Impacts of ocean acidification and warming on shell mineralogy in the juvenile American lobster

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The American lobster fishery is a significant component of the New England economy and community. Gulf of Maine lobster populations are currently experiencing the effects of rapid warming and acidification due to climate change [1]. Though lobster shells are primarily constructed of chitin, lobsters strategically precipitate key minerals (calcite, ACC, CAP) in the shell during development to enhance structural integrity and help protect against bacterial intrusion by creating an alkaline buffer boundary [2]. We hypothesize that the combined stress of low pH and high temperatures will result in 1) significantly less mineral presence, 2) the precipitation of less energetically stable polymorphs or crystal lattice deformation of CAP and calcite, and 3) greater/more severe bacterial lesions. Our research shows significantly less calcium and higher incidence of twinning in shells from the multi-stressor treatment.

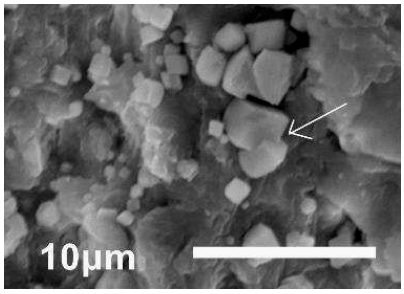

Figure 1: Twinning (01·1 nested); multi-stressor treatment

Mineralogy within shell lesions shows a decline in abundance and size differences due to treatment conditions resulting in a decrease in the efficacy of the bacterial buffer boundary. The results from this study enhance our understanding of lobster and, more broadly, crustacean biomineralogy by revealing how those minerals aid in protection against bacterial intrusion and how increasing warming and acidification affect these critical components leading to reduced survival.

[1] Pershing *et al* (2015) *Sci. Res. Rep.* **350**, 809-812. [2] Kunkel *et al* (2012) *J. Shellfish. Res.* **31**, 515-526.