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SHORT COMMUNICATION

New record of the non-indigenous crab *Percnon gibbesi* (H. Milne Edwards, 1853) from Palagruža archipelago (Adriatic Sea)

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*Several individuals of non-indigenous grapsid crab *Percnon gibbesi* (H. Milne Edwards, 1853) have been observed and photographed in the area of Palagruža archipelago (Adriatic Sea, Croatia). This is additional confirmed record of this species in the Adriatic Sea. It suggests subsequent range expansion of this species and provides further evidence of its establishment in Adriatic waters*

Key words: *Percnon gibbesi*, new record, northward spreading, invasive, Adriatic Sea

INTRODUCTION

Many marine alien species exhibit invasive behaviour which can lead to alterations in ecosystem functioning, biodiversity loss, and negative impact on human activities such as fisheries, tourism and aquaculture (STREFTARIS & ZENETOS, 2006). In the Adriatic Sea, there is a significant increase of occurrences of alien marine species during the last decades (ZENETOS *et al.* 2010; PEČAREVIĆ *et al.* 2013). For most of them the geographical range keeps expanding: this phenomenon could be attributed both to the presence of empty ecological niches and to global warming (LIPEJ *et al.* 2009).

Sally lightfoot crab *Percnon gibbesi* is a primarily algivorous crab (PUCCIO *et al.*, 2006) of the shallow infra-littoral rocky shores. It is a widely distributed species, its range extending from California to Chile, Florida to Brazil, and Madeira to the Gulf of Guinea (MANNING & HOLTHUIS, 1981). It was first recorded in the Mediterranean Sea in 1999 from the island of

Linosa (Strait of Sicily) (RELINI *et al.* 2000) and has subsequently spread throughout the Mediterranean Sea (SUARIA *et al.*, 2017). Its mode of introduction is unclear with proposed mechanisms of introduction such as migration through Strait of Gibraltar by larval drift or by accidental releases from the aquarium trade or other shipping related activities (YOKES & GALIL, 2006). The spreading pattern of the species in the Mediterranean was reviewed by KATSANEVAKIS *et al.* (2011) who also documented its presence in the Adriatic Sea for the first time (Sazani Island, Albania). Subsequently, its presence in the Adriatic was documented for the Croatian and Italian coasts (DULČIĆ & DRAGIČEVIĆ, 2015; UNGARO & PASTORELLI, 2015).

The present study reports on the subsequent northward range expansion of this species in the Adriatic Sea with evidence of its further establishment in Adriatic waters.

MATERIAL AND METHODS

On 18 September 2018, during casual diving activity, a researcher from Institute of Oceanography and Fisheries observed and photographed (Fig. 1a) a crab at 2 m depth on the island of Mala Palagruža (42.389053° N, 16.270035° E; Fig 2 – location “d1”). It was observed hiding between the boulders and in the vicinity of the sea anemone *Anemonia* sp. The individual was photographed and identified as *Percnon gibbesi*. Following year, on 21st of August 2019, approx. 20 specimens were observed in the similar habitat and depth, but on a different location (42.39070° N, 16.26633° E; Fig. 1b; location “d2” in Fig. 2). Identification was carried out following description by RELINI et al. (2000). Upon the first finding, the diver investigated majority of coastline area of both Velika and Mala Palagruža Island (1-2 m depth) approx. 2

km in length. In the following year, only shallow area of Vela Palagruža was investigated.

RESULTS AND DISCUSSION

Morphological features and colour of observed individuals were in agreement with descriptions of *Percnon gibbesi* by various authors (RELINI et al., 2000; FANELLI & AZZURRO 2004; THESSALOU-LEGAKI et al., 2006). Present finding indicates northward extension of distribution of *P. gibbesi* up to Palagruža Island, area further north than area of Molunat Bay (Fig 2. - location “b”), where it was previously recorded in 2014 (DULČIĆ & DRAGIČEVIĆ, 2015). Crabs were photographed near the shores of Mala and Vela Palagruža Island, which consisted of boulders, narrow cracks and scattered pebbles with algal cover. These habitat characteristics agree with habitat preferences of *P. gibbesi* for shallow

