



Abstract

# Population Dynamics of Two Resident Fish Species with Contrasting Habitat Preferences: Temporal Changes over Eutrophic Crises in the Mar Menor Coastal Lagoon (SE Iberian Peninsula) <sup>†</sup>

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**Abstract:** The Mar Menor coastal lagoon is a paradigmatic example of a transitional system under high human disturbance, which in the last years has resulted in occasional fish kill due to extreme anoxic conditions. Here, we assess the abundance temporal trend of two conservation-concern resident fish species with contrasting habitat preferences: *Pomatoschistus marmoratus*, associated with sandy open bottoms, and *Syngnathus abaster*, associated with vegetated bottoms. Both species have been historically abundant in the shallow areas of the Mar Menor. Temporal change was related to three dystrophic crisis events, leading to a lagoon-scale mortality of deep seagrass meadow before spring 2016 and two fish kills occurring in autumn 2019 and summer 2021. After deep seagrass meadow mortality (2017/19), *S. abaster* showed an increased abundance (annual mean: 5 ind/100 m<sup>2</sup> to 23 ind/100 m<sup>2</sup>), whereas abundance of *P. marmoratus* decreased (annual mean: 37 ind/100 m<sup>2</sup> to 10 ind/100 m<sup>2</sup>) in comparison to reference values (2002/04). At that point, shallow areas had experienced great habitat changes, with an increase both in the mud portion of the substrate (driven by the deep seagrass decomposition process), and in the vegetated surface (due to nutrient input), thus modifying the mesohabitat selected by the species. Before the first fish kill (autumn 2019), the abundance of both species markedly increased, likely as a response to an anoxia-mediated refugee search by deep-habitat metapopulations. A slow recovery was detected after the 2020 recruitment period for both species, reaching record values for *P. marmoratus* (75 ind/100 m<sup>2</sup>) in summer 2021, possibly related again to the search for more oxygenated shallow areas, since shortly thereafter a new dystrophic crisis occurred (summer 2021). Since then, the abundance of both species has steeply decreased to less than 2 ind/100 m<sup>2</sup>, highlighting a critical threat to the long-term population viability of these conservation-concern species. As supported here, long-term monitoring programs provide insightful data on the response of fish species to acute human-related disturbance events, offering necessary information to guide the development of management and conservation actions.

**Keywords:** shallow areas; *Pomatoschistus marmoratus*; *Syngnathus abaster*; fish kill

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