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First record of the Red Sea Mantis shrimp *Erugosquilla massavensis* (Kossmann, 1880) in the Greek Ionian Sea

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The presence of the Red Sea Mantis shrimp *Erugosquilla massavensis* (Kossmann, 1880) is here reported for the first time from the southeastern Ionian Sea (Zakynthos Island, Greece). This record is the first evidence of the presence of a Lessepsian migrant crustacean in the aforementioned area while it fills the gap in the ongoing westward and northward distribution range expansion of this wide spread invader of the Mediterranean basin.

Key words: Stomatopoda, *Erugosquilla massavensis*, Lessepsian migration, Mediterranean Sea, alien

INTRODUCTION

Aquatic invasions can have a considerable imprint on ecosystem services and biodiversity therefore resulting in ecological and economic impacts while raising conservation challenges (KATSANEVAKIS *et al.*, 2014). The subphylum of Crustacea incorporates some of the most successful and widespread aquatic alien species that have invaded the Mediterranean Sea (ZENETOS *et al.*, 2012). Among these species, *Erugosquilla massavensis* (Kossmann, 1880) (Crustacea: Stomatopoda: Squillidae), native to the Red Sea and the Persian Gulf, is known as one of the very early invaders in the Mediterranean that dates back to 1933 while being the first stomatopod

species introduced via the Suez Canal (STEUER, 1936; 1938). Today it thrives along the Levantine coasts and it is well expanded up to the Aegean and the Marmara seas (ÖZCAN *et al.*, 2008; ELNAIS, 2017; CORSINI-FOKA *et al.*, 2017). It has been recorded from the Libyan waters (SHAKMAN & KINZELBACH, 2007) and from the Tunisian coasts, which are the westernmost limits of its range size in the southern Mediterranean Sea (ABDELSALAM, 2014; OUNIFI BEN AMOR *et al.*, 2015), while recently it has been reported in the southwestern Ionian Sea, off the island of Sicily, Italy (CORSINI-FOKA *et al.*, 2017).

The aim of this paper is to present the presence of the alien *E. massavensis* for the first time in the Greek Ionian Sea presumably as a result of its westward distribution range expansion.

MATERIAL AND METHODS

The current research was conducted within the framework of the Interreg – Med research project ‘Fishing Governance in MPAs: Potentialities for Blue Economy’ FISHMPABLUE-2 that includes monitoring of small-scale fisheries catches. During the sampling activity of this project, which covered areas inside and outside the National Marine Park of Zakynthos (Zakynthos Island, Southern Ionian Sea, Greece), a single specimen of *E. massavensis* was caught on the 9th of December 2017. This specimen was collected at 10m depth (37.775015 N; 20.905713E; WGS84) by means of a trammel net operated by a small scale fishing boat in close vicinity to Zakynthos town harbor and Agios Charalampis river estuary (Fig. 1).

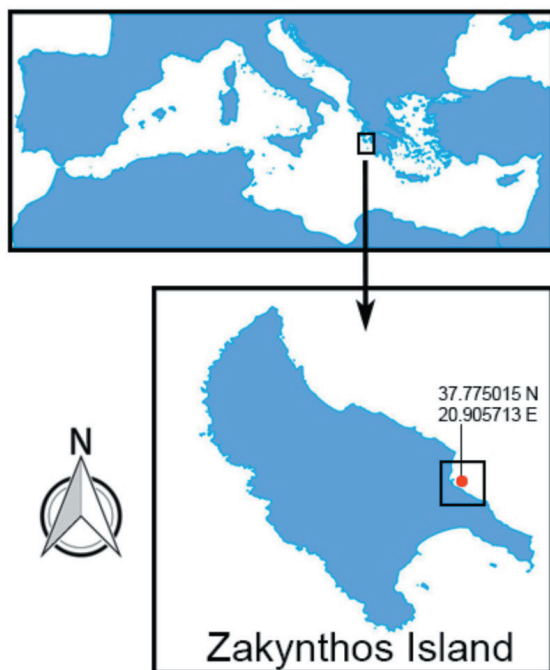


Fig. 1. Location of the first record of *Erugosquilla massavensis* in the Greek Ionian Sea

The substrate of the sampled area is characterized as muddy with sandy patches. The specimen was photographed and measured for total length (TL, in mm) onboard the fishing vessel by the authors. Identification of the specimen was based on LEWINSOHN & MANNING (1980) and GALIL et al. (2002).



