

ADDITIONAL RECORD OF THE ALIEN CRAB *ACTAEODES TOMENTOSUS* (BRACHYURA: XANTHIDAE: ACTAEINAE) FROM TUNISIAN MARINE WATERS

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ABSTRACT

The occurrence of the Xanthid crab Actaeodes tomentosus, an Erythrean species, is recorded for the second time from the Tunisian marine waters. A single female was captured by hand on October 2016 during scuba diving survey carried out in the Marine Protected Area of Zembra. The specimen was caught at 1 m depth anchored to a rock. The carapace length and width were respectively 9.1 mm and 14.3 mm. This record constitutes the northernmost extension range of the species not only in Tunisia but also at a Mediterranean scale. A. tomentosus is neurotoxic containing the "Tetrodotoxin", which is widespread in the Indo-Pacific region and considered among the most common intertidal coral reefs species.

Key words: Marine Protected Area, bioinvasion, decapods, diving survey, extension range, Tunisia

NUOVA SEGNALAZIONE DEL GRANCHIO ALIENO *ACTAEODES TOMENTOSUS* (BRACHYURA: XANTHIDAE: ACTAEINAE) IN ACQUE MARINE DELLA TUNISIA

SINTESI

La presenza di una specie eritrea di granchi della famiglia Xanthidae, Actaeodes tomentosus, è stata registrata per la seconda volta nel mare della Tunisia. Una singola femmina è stata catturata con le mani nell'ottobre del 2016, durante un'indagine subacquea condotta nell'area marina protetta di Zembra. Il granchio è stato catturato a 1 m di profondità, mentre si trovava saldamente aggrappato ad una roccia. La lunghezza e la larghezza del carapace erano rispettivamente di 9,1 mm e 14,3 mm. Questo ritrovamento costituisce la segnalazione più settentrionale delle specie, non solo in Tunisia, ma anche su scala mediterranea. A. tomentosus è una specie neurotossica, contenente la tetrodotossina. È diffusa nella regione indo-pacifica ed è considerata tra le più comuni specie di barriere coralline intertidali.

Parole chiave: area marina protetta, bioinvasione, decapodi, indagine subacquea, estensione, Tunisia

INTRODUCTION

Invasive species are considered as a major threat (Azzurro *et al.*, 2019) and the second most common cause of species extinction after habitat destruction (Bellard *et al.*, 2016). The Mediterranean is the most invaded Sea in the world (Galil *et al.*, 2014), and of the 821 Non-Indigenous Species (NIS) recorded up to date, more than a half are established (Zenetos *et al.*, 2017). This region is known to support several crab invasions (Swart *et al.*, 2018). Over 39 alien Brachyura species of Red Sea/Indo-Pacific origin have been well documented in the Mediterranean Sea, mainly in the eastern Basin (Klaoudatos & Kaporis, 2014). Decapods are the best known marine invasive crustaceans due

to their easy larvae dispersal (Landeira *et al.*, 2019), their high reproductive rate and wide environmental tolerance allowing an important establishment success (Gothland *et al.*, 2014) and particularly the adverse environmental and socio-economic impacts that can inflict such species. Indeed, some crabs from Portunidae (*Portunus segnis* (Forskål, 1775), *Callinectes sapidus* Rathbun, 1896) or Epialtidae (*Libinia dubia* H. Milne Edwards, 1834) families have strongly affected human health, ecosystems and fishery activities in Tunisian waters (Khamassi *et al.*, 2019; Rjiba *et al.*, 2019; Chaffai *et al.*, 2020).

According to Corsini-Foka & Kondylatos (2015), four alien xanthid crabs occur in the Mediterranean Sea; *Atergatis roseus* (Rüppell, 1830), *Actaea savignii*

