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ANIMAL SCIENCE

Range extensions of three marine shrimps (Caridea: Alpheidae, Palaemonidae) on the Brazilian coast

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Abstract: Three caridean shrimps have their distribution range extended on the Brazilian coast. *Alpheus carlae* Anker, 2012 (Alpheidae), previously reported from Ceará to São Paulo, and *Typton fapespae* Almeida, Anker & Mantelatto, 2014 (Palaemonidae), previously known only from Rio de Janeiro and São Paulo, are both now reported from Santa Catarina, the new southernmost record of these species in the Atlantic Ocean. *Athanas nitescens* (Leach, 1813) (Alpheidae), an invasive species from the eastern Atlantic first reported from São Paulo in 2012 based on a single male, is now confirmed to have established populations in Brazil with the finding of ovigerous females on the coast of Rio de Janeiro. Illustrations for all three species are provided based on the new material.

Key words: Biodiversity, Crustacea, Decapoda, southwestern Atlantic, intertidal.

INTRODUCTION

The infraorder Caridea Dana, 1852 comprises the second most speciose infraorder of decapod crustaceans with over 3400 described species (De Grave et al. 2009, De Grave & Fransen 2011, Herrera-Barquín et al. 2018). Carideans have great ecological relevance due to their role in the food chain and presence in many different aquatic habitats, from pelagic to benthic species within marine, brackish and freshwater environments (De Grave & Anker 2008).

In Brazil, there have been many attempts to summarize the caridean diversity (Ramos-Porto & Coelho 1990, 1991, 1998, Christoffersen 1998, Melo 2003, Coelho et al. 2006, Ferreira et al. 2010, Vieira et al. 2012, Soledade & Almeida 2013). However, due to the Brazilian's wide and habitat diverse coast, the distributional range of many shrimp species is still far from being completely understood. As a result, many recent studies have been published dealing with new records, filling distributional gaps for various species and thus providing valuable information for future marine biodiversity assessments (e.g., Cardoso 2009, Pachelle et al. 2011, 2012, 2015, 2016, Almeida et al. 2012a, b, 2013, 2015, 2018, Anker et al. 2014, 2016, Giraldes & Freire 2015 and more).

In a series of collections made in two southeastern states of Brazil in 2017, three species of caridean shrimps were obtained and later found to represent the new southernmost record for these species on the Brazilian coast and the southwestern Atlantic Ocean.

MATERIALS AND METHODS

The specimens were collected under rocks during low tide in three localities in the states of Rio de Janeiro and Santa Catarina. After collection, the

specimens were anesthetized in a solution of clove oil and seawater, then photographed prior preservation in 70% ethanol. In laboratory, the individuals were sexed, measured and drawn with the aid of a stereomicroscope equipped with a camera lucida. Carapace length (cl, in mm) was used as standard size parameter, measured from the post-orbital angle along the dorsal mid-line to the posterior margin of the carapace; specifically for *Alpheus carlae* Anker, 2012, because the rostrum is very short and the ocular hood obscures the post-orbital angle, cl was measured from the tip of the rostrum to the posterior margin of the carapace. All material is deposited in the carcinological collection of the Museu de Zoologia, Universidade de São Paulo (MZUSP), São Paulo, Brazil.

RESULTS AND DISCUSSION

Systematics

Order Decapoda Latreille, 1802

Infraorder Caridea Dana, 1852

Family Alpheidae Rafinesque, 1815

Alpheus carlae Anker, 2012

Alpheus carlae Anker, 2012: 61, figs. 41–48, 64H, 65H, 66H, 67G, 68B – Santos et al. 2012: 150, fig. 3C – Soledade and Almeida 2013: 97, fig. 4D – Almeida et al. 2013: 1398 – Soledade et al. 2015: 57, fig. 3C – Almeida et al. 2018: 336, fig. 1C.

Material examined

Brazil, Santa Catarina, Florianópolis, Santo Antônio beach, 27º30'17.8"S 48º31'23.1"W, under rock, C. Mendes & P. Pachelle colls., 23 June 2017: 1 male (cl 9.6 mm), MZUSP 39069.

