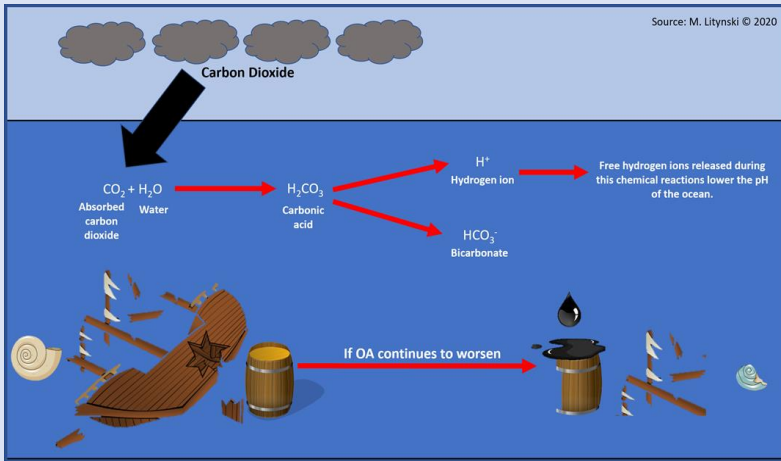


Ocean Acidification Impacts on Archaeological Resources: Public Outreach and Education Through a High-School Lesson Plan and Experiment

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Introduction: Shipwrecks and other underwater archaeological resources are at risk of deteriorating due to ocean acidification (OA). The loss of these cultural resources as oceans become more acidic not only negatively affects the study of history and human lifeways, but also has economic implications. As part of an independent research study, the author created a high-school lesson plan concerning the corrosion of metals commonly found on historical shipwreck sites and the disintegration of oyster shells in acidic oceanlike environments reconstructed in mason jars representing present and projected future OA conditions.



What is the Experiment?

Students will obtain first-hand experience observing the corrosion of metals commonly found on historical shipwreck sites (including brass, copper, stainless steel, and stainless steel with zinc plating) and the disintegration of oyster shells representing native sites within saltwater of different levels of acidity representing both present and future ocean acidification conditions. The experiment requires students to take observations of the objects being studied over a one-month long period, with approximately 45 minutes of observations undertaken per week. The timeframe of this experiment may be altered depending on laboratory access and changes in the school semester.



Materials:

- 4 liters (~1 gallon) of distilled water
- 8 Tbsp sea salt
- 1 sharpie pen
- 5 pieces of brass
- 5 pieces of stainless steel
- 5 pieces of stainless steel with zinc
- 5 pieces of copper
- 5 oyster shell fragments
- Baking soda as needed
- Distilled white vinegar (5% acidity) as needed
- 1 large bowl/pot
- 25 mason jars with lids + 1 extra
- 1 handheld pH meter or pH test strips
- Filter paper
- Measuring cup and measuring spoons



Why is This Experiment Important?

This experiment provides students and members of the public an opportunity to learn about underwater cultural resources and better understand how OA can lead to the loss of cultural heritage and history. The hands-on approach this experiment offers promotes learning and discovery and helps students develop an understanding of the scientific method through direct interaction with the data collected.



Experimental Procedure: Students will pour 4 liters of water into a large bowl/pot. 8 Tbsp of sea salt will be added to the water and stirred until thoroughly combined. Mason jars will be labeled with materials and pH levels. Students may use a calibrated pH meter or pH test strips to measure the initial pH of the seawater. To raise and lower the pH, students should use baking soda and vinegar in very small increments. Students should select pH increments that are equally spaced and represent present and future ocean acidification conditions. For example, 8.1 (pH today), 7.9, 7.7, 7.5 (pH estimated for 2100), and a rapid test using pure vinegar. Observations to be logged for further discussion.



About McKenna Litynski:

McKenna Litynski, a senior at SMCM, completed an educational handout on ocean acidification and cultural resources for MACAN and created a questionnaire for professional organizations focusing on climate change and archaeology. Additionally, Litynski organized the "Climate Change and Maritime Heritage: Interdisciplinary Perspectives" international virtual conference on April 5th and April 6th. At this conference, practitioners across the world discussed the impacts of climate change on submerged archaeological resources through an interdisciplinary and collaborative approach. For additional information, please email: mlitynski@smcm.edu.

