Nutrient Concentrations & Plankton

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Introduction

- The Green Revolution → increased nitrates and phosphates in fertilizers
- Agricultural runoff from nutrient-dense fertilizers causes eutrophication (algae grows and depletes oxygen, which kills aquatic organisms)
- *Ulva Intestinalis* = Algae that blooms in response to high levels of nutrients in aquatic ecosystems
- Many communities including Watsonville are heavily involved in commercial agriculture, so issue of agricultural runoff is very worrisome
- **Testable Question:** How do nutrient concentrations, in areas with and without *Ulva Intestinalis*, affect the species richness and abundance of plankton populations in Elkhorn Slough?
- Species richness: The number of species within a given sample, community, or area
- Species abundance: The number of individuals per species
- **Hypothesis:** There will be more species richness and diversity of plankton in areas with *Ulva Intestinalis*. We think this because we believe the plankton will be attracted to areas with more nutrient density.
- Purpose: To raise awareness for issues like agricultural runoff and nutrient pollution.

Above we can see the Sushi Chuy group. From left to right: Joana Rubio, Olivia Gurnee, Priscilla Quintero, Luz Lopez and Ahtziri Carranza. (Picture by Edwin Ortega)

Methods

1) Contacted Peggy Foletta, an education specialist at Elkhorn Slough, to ensure that no *Ulva Intestinalis* was present in Location 1, and that *Ulva Intestinalis* was in Location 2 (she moved *Ulva Intestinalis* accordingly) * only 1st week
2) Collected materials and headed out to Eby Dock, Location 1 with Ulva (an approximate 15 minute walk)
3) Collected METADATA (DO & weather) with SparkVue, metadata included taking water temperature (GLOBE protocol) and conducted nitrate (GLOBE protocol) and phosphate tests and collected plankton samples (5 sweeps with the plankton tow)
4) Walked to Location 2 (with Ulva) and repeated procedure #3
5) Walked to lab (15 min walk), once there, two members cleaned equipment (boots, waders, plankton tow) outside. The other two identified plankton under a microscope by first mixing each sample jar five times, then using an eyedropper to place five drops of each sample onto a slide. When examined under the microscope, the number of individual plankton and the number of plankton species found were counted for both sample jars.

The Sushi Chuy team heading to Eby Dock. (Picture by Joana R.)

Figure 1. Olivia measuring the dissolved oxygen in Location 2. (Picture by Joana R.)

Figure 2. Luz and Priscilla performing the plankton sweeps. (Picture by Joana R.)

Figure 3. Joana looking at plankton samples under the microscope. (Picture by Olivia G.)

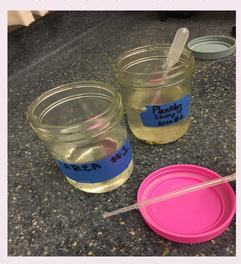

Figure 4. Above we can see plankton samples from both locations. (Picture by Joana R.)

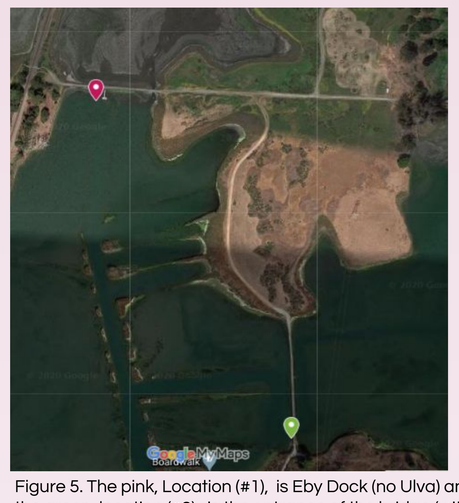

Figure 5. The pink, Location (#1), is Eby Dock (no Ulva) and the green, location (#2), is the entrance of the bridge (with Ulva). (GoogleMyMaps picture)

Figure 7. Location #1 without *Ulva Intestinalis* at Eby Docks. (Picture by Priscilla Q.)

Figure 6. A demonstration of how the high tide looked. (Picture by Luz L.)

Figure 8. Location #2 with *Ulva Intestinalis* at the entrance of the bridge. (Picture by Joana R.)

Results

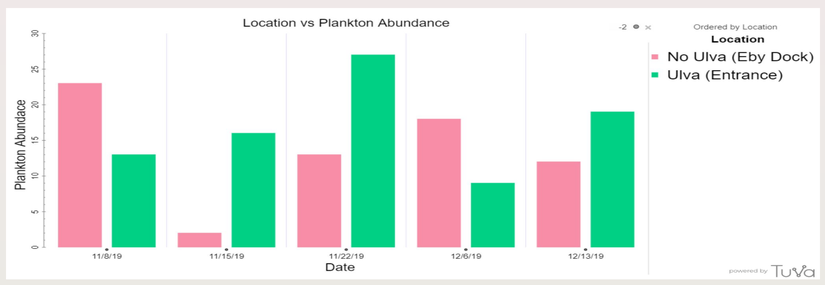

Figure 9. To our left we can see the abundance of plankton found at both locations for different dates.

