

Modern diatom assemblages as tools for paleoenvironmental reconstruction: a case study from estuarine intertidal zones in southern Iberia

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Diatoms are unicellular algae that live in saline, brackish and freshwater environments, either floating in the water column or associated with various substrates (e.g., muddy and sandy sediments). Diatoms are sensitive to changes in environmental variables such as salinity, sediment texture, nutrient availability, light and temperature. This characteristic, along with their short lifespan, allows diatoms to quickly respond to environmental changes. Since the beginning of the 20th century, diatoms have been widely used to study the Holocene evolution of estuaries worldwide, particularly to reconstruct ecological responses to sea-level and climate changes. However, diatoms have been poorly studied in estuarine intertidal zones, due to the complexity of these environments, which have both fluvial and marine influences. The aim of this study was to understand diatom diversity and spatial distribution in intertidal zones from two geomorphologically and hydrologically distinct estuaries. Sediment samples were collected from within the intertidal zones along the Arade and Guadiana River estuaries in southern Iberia. The sampling points embraced almost all the tidal and salinity gradients of both estuaries, capturing the highest possible environmental variability and hence of diatom assemblages. At each sampling point, the salinity and pH of the sediment interstitial water were measured. The sediment samples were subdivided for diatom identification, textural analysis and organic matter determination. All sampling points were georeferenced by DGPS and the duration of tidal inundation was calculated for each site. Following diatom identification, the data were analysed statistically (i.e. cluster analysis, PCA, DCA and RDA). The present study revealed that there is a great diatom diversity in both estuaries (418 species), with several species new to science. The most important diatom species (with abundances higher or equal to 5%) occur in five ecological groups, which are associated to five distinct environments: lower estuary sandflats, lower estuary mudflats, middle to upper estuary mudflats, lower estuary salt marshes and middle estuary salt marshes. This study allowed us to establish modern analogues that are essential for developing transfer functions (quantitative palaeoenvironmental estimates). These methods will enable more accurate Holocene paleoenvironmental reconstructions on the southern Iberian coast and will improve knowledge about the evolution of estuarine environments globally. The work was supported by the SFRH/BD/62405/2009 fellowship, funded by the Portuguese Foundation for Science and Technology.