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Research Article

First record of Bristly mail chiton (*Acanthochitona crinita*) in the Panamanian Caribbean

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Abstract

This report presents the first record of the spiny chiton *Acanthochitona crinita* in the Panamanian Caribbean. This species is common in the northeastern Atlantic. According to the data, a total of six specimens were recorded in April, May, and June of 2025. Three of the specimens were selected for further analysis in the forensic research laboratory. These specimens were preserved for DNA sampling. A meticulous dissection process was performed to extract the valves and photograph the spicules. Analysis of the valves confirmed the presence of *A. crinita*, thus verifying the taxonomic identification. Further research is needed to determine whether this organism has a population in the region and, if so, its potential impact on the area's ecosystems.

Key Words: *Acanthochitona Crinita*; Chitons; Valves; Mollusks; Spicules; Distribution.

Abbreviations: CN: organisms sighted but not collected; CD: organisms recollected; BL: Body lenght BW: Body width;

Introduction

The geographic distribution of a species is a key component in understanding its ecology, biology, and conservation status. However, recent changes in their distribution may be due to climate change or human activity. The phylum Mollusca is a vast taxonomic group in terms of morphological differences (Scherholz et al., [1]). The class of chitons (Polyplacophora) is one of 7 classes that make up the phylum Mollusca, small compared to the other classes; the taxon of chitons has about 1000 described species, of which 430 are fossils, which are distributed around the world (Bode, 1989[2]; Vendrasco et al., [3]; Irisarri et al., [4]; Alarcón-Chavira, [5]; Ibáñez et al., [6]; Te Gómez, [7]; Vončina et al., [8]). This class has a diversity of habitats ranging from the intertidal zone on rocky substrates to ≈70 meters deep, and even species have been reported living in abyssal depths (Schwabe, & Sellanes [9]). Being a benthic herbivore, it aids in the control of the growth and distribution of algae in the intertidal zone (Aguilera & Navarrete [10]), as well as elliptical organisms on rocky substrates (Kaas & Van Belle [11]). Its ability to

colonize new environments, tolerance to various physicochemical conditions, and reproductive potential give it the characteristics of an invasive species (Tunnel et al. [12].

The members of this taxonomic group are exclusively marine organisms, oval-shaped, they have bilateral symmetry. It also has a series of calcareous protuberances called spicules (Scheltema, [13]; Vendrasco et al., [3]; Alarcón-Chavira, [5] Te Gómez, [7]; Vončina et al., [8]). Although a distinction is made in terms of cephalic and anal plates, these organisms do not have a real head since they do not have eyes, brains or tentacles in this part (Alarcón-Chavira, [5]).

The genus Acanthochitona is a taxonomic group that includes multiple species such as: A. crinita (Pennant, 1777), *A. facicularis* (Linnaeus, 1767), *A. oblonga* (Leloup, 1968), *A. pilosa* (Schmidt-Petersen, Schwabe et Haszprunar, 2015), *A. discrepans* (Brown [8]), *A. avícula* (P. P. Carpenter, 1864), among many others (Lyons, [14]; Bode, [2]; Alarcón-Chavira [5]; Strack & Leotta, [15]; A. Jardim et al., [16]; Te Gómez, [7]). A. discrepans was found in questionable taxonomic status until 2023, with the evidence presented by Vončina et al.

Acanthochitona crinita is a species whose morphology is highly variable, with very different coloration patterns between organisms of the same species. It is a polychromatic organism (Alarcón-Chavira, [5]; Mitov, [17]; Mitov, [18]). This species is characterized by having 18 tufts of spicules (Bode, [2]; Alarcón-Chavira, [5]; Mitov, [17]). Its distribution is reported for the northeastern European Atlantic, including: from the British Isles, the Black Sea, to the Mediterranean Sea (Bode, [4]; Strack & Leotta, [15]; Mitov, [11]; Matiov, [18]; A. Jardim et al., [16]). The genus is present in the American region with about 18 reported species, but the species A. crinita only had one previous report in the United States (Lyons, [14]; García-Ríos & Álvarez-Ruiz, [19]; Alarcón-Chavira, [5]).

The discovery of *Acanthochitona crinita* on the Caribbean coast of Panama represents a new geographical record for the species, expanding its known distribution range and providing valuable data for the knowledge of marine biodiversity for this region. Although A. crinita has not exhibited any documented invasive behaviors, its capacity to adhere to surfaces and its resistance to variable environmental conditions could potentially facilitate its establishment in new environments (Schwabe et al., [20]).

Materials And Methods

During an exploratory tour focused on the characterization of marine invertebrates carried out on April 2, 2025, an inspection was carried out in the seagrass area located in front of María Soto beach (9° 31' 28.28" and -79° 41' 5.51") in the province of Colón, Caribbean coast of Panama, during the summer season. where trade winds, strong waves, and high sediment resuspension predominate. The prospection of marine invertebrates was carried out in shallow waters, by manually searching for the substrate where the rocks and fragments of dead corals were found among the seagrass. For the collection of the specimens, nets, chisels, tweezers, and cuvettes were used, where the samples were stored. During the search, some chitons were sighted, where the presence of some chitons could be determined as an unusual morphology compared to the commonly observed species. The characteristic arrangement and composition of their tufts of spicules, typical of the genus Acanthochitona, were identified in these (Figure 1). Photographs of the organism were taken. Later, on May 14, 2025, another exploration tour was carried out to continue with the search for specimens. During this day, they collected two new organisms at the same coordinates as the previous organism (Figure 2). They were preserved in 350 ml bottles of 70% alcohol for subsequent morphological analysis in the laboratory and for subsequent analysis for genetic studies.

