

Conclusions

The oceans are an essential part of human life. More than 70% of the Planet Earth is comprised of ocean water. The oceans serve as a source of transportation, provide food, and produce more than 50% of the oxygen in the atmosphere. However, the much resourceful oceans are being destroyed by the process of ocean acidification. When the excess CO₂ in the atmosphere is absorbed into the oceans, the water becomes more acidic and this is known as ocean acidification. The acidic ocean water does not allow for calcification to occur, which means coral reef formation and shelled animal growth are endangered. As the process of ocean acidification progresses, the entire ocean ecosystem is at risk of becoming unstable and potentially extinct over time.

In this experiment, seagrass and sea lettuce were tested in tanks filled with ocean water to determine if these plants can reduce the acidity or reverse the effects of acidification. **It was hypothesized that each of the different tanks will start with a pH of 8.0 units. The container with seagrass is predicted to increase the pH 0.25 units by the end of the experiment, resulting in a pH of 8.25. The container with sea lettuce is predicted to increase the water level 0.15 units, ending at 8.15. The last of the containers, containing both seagrass and sea lettuce is thought to have an overall increase of 0.20 units in pH with the outcome of 8.20 pH units.** This hypothesis was incorrect because the containers started off with a pH significantly above 8.0 units.

The control tank's pH did not show any consistency or pattern throughout the trials conducted. The pH of just plain ocean water would increase and drop significantly, as much as 0.3 unit fluctuation. However, the containers with plants showed an increasing trend in the pH values throughout the trials conducted. The pH of tanks with plants would sometimes read lower than the control but was much more predictable as it followed a gradual inclining pattern.

The other variables measured were sanity variables. These variables were measured to make sure this water matched the natural environment of a coral reef, where ocean acidification is having most effect. All of the sanity variables: salinity, specific gravity, calcium level, and temperature stayed in the natural levels for the most part. Salinity varied from 32-39ppt and averaged 37ppt from all the data. This is just slightly over the natural salinity level of 35ppt. The temperature of a coral reef is normally warm water, between 23.3-28.8 degrees Celsius. The temperature readings in this experiment were within this range. The average calcium level from

all the tests is 452ppm. This is also slightly above the natural level of 420ppm, but as researched, higher calcium level provides no harm where as lower calcium level can be fatal to an ocean ecosystem. Because all of the sanity variables stayed within the range required, the data and conclusions is representative of a coral reef environment.

Since seagrass and sea lettuce both reduce acidity (increase pH), these plants could be used to buffer the effects of ocean acidification on coral reefs. The coral reefs are getting hit the hardest right now and if decreasing the carbon dioxide emissions in the atmosphere is not convenient enough, growing seagrass and sea lettuce is the other best alternative. If seagrass beds and sea lettuce fields were to be propagated near/in coral reefs by marine biologists, this would slow down and perhaps even stop ocean acidification from destroying yet another reef.

Recommendations

This experiment had its strengths and areas that could be modified if done again in the future. Throughout testing, five different variables were measured: pH, salinity, specific gravity, temperature, and calcium level. These variables were sufficient for the purpose of this experiment but if more variables were measured the data would be even more accurate. If one was to measure alkalinity, magnesium, phosphate, and ammonia in addition to the variables measured in this experiment, this would allow even more accuracy.

The main variable in this experiment was measuring the pH. Therefore it would be more beneficial to use a pH monitor that detected up to the thousandths place. This would provide more accuracy, and even the slightest changes in pH would be recorded.

In this experiment, the light on the aquariums was turned on in the morning time and turned off in the night, however no specific time. It is recommended that one would say turn the aquarium light on at 7:00 am and turn it off at 5:00 pm. This would prevent the plants from getting more light on some days than others, and would be more consistent.

For this experiment, the data was recorded at various times in the day. If the data was to be recorded at the same time every day, it would be more consistent, and the graph would be able to represent the data spaced by twenty-four hours. It would also avoid from creating confusion in the temperature variable because it was observed that when the data was recorded earlier in the day, the temperature was slightly lower. This is because the light bulb had been on for less time, but when the graphs are generated, the time of day the data was recorded is not indicated. Therefore, it looks like a drop in temperature all of a sudden. Recording the data at a consistent hour would avoid these misinterpretations.

Another aspect of this project that could be done differently is the time span of a trial. The trials in this experiment ran for fourteen day, or two weeks but perhaps someone else could increase the time span of a trial to a month. This would be able to illustrate the pH increase after the two week mark of whether it continues increasing at this rate or stabilizes.

A final revision of this experiment would be to use bigger testing containers. This experiment was preceded in one gallon containers. It would be interesting to see if the pH increase rate is the same for a two gallon or even five gallon container with the same concentration of plants. Even though there are places this experiment can be revised, it is evident that this experiment was conducted well enough to form a solid conclusion.