



Environmental Sciences: Ocean Acidification

Paper citation: Dojiri SS, Dojiri M (2014). The Effects of Ocean Acidification on the Development and Calcification of the Larval Shells of the Red Abalone *Haliotis rufescens* Swainson, 1822. J Emerging Investigators 30: 1-6

Tansel DZ, Arreaza A, Tansel B (2014). Effect of pH Change on Exoskeletons of Selected Saltwater Organisms Which Rely on Calcium Fixation. J Emerging Investigators 16: 1-5

Paper questions

In reading through the assigned papers, please answer the following questions:

1. What is the question being investigated by the researchers?

The authors want to learn more about the possible effects of ocean acidification due to increasing levels of CO₂ in the atmosphere.

2. How do the two papers differ in their approach to learn how ocean acidification is affecting marine life?

The two papers use different methods of water acidification (Dojiri and Dojiri used CO₂ injection, while Tansel et al. prepared solutions prior to the experiment using more concentrated acids and bases.

In addition, Dojiri and Dojiri ask about the effects of pH on abalone larval development, while Tansel et al. focus on changes in exoskeleton mass (from a collection of marine organisms) in various pH water,

3. What is the experimental readout (dependent variable) that the Dojiri and Dojiri use in their experiments?

Dojiri and Dojiri use a qualitative assessment of shell shape, but quantify the percentage abalones in each pH in which development is impaired.



4. What is the experimental readout (dependent variable) that the Tansel et al. use in their experiments?

Tansel et al. assess the change in mass of exoskeletons after 5 days of exposure to a given pH.

5. One of the papers uses quantitative measures to assess changes in ocean organizations due to water acidification, and the other uses qualitative measures. Which approach do you appreciate more and why?

Students may have many possible answers. Qualitative measures are important because they can often capture complex features of the experiment that are difficult to quantify. Quantitative measures are standardized and more rigorous to compare across sample types.

6. What were the results of the authors' experiments, and what is their interpretation?

Both sets of authors find differences in their samples exposed to different levels of pH. Dojiri and Dojiri find an increase in abalone shell abnormalities as pH becomes more acidic. Tansel et al. find a decrease in the mass of fan coral and kitten's paw at more acidic pH.

7. Propose two follow-up experiments that could be performed given the data presented in this paper.

The authors could conduct these experiments over a longer timescale, use different organisms or shells, ask how water temperature interacts with pH to cause the observed effects, or study effects of pH on abalones at later stages of their development or lifespan.