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SCIENTIFIC NOTE

Arquivos de Ciências do Mar

NEW RECORD OF CALLIACTIS TRICOLOR (LE SUEUR, 1817)(CNIDARIA, ACTINARIA, HORMATHIIDAE) FROM NORTHEASTERN BRAZILIAN COAST

Novo registro de *Calliactis tricolor* (Le Sueur, 1817) (Cnidaria, Actinaria, Hormathiidae) para a costa do nordeste do Brasil

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ABSTRACT

We report the first occurrence of the sea anemone *Calliactis tricolor* (Le Sueur, 1817) from the State of Pernambuco (Brazil), associated with the mollusk species *Semicassis granulata* (Born, 1778), and the shell occupied by hermit crab *Clibanarius symmetricus* (Randall, 1840). The invertebrate species were collected as bycatch fauna through fishing activity in Guadalupe beach (8° 41' 26.81" S; 35° 3' 47.98" W), northeastern Brazil, in August 2019, at depth of 20 m, using a bottom trawl net (1 cm of mesh). The presence of *C. tricolor* in the State of Pernambuco expands its distributional range in the northeastern Brazilian coast and fills the gap of occurrence between the States of Ceará and Bahia (previous records).

Keywords: Commensalism, Epibiosis, Sea Anemone, State of Pernambuco, Bycatch Fauna.

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RESUMO

Reportamos a primeira ocorrência da anêmona do mar Calliactis tricolor *(Le Sueur, 1817) para o Estado de Pernambuco (Brasil), associada com a espécie de molusco* Semicassis granulata *(Born, 1778) e a concha ocupada pelo caranguejo* ermitão Clibanarius symmetricus *(Randall, 1840). As espécies de invertebrados foram coletadas como fauna acompanhante através da atividade pesqueira na praia de Guadalupe (8° 41' 26.81" S; 35° 3' 47.98" W), nordeste do Brasil, em Agosto de 2019, na profundidade de 20 m, usando rede de arrasto (1 cm de malha). A presença do* C. tricolor *no Estado de Pernambuco expande sua amplitude distribucional na costa nordeste brasileira, preenchendo as lacunas de ocorrência entre os Estados do Ceará e Bahia (registros anteriores).*

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Palavras-chave*: Comensalismo, Epibiose, Anêmona do mar, Estado de Pernambuco, Fauna acompanhante.*

INTRODUCTION

The coral reefs are considered an unique ecosystem in marine zones, due its fundamental role as the basis of the food chain, combining a high primary production and a high flow of energy and organic matter, thereby sustaining an expressive biodiversity of marine invertebrates and vertebrates (e.g. bryozoans, sponges, anemone, echinoderms, mollusks, crustaceans, fishes and others organisms) (Wagner *et al*., 2020; Alves-Júnior *et al*., 2021; 2022).

In the coral reefs associated with coastal zones, the sea anemones are widely distributed in benthonic habitats along the Atlantic Ocean, as epibionts in biogenic or artificial substrata; they are found adhered to mollusks, sponges, corals and crustaceans, performing numerous ecological relationships such as mutualism, symbiotic and commensalism relationships (Tello-Musi *et al*., 2018). Among the most common sea anemones found in the reef environment, the genus *Calliactis* Verrill, 1869 (Hormathiidae Carlgren, 1932) contains 20 species widely distributed in shallow waters along the Western Atlantic (Gusmão *et al*., 2020).

Up to date, *Calliactis tricolor* (Le Sueur, 1817) has a broad distribution in southeast and south regions of the United States, Gulf of Mexico, Caribbean Sea to South America (Carlgren & Hedgpeth, 1952; Zamponi *et al*., 1998; González-Muñoz *et al*., 2013; Tello-Musi *et al*., 2018). The species *C. tricolor* is documented in literature as epibiont in mollusk shells occupied by hermit crabs; in a mutualistic symbiotic relationship, which the sea anemone offers protection against predators such as fishes, octopus and others crabs, while the hermit crabs, due to its mobility, can provide different food sources for the anemone, and in addition, protection against anemone predators, as echinoderms and polychaetes (fireworms) (Brooks & Gwaltney, 1993; Tello-Musi *et al*., 2018).

