IMPACT OF ALGAE ON BIODIVERSITY

MACAULAY HONORS COLLEGE

Lucy McGee, Jessica Zhou & Katheryne Herrera-Burgos

Key Words

- **Cyanobacteria** - Photosynthetic bacteria, produces oxygen & can be toxic to both humans and animals
- **Benthic macroinvertebrates** - Aquatic animals without a backbone that live close to the floor of aquatic environment
- **Zooplankton** - Tiny organisms near aquatic surfaces
- **Phototropic** - Organism that can use light as an energy source
- **Eutrophication** - Aquatic environment becomes too nutrient rich, leads to excess growth of algae and plants

Introduction

Our analysis is on the effect of algae, a phototrophic organism, on water quality and biodiversity. Algae growth thrives due to excess nutrients coming from agricultural runoff, notably from fertilizers containing nitrogen and phosphorus compounds, leading to eutrophication and competition (Gilbert & Burford, 2017). There's a marked increase in certain species while other organisms decrease, reinforcing the loop between algae, eutrophication, decomposition, and increased greenhouse gasses (Amorim & Moura, 2021). Scientists have tried to find impacts of algae blooms on the environment but food chains are complex and the change in biodiversity is still in question. Our goal is to use the open data sources on algae growth, aquatic organisms, and water quality to analyze the correlation between algae growth and aquatic biodiversity.

Methodology

We used the National Lake Assessment from the U.S. Environmental Protection Agency in New York during 2012- 2022. We used the water chemistry data set to compare the means of chlorophyll A (an indicator of algae levels), total nitrogen, and total phosphorus. To measure the effects of algae on biodiversity, we took the average number of benthic organisms/zooplankton and compared it with levels of chlorophyll A over 2012-2022. For impact of algae on zooplankton, we used the averages of the zooplankton biomass found and compared it to the average amount of chlorophyll A across the years. While making the graphs, there were some points we had to omit due to location, incomplete data, or inconsistent information throughout the years.