Distribution

Western Atlantic: USA (Florida), Puerto Rico, Jamaica, Belize, Panama, Venezuela, French Guyana, Brazil (Ceará, Paraíba, Pernambuco, Alagoas, Bahia, Rio de Janeiro, São Paulo and Santa Catarina) (Anker 2012, Soledade & Almeida 2013, Almeida et al. 2018, present study).

Remarks

Alpheus carlae (Figure 1) belongs to the large and taxonomically challenging *A. armillatus* H. Milne-Edwards, 1837 species complex (Anker 2012). Nonetheless, *A. carlae* can be readily recognized in life by its diagnostic color pattern, especially in the major and minor chelae covered with several bluish blotches and the pleon with three paired black spots, each pair distributed along the second, third and fourth somites (Figure 1). Previously known from Florida to São Paulo (see full record in Anker 2012, Soledade & Almeida 2013), the specimen from Santa Catarina represents the new southernmost record of the species in the western Atlantic, extending its distribution in at least 2 degrees of south latitude from Cananéia, São Paulo (Anker 2012) to Florianópolis, Santa Catarina (present study).

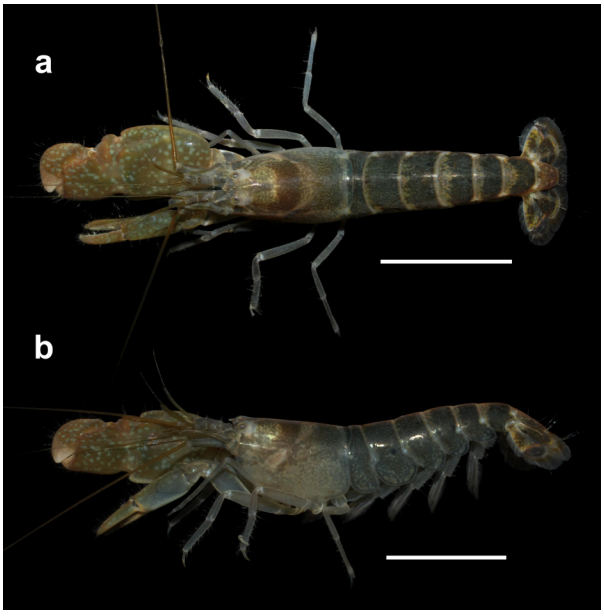

Figure 1. ***Alpheus carlae*** **Anker, 2012, male, cl 9.6 mm (MZUSP 39069), in dorsal (a) and lateral (b) views. Scale bars: 10 mm.**

Athanas nitescens (Leach, 1813)

Palaemon nitescens Leach, 1813: 401.

Athanas nitescens (Leach, 1813) – Holthuis and Gottlieb, 1958: 27, figs. 2–3 – Almeida et al. 2012b: 560, fig. 2a–k – Almeida et al. 2018: 343, fig. 2B.

Material examined

Brazil, Rio de Janeiro, Paraty, Pontal beach, 23º12'50.8"S 44º42'43.7"W, under rocks, C. Mendes & P. Pachelle colls., 09 May 2017: 1 female (cl 2.9 mm), 2 ovigerous females (cl 2.9, 3.6 mm), MZUSP 39070.

Distribution

Eastern Atlantic: southwestern Norway to Republic of the Congo, including the Mediterranean. Western Atlantic: Brazil (Rio de Janeiro and São Paulo) (Holthuis & Gottlieb 1958, Crosnier 1971, Almeida et al. 2012b; present study).

