Ecological Indicators 106 (2019) 105435

Contents lists available at ScienceDirect

Ecological Indicators

journal homepage: www.elsevier.com/locate/ecolind

Original Articles

Structural and functional composition of fish communities associated to *Zostera noltii* meadows as a response to natural habitat recovery

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ARTICLE INFO

Keywords:
Seagrass
Spatial-temporal variations
Habitat modification
Climate change
Estuaries
Portugal

ABSTRACT

During 2008, the *Zostera noltii* meadows located in the lower Mira estuary (SW Portugal) disappeared completely. However, during 2009, symptoms of natural recovery were observed, and in 2015 totally mature patches were detected. This allowed to investigate the temporal and spatial distribution patterns of the composition and structure of ichthyofaunal communities under two distinct habitat ecological conditions: before the collapse of mature vegetation of seagrass beds, in the 1980s (historical data), and after the natural habitat recovery process (new data). Significant differences were detected in the fish communities i) before and after the recovery process; and *ii*) in the seagrass beds and adjacent bare areas before the collapse, but no differences were observed after the natural recovery between seagrass fish communities and bare adjacent areas. Fish communities of seagrass beds in the 1980s were, in general, characterized by higher values of species richness, diversity and abundance. Apparently, the collapse of seagrass beds led to the disappearing of some fish species and to a decrease in abundance of others. Generally, such fish species have not returned to the system or recovered the population status during this early recovery process. This study addressed significant shifts that occurred in the lower Mira estuary fish communities in the last 30 years. Climate change may have influenced those alterations, although the event of the seagrass beds collapse seems to be the main driver of the community shifts.

1. Introduction

Seagrass beds comprise some of the most heterogeneous shallow-water structures of estuarine/marine ecosystems in the world (Hughes et al., 2009). These habitats have important roles in coastal ecosystems providing high-value ecosystem services and are typically considered as ecosystem engineers (Borum et al., 2004; Bos et al., 2007). There have been numerous reports of seagrass decline worldwide indicating these habitats are undergoing a global crisis with important consequences for coastal biodiversity, environmental state and economy (Boström et al., 2006; Hughes et al., 2009). Seagrass meadows are important in primary production, nutrient cycling, sediment and nutrient trapping and stabilization (Williams and Heck, 2001; Boström et al., 2006; Orth et al., 2006). As seagrasses are important marine foundation species, providing habitats for several communities, and enhancing biodiversity by associated species (Ellison et al., 2005), their decline may also threaten the latter organisms (Hughes et al., 2009). Many studies have reported that seagrass beds provide higher biomass, abundance, diversity and productivity of fish communities than unvegetated substrata (Jenkins and Wheatley, 1998; Mattila et al., 1999; Guidetti, 2000; Boström et al., 2006; Orth et al., 2006). These features are explained by the high productivity and structural complexity of the seagrass beds. They act as nursery areas for many species, as they provide shelter from predators, and function as feeding grounds for many others, some of which are economically important, and constitute an integral part of some relevant routes for migratory fishes (Heck et al., 1989; Almeida 1994; Gray et al., 1996; Costa et al., 2001). Seagrass loss leads to decrease in fish communities' abundance, biomass, species richness,

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https://doi.org/10.1016/j.ecolind.2019.05.066
Received 1 October 2018; Received in revised form 9 May 2019; Accepted 22 May 2019