



A new case of leucism in blue crab, *Callinectes sapidus* Rathbun, 1896 (Decapoda: Portunidae), in a natural protected area from the southern Gulf of Mexico

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Abstract. The occurrence of a blue crab (*Callinectes sapidus*) individual with leucism in a natural protected area from the southern Gulf of Mexico is reported. This case increases the number of occurrences of commercially important aquatic species with body coloration alterations in the region.

Key words: blue crab, leucism, Terminos Lagoon.

Un nuevo caso de leucismo en la jaiba azul, *Callinectes sapidus*, en una área natural protegida del sur del Golfo de México. Resumen: Se reporta la presencia de un individuo de jaiba azul (*Callinectes sapidus*) con leucismo en un área natural protegida del sur del Golfo de México. Este estudio incrementa el número de casos de especies acuáticas de importancia comercial con alteraciones en la coloración del cuerpo en la región.

Palabras clave: jaiba azul, leucismo, Laguna de Términos.

The Atlantic blue crab (*Callinectes sapidus* Rathbun, 1896) is a commercially important species in the southern Gulf of Mexico (GOM), ranking as the second-largest fishery in Mexican GOM waters and sixth place in the state of Campeche. In 2021, landings of this species were estimated at 2,183 metric tons (CONAPESCA 2021). Its geographical distribution spans from Nova Scotia, Canada to La Plata River in Argentina, including GOM (Williams 1974). This decapod crab belonging to the Portunidae family is one of the 15 species reported for the *Callinectes* genus. It is characterized by a

carapace twice as wide as it is long with the ninth spine prominent on each side. It has two triangular teeth in front, accompanied by two pointed one on each side of these. The fifth pair of legs is flattened, a modification that allows them to swim. Finally, the color of the carapace varies between olive green or bluish green on the back and white on the ventral part (Gosner 1978, Williams 1984). It inhabiting shallow brackish coastal lagoons and estuaries with sandy and mud bottoms. Albinism is a genetic anomaly characterized by the total absence of pigmentation in the skin, hair and eyes of an

organism, caused mainly by the alteration of a recessive gene that affects the production of melanin (Li *et al.* 2017); whereas, leucism is when a total or partial loss of skin pigmentation occurs but the individual has a normal iris pigmentation (Jimenez-Alvarado *et al.* 2023). While albinism and leucism is a known condition in many invertebrates, it has been rarely documented in the literature. However, there are cases such as the sea cucumber *Isostichopus fuscus* (Ludwig, 1875) in the Gulf of California and *I. badionotus* (Selenka, 1867) on the coast of Yucatán in Mexico (Fernández-Rivera *et al.* 2015; Wakida-Kusunoki *et al.* 2016), partial albinism in the blue lobster *Palinurus inflatus* Bouvier, 1895 in the Mexican Pacific (Landa-Jaime *et al.* 2018), the crab *Procambarus clarkii* (Girard, 1852) in Japan (Natanaki 1999), as well as cases of partial albinism in *C. sapidus* (Türker İlkyaz & Tosunoglu 2019). This scarcity of records may be attributed to albinism's effects on factors such as camouflage deficiencies, intraspecific communication, and thermoregulation, which would prevent these phenotypes from being abundant (Hogarth 1982). The main goal of this study is to report the

first recorded case of a blue crab individual with partial albinism within the southern GOM, specifically within an ecologically t natural protected area (NPA).

The blue crab individual was collected on July 19, 2023, at Bahamita ($-91^{\circ}41'32''$ W and $18^{\circ}40'38''$ N), located in the central region of Terminos Lagoon, an important natural protected area (NPA) in the southern GOM and adjacent to an oil extraction activity zone (see Fig. 1). The collection was carried out by the artisanal fishery fleet, which operated with circular traps of 60 cm of diameter, the circle was made of galvanized rod and the trap's body with monofilament nylon mesh size of 6.35 cm (2.5 inch). The bait used was fresh herring (*Harengula clupeola* Cuvier, 1829) cut in two pieces, and the trap was deployed at a depth of 1.8 meters in surrounding areas dominated by seagrasses (*Thalassia testudinum* Koenig, 1805). The individual blue crab was identified according to the morphological and coloration characteristics described by Williams (1974) and was determined to be an immature male, with 87 mm of carapace width and 61 g of total weight.

