

Filling the gap on Italian records of an invasive species: first records of the Blue Crab, *Callinectes sapidus* Rathbun, 1896 (Decapoda: Brachyura: Portunidae), in Latium and Campania (Tyrrhenian Sea)

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Callinectes sapidus is considered one of the worst invasive species in the Mediterranean Sea. After its first observation in 1948, the species has colonized several Mediterranean areas. In this work, we report the first records of the species in Latium and Campania (northern-central and central Tyrrhenian Sea respectively), filling a gap in its distribution along the Italian coasts. We also provide a review of Italian records.

Key words: Tyrrhenian Sea; non-indigenous species; invasive species; biological invasion; crabs

INTRODUCTION

Callinectes sapidus Rathbun, 1896 (Crustacea, Decapoda, Portunidae) is a western Atlantic species whose natural distribution extends from Nova Scotia to northern Argentina (GALIL *et al.*, 2002). This brachyuran, commonly known as Atlantic Blue Crab or, more simply, Blue Crab, is a voracious predator that lives in both marine and transitional environments, such as estuaries and lagoons, usually at depths less than 35 m (HILL *et al.*, 1989). Moreover, this crab shows

high fecundity, excellent swimming capacity and aggressive behaviour (GALIL *et al.*, 2002). All these traits make it one of the 100 “Worst Invasive Alien Species” in the Mediterranean Sea (STREFTARIS & ZENETOS, 2006). Currently, *C. sapidus* occurs in seven of the nine South-European Marine Ecoregions (MANCINELLI *et al.*, 2017) and has produced negative impacts on coastal human activities (STREFTARIS & ZENETOS, 2006; KATSANEVAKIS *et al.*, 2014). Its introduction in the Mediterranean Sea is probably related to ballast waters (HOLTHUIS & GOTTLIEB,

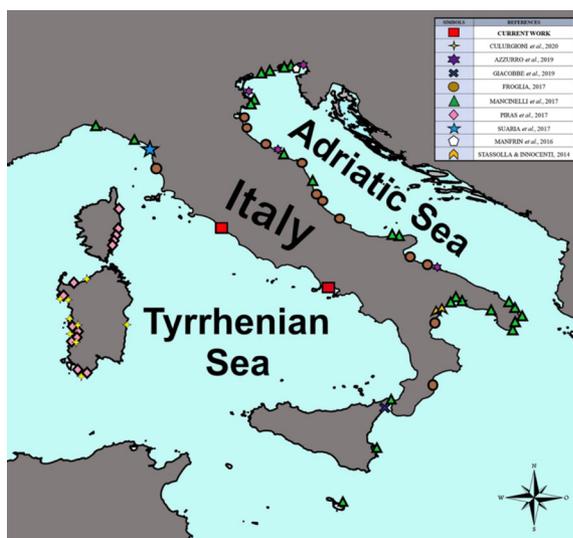


Fig. 1. Distribution map of all reported records of *C. sapidus* in Italian waters. All the main references that include all the records of *C. sapidus* from Italian waters are reported in the legend with corresponding symbols

1955). Recently, the species was recorded in the Baltic basin, expanding its distribution range in northern Europe (CZERNIEJEWSKI *et al.*, 2019).

In America, blue crabs are fished commercially and recreationally. The commercial fishery of the Blue Crab had begun in the Chesapeake Bay region in 1880 (CHURCHILL, 1921). In the United States, the fishery is made up of hundreds to thousands of small-scale, sometimes artisanal, fishermen (STAGG & WHILDEN, 1997).