Results

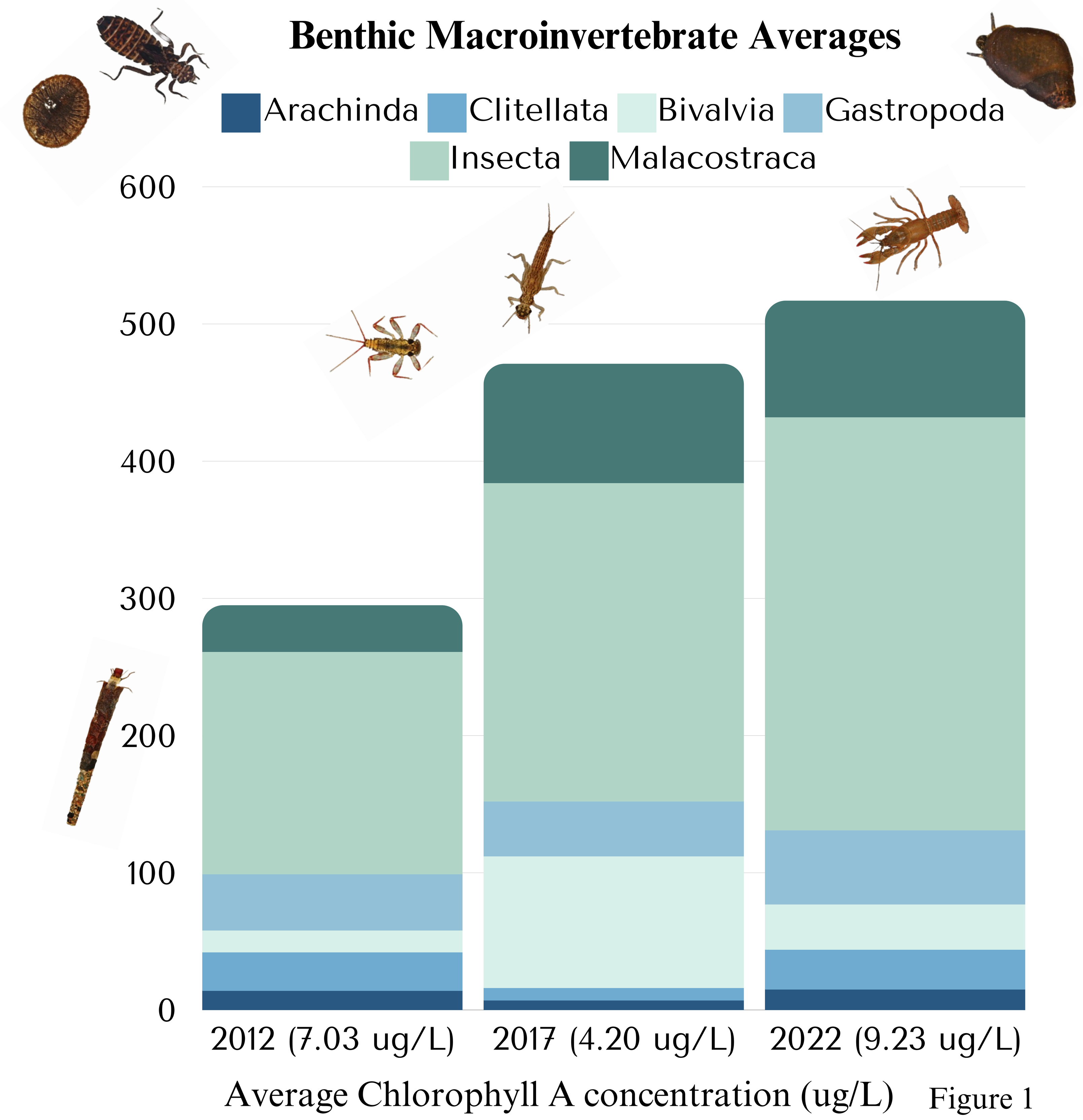

Figure 1

* PLEASE NOTE THAT THE SAMPLE SIZE AND LOCATION VARIED THROUGHOUT THE YEARS *

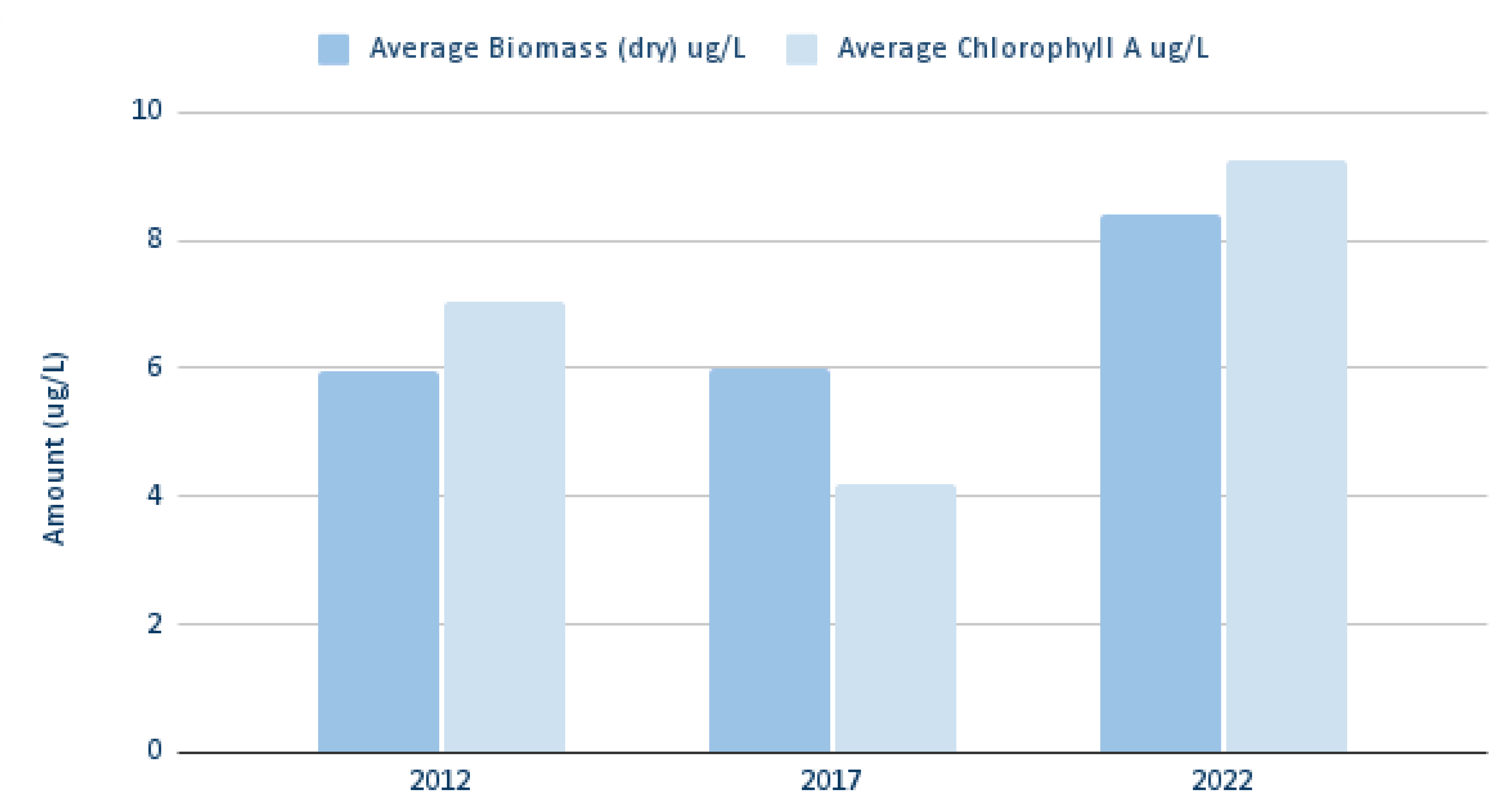

Figure 2

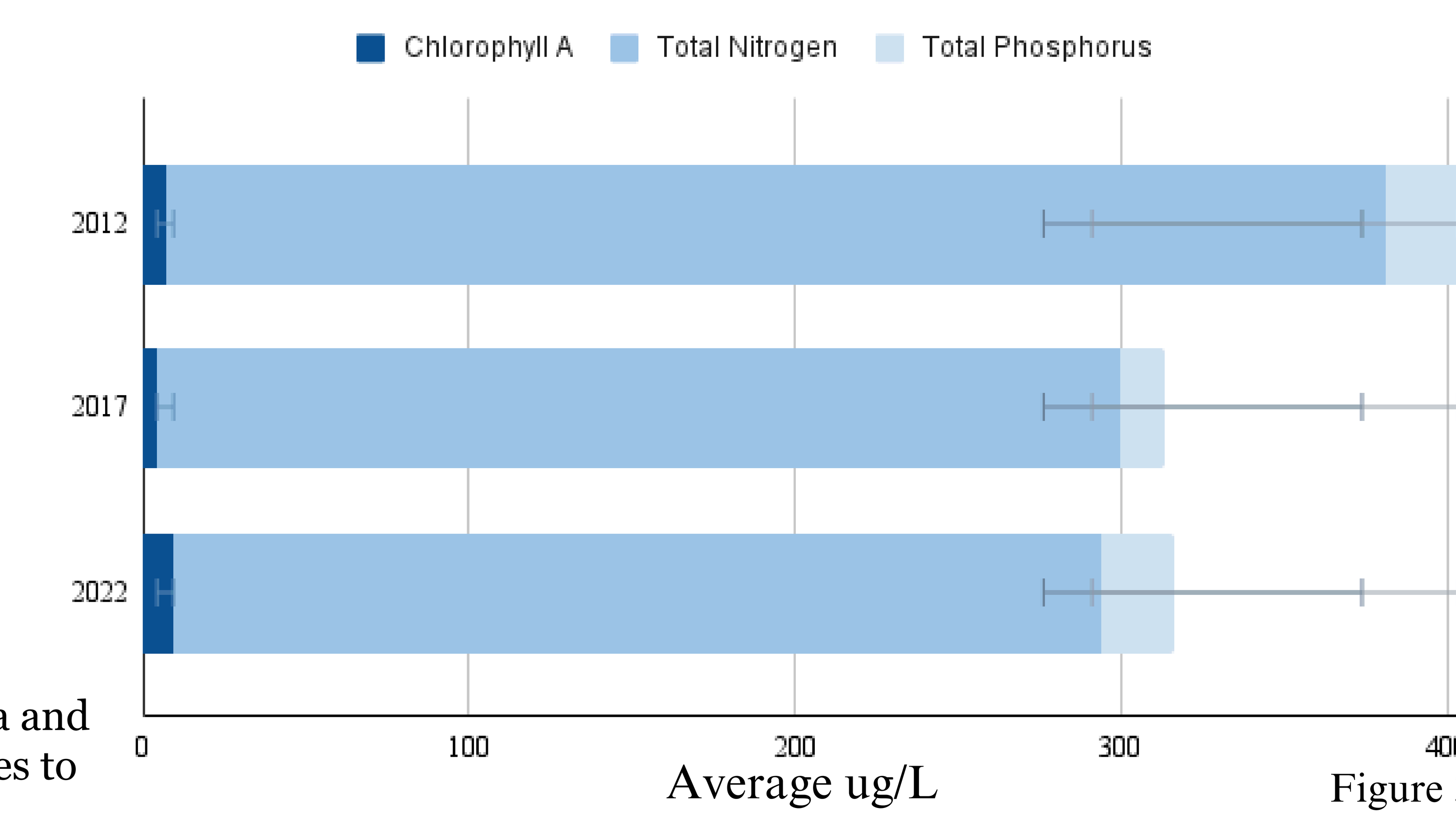

Figure 3

Conclusions

From the benthic macroinvertebrate graph, 2022 has the highest average of insecta and chlorophyll, possibly indicating that an increase in chlorophyll allows certain classes to thrive, while others like bivalvia (clams, mussels, oysters and more) are negatively affected. This was indicated because the average bivalvia count dropped from 96 bivalvia in 2017 (4.20 ug/L chlorophyll a) to 33 in 2022 (9.23 ug/L).

From figure 2, the higher the average of chlorophyll, the higher the dry microgram mass of zooplankton biomass. Though 2012 and 2017 have almost the same amount of zooplankton mass, this could be due to the difference in sample size (2012 had a smaller sample size than 2017 and 2022). 2022 had the largest sample size and a jump in average chlorophyll A concentration and zooplankton biomass which indicates the increased algae presence allows zooplankton to thrive, as it is a reliable food source.

The nitrogen and phosphorus graph (figure 3) is inconclusive because of the skew the 2012 data presented due to small sample size. Further data is necessary to provide reliable trends.

Scan For References