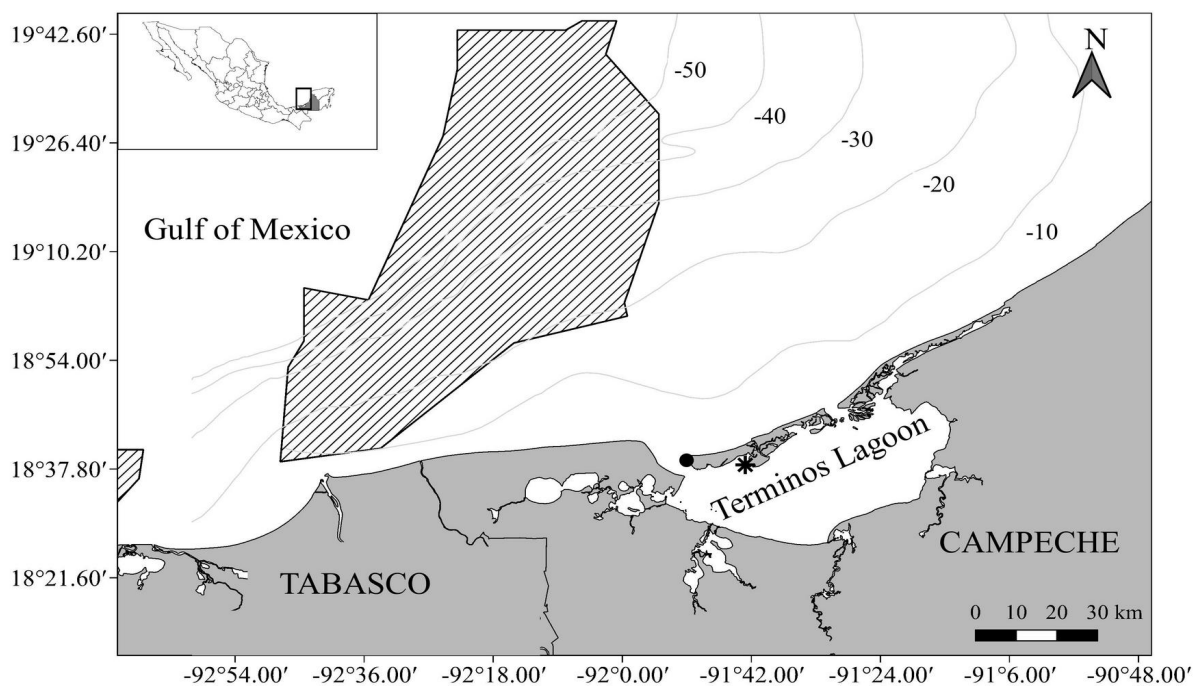


Figure 1. Catch site of blue crab (*C. sapidus*) individual (black asterisk) with leucism in the Natural Protected Area of Terminos Lagoon from the southern Gulf of Mexico. The black point represents Ciudad del Carmen, the striped polygon is the Platform Exclusion Zone (oil extraction area), and negative numbers are the isobaths in meters.

Natural coloration and other morphological characteristics were observed in the blue crab, which showed lack pigmentation in some appendages of the individual. The entire cheliped (dactyl, propodus, carpus and merus) lacked coloration on the left side, as did the second and fourth pereopods. Additionally, the third pereopod had the dactyl, propodus and carpus with an absence of natural coloration (Fig. 2). On the right side, the cheliped had lack of coloring only on the merus and carpus; likewise, the entire fourth pereopod exhibited a distinctive white coloration, indicating leucism in this individual (Fig. 2).

This report increases the number of commercially important species displaying abnormalities in their natural coloration within the southern GOM, particularly in the natural protected area. Albinism and leucism has been reported in various aquatic organisms, including finfishes (Wakida-Kusunoki & Amador-del-Ángel 2013, Guerra-Jiménez & Lara-Mendoza 2018), elasmobranch fishes (Sandoval-Castillo 2006,

Wakida-Kusunoky 2015, Mendoza-Carranza *et al.* 2016, Lara-Mendoza & Guerra-Jiménez 2019), sea cucumber (Fernández-Rivera Melo *et al.* 2015), as well as in numerous crustacean species (Sims & Joyce 1965, James 1978, Natanaki 1999, Landa-Jaime *et al.* 2018, Kale *et al.* 2020). Similarly, Türker İlkyaz & Tosunoglu (2019) reported partial albinism in a female specimen of *C. sapidus* captured in the Köyceğiz lagoon in Turkey. This specimen, like the one found in our study, had normal coloration in the carapace, and pseudo albinism in most of extremities.

Albinism in fishes could be caused by three main factors: random genetic alterations, the effect of pollution, or genetic alterations driven by population size (Evangelista-Leal *et al.* 2013). However, the presence of albinism and leucism in crustaceans resulting from a lack of pigmentation due to genetic factors may be questionable (Hogart 1982). In that sense, Hogart (1978) demonstrated that the coloration patterns of some juvenile



Figure 2. Blue crab, *C. sapidus*, showing the leucism (a and b) and normal individual (c and d) by the dorsal and ventral sides, respectively.

Carcinus maenas (Linnaeus, 1758) organisms changed with each molt. Given the absence of evidence to explain the cause of the leucism observed in the organism in this study, it remains unknown whether it results from a lack of pigmentation, genetic factors, or a combination of both. Additionally, it could also be possible that climate change is affecting various physiological processes in many invertebrate species, particularly in mollusks and crustaceans, mainly due to the increase in the temperature and acidification of the sea and coastal lagoons (Vargas *et al.* 2022).

It is necessary to broaden the scope of research in this area, especially given the recent identification of several cases of abnormalities and the occurrence of wild species with some degree of altered coloration in the southern Gulf of Mexico. It is important to identify the underlying causes and sources of these alterations, investigate any potential risks to human health, and assess their effects on wild populations.

Ethical statement

The present investigation did not involve regulated animals and did not require approval by an Ethical Committee. There are no conflicts of interest in this manuscript

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