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New records of the hairy crab *Pilumnus dasypodus* (Decapoda, Brachyura, Pilumnidae) in Northeastern Brazil

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Abstract: *Pilumnus dasypodus* is reported for the first time in the state of Rio Grande do Norte, Northeastern Brazil. Sampling occurred in the north and south coast of the state in four locations (the farthest about 500 km of the known south distribution of the species). This new record increases the information about the distribution of this species, showing a possible relationship between the distribution of species and the Atlantic Tropical Ecoregion.

Key words: hairy crab, disjunct distribution, Atlantic Tropical Ecoregion

The infraorder Brachyura Linnaeus, 1758 is currently constituted by 6,793 species, among these, 372 species belong to the family Pilumnidae Samouelle, 1819, known as "hairy crabs" (Ng and Tan 1984; Ng *et al.* 2008). According to Melo (1996), the genus *Pilumnus* Leach, 1816 has seven species along the coasts the American continent: *P. caribaeus* Desbonne & Schramm, 1867, *P. diomedeae* Rathbun, 1894, *P. floridanus* Stimpson, 1871, *P. quoyi* H. Milne-Edwards, 1880, *P. reticulatus* Stimpson, 1860, *P. spinosissimus* Rathbun, 1898 and *P. dasypodus* Kingsley, 1879.

The species *Pilumnus dasypodus* inhabits mostly sand bottoms, shells, corals, mangrove roots, pillars of piers and the continental shelf up to 30 m deep (Melo 1996; Lima Júnior *et al.* 2010). Furthermore, this species also is found in cultivations of seaweed (Marochi and Masunari 2011) and especially in rocky shores, which offers shelter for small brachyurans that lack other means of defense (Gouvêa 1986). According to McCoskey (1970), this species is associated with coral reefs of the species *Oculina arbuscula* Agassiz, 1864 in North and South Carolina, USA, but Gore *et al.* (1976, 1978) observed *P. dasypodus* associated to polychaete reefs of the family Sabellariidae along the east coast of Florida, USA. Gore *et al.* (1978) reported that *P. dasypodus* is an omnivorous species that optionally plays the role of predator-saprophage and also consumes algae.

This species has disjunct distribution in the Western Atlantic, with each area separated by an expanse, from Pará to Rio Grande do Norte (Brazil), with no occurrence of the species (Melo 1996). In the northern portion of the distribution, north of Amapá (Brazil), *P. dasypodus* occurs from North and South Carolina, Gulf of Mexico, Antilles and Venezuela to Suriname, while in the southern region the distribution extends from Paraíba to Santa Catarina (Brazil) (Rathbun 1900, 1930; Barreto *et al.* 1993, Melo 1996; Coelho *et al.* 2008). Recently, Lima Júnior *et al.* (2010) recorded the occurrence of *P. dasypodus* at Praia do Coqueiro (Piauí) in the area described above without the occurrence of the species in the Western Atlantic. The presence of *P. dasypodus* at Paraíba and Piauí suggest that the species may also occur in the area between the two sampled locations and, probably Rio Grande do Norte (Figure 1a). A similar situation was observed for Portunoidea crab *Callinectes sapidus* Rathbun, 1896, with distribution similar to *P. dasypodus* and recently was described to Rio Grande do Norte by Alencar *et al.* (2013).

Some states in northeastern Brazil have significant carcinological research, such as Pernambuco and Alagoas, while other states have shortages of primary data, such as occurrence. In Rio Grande do Norte, surveys conducted by Ferreira and Sankarankutty (2002) are noteworthy, with samplings made on the estuary of the Potengi River (Natal) and Cavalos River (Macau) and Coelho *et al.* (2008) with samplings made all over the northeasterner Brazilian coast and oceanic isles of Rio Grande do Norte. Thus, the objective of this study was to describe the first occurrence of *P. dasypodus* in Rio Grande do Norte, Brazil.

Since 2011, collections are conducted regularly on the coast of Rio Grande do Norte, by the team of researchers and students of the Study Group on Ecology and Phisiology of Aquatic Animals (Grupo de Estudos em Ecologia e Fisiologia de Animais Aquáticos – GEEFAA /UFRN). The samplings were conducted in four localities. Porto do Mangue beach (distant about 500 km of the known south distribution), Porto do Mangue, north shore of the state (05°02′39″ S, 036°43′39″ W). Rio do Fogo beach (about 250 km of the known south distribution), Rio do Fogo, north shore (05°16′16″ S, 035°23′02″ W). Santa Rita beach (about 200 km of the known south distribution), Extremoz, north shore (05°40′36″ S, 035°11′47″ W). Do Amor beach (about 100 km of the known south distribution), Tibau do Sul, south shore of the state (06°14′22″ S, 035°02′19″ W) (Figure 1b).

