Classification of Holocene Foraminifera Bio-Facies Within the Transgressive Lower Lafourche Headland, Louisiana

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Abstract

Foraminifera assemblages of the Mississippi River delta region represent distinctive biofacies that have been shown to vary in species composition and population count as a function of clastic sedimentation rate, salinity, elevation relative to mean sea level, mechanical energy, and food supply. Across the Mississippi River delta plain foraminifera biofacies have been documented for a wide array of fluvial and marine environments such as the intertidal marsh and mudflat; interdistributary bay and estuary; salt wedge of active distributary channels, delta-front sands and barrier islands; prodelta; turbulent inner shelf, middle shelf, and outer shelf. The preliminary results presented herein enhance and extend existing research by incorporating improved preparation techniques, modern taxonomy, and replicate sampling to more tightly constrain the environmental variables that control foraminiferal distributions within a transgressive marsh environment.

The coastal Louisiana location for this study is a transgressive, saline marsh within the lower Lafourche headland of the south-central delta plain. Marsh surface samples were taken along transects from highest high water, marsh interior, lowest low water marsh, marsh edge, intertidal mud flat, and tidal creek. Precise elevation surveys were conducted for each sample site and sediment samples were obtained for analysis of foraminifera, sediment grain size, organic carbon, pore-water salinity, and sediment and air temperature. Preliminary results indicate that environmental variables such as elevation, grain size, and salinity apparently strongly influence the distribution of agglutinated marsh and coastal carbonate foraminifera in the study site. For example, *Trochammina inflata*, and *Siphotrochammina lobata* dominate the foraminiferal assemblage at higher elevations (~0.6 m) that are covered by mangroves and where pore water salinities exceed 50 practical salinity units. By contrast, *Miliammina fusca* dominates the *Spartina*-covered marsh interior (elevation = 0.4 m) where pore waters are near normal marine salinity (24 practical salinity units). *Arenoparella mexicana* and coarsely agglutinated *Ammotium crassus* dominate the barren mudflat (elevation =0.1 m) and pore waters are normal marine salinity (35 practical salinity units). However, the mudflat also contained a small amount of the carbonate species. These carbonate test building *Elphidium cf. E. matagordanum* and *Ammonia parkinsoniana*, dominated the subtidal creek. The assemblages change distinctly with elevation from the upper to the lower intertidal zones along with vegetation and pore water salinity. Such clear changes may provide great sensitivity in delineating intertidal sediments in the subsurface.

This approach for foraminifera biofacies analysis provides the opportunity to develop a surficial model of foraminifera biofacies within saline influenced marsh of the Louisiana coastal zone. Biofacies models can provide important comparative tools that can be used to evaluate the factors that most strongly influence foraminifera occupation and propagation. It can also be used as a measure of the health of other coastal marshes and marsh restoration success.