The first confirmed record for the Mediterranean is dated back to 1948 (GIORDANI SOIKA, 1951), although its presence was suspected as early as 1935 (NEHRING, 2011). In Italian waters, the majority of records were from the Adriatic and Ionian seas (STASOLLA & INNOCENTI, 2014; MANFRIN *et al.*, 2016; AZZURRO *et al.*, 2019), while in western Italy the species was reported only from Sardinia (PIRAS *et al.*, 2019), Liguria (MANCINELLI *et al.*, 2017; SUARIA *et al.*, 2017) and Tuscany (FROGLIA, 2017). With the exception of Sardinia, the area of the Strait of Messina and the northern Tyrrhenian Sea (CAVALIERE & BERDAR, 1975; BISCONTI & SILVI, 2005; GIACOBBE *et al.*, 2019; CULURGIONI *et al.*, 2020), no records were reported from the Tyrrhenian Sea in the wide coastal tract extending from Latium to Calabria.

In this work, we report the presence of *C. sapidus* in new Tyrrhenian localities (Latium and Campania), filling a gap in the distribution of this alien species in Italian waters. Furthermore, we provide a systematic review of the presence of the species in Italy and discuss the success of its invasion.

MATERIAL AND METHODS

On 28th July 2019, a single specimen of *C. sapidus* was photographed at Bacoli (central Tyrrhenian Sea), in the coastal lagoon of the Lake Miseno, at depth of about 1.5 m (40.7930 N, 14.07640 E), on muddy bottom with vegetation.

On 9th December 2019, a single female specimen of *C. sapidus* was caught by trammel net, off Civitavecchia (northern-central Tyrrhenian Sea). The species was caught on sandy-muddy bottom at a depth of about 35 m (42.14850 N, 11.72050 E), about 2.5 km from the mouth of the River Mignone. The specimen was photographed, preserved in 4% buffered formalin and deposited in the marine invertebrate collection of the Laboratory of Experimental Oceanology and Marine Ecology of Civitavecchia, with code AL-15-FRA-19.

A systematic literature review of the records of the species in Italian waters was performed. All known records of *C. sapidus* in Italian waters are reported in Fig. 1: from the first one in the Adriatic Sea (GIORDANI SOIKA, 1951) to the present records from the Tyrrhenian Sea, filling the gap in the species' distribution in Italian waters.

RESULTS AND DISCUSSION

The specimens of *C. sapidus* were identified following WILLIAMS (1974). This crab has a carapace wide more than twice than long (including the antero-lateral spines) with nine anterolateral, acuminate teeth; the larger one at the lateral corner. The merus has 3 very strong inner spines increasing in size distally. The two last segments of the fifth legs flattened in form of paddles. The color varies from grayish to brownish and blue dorsally and pale yellow ventrally.



Fig. 2. The specimen of *C. sapidus* photographed at Bacoli (central Tyrrhenian Sea)

The sex of the specimen photographed at Bacoli was not determined because the ventral part of the crab was not visible in the photos. However, the carapace width (CW) was estimated to be about 150 mm (Fig. 2).

The female specimen caught at Civitavecchia had a carapace width (CW) of 198 mm and a carapace length (CL) of 86 mm (Fig. 3).

Being an aggressive species and a voracious predator, *C. sapidus* could pose a threat for several indigenous species and can directly compete with other indigenous crabs for food and space (GENNAIO *et al.*, 2006; NEHRING *et al.*, 2008). The predation of the crab on fishery resources could also negatively affect this activity (PRADO *et al.*, 2020). Furthermore, the Blue Crab is also a host for several parasites and diseases, some of which might potentially cause mass mortalities (MESSICK & SINDERMAN, 1992). Hence, the importance of rigorous monitoring programs for this species along all the Mediterranean coasts, and in particular in key areas. For example, the natural reserve of Tarquinia (near Civitavecchia) hosts a coastal lagoon with high diversity in which the invasive crab could have disastrous effects and use areas such as this as stepping stone for subsequent spread into other areas. In this regard, citizen science projects are an effective tool for the early detection and monitoring of non-indigenous species (TIRALONGO *et al.*, 2019). In several Italian locations, such as in some areas of Sicily, due to its abundance and good taste the species begins to be commercialized for human consumption. For example we have recently documented the presence of the

