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ORIGINAL PAPER

Nematode biomass and morphometric attributes as descriptors during a major *Zostera noltii* collapse

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Abstract

Benthic nematodes are recognized as suitable organisms to provide valuable information on the potential ecological effects of natural and anthropogenic disturbances in aquatic ecosystems. The biomass and morphometric attributes of nematodes (body length, width, and length/width) collected in the Mira estuary (SW Portugal) were analysed before the collapse and during the natural recovery process of the *Zostera noltii* bed. In addition, their relationship with community characteristics and environmental variables was studied. Moreover, biomass and morphometric attributes were investigated for their potential use as a complementary tool to the classical descriptor "density" (from which several other descriptors are derived) when studying nematodes as biological indicators. Nematode biomass and morphometric attributes proved to be valuable as correlate with the environmental changes associated with the *Z. noltii* collapse. High values of nematode biomass, length, width, and length/width ratio were observed during the early recovery process of *Z. noltii*, contrasting with nematode densities, which showed consistently higher values before the collapse. These findings suggest that biomass and morphometric attributes indicate a functional adaptation of nematode communities to the new environmental conditions in the early recovery process of *Z. noltii*. Therefore, these traits may be used to provide complementary information to standing stocks of nematode assemblages so as to assess ecological changes over spatial and temporal scales in marine ecosystems, particularly within seagrass bed habitats.

Introduction

Over the last decades, seagrasses have been particularly vulnerable to natural and anthropogenic pressures, namely, climate change and its derived effects (Green and Short 2003; Orth et al. 2006; Duarte et al. 2008; Valle et al. 2014). Recently, these accelerating pressures have caused the disappearance of many seagrass areas (Hughes et al. 2009; Waycott et al. 2009). The important role that seagrass beds play in enhancing biodiversity is related to the stabilization of the water flow and sedimentation, with particular emphasis on primary production and nutrient cycling (Boström et al. 2006; Orth et al. 2006; Short et al. 2011). Accordingly, many studies have shown that, in the presence of seagrass beds, benthic organisms increase their abundance and diversity, as well as their biomass and productivity, whereas results are opposite for communities within unvegetated sediments (Edgar et al. 1994; Boström and Bonsdorff 1997; Webster et al. 1998; Hemminga and Duarte 2000; Hirst and Attrill 2008). Free-living nematodes are structurally and functionally diverse (Moens and Vincx 1997), respond rapidly to environmental changes (Coull 1999), and are found in any habitat, from the highly polluted to the most untouched (Coull and Chandler 1992). Due to their wide range of characteristics, they are representative of the overall ecosystem status and are considered suitable indicators for detecting changes in estuarine environmental conditions over spatial and temporal scales (Coull 1999; Fisher and Sheaves 2003; Norling et al. 2007; Danovaro et al. 2008).

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