Marine biofilms do not vary in their susceptibility to ultra-violet light

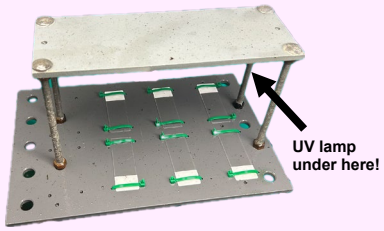
Tia Landry, Aaron Cogger, Michael Murtaugh, James Hanlon, Russell C Wyeth
Department of Biology, St. Francis Xavier University
TL: x2022bzq@stfx.ca; RCW: rwyeth@stfx.ca

Introduction

- Ultra-violet light stops marine biofilms (microbial communities on surfaces)
- Unknown: how much biofilms and their susceptibility to UV-light vary over time and location (i.e. temporal & spatial variability)

Methods

- Slide holders with and without UV light at a dock in Port Hawkesbury
- **Expts 1, 2, 3: Temporal**
  Control vs UV compared at 3 different times at same location
- **Expts 4,5: Temporal & Spatial**
  Control vs UV compared at 2 different times at 3 different locations



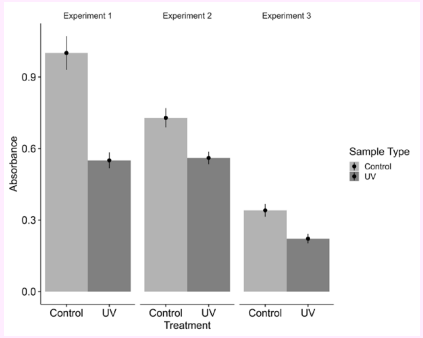
Measured biofilm using crystal violet

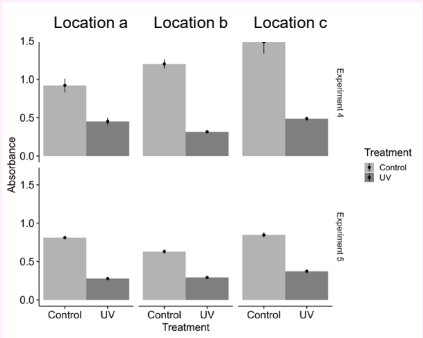
- Expose slides to **crystal violet** solution, then **ethanol**
- Measure crystal violet concentration in ethanol using **spectrophotometer**
  ➔ **proportionate to biofilm on slide**

Hypothesis

Different times & locations will result in no difference in biofilms

Results

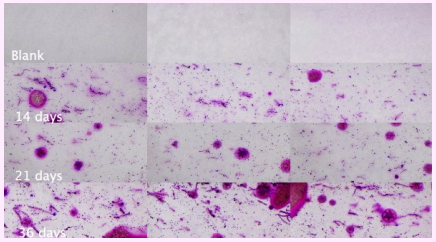




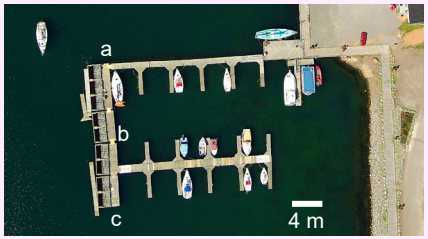
Experiments 1, 2 & 3: Mid-August, Late August, Late September:
➔ biofilms vary over time; reduction by UV does not vary over time

Experiments 4 & 5: 3 locations; Early August, Mid September:
➔ biofilms vary over time and location; reduction by UV does not vary over either

Example biofilm staining by crystal violet



3 locations on the dock at Port Hawkesbury

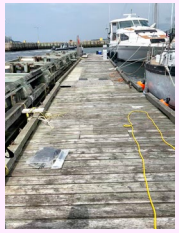


Discussion

- Biofilms forming at different times and locations varied, likely because of varying environmental conditions
- In particular, decreasing temperature likely caused decreasing amount of biofilm (Expt 1>2>3, and Expt 4>5)
- At all times, UV reduced biofilms, regardless of environmental conditions.

Implications

- Testing the effects of UV on biofilms depends neither on time or location
  ➔ can run different experiments at different locations or times
- Use of crystal violet is an effective method to measure biofilm growth



Further Investigation

- Test effects of salinity or pH on biofilms and reduction by UV
- Test effects of water flow rates
- Test effects of UV lamp distance
- Explore additional more precise methods to measure biofilms (e.g. metabarcoding)