

PH & SEAWEED ABUNDANCE ACROSS COASTAL SITES

OCEANOGRAPHY 101

SOLEIL HERNANDEZ, MICAH PETRICH

Research Question & Background

Research Question:

How do pH levels and seaweed abundance vary between an estuary, marina, and secluded beach?

Seaweeds are important coastal organisms because they provide food and habitat for many marine species. Research shows that seaweeds act as “important primary producers and ecological engineers in coastal ecosystems.” (Hu et al., 2023).

Hypothesis

We predicted that the estuary and marina would show lower pH levels due to runoff, while the secluded beach would have a higher (more basic) pH. We also expected greater seaweed abundance at the estuary and Locust Beach, and less in the marina.

Methods

Methods

We used notebooks, phone cameras, small sampling jars, and pH indicator strips to collect data. We visited Marine Park (estuary), Zuanich Point Park (marina), and Locust Beach (secluded beach) in Bellingham, Washington (Figure 4), collecting samples around 2:30 pm during mid-to-low tide.

Procedure

At each site, we tested water pH from several spots and photographed and recorded seaweed abundance (Figure 5), then compared results across the three locations.

Figure 1. pH measurements and observed seaweed diversity recorded at three coastal sampling sites.

DATE & TIME	LOCATION	PH LEVEL	SEAWEED TYPE
2/11/26 2:20pm - 2:30pm	Marine Park Sample 1: Estuary (near bridge/outflow)	7.3	No seaweed found, no seaweed expected
	Marine Park Sample 2: Estuary channel	7.1	7 seaweed types observed (see Figure 5)
	Marine Park Sample 3: North of estuary	7.9	6 seaweed types observed (see Figure 5)
2/18/26 2:20pm - 2:30pm	Zuanich Point Park Sample 1: Marina side	6.0	1 seaweed type observed (see Figure 5)
	Zuanich Point Park Sample 2: Ocean side	6.0	2 seaweed types observed (see Figure 5)
2/25/26 2:20pm - 2:30pm	Locust Beach Sample 1: Stream outlet	6.8	No seaweed found, no seaweed expected
	Locust Beach Sample 2: Near stream mouth	6.4	1 seaweed type observed (see Figure 5)
	Locust Beach Sample 3: North side	6.6	1 seaweed type observed (see Figure 5)

