

1. Research Question & Background

As coastal erosion and development occurs throughout Bellingham, various species are facing the consequences of ecosystem changes. One such species is the Pisaster Ochreous, stretching from Prince William Sound in Alaska to Point Sal in Santa Barbara Co., California. To thrive, the Pisaster Ochreous requires rocky tidepools, water temperatures of less than 23 C, pH between 8.1 and 8.4, and as much dissolved oxygen as possible! (Animal Network)

As a keystone species, environmental variations influence this star's physiological performance and species interactions (Sanford, 2002). Therefore, we wondered:

By way of shore and water quality analysis, how does coastal development impact sea star's ability to live and reproduce in the Puget Sound? We hypothesized that factors like human use frequency, the proximity of nearby waste treatment plants and urban centers impact the suitability of Puget Sound as habitat for the Pisaster Ochreous.

2. Methods

Materials & Location

For our study, we required various materials to test the quality of the water. We used a pH meter, nitrate probe, and dissolved oxygen tablets to tell us the levels of these components in the water. We collected samples from popular, coastally developed areas and natural beaches to understand the human impact on the Pisaster Ochreous. We collected data from beaches ranging from the Lummi Shore to Larabee State Park at low tide to investigate the surface of the beaches for starfish.

Procedure

We gathered samples and took the temperature of the water from our locations to take back to the lab to study. While we were at the beaches, we looked for starfish nearby.

