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**Rapid Communication****The arrival of the American blue crab, *Callinectes sapidus* Rathbun, 1896 (Decapoda: Brachyura: Portunidae), in the Gulf of Lions (Mediterranean Sea)**Céline Labrune<sup>1,\*</sup>, Elsa Amilhat<sup>2,3</sup>, Jean-Michel Amouroux<sup>1</sup>, Coraline Jabouin<sup>4</sup>, Alexandra Gigou<sup>4</sup> and Pierre Noël<sup>5</sup><sup>1</sup>Sorbonne Universités, CNRS, Laboratoire d'Ecogéochimie des Environnements Benthiques, LECOB UMR8222, F-66650 Banyuls-sur-Mer, France<sup>2</sup>Univ. Perpignan Via Domitia, Centre de Formation et de Recherche sur les Environnements Méditerranéens, UMR 5110, F 66860, Perpignan, France<sup>3</sup>CNRS, Centre de Formation et de Recherche sur les Environnements Méditerranéens, UMR 5110, F 66860, Perpignan, France<sup>4</sup>Parc naturel marin du golfe du Lion - Agence française pour la biodiversité "Le Nadar", Hall C - 5 square Félix Nadar - 94300 Vincennes, France<sup>5</sup>UMS 2006 AFB-CNRS-MNHN, "Patrimoine Naturel", Muséum national d'Histoire naturelle, CP 48, F-75231 Paris cedex 05, FranceAuthor e-mails: [labrune@obs-banyuls.fr](mailto:labrune@obs-banyuls.fr) (CL), [elsa.amilhat@univ-perp.fr](mailto:elsa.amilhat@univ-perp.fr) (EA), [phaxas.amouroux@gmail.com](mailto:phaxas.amouroux@gmail.com) (JMA), [coraline.jabouin@afbiodiversite.fr](mailto:coraline.jabouin@afbiodiversite.fr) (CJ), [alexandra.gigou@afbiodiversite.fr](mailto:alexandra.gigou@afbiodiversite.fr) (AG), [pierre.noel@mnhn.fr](mailto:pierre.noel@mnhn.fr) (PN)

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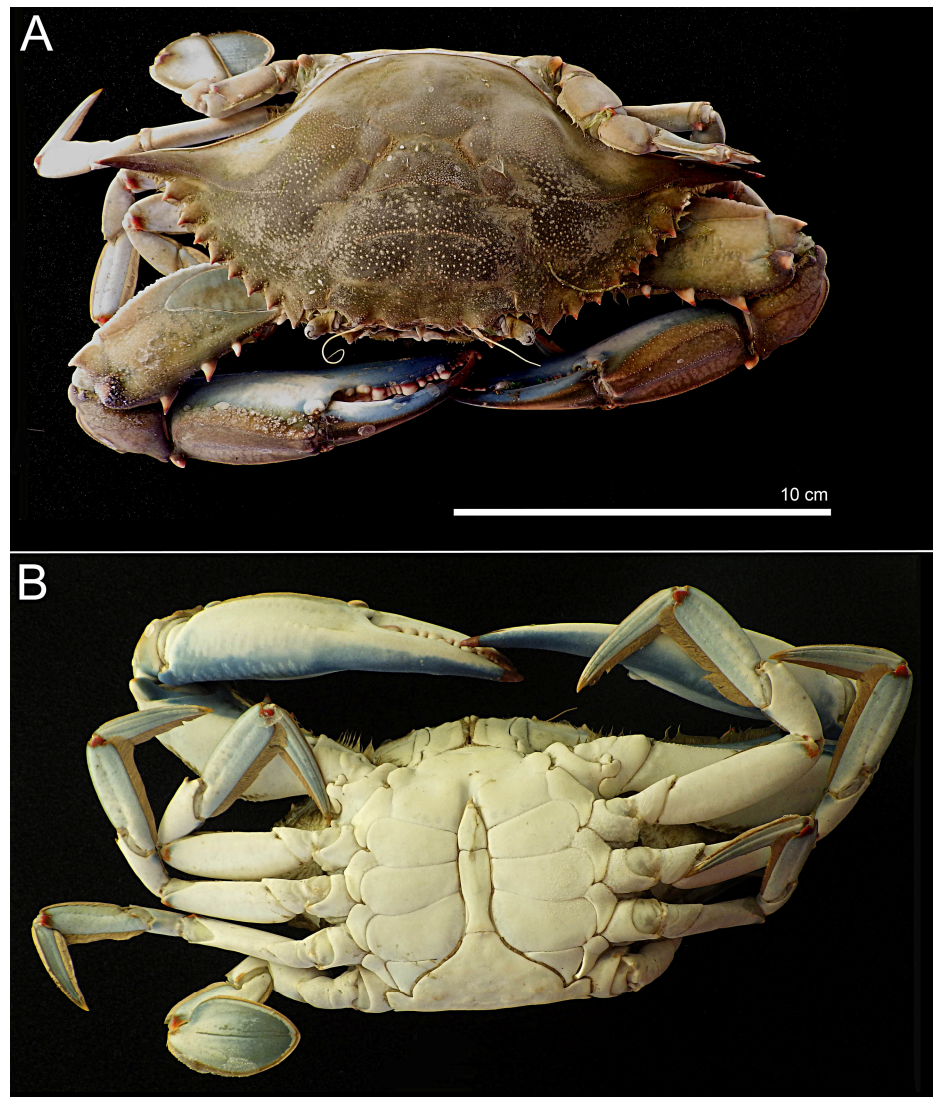
**Received:** 20 December 2018**Accepted:** 31 May 2019**Published:** 2 September 2019**Thematic editor:** Cynthia McKenzie**Copyright:** © Labrune et al.This is an open access article distributed under terms of the Creative Commons Attribution License ([Attribution 4.0 International - CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).**OPEN ACCESS****Abstract**