Remarks

Athanas nitescens, (Figure 2) a species with extensive distribution in the eastern Atlantic, was first reported in the western Atlantic based on a single male collected in the state of São Paulo, Brazil (Almeida et al. 2012b). According to Almeida et al. (2012b), if *A. nitescens* had established populations in the area, the populations from São Paulo could then act as source for dispersion to nearby states, following the same pattern as *Athanas dimorphus* Ortmann, 1894, another invasive species in Brazil (Pachelle et al. 2011, Almeida et al. 2012b). In fact, the discovery of ovigerous females in Rio de Janeiro confirms that the species is spreading to other states. Among the characters listed in Almeida et al. (2012b: table I), *A. nitescens* can be easily separated from its invasive congener in that the first chelipeds carried extended (vs. carried folded in *A. dimorphus*) and the frontal margin of carapace bearing a supra-orbital tooth (vs. without supra-orbital tooth in *A. dimorphus*) (Figure 2b, d; Almeida et al. 2012b: fig. 1b, g–i). *Athanas nitescens* is known for displaying a number of polymorphic characters, including proportions of the first chelipeds and antennular peduncles, shape of the rostrum and armature of fifth abdominal pleura in the populations across the eastern Atlantic (cf. Holthuis & Gottlieb 1958). Although *A. nitescens* may be a species complex (Anker 2001, Anker & Ahyong 2007), our specimens present the typical form for the species, resembling the individual figured in Almeida et al. (2012b). Whether the Rio de Janeiro population originated from São Paulo or constitutes a new invasion remains to be confirmed in future genetic analysis.

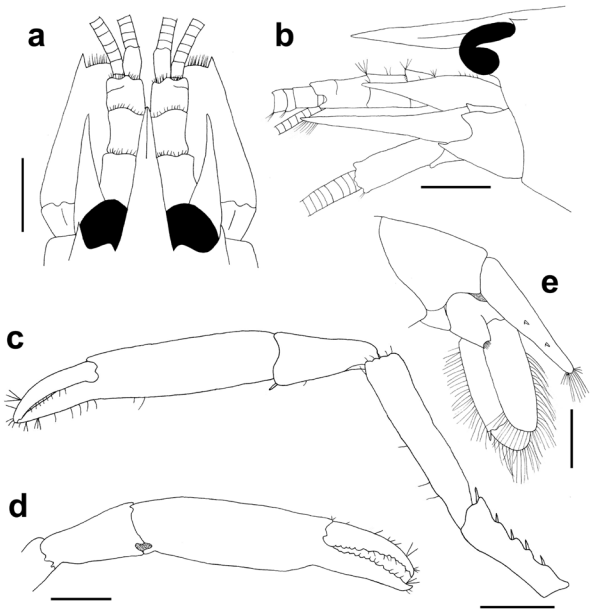

Figure 2. ***Athanas nitescens*** **(Leach, 1813), ovigerous female, cl 2.9 mm (MZUSP 39070). a. Frontal margin and cephalic appendages, dorsal view; b. Same, lateral view; c. Left P1, lateral view; d. Same, chela and carpus, mesial view; E. Sixth abdominal segment, left uropod and telson, lateral view. Scale bars: 0.5 mm.**

Palaemonidae Rafinesque, 1815

Typton fapespae Almeida, Anker and Mantelatto, 2014

Typton gnathophylloides – Nalesso et al. 1995: 96 – Duarte and Nalesso, 1996: 143 – Amaral et al. 2010: 249 [not *T. gnathophylloides* Holthuis, 1951]

Typton fapespae Almeida, Anker and Mantelatto, 2014: 111, figs. 1–5 – Pachelle et al. 2015: 319.

Material examined

Brazil, Santa Catarina, Florianópolis, Ribeirão da Ilha, rocky shore, 27°43'02.4"S 48°33'51.2"W, under rock, inside orange sponge, C. Mendes & P. Pachelle colls., 24 June 2017: 1 ovigerous female (cl 1.9 mm), MZUSP 39072; 1 male (cl 2.0 mm), MZUSP 39073; 1 ovigerous female (cl 1.8 mm), MZUSP 39074; 1 male (cl 2.1 mm), MZUSP 39075.

Distribution

Western Atlantic: Brazil (Rio de Janeiro, São Paulo and Santa Catarina) (Almeida et al. 2014, Pachelle et al. 2015; present study).

