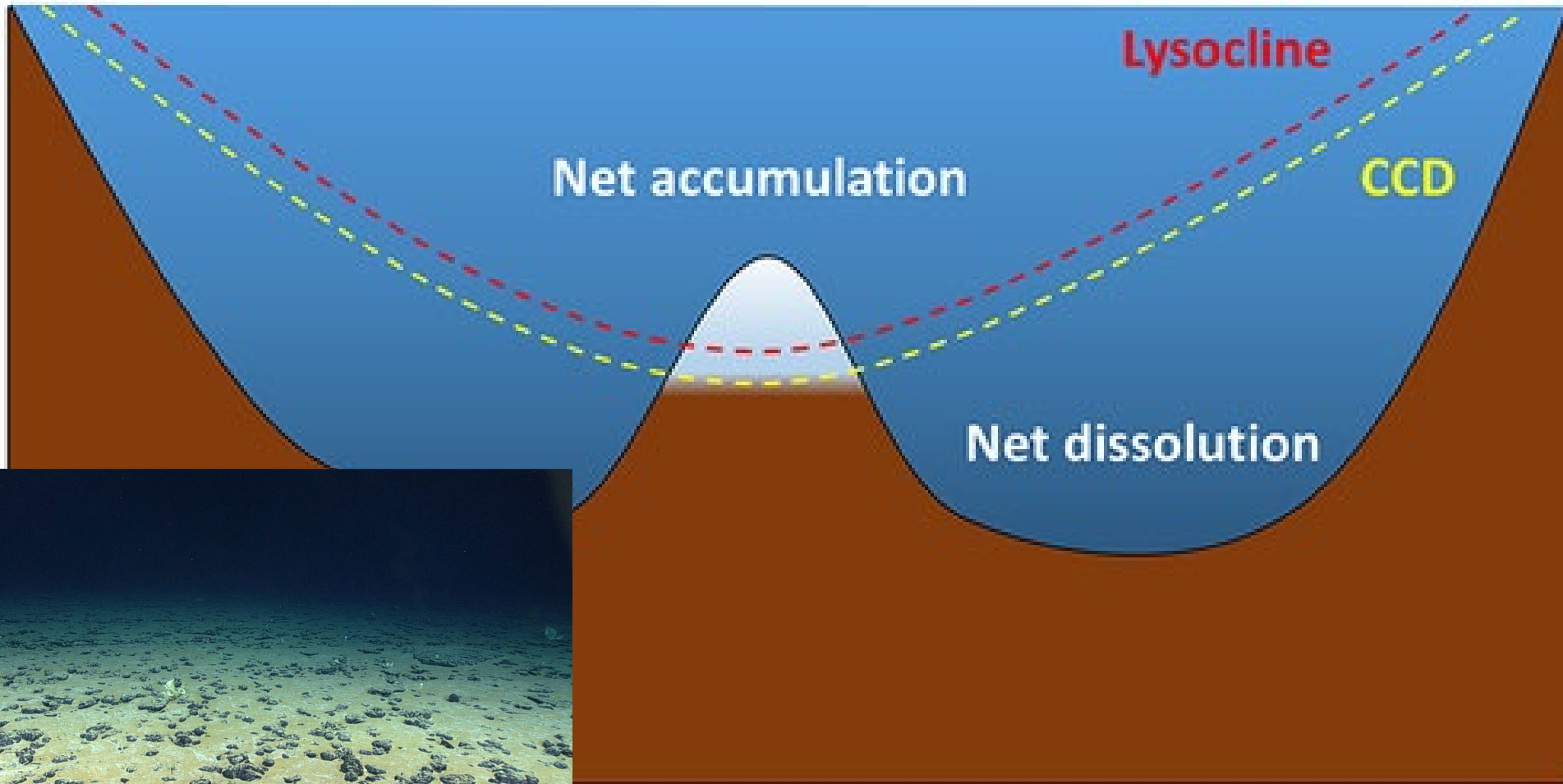


The Issue





Webb, P. (n.d.). 12.6 Sediment Distribution. Retrieved December 12, 2025, from <https://rwu.pressbooks.pub/webboceanography/chapter/12-6-sediment-distribution/>





Webb, P. (n.d.). 12.6 Sediment Distribution. Retrieved December 12, 2025, from <https://rwu.pressbooks.pub/webboceanography/chapter/12-6-sediment-distribution/>

Solution: Buffer



Long-term
survivor hazard
(Mackenzie et al., 2022).

Impacts of Seawater pH Buffering on the Larval Microbiome and Carry-Over Effects on Later-Life Disease Susceptibility in Pacific Oysters

Authors: [Clara L. Mackenzie](#)  , [Christopher M. Pearce](#), [Sarah Leduc](#), [Daniel Roth](#), [Colleen T. E. Kellogg](#), [Rute B. G. Clemente-Carvalho](#), [Timothy J. Green](#) | [AUTHORS INFO & AFFILIATIONS](#)

<https://doi.org/10.1128/aem.01654-22> •  Check for updates

 8 / 1,829



 CITE

PDF/EPUB

ABSTRACT

Ocean acidification upwelling events and the resulting lowered aragonite saturation state of seawater have been linked to high mortality of marine bivalve larvae in hatcheries. Major oyster seed producers along North America’s west coast have mitigated impacts via seawater pH buffering (e.g., addition of soda ash). However, little consideration has been given to whether such practice may impact the larval microbiome, with potential carry-over effects on immune competency and disease susceptibility in later-life stages. To investigate possible impacts, Pacific oysters (*Crassostrea gigas*) were reared under soda ash pH buffered or ambient pH seawater conditions for the first 24 h of development. Both treatment groups were then reared under ambient pH conditions for the remainder of the developmental period. Larval microbiome, immune status (via gene expression), growth, and survival were assessed throughout the developmental period.

