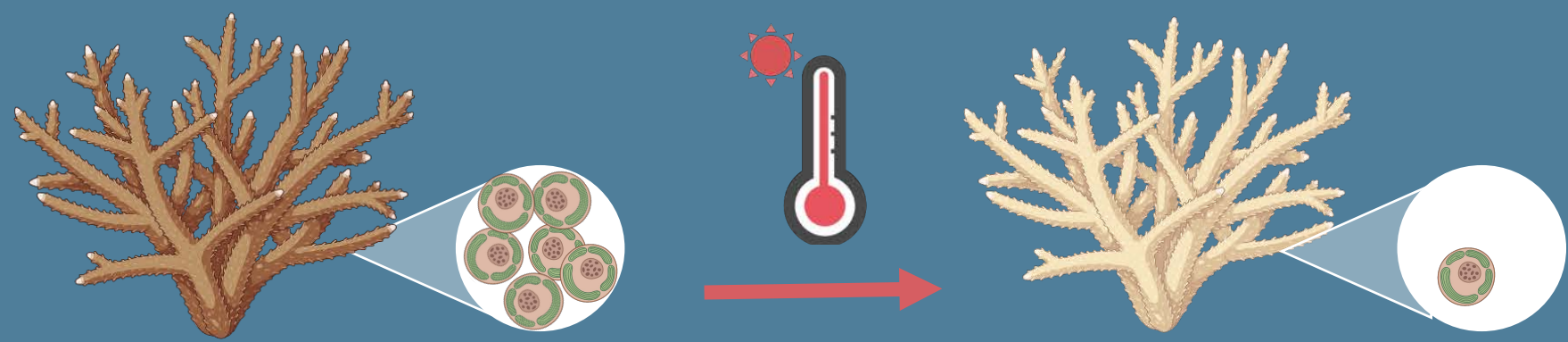


## Climate change threatens corals

Coral bleaching is one of the most visible symptoms of ocean warming.

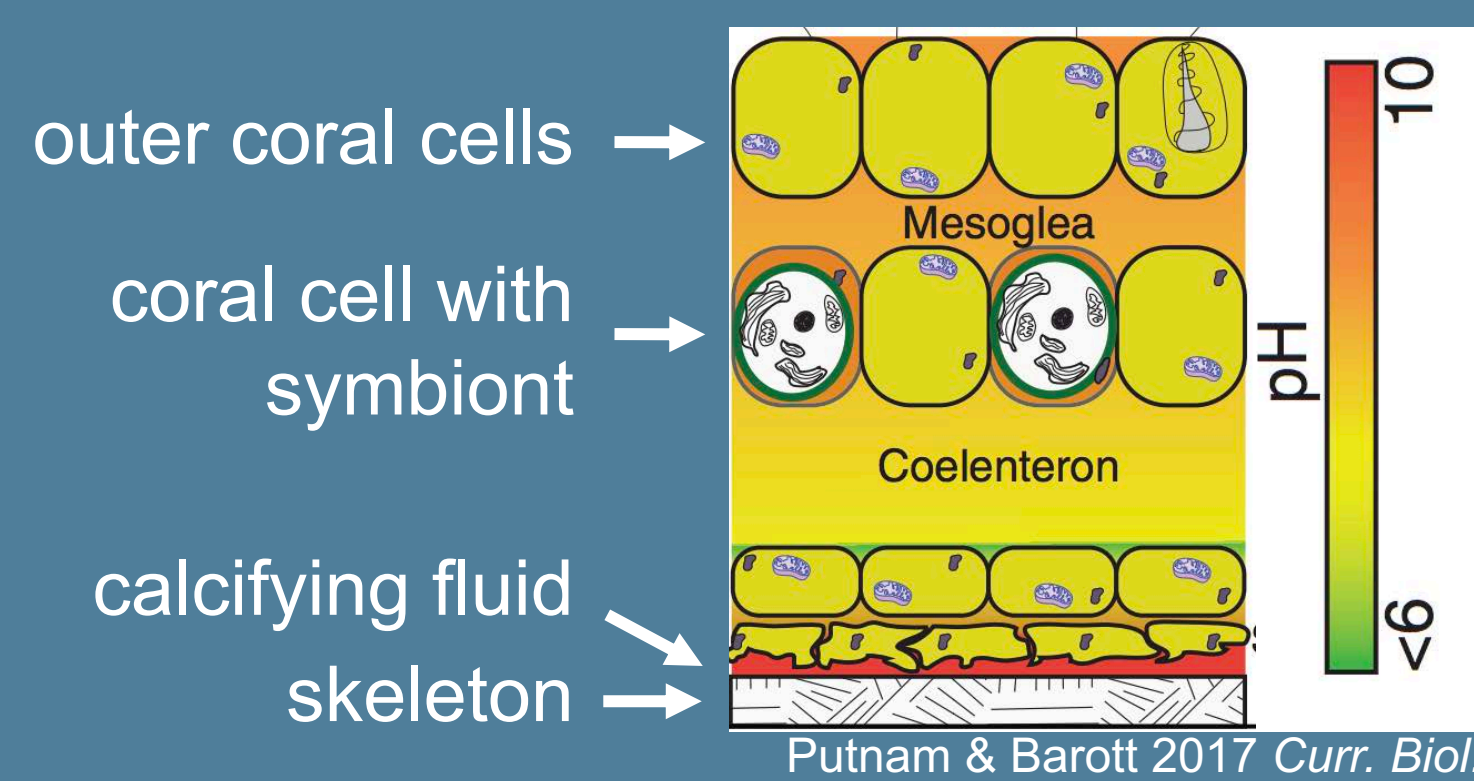
Healthy corals host symbiotic algae that provide energy for the coral.

