IMPACT OF FUTURE CLIMATE CHANGE ON THE PHYTOPLANKTON OF KILPISJÄRVI

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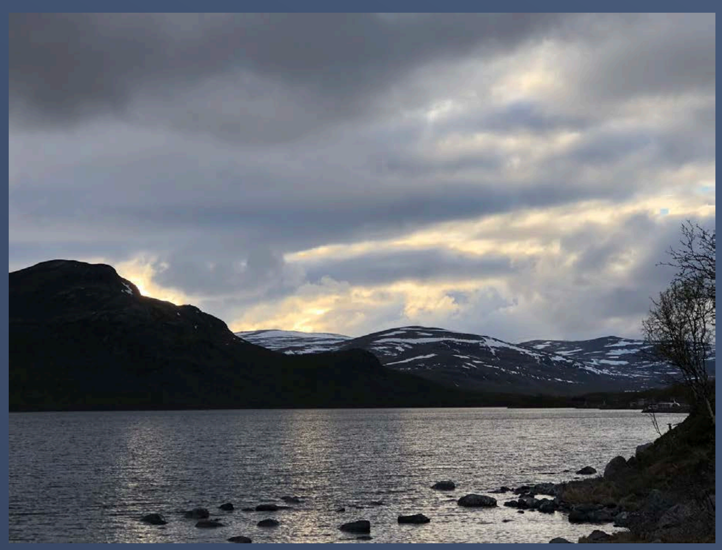

Figure 1. Kilpisjärvi – June 2018

Introduction:

- Phytoplankton are crucial to lake ecosystems because they are at the bottom of the food chain.
- Kilpisjärvi has a variety of phytoplankton including the diatom Asterionellopsis.

Figure 2. Asterionellopsis

- Due to Kilpisjärvi's location at the southern edge of the Arctic Circle in Northern Finland it has seen very little climate change thus far.
- Climate change will cause higher temperature and acidity in lakes and other bodies of water as the earth warms and CO_2 levels rise.
- This is an important study because Kilpisjärvi has not changed much yet compared to other arctic environments and projected climate change could affect this ecosystem tremendously. The overall impact of the study is understanding how the diverse and lush ecosystem of Kilpisjarvi will change when climate change begins to affect it.

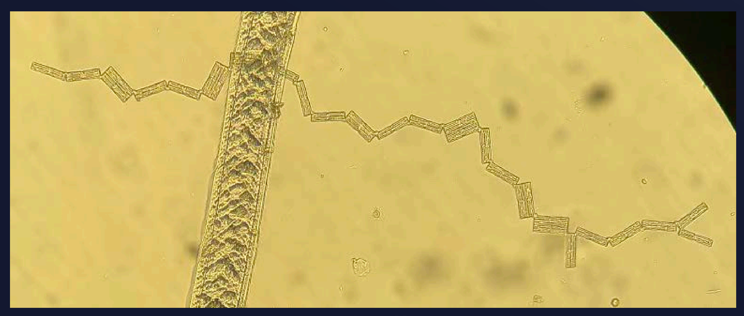

Figure 3. Tabellaria Chain

Research Questions and Hypothesis:

Question: How will climate change affect the abundance of phytoplankton at Kilpisjärvi?

Hypothesis: Phytoplankton populations in KilpisJärvi will decline with increased temperature and acidity from rising CO_2 concentrations.

Methods:

- Built three small greenhouses (GH) ~0.3m X 0.3m near the lakes edge using metal stakes, clear wrap, and duct tape.
- The first GH (Control) had the least amount of wrap to maintain ambient temp while protecting jars from the elements. The second GH (Group A) had a few more layers of wrap to increase temp slightly. While the third GH (Group B) had the most wrap to increase the temp even more.
- An access point was cut into the top of each of the GHs and structured with duct tape. These doors were then secured closed with duct tape when not in use.

