

Ambidexter symmetricus Manning & Chace, 1971 (Decapoda, Processidae): first record for Rio Grande do Norte and overview of the species distribution on the Brazilian coast

Alex Barbosa de Moraes,^{1,4,5} Daniele Cosme Soares de Moraes,^{2,4} Nielson Felix Caetano França,^{1,4} Jéssica Medeiros Malheiros,⁴ Fúlvio Aurélio de Moraes Freire^{1,2,3,4}

1 Programa de Pós-Graduação em Sistemática e Evolução, Universidade Federal do Rio Grande do Norte, CEP 59072-970, Natal, RN, Brazil. **2** Programa de Pós-Graduação em Ecologia, Universidade Federal do Rio Grande do Norte, CEP 59072-970, Natal, RN, Brazil. **3** Universidade Federal do Rio Grande do Norte, Centro de Biociências, Departamento de Botânica e Zoologia, CEP 59072-970, Natal, RN, Brazil. **4** Grupo de Estudos em Ecologia e Fisiologia de Animais Aquáticos.

Corresponding author: Alex Barbosa de Moraes, alexbarbosa@outlook.com

Abstract

We present the first record of *Ambidexter symmetricus* Manning & Chace, 1971 for the state of Rio Grande do Norte, northeastern Brazil, filling a distribution gap of this species in the country. We confirm the preference of this species for seagrass meadows in the Curimataú river estuary. Lastly, a brief overview and an updated distribution map for the records of this species on the Brazilian coast are provided.

Key words

Caridea; Curimataú river basin; estuary; range extension.

Academic editor: Felipe Bezerra Ribeiro | Received 19 January 2018 | Accepted 25 May 2018 | Published 15 June 2018

Citation: Moraes AB, Moraes DCS, França NFC, Malheiros JM, Freire FAM (2018) *Ambidexter symmetricus* Manning & Chace, 1971 (Decapoda, Processidae): first record for Rio Grande do Norte and overview of the species distribution on the Brazilian coast. Check List 14 (3): 539–544. <https://doi.org/10.15560/14.3.539>

Introduction

The processid genus *Ambidexter* Manning & Chace, 1971 is composed of 3 species worldwide, *A. panamensis* Abele, 1972, *A. swifti* Abele, 1972, and *A. symmetricus* Manning & Chace, 1971, all of which distributed in the Western Atlantic and Eastern Pacific oceans (Manning and Chace 1971, Abele 1972, De Grave and Anker 2013). *Ambidexter symmetricus* is a small shrimp (maximum carapace length: 6.7 mm) that commonly occurs in shallow waters (0–20 m) of coastal and estuarine regions where it inhabits sea grass meadows (*Halodule wrightii*, *Thalassia testudinum*, *Syringodium filiforme*, and *Diplanthera*

spp.) (Manning and Chace 1971, Lewis 1984, Souza et al. 2011, Pachele et al. 2016, Rasch and Bauer 2016). This species has cryptic and nocturnal habits, usually burying itself in sandy or muddy soft substrates during the day and emerging at night to feed (Manning and Chace 1971, Barba et al. 2005).

Ambidexter symmetricus is the only representative of its genus with an amphi-American distribution; it occurs in the western Atlantic from Florida (USA) to Santa Catarina (Brazil) (Manning and Chace 1971, Abele 1972, Pachele et al., 2016), and in the eastern Pacific, known only by 1 record in the western Gulf of California (Mexico) (Ríos and Carvacho 1982). In Brazil, this