Despite its broad distribution in the Americas (Atlantic side), in Brazilian waters, *C. tricolor* occurs only in the northeast region, with records in the States of Maranhão, Ceará and Bahia (Tello-Musi *et al*., 2018). Based on that, in this paper we report the first occurrence of *C. tricolor* from the State of Pernambuco, Brazil, associated as an epibiont in the shell of *Semicassis granulata* (Born, 1778) occupied by hermit crab *Clibanarius symmetricus* (Randall, 1840).

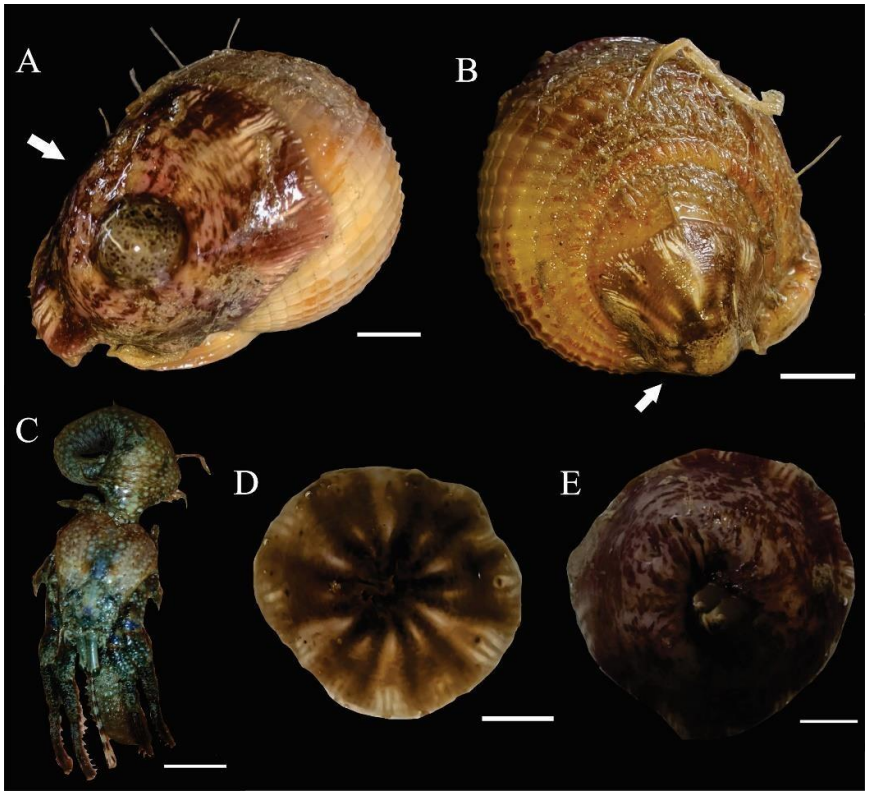
The material herein examined was collected as bycatch fauna of the fisheries activity in the municipality of Rio Formoso, located in the south coast of the State of Pernambuco (8° 41' 26.81" S; 35° 3' 47.98" W). Samples were carried out in August 2021, using a shrimp fishery boat (*Colonia Z-5*), with trawls performed using a shrimp net of 1 cm of mesh, in

muddy bottoms (~20 meters of depth), during 4-5 hours. The region near Guadalupe is characterized by the presence of fringing reefs, protected by the Environmental Protection Area "*APA Costa dos Corais*", which is closed to human activities as fisheries and exploration of natural resources, and covers a total of 300 km between Tamandaré (Pernambuco) and Paripueira (Alagoas) (Ferreira *et al*., 2000).

This area is delimited by the megathermal climate with rainfall concentrated from March to August and a well-defined dry period (September to February), characterizing the As' climate (Hot Humid Tropical) (Köeppen, 1948). After the samples, the individuals were allocated in plastic bags and stored in the freezer for the identification of each group collected as bycatch fauna. In the laboratory, the species were sorted out, photographed and measured using a digital caliper (0.01 mm) in total length (TL) and identified to species level through the literature for each group. After the identification, the individuals were preserved in 70% ethanol and deposited at the National Center for Research and Conservation of Marine Biodiversity of the Northeast (CEPENE/ICMBio).

