



CALIFORNIA STATE SCIENCE FAIR 2010 PROJECT SUMMARY

Name(s) Michael L. Janner	Project Number J1908
Project Title The Effect of Ocean Acidification on the Acoustic Properties of Water	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my experiment was to determine if the acidification of Earth's oceans would have an effect on how sounds traveled through ocean water, and if there was an effect, which frequencies of sound would be most affected.</p> <p>Methods/Materials A 3 inch by 10 foot drain pipe was filled with water of five different acidities (pH 5 - pH 9). Five frequencies of sound (2,500 Hz, 1,900 Hz, 1,300 Hz, 700 Hz, and 200 Hz) were generated at one end of the drain pipe with amplitudes of 95 decibels (dB). The amplitudes of the sounds were then measured in all acidities of water using a decibel meter at 5 and 10 feet away from the source. This process was repeated 10 times for a total of 500 individual tests. Using the amplitudes of the sounds at both distances, the attenuations of the sounds were calculated and compared.</p> <p>Results The results showed that changing the acidity of water did not cause sounds to attenuate differently. This was consistent for all of the frequencies of sound used in the project. The greatest average change for one specific frequency between two different pH levels was 0.5 dB, while most of the changes were near 0.3 dB. Both of these changes were insignificant, considering that all of the sounds were generated at 95 dB.</p> <p>Conclusions/Discussion This experiment was conducted because, although there were many reports regarding how ocean acidification would affect sound, few of these reports referenced a scientific investigation. The results showed that the acidity of water did not affect the attenuation of sound. This disproved my hypothesis. Most reports that claimed that ocean acidification would affect sound levels estimated that sounds would travel 60 to 70 percent farther underwater with a decrease of 1 pH unit. This experiment had a total pH decrease of 4 units. Also, five different frequencies of sound were tested, most of which were low frequency. Most reports suggested that if any sounds were affected by ocean acidification, low frequency sounds would be affected the most. Therefore, because no change in attenuation was measured with low frequency sounds, it is very unlikely for any sounds to be affected by a change in water acidity. The results of this experiment suggest that ocean acidification will not increase sound levels in the oceans.</p>	
Summary Statement My experiment tested the effect of ocean acidification, caused by the oceans' absorption of carbon dioxide emissions, on the attenuation of sounds underwater.	
Help Received Michael Levernier, an engineer, answered questions in person, through e-mail, and over the phone.	