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Author Affiliation:

¹Mersin University Faculty of Fisheries, Mersin University Marine Life Museum, Turkey

²University of Iskenderun Technical, Faculty of Marine Science and Technology, Iskenderun, Hatay, Turkey

*Corresponding Author

Mersin University Faculty of Fisheries, Mersin University Marine Life Museum,

Turkey

Email: ayasdeniz@gmail.com

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Distribution record of the spiny crab *Acanthonyx lunulatus* (Risso, 1816) and the bristle crab *Pilumnopus vauquelini* (Audouin, 1826) in the rocky bottom habitat of Mersin (Akkum)

Deniz Ayas^{1*}, Deniz Ergüden²

ABSTRACT

The present investigates the distribution of *Acanthonyx lunulatus* and *Pilumnopus vauquelini* in rocky bottom habitats in the Akkum region of Mersin (the Mediterranean coast of Turkey). During the ecological survey, the female spiny crab species (*A. lunulatus*) and the male bristle crab (*P. vauquelini*) were collected during dives along the Erdemli-Akkum coast in July and August 2024. Samples were obtained from the rocky area at a depth of approximately 3 m. The identification of two species of crab was based on distinctive morphological features. The shell lengths and widths of the two crab specimens were measured meticulously using digital callipers. The details of both specimens were then recorded at the Mersin University Museum of Marine Life, and catalogue numbers were allocated for both species. Both crab species play essential roles in benthic ecosystems. *A. lunulatus* inhabits rocky areas usually covered with algae, while *P. vauquelini* prefers microhabitats such as under rocks and crevices. *A. lunulatus* has ecosystem engineering roles such as increasing microhabitat diversity and providing shelter, while *P. vauquelini* contributes to the sustainability of seafloor ecosystems by consuming organic matter and mixing sediments. This study provides an essential basis for assessing the long-term effects of human impact and invasive crab species on Mediterranean ecosystems. Also, it presents important information for the development of regional biodiversity management and conservation strategies. Besides, long-term monitoring studies are needed to understand better the impact of environmental factors on the distribution of these species.

Keywords: Crab, *Acanthonyx lunulatus*, Epialtidae, *Pilumnopus vauquelini*, Pilumnidae, Mersin Bay

1. INTRODUCTION

As one of the world's most biodiverse seas, the Mediterranean is of global importance, ecologically and economically. Despite covering only 0.8% of the world's surface area, the Mediterranean is home to approximately 17% of its marine species (Coll et al., 2010). The Mediterranean is a priority region for biodiversity due to its combination of high endemism and unique ecosystem services. Benthic ecosystems are a cornerstone of this biodiversity, with critical functions such as supporting seafloor detritus cycling, recycling organic matter, and shaping the physical structure of the habitat by mixing sediments (Berke, 2010).

However, Mediterranean ecosystems are increasingly threatened by increasing human impacts and global climate change (Corrales et al., 2018). *A. lunulatus* and *P. vauquelini* represent two ecologically significant species of crab inhabiting Mediterranean rocky bottom habitats. *A. lunulatus* (Risso, 1816) has a wide distribution in the eastern Atlantic and Mediterranean, from Portugal to Namibia (Ingle, 1993). This species occupies rocky areas covered with algae and plays ecosystem engineering roles such as maintaining the physical structure of the habitat, providing shelter for other organisms, and increasing microhabitat diversity. *P. vauquelini*, first described by Audouin in 1826, is widespread in the eastern parts of the Mediterranean and is also found in the eastern Atlantic (Ng et al., 2008; Türkay, 2001).

This species, which generally prefers microhabitats such as under rocks and crevices, contributes directly to the functioning of seafloor ecosystems by consuming organic matter and promoting sediment mixing. In recent decades, anthropogenic pressures in the Mediterranean have severely affected the distribution and abundance of these species. Coastal development, tourism, overfishing, and climate change have led to serious problems such as habitat loss and reduced species diversity (Corrales et al., 2018). Furthermore, the proliferation of invasive species in the Mediterranean has become a significant concern, endangering the population dynamics of native species.

