



The herbivory of the invasive crab *Percnon gibbesi* in the Mediterranean is not a threat for the endemic seagrass *Posidonia oceanica*

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Herbivory, from small invertebrates to megaherbivores, shapes community structure and ecosystem processes in seagrass meadows (Valentine & Heck 2021). In the Mediterranean, these meadows are dominated by *Posidonia oceanica*, whose primary consumers are generalist feeders: the herbivorous fish *Sarpa salpa* and the grazing sea urchin *Paracentrotus lividus* (Prado et al. 2007). *P. oceanica* possesses several defence mechanisms, such as compensatory shoot growth, chemical deterrents and predator-mediated control. Despite the high abundance of both herbivores throughout the region, these

mechanisms enable *P. oceanica* to withstand herbivory. Instances of excessive grazing on *P. oceanica* are rarely observed and are typically linked to environmental disturbances such as nutrient enrichment (Buñuel et al. 2023). However, it has recently been demonstrated that under warmer conditions, *P. oceanica* can diminish its deterrent mechanisms, increasing its palatability to herbivores and thereby altering seagrass-consumer interactions (Buñuel et al. 2021). Understanding these dynamics is critical for safeguarding ecosystem resilience and anticipating the range expansion of tropical herbivores into temperate systems (Vergés et al. 2014).

A study by Puentes and Anton (2025) investigated the consumption of *P. oceanica* by the invasive crab *Percnon gibbesi*, which has been established in the Mediterranean for nearly three decades (García and Reviriego 2000). In the context of seagrass-consumer dynamics in the warming seas, this study addresses an ecologically important and timely topic. Under laboratory conditions and feeding trials on healthy seagrass tissues, the authors observed that *P. gibbesi* grazed not only on *P. oceanica* leaves but also on fruits and basal rhizomes—a behaviour not previously documented in the field. They concluded that, through increased consumption, the invasion of *P. gibbesi* could pose a great threat to shallow *P. oceanica* meadows in the Mediterranean. While we appreciate the study's novel findings about *P. gibbesi*'s dietary affinities, we challenge some aspects of its experimental design and main conclusions.

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In the experimental design by Puentes and Anton (2025), crabs were offered only *P. oceanica* tissues, without access to alternative food sources. However, prior studies using stomach-content and stable-isotope analyses have characterised *P. gibbesi* as an opportunistic omnivore that preferentially consumes filamentous and corticated algal turfs, encrusting algae, and small invertebrates (Puccio et al. 2006; Bada et al. 2022). Consequently, the absence of these preferred items in the experiment may have biased the crabs toward seagrass consumption. Thus, the forced-choice laboratory experiment, in this instance, limits the applicability of the findings to natural settings. A choice experiment that provides both *P. oceanica* tissues and typical food resources would more accurately reflect the species' natural dietary preferences and its potential impact on seagrass meadows. Bada et al. (2022) reports *P. oceanica* fragments in crab stomachs mostly during autumn and winter, likely due to the opportunistic feeding on dead leaves, which accumulate on Mediterranean shores during these seasons, rather than active grazing on living meadows. This further underscores the importance of providing alternative food resources in the experimental design of Puentes and Anton's study. Had such options been available, crab consumption of live seagrass might have been significantly lower, potentially altering the study's conclusions. Consequently, we caution against presenting such experimental results in overly definitive terms, especially when studies lack robust experimental design and/or in situ field validation. Overgeneralisations risk sensationalising preliminary results and may compromise the integrity of scientific discourse. Careful qualification of experimental inferences —by explicitly acknowledging their context and limitations— is essential to prevent subsequent research from building on premises that may not hold in the field, ultimately fostering more rigorous and reliable progress across the discipline.

More importantly, even though *P. gibbesi* can consume healthy *P. oceanica* tissues under laboratory conditions, the ecological relevance of this finding depends entirely on the spatial overlap between the two species in the wild. Field surveys show that in the Mediterranean *P. gibbesi* is found almost exclusively on shallow rocky platforms and boulders covered in algal turf or encrusting algae, between 0–4 m depth, with peak densities around 1 m (Deudero et al. 2005; Sciberras & Schembri 2008). Records at greater depths are rare, with only occasional

observations down to 8 m (Deudero et al. 2005; Sciberras & Schembri 2008; Anton, personal communication). Depending on water transparency, *P. oceanica* can be found from the shoreline to 25–45 m depth (Boudourisque et al. 2009; Marbà et al. 2014). In calm, clear waters, the species can even form emergent barrier reefs (Bonhomme et al. 2015; Hachani et al. 2016). However, cumulative anthropogenic (e.g. Marbà et al. 2014; de los Santos et al. 2019; Blanco-Murillo et al. 2022; Pergent-Martini et al. 2022) and climatic (e.g. Díaz-Almela et al. 2009; Jordà et al. 2012) impacts have driven a seaward retreat of the upper depth limit, with most meadows now established below 5 m (e.g. Infantes et al. 2009; Vacchi et al. 2010; Montefalcone et al. 2019; Pergent-Martini et al. 2022). Shallow barrier habitats now persist only in a few exceptionally pristine locations and no longer represent a broader Mediterranean-wide distribution (Hachani et al. 2016). Consequently, given that *P. gibbesi* is virtually absent below 4 m depth, while the upper depth limit of *P. oceanica* has shifted below 5 m in most Mediterranean areas, this bathymetric mismatch significantly limits the potential for herbivory by *P. gibbesi* on *P. oceanica*. As a result, any herbivory impacts are likely restricted to few shallow, localized areas of spatial overlap, further minimizing the invasive crab's overall herbivory risk to *P. oceanica*.

In conclusion, we acknowledge the contribution of Puentes and Antón experimental insights but we do not share their view that the invasive crab *P. gibbesi* poses a significant threat to the endemic seagrass *P. oceanica*. Remaining vigilant to emerging stressors is, of course, essential for understanding and managing seagrass vulnerability. However, highlighting speculative pressures on this iconic and already well-protected species risks diverting attention and funding away from more pressing evidence-based conservation challenges. A balanced, evidence-focused approach will ensure that research and management efforts are directed where they can achieve the greatest socioecological benefits.

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