May 2015

Organic content and silt to sand ratio in correlation with porewater sulfide concentrations found in eel grass (Zostera marina) beds

Clarissa Felling
Western Washington University

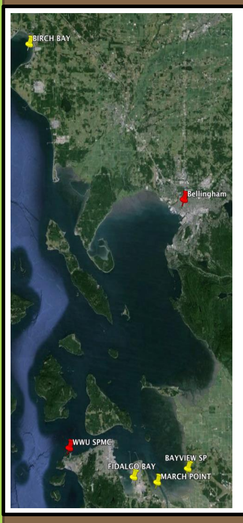
Sediment interactions with porewater sulfide concentrations in eelgrass meadows (*Zostera marina*)

Clarissa Felling, Department of Biology, Sylvia Yang, Shannon Point Marine Center, Western Washington University

Introduction

Eelgrass meadows are a vital marine habitat for both economically valuable species and nutrient cycling. Due to ecological functions such as these, eelgrass is considered an indicator of Puget Sound health.[1] Goals to increase the distribution of eel grass by 20% in 2020 motivate investigations of conditions that limit eelgrass distribution. Sulfide, a chemical found in the sediment's porewater, could limit eelgrass because it is potentially toxic.[2,3] However, sulfide is difficult to extract and measure in the field. Sulfide forms in organic rich sediment; therefore, sediment characteristics could be used to estimate sulfide concentration. In this study, we asked: **How do sediment characteristics, such as organic matter and grain size, correlate with the amount of porewater sulfide in eelgrass meadows?**

Methods



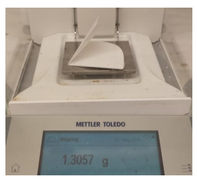
Field Sampling

- August 2014, 4 sites sampled.
- At each site: 8 samples of sediment with corresponding porewater was extracted either by coring or sipping.
- Porewater sulfide concentration was measured.

Sediment Characteristics

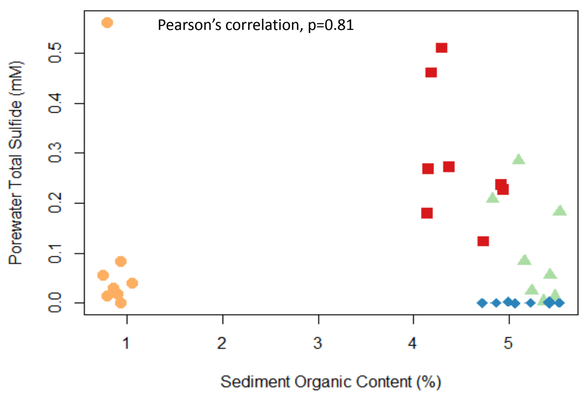
- Organic Matter: Samples were dried, weighed, burned in a muffle furnace at 500^{o}C for 3 hours to remove organic material, and reweighed. % organic content of original weight.

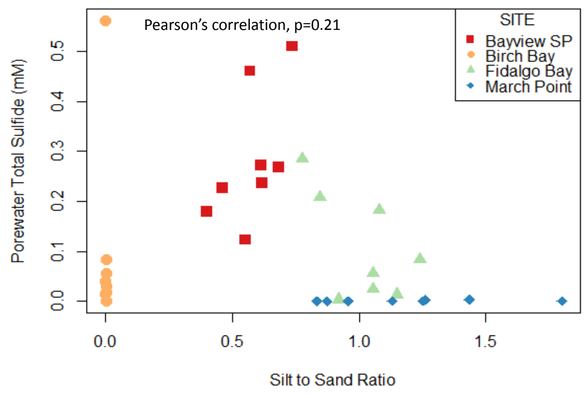
- Grain Size: Samples were wet-sieved. Silt (< 63 µm) and sand (> 63 µm) fractions were dried and weighed. Silt to sand ratio was calculated.