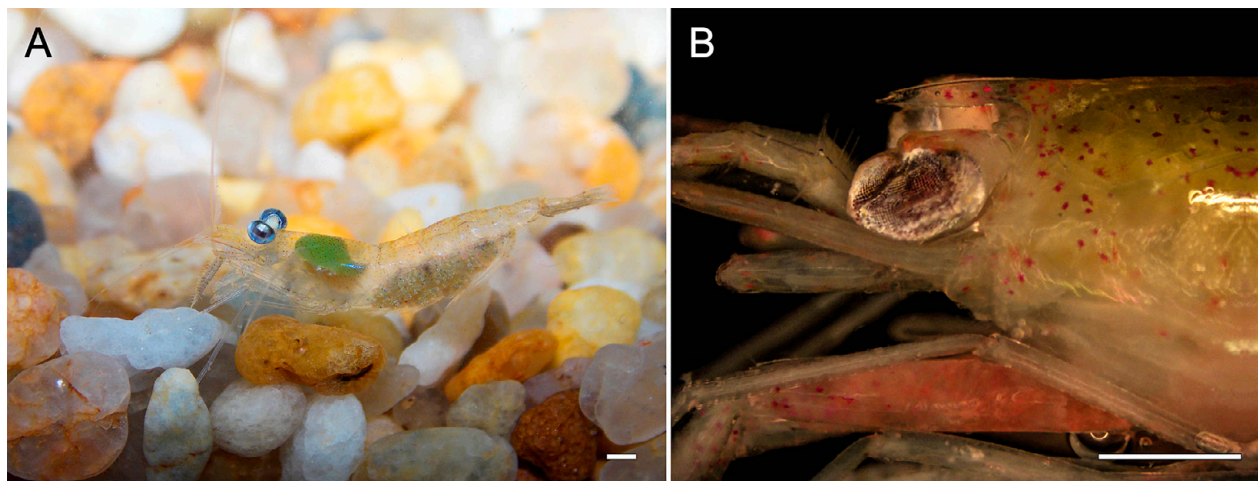


Figure 1. *Ambidexter symmetricus* Manning & Chace, 1971 from the Curimataú River, Rio Grande do Norte, Brazil (GEEFAA/UFRN 890). Lateral view. **A.** Live adult female. **B.** Same, antero-lateral view of the cephalothorax showing bifid rostrum. Specimen fixed in 70% ethanol. Scale bar = 1 mm.

species has been reported from several localities in the states of Ceará, Paraíba, Pernambuco, Espírito Santo, Bahia, Rio de Janeiro, São Paulo, and Santa Catarina (Ramos-Porto 1977, Christoffersen 1980, Ramos-Porto 1980, Santos and Coelho 1995, Santos and Coelho 1998, Coelho et al. 2006, Nascimento and Torres 2007, Riul et al. 2008, Souza et al. 2011, Almeida et al. 2012, Amaral et al. 2010, Terossi and Mantelatto 2014, Pachellet et al. 2016). However, many gaps remain throughout the distribution of *A. symmetricus* in Brazil. Thus, we report the first occurrence record of *A. symmetricus* in the state of Rio Grande do Norte, which fills 1 of these distribution gaps on the coast of Brazil.

Methods

The specimens were collected in the tropical estuarine system of the Curimataú River, which is located on the southern coast of the state of Rio Grande do Norte, near the border with the state of Paraíba, Brazil. It is within the Köppen-Geiger climate region As (Miranda et al. 2006, Rubel and Kottek 2010). At sampled site near the mouth of the estuary, the width of the Curimataú River is 570 m and the maximum depth varies from 0 to 1.80 m. On both were observed large sandbanks that are exposed at low tide. The substrate of the river is clayey, with a predominance of sedimentary fractions of silt and clay over most of the area sampled, but shallower areas had predominantly of sedimentary fractions of fine sand. Throughout the year, the water temperature varies little, approximately 26.6–28.8 °C. The bottom salinity varies between 29 and 36 ppt (Miranda et al. 2006, A.B. de Moraes personal observation).

The field samplings were performed at random linear stretches of 500 m (500 m transects) were along the border of the Curimataú river estuary (between 06°19'25"S, 035°03'08" W and 06°19'05" S, 035°02'45" W). The samples were collected with the aid of an artisanal shrimp trawl (12 m × 2 m, 5 mm mesh), in areas with

and without occurrence of sea grass, in accordance to federal environmental laws (Collection license SISBIO-IBAMA #28314-1). Digital calipers (0.01 mm accuracy) were used to measure the length of the carapace of the specimens (LC, linear distance between the poster orbital margin and the posterior dorsal margin of the carapace). The sex of the specimens was determined by the appendix masculina on the second pair of pleopods. Finally, the specimens were fixed in 70% ethanol and 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.