After reaching the Italian and Spanish coasts of the Western Mediterranean Sea, the American blue crab *Callinectes sapidus* was finally observed on the French coasts. To date, it has been caught in eleven lagoons and three sites of the French coast. Its strong invasion capacities will probably lead to important changes in the structure and composition of French lagoon biota.

**Key words:** Atlantic blue crab; invasive species; Western Mediterranean; lagoons, wetlands**Introduction**

The American blue crab, *Callinectes sapidus* Rathbun, 1896, is native to the estuaries and coastal waters of the western Atlantic. Its natural distribution extends from Nova Scotia to northern Argentina (Galil et al. 2002). *C. sapidus* has been included among the 100 worst Invasive Alien Species in the Mediterranean Sea (Streftaris and Zenetos 2006); it has been introduced to the Mediterranean probably through ballast waters (Holthuis and Gottlieb 1955) and it first colonized the eastern part (Galil 2011). Recently, different scientific papers and communications reported its arrival in several places in the western Mediterranean Sea such as the Algerian and Sardinian (Italy) coastal waters (Benabdi et al. 2019; Piras et al. 2019), the coastal lagoons of Ebro Delta (Spain) (Castejón and Guerao 2013), the estuary of the Segura river (Spain) (González-Wangüemert and Pujol 2016), the lagoons of eastern Corsica (France) (Garrido et al. 2018; Noël 2018) and the Balearic Islands (Spain) (Garcia et al. 2018).

Zibrowius reported the occurrence of *Callinectes sapidus* in the Mediterranean Berre lagoon (France) in 1962 (Galil et al. 2002), but its presence on the French Mediterranean coast was not observed again until



**Figure 1.** *Callinectes sapidus* male specimen collected on 11<sup>th</sup> September 2017 in Canet Lagoon, France. Photo by C. Labrune and JM Amouroux.

2016 (*present communication*, Supplementary material Table S1). A recent published distribution map of *C. sapidus* in the Mediterranean (Suaria et al. 2017; Mancinelli et al. 2017a) reported a single observation on the French Mediterranean coast which may be the one reported by Zibrowius (Galil et al. 2002).

The aim of this communication is to report the observations of *Callinectes sapidus* on the French Mediterranean coast and publish French records from the grey literature (Garrido et al. 2018; Noël 2016, 2017, 2018, 2019; Noël and Buron 2017; Pôle relais lagunes 2018). An updated map of distribution is proposed and new records are detailed in the present communication.

### Materials and methods

A single adult male *Callinectes sapidus* was captured by commercial fishery on 11 September 2017 at a depth of 1m in Canet Lagoon, French Mediterranean (42°40.2'N; 3°01.6'E WGS84) (Figure 1). The specimen was photographed and

frozen at the LECOB in Banyuls-sur-Mer. The carapace length (distance between the tip of the frontal teeth and the posterior margin of the carapace) was 74 mm, and carapace width (between the tips of the longest lateral carapace spines) was 160 mm.

