

Material of *Munida* Leach (Decapoda: Galatheididae) collected off the northeast coast of Brazil under the Revizee Program

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Abstract

The purpose of this work was to analyze the distribution patterns of the species of the genus *Munida* collected under the REVIZEE Program (Living Resources in the Exclusive Economic Zone) off the Brazilian northeast coast. The study area extended from the mouth of the Parnaíba River (02° 50'S, 41° 50'W) to Salvador (13° 00'S, 38° 30'W), including Saint Paul's Rocks (00° 55'N, 29° 22'W), Fernando de Noronha (03°56'S, 32°25'W) and Rocas Atoll (03°53'S, 33°49'W). The collections were made during three cruises of R.V. "Antaris" between 1995 and 1998. Four species of *Munida* were collected. The general distribution patterns of the species are discussed.

Key words: Crustacea, Decapoda, Galatheididae, *Munida*, REVIZEE Program, Brazilian northeast coast.

Introduction

The United Nations Convention of the Law of the Sea (UNCLOS) granted to each coastal country the right of exclusive use of the marine resources within the 200 n. m. economic zone, and at the same time the concept of sustainable use of the marine environment was introduced. Following the recommendation of UNCLOS, in 1994 the Brazilian government established the national Revizee Program (Living Resources in the Exclusive Economic Zone).

This program had several specific objectives, to be accomplished within 10 years. These included the estimation of the distribution, seasonal variation, abundance and potential sustainable yield of fishery stocks; the obtaining of general information on the structure and dynamics of the marine ecosystem which the living resources inhabit; and the evaluation and monitoring of the potential sustainable yield and prospects for the future exploitation of marine resources and the definition of new research fields for conservation and monitoring objectives.

The REVIZEE Program covered the entire Brazilian coast, but, for operational purposes, the area was divided into four regions, termed "scores", each region with specific oceanographic characteristics: Northern, Northeastern, Central and Southern.

The northeastern score extended from the mouth of the Parnaíba River (02° 50'S, 41° 50'W) south to Salvador (13° 00'S, 38° 30'W), and included Saint Paul's Rocks (00° 55'N, 29° 22'W), Fernando de Noronha (03°56'S, 32°25'W) and Rocas Atoll (03°53'S, 33°49'W).

Munida is one of the dominant genus in the family Galatheididae. The genus has a wide geographical and bathymetric distribution, occurring in the tropical and temperate zones of all the oceans, and at depths ranging from 10 to about 2000 meters (Baba, 1988). Sixteen species of the genus *Munida* are known in the Brazilian coast (Melo-Filho and Melo, 2001).

The species of *Munida* share certain peculiar characteristics, rarely found in any other marine group. Several species may live close together in the same area (syntopy), according Laird *et al.* 1976. In addition they exhibit a high degree of minor intraspecific variation and, paradoxically, only slight variability among the different species in their general aspect (Benedict, 1902; Melo-Filho and Melo, 2001).

Material and Methods

The collections were made by R.V. "Antaris", by use of a rectangular iron dredge of 70 liters capacity, during three cruises between 1995 and 1998. Material of the genus *Munida* was obtained at several oceanographic stations of all three cruises (Table I) and sent to the Museu de Zoologia da Universidade de São Paulo (MZUSP) for identification. These specimens were compared with type material collected by the H.M.S. "Challenger" (Natural History Museum, London, BMNH), U.S.S. "Albatross" (National Museum of Natural History, Washington, USNM) and R.V. "Canopus" (DOUFPE).

The specimens studied are deposited in the carcinological collection of the Departamento de Oceanografia da Universidade Federal de Pernambuco (DOUFPE). Descriptions and figures of all the species were provided by Melo-Filho and Melo, 2001.

Table I: List of oceanographic stations (Revizee-NE Program, R.V. "Antaris") where species of the genus *Munida* were collected: A. cruise and station number; B. date; C. position; D. depth (m); E. temperature (°C); F. species (*M. angulata*, ang; *M. atlantica*, atl; *M. pusilla*, psl and *M. spinifrons*, snf).