Long-term survivor hazard (Mackenzie et al., 2022).



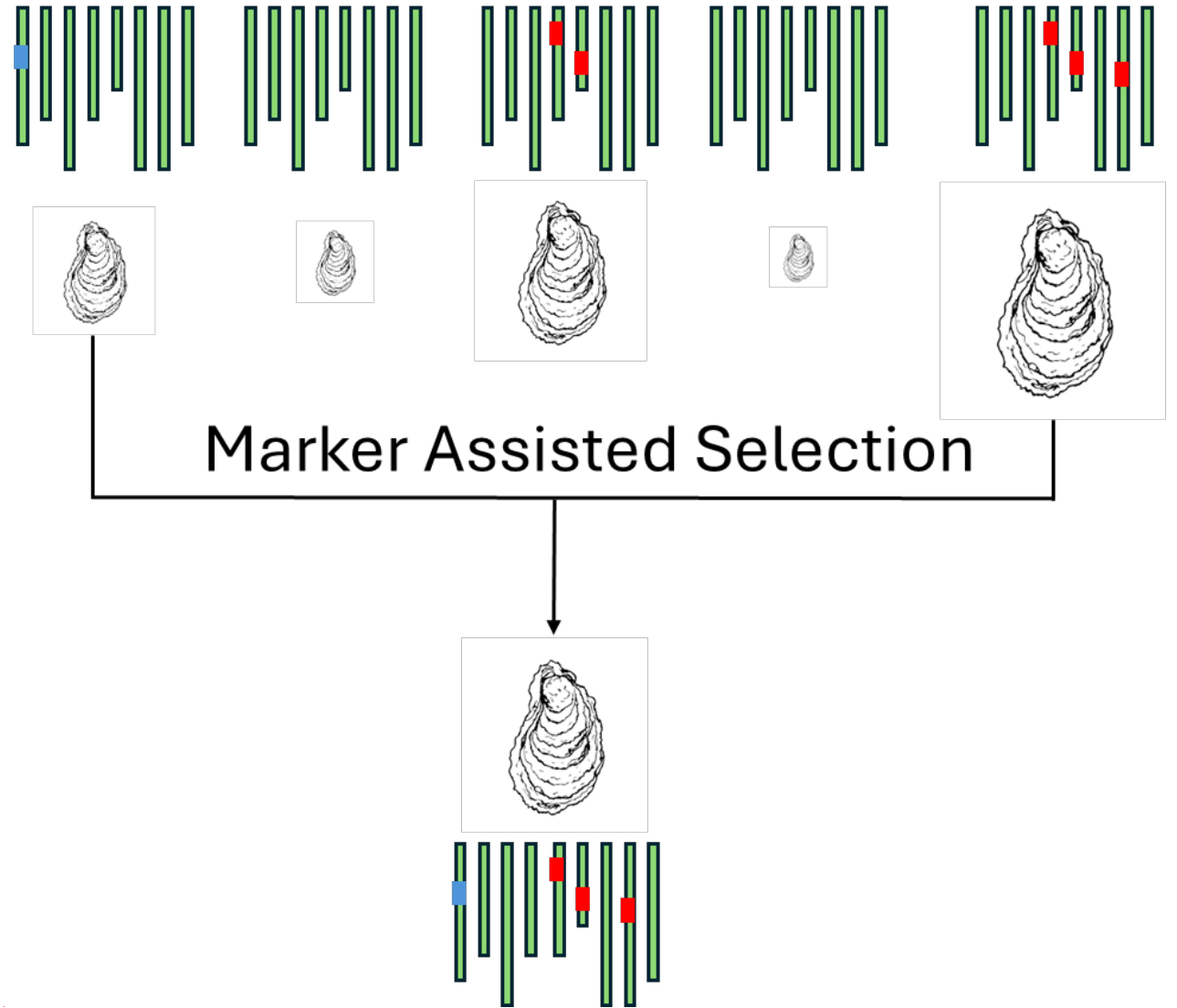
Solution: Breeding Programs