Remarks

Typton fapespae (Figures 3, 4) was recently described and is so far a species endemic to Brazil (Almeida et al. 2014). Among the other Brazilian species of *Typton* Costa, 1844, *T. fapespae* is readily recognized by the strong median tooth on the distal margin of the sixth pleonal somite (Figure 4e). After its discovery in São Paulo, the species was reported one year later from Rio de Janeiro (Pachelle et al. 2015), and is now also known from Santa Catarina (present study). Thus, Florianópolis is the new southernmost record of the species in Brazil and the western Atlantic, extending its distribution in at least 2 degrees of south latitude.

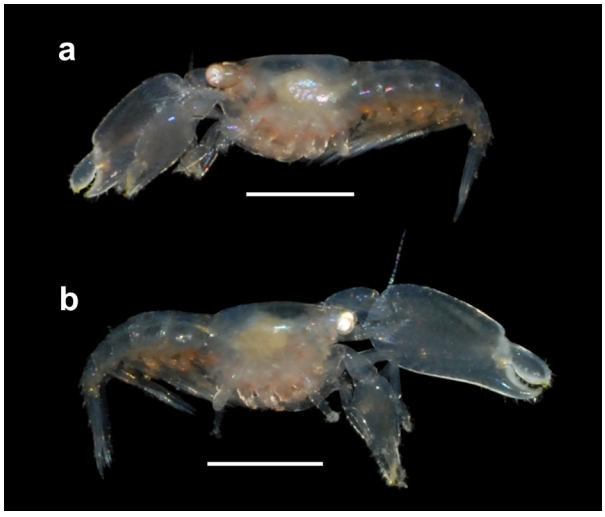

Figure 3. ***Typton fapespae*** **Almeida, Anker & Mantelatto, 2014, ovigerous females, (a) cl 1.9 mm, (b) cl 1.8 mm, lateral view. Scale bars: 2 mm.**

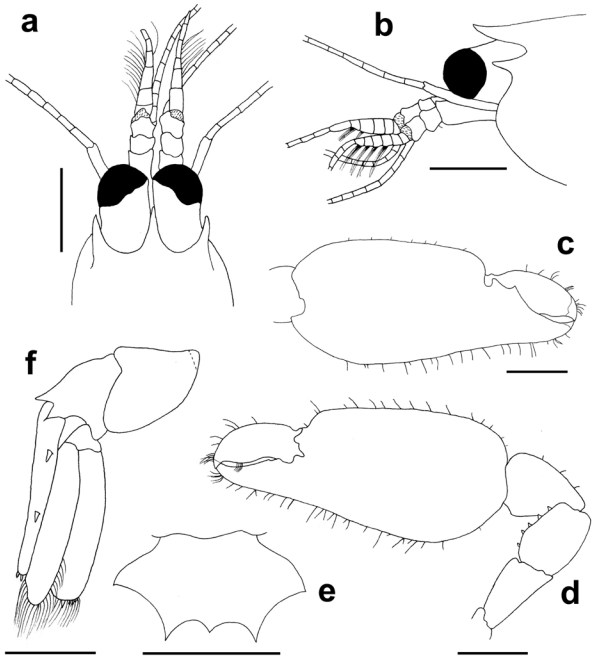

Figure 4. ***Typton fapespae*** **Almeida, Anker & Mantelatto, 2014, ovigerous female, cl 1.8 mm (MZUSP 39074). a. Frontal margin and cephalic appendages, dorsal view; b. Same, lateral view; c. Left major P2, chela, mesial view; d. Same, entire cheliped, lateral view; e. Sixth abdominal segment, dorsal view; f. Sixth abdominal segment, right uropod and telson, lateral view. Scale bars: 0.5 mm.**

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Luciane A.A. Ferreira: Wrote the main text and did the drawings. Cecili B. Mendes: Collected and photographed the specimens, revised and formatted the text. Paulo P.G. Pachelle Collected, photographed and identified the specimens, revised and formatted the text.