A	B	C	D	E	F
Cr. I - st. 70	02/IX/95	03° 48'S: 34 45'W	63.0	26.52	snf
Cr. I - st. 210	12/X/95	03° 50'S: 37 37'W	166.0	25.78	atl, ang
Cr. I - st. 213	13/X/95	04° 38'S: 36 44'W	51.8	26.41	ang
Cr. I - st. 215	13/X/95	04° 38'S: 36 42'W	77.5	26.30	ang
Cr. II - st. 117-115	01/III/97	03° 28'S: 35 02'W	66.0	26.85	snf
Cr. II - st. 120	01/VI/97	04° 02'S: 35 48'W	70.0	23.75	ang, pls, snf
Cr. III - st. 40	15/IV/98	04° 05'S: 37 25'W	50.0	28.98	ang
Cr. III - st. 60	27/IV/98	04° 15'S: 33 14'W	60.0	27.92	ang
Cr. III - st. 75A	07/VI/98	01° 29'S: 38 41'W	54.0	28.21	snf
Cr. III - st 85	04/VI/98	3°24'S: 35°1.8'W	61.80	28.31	snf

Results

Munida angulata Benedict, 1902

Munida angulata Benedict, 1902: 252, fig. 4; Haig, 1956: 4; Bullis and Thompson, 1965: 9; Abele and Kim, 1986: 35, fig. a, p. 404; Melo-Filho and Melo, 1997: 190, fig. 1, a-g; Melo, 1999: 176, figs. 105, 106; Melo-Filho and Melo, 2001: 1142, figs. 4-5.

Munida spinifrons: Coelho, 1967-69: 232 [part.]; Coelho and Ramos, 1972: 344 [part.].

Munida brasiliae Coelho, 1973: 344 [part.]; Coelho and Ramos-Porto, 1980: 136 [part.]; Coelho, Ramos-Porto and Calado, 1986: 88 [part.].

Material Examined. Brazil: Ceará – R.V. "Antaris": Cruise I, st. 210, 166 m, 2 ex. Cruise II, st. 120, 70 m., 1 ex. Cruise III, st. 40, 50 m., 7 ex.; st. 60, 60 m., 1 ex. Rio Grande do Norte - N. Oc. "Antaris": Cruise I, st. 213, 51,8 m., 2 ex.; st. 215, 77,4 m., 1 ex.

Distribution. Western Atlantic: Florida (east coast), Gulf of Mexico (north coast), Caribbean Sea (continental coast: Colombia, Aruba, Venezuela), Brazil (Maranhão, Ceará, Rio Grande do Norte). Between 38 and 166 meters depth.

Remarks: The specimens collected at Station 210, 166 m, occurred far beyond the maximum depth reported in the literature, which is 75 m according to Melo-Filho and Melo (2001).

Munida atlantica Melo-Filho and Melo, 1994

Munida spinifrons: Coelho, 1967-69: 232 [*part.*]; Coelho and Ramos, 1972: 344 [*part.*].

Munida brasiliae: Coelho and Ramos-Porto, 1980: 136 [*part.*].

Munida atlantica Melo-Filho and Melo, 1994: 50, figs. 1-7; Melo, 1999: 178, figs. 107-108; Melo-Filho and Melo, 2001: 1143, figs. 6-7.

Material Examined. Brazil: Ceará - R.V. "Antaris": Cruise I, st. 210, 166 m, 1 ex.

Distribution. Western Atlantic: Brazil (Ceará). Between 58 and 166 meters depth.

Remarks. This is the first known record since the type material was collected. The type locality is off Aracati, Ceará (R.V. "Canopus", Station 45, 04° 14'S, 37° 22'W).

Munida pusilla Benedict, 1902

Munida pusilla Benedict, 1902: 268, fig. 16; Haig, 1956: 2; Springer and Bullis, 1956: 15; Williams, 1984: 256, fig. 171; Abele and Kim, 1986: 35, figs. f-g, p. 403; Melo, 1999: 198, figs. 127-128; Melo-Filho and Melo, 2001: 1159, figs. 26-27.

Munida spinifrons: Coelho and Ramos, 1972: 171 [*part.*].

Munida brasiliae Coelho, 1973: 344 [*part.*].

Material Examined. Brazil: Ceará - N. Oc. "Antaris": Cruise II, st. 120, 70 m, 1 ex.

