Relationship between ocean surface temperature and paralytic shellfish toxins at a Wrangell beach.

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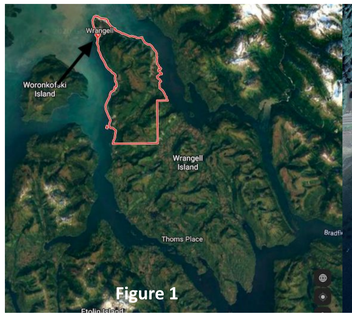
Introduction

Shellfish with high levels of toxins, when consumed by humans, can have dangerous health effects (Lewitus, 2012). As the ocean continues to warm, aquatic organisms like phytoplankton will respond to the increasing temperatures. Studies show that a warming climate could increase the frequency of harmful algal blooms (Dutkiewicz, 2013). Harmful algal blooms have been known to cause an accumulation of saxitoxin, a paralytic shellfish toxin (PST), in shellfish. In our study, we are monitoring levels of shellfish toxins at a previously unmonitored beach in Wrangell where shellfish are harvested.

Hypothesis

An increase in PSTs will be detected in shellfish as the water gets warmer.

Methods



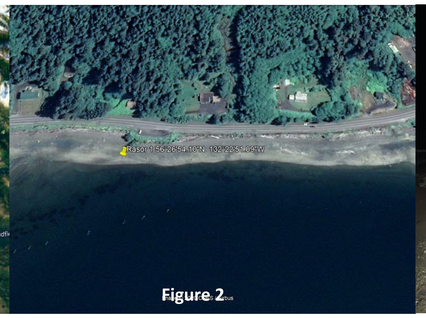


Figure 1: Location of Shellfish Sampling Site on Wrangell Island (56° 26'54.10"N 132° 22'51.09"W)
Figure 2: Wrangell Beach Site

- January through April, we conducted plankton tows at Wrangell Beach to collect water samples, while noting additional information (water/air temperatures, salinity, tides, wind, water turbulence).
- We observed the water samples under microscopes and documented any sighted phytoplankton species.
- Once a month, we collected 100 grams of blue mussels, cockles and butter clams at the Wrangell Beach site.
- Then we shucked the blue muscles, cockles and butter clams and send the meat to the STAERL lab.
- At the lab, the shellfish species are homogenized and tested for levels of saxitoxins using a receptor binding assay.
- After obtaining the samples' toxin levels from STAERL, we compared the data to the historical data (2016-current) of a different location, the Shoemaker site.

References:

1. Dutkiewicz, S., Scott, J. R., & Follows, M. J. (2013). Winners and losers: Ecological and biogeochemical changes in a warming ocean. *Global Biogeochemical Cycles*, *27*(2), 463-477.
2. Lewitus, A. J., Horner, R. A., Caron, D. A., Garcia-Mendoza, E., Hickey, B. M., Hunter, M., ... & Lessard, E. J. (2012). Harmful algal blooms along the North American west coast region: History, trends, causes, and impacts. *Harmful algae*, *19*, 133-159.

Preliminary Results

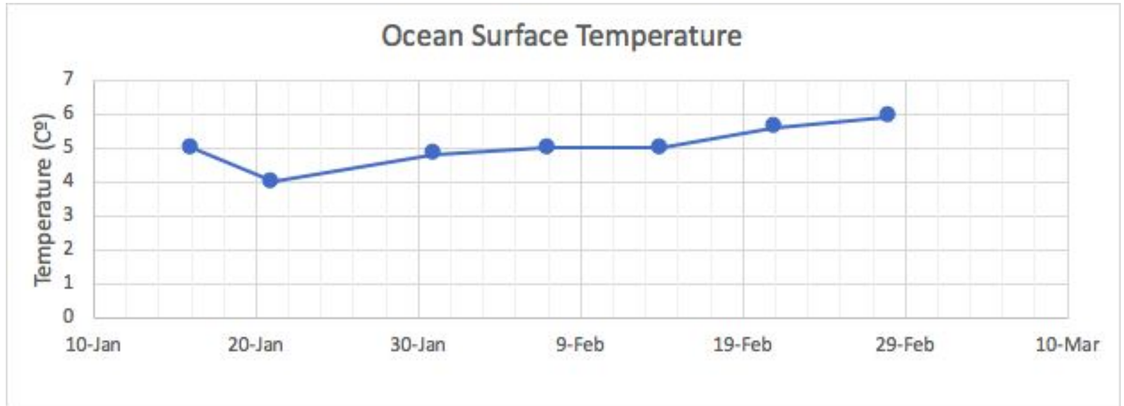


Figure 3. Ocean surface temperature trends between January through March 2020 at Wrangell beach.

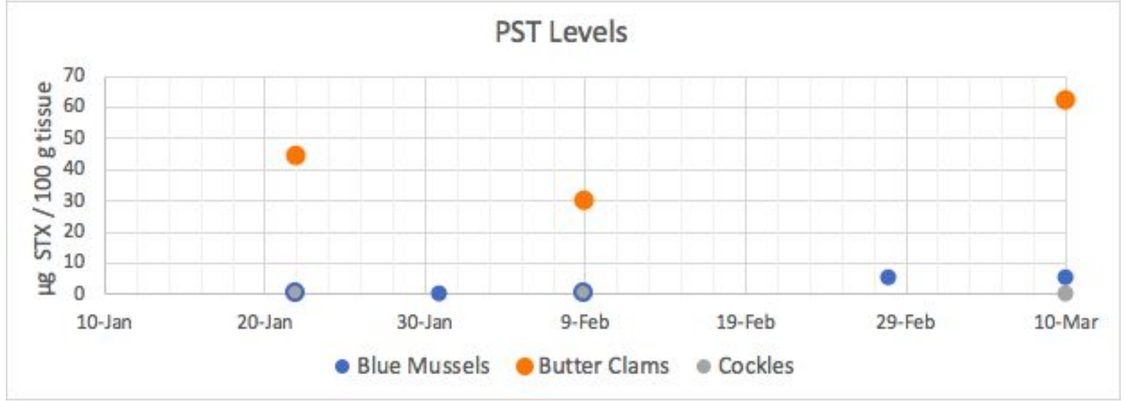


Figure 4. Paralytic shellfish toxin levels of blue mussels (blue), butter clams (orange), and cockles (gray) between January through March 2020 at Wrangell beach.

- Temperature increased as the study progressed (Figure 3)
- Levels of PSTs increased in Blue Mussels throughout the study
- Levels of PSTs varied in Butter Clams
- No PST levels were detected in Cockles (Figure 4).
- No Alexandrium was detected throughout the study.

Discussion

As seen figures 3 and 4, our hypothesis, which is as temperature increases, the PST levels will also increase, was supported. We believe this increase in PSTs is due to the influx of nutrients found in warmer waters. With the global trend of warming ocean temperatures, we wonder if higher levels PSTs will be more prevalent in the future. The next step in our research would be to continue to observe the levels of PSTs throughout the summer.

We would like to acknowledge Wrangell High School for allowing us to participate in this project. We would also like to thank our teachers, especially our science teacher Heather Howe, for providing the flexibility for us to conduct field research during class time. Additionally, we want to recognize the high school secretary, Megan Powell, for letting us use her office as a quiet workspace. Lastly, we acknowledge our parents for supporting us throughout this program.