2017

Session D, 2017 Third Place: The Effects of Sunscreen on Photosynthetic Filamentous Algae

Matthew McBride

Andrew Measshaw

Lorenzo Natalie

The Effects of Sunscreen on Photosynthetic Filamentous Algae

http://aquaplant.tamu.edu/plant-identification/visual-index/filamentous-algae/

Matt McBride, Andrew Measha w, Lorenzo Natalie

Introduction

- We observed people applying sunscreen around swimming docks
- Sunscreen can have impacts on marine plants/environments (Danovaro et al. 2008)
- Algal photosynthesis and growth inhibited by UV rays (Piiparinen et al. 2011 and Joint et al. 2007)
- Algae impacts dissolved oxygen (Yoshikawa et al. 2007)
- DO impacts species richness/diversity (Killgore et al. 2001)

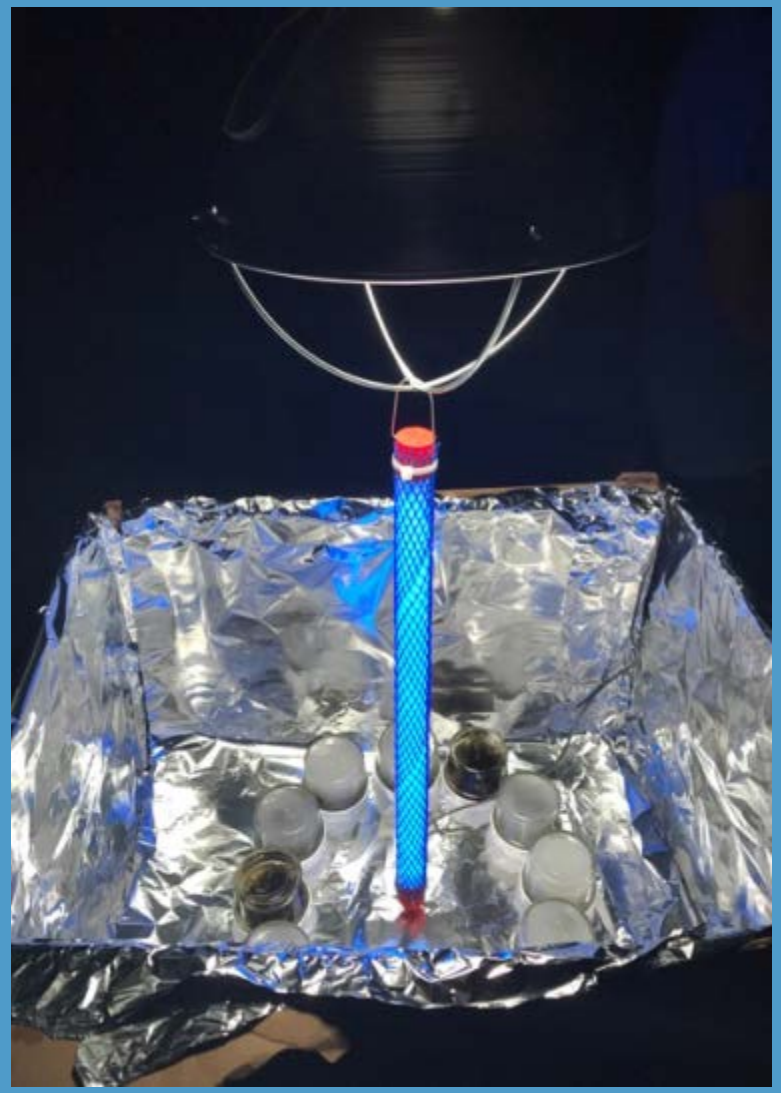
Introduction

H_1: Treating algae with sunscreen will increase photosynthesis

H_0: There will be no difference in photosynthesis between the control and sunscreen treated algae