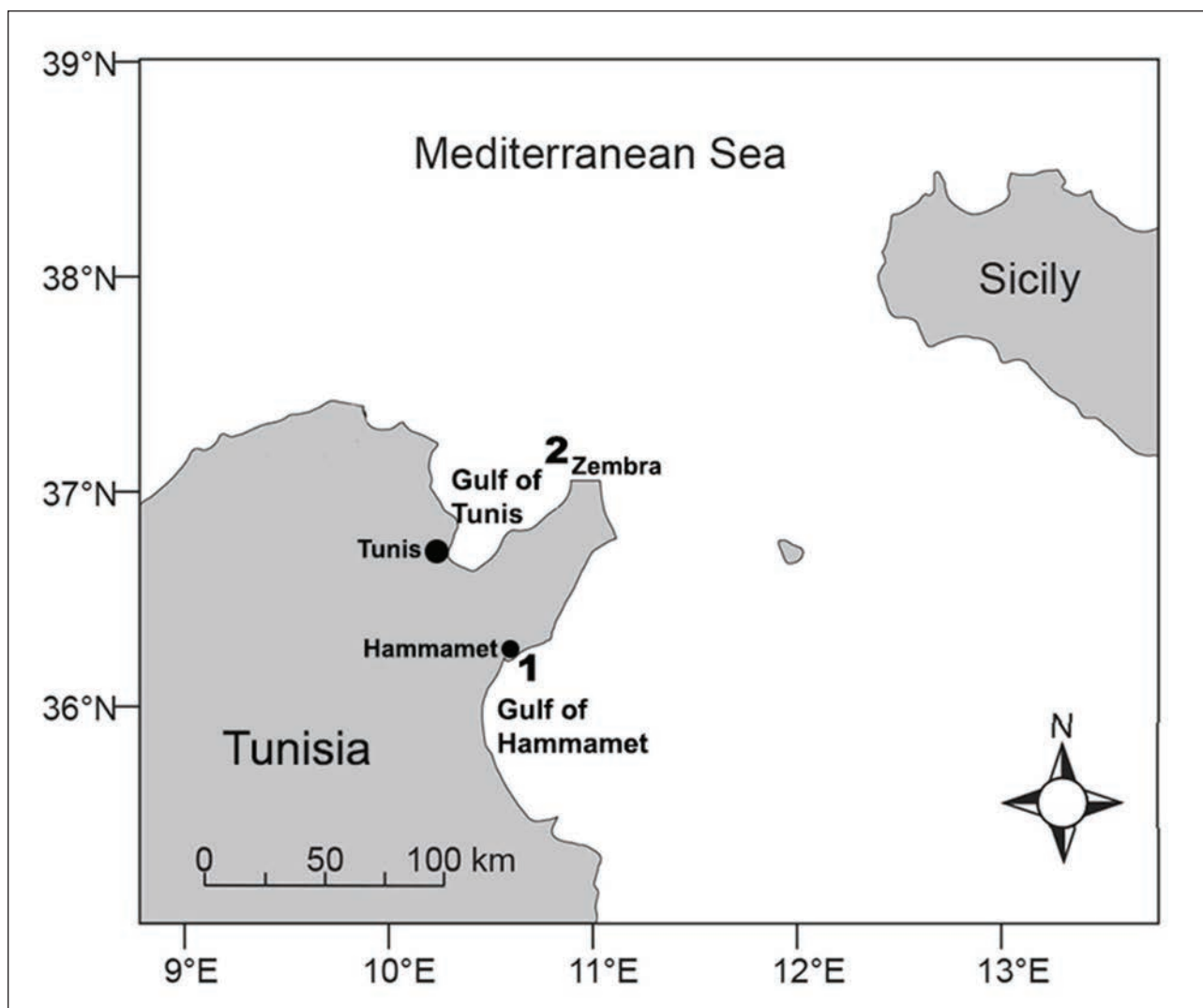


Fig. 1: Map of northern Tunisia (redrawn from Capapé *et al.*, 2020) indicating the capture sites of *Actaeodes tomentosus* (ref. INAT- IXAN-Ac-tom0) from the Tunisian waters. 1. Marina of Hammamet. 2. Zembra Island.
Sl. 1: Zemljevid severne Tunizije (prerisano iz Capapé in sod., 2020) z lokaliteto, kjer je bila najdena rakovica vrste *Actaeodes tomentosus* (ref. INAT- IXAN-Ac-tom0) v tunizijskih vodah. 1. Marina v Hammamet. 2. Otok Zembra.

