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First record of *Potimirim potimirim* (Müller, 1881) (Crustacea, Decapoda, Atyidae) from Rio Grande do Norte, northeastern Brazil

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Abstract: *Potimirim potimirim* (Müller, 1881), a species of coastal freshwater shrimp, is recorded for the first time from the state of Rio Grande do Norte, northeastern of Brazil, where it was collected in a small tributary of the Potengi River. This record extends the distribution of this species about 220 km north along Brazilian coast. New records, such as this, reinforce the need for greater research efforts in the northeastern freshwater ecosystems of Brazil to provide better understand the region's biodiversity and establish better parameters for conservation actions.

Key words: Neotropics; Caridea; freshwater shrimp; coastal basins; range extension; Northeastern Caatinga and Coastal Drainages ecoregion

The family Atyidae De Haan, 1849 is a group of mainly freshwater shrimps of about 469 species belonging to over 40 genera and distributed worldwide (De Grave & Fransen 2011). Despite the large diversity of this group, the Neotropical Region has just 19 known species (De Grave et al. 2008).

The genus *Potimirim* Holthuis, 1954 occurs in rivers and coastal streams of the South American continent (Torati & Mantelatto 2012). It comprises five valid species, of which only *Potimirim brasiliana* Villalobos, 1959 and *P. potimirim* (Müller, 1881) are native to coastal river basins of Brazil (Torati & Mantelatto 2012).

Potimirim potimirim, commonly known in Brazil as "tiny shrimp" (*camarão miúdo*) or "neon shrimp" (*camarão neon*), are generally found attached to underwater marginal vegetation, among roots of aquatic plants, or hidden under submerged rocks (Barros & Fontoura 1996; Lima et al. 2006). This species can live in water reaching temperatures up to 30°C (Coelho & Ramos-Porto 1985). *Potimirim potimirim* occurs in all states along the Brazilian east coast, except for Rio Grande do Norte, Paraíba, Alagoas, and Rio Grande do Sul (Müller 1892; Teixeira & Sá 1998; Anger & Moreira 1998; Lima & Oshiro 1999; Dos Santos & Coelho 2001; Almeida et al. 2008; Sampaio et al. 2009; Torati & Mantelatto 2012).

Limnic ecoregions are large areas of hydrographic basins that present distinct assembles of freshwater species (Abell et al. 2008). *Potimirim potimirim* occurs in four of the nine freshwater ecoregions on Brazilian east coast: Northeastern Caatinga and Coastal Drainages, Northeastern Atlantic Forest, Ribeira de Iguape, and Southeastern Atlantic Forest.

This species is an important component of limnic ecosystems, playing a fundamental role in transport and retention of detritus, in nutrient cycling (Covich et al. 1999; Crowl et al. 2001), and in promoting sediment resuspension (Moulton et al. 2004). Moreover, this species cleans hard substrates, exerting a negative influence on periphyton (Souza & Moulton 2005).

We record here, for the first time, the presence of *P. potimirim* from the state of Rio Grande do Norte, northeastern Brazil.

Our collections were made in 2013 and 2014 from a small tributary of the Potengi River, Rio Grande do Norte, Brazil (Figures 1 and 2) in accordance to federal environmental laws (Collection license SISBIO-IBAMA #28314-1). Shrimps were captured in a permanent, low-energy, first-order stream (energy order scale, sensu Cardoso et al. 2006) with clear water. In the area sampled, the stream ranges from 1.5 m to 3.0 wide and 20 cm to 80 cm deep. Along most of its course it is shaded by native forest. The