Marker Assisted Selection

Selecting for trait of interest based on genetic signatures

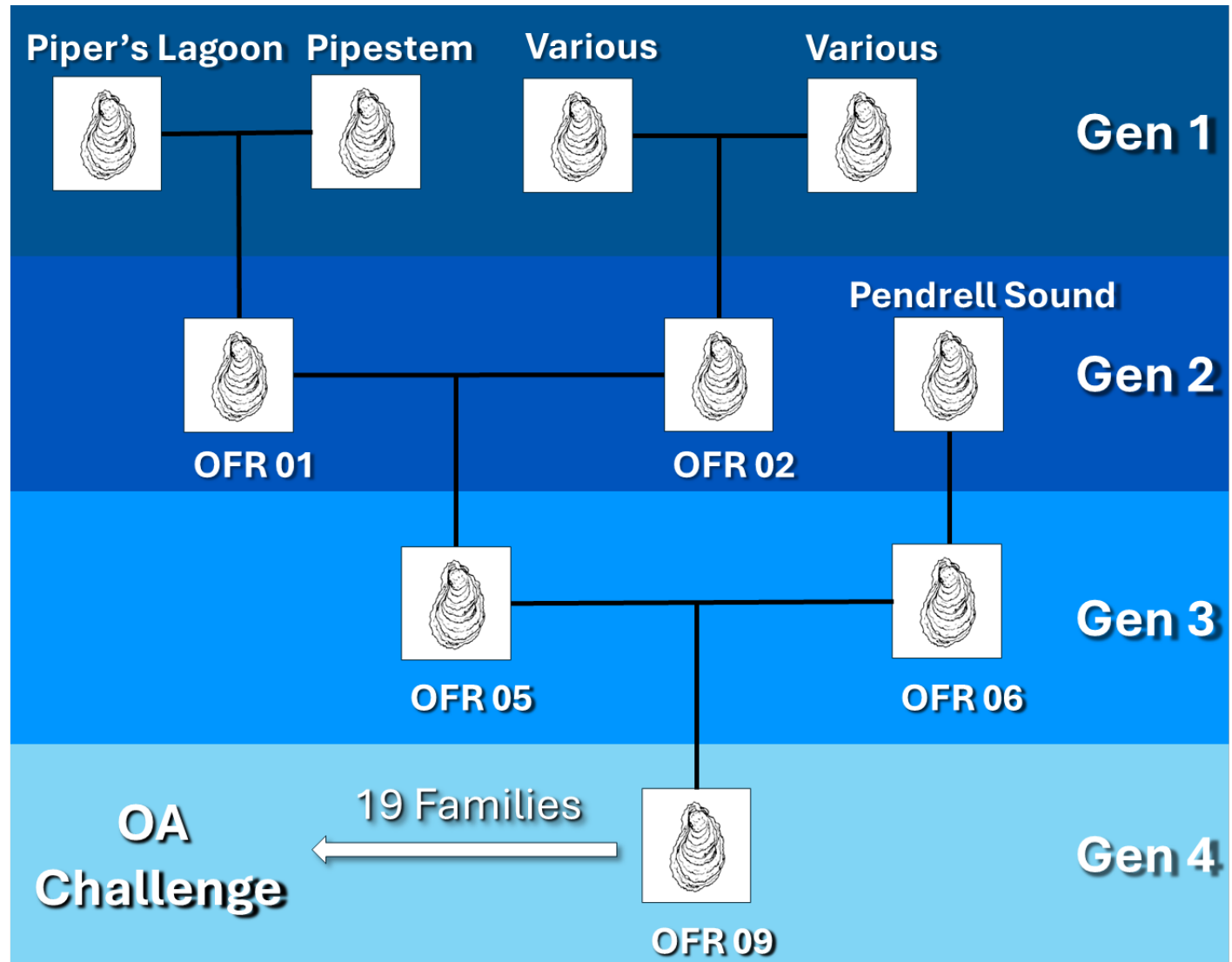
Resilience

Growth

