Exploring the Relations Between Oceanic pH Level, Sea Glass, and the Environment

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Oceanography 101

Research Question & Background

Our research question was "Can sea glass be an accurate indicator of ocean P.H. levels based on its opacity?"

According to Kristin Hissong, sea glass collected near bodies of water with higher pH levels produce glass with a greater opacity such as the Atlantic Ocean as opposed to glass collected near bodies of water with lower pH levels producing more transparent glass with rounded edges such as bays (2019).

Ocean acidification is a consequence of global warming and results in low pH levels. When this occurs, fish can't detect predators, disrupting the food web and affecting humans who rely on seafood as a food source and our economy when there is no longer a need for commercial fishing (*Ocean Acidification*, 2020). Swimming in bodies of water with abnormal pH levels results in stinging eyes and skin irritability (Department of Health & Human Services, n.d.). If sea glass can accurately indicate an ocean's pH level, an immediate benefit would be knowing if it is safe to swim and a long-term benefit would be helping to monitor an environmental issue.

Methods

Materials & Location

Our materials included 8 pH test strips (2 for each location), Ziploc bags for collecting the sea glass, a hula hoop as a quadrat device, and small tubes for water sample collection. We visited Boulevard Park, a beach near the Lummi Bay Island ferry route, Teddy Bear Cove, and Jorgenson Pier in Blaine.

Procedure

We collected our data by visiting each of the beaches named above, collecting glass from the shoreline, observing the glass we collected and making predictions based on our research, and then testing the pH level of the water at each beach.

Steps we took for collecting glass:

- Tossing hula hoop in 5 different areas of the beach
- Spending 10 minutes at each circle collecting as much glass from inside the circle as we could
- Writing down our observation from each circle

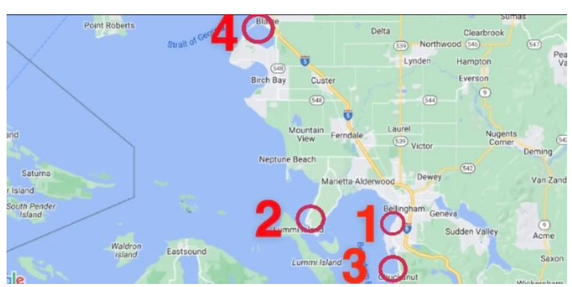


Figure 1. Beaches where sea glass was collected (Boulevard, Lummi Bay, Teddy Bear cove, and Jorgenson Pier (Blaine).)

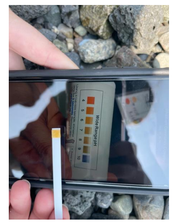
Research Findings: Sea glass and PH observations

1

2

Boulevard Park:

Size: Small with some tiny and medium
Color: Majority was clear and brown, some green, one blue piece
Clarity: Fairly opaque
Quantity: 30 pieces per circle.
Prediction: High pH level
pH test results: Estimated 7

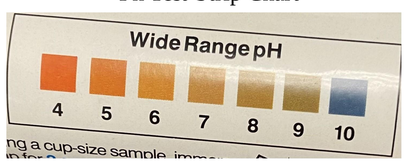


Lummi Bay:

Size: Medium
Color: Brown and Clear
Clarity: Very Opaque
Quantity: 0-5 per circle
Prediction: High pH level
pH test results: Estimated 6.5

Sea glass collected at Boulevard Park

Ph Test Strip Chart



Sea glass collected at Teddy Bear Cove

3

Teddy Bear Cove:

Size: Majority small, some tiny, few medium.
Color: Majority was brown, some clear, a few green and blue.
Clarity: Transparent but rounded edges
Quantity: 20-30 Pieces per circle
Prediction: Low-normal pH level
PH test results: Estimated 7

4

Jorgensen Pier (Blaine):

Size: Majority very large, some large, few small-medium.
Color: Majority brown and clear, some green, a few blues.
Clarity: Transparent but rounded edges.
Quantity: 20-30 per circle.
Prediction: Low pH level
PH test results: Estimated 7.5

Left, top bottom; An example of one out of the five hula hoop tosses at each beach where sea glass was collected. Right top to bottom; pH test strips taken from each location being compared to a pH scale.

Discussion

After conducting our research, we concluded that sea glass is not an indicator of ocean pH levels based on its clarity. The collected data can be categorized as small opaque at location 1, medium opaque at location 2, small transparent at location 3, and large transparent at location 4. Despite the variety of data, the test results were similar and imprecise ultimately leading to the answer of sea glass not being an indicator of pH levels.

We struggled to produce precise test results because of our use of pH test strips to test the water samples we collected. With a different strategy for testing the water samples' pH levels, we could have had more specific answers leading to a different conclusion. Our research may have been better suited if conducted in a controlled setting like a lab where variables that would affect the glass in the natural world could be eliminated. Hissong's idea of the relation between sea glass and pH levels could have differed from the results of research because of the different locations from around the world that were mentioned as opposed to our 4 locations in 1 county (2019). There is also a very limited amount of scientific research on the effects of pH on sea glass and on sea glass in general.

Once we found our conclusion, we began wondering how sea glass and its collection affect the environment versus what it could do for the environment. The EPA qualifies sea glass as marine debris based on a definition provided by NOAA and aquatic trash (2022). These definitions mean sea glass serves no purpose to the ocean's ecosystems and is only valuable when it is collected. This is an issue because the collection of sea glass can lead to coastal erosion and damage to marine habitats (Joe, 2023). Leaving sea glass on the beaches poses its own issues though because it is a danger for marine species as the glass can make its way into the stomachs of marine life leading to their death (United States Environmental Protection Agency, 2022). Sea glass when left on beaches can also be weathered down into micro-size pieces and when mixed into our ecosystem, can eventually make its way into the human respiratory system (Kumari et al, 2022). This means that if research is continued to determine if sea glass can be beneficial to the environment in any way, the study's benefits should be considered against the negative effects of the glass's removal.

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