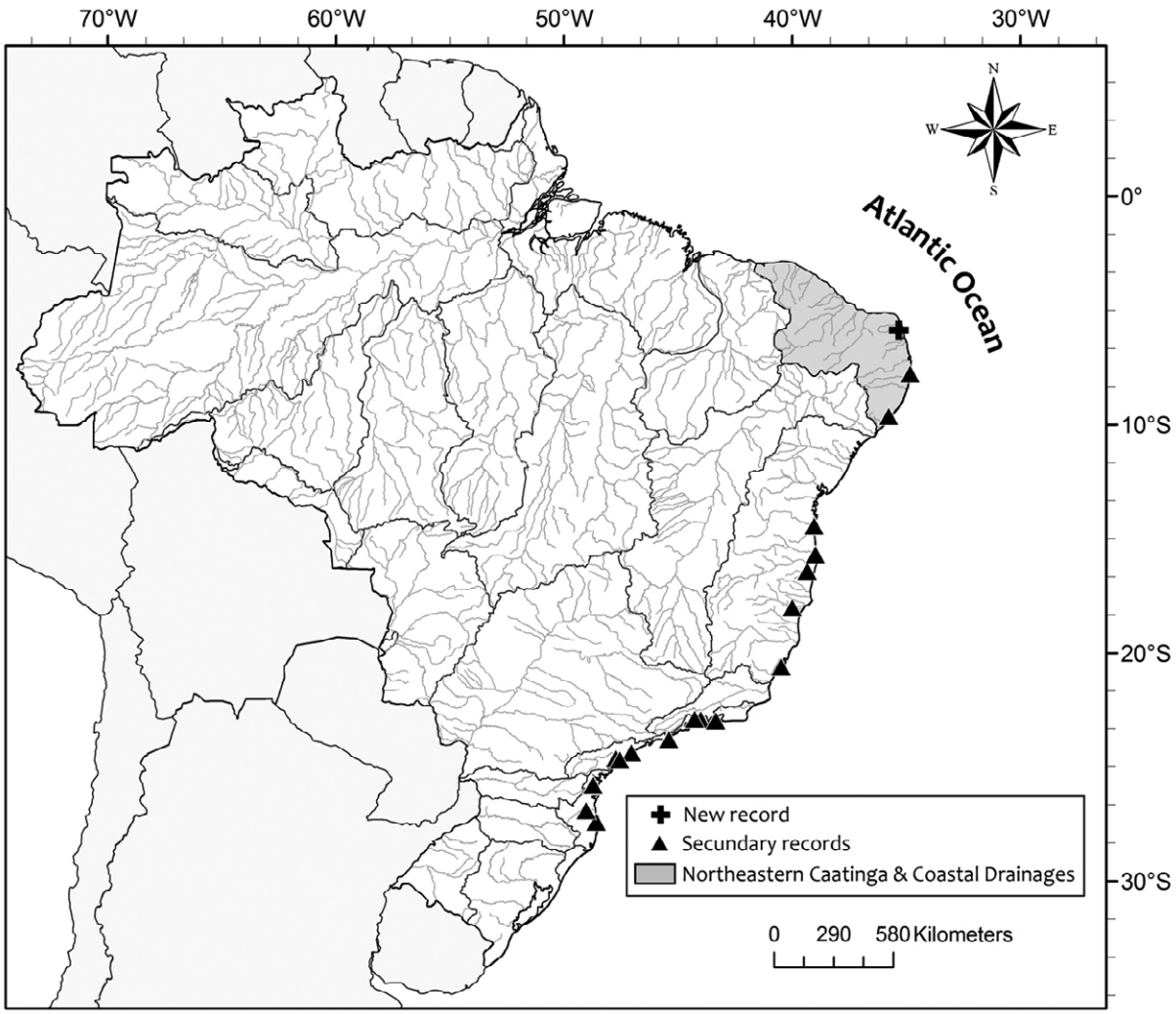

Figure 1. Geographical distribution of *Potimirim potimirim* (Müller, 1881) in Brazil, emphasizing the Northeastern Caatinga and Coastal Drainages freshwater ecoregion. The ecoregion's geographical delimitation is as proposed by ABELL et al. (2008). Geodetic datum WGS84.

stream's substrate is composed by muddy, organic material and a large amount of submerged leaf litter (leaves, twigs, and fruits from the surrounding vegetation).

Our diurnal samples were made using sieves with 2-mm mesh. Collected specimens were identified according to MELO (2003) and MÜLLER (1892). A digital caliper (0.01 mm precision) was used to measure specimens' total length (TL, post-orbital margin to posterior dorsal margin of telson) and cephalothorax length (CL, post-orbital margin to posterior dorsal margin of carapace).

