

arm length, but the additive effects of these two

Anthropogenic CO₂ is significantly changing the pCO₂, temperature, and carbonate chemistry of seawater. Recent projections suggest that, within the next century, ocean pCO₂ will increase by approximately 600–700 μatm (ocean acidification) and ocean temperatures will increase by 1.3–3.0 °C (ocean warming).¹ The combined effects of these variables is termed marine climate stress. A particular concern revolves around the capacity for marine climate stress to inhibit the ability of m

opposing hypotheses for the way in which marine climate stress will influence echinoderm calcification, metabolic efficiency, and reproduction: either an additive or synergistic effect.^{3,4}

In this study, were exposed to ocean water of either ambient, high temperature, high pCO₂, or high temperature and high pCO₂ for 60 days, and the regeneration length of the amputated arm

factors resulted in smaller regenerated arms compared to ambient conditions (Figure 1). Sea stars regenerating under high pCO₂ exhibited a lower proportion of calcified mass, which could be the result of a more energetically demanding calcification process associated with marine climate stress (Figure 2). These results indicate that calcification is sensitive to increasing pCO₂, and that climate change will have an overall net negative effect on sea star arm regeneration. Such effects could translate into lower predation rates by a key consumer in the temperate rocky intertidal of North America.

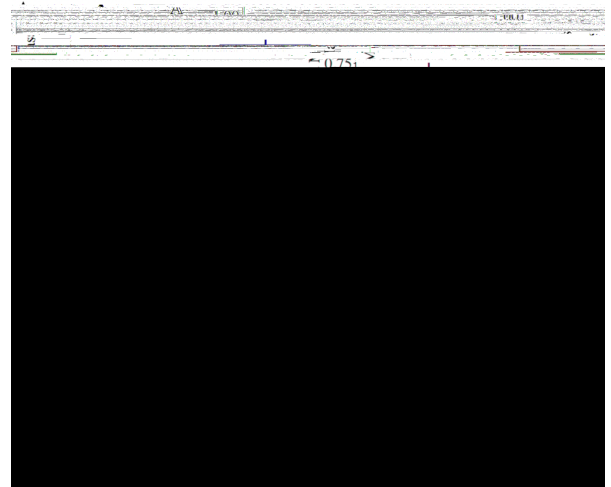
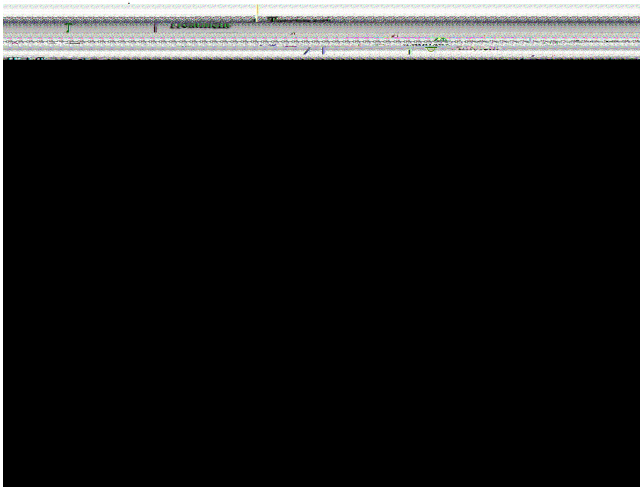


Figure 1. Measurement of arm regeneration length (cm) for sea stars under different conditions.

Figure 2. Measurement of arm regeneration length (cm) for sea stars under different conditions.

[1] Caldeira and Wickett (2003). *Science*, 302, 365. [2] Fabry et al. (2008). *Journal of Geophysical Research*, 113, 414- 432. [3] Bingham et al. (2000). *Journal of Geophysical Research*, 105, 596-605. [4] Hu et al. (2014). *Journal of Geophysical Research*, 119, 2411-2421.