

Rapid Communication**On the presence of *Charybdis (Charybdis) hellerii* (A. Milne-Edwards, 1867) on the Mexican coast of the Gulf of Mexico**

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OPEN ACCESS**Abstract**

This is the first report of *Charybdis (Charybdis) hellerii* (A. Milne-Edwards, 1867) on the Mexican coast of the Gulf of Mexico. Six specimens were collected with crab traps in Sisal, Yucatan, and one in Bahamita on the marine coast of the Laguna de Términos in Campeche, Mexico, with a seabob trawl net. Further sampling and monitoring are required to find conclusive evidence that the species is established in this area. The appearance of this species is a concern due to the potential impact it could have on the populations of other native species of crabs of economic importance.

Key words: Brachyura, Indo-Pacific swimming crab, invasive alien species, artisanal crab fishery, shrimp trawl fishery, Yucatan, Campeche

Introduction

The swimming crab, *Charybdis (Charybdis) hellerii* (A. Milne-Edwards, 1867), is a widely distributed portunid species in the Indo-West Pacific, including the Red Sea (Kensley 1981), and is an invasive species in the eastern Mediterranean (Lemaitre 1995). The presence of this portunid as an exotic species in the western Atlantic has been recognized since the end of the 1980s, when Campos and Türkay (1989) first recorded the species in Colombian waters. The subsequent chronology of its geographic dispersion in the western Atlantic is described in detail by Negri et al. (2018). A worldwide haplotype analysis done by Negri et al. (2018), confirmed the Mediterranean Sea as the main source of the American population, probably through larvae transported in ballast water.

This study provides the first records of this Indo-Pacific swimming crab on the Mexican coast. These crabs were caught with traps on 8 October 2009

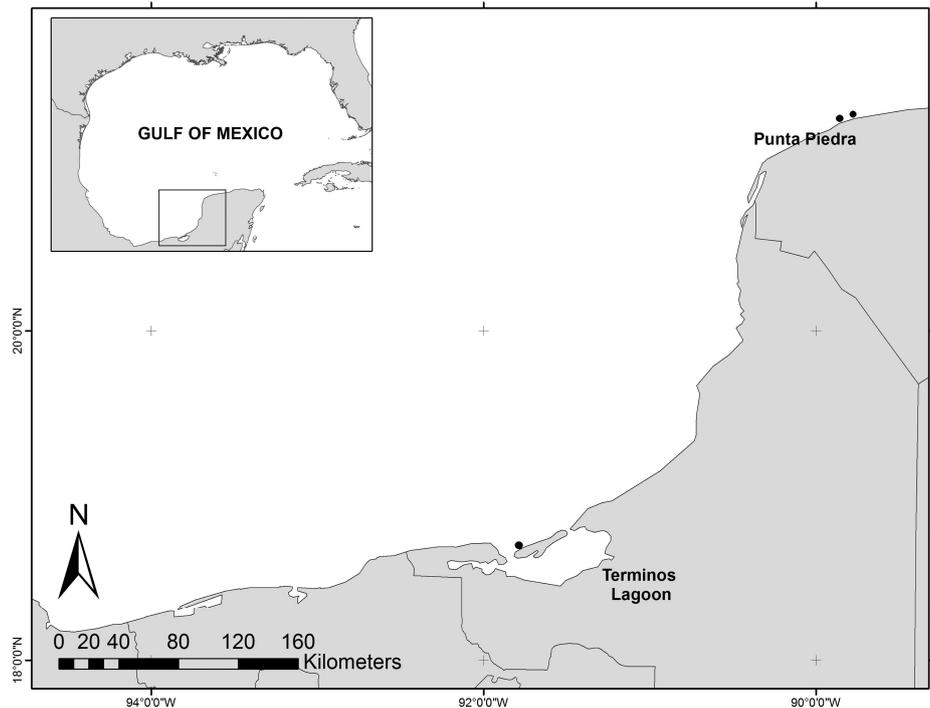


Figure 1. Map of the two localities where *Charybdis hellerii* have been collected since 2009: Punta Piedra, Sisal, Yucatan and Laguna de Términos, Campeche.

in Sisal, Yucatan and by a small shrimp trawler on 24 March 2015 in Bahamita beach, the seaside portion of Laguna de Términos, Campeche. Thus, this study confirms the expected presence of *C. hellerii* on the southeastern coast of the Gulf of Mexico.

Materials and methods

The first specimen of *C. hellerii* from Mexico was collected on 8 October 2009, by Cynthia Delgado in shallow, coastal soft sediment, close to “Punta Piedra”, Sisal, Yucatan, México, (21°09'39.10"N; 90°04'21.70"W) using baited 60 × 30 cm traps, with a 15 cm opening diameter and a 1 cm mesh aperture, placed overnight. These traps are commonly used in the artisanal crab fishery that supply the local fishery for *Octopus maya* (Voss and Solís, 1966) with live bait, and the bait fishery mainly targets portunid and calappid crabs (Hernández et al. 2012). Sampling of the bait fishery was designed to update the checklist of brachyuran crabs in the study area. This first specimen (SIS-CD-079) was originally deposited in the crustacean collection of Unidad Multidisciplinaria de Docencia e Investigación de Sisal (UMDI-Sisal) (SIS-CD), UNAM. Species identification was initially determined by one of the co-authors (JLV) based on the description of Lemaitre (1995), but the specimen unfortunately was lost.