To compare occurrence records of this species at our sites with the presence or absence of marine grass, the homogeneity of data variance and normality were verified by the Levene and Shapiro-Wilks tests, respectively (Zar 1996). Then, a Wilcoxon's test (non-parametric data) was performed, using the significance level of 5% (Zar 1996).

A distribution map was created using the ArcMap 10.1 application of the ESRI ArcGIS™ program package using compiled data (Table 1). The list of locations is based on literature records and our new records. For records that were not georeferenced, we estimated geographic coordinates using the Google Earth® (version 7.1.2.2041).

Results

Order Decapoda Latreille, 1802
 Infraorder Caridea Dana, 1852
 Family Processidae Ortmann, 1896
 Genus *Ambidexter* Manning & Chace, 1971

***Ambidexter symmetricus* Manning & Chace, 1971**
 Figure 1

Ambidexter symmetricus Manning and Chace 1971: 3, figs 1, 2.

Table 1. Records of *Ambidexter symmetricus* Manning & Chace, 1971 in Brazil. Present study highlighted in bold. Geodetic datum = WGS84. * = Records with georeferenced localization estimated based on the description provided on each record.

Location number	Collection site (state)	Latitude	Longitude	Reference
1	Corrente Nordeste, Norte do Brasil	01°29'S	039°32'W	Coelho Filho 2006*
2	Praia de Requenguela, Banco dos Cajuais (Ceará)	04°40'47"S	037°20'44"W	Pachelle et al. 2016
3	Estuário do rio Curimataú (Rio Grande do Norte)	06°19'10"S	035°02'45"W	Present study
4	Ponta do Cabo Branco, praia de Cabo Branco (Paraíba)	07°08'50"S	034°47'51"W	Riul et al. 2008
5	Canal de Santa Cruz (Pernambuco)	07°44'51"S	034°49'13"W	Ramos-Porto 1980*
6	Rio Jaguaribe (Pernambuco)	07°43'S	034°49'W	Souza et al. 2011
7	Praia de Pilar (Pernambuco)	07°45'S	034°49'W	Souza et al. 2011
8	Praia Forno de Cal (Pernambuco)	07°46'S	034°50'W	Souza et al. 2011
9	Rio Paripe (Pernambuco)	07°48'S	034°51'W	Souza et al. 2011
10	Banco de areia Ramalho (Pernambuco)	07°49'S	034°49'W	Souza et al. 2011
11	Praia de Boa Viagem (Pernambuco)	08°08'S	034°54'W	Souza et al. 2011
12	Praia de Boa Viagem (Pernambuco)	08°07'17"S	034°53'41"W	Nascimento and Torres 2007
13	Praia de Piedade (Pernambuco)	08°10'S	034°55'W	Souza et al. 2011
14	Praia de Candeias e Piedade (Pernambuco)	08°11'19"S	034°54'W	Coelho-Santos and Coelho 1998, Souza et al. 2011*
15	Praia de Suape (=Barra Itapoama) (Pernambuco)	08°21'S	034°57'W	Souza et al. 2011
16	Maraú, ilha do Tanque (Bahia)	14°00'47.8"S	038°59'00.5"W	Almeida et al. 2012*
17	Maraú, Ilha do Tanque (Bahia)	14°00'59"S	038°59'15.6"W	Almeida et al. 2012*
18	Praia do Castelhana (Espírito Santo)	20°50'3.24"S	040°37'18.33"W	Christoffersen 1980*
19	Praia de Zumbi (Rio de Janeiro)	22°49'12.65"S	043°10'28.44"W	Christoffersen 1980*
20	Ilha do Japonês (Rio de Janeiro)	22°52'53.79"S	042°00'17.48"W	Christoffersen 1980*
21	Praia Grande (São Paulo)	23°28'19"S	045°03'59"W	Christoffersen 1980*
22	Praia do Lamberto (São Paulo)	23°29'46.01"S	045°06'41.53"W	Christoffersen 1980*
23	Baía do Araçá (São Paulo)	23°48'55"S	045°24'14"W	Amaral et al. 2010*
24	Praia do Araçá (São Paulo)	23°48'S	045°24'W	Terossi and Mantelatto 2014, Christoffersen 1980*
25	Baía do Trapandé (São Paulo)	25°02'37"S	047°56'33"W	Christoffersen 1980*
26	Praia de Porto Belo (Santa Catarina)	27°09'21"S	048°32'49"W	Christoffersen 1980*
27	São José. Praia de Ponta de Baixo (Santa Catarina)	27°38'03"S	048°37'40"W	Christoffersen 1980*
28	Ilha de Santa Catarina. Alto Ribeirão (Santa Catarina)	27°42'00"S	048°33'07"W	Christoffersen 1980*
29	Praia da Armação (Santa Catarina)	26°47'11"S	048°37'34"W	Christoffersen 1980*