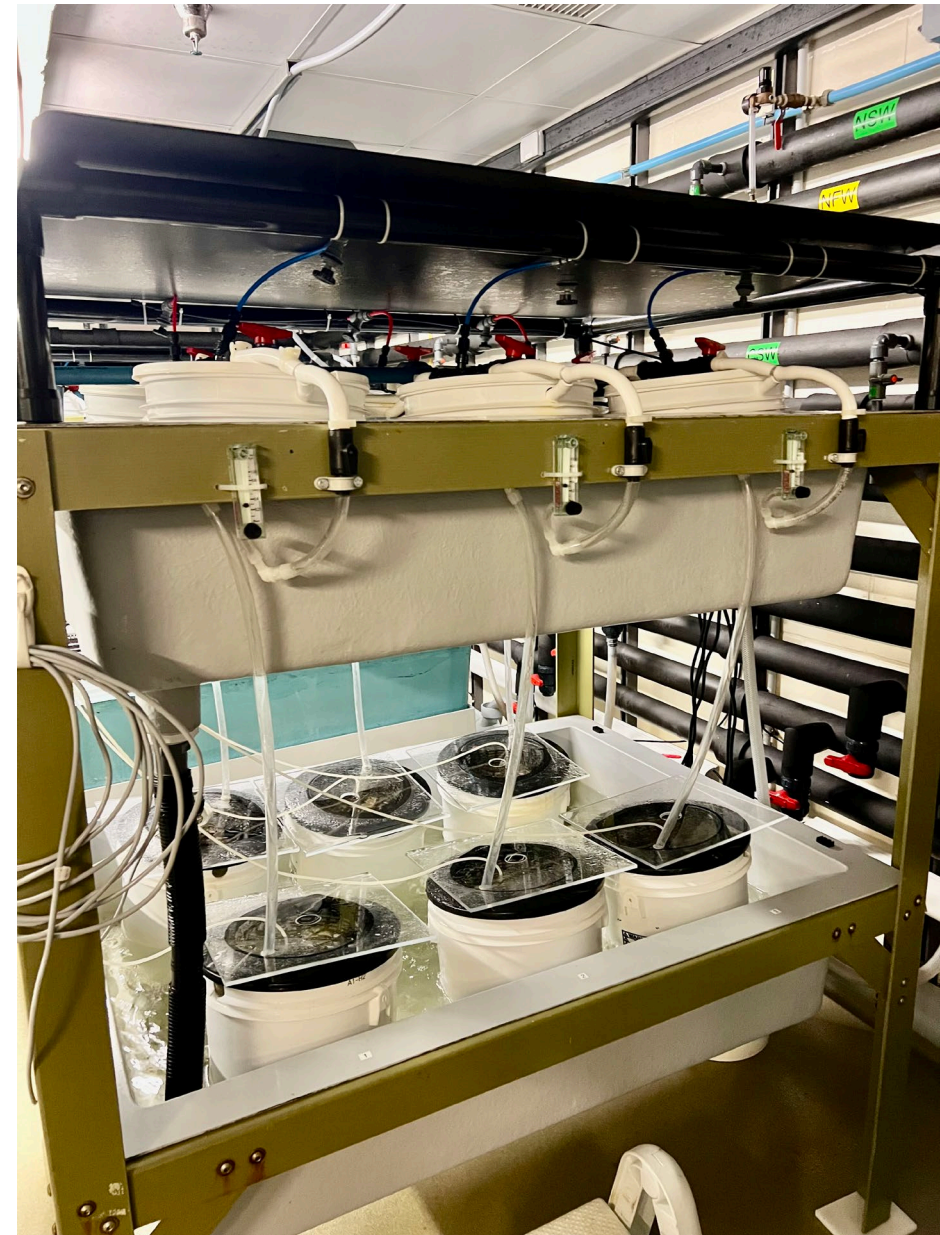


Experiment:

Trait: Growth in OA

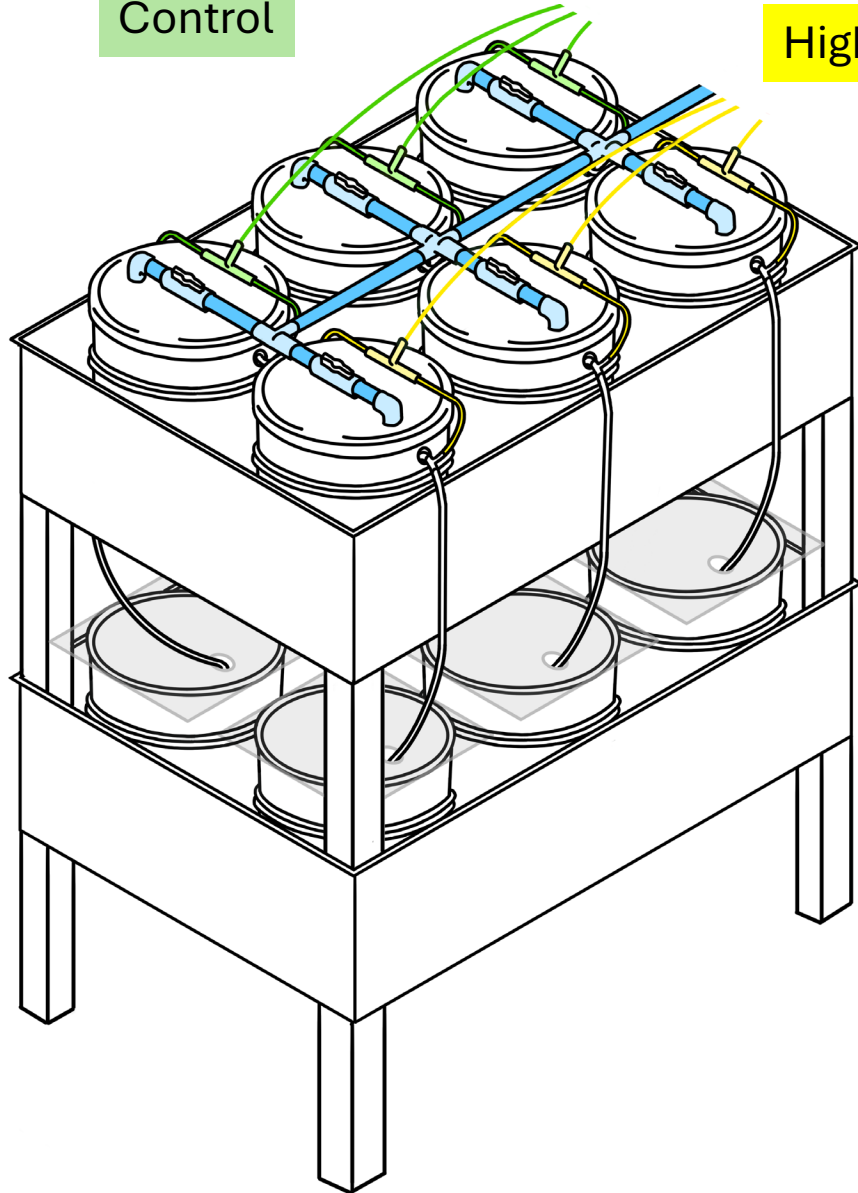


Experiment:



Control

High pCO₂



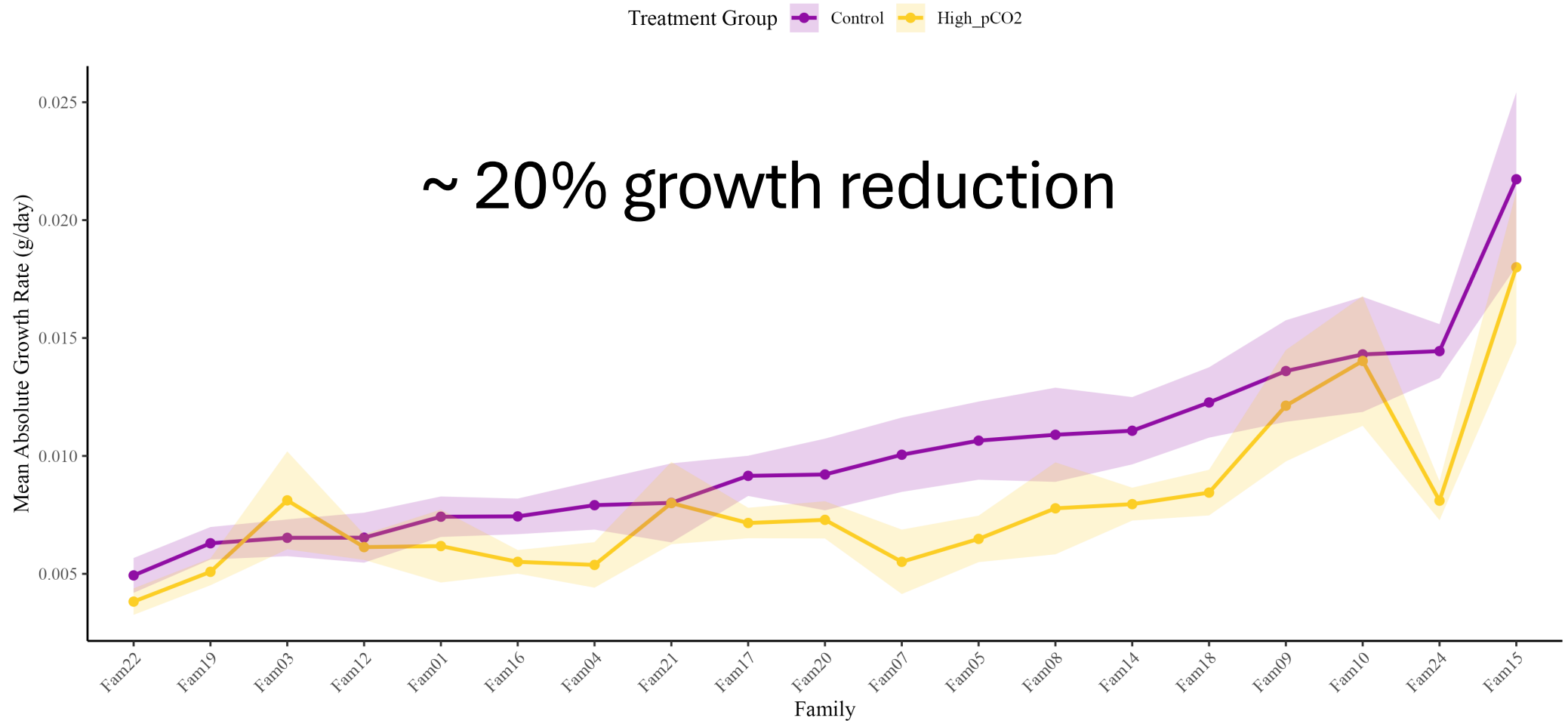
PBS FOCCOAL Lab

	Temp	pH	pCO ₂	ΩCa	Ωarg
Control	15.58	7.82	641.73	1.98	1.26
High pCO ₂	15.69	7.51	1368.87	1.03	0.66

Results OA Trial

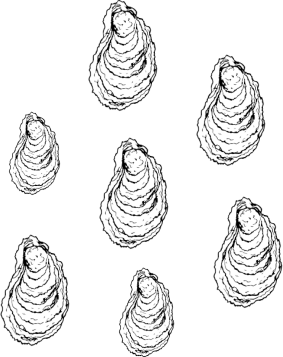
$$AGR\left(\frac{g}{day}\right) = \frac{(\text{Post-expt.wt (g)} - \text{Pre-expt.wt (g)})}{90 \text{ days}}$$