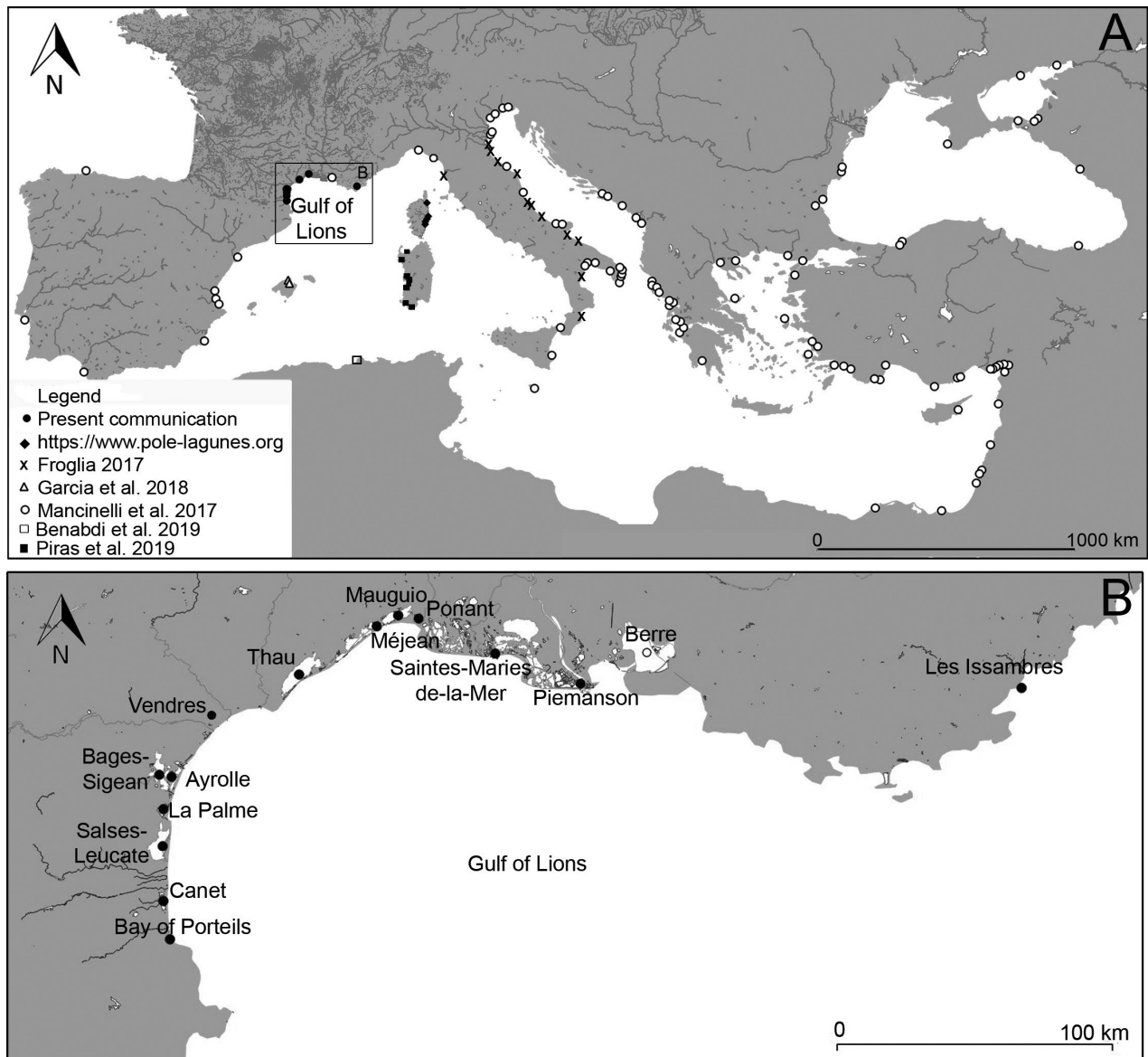
The identification of the crabs was based on carapace morphology and the coloration pattern according to Williams (1974).