New records. Brazil: Rio Grande do Norte: Canguaretama, Curimataú River on marine grass, 06°19'10" S, 035°02'45" W: 19-V-2017, 3 ♀ ovigerous, CL = 3.9–5.2 mm, GEEFAA/UFRN 887; 2 ♀ ovigerous, CL = 4.4–5mm), GEEFAA/UFRN 888. 10-I-2017, 8 ♀ (CL = 2.7–4.6 mm); 3 ♀ ovigerous (CL = 3.4–4.6 mm), GEEFAA/UFRN 889, 890.

Previous records in Brazil. Northeast Continental Shelf (Coelho Filho 2006), Ceará (Pachelle et al. 2016), Paraíba (Riul et al. 2008), Pernambuco (Ramos-Porto 1977, Ramos-Porto 1980, Santos and Coelho 1995, Santos and Coelho 1998, Coelho et al. 2006, Nascimento and Torres 2007, Souza et al. 2011), Bahia (Almeida et al. 2012), Espírito Santo (Christoffersen 1980), Rio de Janeiro (Christoffersen 1980), São Paulo (Christoffersen, 1980, Amaral et al. 2010, Terossi and Mantelatto 2014), and Santa Catarina (Christoffersen, 1980) (Table 1).

Type locality. Biscayne Bay, Miami, Dade County, Florida, USA (Manning and Chace 1971).

Distribution. Western Atlantic: USA (Florida), Gulf of Mexico, Caribbean Sea, and Brazil (from Ceará to Santa Catarina). Eastern Pacific: Mexico (Gulf of California) (Manning and Chace 1971, Abele 1972, Christoffersen

1980, Ríos and Carvacho 1982, Riul et al. 2008, Almeida and Bezerra 2011, Almeida et al. 2012, Pachelle et al. 2016, this study).

Identification. Rostrum slightly curved down, not extending beyond anterior margin of eye; apex bifid with longer lower tooth. Antennal spine present. Stylocerite rounded and laterally unarmed. Second pair of pereopods symmetrical, with 4 meral articles and 9 or 10 carpal articles. Carpus of the fifth pair of pereopods longer than the propodus. Fifth abdominal somite unarmed post-laterally. Abdominal sternites unarmed.

Color. Body covered with scattered red chromatophores, background semitransparent. Chromatophores arranged in a transverse band on the anterior portion of the abdomen. The color is also concentrated in the carapace, pleura and appendages (Fig. 1).

Discussion

From 56 different points sampled, the most common type of substrate was sedimentary fractions of silt and clay. Despite this, all of specimens collected of *A. symmetricus* occurred in areas where marine grass was present (Wilcoxon test, $p < 0.001$). Specimens of *A. symmetricus*

were also located visually in small pools formed during the low tide near these areas. These observations agree with the ones presented by Manning and Chace (1971) and Rasch and Bauer (2016), who discussed that this species is recurrent of marine grass meadows, which makes it an important component of these habitats. However, this species has also been reported from areas having substrates formed by calcareous algae (Ramos-Porto 1980), biogenic coarse sand (Coelho Filho 2006), sandstone reefs (Nascimento and Torres 2007), and intertidal rocks (Terossi and Mantellato 2014).

Pachelle et al. (2016) stated that *A. symmetricus* is well-distributed throughout the Brazilian territory, it is quite rare and difficult to find due to its nocturnal habit. In fact, most Brazilian records in the literature are based on the capture of only 1–3 specimens (Christoffersen 1980, Coelho and Santos 1988, Coelho Filho 2006, Nascimento and Torres 2007, Riu et al. 2008, Almeida et al. 2012, Pachelle et al. 2016).