Distribution. Western Atlantic: Carolines, Florida (east coast), Gulf of Mexico (northeast and southeast coast), Caribbean Sea (continental coast: Mexico, Colombia, Venezuela), Brazil (Amapá, Ceará). Between 38 and 122 meters depth.

Remarks. This is the second occurrence of *M. pusilla* off the Brazilian coast, and extends the species' known distribution far to the south. According to Melo-Filho and Melo (2001), the first occurrence was off Cabo Norte, Amapá (R.V. "Alm. Saldanha", Station 1784, 03° 08'N, 49° 07'W, 85 meters depth).

Munida spinifrons Henderson, 1885

Munida spinifrons Henderson, 1885: 412; 1888: 144, pl. 15, figs. 1, 1a, 1b; A. Milne-Edwards and Bouvier, 1894a: 256; Moreira, 1901: 83; Coelho, 1967-69: 232 [*part.*]; Pequegnat and Pequegnat, 1970: 127; Coelho and Ramos, 1972: 171 [*part.*]; Fausto-Filho, 1978: 67; Abele and Kim, 1986: 36, fig. a, p. 401; Coelho, Ramos-Porto and Calado, 1986: 88; Baba and Camp, 1988: 414, fig. 1; Melo-Filho and Melo, 1992: 763, figs. 8-14; Melo, 1999: 202, figs. 131-132; Melo-Filho and Melo, 2001: 1163, figs. 30-31.

Material Examined. Brazil: Ceará - R.V. "Antaris": Cruise I, st. 70 (near Rocas Atoll), 63 m, 2 ex. Cruise II, st. 117-115 (near Banks off Rio Grande do Norte), 66 m, 2 ex.; st. 120, 70 m, 6 ex. Cruise III, st. 75A, 54 m; Fernando de Noronha - R.V. "Antaris" Cruise I, st. 85, 61.8 m, 1 ex.

Distribution. Western Atlantic: Florida (east coast, to the north of Canaveral Cape) and Brazil (Amapá, Ceará, Rio Grande do Norte, Fernando de Noronha, Rocas Atoll, Espírito Santo, Rio de Janeiro, and São Paulo). Between 13 and 150 meters depth.

Remarks: According to Melo-Filho (1997), *Munida spinifrons*, is a euryhaline and eurytopic species. This is the only species of *Munida* known from the vicinity of Rocas Atoll.

Discussion

A review about current systems in Brazil and other physical characteristics related with biogeographical boundaries in Brazilian waters can be found in Emilsson (1959), Palacio (1982) and Melo-Filho (1997). From a zoogeographical point of view, the area delimited by the Northeast Score of the Revizee Program, extending from the Parnaíba River in the north to Salvador in the south, is part of the Brazilian Biotic Province. According to Melo-Filho (1997), the Brazilian Province begins at the mouth of the Parnaíba River and extends south to Cabo Frio.

Specimens of the genus *Munida* were collected off the coast of Ceará and Rio Grande do Norte, including shallow banks, or in the vicinity of Rocas Atoll. This area is influenced by the Guyana Current or the equatorial current system. To the south of the Parnaíba as far as Rio Grande do Norte, the coast is narrow and with insignificant coastal elements, little influenced by continental fresh waters. The water of the entire area is warm (up to 25 °C) and very saline (about 36.5 ‰).

Most of the dredging done by R V. "Antaris" during the Revizee Program was in shallow waters. Areas of the bottom influenced by the counter-currents, which flow at depths below 200 meters and have lower temperature and salinity, were excluded from the survey. This explains the absence of most of the subtropical species of *Munida* which have been collected in the same area in previous surveys (Melo-Filho and Melo, 2001).

Coelho (1967-69) suggested that Rocas Atoll, Fernando de Noronha and the Banks off Rio Grande do Norte form a biotic unit, called the "Insular" Province. This province is isolated from the continental shelf by great distances and depths. Fausto-Filho (1974) agreed with the opinion of Coelho (1967-69), pointing out that the fauna of that region is much less diverse than in regions nearer the continent. On the other hand, Fausto-Filho (1974) noted that this area contains few endemic species and has a close environmental and faunal similarity to the Brazilian northeast coast. Melo-Filho (1997), basing his opinion on the distribution of the genus *Munida*, termed that area the "Insular Sub-province".