While efforts to capture more specimens were conducted from 2010 to 2013, it was only after a drawing of the species was given to several fishermen (who used crab traps), and a monetary reward offered, that several specimens were captured within the same region (Figure 1). Recently,



Figure 2. Examples of *Charybdis hellerii* collected in southern Gulf of Mexico coastal zones near Sisal harbor. Two males (CNCR 31707 and YUC-CC-255-1234) and one ovigerous female (YUC-CC-255-1234). Note the sand tube worms on top of the female carapace and puncture in the right third pereopod merus, lack of dactylus in the right fourth pereopod and ulcerated left swimming leg dactyl. Photographs by Nuno Simoes.

another specimen from the seaside portion of Laguna de Términos was collected, extending the distribution range of the species within Mexican waters by approximately 341 kilometers. This last specimen was caught accidentally on 24 March 2015 in a shrimp trawl. The specimens were deposited in the “Colección Nacional de Crustáceos” (CNCR), Instituto de Biología, UNAM, and in the “Colección de Crustáceos de Yucatán”, UMDI-Sisal, UNAM, Yucatán (YUC-CC). A selection of four specimens was photographed both dorsally and ventrally. Sex was determined and carapace width and length in mm (CW, CL) recorded for all collected specimens.

Results

The captured crabs closely fit the description given by Apel and Spiridinov (1998) of *Charybdis hellerii*: concave carapace with six prominent frontal teeth, first and second smaller than the following ones and subequal, last one slightly more prominent than the preceding one; chelipeds with spines, brown distally, fingers black with white tips (Figure 2). The six individuals were between 63.9 and 71.2 mm CW. Five specimens were male and one was an ovigerous female.

Material examined

A total of seven specimens have been collected since 2009 as follows. YUC-CC-255-11-1021 (specimen lost), 2–3 m depth, 8/10/2009, coarse sand and boulders on calcareous platform, Punta Piedra, Sisal (21°09'39.10"N; 90°04'21.70"W). This specimen lacked the right chela and right swimming leg, and had barnacles growing on the left chela. 1♂, CW 68.4 mm, CL 44.6 mm, CNCR 31707, 2–3 m depth, 15/11/2013, coarse sand and boulders on calcareous platform, Punta Piedra, Sisal (21°09'30.71"N; 90°5'12.07"W). 1♂, CW 62.02 mm, CL 43.01 mm, YUC-CC-255-1234, 2–3 m depth, 15/11/2013, coarse sand and boulders on calcareous platform, Punta Piedra, Sisal (21°09'30.71"N; 90°05'12.07"W). 1♂, CW 69.9 mm, CL 48.1 mm and 1♀, ovigerous, CW 58.9 mm, CL 42.7 mm, YUC-CC-255-11-1602, 2–3 m depth, 24/11/2014, coarse sand and boulders on calcareous platform, Punta Piedra, Sisal (21°09'30.71"N; 90°5'12.07"W). 2♂, CW 71.8–71.2 mm, CL 51.8–50.4 mm, YUC-CC-255-11-2143 – 24/03/2015, 9 m depth, soft silt and sand with patches of submerged vegetation, Bahamita, Isla del Carmen, Campeche (18°40'45.84"N; 91°50'2.24"W).

Discussion

The route through which *C. hellerii* entered the western Atlantic is strongly believed to have been via larvae transported in ship ballast water from the Mediterranean (Negri et al. 2018).

The presence of specimens of *C. hellerii* along the Mexican coast may be the result of natural larval dispersal from established populations in the Caribbean through the Yucatan channel, or from west Florida, south Alabama, Mississippi and Louisiana through the complex and dynamic east-west Gulf of Mexico gyres formed from the loop current (Gough et al. 2019). An alternative hypothesis is that these specimens may represent new independent introductions of larvae through ship ballast water. The specimens recorded in this study were caught in areas close to Progreso and Ciudad del Carmen harbors with known connections with other zones where *C. hellerii* occurs (Florida, Cuba, Dominican Republic). The port of Progreso, Yucatan, moves around 2 million tons of cargo and 300,000 passengers per year (Puertos Yucatan 2016), whilst Cd. Del Carmen port provides boating services to the busiest oil production area in Mexico, Campeche sound, providing 78% of all the oil produced in the country (PEMEX 2016). Both scenarios have numerous international ship exchanges which increase the likelihood of introduction by means of ballast water.

The impacts of the Indo-Pacific swimming crab in its introduced range are not well documented. However, *C. hellerii* is an omnivore and it has been found to feed mainly on crustaceans (native crab species), molluscs and algae (Sant'Anna et al. 2015). Thus, with such a wide and generalized diet, an established population could conceivably affect local crab

populations through predation and direct competition for food (Sant'Anna et al. 2015). In a recent study, Oliveira (2016) mentions that in Brazil, six species of crabs, including *Menippe nodifrons*, showed decreases in their populations after the establishment and subsequent population increase of *C. hellerii*, suggesting potential competition for resources in rocky coastal areas where it co-occurs with these six native species.

The presence of an ovigerous female in this study suggests that a breeding population may have established. However, further sampling and long-term monitoring are necessary to verify this and to determine the extent of the establishment of *C. hellerii* on the Mexican coast of the Gulf of Mexico, and its potential ecological impacts.

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