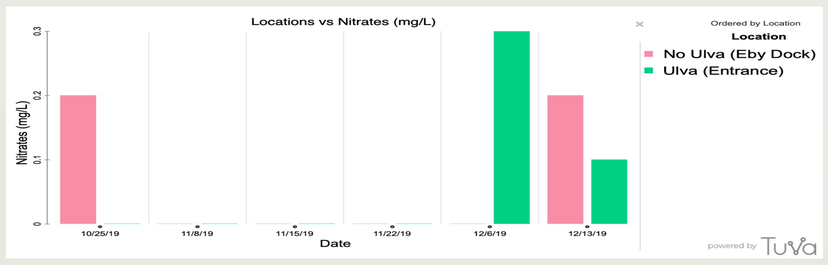

Figure 10. To our right we can see the amount of nitrates found at each location for different dates. Although we also measured the phosphates, we decided to not include the graph because all of our results were zero.

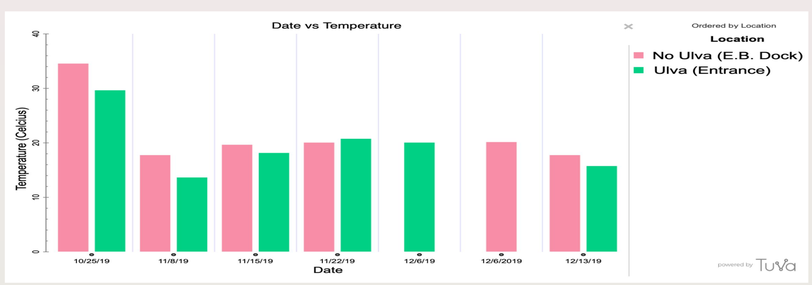

Figure 11. To our left we can see how at the beginning of our data collection days the temperature was high, but after that the temperature began to decrease.

Least Squares Line

	Y	Slope	X	Intercept	r	r^2
Phosphates (mg/L)						
Nitrates (mg/L)	Plankton Abundace	-20	Nitrates (mg/L)	16	-0.308	0.09485

Figure 12. To our left we can see a table that shows the r^2 value for the nitrates. This table shows that r^2 is less than 1, which means that there is no correlation between the points. On the other hand, phosphates has no r^2 value because all the results for the phosphate tests were 0.

Discussion

- Data demonstrated that there is no correlation between plankton abundance and nutrient concentration
- These results might have been due to the constantly changing variables at the slough such as tides, drastic temperature changes, and rain.
- The occurrence of rain increased the concentration of nitrates at both of our locations, this might've been because of the runoffs in the local agricultural fields.
- If research time was extended, we believe that we would have found some correlation between Ulva, plankton, and nutrients.
- We would also choose locations that are farther apart from one another (so as to diversify our data), would have attempted to manage our time better to ensure enough time for each step of our procedure and observed other organisms that could have affected plankton or Ulva.

Literature Cited

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"Nutrient Pollution." EPA, Environmental Protection Agency (November 13, 2019) www.epa.gov/nutrientpollution.

"Clear Choices Wants You!" Clear Choices Clean Water (December 12, 2019) indiana.clearchoicescleanwater.org/lawns/fertilizer-impacts.

Acknowledgments

"We would like to thank our mentor, Ahtziri Carranza, for helping us during our field days and for making sure that we had a great time. As a whole group, we would also like to thank Daniel Johnston for guiding us and reviewing our poster elements in order for our poster to be polished. Lastly we would like to thank Satina Ciandro, Enrique Melgoza, Peggy Foletta, Martha Arciniega and the rest of the WATCH and Elkhorn Slough staff for taking the time to help us on our field days and for helping us have a presentable and polished poster. " - Sushi Chuy Team

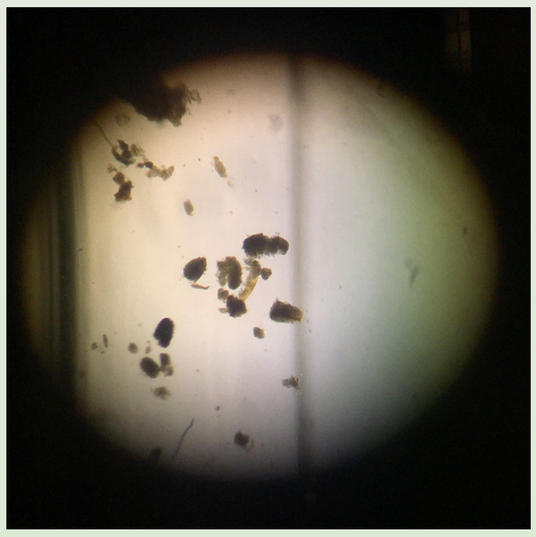

Figure 13. Above we can see plankton samples under the microscope. (Photo by Luz L.)

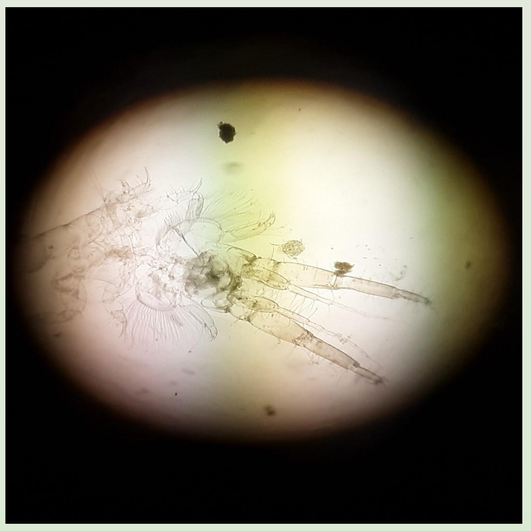

Figure 14. Above is an image of a deceased krill found in a sample from Location 1. (Picture by Olivia G.)

Figure 15. An image of two different types of plankton. (Photo by Luz L.)