Clayoquot Sound Harmful Algal Blooms Investigation of Sydney Inlet

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INTRODUCTION
In 2014 and 2019, an unusually warm patch of water in the North Pacific called the Blob, came ashore in early fall of both years. Researchers from the University of Washington Tacoma were interested to see if this warm water intruded into Sydney Inlet of Clayquot Sound, located off the west coast of Vancouver Island. Clayquot Sound is not only a protected biosphere, but also a major source of food and income for the neighboring areas, and an important part of the cultural aspects for the neighboring tribes. The dinoflagellate Alexandrium, which is responsible for paralytic shellfish poisoning (PSP), has been present in Clayquot Sound for some time. Because Alexandrium prefers to grow in warmer waters, one of the potential effects of the Blob intruding into the inlet would be that the number of days that favor Alexandrium growth will increase. Should this occur, this would lead to longer shelfish bed closures and other issues which would be detrimental to the neighboring communities.

OBJECTIVE
To determine if the warm waters from the Blob intruded into the inlets of Clayquot Sound in 2019, potentially effecting the local ecosystem and creating favorable conditions for Harmful Algal Blooms to form.

METHODS
For the summers of 2014 and 2019, UWT faculty and students surveyed multiple stations around Clayquot Sound.
- These surveys included conductivity, temperature and depth (CTD) profiles of temperature, salinity, density, dissolved oxygen, fluorescence, and transmissivity.
- Discrete water samples were also taken and then frozen and sent to the lab at UW Seattle to be analyzed for nutrient levels.
- The nutrient data was separated into surface and bottom data for analysis. Microsoft Excel was used for five number summaries and Box and whisker plots for the nutrients data. ArcGIS was used to create choropleth maps which visually showed the concentrations for surface and bottom nutrients at each location.
- CTD profiles were created for all properties using Excel. Plots made in Surfer 15 were used to show differences of the CTD data from a more visual perspective.
- Data points from 2013 and 2014 were compared for each of the nutrient and CTD profiles.

RESULTS
Sydney Inlet showed an average increase of 1°C within the water body, as well as a decrease in nitrate and phosphate concentrations and an increase in fluorescence in 2019 compared to 2014.

2014 CTD and nutrients data: https://sites.google.com/uw.edu/clayoquotsound-2014/home
2019 data: https://sites.google.com/uw.edu/clayoquotsound-2019/inlets/sydney-inlet

CONCLUSIONS
The data would suggest an increase in phytoplankton, and an increase in favorable conditions for Alexandrium as well. The significant increase in water temperature would suggest that the warmer waters from the Blob may have intruded into the waters of Sydney Inlet during 2019. Because of this, it is recommended that shelfish beds take more safety precautions during warming events like the Blob in the future.

Future work could include investigations of concentrations of Alexandrium cysts within the sediments at each location within Sydney Inlet over multiple years to track its migration.

REFERENCES
Thank you to my mentor Julie Masura and to the students and staff of the University of Washington who collected the nutrients and CTD data and worked on the 2014 and 2019 websites.