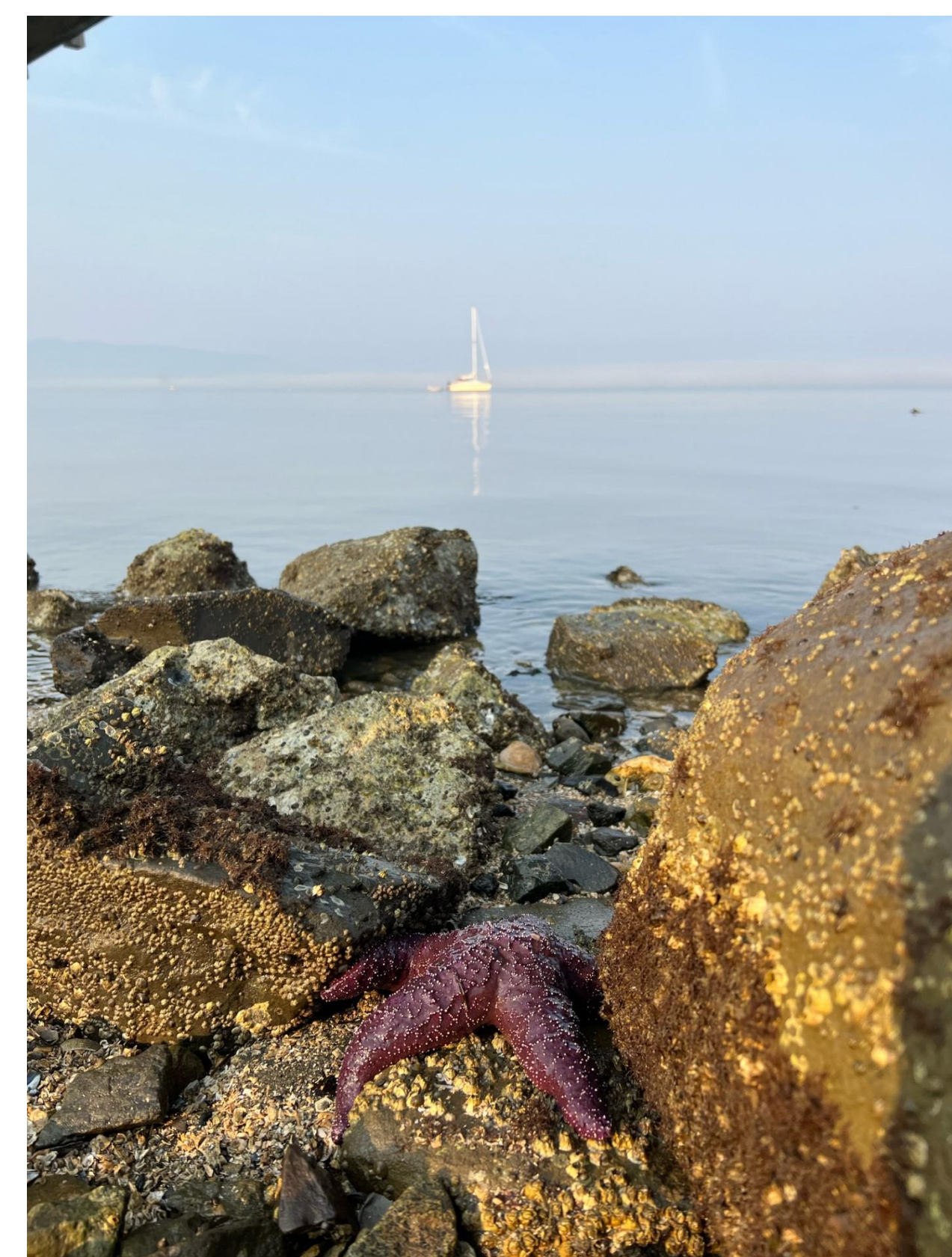


Figure 1. One star fish resting with an amazing view at Boulevard Park!

3. Results

Regarding the water quality of PNW's beaches, the results in dissolved oxygen concentration and pH levels relatively stayed the same (slightly below 10 ppm). Most notably, however, was the variance in nitrate levels between the 7 tested beaches. Squalicum Beach had the lowest concentration of nitrates while Boulevard Park's waters exceeded 35 mg/L of nitrates, followed closely by Birch Bay's boat launch and Lummi Reservation waters. As for the presence of Pisaster Ochreous sea stars in PNW waters: Only Marine Park, Larabee State Park, and Boulevard Park had less than 3 sea stars sighted in the area.