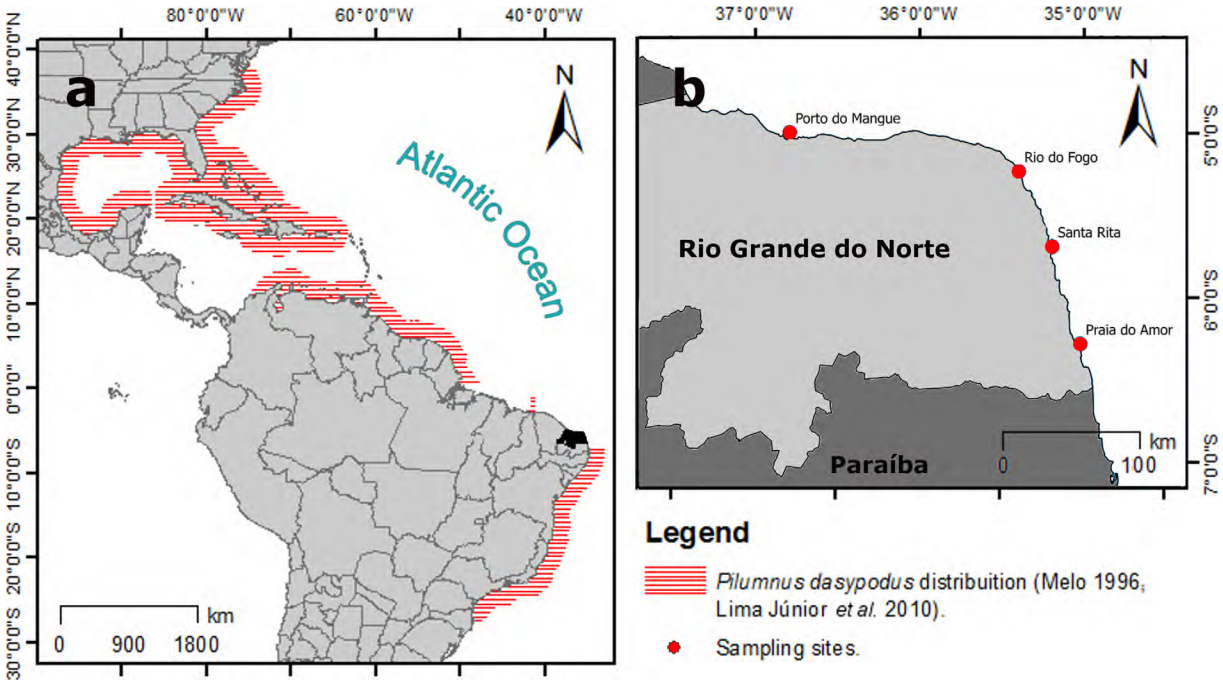

Figure 1. (**a**) Geographic distribution of *Pilumnus dasypodus* in the western Atlantic Ocean (lines = records from the published literature and present study). Black region = new record from state of Rio Grande do Norte, Brazil. (**b**) Map of state of Rio Grande do Norte, Brazil, indicating the collection sites.

At Porto do Mangue, the sampling was carried out near to the coast. The geology of the region is dominated by shoals, due to accumulation of alluvial sediments next to the estuary, with a large biomass of macroalgae (Vital 2009). At Rio do Fogo, the second location, the materials sampled were algae's scallops cultivation located on the mid-intertidal, bordering calcareous algae formations, with *Gracilaria birdiae* Plastino & E. C. Oliveira as the predominant species. At locations of Santa Rita and Do Amor, samplings were performed in the mesolittoral region, near bathers, in consolidated substratum, in calcareous algae reefs and in Sabellariidae reefs.

In all cases, we used active sampling method for capture of individuals, except for Porto do Mangue, where the sampling was conducted by using a trawl in a fishing boat, with a net that had 4 mm between knots and was 5 m deep, during 20 minutes in a speed of 1.08 knot. Afterwards, the collected specimens were put into individual plastic bottles, labeled and stored in a freezer for later study in the lab. The crabs were identified using Melo (1996) and Marochi and Masunari (2011), by observing the characters on the dorsum of the cephalothorax, anterolateral spines, shape of the chelipeds, presence of accessory structures such as spines and tubercles, and ambulatory legs. The sexing was achieved by counting the number of pairs of pleopods, two for males and four for females. After identification and sexing, the specimens were stored in carcinological collection of the GEEFAA of the Universidade Federal do Rio Grande do Norte (Federal University of Rio Grande do Norte - UFRN) and fixed in alcohol 70%. In addition, the animals were measured for carapace width (CW) with a digital caliper (±0.1 mm accuracy).