Methods

Methods



- Sunlight and Artificial light experiments

  Two sets of sunscreen concentrations

  - ¼ mL, ½ mL, 1 mL

  - 1/32 mL, 1/16 mL, 1/8 mL

- Control: algae with no sunscreen

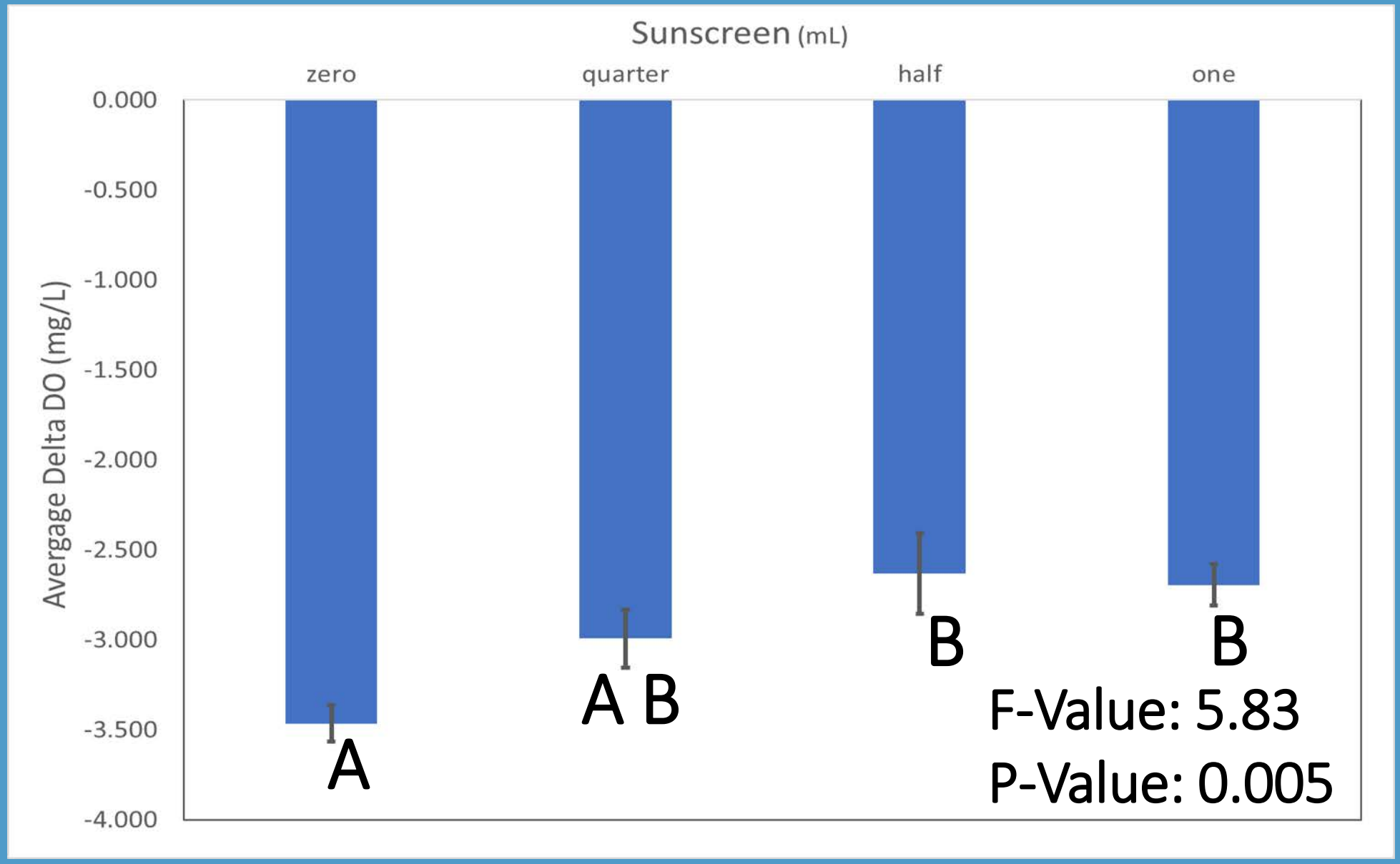
