

ABSTRACT

Mangrove, Seagrass, and Coral Reef Community Interactions of the Falmouth Coast, North West Jamaica

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The chemical, physical and biological interactions of the mangrove, seagrass and coral reef communities of Salt Marsh, Falmouth, Jamaica were assessed on a monthly basis from April 1997 to March 1998. Eleven (11) sampling stations were situated across the three zones covering an area of approximately 100 km². Physical, chemical and plankton samples were collected on each sampling occasion.

The study site is located on a narrow coastal shelf, and is characterised by having a shallow bathymetry. A high level of mixing of the water column occurs during periods of high hydrological (wind) activity, from the action of wind derived currents and waves. As a result of this it was found that the water column and sediment were apparently homogenous with respect to dissolved nutrients (nitrates and phosphates). There was however, a difference in nutrient concentration between the sediment and water column.

While there were no detectable nutrient concentration gradients between the mangrove, seagrass and coral reef zones, the offshore waters of Falmouth and the Martha Brae River appear to have an impact on the water quality of the offshore coral reef zone. The average nutrient concentrations detected in the water column above the mangrove, seagrass, coral reef and offshore Falmouth for dissolved inorganic nitrate were; 0.94, 0.79, 1.11 and 1.22 $\mu\text{Mol l}^{-1}$ respectively, and for dissolved inorganic phosphate the values were; 0.24 (mangrove), 0.31 (seagrass), 0.33 (coral reef) and 0.26 $\mu\text{Mol l}^{-1}$ (offshore Falmouth). The average nitrate concentrations detected in the sediment were; 1.75 (mangrove), 2.08 (seagrass) and 1.95 (coral reef) $\mu\text{Mol l}^{-1}$, and the average phosphate sediment concentrations were 0.24, 0.26 and 0.18 $\mu\text{Mol l}^{-1}$ in the mangrove, seagrass and coral reef zones respectively. The differences in nutrient concentrations suggest that there may be a flow of nutrients between the sediments and water column.

There were no clear seasonal trends observed over the period of sampling as a clear correlation between rainfall and nutrient and plankton dynamics could not be made. During the period of sampling, differences in nutrient and chlorophyll 'a' concentrations were observed during one particular period of high rainfall during the month of June.

It was found that mean nutrient and chlorophyll 'a' concentrations in the water column were detected at lower concentrations during periods of high energy

hydrological activity (NO_3 - $0.75 \mu\text{Mol l}^{-1}$, PO_4 - $0.22 \mu\text{Mol l}^{-1}$, Chl 'a' - 0.07 mg m^{-3}) when compared to normal conditions (NO_3 - $1.1 \mu\text{Mol l}^{-1}$, PO_4 - $0.34 \mu\text{Mol l}^{-1}$ Chl 'a' 0.17 mg m^{-3}).

During high energy conditions mean zooplankton numbers were higher than those numbers detected in normal hydrological conditions (high energy - $4358 \text{ indiv. m}^{-3}$ and normal - $1303 \text{ indiv. m}^{-3}$) . These results confirm that during periods of high hydrological activity the effects of bioturbation on the benthic community (mangrove roots, seagrass blades) resulted in an increase in the numbers of benthic zooplankton into the water column.

Generally low phytoplankton biomass values over the year of sampling suggest that the waters of Salt Marsh are not eutrophic. Chlorophyll 'a' concentrations were detected at 0.28 (mangrove), 0.07 (seagrass) and 0.005 (coral reef) mg m^{-3} . An analysis of the size fractions shows that the phytoplankton community was dominated by net plankton. The presence of net plankton at the site may be a direct result of nutrient enrichment from the town of Falmouth.

The mangrove zone supported the highest phytoplankton biomass concentrations which were significantly higher than the seagrass and coral reef zones, which were not significantly different from each other. The mangrove zone was also found to support the highest numbers of zooplankton. The planktonic community

can be used to delineate the study area into two zones, an inshore mangrove zone and an outer seagrass/coral reef zone.

This study showed that a nutrient concentration gradient between the mangrove, seagrass and coral reef communities cannot be clearly defined. The offshore waters overlying the coral reef zone appear to be affected by the Martha Brae and the town of Falmouth from the movement of water via longshore drift along the coast.

The distribution of the planktonic community across the three zones may give an indication of zonation between the inshore and the offshore communities. In addition, the interactions between the coastal communities are highly complex including nutrient exchange via planktonic, floral and faunal interactions.

Keywords: Peter Edwards, Mangrove, seagrass and coral reef community interactions, Falmouth, Jamaica.