Since the capture of this specimen, we recorded the observations of this species around the French Mediterranean (principally via fishermen and coastal lagoons managers observations) in order to estimate the extent of the invasion of the species. Based on these French observations and on literature (Benabdi et al. 2019; Frogia 2017; Garido et al. 2018; Mancinelli et al. 2017a; Piras et al. 2019) the present study gives an updated distribution map of *Callinectes sapidus* in the Mediterranean.

## Results and discussion

An update of the map published by Mancinelli et al. (2017a) is presented in Figure 2A. This map takes into account the correction of two erroneous records pointed out by Crocetta (2006) and Torchio (1968) but reported in Mancinelli et al. (2017a). These were misidentifications of *Portumnus segnis* (Forskål, 1775) with *C. sapidus* from Messina and Augusta bay (Sicily) (Crocetta 2006; Torchio 1968). Records reported by fishermen on the French continental coast are presented in Table S1 and Figure 2B. It shows that most specimens were found in lagoons but *Callinectes sapidus* was also found in the sea. These new records fill the gap constituted by the French Mediterranean coast on the presence of *Callinectes sapidus*.

The sightings/catches reported in the present paper are the first records of the presence of *C. sapidus* since Zibrowius' work (pers. comm. 1962 in Galil et al. 2002) in the French continental Mediterranean coast (Figure 2B). The scenario is comparable to the sightings of *C. sapidus* in the Adriatic Sea which was first reported in 1949 in the Grado Lagoon and then was not observed until 2015 when it reappeared in the Gulf of Trieste (Manfrin et al. 2016). This suggests that the presence of *C. sapidus* is not always synonyms of an invasion. In fact, to be considered as established, the crab should be able to reproduce on the French coast, which seems to not be the case yet as opposed to the populations in the eastern part of Mediterranean (Nehring 2011), the Adriatic Sea (Cilenti et al. 2015) and in the Torre Colimena basin along the Ionian coast (Carrozzo et al. 2014). However, a single ovigerous female was recorded in Camargue "Petit Rhône" on August 26<sup>th</sup> 2019 by D. Marobin-Louche (fide Noël 2019). The recent arrival of *C. sapidus* on the western Mediterranean is not yet well understood. However, a stepping stone model with intermediary populations settling further west and/or the transport of larvae in ballast water are hypothesis which cannot be excluded.



**Figure 2.** Updated distribution map of *Callinectes sapidus* published in Mancinelli et al. (2017a). A: Whole Mediterranean and Black Sea; B: Gulf of Lions (for details see Supplementary material Table S1).

Castejon and Guerao (2013) reported the first occurrence of *Callinectes sapidus* in 2012 in the Ebro Delta on the Mediterranean coast of Spain. Since then it has spread around forming established populations (Pla Ventura et al. 2018). In 2016, the Spanish Ministry of Fishery included *C. sapidus* on its list of commercial fish species (Garcia et al. 2018) and it is now commercialized and served in restaurants.

The rapid expansion of *C. sapidus* in the French Mediterranean may cause severe impacts on (1) local biodiversity and (2) economic activities since the invading lagoons in the region support commercial fisheries and aquaculture activities. Mancinelli et al. (2017b) showed that the blue crab can interact, by competition or predation, with a wide spectrum of native crab and fish species resulting in potentially high ecological impacts. Its predation on exploited species such as the Pacific oyster *Magallana gigas*, the blue mussel *Mytilus* spp. or other species is problematic because the

crab feeds directly on the fishing nets which causes extensive damage. Mancinelli et al. (2017b) underline the need of a “strengths, weaknesses, opportunities, and threats” (SWOT) analysis prior to the establishment of a management strategy for the blue crab *Callinectes sapidus* as a shellfish. The negative effects of *C. sapidus* on native biocenoses must be made explicit; and the nature and extent of these negative effects must be demonstrated and quantified (Mancinelli et al. 2017a).

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### Supplementary material

The following supplementary material is available for this article:

**Table S1.** Dates and localization of captures of *Callinectes sapidus* on the French Mediterranean littoral.

This material is available as part of online article from:

[http://www.reabic.net/journals/bir/2019/Supplements/BIR\\_2019\\_Labruno\\_et\\_al\\_Table\\_S1.xlsx](http://www.reabic.net/journals/bir/2019/Supplements/BIR_2019_Labruno_et_al_Table_S1.xlsx)