- 188 mL Jars with 4 ml of Algae

- DO probe: before and after measurements

Results

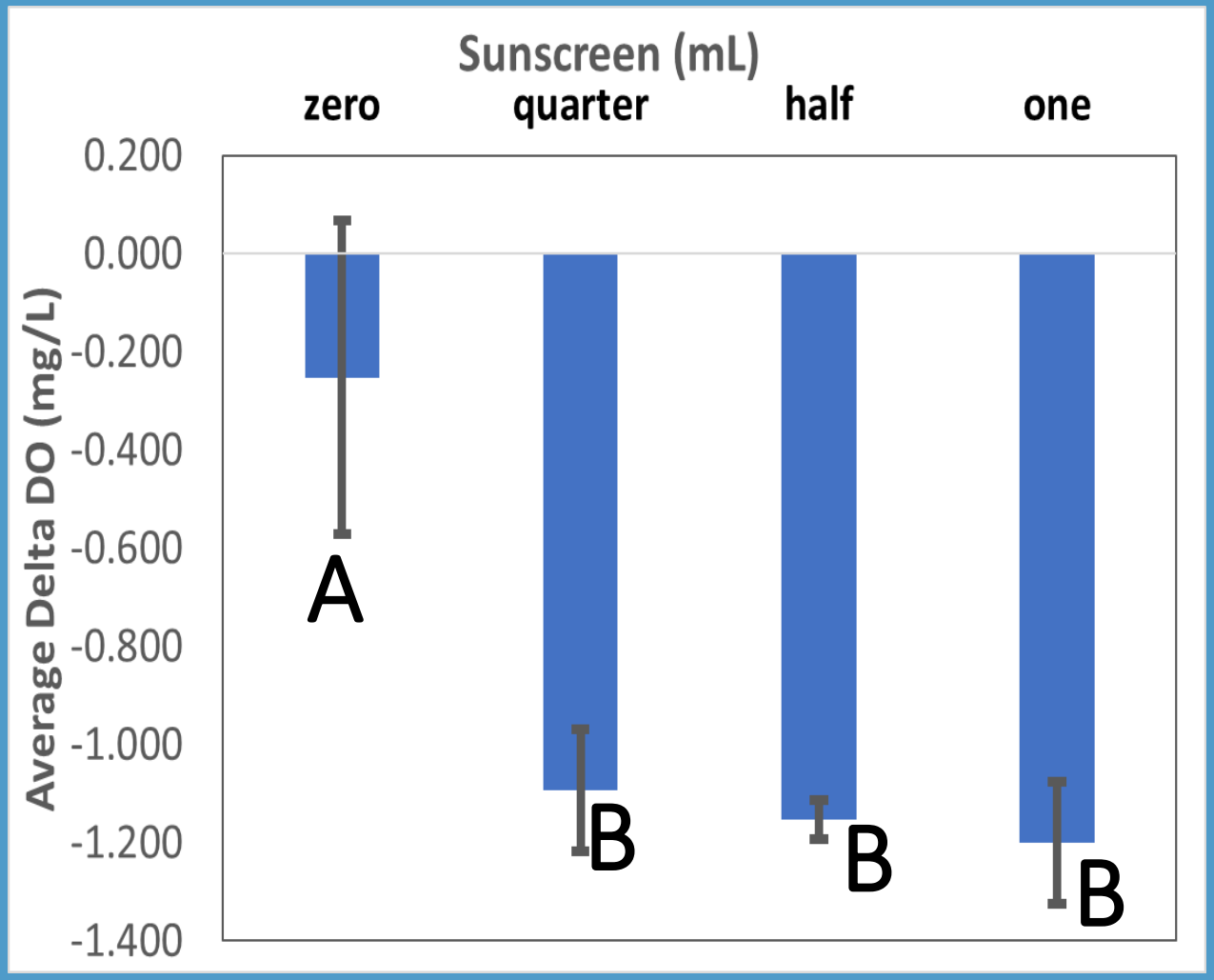
- A total of 84 jars of algae were tested
- Six different trials lasting six hours