Order Decapoda Latreille, 1802
Infraorder Brachyura Linnaeus, 1758
Family Pilumnidae Samouelle, 1819
Genus *Pilumnus* Leach, 1816

Pilumnus dasypodus Kingsley, 1879
(Figure 2a)

Material examined: 1♂, Porto do Mangue (voucher number GEEFAA/UFRN-075); 3♂ and 3♀, Rio do Fogo (GEEFAA/UFRN-025), 1♂, Extremoz (GEEFAA/UFRN-026); 1♂, Tibau do Sul (GEEFAA/UFRN-074). At Tibau do Sul, specimen was collected with the highest CW value (8.3 mm), while at Rio do Fogo the specimen of least value was obtained (4.9 mm) (Table 1).

Comparative material examined: 1♂, 1♀ and 1 juvenile, Suape, Pernambuco, 30/VII/1965, PA Coelho det. (MOUFPE-6639); 4♂ and 1♀, 19/IV/2007, St. 01 (08°36'42.37"

Table 1. Descriptive statistics for *Pilumnus dasypodus* specimens in each location. Show values of carapace width of males and females. M – Males. F – Females. N – Absolute abundance. Max - Maximum. Min - Minimum. S. D. - Standard deviation.

	Porto do Mangue		Rio do Fogo		Extremoz		Tibau do Sul	
Sex	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
N	1	—	3	3	1	—	1	—
Max (mm)	—	—	6.9	7.2	—	—	—	—
Min (mm)	—	—	4.9	5.5	—	—	—	—
Mean (mm)	6.4	—	6.0	6.3	5.5	—	8.3	—
S. D.	—	—	1.0	0.8	—	—	—	—