Treatment Response Graph: Control vs High pCO2

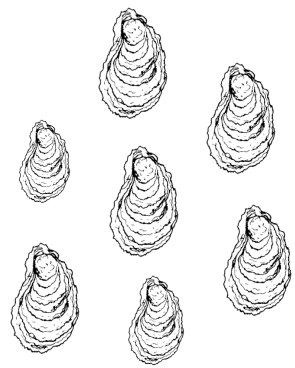


Results: Genetic Association

Sequenced 470
oysters



Results: Genetic Association

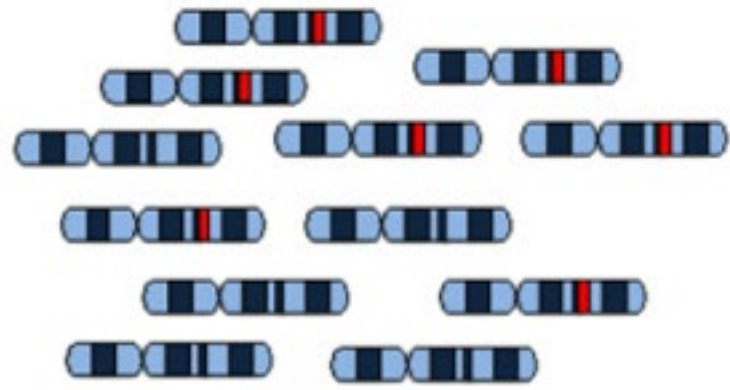
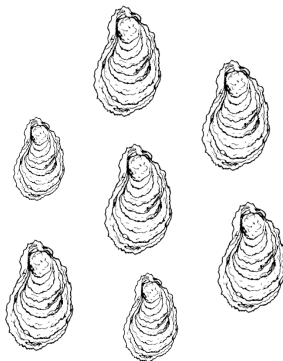


~ 25/
family



Amplicon Panel ~ \$14 per sample

Results: Genetic Association



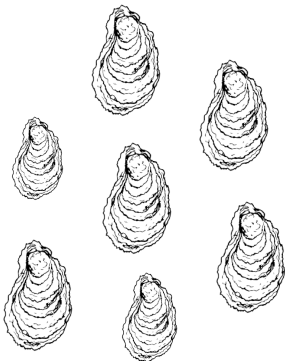
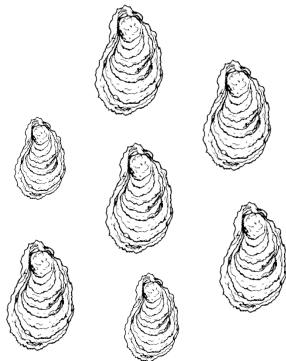
Sequence Data

Looked for significant mutations between oysters

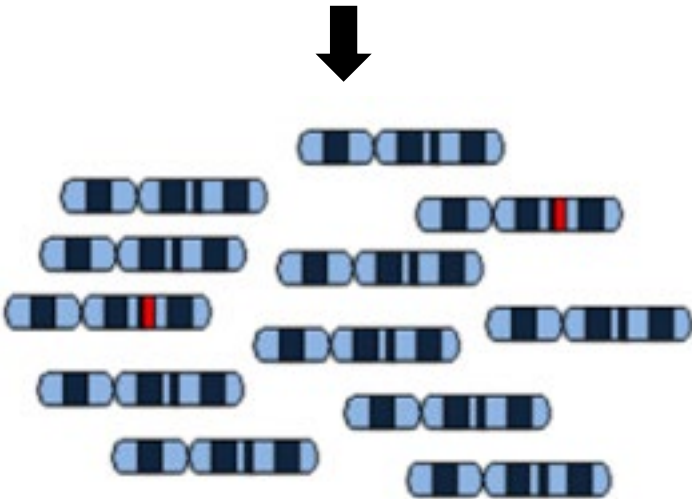
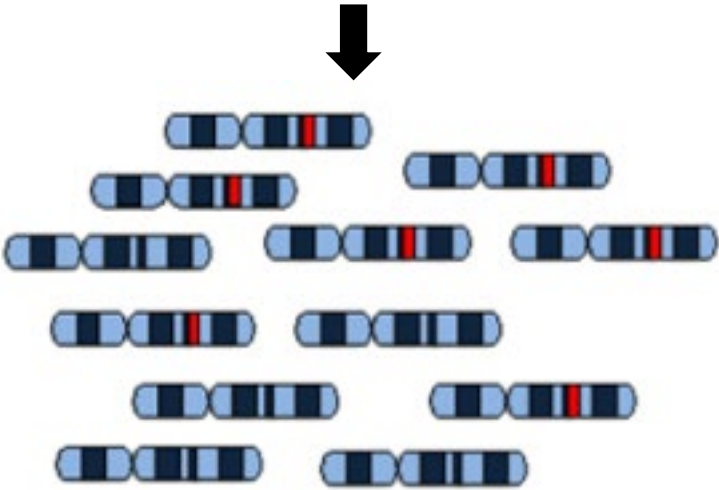
Results: Genetic Association