Results


Sunscreen (mL)
zero
quarter
half
one
0.000
-0.500
-1.000
-1.500
-2.000
-2.500
-3.000
-3.500
-4.000
Avergage Delta DO (mg/L)
A
A B
B
B
F-Value: 5.83
P-Value: 0.005

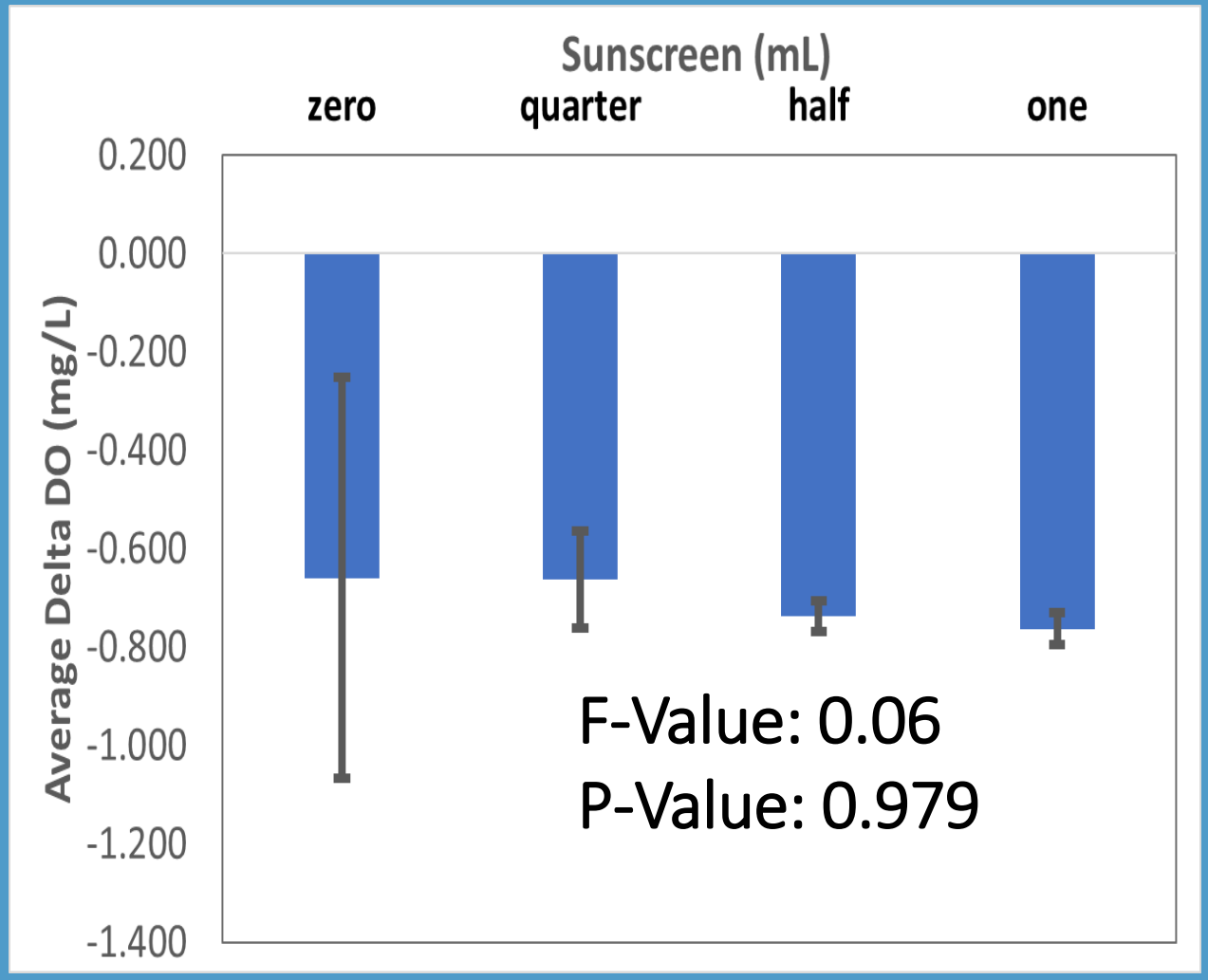
Results

Grown light and UV Light

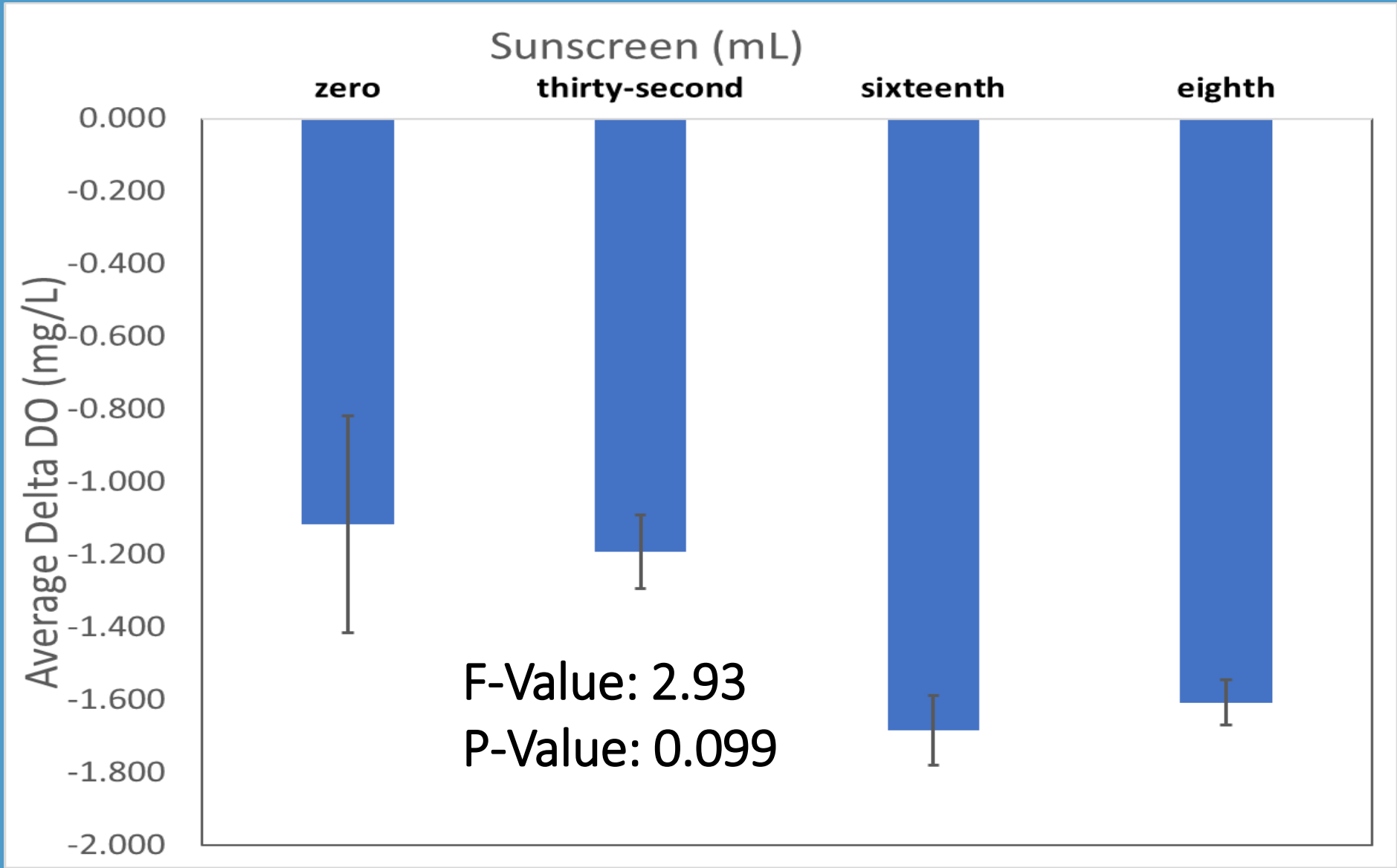


F-Value: 6.77 P-Value: 0.014

Grown light and No UV Light

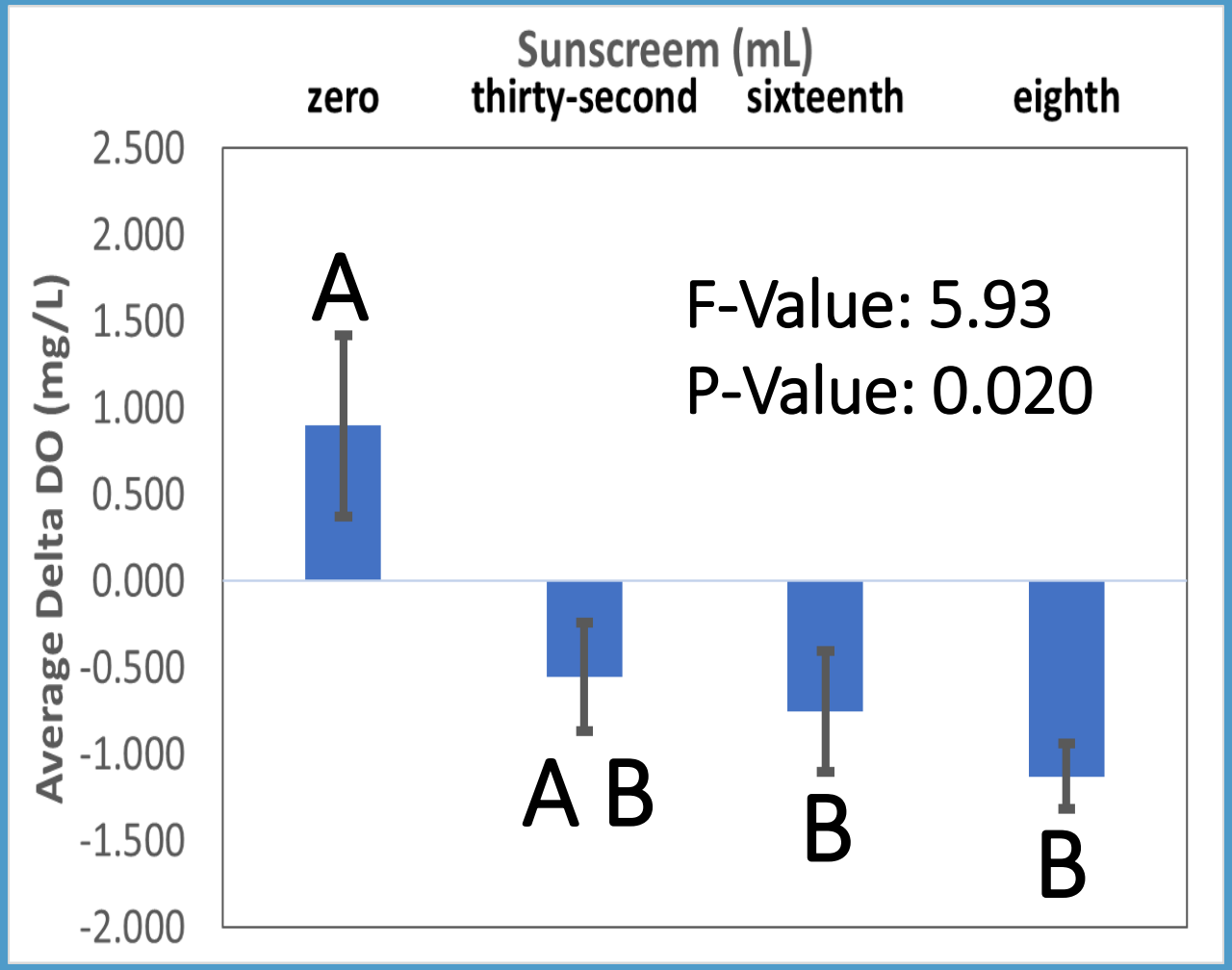


Results

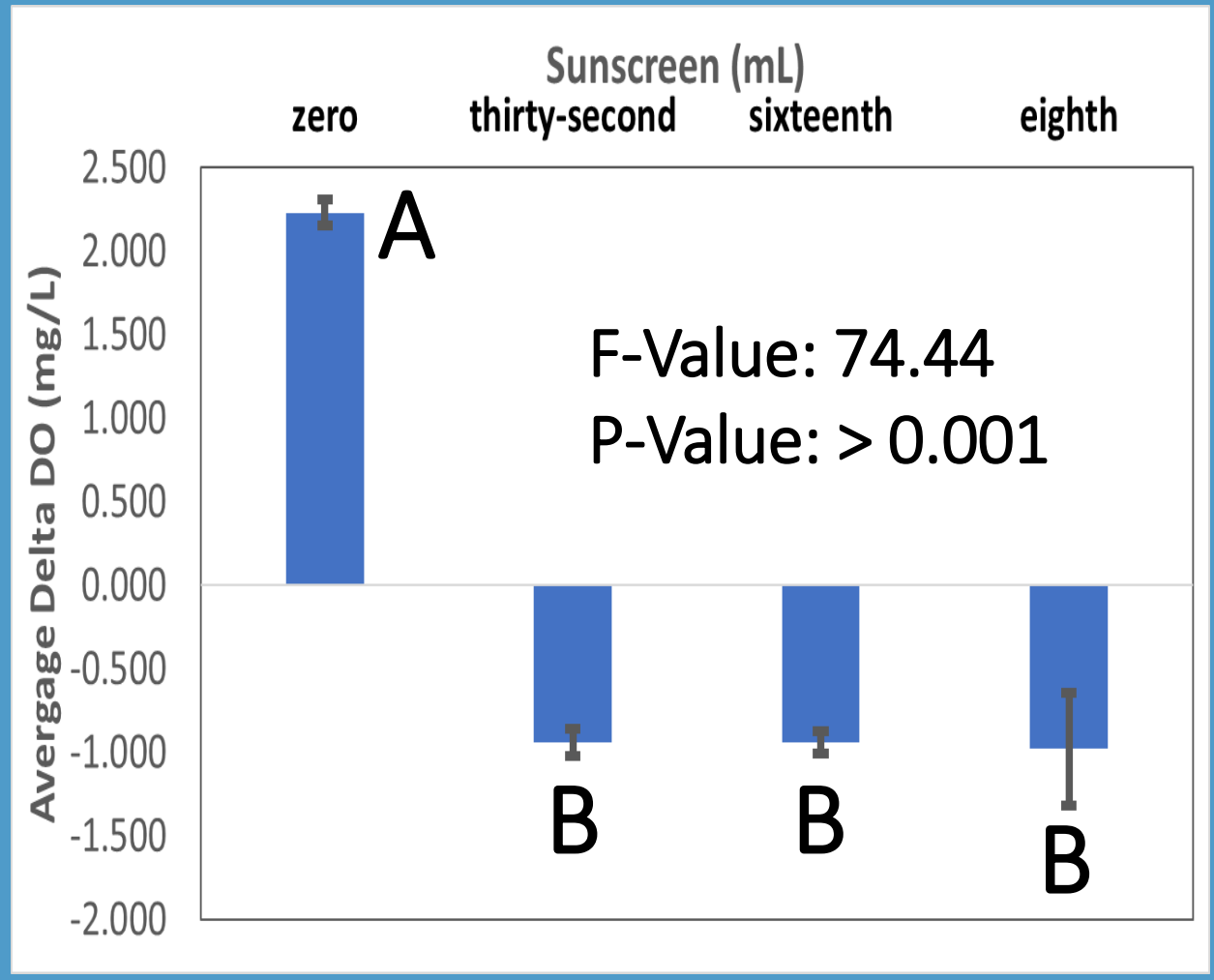

Sunscreen (mL)
zero
thirty-second
sixteenth
eighth
0.000
-0.200
-0.400
-0.600
-0.800
-1.000
-1.200
-1.400
-1.600
-1.800
-2.000
Average Delta DO (mg/L)
F-Value: 2.93
P-Value: 0.099

Results

Grown light and UV Light



Grown light and No UV Light



