Introduction
Reliable, quantitative process of past sea-level and paleoenvironmental change is crucial in integrating biologic and historical records into predictive models in order to better understand the response of coastal systems to marine inundation. Microfossils are used to reconstruct Holocene sea levels, with the use of benthiic foraminifera (Wilson and Ettensohn, 1996) for study; however, these biological proxies are somewhat limited due to spatial restrictions and poor temporal resolution of data. As such, non-biologic processes become more notably tropical environments. In this study, we aim to overcome the confines of existent indicators by adopting the use of stable carbon isotope ratios of organic matter – a technique routinely used for paleoenvironmental reconstructions in lacustrine environments – to a tropical coastal setting.

Sea-level indicators
A sea-level indicator is a physical, biological or chemical feature that must possess a systematic and quantitative relationship to elevation within the intertidal zone, each sample is

Sea-level indicators

Stable carbon isotopes
Stable carbon isotopes (the ratio of 13C to 12C with reference to a standard; δ 13C) are used to deduce past sea-level change in tropical and more notably temperate environments. In this work, however, indicates that post-

Modern intertidal mangrove environments from three sites in Puerto Rico were selected for study (Figure 3). To determine the relationship of contemporary samples of foraminifera and stable carbon isotopes to elevation within the tidal frame, transects perpendicular to the shoreline from low elevation, tidal flat environments were set up. At each sampling station along the transect, 1-cm samples were collected for identification of foraminifera and stable carbon isotopes, C/N, and grain size analyses. Fresh and decaying vegetation from the intertidal zones were collected. A Russian hand net was used to collect a sediment core from the site at Rio Grande. The core was sampled for foraminiferal identification and stable carbon isotope, C/N, and grain size analyses. δ 13C values were measured in laboratories at the University of Puerto Rico (UPR) and the University of Florida (UF). The δ 13C and δ 15N values for the samples were measured at the British Geological Survey (BGS) on plant and sediment samples by combustion in a Costech Elemental Analyser coupled online to an Optima dual-inlet mass spectrometer.

For measurement of δ 13C, sediment samples were treated with 5% HCl overnight, mixed with deionized water, dried in an oven at 40°C, and milled to a fine powder using a pestle and mortar. Plant samples were washed with HCl water, dried in an oven at 40°C and milled to a fine powder.

Table 1. Mean and range (within 95% confidence) of δ 13C, total organic carbon (TOC), total nitrogen (TN), and C/N of foraminiferal and intertidal environments from sampling sites within the intertidal zone at Ponce de Leon Inlet (ANOA). Sampling stations were assigned to total flat, Rhizophora, and Avicennia environmental groups on the basis of ANOVA and Tukey-Kramer application. δ 13C, TOC, and TN were assigned as response variables and the model was run with sites nested. Sampling stations located in transition zones between vegetation types were excluded from analysis. On the basis of δ 13C, total flat, Rhizophora and Avicennia environments are significantly different and the model is significant (F-ratio=49.91, p<0.05). For TOC, Rhizophora is significantly different than tidal flat and the model is significant (F-ratio=4.03, p=0.05). For TN the environments are not significantly different and the model is not significant (F-ratio=0.36, p>0.05).

References