Occurrence of shrimp species (Crustacea: Decapoda: Natantia: Penaeidea and Caridea) in Ubatuba Bay, Ubatuba, SP, Brazil

Rogério Caetano da Costa, Adilson Fransozo, Fernando Luis Medina Mantelatto, and Rodrigo Hebeller Castro

(RCC, AF, RHC) Departamento de Zoologia, Instituto de Biociências, “Campus” de Botucatu, Universidade Estadual Paulista (UNESP), CEP. 18618-000, Botucatu (SP), Brasil, e-mail: fransozo@ibb.unesp.br;
(FLMM) Departamento de Biologia—Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto, Universidade de São Paulo (USP), Av. Bandeirantes, 3900, CEP. 14040-901, Ribeirão Preto (SP), Brasil, e-mail: flmantel@spider.usp.br

Abstract.—The species composition of Penaeidea and Caridea shrimp was studied in Ubatuba Bay, São Paulo, Brazil. Samples were taken monthly from September 1995 to August 1996, using two double-rig trawling nets. A total of 21 marine shrimps species were obtained, belonging to eight families. Sergestoids were represented by a single species of Sergestidae, while penaeoids comprised three families, Penaeidae, Sicyoniidae and Solenoceridae. Caridea shrimps belonged to two superfamilies, the Palaemonoidea, represented by Palaemonidae; and Alpheoidea by three families, Alpheidae, Ogyrididae and Hippolytidae. 

Sicyonia laevigata Stimpson, 1871 and Nematopalaemon schmitti (Holthuis, 1950) represent first records in São Paulo State, Brazil.

Seven families of Dendrobranchiata shrimps, represented by 26 genera and 61 species, have been reported for the Brazilian Coast (D’Incao 1995). For the Pleocyemata, Holthuis (1993) listed 15 caridean superfamilies and 31 families. Among these, most representatives belonged to Alpheoidea and Palaemonoidea with 38 and 48 species, respectively (Ramos-Porto 1986, Holthuis 1993). Taxonomic information on Dendrobranchiata and Caridea species found in the Brazilian coast is scant (Corrêa 1977; Christoffersen 1979, 1982; Bond-Buckup & Buckup 1989, D’Incao 1995). Most of the studies dealing with the biodiversity of this group have focused on biological aspects of these organisms (Iwai 1973, Abreu 1980, Pires 1992, Nakagaki et al. 1995). The objective of the present study is to determine the composition of marine shrimp species (Dendrobranchiata and Caridea) in Ubatuba Bay, northern coast of São Paulo State, in order to contribute to a better assessment of local marine biodiversity.

Material and Methods

Ubatuba Bay is located on the northern part of São Paulo State (23°25'00" to 23°27'34"S and 45°00'30" to 45°03'30"W), where the coastline consists of several inlets and major bays. According to Castro Filho et al. (1987), this region is affected by three water masses, with different distributional patterns in the summer and winter. Coastal Water (CW) has a high temperature and low salinity (T > 20°C, S < 36‰) Tropical Water (TW) has both a high temperature and salinity (T > 20°C, S > 36‰), and South Atlantic Central Water (SACW) has both a low temperature and salinity (T < 18°C, S < 36‰) following an annual cycle. The dynamics of these currents are responsible for seasonal alterations of temperature, salinity and nutrients concentrations. Ubatuba Bay can be divided into an inner and an outer section. The inner section is affected by direct fresh water drainage from four small...
rivers (Indaiá, Grande de Ubatuba, Lagoa and Acará) and consequently receives a continuous input of domestic sewage and considerable deposition of organic matter. The outer section is exposed to oceanic influence. Detailed descriptions of environmental factors of the Bay, and the study site characteristics can be found in Mantelatto & Fransozo (1999).

Samples were obtained on a monthly basis from September of 1995 to August of 1996. A shrimp fishery boat supplied with 3.5 m-opening double-rig trawling nets was used. The mesh size was 12 mm except in the cod end where it was 10 mm.

Dendrobranchiata shrimps were identified according to D’Incao (1995) and Pérez Farfante (1997). In the case of juvenile specimens of Farfantepenaeus Burukovsky, 1997, the morphology of the last abdominal somite was used for identification as described by Pérez Farfante (1969) and F. D’Incao, pers. comm.

Results

The material obtained contains eight families and 21 species. The Sergestoidea were represented by a single sergestid species. Species belonging to Penaeidae, Sicyoniidae and Solenoceridae were also collected (Table 1). Among the carideans, representatives of two superfamilies were found. Palaemonoidea was represented by the study area by the family Palaemonidae, while the Alpheoidea comprised alpheids, ogyridids and hippolytids (Table 2).

Discussion

This study was restricted to a survey of the soft-sediment bottoms of Ubatuba Bay which is a small area compared to the vast Brazilian coast. This region is located at the Paulista biogeographic Province which comprises the coastal region between Espírito Santo and Santa Catarina States. The mixed feature of the fauna of this region can be explained by the thermal regime of the waters, which can harbor tropical, temperate and subtartaric species (Coelho & Ramos 1972). Nevertheless, Melo (1985) based on the low level of endemism, asserts that the southeastern-south littoral of Brazil does not represent a faunal Province, but a transition area.