Munida angulata, according to Melo-Filho (*op. cit.*), has a wide ecological tolerance, occurring both in subtropical waters (Florida and the northern Gulf of Mexico) and in tropical waters (the continental coast of the Caribbean and the Brazilian northeast coast). Because it is a shallow-water species that prefers the shelf to the slope, the occurrence of *M. angulata* in the study area was expected.

Munida atlantica is a shallow-water tropical species, endemic to the Brazilian northeastern coast. The present record is the first since the species was originally described, and is close to the type locality.

Only one specimen of *Munida pusilla* had been collected previously off the Brazilian coast (Melo-Filho and Melo, 2001). The collection of another specimen, off Ceará (R.V. "Antaris", Cruise II, Station 120) significantly extended the known distribution of this species to the south.

Munida spinifrons occurs in shallow waters along the Brazilian tropical coast, including Rocas Atoll, Fernando de Noronha and the Banks (Melo-Filho, 1992; 1997). However, there are some records from subtropical waters in the northern hemisphere (Florida, north of Cape Canaveral) and the southern hemisphere, off the states of Rio de Janeiro (south of Cabo Frio) and São Paulo. The population off the Brazilian tropical coast has well-developed rostral spinulation, whereas in the populations in subtropical waters the rostral spinulation is less obvious.

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References

- Abele, L. G. and Kim, W. 1986. *An illustrated guide to the marine decapod crustaceans of Florida*. Florida, Department of Environmental Regulation. Technical Series, v. 8, n. 1. 760 p.
- Baba, K. 1988. *Chirostylid and Galatheid Crustaceans (Decapoda: Anomura) of the "Albatross" Philippine Expedition, 1907-1910*. Tokyo, The Carcinological Society of Japan. Researches on Crustacea, Special number 2: 203 p.
- Baba, K. And Camp, D. K. 1988. Two species of galatheid crustaceans (Decapoda: Anomura) new to Florida, *Munida spinifrons* Henderson, and *Munidopsis kucki*, new species. Proceedings of the Biological Society of Washington, 10 (2): 414-422.
- Benedict, J. E. 1902. Description of a new genus and forty-six new species of crustaceans of the Family Galatheidae with a list of the known marine species. Proceedings of the United States National Museum, 26 (1311): 243-334.
- Bullis Jr., H. R. and Thompson, J. R. 1965. Collections by the exploratory fishing vessels "Oregon", "Silver Bay", "Combat", and "Pelican" made during 1956-1960 in the southwestern North Atlantic. Special Scientific Report of the United States Fisheries Fish and Wildlife Service, 510: 1-130.
- Coelho, P. A. 1967-69. A distribuição dos crustáceos decápodos reptantes do norte do Brasil. Trabalhos Oceanográficos da Universidade Federal de Pernambuco, 9/11: 223-238.
- Coelho, P. A. 1973. Descrição preliminar de *Munida brasiliae*, n.sp., do Norte e Nordeste do Brasil (Crustacea: Decapoda: Galatheidae). Ciência e Cultura, 25 (6): 344.
- Coelho, P. A. and Ramos, M. A. 1972. A constituição e a distribuição da fauna de decápodos do litoral leste da América do Sul entre as latitudes de 5°N e 39°S. Trabalhos do Instituto Oceanográfico da Universidade Federal de Pernambuco, 13: 133-236.
- Coelho, P. A. and Ramos-Porto, M. A. 1980. Crustáceos decápodos da costa do Maranhão, Brasil. Boletim do Instituto Oceanográfico, 29 (2): 135-138.
- Coelho, P. A.; Ramos-Porto, M. and Calado, T. C. S. 1986. Litoral do Rio Grande do Norte: Decapoda. Caderno Ômega da Universidade Federal Rural de Pernambuco, Série Ciências Aquáticas, 2: 79-105.
- Emilsson, I. 1959. Alguns aspectos físicos e químicos das águas marinhas brasileiras. Ciência e Cultura, 11 (2): 44-55.
- Fausto-Filho, J. 1978. Crustáceos estomatópodos e decápodos dos substratos de lama do Nordeste brasileiro. Arquivos de Ciências do Mar, 18 (1-2): 63-71.
- Haig, J. 1956. The Galatheidae (Crustacea: Anomura) of the Allan Hancock Expedition with a review of the Porcellanidae of the Western Atlantic. Report of Allan Hancock Atlantic Expedition, 8: 1-44.
- Henderson, J. R. 1885. Diagnoses of the new species of Galatheidea collected during the "Challenger" Expedition. Annals and Magazine of Natural History, 5 (16): 407-421.
- Henderson, J. R. 1888. Report on the Anomura collected by H.M.S. "Challenger" during the years 1873-76. Report on the scientific results of the voyage of H.M.S. "Challenger" during the years 1873-76, Zoology, 27: 1-221.
- Laird, C. E.; E. G. Lewis and P. A. Haefner, Jr. 1976. Occurrence of two galatheidae crustaceans, *Munida forceps* and *Munidopsis bermudezi*, in the Chesapeake Bight the Western North Atlantic Ocean. Fishery Bulletin 74 (2): 462-463.
- Melo, G. A. S. 1999. Manual de identificação dos Crustacea Decapoda do litoral brasileiro: Anomura, Thalassinidea, Palinuridea, Astacidea. São Paulo, Plêiade Ed and FAPESP. 551 p.
- Melo-Filho, 1992. *Taxonomia e distribuição do gênero Munida Leach (Crustacea: Decapoda: Galatheidae) na costa brasileira*. Rio Claro, Instituto de Biociências, Universidade Estadual Paulista. 187 p.
- Melo-Filho, 1997. *O gênero Munida Leach (Crustacea: Decapoda: Galatheidae) no Atlântico e Mediterrâneo: Composição e Biogeografia*. São Paulo, Instituto de Biociências, Universidade de São Paulo. 248 p.