A final collection of organisms was carried out on June 8, 2025, during which a new specimen identified as CD3 was obtained, using the same technique applied in previous collections with CD1 and CD2 specimens. The CD coding refers to specimens collected in the María Soto seagrass area for morphological and genetic analysis purposes. In addition, two smaller organisms were sighted, registered under the codes CN2 and CN3, which were photographically documented but not collected.

Figure 1: First organism (CN) sighted under a rock in the seagrasses of María Soto, Colon. (Photo by Digna González).

Figure 2: CD1 specimen: second individual recorded and captured during prospecting, intended for morphological analysis in the laboratory. (Photo by Digna González).

Results

For each specimen, the following morphometric measurements were obtained in cm: The morphometric measurements of CN1 resulted in a body width BW of 2 cm, a BL length of 4 cm, and a BL/BW ratio of 2. Of the collected specimens, the first to be dissected was CD1, with a BL measurement of 5.5 cm, a BW of 3.5 cm, and a BL/BW ratio of 1.57. Specimen CD2, with a BL measurement of 6.7 cm, a BW of 4.3 cm, and a BL/BW ratio of 1.55, was dissected at the end of the process. The corresponding measurements for CD3 were: BL measurement of 5.7 cm, BW measurement of 3.9 cm, and a BL/BW ratio of 1.46.

Organisms CN2 and CN3 were not captured because they were housed within a coral reef; however, their size was visually estimated at approximately BL 3 cm, a BW 1.5 cm, and a BL/BW ratio of 2. In the laboratory, the two organisms coded as CD1 and CD2 were dissected. Sections of the mantle were taken for spicule analysis. These were cut from the base to preserve intact spicule clusters. The clusters were photographed with a camera to measure spicule length and number (see Figures 5, 6,7 and 8 in annexes). To extract the dorsal plates, an incision was made in the mantle using a sterile scalpel, and then as much of the mantle as possible was carefully removed. This was due to the hardening of the individuals, which made access to the dorsal plates difficult. Once the dorsal plates (valves) were exposed, they were removed with the use of forceps, which were used to remove residual connective tissue adhering to the structures. The plates were cleaned, enumerated, and prepared for morphological analysis using a stereomicroscope (see Figures 3 and 4). Morphological characteristics such as length, shape, number of plates characteristic of the genus, and surface ornamentation were recorded, all of which are essential for the taxonomic identification of chitons. Finally, high-resolution photographic documentation of the spicules was obtained using a microscopic camera (Konus, Camera USB plug), an OPTIKA microscope.

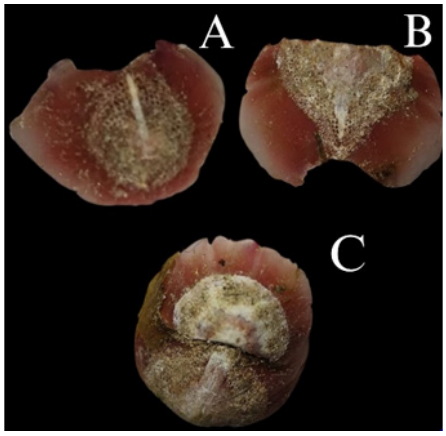

Figure 3: Photographs of three valves of specimen CD1: A) anterior (front) valve, B) fifth intermediate valve, and C) posterior (last) valve.

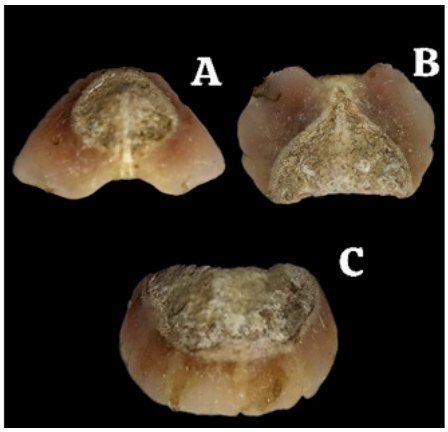

Figure 4: Photographs of three valves of specimen CD2: A) anterior (front) valve, B) fifth intermediate valve, and C) posterior (last) valve.

Conclusion

The findings obtained in this study highlight the need for further studies to determine whether a viable population of *A. crinita* exists, especially considering the presence of individuals of varying sizes in the area. It is unknown whether the presence of this chiton has any significant impact on the local ecosystem in the area, or what factors might be related to its appearance in the area. It is significant to highlight that the presence of this organism had not been reported in previous years, so it could be a recent distribution and could represent an expansion of its distribution area, or an omission of previous records. There is insufficient information on its presence in other parts of the Panamanian Caribbean, as well as outside the sampling site. Therefore, this study establishes a baseline for the development of an updated list of mollusk diversity in the Panamanian Caribbean.

Declarations

Ethics approval and consent to participate: Not applicable.

- Consent for publication: we the authors consent to participate in the publication of this article with "Journal of Ecology and Environment"

- Availability of data and materials: The raw data supporting the conclusions of this article will be made available by the authors on request.

- Competing interests: Nonexistent.

- Funding: CREHO

- Authors' contributions: B. B. writing, measuring organisms, E. A. writing and translation, A. G. dissection and writing, Y. J. writing and lab photographs, Y. R. redaction and writing, S. M. edition.

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