The finding of S. laevigata and N. schmitti is of significance as they represent first records of these species in the State of São Paulo.

The total number of species of Dendrobranchiata now known to occur in São Paulo State is 19. Species not found during our survey include four penaeoideans, such as Solenocera necopina Burkenroad, 1939, Solenocera atlantidis Burkenroad, 1939, Mesopenaeus tropicalis (Bouvier, 1905), and Parapenaeus americanus Rathbun, 1901; and three sergestoideans, Lucifer faxoni Borradaile, 1915, Lucifer typus H. Milne Edwards, 1837, and Sergia robusta (Smith, 1882).

Parapenaeus americanus is a species know to occur at depths of 50 to 70 m, much below the deepest trawl performed during the present survey in Ubatuba Bay (up to 17 m). Previous records of S. necopina, S. atlantidis and M. tropicalis in this region were considered atypical (Pires 1992), and this has been confirmed in our survey. Using a lower sampling effort and avoiding rocky coast areas, Nakagaki et al. (1995) did not find S. laevigata, S. parri and F. paulensis in Ubatuba Bay.

Considering the presence of N. schmitti, the number of palaemonid species in São Paulo State is now 14, including freshwater and estuarine species. Five of these are considered common marine species but only two were found during this study, N. schmitti and L. paulensis.

According to Bond-Buckup & Buckup (1989), P. pandaliformis preferably inhabits fresh or brackish water environments. However, Ramos-Porto (1986) occasionally found this species in marine habitats. During the present study, two specimens of P. pandaliformis were collected near the drainage of a river. Low-salinity conditions
Table 1.—List of shrimp species of Dendrobranchiata collected in the Ubatuba Bay. (SW = shallow water; PE = pelagic zone).

<table>
<thead>
<tr>
<th>Species</th>
<th>Distribution</th>
<th>Depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sergestidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetes americanus Ortmann, 1893</td>
<td>Western Atlantic: Guyana, Puerto Rico to Brazil (from Pará to Rio Grande do Sul).</td>
<td>PE to 40</td>
</tr>
</tbody>
</table>

Penaeidae

Zapantepeanaebrasiliensis (Latreille, 1817) Western Atlantic: USA (Cape Hatteras, North Carolina) to Brazil (from Amapá to Rio Grande do Sul). SW to 366
Farfantepeanaepaulensis (Pérez Farfante, 1967) Western Atlantic: Brazil (from Bahia to Rio Grande do Sul) to Argentina (Mar del Plata). SW to 150
Litopenaeus schmitti (Burkenroad, 1936) Western Atlantic: Baia de Matanzas, Cuba to Brazil (from Amapá to Rio Grande do Sul). SW to 50
Artemesia longinaris Bate, 1888 Western Atlantic: Brazil (from Rio de Janeiro to Rio Grande do Sul) to Argentina (province of Chubut). 2 to 125
Rimapenaeus constrictus (Stimpson, 1874) Western Atlantic: USA (Chesapeake Bay, Virginia) to Brazil (from Amapá to Santa Catarina). 1.5 to 127
Xiphopenaeus kroyeri (Heller, 1862) Western Atlantic: USA (Virginia) to Brazil (from Amapá to Rio Grande do Sul). SW to 70

Solenoceridae

Pleoticus muelleri (Bate, 1888) Western Atlantic: Brazil (from Espírito Santo to Rio Grande do Sul) to Argentina (Santa Cruz). SW to 600

Sicyoniidae

Sicyonia dorsalis Kingsley, 1878 Western Atlantic: USA (Cape Hatteras, North Carolina) to Brazil (from Amapá to Santa Catarina). 3 to 420
Sicyonia typica (Boeck, 1864) Western Atlantic: USA (North Carolina) to Brazil (from Amapá to Rio Grande do Sul). SW to 100
Sicyonia laevigata Stimpson, 1871 Western Atlantic: USA (Beaufort, North Carolina) to Brazil (from Amapá to Rio Grande do Sul). SW to 100
Sicyonia parri (Burkenroad, 1934) Western Atlantic: USA (North Carolina) to Brazil (from Maranhão to São Paulo). SW to 87

Alpheoids are represented by 23 species in the State of São Paulo, of which six were obtained during our study. Ogyrides alpherostris occurs preferably in estuaries and was also found with A. floridanus and E. oplophoroides in marine habitats. Alpheus intrinsecus is commonly found in protected embayments areas (Christoffersen 1979, 1980, 1982). The occurrence of the alpheid A. bouvieri was also presumably atypical because this species lives in the intertidal zone, frequently in rocky crevices or associated to sand colonies of tubicolous polychaetes belonging to the genus Phragmatopoma Mörch, 1863 (Christoffersen 1979).