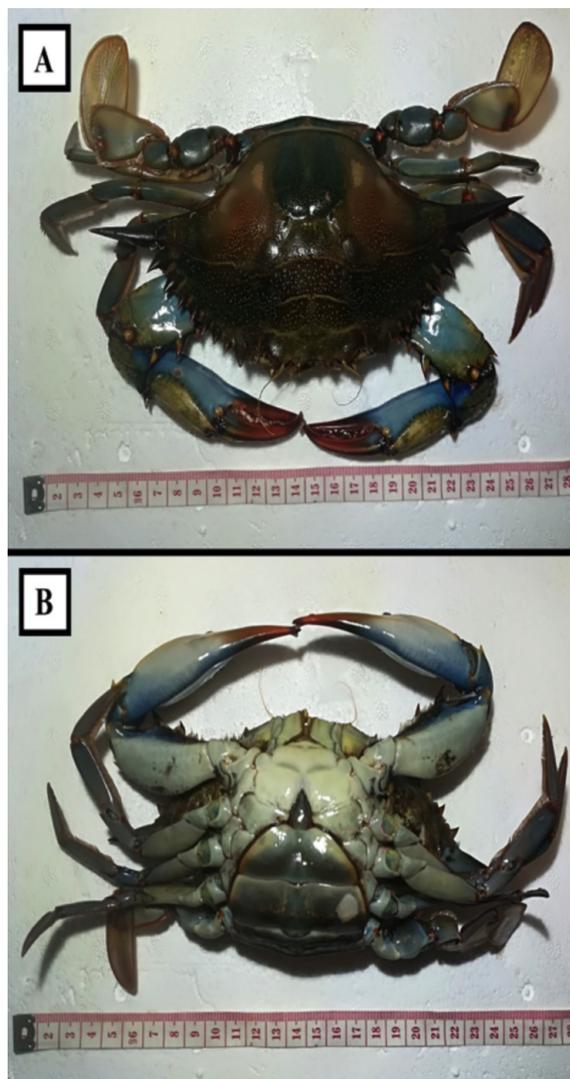


Fig. 3. The female specimen of *C. sapidus* caught by trammel net at Civitavecchia. A. dorsal view. B. ventral view

species in local markets of the eastern Sicily: Catania, Marzamemi and Portopalo of Capo Passero. The species was also reported by citizen scientists to the authors in new areas around Sicily: Marina of Modica and in the coastal lagoon of Longarini (Ispica).

This work represents the first records of *C. sapidus* from Latium and Campania coasts, located in the northern-central and central part of the Tyrrhenian Sea, respectively. However, the capture of a single individual for each area is not enough to testify the presence of a stable population and further monitoring on the presence and distribution of *C. sapidus* along the

Latium and Campania coasts is required. In conclusion, the records here reported extend the known geographical distribution of *C. sapidus* along Italian coasts, filling a gap in its distribution. The monitoring of this invasive species require special attention, and new studies should be performed on the role that fishing and biological control can have on the Mediterranean populations of the crab (TIRALONGO *et al.*, 2021).

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**Nadopuna praznine u talijanskim zapisima o invazivnoj vrsti:
prvi nalaz plavog raka, *Callinectes sapidus* Rathbun, 1896,
(Decapoda: Brachyura: Portunidae), u talijanskim
pokrajinama Latium i Campania (Tirensko more)**

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SAŽETAK

Plavi rak, *Callinectes sapidus* smatra se jednom od najgorih invazivnih vrsta u Sredozemnom moru. Nakon prvog nalaza 1948. godine, vrsta je kolonizirala nekoliko mediteranskih područja. U ovom radu izvještavamo o prvim zapisima o vrsti u pokrajinama Latium i Campania (sjeverno-centralno i središnje Tirensko more), popunjavajući nedostatak nalaza o njihovoj rasprostranjenosti duž talijanskih obala. Prikazan je pregled svih talijanskih nalaza.

Ključne riječi: Tirensko more; neautohtone vrste; invazivne vrste; biološka invazija; rakovi