Discussion

- Sunscreen significantly decreased DO
- Sunscreen and UV light are likely additive stressors
- Impacts on DO may impact aquatic organisms

Discussion

Drawbacks in methods:

- Replace/filter Water?
- Small containers
- Temp. as covariant
- Measuring algae/content of algae
- UV levels (Collen et. Al, 1992)

Conclusion

- The data did not support our initial hypothesis
- Samples treated with sunscreen significantly decreased dissolved oxygen.

Conclusion

Ultimately, we:

-Found that sunscreen had a negative impact on algae in the environments we tested

-Explored and modified our experiment using the scientific method

-Potential for other studies to build upon in the future

Acknowledgements

Special thanks to;

Dr. Shultz

Maria

Emily

Dr. Bowman

And all other CLBS Staff

Citations

Cullen, J.J., Neale, P.J., and Lesser, M.P. 1992. Biological weighting function for the inhibition of phytoplankton photosynthesis by ultraviolet radiation. Science (Washington, D.C.), 258: 646–650

Danovaro, Roberto, Lucia Bongiorni, Cinzia Corinaldesi, Donato Giovannelli, Elisabetta Damiani, Paola Astolfi, Lucedio Greci, and Antonio Pusceddu. "Sunscreens Cause Coral Bleaching by Promoting Viral Infections." *Environmental Health Perspectives*. National Institute of Environmental Health Sciences, 3 Apr. 2008. Web. 28 July 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2291018/>.