3a. Water Quality

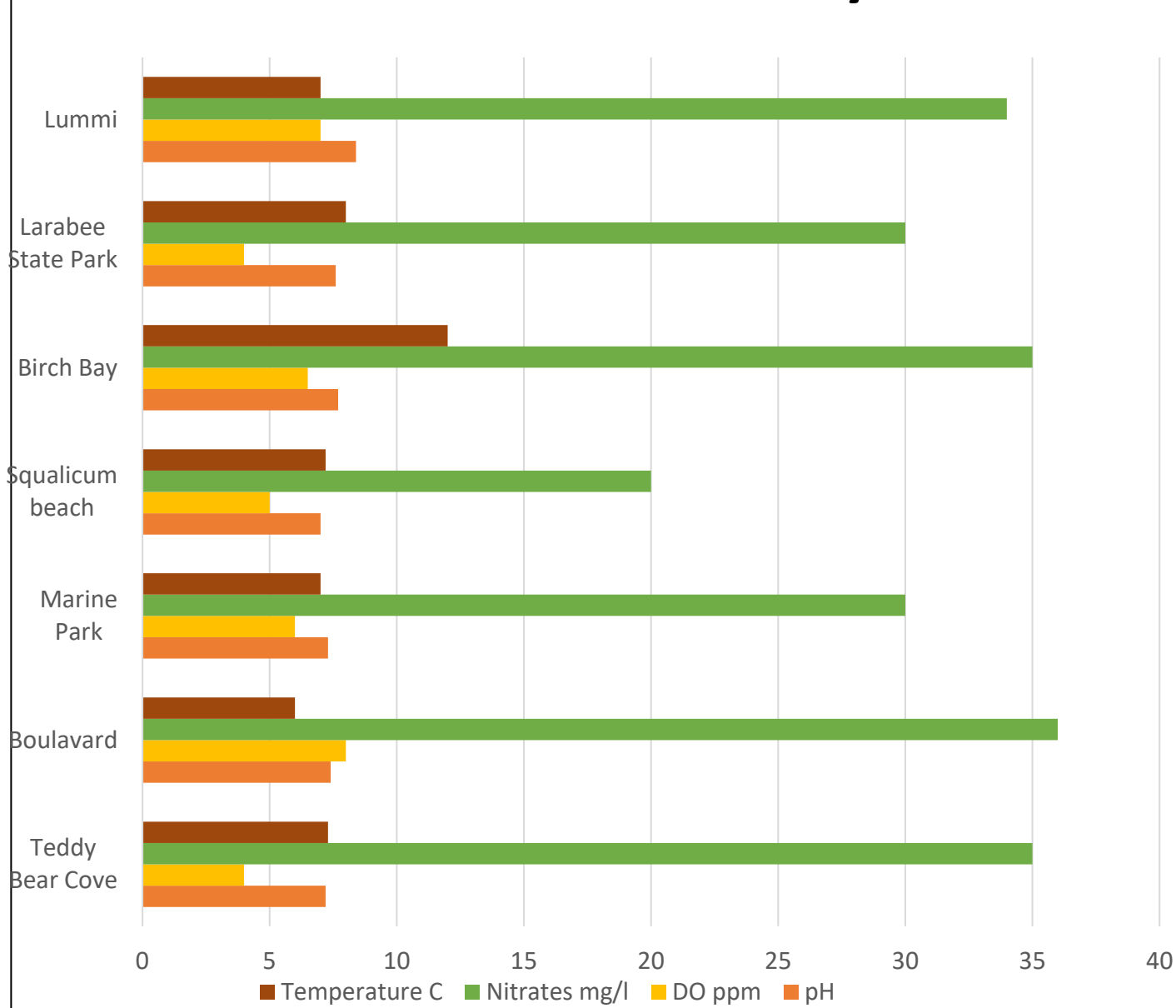


Table 1. Temperature, Nitrates, DO, and pH all tested using probes and DO tablets. This data helps us understand the water quality in our chosen locations.

