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pH and temperature profiles in Salish Sea in regards to Ocean Acidification (2017-2021)

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Introduction

Estuaries are bodies of water where freshwater and saltwater mix, creating a chemically active body of water. The majority of chemical activity, such as pH, is natural, but it can be magnified by anthropogenic influences. An example of this is ocean acidification, a global crisis that is mainly caused by excess carbon dioxide in the atmosphere being absorbed by bodies of water, altering the water chemistry. Robbins and Liste (2018) have documented a decrease of pH, or the measure of how acidic or basic a solution is, and an increase in temperature as an indication of global warming. This study assesses whether pH and temperature trends in Possession Sound are similar to results elsewhere.

Study Site

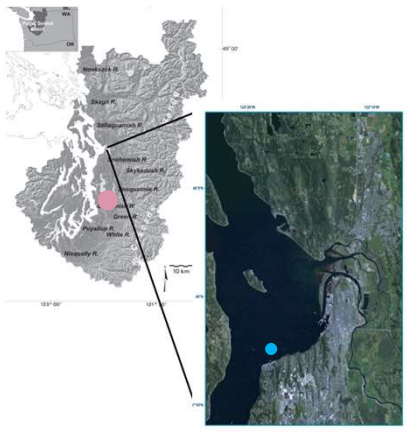


Fig. 1 Map showing Puget Sound (top) with Possession Sound marked by a pink circle. The close-up of the Snohomish River Estuary system in Possession Sound (bottom) shows the study site: Mount Baker Terminal (MBT).

Methods

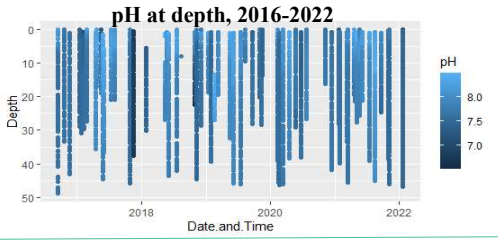
The data utilized throughout this study were collected by Ocean Research College Academy (ORCA) from 2016-2022. The pH and temperature vertical profiles were collected from a YSI EXO Sonde (see below) at MBT during SOPS cruises 111-203.

ORCA

The Ocean Research College Academy is a dual enrollment program where high school juniors and seniors experience innovative, interdisciplinary and student-centered learning. A longitudinal study of the local estuary forms the backbone of the first-year experience, and leads students to conduct independent research in their second year of the program. ORCA has received grants for a research lab, research vessel, and summer research funded by the National Science Foundation.

Results

Fig. 2 This compiled pH-focused graph shows pH profiles, through a color gradient, at MBT from 9/14/2016 through 1/21/2022. The graph depicts pH in relation to depth and sorted by the date by which data were collected. Outliers above a pH of 8.5 and below 6.5 were emitted.



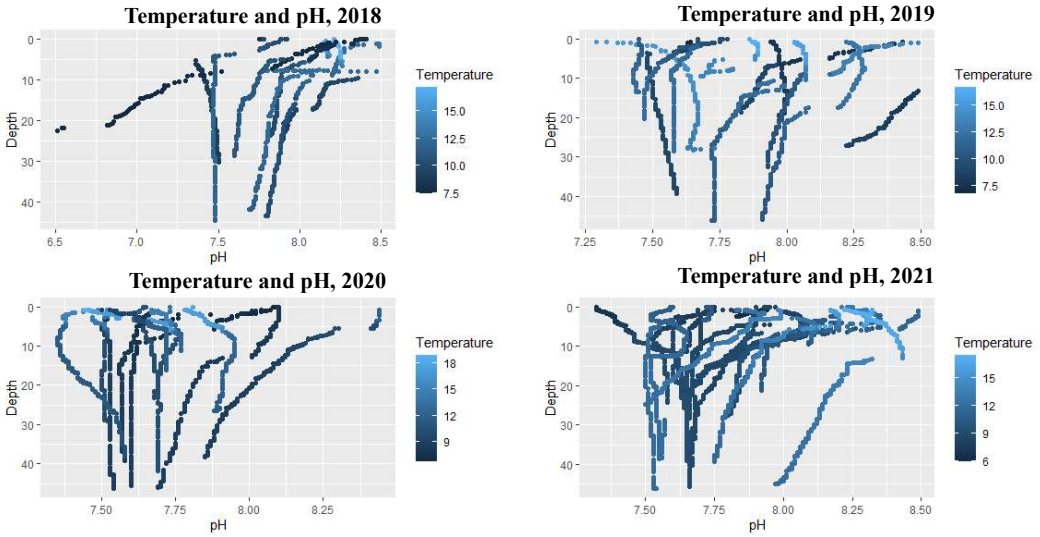


Fig. 3 These four scatterplot graphs are divided by year and show pH profiles at depth. The temperature profiles are represented by a color gradient. Data were taken 1/24/2018 through 11/2/2021 at MBT. Outliers above a pH of 8.5 and below 6.5 were emitted.

To-Date Summary

The goal of this study was to investigate pH and temperature trends over 2016-2022 to find connections between trends in the Possession Sound and suggested trends of ocean acidification. Overall, based on Figure 2, pH trend tend to become more acidic around wintertime each year, and more basic in spring/summer seasons. In Figure 3, temperature generally decreased as depth increases while pH levels varied. Data suggests further work on seasonal framework for greater confidence in temperature and pH comparisons in the water column. Although there is no large change between the years, this does not discount the effects of ocean acidification. Analysis of a longer period (beyond 6 years) will yield greater confidence in trend identification.

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