When temperatures rise, corals expel symbionts as a stress response. This limits the energy available for corals to maintain homeostasis and grow.



## Why does coral acid-base regulation matter?

Even though coral reefs are < 3% of the ocean by area, they provide habitat for over 25% of total marine biodiversity. Corals build massive skeletons that form the physical foundation of coral reef ecosystems. To keep building reefs, corals must regulate the internal fluid next to their skeletons to keep it alkaline.

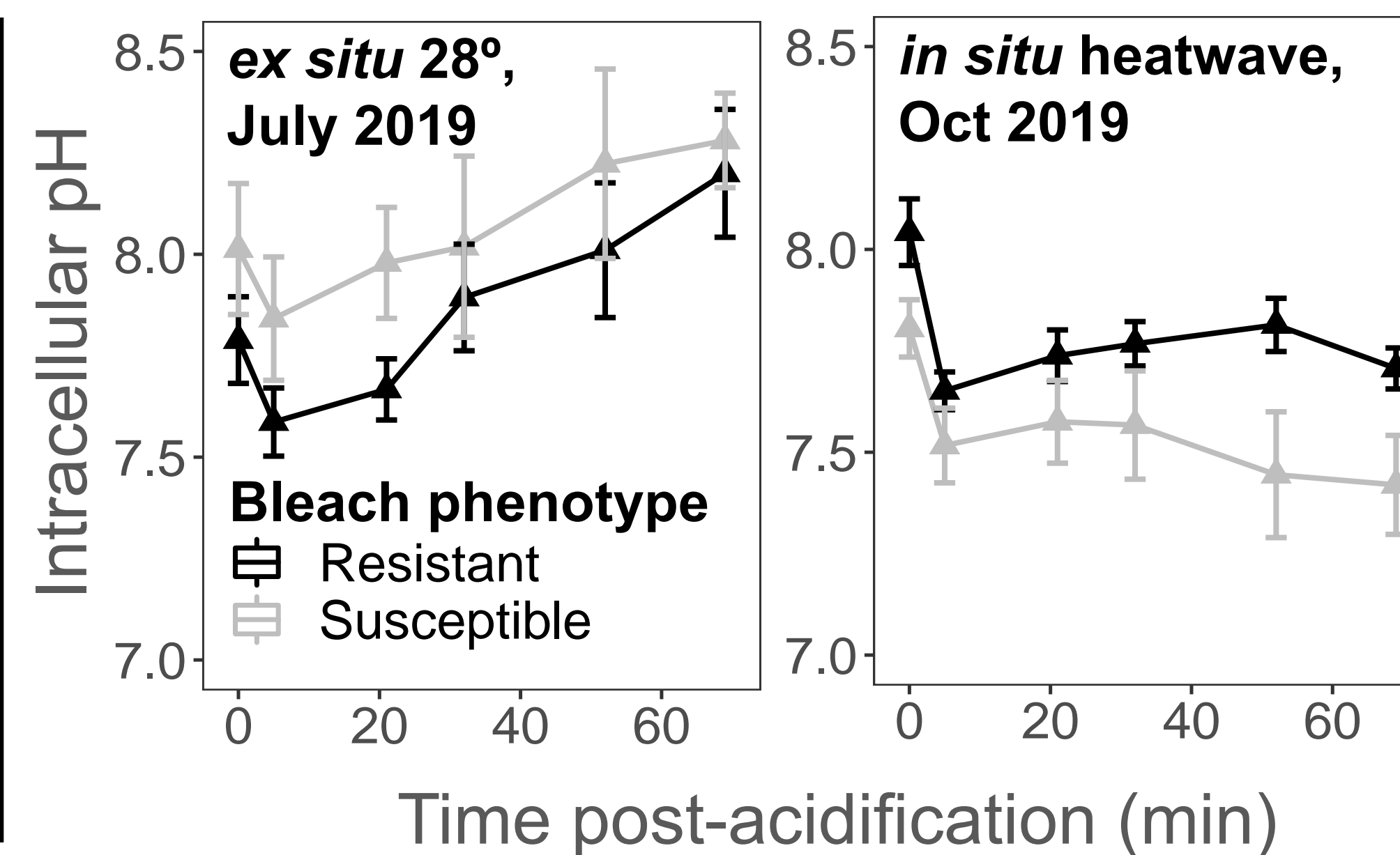
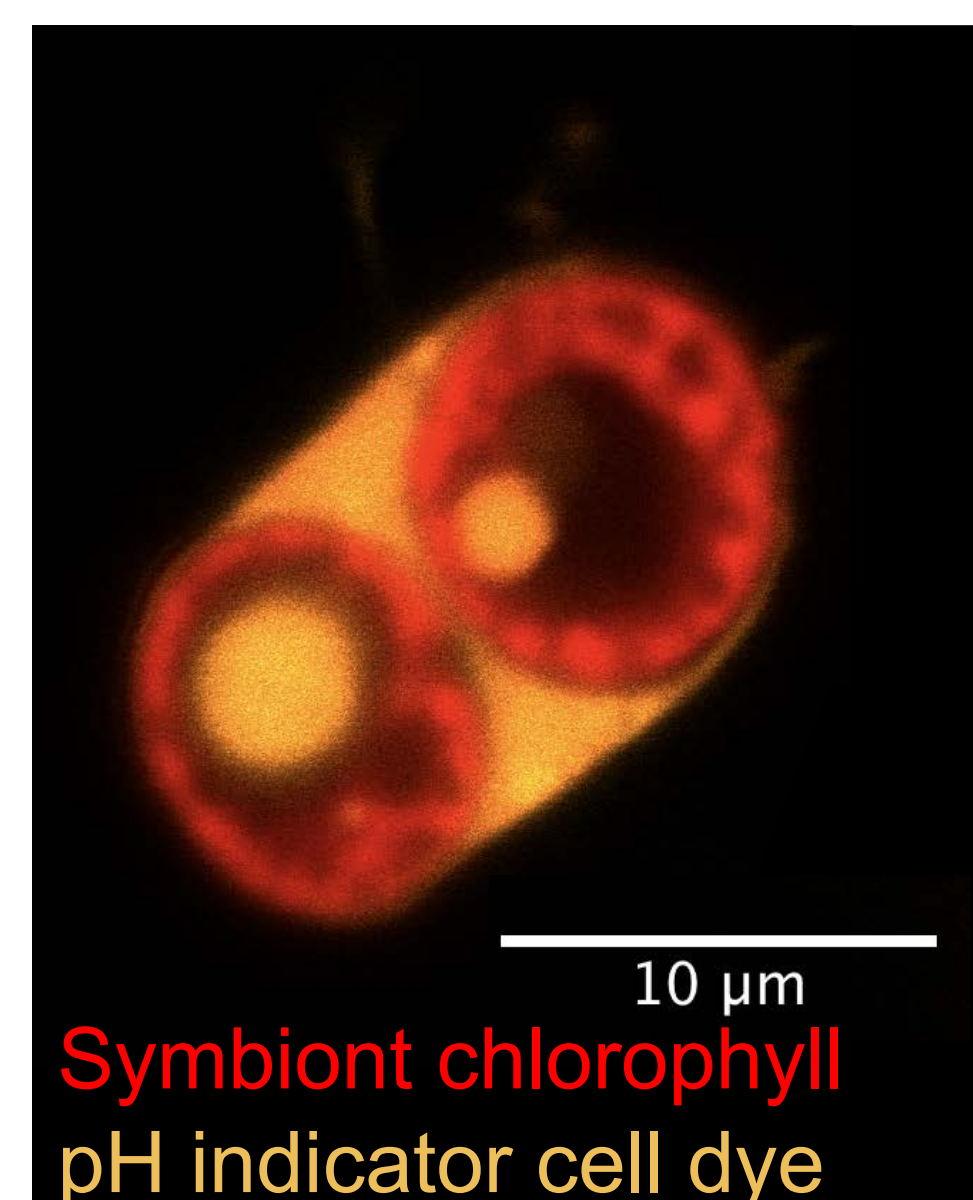


