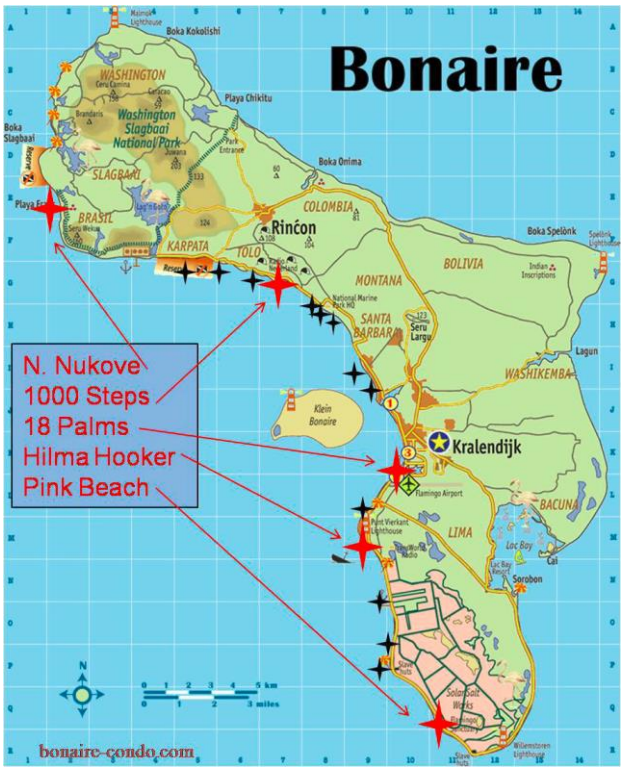
Lab: Coral Reef Biodiversity

(modified from Virginia Institute of Marine Science)

Background



Coral reefs are one of the most biodiverse habitats in the world; meaning many species live or depend on the reef for food and shelter. Because coral reefs have such high biodiversity they are very important to the health of the ocean creating stability in water chemistry and sediment transport, improving water quality and controlling carbon dioxide levels. Unfortunately coral reefs are very susceptible to small changes in water quality and environmental conditions, overfishing and habitat destruction. Biodiversity can be quantified in several ways, including: species richness; the Simpson index; the Shannon-Wiener index (or more commonly, the Shannon index); and species evenness. These indices allow scientist to compare different sites using the same measures, allowing for an "apples to apples" comparison. While it is possible to survey a coral reef using quadrats, scientists are now using cutting-edge technology to closely examine the entire reef; instead of extrapolating results from several study sites. Scientists at the Virginia Institute of Marine Science are taking video of reefs and then analyzing it via a computer program back in the lab. This method cuts down on the inherent error associated with the quadrat system and actually requires less time and money spent in the field.

Prelab Questions

1. Why are coral reefs important to the health of the ocean?

2. Why are diversity indices important?

3. How can video be used to analyze coral reefs?

Data Analysis

Using the coral reef key (**Figure 2**), identify what lies immediately beneath the center of each of the 50 random points in **Figure 3 and Figure 4**. Record your answers in Table 1 of the **Coral Snapshots Spreadsheet**.

In Table 2, column B, combine your data from Table 1 into the six listed categories for both the 1000 Steps shallow and deep sites. Next, in column C calculate the Percent of Transect for each identifier (stony coral, octocoral, etc.) by dividing the abundance of each individual identifier by the Total Abundance (do not include the abundance of the Shadow identifier). *Note that Table 2 will do several calculations for you (pink and green cells) and produce several biodiversity indices you learned about earlier. Table 3 includes representative Shannon-Wiener Indices and other traits from the other project-sampling sites around Bonaire (refer to **Figure 1**, the map of Bonaire as needed). Add the Shannon-Wiener Indices you calculated for both 1000 Steps sites and the Percent of Transect for the stony corals and octocorals. Record your results below from Table 2.

Table 2 Summary: Shallow Site (Figure 3)

Total Abundance (N):	
Richness (S):	
Shannon-Wiener Index of Diversity (H'):	
Evenness (H'/ln(S)):	

Table 2 Summary: Bonaire Deep Water Site (Figure 4)

Total Abundance (N):	
Richness (S):	
Shannon-Wiener Index of Diversity (H'):	
Evenness (H'/ln(S)):	

Postlab Questions

4. Based on the data analyzed in Table 2, which of the two sites (Shallow Water or Deep Water) was more diverse, as indicated by the Shannon Index? Why do you think this is?

5. Based on Table 3, how does the biodiversity of shallow sites compare to deep sites through all locations?

6. Using the data from Table 3 and looking at Figure 1, how does the biodiversity of sites near major development (like the capital city) compare to sites far from development?

7. What might cause the differences you saw in question 6?

8. The images used during this activity were taken during daylight hours. Would you expect different abundances of fish and invertebrates at night? Why or why not?

9. Describe the advantages and disadvantages of how this process is used to analyze the coral (using snapshots from video and assigning randomly generated points).

10. Describe how these techniques could be used to analyze other ecosystems. Give at least two examples.