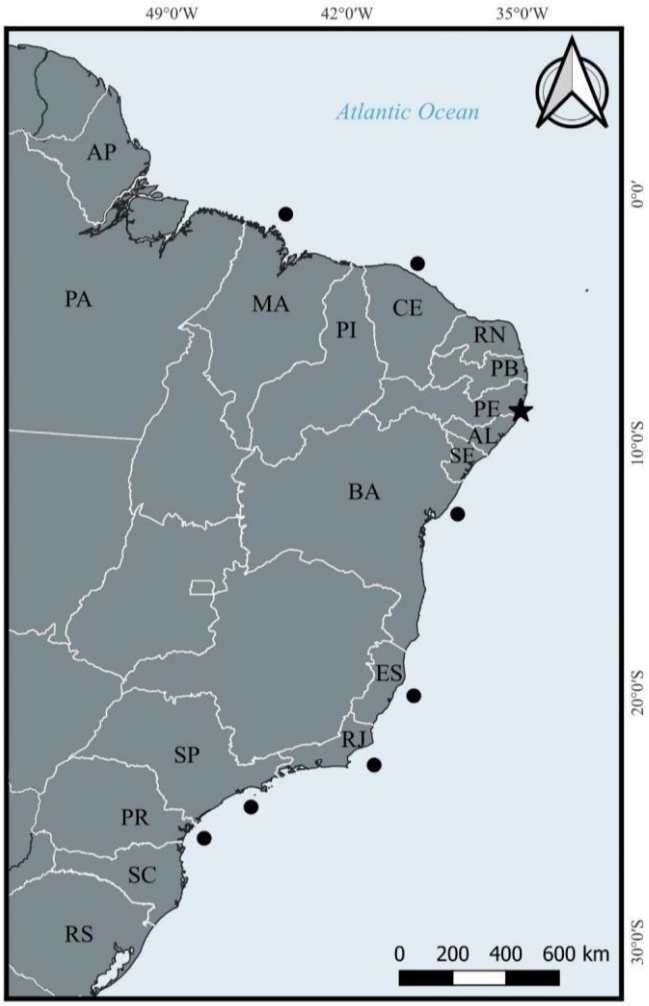
Two specimens of *C. tricolor* (Figure 1 A-B, D-E) (TL: 0.5 cm; 1 cm) were identified among the bycatch material collected in Guadalup Beach (8° 41' 26.81" S; 35° 3' 47.98" W), at 20 m of depth, in muddy substrate, voucher number: 466. *Calliactis tricolor* was observed as epibiont in *S. granulata* (Figure 1 B) (TL: 3.5 cm), voucher number: 467; this gastropod shell was occupied by the hermit crab *C. symmetricus* (Figure 1 C) (TL: 5 cm), voucher number: 468. *Calliactis tricolor* fits well with the description provided by Carlgren & Hedgpeth (1952), González-Muñoz *et al*. (2013) and Tello-Musi *et al*. (2018), with main characteristics: column smooth or slightly rough, color orange to brown, with small longitudinal white spots in the proximal column. Two rows of dark-orange cinclides in the proximal column and close to the limbus; first row with 12 cinclides and second with 24 (being 2 smaller cinclides of the second row between each pair of the 12 larger cinclides of the first row). Orange acontia protruding from cinclides and from the oral disc.

Figure 1 - A-B) *Calliactis tricolor* (Le Sueur, 1817) adhered on mollusk shell of *Semicassis granulata* (Born, 1778). C) Hermit crab *Clibanarius symmetricus* (Randall, 1840). D-E) Specimens of *C. tricolor* in highlighted view. Scale bars = 0.5 mm



C. tricolor is restricted to the Americas (Atlantic side), its distribution covers the United States of America (Virginia, North Carolina, South Carolina, Florida, Georgia, Alabama, Mississippi, Louisiana, Texas, US Virgin Islands, British Virgin Islands), Cuba, México (Yucatán, Isla de En medio, Sistema Arrecifal Veracruzano, La Gallega, Sistema Arrecifal Veracruzano), Jamaica, Porto Rico, Barbados, Colômbia (Santa Marta, Tayrona Park), Venezuela, Suriname and Brazil (Maranhão, Ceará, Pernambuco [new record], Bahia, Espírito Santo, Rio de Janeiro, São Paulo, Paraná) (Carlgren & Hedgpeth, 1952; Zamponi *et al*., 1998; Nogueira Jr. *et al*., 2006; González-Muñoz *et al*., 2013; González-Muñoz *et al*., 2015; Tello-Musi *et al*., 2018) (Figure 2).

