Chapter 11
Record of Anthropogenic and Natural Modification Along Tunisian Coast, Based on the Micropaleontological Proxy during the Holocene and Anthropocene

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ABSTRACT

The Tunisian coast has witnessed radical changes during the Late Holocene and the Anthropocene, including sea level variation, increasing polluting activities and obvious climatic changes. Among other geological proxies, micropaleontology revealed an efficient tool to infer changes. This work is a deepened discussion of recent works on the micropaleontology of exoreic wetlands stretching along the Tunisian coast. This review explores the role of these microfossils in deciphering the Holocene depositional environments of Tunisian lagoons, drawing upon relevant research. Microfossils serve as excellent bioindicators, providing early warnings of potential environmental risks related to heavy metal contamination. As a tangled relationship, micropaleontology and microplastics are seemingly disparate fields,

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yet they are increasingly intertwined due to the pervasive presence of plastic pollution in our environment.

INTRODUCTION

Microorganisms like diatoms, dinoflagellate cysts, ostracods, and foraminifera are valuable tools for understanding past and current coastal lagoon environments (Gío Argáez et al., 2024). Scientists use their presence, absence, abundance, and population patterns to reconstruct environmental conditions (Alves et al., 2015; Ben Rouina et al., 2024a,b,c). Among these, ostracods and foraminifera are particularly useful for tracking changes in recent and ancient environments. Their populations and species diversity are influenced by factors like water temperature, salinity, depth, sediment type, oxygen levels, nutrient availability, and water movement. Studies in Tunisia have shown that variations in sea level, coastal changes, and extreme events have significantly impacted the evolution of coastal environments over the Quaternary period, namely the Holocene (Thornton et al., 1980; Ruiz et al., 2012). These impacts are reflected in the microfossil record, allowing researchers to reconstruct past environmental conditions and understand how these environments have changed over time. On the other hand, micropaleontology plays a crucial role in understanding the impact of pollution on the Earth system and the onset of the Anthropocene (Silva et al., 2022). Micropaleontologists examine foraminifera, diatoms, ostracods, and other microscopic organisms that are highly sensitive to changes in water quality, salinity, temperature, oxygen levels, and nutrient availability. These changes can be caused by pollution from industrial activities, agricultural runoff, and other human activities. Preserved in sediments, these organisms provide a continuous record of past environmental conditions. By analyzing the abundance, diversity, and species composition of these fossils, scientists can reconstruct past environmental changes and identify the impact of pollution. This allows scientists to assess the impact of pollution in the context of natural variations and identify unique anthropogenic impacts. For example, elevated levels of heavy metals, microplastics, and other pollutants can be linked to industrial activities and urbanization (Essefi, 2020, 2021; Gharsalli et al., 2020; Essefi and Hajji, 2022a,b,c). Micropaleontologists have documented significant declines in the diversity and abundance of certain micropaleontological species, indicating the negative effects of pollution on marine and freshwater ecosystems. Further, micropaleontological records are used to reconstruct past climate change and its impacts on marine environments. Understanding the past response of micropaleontological communities to climate change can inform predictions about future impacts. The widespread distribution of microplastics, heavy metals, and other pollutants in marine sediments are key indicators of the Anthropocene. The