

Extension of the geographical distribution of some brachyuran and porcellanid decapods (Crustacea) to the coast of the State of São Paulo, Brazil

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ABSTRACT. Investigations of the distribution of marine organisms provide a better understanding of the patterns of distribution and dispersal of these animals. Extensions of the distributional limits of decapod crustaceans in Brazilian waters have been recorded steadily and gradually, but these limits still remain poorly understood. The present study provides information extending the known range of eight species of brachyuran crabs and one species of porcellanid crab. The animals were obtained by Scuba diving during a sampling program carried out near Vitória Island, Ilhabela, on the northeastern coast of the State of São Paulo (23°44'04"S-45°01'35"W) between February, 2004 and January, 2005. These new records extend the geographical distributions of the porcellanid *Petrolisthes amoenus* (Guérin Menéville, 1855), the majoids *Mithrax caribbaeus* Rathbun, 1920, *Mithrax verrucosus* H. Milne Edwards, 1832, *Nemausa acuticornis* (Stimpson, 1871) and *Teleophrys ornatus* Rathbun, 1901, and the xanthoids *Domecia acanthophora acanthophora* (Desbonne & Schramm, 1867), *Garthiope spinipes* (A. Milne Edwards, 1880), *Xanthodius denticulatus* (White, 1847) and *Xanthodius parvulus* (Fabricius, 1793) to the São Paulo coast. These new records may be related to different mechanisms of larval dispersal, larval transport by ballast water, or may simply be exceptional records.

KEY WORDS. Ballast water; Brachyura; dispersal; new record; Porcellanidae.

RESUMO. Extensão da distribuição geográfica de alguns decápodos braquiúros e porcelanídeos (Crustacea) para a costa do Estado de São Paulo, Brasil. Investigações sobre a distribuição de organismos marinhos proporcionam um melhor entendimento dos padrões de distribuição e dispersão desses animais. As ampliações dos limites de distribuição de crustáceos decápodos em águas brasileiras têm sido registradas de maneira constante e gradual, mas ainda permanecem pouco compreendidas. Este estudo fornece informações sobre a ampliação da distribuição de oito espécies de caranguejos braquiúros e uma espécie de caranguejo porcelanídeo. Os animais foram obtidos por meio de mergulho Scuba durante um programa amostral, realizado na região da Ilha da Vitória, Ilhabela, litoral norte paulista (23°44'04"S-45°01'35"W), entre fevereiro de 2004 e janeiro de 2005. Estes novos registros ampliam a distribuição geográfica do porcelanídeo *Petrolisthes amoenus* (Guérin Menéville, 1855), dos majóideos *Mithrax caribbaeus* Rathbun, 1920, *Mithrax verrucosus* H. Milne Edwards, 1832, *Nemausa acuticornis* (Stimpson, 1871) e *Teleophrys ornatus* Rathbun, 1901, além dos xantóideos *Domecia acanthophora acanthophora* (Desbonne & Schramm, 1867), *Garthiope spinipes* (A. Milne Edwards, 1880), *Xanthodius denticulatus* (White, 1847) e *Xanthodius parvulus* (Fabricius, 1793) para o litoral paulista. O recente registro dessas espécies pode estar relacionado com diferentes mecanismos de dispersão larval, transporte larval por meio de água de lastro ou ainda o registro tardio.

PALAVRAS-CHAVE. Água de lastro; Brachyura; dispersão; novo registro; Porcellanidae.

Decapod crustaceans represent one of the most important groups of the sublittoral benthic macrofauna on rocky coasts. On the entire American continent, about 2470 species of decapod crustaceans are known (BOSCHI 2000), of which approximately 300 brachyuran crabs and 23 porcellanid crabs have been recorded for the Brazilian coast (MELO 1996, 1999,

BERTINI *et al.* 2004). However, an evaluation of the exact distribution and the precise number of species that comprise the decapod fauna along the Brazilian coast in an arduous task, especially because of the steady increase in new records extending the range of these organisms (*e.g.* MELO 1990, MELO *et al.* 2000, RAMOS-PORTO *et al.* 2000, TARGINO *et al.* 2001, COBO *et al.*

2002, ALMEIDA *et al.* 2003, BEZERRA *et al.* 2005).

The superfamily Majoidea Samouelle, 1819 includes 6 families and 45 genera, containing a minimum of 80 species described for the Brazilian coast (MELO 1998, MARTIN & DAVIS 2001). The superfamily Xanthoidea MacLeay, 1838 remains in need of a thorough taxonomic and phylogenetic revision, and because of this, as suggested by MARTIN & DAVIS (2001), those species pertaining to this group must be treated as members of the old family Xanthidae *s.l.* Within the superfamily Galatheaidea Samouelle, 1819, the family Porcellanidae includes seven genera and 23 species which occur along the Brazilian coast (MELO 1999).