Our material represents the first record of this species for the state of Rio Grande do Norte, filling 1 of the gaps in the distribution of the species along the Brazilian coast. The new sites are located 92 km from the nearest southern record in Paraíba (Riul et al. 2008) and 375 km from the nearest northern record in Ceará (Pachelle et al. 2016) (Fig. 2). The only records of this species from the states of Espírito Santo, Rio de Janeiro, and Santa Catarina are those collected between 1970 and 1980 and reported by Christoffersen (1980).

Acknowledgements

We are grateful to the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), for the tendered scholarship to Alex B. de Moraes, Daniele C. S. de Moraes, Nielson F. C. França and Jéssica M. Malheiros and to the members of GEEFAA for all the laboratorial support. The authors would also like to thank the Programa de Pós Graduação em Sistemática e Evolução (UFRN) for the assistance in photographing the specimens.

Authors' Contributions

ABM, DCSM, NFCF, and JMM collected the data, ABM identified the animals, ABM did the taxonomic description, ABM, DCSM, NFCF, JMM, and FAMF wrote the text.

References

- Abele LG (1972) A review of the genus *Ambidexter* (Crustacea: Decapoda: Processidae) in Panama. *Bulletin of Marine Science* 22: 365–380.
- Almeida AO, Bezerra LEA (2011) *Nikoides schmitti* Manning & Chace, 1971 (Caridea: Processidae) in the South Atlantic Ocean, with an updated list and key for processid shrimps of Brazil. *Zootaxa* 2864: 34–42.
- Almeida AO, Boehs G, Araújo-Silva CL, Bezerra LEA (2012) Shallow-water caridean shrimps from southern Bahia, Brazil, including the first record of *Synalpheus ul* (Alpheidae) in the southwestern Atlantic Ocean. *Zootaxa* 3347: 1–35. <https://doi.org/10.11646/zootaxa.3905.1.3>
- Barba E, Raz-Guzman A, Sánchez AJ (2005) Distribution patterns of estuarine caridean shrimps in the southwestern Gulf of Mexico. *Crustaceana* 78(6): 709–726. <https://doi.org/10.1163/156854005774353502>
- Coelho PA, Almeida AO, Souza-Filho JF, Bezerra LEA, Giraldez BW (2006) Diversity and distribution of the marine and estuarine shrimps (Dendrobranchiata, Stenopodidea and Caridea) from north and northeast Brazil. *Zootaxa* 1221: 41–62.
- Coelho Filho PA (2006) Checklist of the decapods (Crustacea) from the outer continental shelf and seamounts from northeast of Brazil—REVIZEE Program (NE III). *Zootaxa* 1184: 1–27.
- Christoffersen ML (1980) Taxonomia e distribuição geográfica dos Alpheoidea (Crustacea, Decapoda, Natantia) do Brasil, Uruguai e norte da Argentina, incluindo considerações sobre a divisão do sul do continente em províncias biogeográficas marinhas. PhD thesis, University of São Paulo, São Paulo, 467 pp.
- Dana JD (1852) *Conspectus crustaceorum*, conspectus of the crustacea of the exploring expedition under Capt. Wilkes, U.S.N. Macroura. *Proceedings of the Academy of Natural Sciences of Philadelphia* 6: 10–28.
- De Grave S, Anker A (2013) New records of processid shrimps from the Indo-West and East Pacific (Crustacea: Decapoda). *Zootaxa* 3640 (2): 224–241. <https://doi.org/10.11646/zootaxa.3640.2.6>
- Latreille PA (1802) *Histoire naturelle, générale et particulière des crustacés et des insectes*. Tome 6. Paris, pls 44–57391 pp.
- Lewis FG (1984) Distribution of macrobenthic crustaceans associated with *Thalassia*, *Halodule* and bare sand substrata. *Marine Ecology, Progress Series* 19: 101–113. <https://doi.org/10.3354/meps019101>
- Manning RB, Chace FA Jr (1971) Shrimps of the family Processidae from the northwestern Atlantic Ocean (Crustacea: Decapoda: Caridea). *Smithsonian Contributions to Zoology* 89: 1–41. <https://doi.org/10.5479/si.00810282.89>
- Miranda LB, Bérnago AL, Ramos e Silva CA (2006) Dynamics of a tropical estuary: Curimatau River, NE Brazil. *Journal of Coastal Research, Special Issue* 39 (2): 697–701.
- Nascimento EF, Torres MFA (2007) Crustáceos decápodos dos recifes da praia de Boa Viagem, Recife – Pernambuco. *Boletim Técnico-Científico do CEPENE* 15 (1): 43–55.
- Ortmann, A (1896) *Das System der Decapoden-Krebse*. *Zoologische Jahrbücher. Abtheilung für Systematik, Geographie und Biologie der Thiere* 9: 409–453.
- Pachelle PPG, Anker A, Mendes CB, Bezerra LEA (2016) Decapod crustaceans from the state of Ceará, northeastern Brazil: an updated checklist of marine and estuarine species, with 23 new records. *Zootaxa* 4131 (1): 001–063. <https://doi.org/10.11646/zootaxa.4131.1.1>
- Ramos-Porto M. (1980) Estudo ecológico da região de Itamaracá, Pernambuco, Brasil. VII Crustáceos Decapodos Natantes. *Trabalhos Oceanográficos da Universidade Federal de Pernambuco* 15: 277–310.
- Ramos-Porto M. (1977) Ocorrência de *Ambidexter symmetricus* Manning & Chace, 1971 no litoral pernambucano. *Ciência e Cultura* 29 (7): 807.
- Rasch JA, Bauer RT (2016) Reproductive pattern and sexual system of the nocturnal seagrass shrimp *Ambidexter symmetricus* (Decapoda: Caridea: Processidae) in a Florida bay. *Marine and Freshwater Research* 67: 1141–1152. <https://doi.org/10.1071/MF14159>
- Riul P, Rodrigues FMA, Xavier-Filho ES, Santos RG, Leonel RMV, Christoffersen ML (2008) Macrocrustaceans from Ponta do Cabo Branco, João Pessoa, Paraíba, Brazil, the easternmost point of South America. *Revista Nordestina de Biologia* 19: 3–13.
- Ríos R, Carvacho A (1982) Caridean shrimps of the Gulf of California. I. New records, with some remarks on amphiamerican distribution. *Pacific Science* 36 (4): 459–465.
- Rubel, F, Kottek M (2010) Observed and projected climate shifts 1901–2100 depicted by world maps of the Köppen-Geiger climate classification. *Meteorology* 19: 135–141. <https://doi.org/10.1127/0941-2948/2010/0430>



