

History-modulated phenotypes drive acclimatization dynamics of coral in response to warming and acidification



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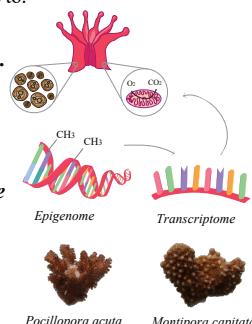
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Previous exposure to sublethal stress events has the potential to create a form of “environmental memory”, ultimately mitigating mortality on reefs in the face of climate change. We expect a resilient (*Montipora capitata*) and a sensitive (*Pocillopora acuta*) coral species to:

1 Display an increased *magnitude* of physiological change in chronic stress conditions and stabilize in recovery conditions.

- Holobiont response: respiration, growth, tissue biomass, bleaching score, total protein concentration, total antioxidant capacity
- Symbiont response: symbiont density, photosynthetic rates, chlorophyll a & c concentration



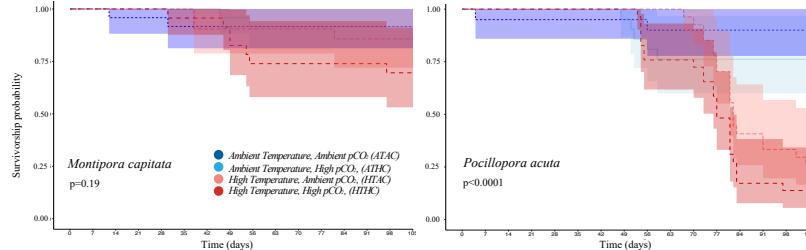
2 Exhibit a DNA methylation modulated decrease in *magnitude* of change in gene expression variability in chronic stress conditions and stabilize in recovery conditions.

- Gene expression levels and variability (RNASeq)
- DNA methylation patterns (MBD-BSeq)

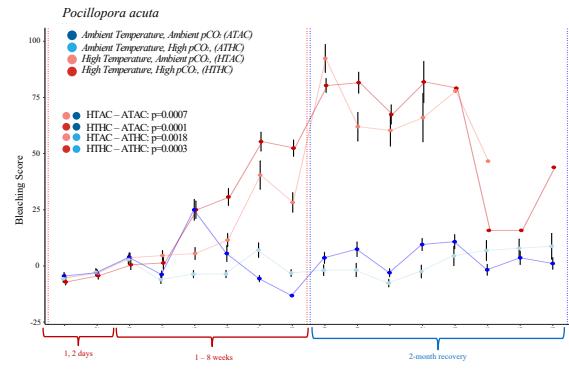
We exposed corals to 2 months of elevated temperature (29.5 °C) and pCO₂ (pH 7.6-7.7) conditions, 2 months of ambient conditions (27 °C; pH 8.0), and a recurrent stress event (Fall 2019 Hawaii Bleaching Event).

We expect prior exposure to a stress condition will produce a decrease in *magnitude* of response in a recurrent stress event (i.e. a history-modulated phenotype in a subsequent stress).

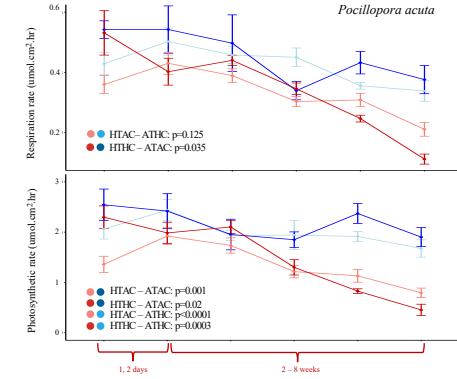
Survivorship probability: Species and exposure to thermal stress are significant indicators of response.



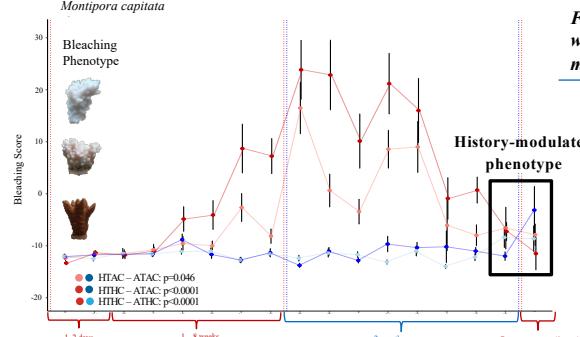
Bleaching Score: species and exposure to thermal stress are the most significant indicators of response. The *magnitude* of change in response increases in chronic stress and stabilizes in recovery.



Respiration and photosynthetic rates: thermal stress is the most significant indicator of response, and the *magnitude* of change increases in chronic stress conditions.



Future Directions; History Matters: Prior thermal exposure will continue to decrease the magnitude of stress response in multiple recurrent stress and recovery events.



- 1 Differential diel thermal history will produce differential inherent DNA methylation patterns.
- 2 The largest diel thermal range will exhibit a larger decrease in *magnitude* of response in DNA methylation, gene expression variability, and physiological response.
- 3 In multiple recurrent stress and recovery events, the *magnitude* of response will continue to decrease with each stress event.