The present study provided information extending the known geographical distribution of species of brachyuran crabs, the majoids *Mithrax caribbaeus* Rathbun, 1920, *Mithrax verrucosus* H. Milne Edwards, 1832, *Nemausa acuticornis* (Stimpson, 1871) and *Teleophrys ornatus* Rathbun, 1901; the xanthoids *Domecia acanthophora acanthophora* (Desbonne & Schramm, 1867), *Garthiope spinipes* (A. Milne Edwards, 1880), *Xanthodius denticulatus* (White, 1847) and *Xanthodius parvulus* (Fabricius, 1793); and the porcellanid *Petrolisthes amoenus* (Guérin Menéville, 1855).

MATERIAL AND METHODS

The material examined was obtained in the course of a sampling program carried out in the region of Vitória Island off São Sebastião, the northeastern coast of the State of São Paulo (23°44'04"S, 45°01'35"W), between February 2004 and January 2005. The collections were made by Scuba diving, during the day, on the rocky sublittoral, at depths between 8 and 20 m. The sampling effort consisted of about two hours per month, by two divers.

During the laboratory procedure, the crabs collected were identified to species level and sexed, and the carapace width (CW) was measured at its widest point. The crabs were preserved in 70% ethanol, and deposited in the Carcinology Collection of the Museu de Zoologia da Universidade de São Paulo (MZUSP).

RESULTS

A total of eight species of Brachyura and one species of Anomura were identified, for which the southern limits of their geographical distribution were extended. Figure 1 indicates the distribution limit previously recorded for each species, as well as the location of the present record.

Mithracidae Balss, 1929

Mithrax caribbaeus Rathbun, 1920

Material examined. One specimen, juvenile male, CW = 4.8 mm. (MZUSP-16709)

Material obtained at: September 2004.

Distribution. Western Atlantic, Antilles, Venezuela and Brazil (from Bahia to Rio de Janeiro) (MELO 1996).

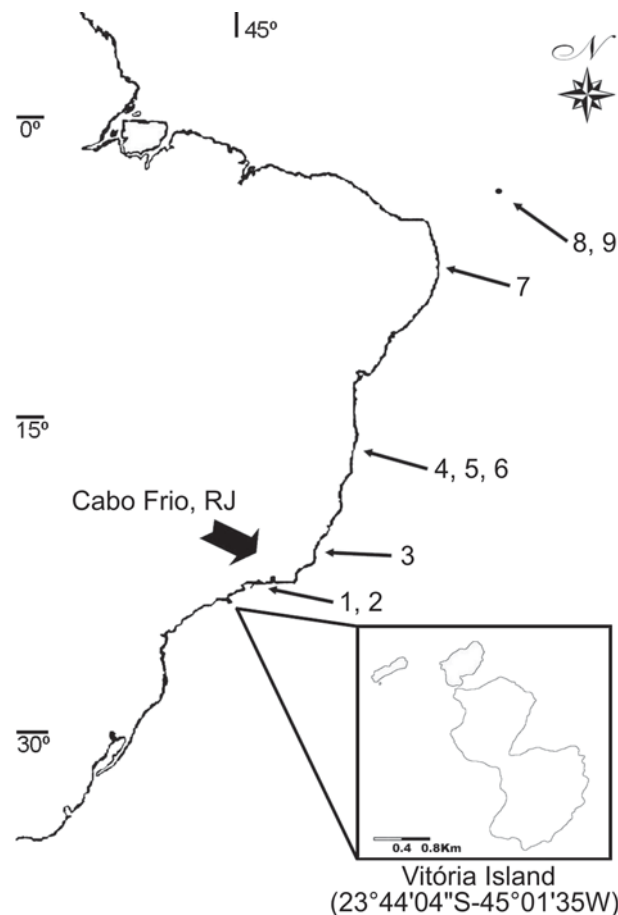


Figure 1. The previously known southern distributional limits of the species of Decapoda collected in this study. (1) *Mithrax caribbaeus*, (2) *Nemausa acuticornis*, (3) *Garthiope spinipes*, (4) *Petrolisthes amoenus*, (5) *Teleophrys ornatus*, (6) *Xanthodius denticulatus*, (7) *Domecia acanthophora acanthophora*, (8) *Mithrax verrucosus*, (9) *Xanthodius parvulus*.

Mithrax verrucosus H. Milne Edwards, 1832

Material examined. Three specimens: 1 juvenile male and 2 juvenile females, CW = 7.4, 5.0 and 6.4 mm respectively. (MZUSP-16708)

Material obtained at: December 2004.

Distribution. Western Atlantic, South Carolina, Florida, Gulf of Mexico, Antilles and Brazil (Fernando de Noronha and Rocas Atoll) (MELO 1996).

Nemausa acuticornis (Stimpson, 1871)

Material examined. Three specimens: 2 juvenile males and 1 juvenile female, CW = 4.5, 6.5 and 6.4 mm respectively. (MZUSP-16704)

Material obtained at: March, April and May 2004.

Distribution. Western Atlantic, North Carolina to Florida,

Gulf of Mexico, Antilles and Brazil (from Amapá to Rio de Janeiro) (MELO 1996).

Teleophrys ornatus Rathbun, 1901

Material examined. Two specimens, both ovigerous females, CW = 7.3 and 7.5 mm. (MZUSP-16706)

Material obtained at: May and June 2004.