This study focuses on *A. lunulatus* (spiny crab) and *P. vauquelini* (bristle crab), two crab species that contribute substantially to the biodiversity of the Mediterranean Sea. The research aims to document the distribution of these species in the rocky habitats of Mersin Bay and to comprehend their ecological roles. It is imperative to comprehend the ecological function of these two species of crab, and the repercussions of anthropogenic activities on their habitat structure, in order to formulate effective biodiversity management and conservation strategies for the region. Moreover, the findings of this study will serve as a crucial foundation for the evaluation of the repercussions of biological invasions on indigenous species within Mediterranean ecosystems.

2. MATERIAL AND METHODS

The female specimen of the spiny crab *A. lunulatus* and the male specimen of the bristle crab *P. vauquelini* were collected during a series of ecological surveys conducted in Mersin Bay in July and August 2024. The objective of the study was to ascertain the biodiversity and distribution of these species in the Mediterranean Sea, with a particular focus on benthic ecosystems. The sampling was carried out by diving in Erdemli-Akkum coast and surveying the sub-benthic microhabitats. The geographical distribution of the samples collected is illustrated in (Figure 1). The identification of *A. lunulatus* was based on the morphological criteria provided by (D'Udekem-d'Acoz, 2001).

This species is usually found in rocky areas overgrown with algae and was collected from similar habitats in this study. Carapace length and width were measured to the nearest millimeter using digital calipers. The specimen was cataloged at Mersin University Marine Life Museum under catalog number MEUDC-24-13-017 and preserved in ethanol (Figure 2). The bristle crab *P. vauquelini* was identified using the identification criteria established by (Holthuis, 1956; Galil et al., 2002). The shell measurements were recorded using digital calipers and the specimen was deposited in the Marine Life Museum of Mersin University under the catalog number MEUDC-24-13-018. Both crab specimens were preserved in ethanol (Figure 2).

