## UNIVERSITY OF MIAMI ROSENSTIEL SCHOOL of MARINE &



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### BACKGROUND

Shallow water coral reef geomorphology and structural sustainability are highly determined by the balance of localized carbonate constructive and destructive sedimentary processes. However, little is known regarding the variability and influence of fundamental sedimentary processes in mesophotic coral ecosystems; deep reef communities 30-150 m below sea level highly valued for potential refugia and shallow-water connectivity. Coral framework production, secondary carbonate accretion (calcareous encrusters), and bioerosion, the three most critical components of net carbonate accumulation, were analyzed in mesophotic reefs south of St. Thomas, U.S. Virgin Islands along a sediment transport and sedimentation limiting low-angle slope.

### **OBJECTIVES**

Quantify and compare mesophotic coral growth rates and secondary carbonate accretion • Determine experimental substrate bioerosion rates and relative contributors



RESULTS

Fringing/patch (9.0 m)

Fig. 1 South Puerto Rican Shelf, 1 m resolution multi-beam batheymetry. The 2 shallow-water reef sites are located in close proximity to the St. Thomas coast. More than 10 km south of St. Thomas, 4 mesophotic coral sites occupy distinctive structural habitats (red insert with 20x vertical exaggeration).

0.06-0.04-0.02mesophotic basin site (44.5 m) Basin

Fig. 2: Recently dead Orbicella annularis (star coral) was collected at 3 mesophotic reef habitats and cut parallel to the primary growth axis. (A) Example of x-radiograph. High bulk density prevented measurement of skeletal density and calcification curves. Red arrows indicate corallite that example luminance graph (in green box) and stable isotope graphs are based on. Brown bars indicate light bands/low density and correlates with isotope data. (B) Comparison of mean linear extension rates indicate differences; all significantly slower than same species from shallow water St. Croix reefs (0.83 ± 0.05 cm/yr)<sup>a</sup>.

# Balance of constructive and destructive carbonate processes on mesophotic coral reefs

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Secondary bank Primary bank







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# EXPERIMENTAL SUBSTRATE RESULTS





## **CONSTRUCTIVE VS. DESTRUCTIVE PROCESSES**