Figure 2 - Map of the geographical distribution of *Calliactis tricolor* (Le Sueur, 1817) along the Brazilian Coast. Black Star = New Record; Black Circle = Previous Records



The occurrence of the sea anemones as epibionts in marine invertebrates is widely observed in literature, as reported by Acuña *et al*. (2003), Nogueira Jr. & Haddad (2005), Nogueira Jr. *et al*. (2006) and Winter & Masunari (2006) in crustaceans; sea anemones associated with mollusks shells as observed by Pastorino (1993), Luzzatto & Pastorino (2006), Schejter & Bremec (2007), Schejter & Escolar (2013) and Tello-Musi *et al*. (2018), and in epibiosis with octocorals as analyzed by Schejter *et al*. (2018). The association of sea anemones with other invertebrates favors different food sources as phytoplankton, zooplankton and organic matter in resuspended debris, covering different regions such as estuaries, coastal zones (e.g. sand beaches, beachrocks, continental shelf bottom) or deep-sea areas (Bach & Herrnkind, 1980).

In addition, the occurrence of *C. tricolor* as opportunistic/facultative epibiont in mobile species such as crustaceans or mollusks, can be beneficial to sea anemone due the extra protection against predators (e.g. echinoderms, polychaeta and fishes) by the mobility of host (Mariscal, 1972; Brooks & Gwaltney, 1993; Nogueira Jr. *et al*., 2006). This protection is also valid for the hermit crab species (mutualistic/ symbiotic relationships), which use the tentacles of the sea anemone *C. tricolor* against predators such as other crustaceans, sea star, octopus and reef fishes (Cutress & Ross, 1969; Cutress *et al*., 1970; McLean & Mariscal, 1973; Bach & Herrnkind, 1980; López-Victoria *et al*., 2004; Tello-Musi *et al*., 2018).

The occurrence of *C. tricolor* in Western Atlantic is poorly documented, due to several records in literature or databases of biodiversity data records contain missing information as geographic distribution (coordinates), depth, substrata, host identification or due the absence of the taxonomic specialists in this group (see the complete list in (Tello-Musi *et al*., 2018). In Brazil, the information about this species is scarce, with many previous records observed only as unpublished data (e.g. dissertations or thesis), or in the Global Biodiversity Information Facility (GBIF) and Ocean Biogeographic Information System (OBIS), however, observations provided in these databases, in some cases, may favor the existence of the dubious records due to the non-conference and identification of the material.

In Brazil, due the absence of information about *C. tricolor*, and associated with the growing impact of human activities in coastal areas as fisheries (bycatch fauna), water eutrophication, climate changes, ocean acidification, this species may suffer direct actions on its distribution, biology and behavior, causing population decline and bringing regional extinction in regions where the species has not been previously cataloged. Thus, in this paper we updated the distributional information about the sea anemone *C. tricolor*, filling the gaps from northeastern Brazil.

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AUTTHOR CONTRIBUTIONS

Conceptualization and Design: RMMCK, FAAJ; **Performed research:** RMMCK, RB and FAAJ; **Acquisition of data:** RMMCK, DEGM, FAAJ; **Analysis and interpretation of data:** RMMCK, DEGM, FAAJ; **Preparation of figures/tables/maps:** DEGM; **Writing – original draft:** RMMCK, RB, FAAJ; **Writing - critical review & editing:** DEGM, RB, FAAJ.

CONSENT FOR PUBLICATION

All authors declare that they have reviewed the content of the manuscript and gave their consent to submit the document.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

All data generated and analyzed during this study are presented in this article.

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