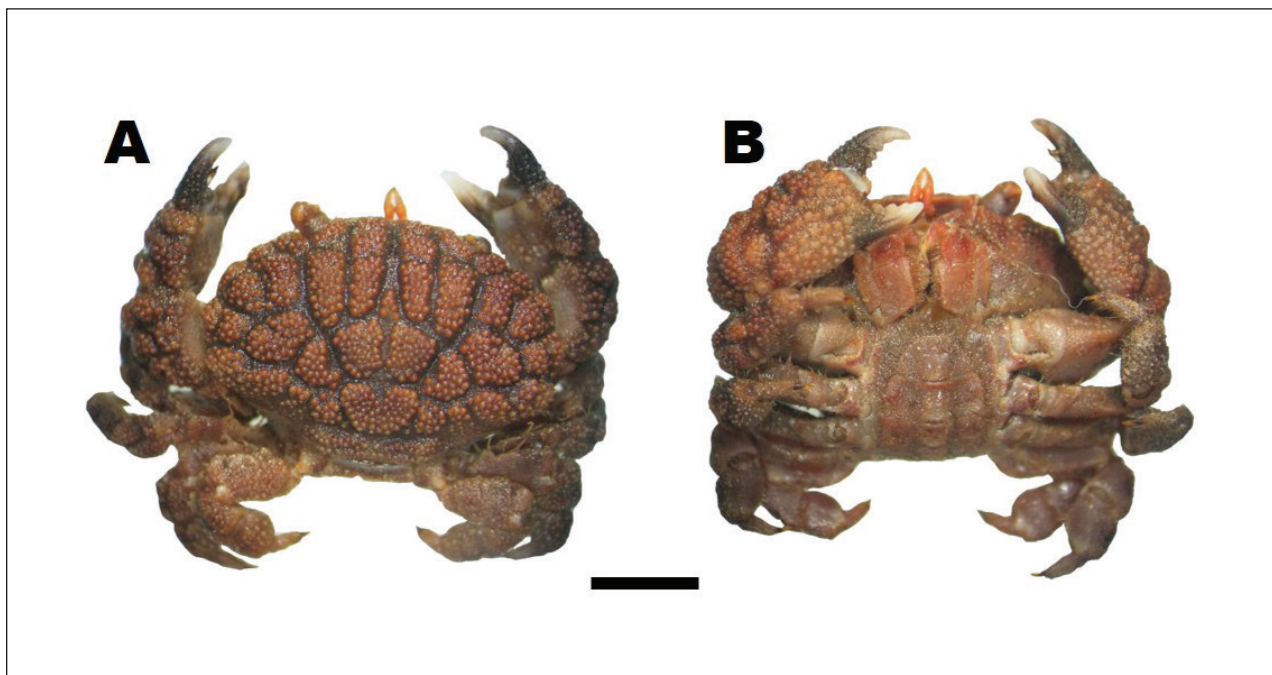


Fig. 2: *Actaeodes tomentosus* (ref. INAT- XAN-Ac-tom01). **A.** Dorsal view. **B.** Ventral view. Scale bar = 5 mm.
Sl. 2: *Actaeodes tomentosus* (ref. INAT- XAN-Ac-tom01). **A.** Hrbtna stran. **B.** Trebušna stran. Merilo = 5 mm.

(H. Milne Edwards, 1834), *Xanthias lamarckii* (H. Milne Edwards, 1834) and *Actaeodes tomentosus* (H. Milne Edwards, 1834), this latter is the most frequent species, worldwide distributed particularly in the Indo-Pacific region, from the Red Sea, Aden, Somalia, Kenya, Tanzania, Mozambique and S. Africa to the Western Indian Ocean islands up to Australia, Japan and Hawaii Islands (Serène 1984).

A. tomentosus was recorded for the first time in the Mediterranean Sea in the shallow coastal waters of Rhodes Island (Corsini-Foka & Kondylatos, 2015). In January 2015, three specimens, two non-ovigerous females and one male, were collected from the marina of Hammamet, located in eastern Tunisia among biofouling (Ounifi Ben Amor *et al.*, 2016).

A larger trend in recorded alien species in the last decades have been locally reported as a main consequence of a heavy biological invasion of mixed origins. More than 150 NIS fauna have been recorded at present. Among them crustacean decapods constitute the main group of alien fauna, more than 50% according to Ounifi-Ben Amor *et al.* (2016) and Ben Souissi *et al.* (2019).

In order to implement effective management plans for marine ecosystems, an accurate and updated spatio-temporal data on species biogeography is required (Katsanevakis *et al.*, 2020). Records of “New-Comers” should not be limited to their first observation. In fact, species distribution knowledge constitute a prerequisite to assess their invasion potential and its progress and

therefore the establishment of the best conservation measures.