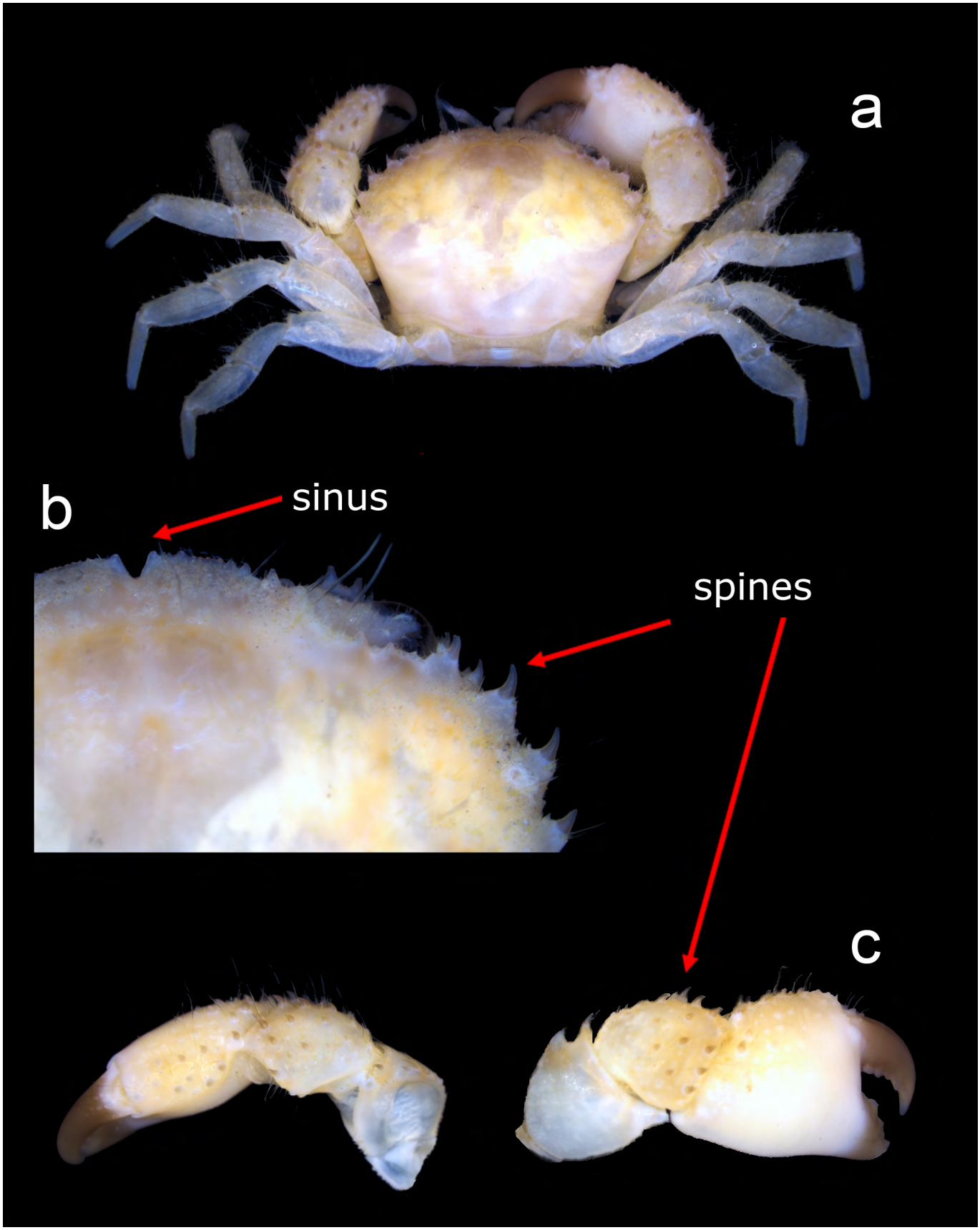

Figure 2. *Pilumnus dasypodus* Kingsley, 1879; male specimen from Porto do Mangue. (**a**) Dorsal view. General view. (**b**) Interorbital and anterolateral region highlighted. Sinus lobes widely separated in a "V" and anterolateral margin with 4 sharp spines, bent spines with a corneal end shape highlighted. (**c**) Dorsal and lateral view of the right cheliped. Bent spines with a corneal end shape highlighted.

S, 035°01′27.64″ W), on rocks and *Halimeda* sp.), AO Almeida det. (MOUFPE-13557).

Diagnosis: Narrow forehead (interorbital region), less than ⅓ of the width of the carapace, bilobed, with 5–6 short spines on its sloping margin; sinus lobes widely separated in a "V" shape (Figure 2b). Convex carapace, accentuating curvature in the anterior half, surface with long setae, granules and short spines in the anterior and anterolateral portions; anterolateral margin with 4 sharp spines, bent spines with a corneal end; orbital margin with 3–4 spines on the upper margin and 7 on the bottom (Figure 2a and 2b). Chelipeds unequal, upper surface and external face of the carpus covered with long and short setae, granules and strong spines (bent spines with a corneal end shape) (Figure 2c). Pattern of bristles, beads and strong spines of the upper face of the chelipeds and on the upper face of the pereiopods (2nd to 5th pair). The apex of spines presents a dark coloration, even after fixation (Figure 2b and 2c). Living specimens, have nut-brown or brown coloration on the carapace and on 2nd and 5th pair of pereiopods; chelipeds with a rosy brown or dark brown coloration in chelipeds; distal parts of the spines and dactyls are always dark (Figure 2a and 2c).

New occurrences of Pilumnidae *Pilumnus dasypodus* crab were verified along almost the entire length of the coast of Rio Grande do Norte state. These new records fill a gap in the currently known distribution (Figure 1). Our results extend the range of this species, expanding the known distribution of the southeast portion, with the recent occurrence according to Lima Junior *et al*. (2010). The results for Rio Grande do Norte become more significant if we take into account the fact that this state is known as "the corner of the South American continent" and thus our collections found specimens of *P. dasypodus* above and below the "corner of the continent".

The importance of determining the occurrence of crustaceans Brachyura above and below this conformation of the continent extends beyond the geographical reference. According to Stramma *et al*. (1990), the coasts of North and Northeast of Brazil are influenced by two oceanic currents that originate from the separation of the South Equatorial Current. According to this author, the South Equatorial Current splits near 10°S into one branch that goes to the northwest, the North Brazil Current, while the other branch going towards the south forming the Brazil Current. According to Alves *et al*. (2012), the distribution of macrobenthic marine crustaceans is affected by these currents originate from the South Equatorial Current, responsible for disjunct distribution pattern of some brachyurans, considering this scenario of marine currents. Spalding *et al*. (2007) explained that there are regions in the marine environment with own pattern biodiversity due to environmental factors characterizing a given area, called by the authors as ecoregions. The same authors also claim that the area fraction from North Carolina to Santa Catarina (Brazil) belong to the same broader ecoregion, named Tropical Atlantic. Based on the known distribution of *P. dasypodus*, which inhabits within this aforementioned ecoregion and with the present new occurrence, our contribution suggests a likely expansion of the distribution of this species in the northeastern Brazilian coast, based on the similarities of the subdivisions of the Tropical Atlantic ecoregion as discussed by Spalding *et al*. (2007). We suggest that further studies of the brachyuran fauna in diverse habitats along the Brazilian northeast coast would lead to a better understanding of the biogeographic distribution of this species.

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