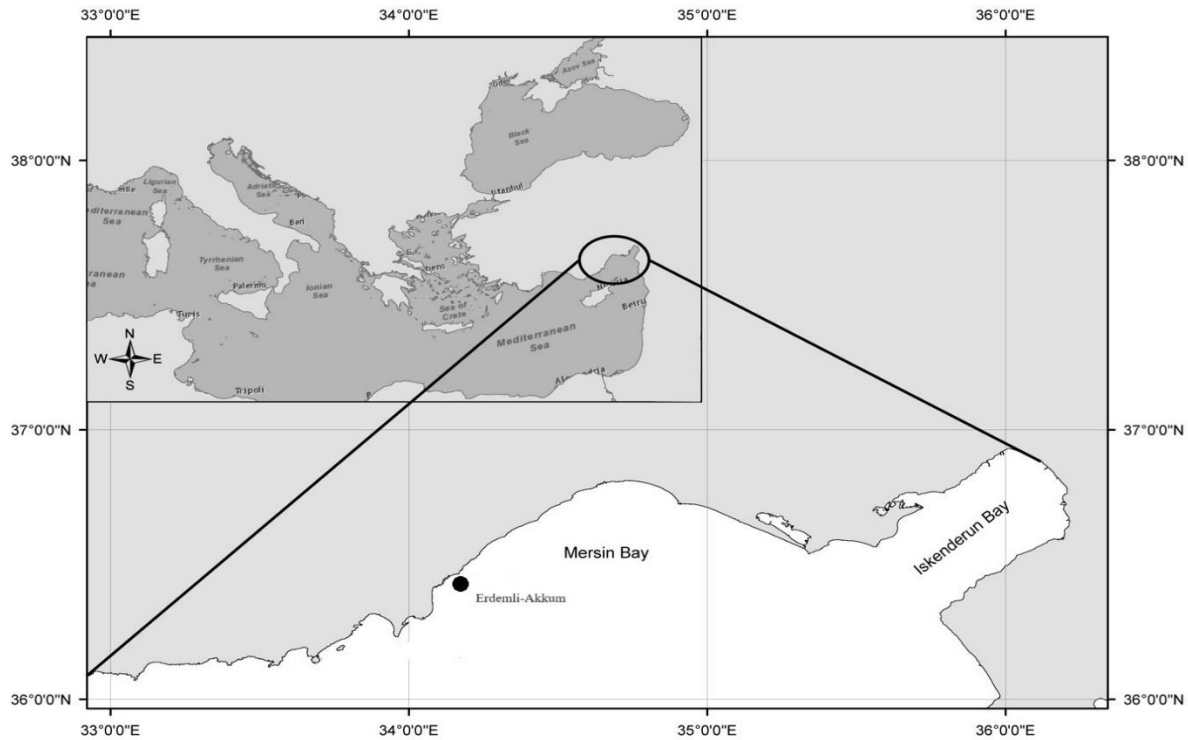


Figure 1 The location where specimens (●) of the *A. lunulatus* and *P. vauquelini* were collected in Mersin Bay

3. RESULTS AND DISCUSSION

A. lunulatus (Risso, 1816) is a species in the order Decapoda, suborder Brachyura, superfamily Majoidea, and family Epialtidae (Ng et al., 2008). This species, which is a member of the genus *Acanthonyx* (Latreille, 1824), is commonly known as the 'spiny crab' and usually inhabits rocky and algae-covered coastal habitats (Ingle, 1993). The present study involved the collection of a female *A. lunulatus* specimen, measuring 12.40 mm in carapace length (CL) and 8.99 mm in carapace width (CW) (Figure 2). This specimen is a valuable representative of the species, exhibiting distinctive morphological characteristics that are indicative of its adaptation to benthic ecosystems. Its ability to thrive in areas abundant in vegetation, particularly *Sargassum*, is a testament to the ecological functions and habitat preferences of *A. lunulatus*.

The identification of the species was based on distinctive morphological features and reliable taxonomic sources (D'Udekem-d'Acoz, 2001). *P. vauquelini* (Audouin, 1826) is a species that belongs to the order Decapoda, suborder Brachyura, and family Pilumnidae. It is endemic to the Red Sea and Persian Gulf and has been documented as an invasive species in the Mediterranean (Ng et al., 2008; Türkay, 2001). Its initial presence in the region was documented in 1924 in Egypt Calman, (1927), followed by reports in Israel Holthuis, (1956) and Turkey (Kocatafl, 1981). Despite its established presence in the Mediterranean, it is seldom observed (Galil et al., 2002).

P. vauquelini has been found to inhabit shallow waters at depths of 0-3 meters, on gravelly substrates mixed with sandy mud or between seagrasses (*Halophila*) and macro-algae (*Sargassum*). The carapace length (CL) of the male specimen examined in this study was 4.22 mm, and the carapace width (CW) was 4.90 mm (Figure 2). This species inhabits environments characterized by abundant vegetation, displaying an ecologically adaptable structure. To date, there is a paucity of detailed information concerning the ecological and economic impact of the species. *P. vauquelini* is considered to have a low invasive potential.

This study documented the distribution of *A. lunulatus* and *P. vauquelini* in Mersin Bay, thereby highlighting their role in Mediterranean ecosystems and their importance for regional biodiversity. In particular, the presence of these species in rocky habitats makes important contributions to the structural and functional processes of Mediterranean benthic ecosystems (Ng et al., 2008). *A. lunulatus* has been shown to increase shelter and microhabitat diversity in algal-covered rocky areas Ingle, (1993), while *P. vauquelini* supports ecosystem functioning by consuming organic matter and mixing sediments in microhabitats such as under rocks and crevices (Türkay, 2001).