Joint, Ian, and Michael B. Jordan. "Effect of Short-term Exposure to UVA and UVB on Potential Phytoplankton Production in UK Coastal Waters | Journal of Plankton Research | Oxford Academic." *OUP Academic*. Oxford University Press, 17 Nov. 2007. Web. 27 July 2017. <https://academic.oup.com/plankt/article-lookup/doi/10.1093/plankt/fbm090>.

Killgore and Hoover. “Effects of hypoxia on fish assemblages in a vegetated waterbody” *Aquatic Plant Management* (2001). Web. 8 August 2017

Citations

Piiparinen, Jonna, and Harri Kuosa. "Impact of UVA Radiation on Algae and Bacteria in Baltic Sea Ice." *Aquatic Microbial Ecology* 63.1 (2011): 75-87. *Research Gate*. Web. 28 July 2017.<https://www.researchgate.net/publication/215693277_Impact_of_UVA_radiation_on_algae_and_bactria_in_Baltic_Sea_ice>

Yoshikawa, Takashi, Osamu Murata, Ken Furuya, and Misturu Eguchi. "Short-term Covariation of Dissolved Oxygen and Phytoplankton Photosynthesis in a Coastal Fish Aquaculture Site." *Short-term Covariation of Dissolved Oxygen and Phytoplankton Photosynthesis in a Coastal Fish Aquaculture Site - ScienceDirect*. Elsevier, 5 July 2007. Web. 27 July 2017. http://www.sciencedirect.com/science/article/pii/S0272771407001473?_rdoc=1&_fmt=high&_origin=gateway&_docanchor=&md5=b8429449ccfc9c30159a5f9aeaa92ffb&ccp=y.

Questions?