Figure 4. Completed greenhouses

- Each GH contained three 600mL jars of Kilpisjärvi lake water.
- Added 7 mL of water from each jar to a petri dish with a 5x5 grid carved into the bottom.
- Used an inverted microscope to count 50 phytoplankton, recording the number of grid cells that were counted to reach 50 individuals.
- Scaled these counts up to calculate an average # of phytoplankton per 7 mL of water, then used this # to calculate the average # of phytoplankton in 600 mL of water in each jar.
- Three counts per jar were taken at zero and 24 hours.
- After the 24 hour measurement, one drop of concentrated acetic acid was added to decrease pH to approximately 5.0 and a final count was taken at 48 hours.

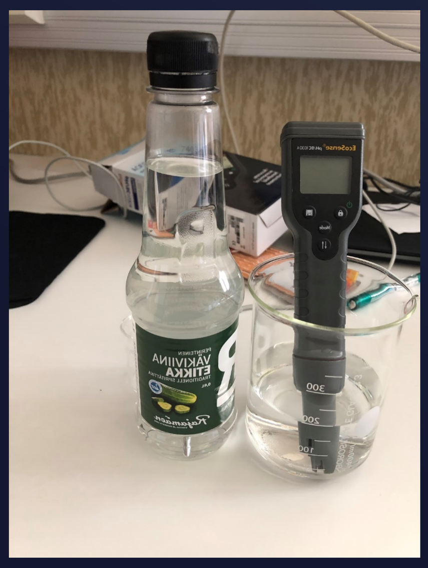

Figure 5. Concentrated acetic acid and pH meter utilized

Results:

Phytoplankton populations increased for both higher temperature and acidity.

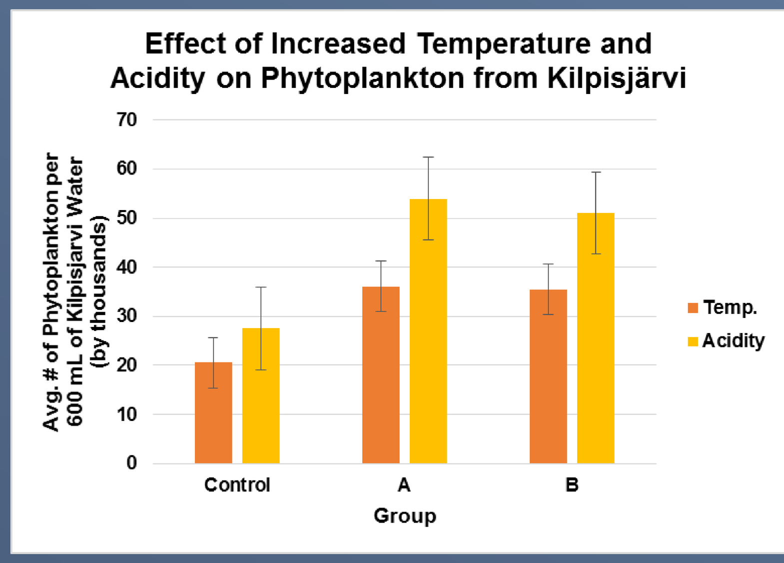

Figure 6. Avg. # of Phytoplankton

Discussion:

- Our results show that the projected future climate change of increased temperature and acidity in Lake Kilpisjärvi will result in an increase in total number of phytoplankton.
- Nearby lakes such as Saanajärvi have been studied and tested in a similar manner as we studied Kilpisjärvi and shown to respond in the same way with increased plankton as lake temperature and acidity rises.
- The over-population of phytoplankton can lead to a severe depletion of oxygen levels and possibly kill other organisms coinhabiting that body of water. This may even cause extinction of some species.
- The only way to prevent the trend from ruining these relatively unaffected Arctic areas is to find ways to limit climate change, such as energy conservation, limiting greenhouse gas emissions, ban things that could pollute the water supply, and live a more sustainable life.

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