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Microgastropod population changes from the early Cretaceous to the Recent in the Gulf Coastal Plain of the USA

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Abstract

A collection of over 150,000 molluscs from the Cretaceous through Recent of the Gulf Coast is analyzed to determine major changes in the abundances, diversities, and taxonomic compositions of microgastropods with a size limit of 5 mm. Five major microgastropod groups are recognized based on the relative abundances of high-order taxa of superfamilial rank and feeding types. First, an early Cretaceous assemblage dominated by *Turritella*, *Nerinea* and *Nerita*. Second, a Campanian Trochoidea-dominated deposit and herbivore feeding type assemblage. Third, a Maestrichtian Philinoidea-dominated carnivore-feeding type assemblage. Fourth, a Paleogene assemblage that is increasingly dominated by carnivores that continues until the end of the Oligocene. Fifth, a more evenly distributed late Neogene assemblage with less dominance by any feeding type. The decline of Trochoidea dominance is closely associated with the ocean thermal minimum at the beginning of the Maestrichtian. The drop in relative microgastropods abundance in the early Paleocene likely reflects paleoenvironmental changes following the KT boundary event. The changes in composition of the carnivore-dominated microgastropod populations in the Oligocene and Miocene appears similarly coeval with the ocean minimum at the end of the Oligocene. This study reveals that the relative abundances and composition of microgastropods are much more sensitive to drops in temperature than for the larger gastropods, and that these temperature drops could be a major contributing factor in the evolution of Gulf Coast microgastropod biotas.

Key words: Abundance, diversity, feeding type, environment, sea temperature

Introduction

The paleo-molluscan diversity of the Gulf Coast has been well documented in monographs and summaries (Dockery 1986; Petuch 1988, 2003). Yet despite the wealth of taxonomic studies *i.e.*, Palmer (1937), MacNeil & Dockery (1984), Mansfield (1930), relatively little work has been done on quantitative analysis of relative abundances of individual taxa as a percentage of the whole population. One such study Stanton *et al.* (1981) confirmed the importance of abundance data in estimating the relative importance of different gastropod taxa in the description and analysis of a community. Understanding this quantitative data has the potential to provide unique insights into the relative importance of taxa in the community architecture. Revealing this biodiversity requires a consistent sampling methodology that quantitatively records the original molluscan death assemblage.

The susceptibility of mollusc communities to temperature changes are well documented (Calnan 1980; Allen *et al.* 2002). Calnan (1980) noted: long-term climatic changes, particularly when accompanied by changes in salinity in shallow-water communities probably affect molluscan distributions more than any other environmental factor. Shallow-water communities on the Gulf Coast have had

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