Effects of Water Temperature on Water Clarity and How This Affects Aquatic Plants

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Abstract

Testing the relationship between water temperature and water clarity allows us to further investigate the deterioration of plant life during the warmer months. As the temperature rises, dissolved oxygen decreases, causing an oversupply of nutrients, making it very habitable to algae. Algae bloom is a very prominent issue in the northern Toledo, Ohio area, making it a vital subject to study. By using thermometers and transparency tubes, the data collected illustrated a strong correlation between the clarity and the temperature during the colder months. Both remained consistent throughout each trial, but were not enough to support the hypothesis, as data for the warmer months was unable to be collected. In total, more research is needed to make a proper conclusion.

Introduction

Research Question- How does the temperature of water affect the clarity and therefore the growth of aquatic plants?

Hypothesis- If the temperature is higher, the water clarity will be worse, causing plants within the water to not develop due to lack of sunlight.

As the weather changes, all forms of life will start to stray from their unique winter survival drills. For bears, this means coming out of hibernation. For plants, this means reducing the production of saps. It could even be as simple as humans going out more with thinner clothing. That being said, the warmer temperatures can also begin to affect water quality. Specifically in the Ottawa River, the warmer temperatures can widely affect the quality of the water body due to harm being done to one of the most essential living parts of the ecosystem — plants. If the temperature is higher, then the clarity of the water will deteriorate due to potential algae bloom/excessive amounts of nutrients. This will cause other plants to not develop as a result of the lack of sunlight; therefore reducing photosynthetic activity. Researching how the temperature affects the clarity of water, and therefore how it affects the plants in the water, is a question that is not only interesting when learning about aquatic plants, but also when trying to understand the biodiversity of the area. Experimenting with aquatic plants can also help us find under what conditions they can thrive.

Methods and Materials

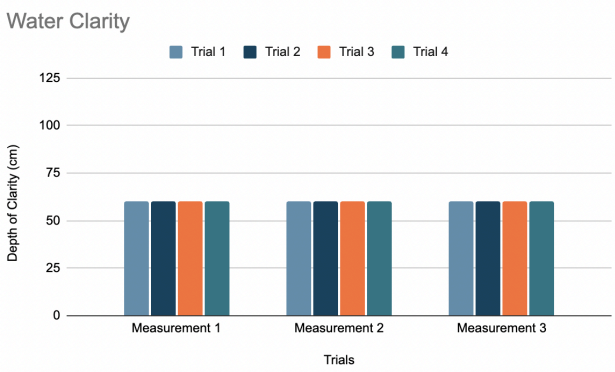
The experiment tested both water clarity and water temperature. To test water clarity, we used a roughly transparent tube measuring to roughly 2 feet (60 cm). We then filled the transparency tube with our sample water from the testing location until we could no longer see the black and white pattern at the bottom of the tube. Finally, we recorded the depth at which we were unable to see the pattern anymore by looking at the measurement markings on the side of the tube. You must make sure that the tube is standing straight up, so you may potentially want someone else to help hold it steady as you pour in the water. Along with that, be positive that you are doing the exact same thing when collecting data for your different trials. We ran three trials with four different measurements in each.

To test water temperature, we took a graduated cylinder measuring to about a maximum of 500 ml. We took 100mL of distilled water and 400 mL of ice to create an ice bath. Then, the water was left to sit for 10 to 15 minutes to reach the lowest possible temperature. The thermometer was then placed directly into the ice bath without removing the bulb of the thermometer from the water, and we let it sit for one more minute. It is important to make sure your thermometer is calibrated before testing a water sample because it ensures accurate results. Once we did this, the temperature read 0℃. Once the thermometer was calibrated, we measured the temperature of the sample water, the sample water was 1℃.

Presentation of Data and Results

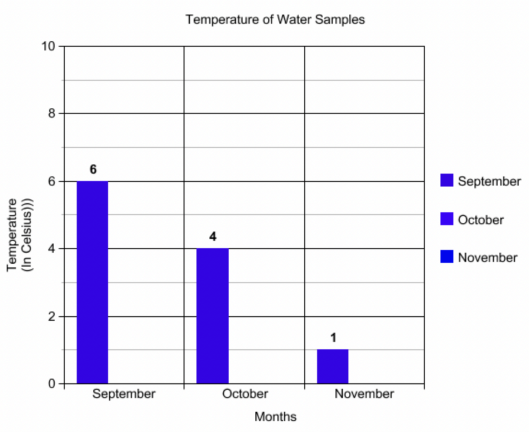
Regarding water quality, the data shows that the water sample is very consistent. At the river site, the water depth in most areas is roughly 1-2 feet, meaning the length of our transparency tube was appropriate for collecting quality data. While testing, the transparency tube was able to be filled to the brim and still reveal the pattern at the bottom. The data set contained no outliers.

Figure 1



When testing the water temperature, the thermometer was calibrated for accurate readings. Collected, were temperatures consistently reading from 1℃ to 6℃. There were no outliers in the data set, and the temperatures from October to November were not drastically different, only differing in about 3℃.

Figure 2



Analysis and Results

These results show a correlation between the temperatures and the water clarity during the three months tested. With the area remaining relatively cool, the clarity also showed no change. However, we were unable to collect any data for a higher temperature. This would be due to the time of year as we were unable to test during warmer seasons. Testing three months during the spring or summer would show a distinct difference in temperatures and clarity, allowing for more accurate results and a more diverse data set. As of now, our hypothesis is not supported due to the need for further research.

However, other studies show that warmer water holds less dissolved oxygen, causing plants such as algae to overpopulate the water. This causes a clouding within the water, and doesn't allow sunlight to reach plants at the bottom of the river. Without generous sunlight, many of these plants will die. In total, if we would conduct more research, we believe our results could show similar results and support our hypothesis.

Conclusion

All in all, the data collected does not support our hypothesis due to the need for more testing. However, what was able to be collected showed a strong correlation between the cold temperature and the water clarity, as both stayed relatively the same throughout the three months.

Discussion

Due to only being able to test clarity during a season of cool temperatures, our hypothesis cannot be supported without collecting data during the warmer seasons. If possible, we would like to collect water samples during three different months in spring or summer. This data would allow us to piece together the second half of our experiment, and properly analyze our data.

Acknowledgments

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