MATERIAL AND METHODS

During a periodic assessment of climate change impacts on marine biodiversity carried out mainly in Tunisian Marine Protected Areas (MPA's), a single female of *Actaeodes tomentosus* specimen was collected by hand at 1 m depth anchored to a rock during scuba diving survey on 15 October 2016 performed in Zembra MPA (37°04'645"N and 11°02'960"E) (Fig.1). The crab was identified as *A. tomentosus* following Serène (1984) and was subsequently preserved in 95% alcohol, and deposited in the Collection of crustacean species at the Institut National Agronomique de Tunisie under the catalogue number: INAT- XAN-Ac-tom01.

RESULTS AND DISCUSSION

The collected specimen was a female exhibiting the typical morphological characters of *A. tomentosus* following Serène (1984). The crab was easily identified by numerous dark granules throughout the carapace and appendages, especially on the outer face of both movable and fixed dactyls. (Fig. 2). The carapace length (CL) and width (CW) were respectively 9.1 mm and 14.3 mm. The ratio CW/CL= 1.58 is near the value (1.55) reported for the species by Serène (1984).

A. tomentosus has been reported in the marina of Hammamet on 2015 (Ounifi-Ben Amor *et al.*, 2016), suggesting that the possible pathway of introduction was maritime traffic. Since this species has now been found in two localities from eastern (Central Mediterranean) and northeastern Tunisia (Western Mediterranean) for a short time, this record constitutes the northernmost extension range of the species not only in the area but also in the wide Mediterranean Sea. Such patterns suggest that viable populations are progressively establishing although it is small and cryptic, and probably escaped to notice.

The arrival of poisoning species is increasingly noted in Tunisian waters (Yahia *et al.*, 2013; Ben Souissi *et al.*, 2014; Ounifi-Ben Amor & Ghanem In Dailianis *et al.* (2016). Indeed, cases of intoxication by Tetrodotoxin (TTX), present in Tetraodontiformes fish (pufferfish) were observed in western Tunisia during year 2013 (Ben Souissi *et al.*, 2014) and also identified in some *A. tomentosus* from Taiwan (Ho *et al.*, 2006), and Saxitoxin and related compounds (STXs) were found in specimens from Japan (Deeds *et al.*, 2008). Several scientific studies confirm the increasing spread and abundance of invasive marine species of human health concern, however, information on their impacts remains unequally and poorly known (Galil, 2018).

Regular monitoring programs in and around MPAs enhance NIS detection to an early invasion stage probably allow their eradication (Otero *et al.*, 2013). However, the risks that NIS can have in these particular habitats are very significant and even harmful (Galil, 2019). Several Non-Indigenous species have been reported the waters surrounding Zembra Island MPA, and such habitat constitute a kind of refuge, where NIS do not face to fishing pressure occurring in these unprotected sites (Giakoumi *et al.*, 2019). In fact, and according to Ounifi-Ben Amor *et al.* (2016) and Ounifi-Ben Amor & Ghanem In Dailianis *et al.* (2016), of the 137 non-indigenous faunal species recorded in Tunisia, 25 species were listed around Zembra MPA and six species have been observed in its surrounding waters. Therefore, in total agreement with Galil (2019), it appears that MPAs with an abundance of Non-Indigenous populations could be considered as seed banks leading to a spill-over effect to neighboring areas.

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NOVI ZAPIS O POJAVLJANJU TUJERODNE RAKOVICE *ACTAEODES TOMENTOSUS* (BRACHYURA: XANTHIDAE: ACTAEINAE) IZ TUNIZIJSKIH MORSKIH VOD

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POVZETEK

Avtorji poročajo o drugem zapisu o pojavljanju rakovice *Actaeodes tomentosus*, eritrejske vrste, v tunizijskih morskih vodah. Samica te vrste je bila ujeta z roko oktobra 2016 med potapljanjem z avtonomno potapljaško opremo v morskem zavarovanem območju Zembra. Primerek je bil ujet na 1 m globine, tesno pritrjen na skalo. Dolžina oklepa je bila 9,1 mm, njegova širina pa 14,3 mm. Ta zapis predstavlja najsevernejši primer pojavljanja vrste v Tuniziji in tudi v Sredozemskem morju. *A. tomentosus* je nevrotoksična vrsta, ki vsebuje strup tetrodotoksin. Je široko razširjena vrsta v Indo-Pacifiku in pogosta vrsta v bibavičnem pasu na koralnih grebenih.

Ključne besede: morsko zavarovano območje, bioinvazija, raki deseteronožci, potapljaški pregled, širjenje areala, Tunizija

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