



## Distribution patterns of benthic bacteria and nematode communities in estuarine sediments

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### ABSTRACT

Benthic organisms are crucial in the regulation of the ecosystem functions. The interactions between benthic nematodes and sediment bacteria across divergent environmental conditions are poorly understood. The main goal of this study was to understand the spatial distribution patterns and diversity of benthic bacterial communities and nematode assemblages of the intertidal sediments in three sampling sites (Navigator, Tróia and Moinho) along Sado Estuary (SW, Portugal). Bacterial communities were described using a 16S metagenomic approach, while nematode assemblages were characterized using morphological identification. Overall, bacterial and nematode communities presented significant diversity between sites ( $p < 0.05$ ), which is primarily related with the environmental variables (e.g., organic matter and percentage of gravel). The spatial distribution of bacterial communities was in accordance with the ecological conditions of three selected sites at a larger scale than nematode assemblages. Previously described as good ecological indicators, nematode assemblages were separated at sampling site level, suggesting that their response is driven by within site specific factors at a smaller scale. Hence, the present study set a fundamental ground for future research on functional interactions between bacteria and nematodes.

### 1. Introduction

Estuarine and coastal benthic ecosystems represent one of the major sources of essential services for human well-being (Bonaglia et al., 2014; Schratzberger et al., 2018). They play a crucial role in regulating fundamental ecosystem functions such as: food production, degradation and distribution of pollutants, recycling of nutrients and transfer energy through higher trophic levels (Schratzberger et al., 2018). These functions are mediated by intra and interspecific interactions between organisms that support the functional integrity of the benthic ecosystems (Schratzberger et al., 2020).

Benthic nematodes are the most abundant taxon of metazoan meiofauna, representing 50–90% of total meiofauna abundance (Semprucci et al., 2014) and are considered an important tool to assess the

effects of natural and anthropogenic disturbances in marine and estuarine sediments (Ridall et al., 2021). These organisms also play important roles in several ecosystem processes, being involved in complex relationships with microbial communities (Bonaglia et al., 2014; Nascimento et al., 2012; Derycke et al., 2016). The trophic composition of the nematode assemblages has been characterized by the morphological diversity of the buccal cavity providing feeding preferences or morphologic restrictions by ingesting certain type of food (e.g., bacteria or detritus). Under adverse environmental conditions, these assemblages can present a high trophic plasticity adopting generalist feeding behaviour (Nascimento et al., 2012; Derycke et al., 2016). Furthermore, nematode activities related with bioturbation, extracellular polymeric substances (EPS) production and grazing have been proved to be important contributors to stimulate the bacterial development and

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