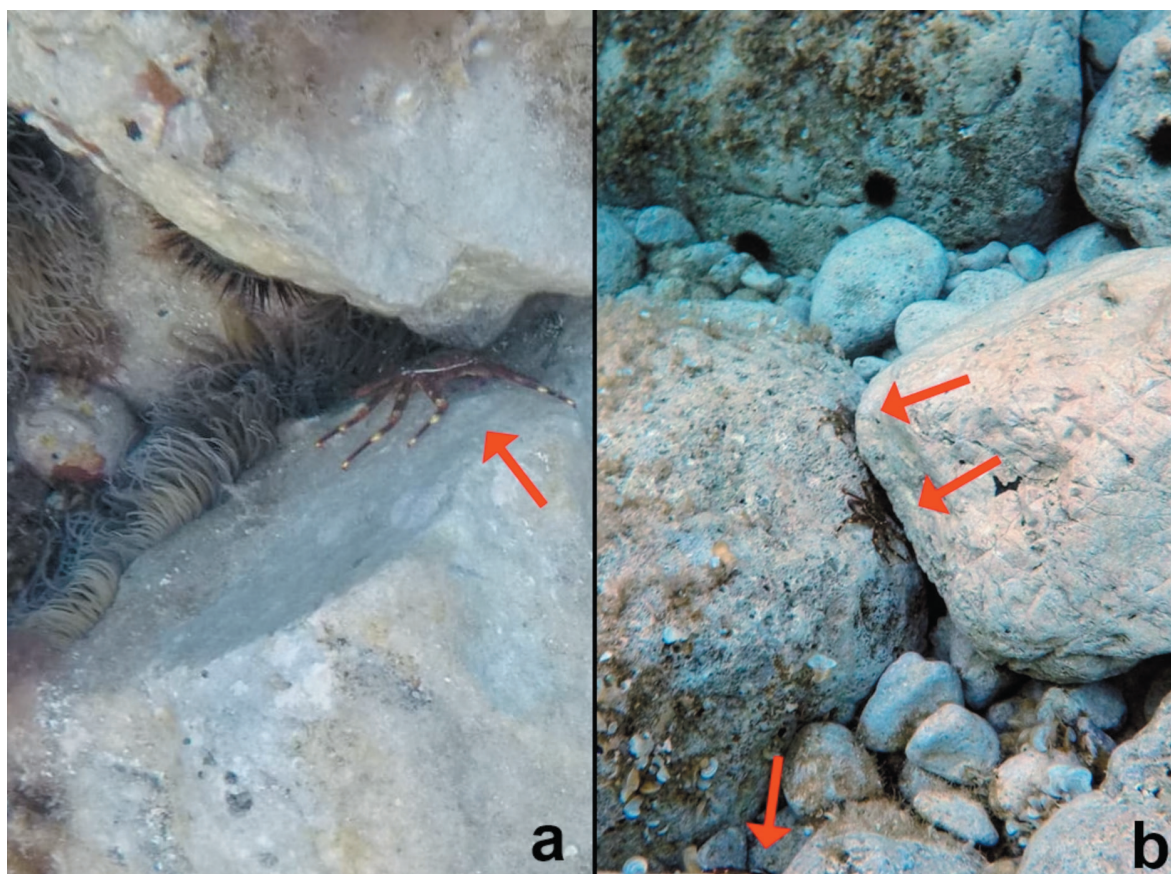


Fig 1. Photos of a specimen of *Percnon gibbesi* photographed at a location on Mala (a) and Vela (b) Palagruža in summer of 2018 and 2019, respectively. Red arrows indicates individual crabs (photo: Denis Gašparević)



Fig 2. Locations of previously documented occurrences of *Percnon gibbesi* from the Adriatic Sea (a – Sazani Island (2010); b – Molunat Bay (2014), c – Bari (2014); d – Palagruža archipelago (2018 and 2019)). Right picture shows zoomed area of Palagruža archipelago with locations of occurrence of *P. gibbesi* in 2018 (d1) and 2019 (d2)

rocks with algal cover (THESSALOU-LEGAKI *et al.* 2006), as also reported by many other authors (e.g. FANELLI & AZZURRO, 2004; DEUDERO *et al.* 2005; RUSSO & VILLANI, 2005; AZZURRO *et al.*, 2011). As the depths around this island reaches over 100 meters from all sides, it is plausible to conclude that the presence of *P. gibbesi* around the island is a consequence of larval drift and subsequent settlement in the area rather than of active migration to the area. Another possibility, which cannot be excluded, is its introduction to the islands by recreational or fishing vessels, which occasionally visit the area, especially during summer months.

Our record, together with those reported by DULČIĆ & DRAGIČEVIĆ (2015) and UNGARO & PASTORELLI (2015), suggests that *P. gibbesi* is spreading in the Adriatic Sea. This could be also supported by the fact that specimens of *P. gibbesi* have been also found in the coastal areas of the islands Vis (central Adriatic) (A. ŽULJEVIĆ, pers. comm.) and Korčula (at the transition from southern to central Adriatic) (G. DRAGOJEVIĆ, pers. comm.).

Given the pace and nature of its spreading, we can presume that it is a matter of time until it reaches areas of Northern Adriatic, although lower temperature regimes in that area may inhibit its subsequent establishment. Additionally, Palagruža archipelago, which is situated

in the middle of the Adriatic Sea, could act as a stepping-stone, aiding its westward (Italian coast) and northward expansion. UNGARO & PASTORELLI (2015) already reported on the finding of *Percnon gibbesi* from the area of Bari (Italy, southern Adriatic) and multiple occurrences have been reported for the northern areas of the Ionian Sea (see SUARIA *et al.*, 2017 and references therein). Up to date, northernmost occurrences of *P. gibbesi* in the Mediterranean Sea has recently been reported by SUARIA *et al.* (2017) for the Ligurian Sea.

Percnon gibbesi is considered among the „worst“ invasive alien species in the Mediterranean Sea (STREFTARIS & ZENETOS, 2006). In the Adriatic, this species is spreading northwards but its impact on the native species occupying the same ecological niche (shallow-water benthic algal grazers) is not yet known and should be evaluated through future investigations.

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**Novi nalaz nezavičajne vrste lakonogog raka
Percnon gibbesi (H. Milne Edwards, 1853)
na području palagruškog otočja (Jadransko more)**

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SAŽETAK

Nekoliko jedinki nezavičajne vrste lakonogog raka, *Percnon gibbesi* (H. Milne Edwards, 1853) zabilježeno je i fotografirano na području palagruškog otočja.

Ovdje se radi o novim potvrđenim nalazima za Jadransko more koji ukazuju na postupno širenje prema sjeveru te ujedno pružaju dokaz o uspostavi populacije ove vrste u Jadranu.

Ključne riječi: *Percnon gibbesi*, novi nalaz, širenje prema sjeveru, invazivna vrsta, Jadransko more