Abstract

Advances in SCUBA technology have allowed mesophotic reefs forming in 30-150 meters water depth to become increasingly familiar. Little is known about these deep water reefs, however early studies have shown that damaging processes that affect reefs in 0-30 meters of water may not harm mesophotic reefs. One way of evaluating local environmental conditions is by examining the interstitial sediments. Grain size and compositional analysis of samples from different reef sites reveal differences in the sediment producers, bioerosional processes, and hydrodynamic conditions. This study compares reef sediments of 3 mesophotic reef sites to 1 shallow water reef on the southern coast of St. Thomas, U.S. Virgin Islands. Understanding differences in shallow and mesophotic reef sediments will help us better understand the processes in the deeper reefs, and their ability to endure in a rapidly changing ocean.

Sediment samples were collected and grain size analyses was completed to determine the relative percentage of sediments in standard size fractions. The data shows similar mean grain size in both shallow and deep reefs suggesting the depositional processes of the different habitats may be analogous. Ongoing research is needed to analyze the composition of the reef sediments from both the mesophotic and shallow reef environments. This analysis may conclude differences in the sediment producers, rates of sediment production, energy regimes, and sediment facies between shallow and deep water reefs.

Methods

Results

Figure 1: South Puerto Rican Shelf, U.S. Virgin Islands.

Figure 2: a) Sieves [44mm - <0.063mm], b) Sediment collected from hillock basin and secondary high bank, c) Sediment collection from hillock basin, d) Shallow patch reef, e) Methodology for collecting mesophotic reef sediments, f) Secondary high bank, g) Primary high bank.

Figure 3: Histogram showing the percent of each sample in each grain size.

Figure 4: Mean Grain Size. Hillock Basin has finer sediment than the other reefs (Larger Phi (Φ) equals finer sediment).

Figure 5: a) Sediment from secondary high bank, b) Experimental design for collection of suspended load and measurement of sedimentation rates.

Conclusions

- Hillock Basin has lower energy regime than the other deep reefs
- Mesophotic reefs exist in both high and low energy environments
- Analysis suggests distinct mesophotic reef sediment facies

Future Work

- Grain size analysis of 1 shallow, 1 intermediate and 2 deep reefs
- Composition analysis of all reef sites (needed to improve characterization of mesophotic facies)
- Compare bed load composition to that of suspended particles