**We asked: Can corals that resist bleaching also maintain their internal pH during heatwaves?**

# Ocean warming acidifies coral cells.

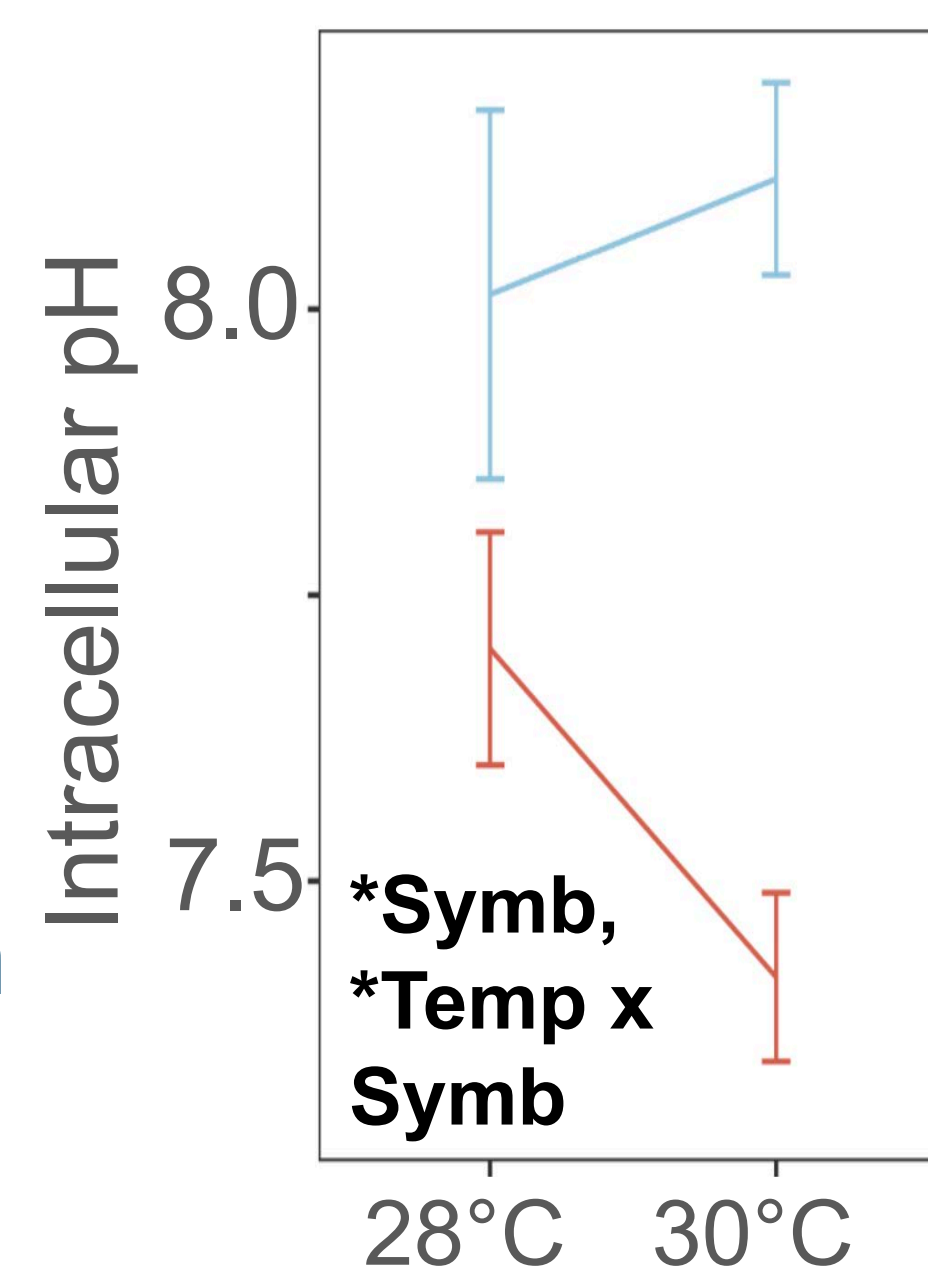
## During marine heatwaves

Corals can normally recover their cell pH after an acute acidification stress test (left), but they can't do this during a marine heatwave (right). Even bleaching-resistant individuals are vulnerable.<sup>1</sup>