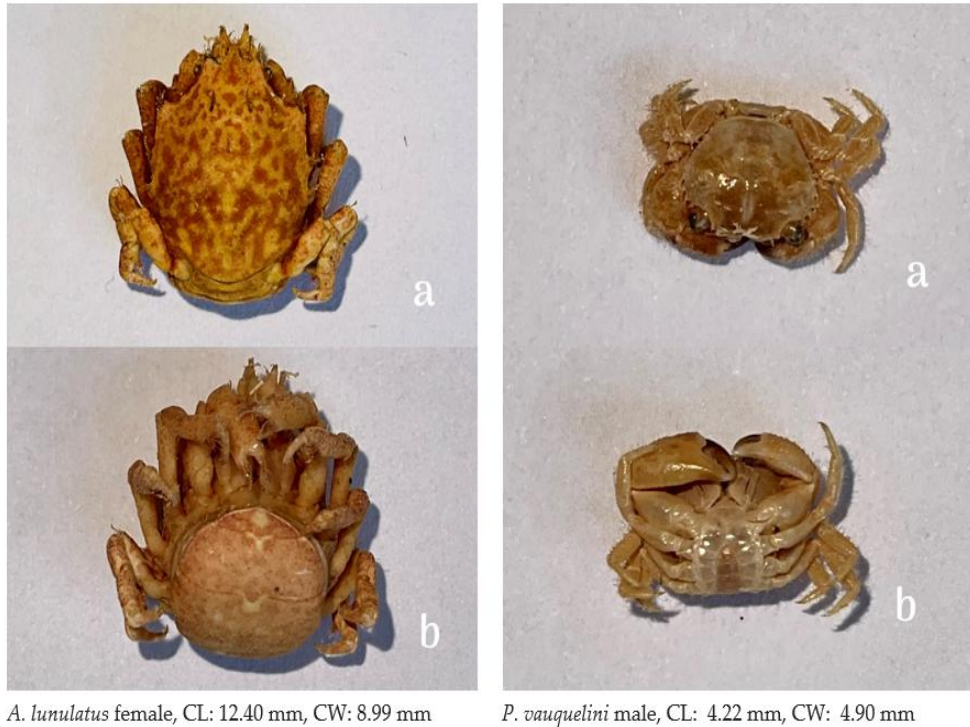


Figure 2 (a) dorsal view (b) ventral view for both crab species

Human activities in coastal areas, such as Mersin Bay, have the potential to impact species populations and habitats. A range of factors, including coastal development, fishing activities, tourism pressure, and global climate change, can lead to a reduction in the size of these species' habitats and alter population dynamics (Corrales et al., 2018). For instance, habitat loss and degradation are believed to be a contributing factor to the limited potential range of these species. This, in turn, can have a detrimental effect on the provision of ecosystem services (Berke, 2010).

Another salient factor influencing the distribution of these species is the proliferation of invasive species in the Mediterranean region. Previous studies have documented that invasive species, such as *Percon gibbesi*, can modify habitat structure through competition for resources with native species, potentially exerting deleterious effects on species such as *A. lunulatus* and *P. vauquelini* (Galil, 2000; Streftaris and Zenetos, 2006). The impact of invasive species may weaken the population dynamics of the species considered in this study and their role in the ecosystem (Streftaris and Zenetos, 2006). In the long term, this has the potential to disrupt the overall balance of Mediterranean ecosystems (Coll et al., 2010).

4. CONCLUSION

The findings of this study furnish a rudimentary comprehension of the ecological function and distribution of the two crab species in Mersin Bay. Nevertheless, comprehensive monitoring studies are imperative to enhance our understanding of the long-term repercussions of human influences and invasive species on these populations. Moreover, the data provide a foundation for the formulation of strategies for the conservation of regional biodiversity. In the future, a thorough investigation of the environmental factors affecting the populations and habitats of these species will be pivotal to the efficacy of conservation.

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Ethical approval & declaration

In this article, as per the animal regulations followed in Faculty of Fisheries, Mersin University Marine Life Museum, Turkey & Faculty of Marine Science and Technology, University of Iskenderun Technical, Turkey, the authors observed the distribution record of the

spiny crab *Acanthonyx lunulatus* (Risso, 1816) and the bristle crab *Pilumnopus vauquelini* (Audouin, 1826) in the rocky bottom habitat of Mersin (Akkum). The Animal ethical guidelines are followed in the study for species observation, identification & experimentation.

Informed consent

Not applicable.

Conflicts of interests:

The authors declare that there are no conflicts of interests.

Funding:

The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

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