Figure 2. Geographic distribution of *Ambidexter symmetricus* Manning & Chace, 1971 in Brazil. Location numbers are listed in Table 1.

- Santos MAC, Coelho PA (1998a) Sazonalidade da ocorrência de crustáceos decápodos no litoral de Jaboatão dos Guararapes, Pernambuco – Brasil. *Trabalhos Oceanográficos da Universidade Federal de Pernambuco* 26 (1): 63–83.
- Santos MAC, Coelho PA (1998b) Camarões (Crustacea Decapoda) do Litoral de Jaboatão dos Guararapes, Pernambuco – Brasil. *Trabalhos Oceanográficos da Universidade Federal de Pernambuco* 26 (1): 63–83.
- Souza JAF, Schwamborn R, Barreto AV, Farias I D, Fernandes LMG, Coelho PA (2011) Marine and estuarine shrimps (Dendrobranchiata, Stenopodidea, and Caridea), of Pernambuco state (Brazil) and northeastern brazilian oceanic islands. *Atlântica*, Rio Grande 33 (1): 33–63. <https://doi.org/10.5088/atl.2011.33.1.33>
- Terossi M, Mantellato FL (2014) First zoeal stage of Processidae (Decapoda, Caridea): review and new descriptions of *Ambidexter symmetricus* Manning and Chace 1971 and *Processa fimbriata* Manning and Chace 1971. *Helgoland Marine Research* 68: 483–489. <https://doi.org/10.1007/s10152-014-0403-6>