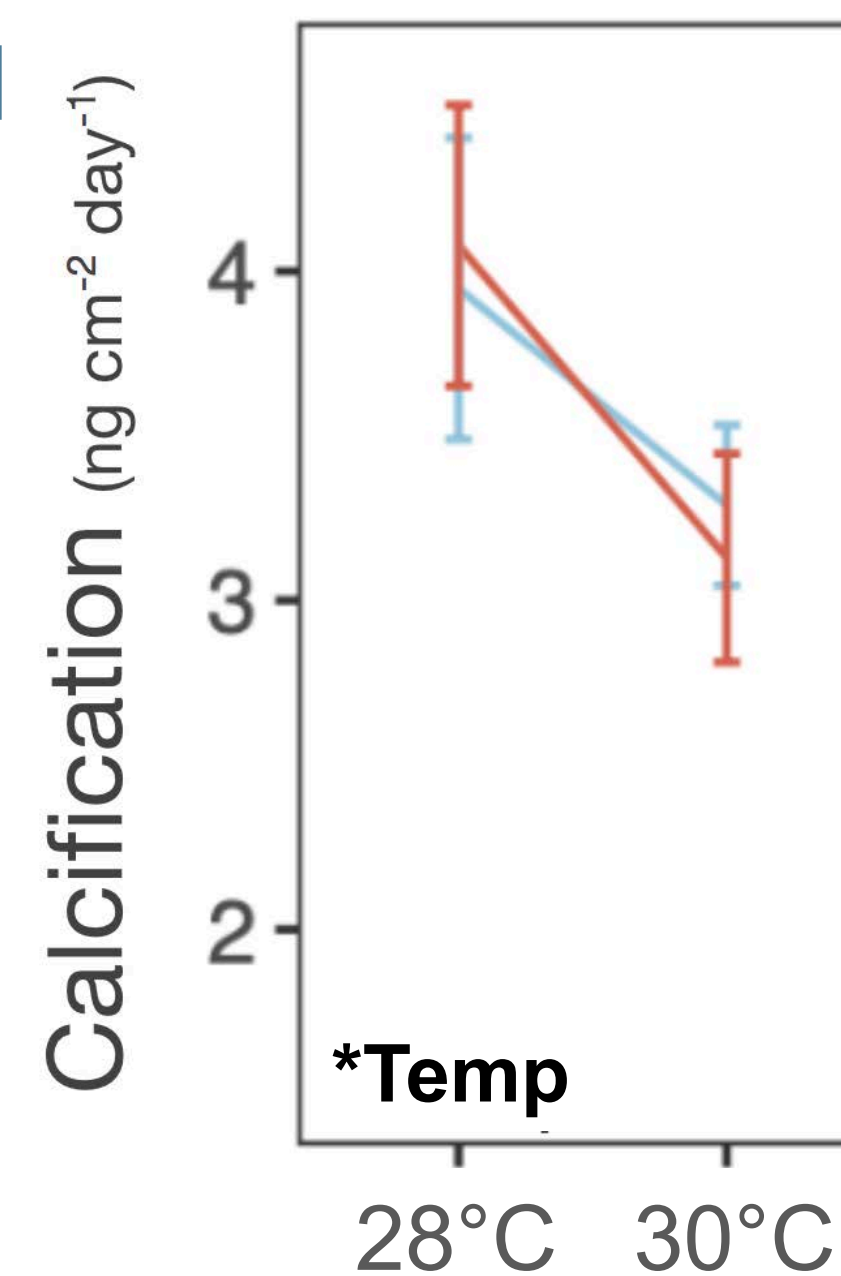


## After experimental heat stress

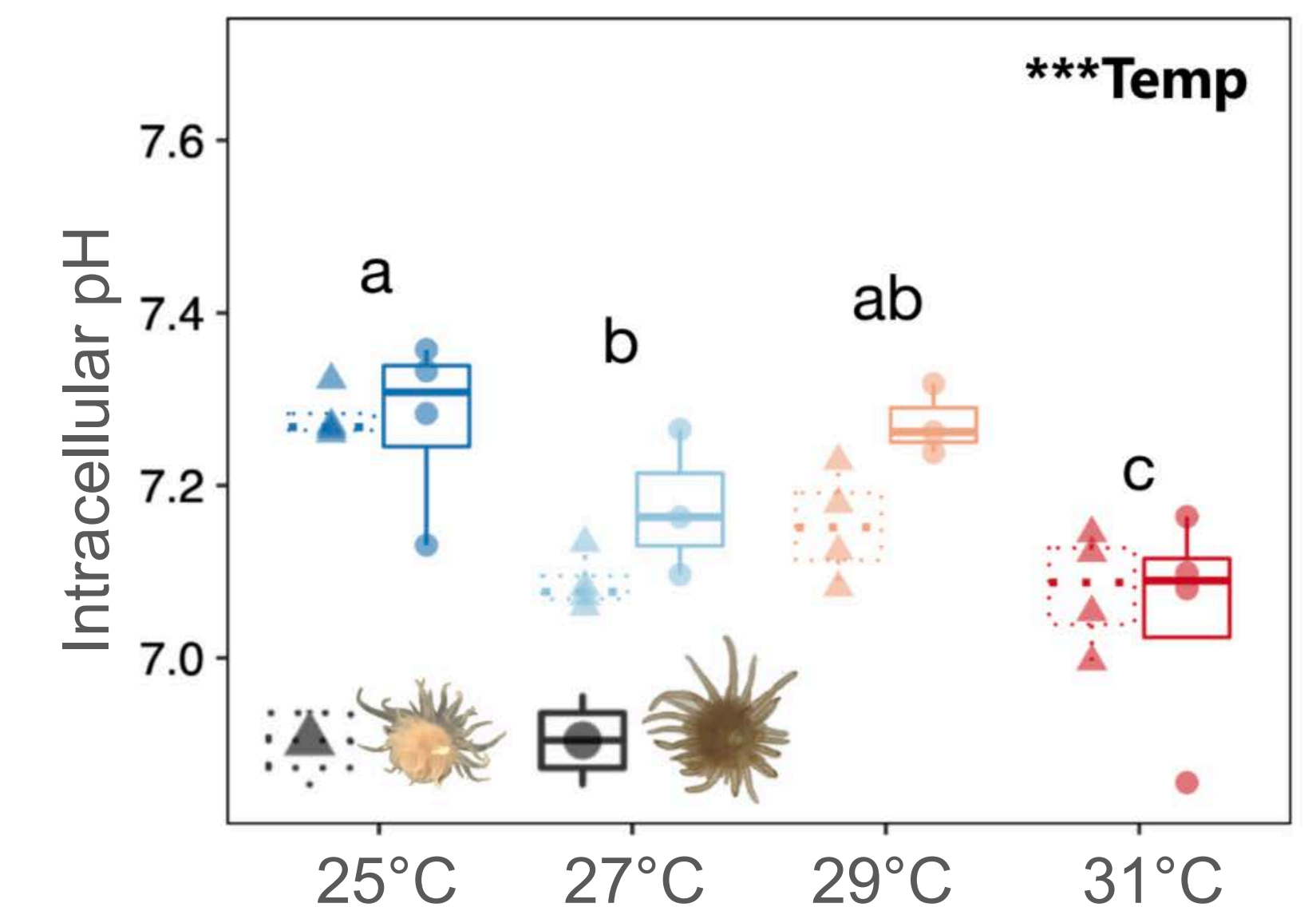
Bleaching-resistant symbionts do not protect against cellular acidification after heat treatment.<sup>2</sup>



Corals build less skeleton after heat treatment, even if they managed to keep their symbionts.<sup>2</sup>



Heat drives cell acidification in related sea anemones even if they have no symbionts to lose in the first place:<sup>3</sup>



**Heat stress directly interferes with coral cellular acid-base chemistry, even when no coral bleaching is observed.**

## Learn more:

<sup>1</sup> Symbiotic dinoflagellates divert energy away from mutualism during coral bleaching recovery



<sup>2</sup> Marine heatwaves depress metabolic activity and impair cellular acid-base homeostasis in corals



<sup>3</sup> Heat stress disrupts acid-base homeostasis in the model cnidarian *Exaiptasia diaphana*



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