

## **The effects of ocean acidification on the feeding physiology of Atlantic surfclams**

Carbon dioxide ( $\text{CO}_2$ ) released into the atmosphere can be absorbed by the world's oceans.  $\text{CO}_2$  reacts with water ( $\text{H}_2\text{O}$ ) to form carbonic acid ( $\text{H}_2\text{CO}_3$ ), which dissociates into bicarbonate ( $\text{HCO}_3^-$ ) and hydrogen ions ( $\text{H}^+$ ). This addition of  $\text{H}^+$  is decreasing ocean pH, which is a phenomenon known as ocean acidification (OA). This change in water chemistry could be detrimental to fishery resource organisms, especially those with calcium carbonate shells. The commercial and recreational fishing industry is vital to the United States economy, supplying 1.62 million jobs and bringing in 208 billion in sales. Atlantic surfclam, *Spisula solidissima*, harvest is one of these important fisheries, grossing \$31 million in 2016. The effects of OA upon surfclams are largely unknown. Physiological functions (i.e., growth, feeding rates) also may be affected by OA conditions. An experiment was conducted to test the effects of OA upon feeding physiology of surfclams. Surfclams were grown under three different  $\text{CO}_2$  conditions: 641 ppm (pH 7.84, the control), 1369 ppm (pH 7.53), and 2180 ppm (pH 7.33) from April 11 –July 5, 2019. Filtration and feeding variables were measured five times during the exposure period using the biodeposition method to determine any response to OA. A significant difference was found in average assimilation efficiencies (AE) and absorption rates (AR) between treatment groups, with clams exposed to highest levels of  $\text{CO}_2$  having significantly reduced AE and AR when compared to the control. Clams exposed to moderate levels of  $\text{CO}_2$  did not behave significantly different from the control in either AE or AR, suggesting a coping strategy. A significant interaction was found in filtration and clearance rates, meaning that on some sampling dates these factors were significantly influenced, and on others they were not. On sampling days that were significant, the same trend was above was observed, where the high  $\text{CO}_2$  corresponded to lower values of CR and FR, and moderate  $\text{CO}_2$  levels corresponded to CR and FR values similar to control.

Advisor: Steven Baer