Cuban Sands & Their Contents

Dylan Metcalfe *Physical Geology 211 - Winter 2025*

Research & Background

The Gardens of the Queen (TGQ) in Cuba is the largest marine reserve in the Caribbean (D. Guggenheim, 2022). The marine reserve protects one of the healthiest coral reefs in the Caribbean. (American Museum of Natural History, 2025). Cuban reefs have vastly avoided the devastating fate of global coral reef bleaching due to high water temperatures, sparking a new curiosity amongst scientists around the world. (Nelson, 2019).

While traveling to TGQ, I had the unique opportunity to survey and collect sand from two different, but neighboring sites. There appeared to be one dominant sand composition & source (figure 1). Finding different sand only 2.5 miles from each other (figure 2) sparked the question: ***What does sand reveal about the transportation mechanisms within The Gardens of the Queen?*** Understanding the contents of each sand sample will provide further understanding to the overall oceanographic story.

Figure 1. Dylan collecting sand sample 1. Photo by Kelley S.

Methods

- Collect Sand in Cuba (figure. 1)
- Dry sand out in the sun on a non-permeable surface until sand is completely dry. (figure 3)
- Evaluate the sand via hand loop and microscope. (figure 3)
- Identify the size, color, and mineral contents of each sample.

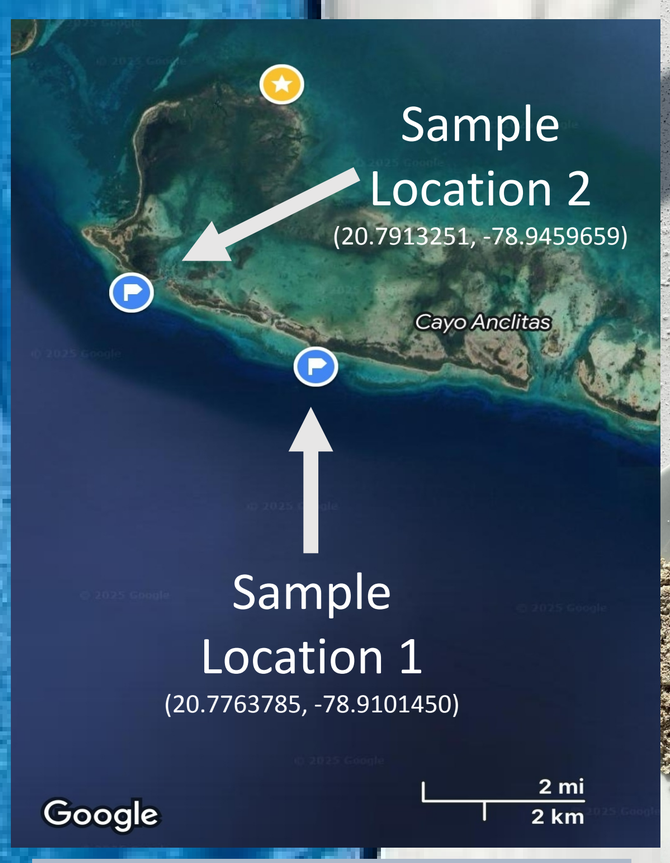

Fig 2 (Above). Google map screen shot of the two sand sample locations.

