Shallow-water caridean shrimps from southern Bahia, Brazil, including the first record of *Synalpheus ul* (Ríos & Duffy, 2007) (Alpheidae) in the southwestern Atlantic Ocean

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Table of contents

Abstract .................................................................................................................. 2
Introduction ........................................................................................................... 2
Material and methods .......................................................................................... 3
Results .................................................................................................................... 5
Taxonomy .............................................................................................................. 5
Infraorder Caridea Dana, 1852 ........................................................................... 5
Family Palaemonidae Rafinesque, 1815 ............................................................. 5
  Brachycarpus biunguiculatus (Lucas, 1846) ....................................................... 5
  Cualetes americanus (Kingsley, 1878) ............................................................... 5
  Leander paulensis Ortmann, 1897 .................................................................... 6
  Macrobrachium acanthurus (Wiegmann, 1836) ................................................. 6
  Palaemon northropi (Rankin, 1898) ................................................................. 6
  Palaemon pandaliformis (Stimpson, 1871) ...................................................... 7
  Urocaris longicaudata Stimpson, 1860 ............................................................. 7
Family Alpheidae Rafinesque, 1815 ................................................................. 7
  Alpheus bouvieri A. Milne-Edwards, 1878 .................................................... 8
  Alpheus chacel Carvacho, 1979 ..................................................................... 9
  Alpheus cristulifer Rathbun, 1900 ................................................................ 10
  Alpheus estuariensis Christoffersen, 1984 .................................................... 10
  Alpheus formosus Gibbes, 1850 ..................................................................... 10
  Alpheus heterochaelis Say, 1818 .................................................................. 11
  Alpheus intrinsecus Spence Bate, 1888 .......................................................... 11
  Alpheus cf. packardi Kingsley, 1880 .............................................................. 11
  Alpheus cf. paracrinitus Miers, 1881 ............................................................... 12
  Alpheus pontederiae de Rocheburne, 1883 .................................................... 13
  Alpheus cf. rostratus W. Kim & Abele, 1988 .................................................. 13
  Automate cf. evermanni Rathbun, 1901 .......................................................... 13
  Leptalpheus axianassae Dworschak & Coelho, 1999 ...................................... 15
  Leptalpheus aff. forcipus Williams, 1965 ...................................................... 15
  Salmoneus carvachoi Anker, 2007 .................................................................. 15
  Synalpheus apioceros Coutière, 1909 .............................................................. 18
  Synalpheus cf. brevicarpus (Herrick, 1891) ..................................................... 18
  Synalpheus frizmuelleri Coutière, 1909 .......................................................... 18
  Synalpheus ul (Ríos & Duffy, 2007) ............................................................... 19
Family Hippolytidae Spence Bate, 1888 ................................................................. 23  
Hippolyte obliquimanus Dana, 1852 .................................................................. 23  
Lauretus parvulus (Stimpson, 1871) .................................................................. 23  
Lysmata cf. intermedia (Kingsley, 1878) ............................................................. 23  
Merguia rhizophorae (Rathbun, 1900) ............................................................... 24  
Thor Manningi Chace, 1972 .................................................................................. 24  
Superfamily Procesoidea Ortmann, 1896 ........................................................ 24  
Family Processidae Ortmann, 1896 .................................................................. 24  
Ambidexter symmetricus Manning & Chace, 1971 ........................................ 24  
Discussion ............................................................................................................. 26  
Acknowledgements ............................................................................................. 29  
References ............................................................................................................ 30  

Abstract

In this contribution, we report 33 species of shallow-water marine and estuarine caridean shrimps from southern Bahia, Brazil. Nine taxa are reported for the first time from Bahia: the alpheids Alpheus cf. paracrinus Miers, 1881, Alpheus cf. rostratus W. Kim & Abele, 1988, Automate cf. evermanni Rathbun, 1901, Leptalpheus aff. forceps Williams, 1965, Leptalpheus axianassae Dworschak & Coelho, 1999, Salmonus carvachoi Anker, 2007 [previously reported as Salmonus cf. ortmanni (Rankin, 1898)] and Synalpheus ul (Rios & Duffy, 2007) (previously reported as Synalpheus cf. pandionis Coutière, 1909); the hippolytid Thor Manningi Chace, 1972; and the processid Ambidexter symmetricus Manning & Chace, 1971. Synalpheus ul is reported for the first time in the South Atlantic Ocean, significantly extending its southern limit in the western Atlantic, and is illustrated herein. The presence of Alpheus bouvieri A. Milne-Edwards, 1878, A. cristulifrons Rathbun, 1900 and A. formosus Gibbes, 1850 in Bahia is confirmed. The southern range limit of the hippolytid Merguia rhizophorae (Rathbun, 1900) is extended from the Mamo River, Ilhéus (14°35'05.6"S; 39°03'10.5"W) to Barra do Cahy, Prado (17°00'45.0"S; 39°10'21.0"W).