Based on data from this study and on others research (Franzo et al. 1992, 1998; Negreiros-Franzo et al. 1997) we can infer that Ubatuba Bay represents an important site in the establishment and development of diverse marine shrimp populations. Continuing studies of inshore and offshore areas will provide a more accurate characterization of the diversity of the region.

Acknowledgments

For financial support we are grateful to the "Fundação de Amparo à Pesquisa do Es-
Table 2.—List of shrimp species of Caridea collected in the Ubatuba Bay. (SW = shallow water; FW = fresh water; IT = intertidal zone; BW = brackish water).

<table>
<thead>
<tr>
<th>Species</th>
<th>Distribution</th>
<th>Depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PALAEOMONOIDA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PALAEMONIDAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Leander paulensis</em> Ortmann,</td>
<td>Western Atlantic: USA (Florida) and Brazil (from Maranhão to São Paulo).</td>
<td>SW to 16</td>
</tr>
<tr>
<td>1897</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Nematopalaeon schmitti</em></td>
<td>Western Atlantic: Guyana and Brazil (from Amapá to São Paulo).</td>
<td>SW to 60</td>
</tr>
<tr>
<td>(Holthuis, 1950)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Palaemon pandaliformis</em></td>
<td>Western Atlantic: Antilles, northern South America and Brazil (from Rio Grande do Norte to Rio Grande do Sul).</td>
<td>SW, FW, and BW</td>
</tr>
<tr>
<td>(Stimpson, 1871)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ALPHEOIDEA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ALPHEIDAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Alpheus intrinsecus</em> Bate,</td>
<td>Western Atlantic: Tobago, Puerto Rico and Brazil (from Ceará to Santa Catarina). Eastern Atlantic: Western Sahara to Zaire.</td>
<td>IT to 40</td>
</tr>
<tr>
<td>1888</td>
<td>Western Atlantic: Bahamas, USA (southeastern Florida), Mexico (Veracruz). Gulf of Mexico, Cuba, Haiti, Puerto Rico, Antigua, Guadeloupe, Bonaire, Curaçao and Brazil (Atol das Rocosas and from Bahia to Rio Grande do Sul).</td>
<td>IT to 78–81</td>
</tr>
<tr>
<td><em>Alpheus floridanus</em> Kingsley,</td>
<td>Western Atlantic: Bermuda, USA, Cat Cay, Barbuda to Tobago Cays, Panama and Brazil (Alagoas and from Espírito Santo to Santa Catarina).</td>
<td>IT to 2</td>
</tr>
<tr>
<td>1878</td>
<td>Western Atlantic: Bermuda, USA (east coast of Florida), Cuba, Antigua to Tobago, Aruba and Brazil (Fernando de Noronha and from Ceará to Rio Grande do Sul).</td>
<td>IT, between rocky</td>
</tr>
<tr>
<td><em>Alpheus nuttingi</em> Schmitt,</td>
<td>Western Atlantic: Bermuda, USA (North and South Carolina, Eastern Florida, Gulf Coast and Louisiana), Dominican Republic and Brazil (Pará and from Rio de Janeiro to Rio Grande do Sul).</td>
<td>0–0.30 to 52</td>
</tr>
<tr>
<td>1924</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Alpheus bouvieri</em> A. Milne-</td>
<td>Western Atlantic: Bermuda, USA (from Virginia to South Carolina, Eastern Florida, Gulf Coast and Louisiana), Dominican Republic and Brazil (Pará and from Rio de Janeiro to Rio Grande do Sul).</td>
<td>0–0.30 to 52</td>
</tr>
<tr>
<td>Edwards, 1878</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OGYRIDIDAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Ogyrides alphaerostris</em></td>
<td>Western Atlantic: USA (North and South Carolina, Georgia, Texas), Guyana, and Brazil (from Amapá to Pernambuco and from Espírito Santo to Rio Grande do Sul) to Uruguay.</td>
<td>5 to 45</td>
</tr>
<tr>
<td>(Kingsley, 1880)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HIPPOLYTIDAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Exhippolysmata opalophoroides</em></td>
<td>Western Atlantic: USA (North and South Carolina, Georgia, Texas), Guyana, and Brazil (from Amapá to Pernambuco and from Espírito Santo to Rio Grande do Sul) to Uruguay.</td>
<td>5 to 45</td>
</tr>
<tr>
<td>(Holthuis, 1948)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We are thankful to Dr. Gustavo Augusto S. Melo, Zoology Museum of the University of São Paulo, Brazil, for confirmed an identification of caridean shrimps, and also Drs. Jack O’Brien and Fernando P. L. Marques for their constructive comments on early drafts of the manuscript. We are also thankful to the NEBECC (Group of Studies on Crustacean Biology, Ecology and Culture) co-workers for their help during field work. All experiments conducted in this study comply with current applicable state and federal laws.
Literature Cited


Bate, C. S. 1888. Report on the Crustacea Macrura collected by the 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 24:i-xc + 942.


Kingsley, J. S. 1878. Notes on the North American