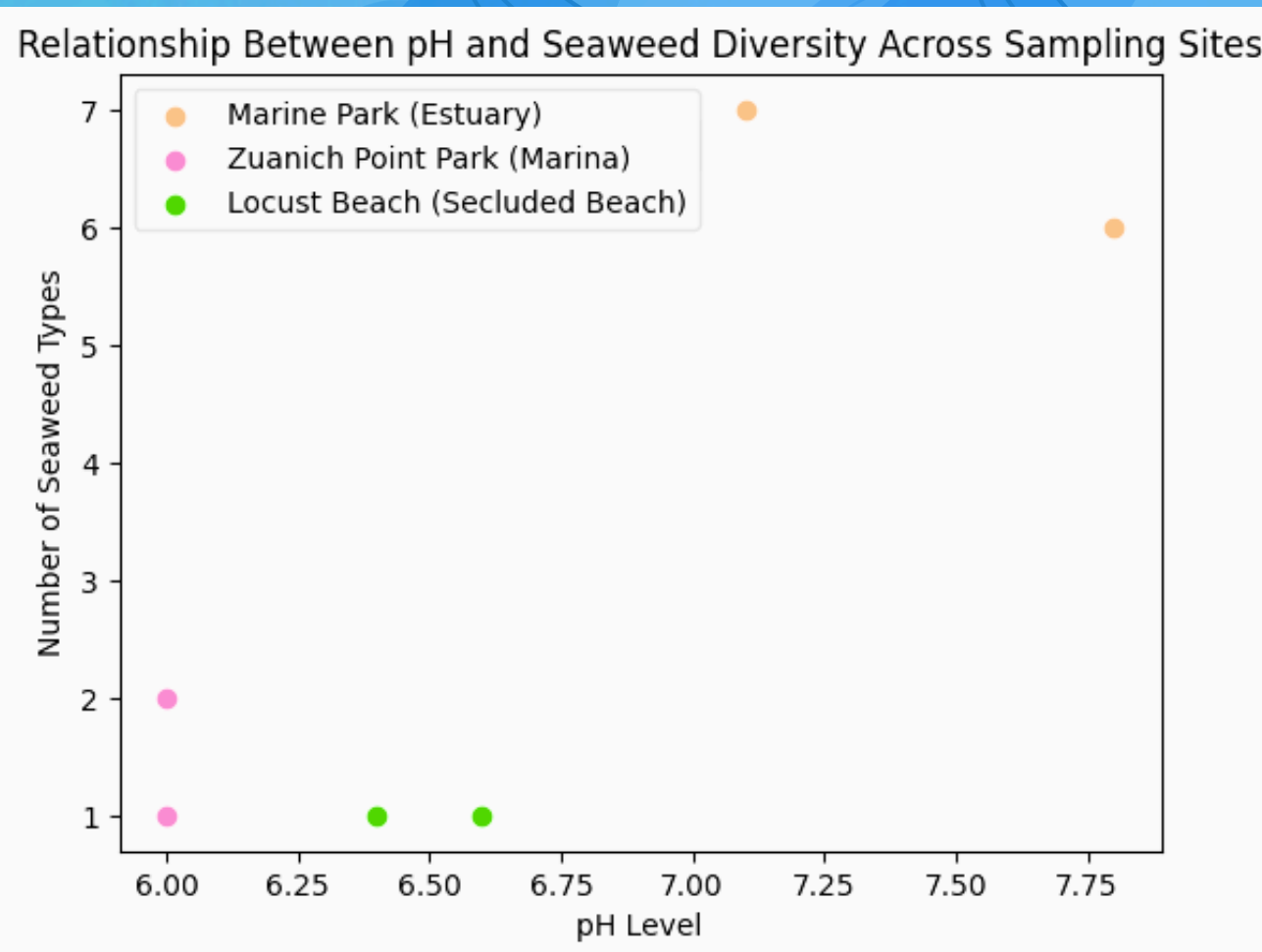


Figure 2. Relationship between pH level and seaweed diversity across the three sampling sites.