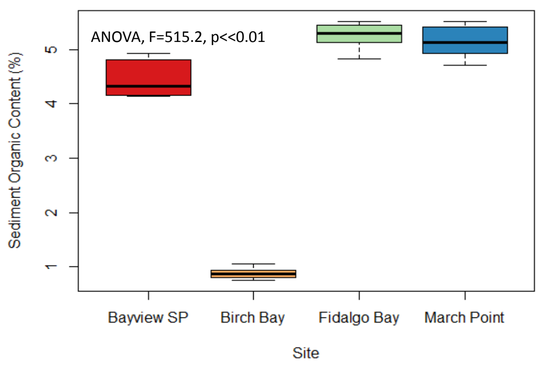
Results

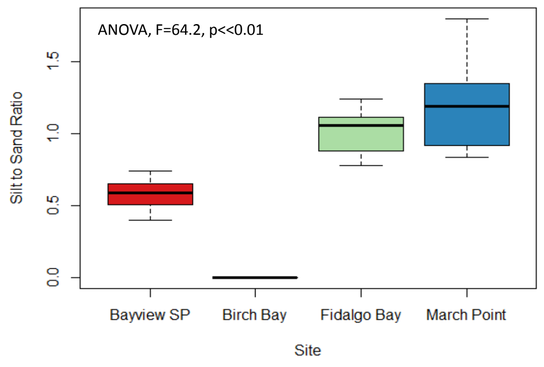
Porewater sulfide concentration did not correlate with organic matter or grain size.



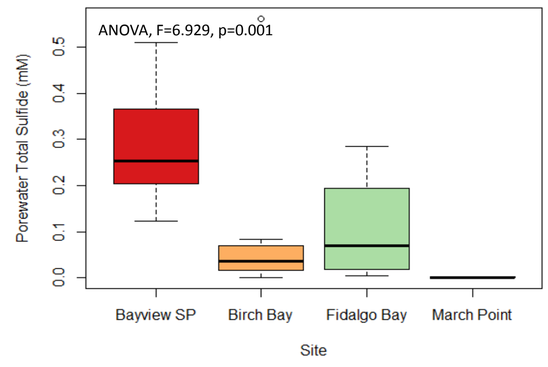


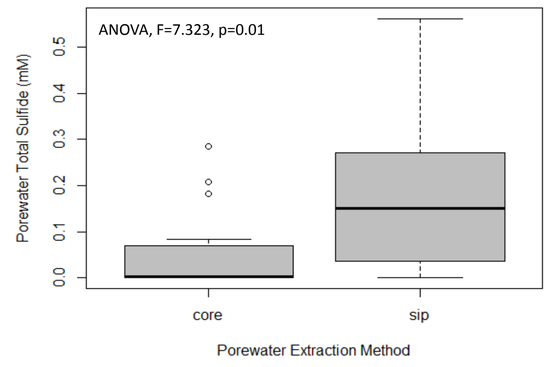
Sediment characteristics differed by site.





Porewater sulfide differed by site and extraction method.





Conclusions

- Sediment characteristics we measured did not correlate to the amount of porewater sulfide.
- Porewater sulfide did relate to site and extraction method.
- Therefore, % organic content and silt to sand ratio cannot be ruled out as indicators of porewater sulfide.
- Future studies should use the same method to extract porewater sulfide from each site.
- Other sediment characteristics could be indicators, such as carbon to nitrogen ratio and redox.
- Sediment characteristics were site-specific and clustered.
- Site locations should be deliberately chosen to sample the entire range of sediment types.

References: 1. (Puget Sound Partnership, http://www.psp.wa.gov/vitalsigns/eelgrass.php). 2. Holmer M., Frederiksen M.S., Mollegaard H. 2005. Aquatic Botany, 81, 367–379. 3. Elliott,J.K., E. Spear, and S. Wyllie-Echeverria. 2006. Marine Ecology 27, 372–380.

Acknowledgements: Washington Sea Grant (funding), HorngYuh Lee (chemistry assistance), Mike Adamczyk (project assistance)