3b. Amount of Star Fish Found in Testing Locations

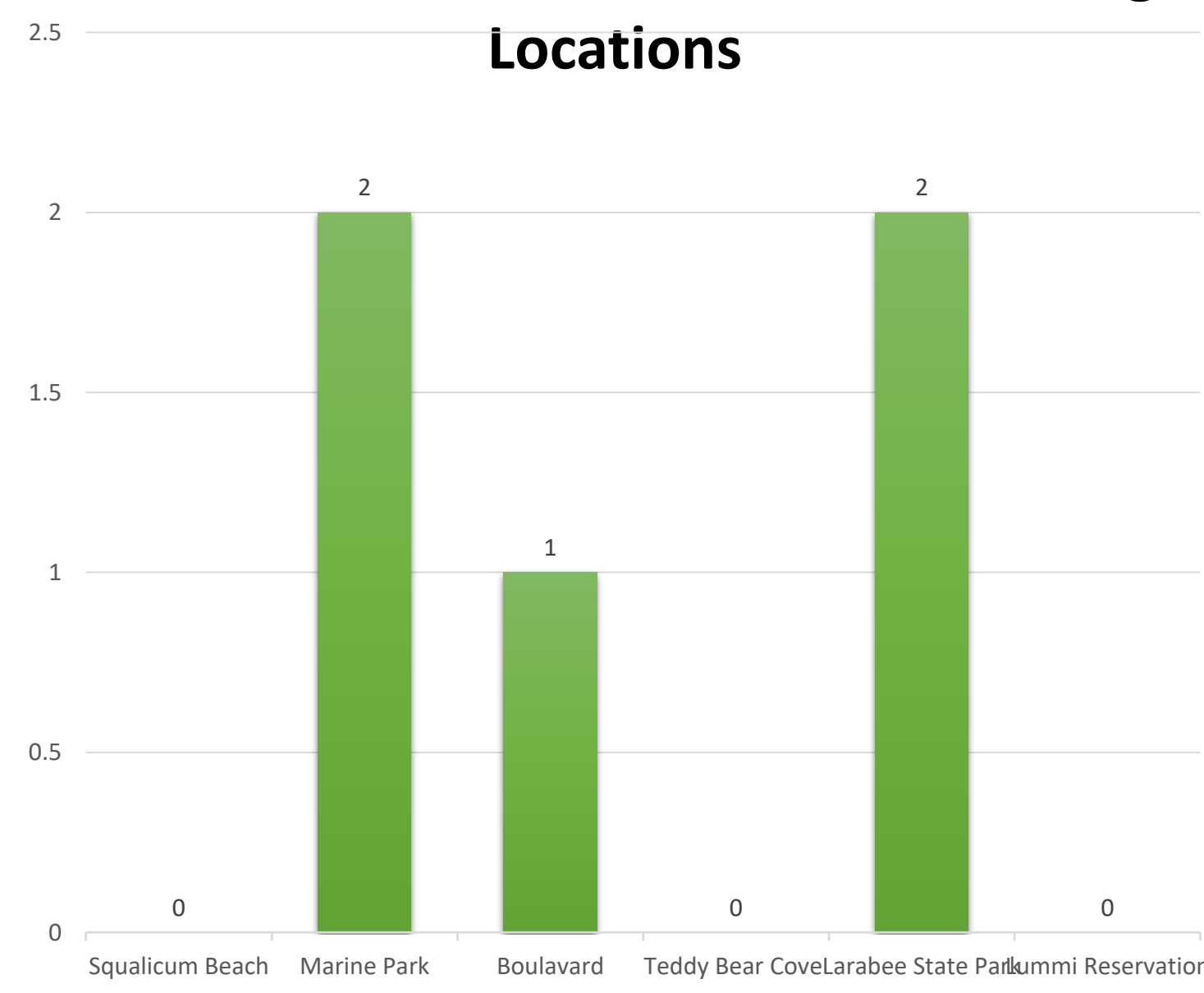


Table 2. This table represents the amount of Oche sea stars found at each location along Bellingham bay.



Figure 2. Two starfish spotted at Marine Park.

4. Discussion (or separated into: Interpretations, Implications & Limitations)

By examining the water quality and physical surroundings of PNW beaches, it can be deduced that beaches nearer to industrial centers and visited by humans more frequently have lower quality water and therefore, are habitat to less Pisaster Ochreous sea stars.

Considering that Marine Park and Larabee State Park share practically identical water quality results, it's not surprising that the most amount of sea stars were found at both beaches. This indicates that of the 7 PNW beaches tested for sea star habitat suitability, these two parks had the prime qualities, followed closely by Boulevard—these beaches met the requirements (outlined in Research Question & Background) for sea star habitat.

Ultimately, our hypothesis was mostly supported. As we predicted, the fact that no sea stars were sighted at Squalicum Beach, Lummi Reservation, and Teddy Bear Cove was attributed to a variety of apparent factors including noticeable solid waste surrounding the beach (as was the case with the Lummi Reservation beach). Despite this, we expected to see sea stars at the beach with the lowest amount of nitrates—as the Pisaster Ochreous needs a low amount of nitrates to thrive. However, Squalicum Beach and the others proved that this was not a common case in Bellingham—sea stars were found even at the beaches with extremely high levels of nitrates (like Boulevard)!

The majority of our water samples were collected during low tide hours. This greatly influenced how many Pisaster Ochreous were sited at time of collection, as it limited a portion of our data concerning the presence of this sea star in the PNW. We recommend that future researchers consider collecting water samples at times of both high and low tide, so that they might reap slightly more diverse results.

5. Acknowledgements

Monia Reiss, Oceanography 101 instructor, is a recipient of our thanks and gratitude, as they provided the needed materials, testing kits, and immense guidance on the process of our project, from planning to execution. We credit out project's success to your assistance!

Lab technician Kris receives a shout out of thanks for graciously allowing us to use his lab supplies for a day of vigorous water sample testing. We credit out project's success to your assistance!

6. Work Cited

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