The sex of each specimen was determined by the presence or absence of the male sexual appendix, which is positioned at the second pair of pleopods. Any egg mass present in ovigerous females were classified according to their stage of development: stage 1, eggs homogeneously colored, with absence of visible pigmentation of the eyes; stage 2, eye pigmentation slightly visible; or stage 3, eyes completely developed (HERRERA-CORREAL et al. 2013). Finally, specimens were fixed in 70% ethanol. These were deposited in the carcinological collection of the Grupo de Estudos de Ecologia e Fisiologia de Animais Aquáticos, Universidade Federal do Rio Grande do Norte (GEEFAA/UFRN), Brazil.

We conducted a literature review to find other occurrence data for *P. potimirim*. When records were not georeferenced, we approximated geographic coordinates using Google Earth® software (version 7.1.2.2041). The map was created using the ArcMap 10.1 application of the ESRI® ArcGIS™ program package (ESRI 2011), with addition of freshwater ecoregion data proposed by ABELL et al. (2008) (Figure 1).

Order Decapoda Latreille, 1802
Infraorder Caridea Dana, 1852
Family Atyidae De Haan, 1849
Genus *Potimirim* Holthuis, 1954

Potimirim potimirim (Müller, 1881): Figure 2
Atyoida potimirim MÜLLER 1881: 155, figures 1–60.
Potimirim potimirim HOLTHUIS 1954: 3.

New records: Brazil: Rio Grande do Norte: Potengi River basin. Unnamed stream, Macaíba, 05°51′50.67″ S, 035°19′ 44.91″ W, 23-X-2014, 1 ♀ specimen, stage 3 ovigerous, TL = 22.83mm; CL = 5.40mm, (GEEFAA/UFRN 356) (Figures 2b,c,d). unnamed stream, Macaíba, 05°51′50.67″S, 035° 19′44.91″ W, 26-VII-2013, 1 ♀specimen, stage 3 ovigerous,