Distribution. Western Atlantic, Gulf of Mexico, Antilles and Brazil (Bahia and Fernando de Noronha) (GOUVÊA 1986, MELO 1996).

Xanthidae *s.l.* MacLeay, 1838

Domecia acanthophora acanthophora (Desbonne & Schramm, 1867)

Material examined. Two specimens: 1 adult female and 1 ovigerous female, CW = 10.2 and 9.8 mm respectively. (MZUSP-16705)

Material obtained at: October and December 2004.

Distribution. Western Atlantic, North Carolina, Bermuda, Florida, Gulf of Mexico, Antilles, northern South America and Brazil (St Paul's Rocks, Rocas Atoll, Fernando de Noronha, Ceará, Paraíba and Pernambuco) (MELO 1996, COELHO-FILHO 2006).

Garthiope spinipes (A. Milne Edwards, 1880)

Material examined. One specimen, adult male, CW = 9.8 mm. (MZUSP-16711)

Material obtained at: July 2004.

Distribution. Western Atlantic, Bermuda, Florida, Gulf of Mexico, Venezuela and Brazil (from Amapá to Espírito Santo) (MELO 1996).

Xanthodius denticulatus (White, 1847)

Material examined. One specimen, adult female, CW = 21.9 mm. (MZUSP-16710)

Material obtained at: May 2004.

Distribution. Western Atlantic, Bermuda, Florida, Gulf of Mexico, Antilles, Venezuela and Brazil (St Paul's Rocks, and from Ceará to Bahia) (MELO 1996).

Xanthodius parvulus (Fabricius, 1793)

Material examined. One specimen, adult female, CW = 6.6 mm. (MZUSP-16707)

Material obtained at: November 2004.

Distribution. Western Atlantic, Bermuda, Florida, Gulf of Mexico, Antilles, Venezuela and Brazil (Rocas Atoll and Fernando de Noronha) (MELO 1996).

Porcellanidae Haworth, 1825

Petrolisthes amoenus (Guérin Menéville, 1855)

Material examined. Five specimens: 2 adult females, 1 ovigerous female and 2 adult males, CW = 4.0, 9.8, 5.3, 6.2 and 7.4 mm respectively. (MZUSP-16713)

Material obtained at: May and June 2004.

Distribution. Western Atlantic, Florida, Antilles, Colombia, Venezuela and Brazil (from Maranhão to Bahia) (MELO 1999).

DISCUSSION

According to BOSCHI (2000), the Brazilian coast can be divided into two biogeographical provinces: the Argentinian, from 43-44°S (Rawson, Chubut, Argentina) to 23°S (Cabo Frio, Rio de Janeiro); and the Brazilian, from 23°S (Cabo Frio, Rio de Janeiro) to 8°56'N (Orinoco River, Venezuela). These provinces are separated by an ecological barrier.

Biogeographical barrier are, generally, difficult areas to detect and can be characterized by marked changes in the intensity of ecological factors. The region of Cabo Frio on the coast of the State of Rio de Janeiro is an upwelling area, and can act as a filter for thermophilic species. However, the influence of the cold water mass in the coastal region of Cabo Frio is variable, principally as a function of wind direction (IKEDA *et al.* 1974, IKEDA 1976, MATSUURA 1986).

The São Paulo coast is treated by many investigators as an area of transition, hydrologically as well as faunistically. The fauna of transition areas, being inhabited by a mixed fauna originating from the adjacent provinces, generally shows relatively low rates of endemism (MELO 1990). The degree of penetration of the species from adjacent provinces into these transition regions depends on the level of seasonal climate variations and on the capacity of these species to tolerate these environmental changes.

The broadening of the geographical limits of *P. amoenus*, *M. verrucosus*, *T. ornatus*, *D. acanthophora acanthophora*, *G. spinipes*, *X. denticulatus* and *X. parvulus* to the São Paulo coast must be evaluated with great care, for two main reasons: the great distance between the previous known limit and the new record reported herein, and the present occurrence of these species in the Argentine Province, passing beyond the Cabo Frio region. The record of these species in the region in question may be a result of natural larval dispersal along with the Brazil Current south of the Cabo Frio region, due to larval tolerance to the low temperature characteristic of the region, or even passing Cabo Frio at times of year in which there is no influence of cold-water upwelling, indicating that these records are exceptional. However, the appearance of a broad hiatus in the geographical distribution of some of these species suggests larval transport by ballast water, as well good investigated by TAVARES & AMOUROUX (2003) and TAVARES & MENDONÇA JR. (2004) or, in the last analysis, the lack of investigations of the biodiversity of those regions where the hiatuses occur.

The occurrence of *N. acuticornis* and *M. caribbaeus* on the São Paulo coast represents a very small range extension, to within the geographical limits of the Argentinian Province, which allows us to infer that this is merely an exceptional record for this specific region. However, the aspects discussed above lead us to suppose that the distribution of all of the species mentioned in this work must be broader than was indicated by this study.

Continual investigations of the decapod community and the use of alternative collecting techniques, as well as studies along the entire Brazilian coast, will provide a better under-

standing of species distributions, as well as of the richness of the decapod fauna in Brazilian waters, improving our knowledge of these crustaceans.

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