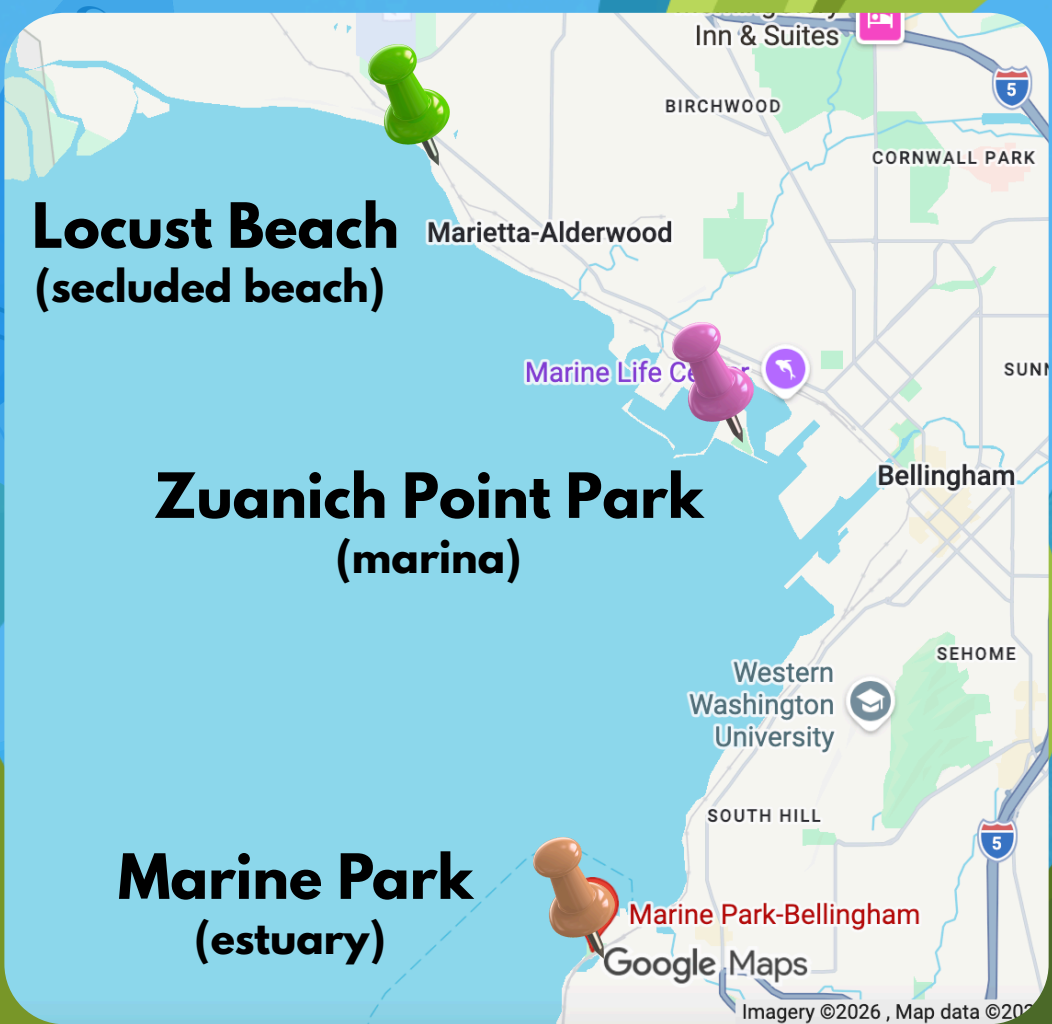


Figure 4. Map of the three sampling locations: Marine Park (estuary), Zuanich Point Park (marina), and Locust Beach (secluded beach).

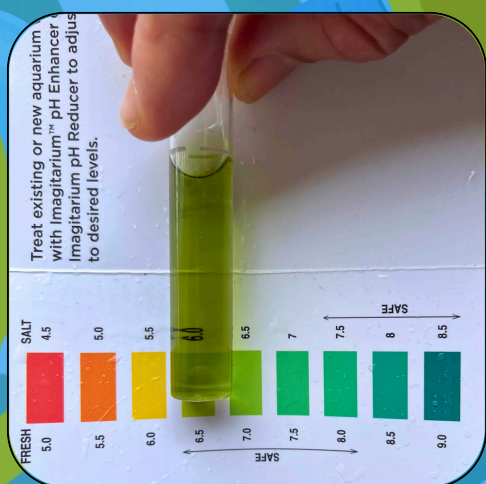


Figure 3. Field sampling using pH indicator strips to estimate water acidity at each site.



Figure 5. Examples of seaweed species observed at Marine Park, Zuanich Point Park, and Locust Beach.

Discussion

Our results showed differences in seaweed diversity between the three coastal locations. Marine Park (estuary) had the greatest diversity with up to seven seaweed types observed, while Zuanich Point Park (marina) had one to two types and Locust Beach (secluded beach) had the lowest diversity with zero to one types. Although pH varied slightly between sites, the estuary supported the greatest seaweed diversity, meaning our results did not fully support our hypothesis, which predicted more seaweed at both Marine Park and Locust Beach. Previous research suggests water chemistry can influence seaweed growth, noting that “seaweeds grown under acidified conditions may alter their growth and photosynthetic capacity.” (Kinnby et al., 2021).

One limitation of this study is that pH was measured using indicator strips instead of a digital probe, making the measurements less precise. In addition, samples were collected on only one day at each site, so changes in tides, weather, or water movement may have affected the results.

Future studies could improve accuracy by using digital probes, collecting data across multiple days, and including additional factors like salinity, temperature, or nutrient levels, to better understand what drives seaweed diversity across coastal habitats.

Acknowledgments & Works Cited

Monica Riess, for guidance and support throughout the project.

Hu, Z. M., Shan, T. F., & Zhang, J. (2023). Ecological and genetic insights into seaweeds’ role in marine ecosystems. *Frontiers in Marine Science*, 10. <https://doi.org/10.3389/fmars.2023.1273405>

Kinnby, A., Whitehouse, M. J., & Pavia, H. (2021). Ocean acidification decreases grazing pressure but alters seaweed growth. *Ecology and Evolution*, 11(5), 2216–2227. <https://doi.org/10.1002/ece3.7210>