Variation in the nutrient content of sediments down core in the Basin and Fringe Mangrove Forests of Jobos Bay, Puerto Rico — 100 years of change

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Research Questions

Does the nutrient content of sediments vary down core between basin and fringe mangrove forests in JBNERR?

If so, is this a reflection of changes in land use patterns in watershed over the last 100 years? In both of the mangrove forest types? What does this variation mean for accretion rates and productivity in this ecosystem?

Why Mangroves are Important

They’re responsible for a net import of nutrients, freshwater, and sediments, and a constant outflow of organic matter and water from terrestrial environments to marine or estuarine waters

They contribute to estuarine and marine food chains, to water quality, and to the maintenance of coastal geomorphology (Crespo et al., 1985)

World’s richest carbon stores (Donato et al. 2011)

Difference between the Fringe and Basin Mangrove Forest

Fringe forests are distinguished by their occurrence along the seaward edge and along the coastal lagoons

Basin forests are characterized by being separated from direct contact with the ocean

Research

Irrigation canals brought water (200 M gal/day, pers. comm. Angel Dieppa) from other watersheds for agriculture from 1914 until 1995 for sugarcane and fruit and vegetable cultivation

Coring Site Locations

At the Basin Forest:
- Dominant species: Short Red (Rhizophora mangle) and Black (Avicennia germinans) mangroves
- Water chemistry taken in standing salt pan: Temperature = 36.3°C (97.3°F)
- Salinity = 83.96 ppt, pH = 7.8

At the Fringe Forest:
- Dominant species: Short Black Mangroves

Jobos Bay National Estuarine Research Reserve

JBNERR was established in 1981, with an acreage of 2,883 ha.

Contains a variety of habitats that include: mangroves, wetlands, extensive seagrass beds, upland dry forests, and lagoons. (JBNERR, 2019)

Mean annual Temperature: 26°C (78.0°F)

Mean annual rainfall: 106-114 cm

Methodology

Field work — June 9th, 2017

A core of 50 cm of depth was taken in the basin and fringe forest, respectively.

Clear water and low tide.

Water chemistry was taken in standing salt pan.

Lab work — From June 9th, 2017

The first 10 cm of the core were sliced into 2 cm, while the remainder of the core was divided into 1 cm samples.

Each slice was then divided for mollusk and root, C, N and P content, %LOI, DBD, and 210Pb dating analysis.

Preliminary Results

- Fringe shows greater variation in % LOI over time, perhaps the fringe is getting additional sediments of the estuary.
- Increasing trend in % P for both sites over time reflect the increase in the global nutrient delivery to streams that occurred during the 20th century.
- Increase of %P at the 8-13 cm interval in the basin forest could be related to agricultural runoff in the watershed and likely reflects the increase in agriculture and urbanization on the area surrounding JBNERR (Dieppa et al., 2008) and changes made to Jobos Bay’s watershed since the beginning of the 20th century (Gonzalez, 2011).

Acknowledgements

JBNERR Research Project — NSF, at the University of Puerto Rico - Rio Piedras Campus, Dr. Joseph “Donny” Smoak and Amanda Dieppa.

Acknowledgements are made to Dr. diceppa at the UPR Botanical Garden, San Juan, Puerto Rico; Dr. Joseph “Donny” Smoak and Amanda Dieppa.

To my mentor, Dr. Danielle Ogurchak, for her patience and dedication; CREST

USFSP; everyone working in the lab team, Sara Wilson, for her patience and dedication.

This material is based upon work supported by the National Science Foundation under Grant No. HRD-1547798. This NSF Grant was awarded to Florida International University as part of the Centers of Research Excellence in Science and Technology (CREST) Program. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.