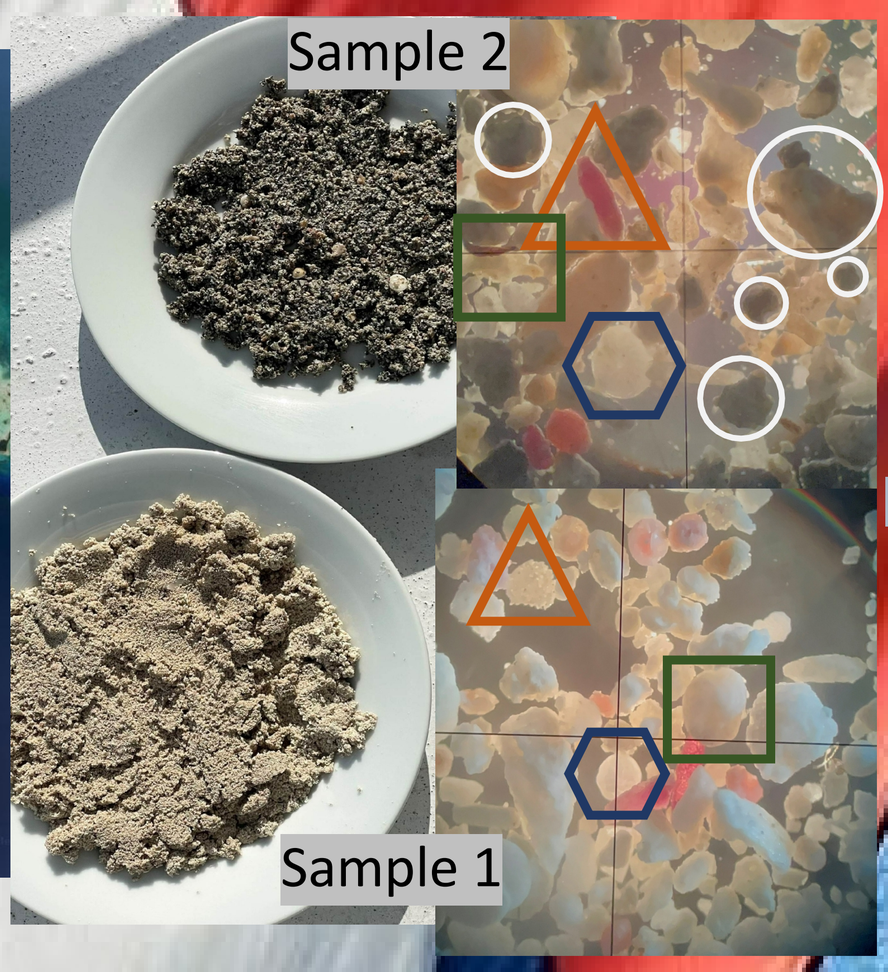

Fig 3. (middle right). Sand sample 1 and 2 while drying
Fig 4. (Middle left Top and bottom) Each sample under 2.5 magnification under the polarized microscope With Orange Triangle identifier of coral, Green square identifies shell, Blue Hexagon shows foram and White Circle showing some of the non-carbonate material.

Fig 5. NullSchool.net ocean current map of sample 1.

Fig 6. NullSchool.net ocean current map of sample 2.

The ocean current is 0.01 meters/second faster at the second location compared to the first at the time of sample collection. Archive data at these same locations show trends of stronger currents measuring at 0.10 m/s at location 1 exactly 10 years prior. The primary difference is the wind direction which is not indicated in these figures but is pushing in east to west in 2025 and pushing in south to southwest on the same day in 2015. Overall, location 2 experiences faster currents at steeper angles to the neighboring land mass.

Results

Upon actual analysis between the two samples there is a distinct difference in composition (figure 3 & 4).

- Sample 1 had less than 1% of its contents remain after being dissolved in acid.
- Sample 1 was is also visually identical to most of the surrounding reef and islands.
- Sample 2 contained additional material that was identified as silica and feldspar.

Discussion & Limitations

My initial observation that the composition of each sand sample varied from each other was validated by deeper investigation of the sand contents. Visual inspection under a microscope as well as chemically evaluating the material by dissolving the sand in acid revealed that while the primary contents are carbonate based, sample 2 did contain non-carbonate material. Evaluating the remaining material under microscope, there were primarily microscopic organisms in both samples while sample 2 contained close to 5% silica and feldspar minerals. When considering the slightly faster moving currents in location 2 compared to location 1, and the overall pattern of currents pushing in from eastern Atlantic ocean, it would make sense that the darker sand is deposited from incoming currents from areas outside of the Caribbean. This implies that there is a measurable amount of influence from traveling sediments outside of the Caribbean. It is unclear if this particular transportation plays a role in the remarkably high health of the TGQ. With more time and a more focused expedition, I could collect more sand samples from surrounding areas to get a more complete picture of the composition of the sand.

Unfortunately, my time in Cuba was short, and while, diving with others with different goals to my own. I was limited to the capacity of my own performance and equipment. The political atmosphere between Cuba and America also presented small challenges that ultimately make repeating this work difficult. I hope to see these challenges resolve in the coming years, allowing for the Cuban government to be supported in more research and surveying of their outer islands. Additionally, upon returning home, I was limited to the tools provided to me at WCC to identify and interpret the sand I had collected. Meaning I was not able to identify my samples more specifically than I have in this project. *Data collection is the key to more questions!*

Acknowledgements

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Background Image: Creative Commons Cuban national flag