High Growth
Response

Low Growth
Response



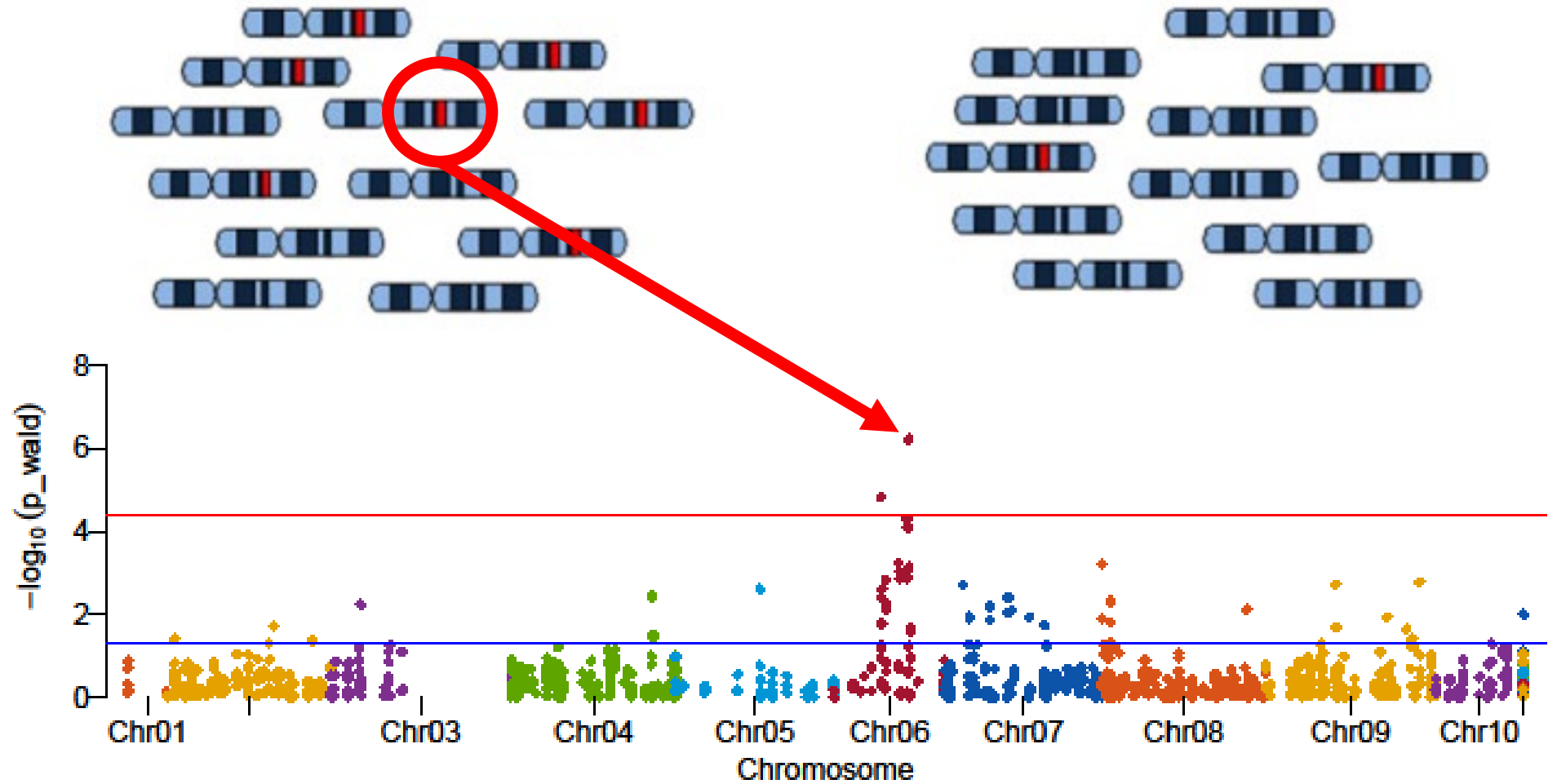
Mutations (SNPs)
High ~ 40%
Low ~ 20%



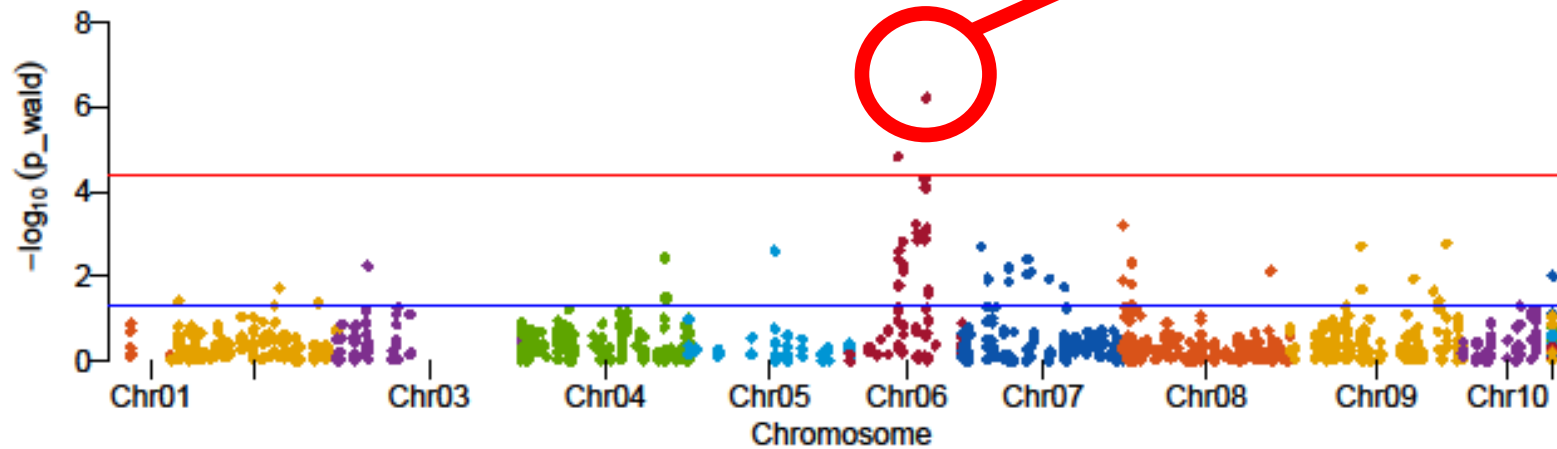
Genetic Association

High Growth Response

Low Growth Response



Genetic Association



Chromosome
NC_047562.1

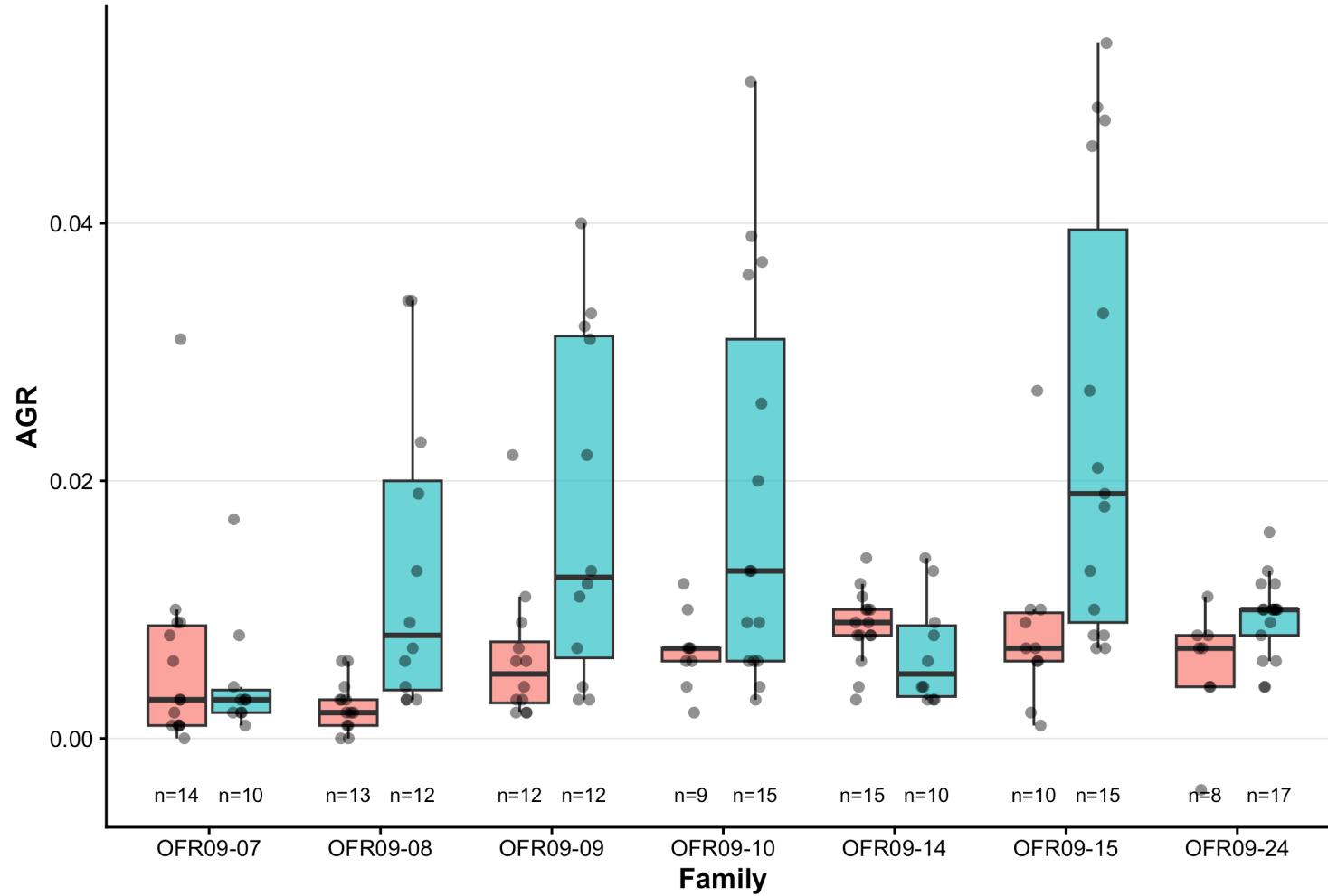
Location
38,779,125 base pairs



von Willebrand factor
A domain-containing
protein 8

Genetic Association – Hits per Family

Genotype (NC.047562.1 38,779,135 bps) ■ 0/0 ■ 0/1



Thank you!



Deep Bay
Marine Field Station

Acknowledgements:

Dr. Timothy Green;
Dr. Ben Sutherland;
Dr. Chris Pearce;
Dr. Clara Mackenzie;
Dr. Sean Rogers;
Karen Leask;
Dr. Andrew Loudon;
BC Shellfish Growers Association;
NSERC



BC SHELLFISH
GROWERS ASSOCIATION



UNIVERSITY OF
CALGARY

Canada



Fisheries and Oceans
Canada

Pêches et Océans
Canada