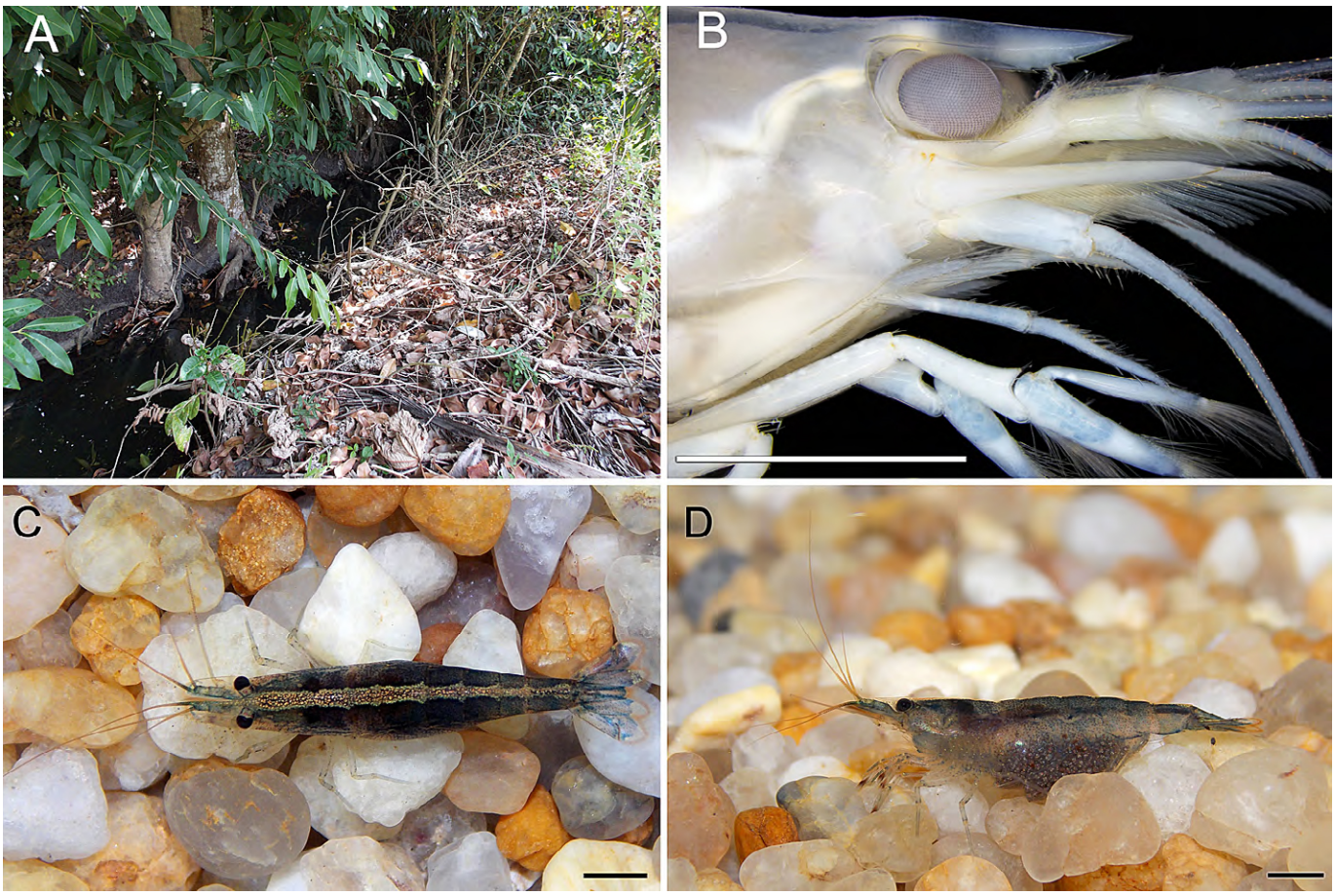

Figure 2. *Potimirim potimirim* (Müller, 1881) from the unnamed stream, Macaíba, Rio Grande do Norte, Brazil. (GEEFAA/UFRN 356). **A.** Collection site. **B.** Antero-lateral view of cephalothorax. **C.** Dorsal view. **D.** Lateral view. Scale bar = 2mm.

TL = 26.44mm; CL = 6.39mm, (GEEFAA/UFRN 357).

Previous records in Brazil: Pernambuco (Gramame River basin), Alagoas (Mundaú), Bahia (Buranhém, Mucuri, Pardo, Tijuípe-Tijuipinho), Espírito Santo (Cachoeirinha and Perocão); Rio de Janeiro (Sahy), São Paulo (Baixada Santista and Ribeira do Iguape), Paraná (Cubatão, Goiaral, Iguaçu), and Santa Catarina (Cachoeira and Itajaí-Açu) (Müller 1881; Ortmann 1897; Moreira 1901; Barros & Braun 1997; Paim et al. 1997; Anger & Moreira 1998; Teixeira & Sá 1998; Lima & Oshiro 1999; Dos Santos & Coelho 2001; Lima & Oshiro 2002; Rocha & Bueno 2004; Lima et al. 2006; Almeida et al. 2008; Sampaio et al. 2009; Boos et al. 2012; Torati & Mantelatto 2012; Paschoal et al. 2013) (Table 1).

Type locality: Rio Itajaí-Açú, Santa Catarina (Müller 1881).

Distribution: USA (Florida), Puerto Rico, Guadeloupe, Trinidad, Panama (Bocas del Toro), Venezuela, and Brazil.

Diagnosis: Rostrum reaching the second antennular article, narrow and sharp, with slightly down-curved top edge. Top median carina unarmed and three teeth on ventral surface. Carapace smooth, anterior margin with a suborbital tooth; pterygostomian spine present in the anteroventral angle of the carapace's edge. Absence of epipodite on base of fourth and fifth pereiopods; carpus of second pair of pereiopods almost as long as propodus, and much longer than first pair of carpus; merus of pereiopods 3–5 armed with three distal spines on ventral surface; dactyl of third and fourth pair of pereiopods with seven spines. Preanal carina on acute format; presence of 20 spines on uropods' diaeresis (Müller 1892; Melo 2003).

Lima & Oshiro (2002) and Lima et al. (2006) remarked that first-order rivers, with unconstrained substrate and high density of submerged leaf litter, were suitable habitat for this species. We were observed these same characteristics at our site in the Potengi River basin.