- Melo-Filho, G. A. S. and Melo, G. A. S. 1992. Reexamination of the material of *Munida* Leach (Crustacea: Anomura: Galatheidae) collected by the H.M.S. "Challenger" (1872-76) along the Brazilian coast. *Proceedings of the Biological Society of Washington*, 105 (4): 760-774.
- Melo-Filho, G. A. S. and Melo, G. A. S. 1994. Three new species of *Munida* (Crustacea: Anomura: Galatheidae) from the Brazilian coast. *Papéis Avulsos de Zoologia*, 39 (5): 49-60.
- Melo-Filho, G. A. S. and Melo, G. A. S. 1997. Redescricao e designação de lectótipos para duas espécies do gênero *Munida* Leach 1820 (Crustacea: Decapoda: Galatheidae) coletadas pelo U.S.F.C. "Albatross" (1885) no Golfo do México. *Papéis Avulsos de Zoologia*, 40 (12): 189-202.
- Melo-Filho and Melo, 2001. Espécies do gênero *Munida* Leach (Crustacea: Decapoda: Galatheidae), distribuídas na costa do Brasil. *Revista Brasileira de Zoologia*, 18 (4): 1135-1176.
- Milne-Edwards, A and Bouvier, E. L. 1894a. Considérations générales sur la famille des Galathéidés. *Annales des Sciences Naturelles, Zoologie Series*, 7 (16): 191-327.
- Moreira, C. 1901. Contribuições para o conhecimento da fauna brasileira. Crustáceos do Brasil. *Archivos do Museu Nacional do Rio de Janeiro*, 11: 1-51.
- Palacio, F. J. 1982. Revisión zoogeográfica marina del sur del Brasil. *Boletim do Instituto Oceanográfico*, 31 (1): 69-92.
- Pequegnat, L. H. and Pequegnat, W. E. 1970. Pp Deep-sea anomurans of superfamily Galatheoidea with descriptions of three new species 125-170. In W. E. Pequegnat & F. A. Chace, Jr. (eds.), Part 5 in *Contributions on the Biology of the Gulf of Mexico*. Texas A&M University Oceanographic Studies, 1.
- Springer, S. and Bullis Jr., H. R. 1956. Collections by the "Oregon" in the Gulf of Mexico. List of crustaceans, mollusks, and fishes identified from collections made by exploratory fishing vessel "Oregon" in the Gulf of Mexico and adjacent seas, 1950 through 1955. *Special Scientific Report United States Fisheries Fish and Wildlife Service*, 196: 1-134.
- Williams, A. B. 1984. Shrimps, lobsters and crabs of the Atlantic coast of the eastern United States, Maine to Florida. Washington, D.C., Smithsonian Institution Press. 550 p.

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