Fig. 2. *Erugosquilla massavensis* collected from the Greek Ionian Sea

RESULTS AND DISCUSSION

The total length (TL) of the collected specimen (Fig. 2) was 112 mm and it fell within the previously reported size range in samples from the Mediterranean region (GALIL et al., 2002; CORSINI-FOKA et al., 2017 and references therein).

Following ELNAIS (2017) list and including the recently detected crab *Dyspanopeus sayi* (Smith, 1869) (ULMAN et al., 2017), a number of 24 alien marine crustacean decapod species and the stomatopod *E. massavensis* are reported from the Greek waters. Up to the present study, only 4 of the above species have been reported and confirmed as elements of the Greek Ionian Sea, all of Atlantic origin, namely *Callinectes sapidus*, *Percnon gibbesi* and *Penaeus aztecus* and considered invasive species (Table 1).

The finding of *E. massavensis* reported in this work documents the first record of a crustacean of Red Sea origin spread to the Greek Ionian Sea, after its introduction into the Mediterranean via the Suez Canal (one of the so-called Lessepsian migrant species). This finding fills the gap in the ongoing westward and northward distribution range expansion of this species in the Mediterranean since CORSINI-FOKA et al. (2017) recently reported its occurrence from the neighboring Ionian Italian waters. Still, the long lived pelagic larvae stage of *E. massavensis* (LEWINSHON & MANNING, 1980) may well contribute towards the expansion of its distribution range.

However, the role of shipping as an introduction vector should not be disregarded given the proximity of the area that this specimen was collected near to the biggest port of Zakynthos Island as well as the heavy marine traffic in the Greek Ionian Sea (www.marinetraffic.com).

Table 1. Alien crustacean decapod and stomatopod species in the Greek Ionian Sea.

Species	Order	Year of 1 st sighting	Origin	References
<i>Percnon gibbesi</i> (H. Milne Edwards, 1853)	Decapoda	2004	West Atlantic Ocean	THESSALOU-LEGAKI <i>et al.</i> (2006)
<i>Calappa pelii</i> (Herklots, 1851)	Decapoda	2005	East Atlantic Ocean	PANCUCCI-PAPADOPOULOU <i>et al.</i> (2005)
<i>Callinectes sapidus</i> (Rathbun, 1896)	Decapoda	2011	West Atlantic Ocean	ELEFThERIOU <i>et al.</i> (2011)
<i>Penaeus aztecus</i> (Ives, 1891)	Decapoda	2013	West Atlantic Ocean	KAPIRIS <i>et al.</i> (2014)
<i>Erugosquilla massavensis</i> (Kossmann, 1880)	Stomatopoda	2017	Red Sea, Persian Gulf	present study

The collected specimen was found in close proximity to Agios Charalampis river estuary. This finding constitutes further evidence that *E. massavensis*, albeit common in coastal areas and open waters, can also tolerate brackish waters (e.g. OUNIFI BEN AMOR *et al.*, 2015; 2016; CORSINI-FOKA *et al.*, 2017).

The success of alien species establishment in the invaded ecosystems is dictated by several factors that include the abiotic characteristics of the invaded environment as well as the biological traits of the alien species and its recipient community (CATFORD *et al.*, 2009). Thus colonization success of the invaders may arise as a result of their capability in occupying the unsaturated niche space and/or the competitive interactions with local species for food, space and shelter. In this respect, recent studies in the Eastern Mediterranean have demonstrated that *E. massavensis* have displaced the indigenous mantis shrimp *Squilla* mantis in both shallow and deeper waters (GÖKOĞLU *et al.*, 2008; ÖZCAN *et al.*, 2008). Although *S. mantis* forms part of the local crustacean fauna, in the Greek Southern Ionian Sea and Zakynthos Island (archives of the National Marine Park of Zakynthos) its interaction with *E. massavensis* is yet far from being understood and further data are needed to quantitatively address such effects.

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Prvi nalaz crvenomorske kozice *Erugosquilla massavensis* (Kossmann, 1880) u Jonskom moru (Grčka)

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SAŽETAK

U ovom radu se iznosi prvi nalaz crvenomorske kozice *Erugosquilla massavensis* (Kossmann, 1880.) na jugoistoku Jonskog mora (otok Zakynthos, Grčka). Ovaj nalaz je prvi dokaz prisutnosti lesepsijskih migrantskih rakova na gore spomenutom području, čime se popunjava jaz u saznanju o širenju rasprostranjenja ovog "osvjača" mediteranskog bazena.

Ključne riječi: Stomatopoda, *Erugosquilla massavensis*, lesepsijske migracije, Sredozemno more