The presence of females with eggs in late stages of development in this stream, about 18 km from the mouth of Potengi River, suggests that this stream may be a spawning ground. We suppose that salinity does not influence egg eclosion. Based on ecological data from Lima & Oshiro (2002) and our observations, we believe that *P. potimirim* prefers streams with reduced salinity for spawning. However, additional samples from along the length of the stream and observing females with eggs in other stages of development are needed to confirm this supposition.

The presence of *P. potimirim* in the states of Pernambuco, Alagoas, and now Rio Grande do Norte suggests that may also occur in Paraíba and Ceará because these states are also within the Northeastern Caatinga and Coastal Drainages ecoregion (Abell et al. 2008).

Table1. Records of *Potimirim potimirim* (Müller, 1881) in Brazil. Geodetic datum WGS84. * = Approximate geographic coordinates.

Source	Locality (Basin)	Latitude	Longitude
Present study	Rio Grande do Norte (Potengi)	05°51′50.67″ S	035°19′44.91″ W
Dos Santos & Coelho (2001)	Pernambuco (Gramame)	07°47′ S	034°50′ W
Teixeira & Sá (1998)	Alagoas (Mundaú)	09°38′03.37″ S	035°46′31.94″ W
Almeida et al. (2008); Torati & Mantelatto (2012)	Bahia (Tijuípe-Tijuipinho)	14°26′39.7″ S	039°03′13.2″ W
Almeida et al. (2008)	Bahia (Tijuípe-Tijuipinho)	14°27′ S	039°01′ W
Pascoal et al. (2013)	Bahia (Pardo)	15°42′ S	038°59′ W
Barros & Braun (1997)	Bahia (Buranhém)	16°25′28″ S	039°21′ W
Paim et al. (1997)	Bahia (Mucuri)	18°01′ S	040°00′ W
Torati & Mantelatto (2012)	Espírito Santo (Cachoeirinha)	20°37′24.9″ S	040°32′35.09″ W
Lima & Oshiro (1999)*	Rio de Janeiro (Sahy)	22°54′59.07″ S	043°59′36.75″ W
Lima & Oshiro (2002); Lima et al. (2006)	Rio de Janeiro (Sahy)	22°56′ S	044°01′ W
Anger & Moreira (1998)	São Paulo (Ribeira de Iguape)	23°49′ S	045°27′ W
Rocha & Bueno (2004)	São Paulo (BaixadaSantista)	24°22′05″ S	047°03′17″ W
Rocha & Bueno (2004)	São Paulo (BaixadaSantista)	24°22′27″ S	047°04′03″ W
Rocha & Bueno (2004)	São Paulo (Ribeira de Iguape)	24°37′37″ S	047°44′43″ W
Rocha & Bueno (2004)	São Paulo (Ribeira de Iguape)	24°38′02″ S	047°44′14″ W
Moreira (1901)*	São Paulo (Ribeira de Iguape)	24°41′20.79″ S	047°33′57.63″ W
Sampaio et al. (2009)	Paraná (Iguaçu)	25°48′52.6″ S	048°44′33.9″ W
Sampaio et al. (2009)	Paraná (Goiaral)	25°49′78.6″ S	048°43′57.0″ W
Sampaio et al. (2009)	Paraná (Cubatão)	25°50′41.5″ S	048°43′83.6″ W
Müller (1881)*	Santa Catarina (Itajaí-Açu)	26°54′29.51″ S	049°02′37.08″ W
Boos et al. (2012); Torati & Mantelatto (2012)	Santa Catarina (Cachoeira)	27°25′08.6″ S	048°35′47.4″ W

Our record of *P. potimirim* from a tributary of Potengi River increases its known range and represents the northernmost occurrence on the Brazilian coast (Table 1). Among the bioecologic studies of this species, the study of population structure by Lima et al. (2006) is outstanding, as is study on the evolution of reproduction in the genus by Grilli et al. (2014). Nevertheless, the biology of *P. potimirim* is not well known, likely because of the low commercial interest in the species. Thus, we emphasize the need for further research that will provide a better understanding of the biodiversity of Brazil's coastal aquatic ecosystems. This will allow for more effective and better targeted conservation actions.

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