Key words: Caridea, Palaemonidae, Alpheidae, Hippolytidae, Processidae, first records

Introduction

With 3438 species described so far, caridean shrimps represent the largest group among shrimp-like decapods and the second most diverse decapod infraorder after Brachyura (De Grave & Fransen 2011). Caridean shrimps are ecologically diversified occurring from tropical to polar regions, in intertidal, subtidal and pelagic habitats, on hard and soft bottoms as epi- or infaunal organisms, on algae and seagrass, or in symbiosis with other animals (Bauer 2004). They also successfully colonized freshwater environments (655 described species), where they occur in a wide variety of habitats from mountain streams to ancient lakes and estuaries (De Grave et al. 2008).

Studies on the taxonomic composition of the caridean fauna of the Brazilian state of Bahia have been few and sporadic. The coastline of Bahia is over 1100 km in extent, comprising more than 12% of the Brazilian coast. This long tropical coastline includes a great diversity of coastal environments that presumably shelter a diverse fauna, which is still only fragmentarily described. The first project that intensively and systematically surveyed the decapod crustacean fauna in Bahia was realized in 2003 (Almeida et al. 2010). The first mentioning of a coastal caridean species from Bahia was that of Smith (1869), who reported A. armillatus H. Milne Edwards, 1837 [in H. Milne Edwards, 1834–1840] (as A. heterochaelis Say, 1818, see Christoffersen 1984) among material collected by the geologist C.F. Hartt in 1867, mainly in the Abrolhos Archipelago and Caravelas. Spence Bate (1888) reported three caridean species collected off Salvador during the Challenger Expedition, including Alpheus intrinsecus Spence Bate, 1888. Coutière (1909), in his important publication on the American snapping shrimp genus Synalpheus Spence Bate, 1888, reported three species from Bahia, based on materials from C.F. Hartt expeditions. A new subspecies of S. minus (Say, 1818) was designated, S. minus bahiensis Coutière, 1909, with the type locality in Plataforma, near Salvador. Several decades passed with apparently no other reports of carideans from Bahia. Gomes Corrêa (1972) compiled information on Decapoda of the Abrolhos Archipelago, adding to the list material collected by the staff of the Museu Nacional, Universidade Federal do Rio de Janeiro. Coelho & Ramos (1972), in a study on decapods from the east coast of South America between 5°N and 39°S, listed 12 caridean species from Bahia. Christoffersen (1979) examined material of 19
species from Bahia (Alpheidae, Ogyrididae, Hippolytidae, Processidae), all collected by the French vessel Calypso in 1961–62. Several stations were sampled along the coast of Bahia by REVIZEE (Avaliação do Potencial Sustentável de Recursos Vivos na Zona Econômica Exclusiva) Program Central Score. The caridean material collected during Cruises V (2001) and VI (2002) (R/V Astro Garoupa, Petrobrás), between 50 and 100 m, was reported in Serejo et al. (2006). The REVIZEE Program’s Cruises Bahia I (1999) and II (2000) (R/V Thalassa, France) brought back a collection of various deep-water carideans (Serejo et al. 2007). A few studies on specific shrimp families include material from Bahia, for instance on the Pasiphaeidae (Tavares & Cardoso 2006), Oplophoridae (Cardoso & Young 2005), Glyphocrangonidae (Komai 2004) and Pandalidae (Cardoso 2009, 2011; Rego & Cardoso 2010). In addition, some estuarine Palaemoninae from Bahia were reported by Ferreira et al. (2010).

Between 2003 and 2008, several projects sponsored by the Universidade Estadual de Santa Cruz in Ilhéus, Bahia (UESC), were carried out to survey the crustacean fauna in coastal areas of the southern part of the state. Previous studies, which were limited to Ilhéus and Camamu Bay, resulted in several new records of shallow-water carideans in Bahia (Almeida et al., 2006; 2007a; 2007b), and the description of a new palaemonid species, Neopontonides brucei Fransen & Almeida, 2009 (Fransen & Almeida, 2009). The objective of the present study is to determine the taxonomic composition of Caridea in shallow marine and estuarine waters of southern Bahia, and to provide some basic ecological data for the species encountered.

Material and methods

Most of the material examined in this study was collected during the projects “Inventariamento da Fauna de Crustáceos Decápodos do Município de Ilhéus, Bahia” (2003–2005) and “Diversidade de Crustáceos do Sudeste e Sul da Bahia, Brasil: I. Ambientes Costeiros” (2006–2008). The sampling methods during the first project in the estuaries of Ilhéus were described by Almeida et al. (2006). In the second project, the study area extended from Cairu (13°34’S; 38°54’W) to Mucuri (18°05’S; 39°33’W) in the southernmost part of the state, on the border with Espírito Santo (Fig. 1). Collection activities were approximately trimestral and covered almost all the coastal municipalities. Samples were qualitative, with no standardization effort, and were conducted in the intertidal and shallow subtidal zones during spring low tides. The most common method used to collect specimens was manual capture. Shrimps were sought in various marine and estuarine microhabitats, such as burrows in sand and mud, decomposing leaves and branches, among roots and trunks of mangrove trees, on and under rocks, among fouling growth on jetties, on algae, on coral rubble, and finally on other marine invertebrates. The infauna was sampled with a PVC suction pump 50 mm in diameter. At the time of capture, data on bottom type and salinity (measured with an optical refractometer) were recorded.

The list of species collected at each sampling station is given in Appendix 1. Geographical range, including previous records in Bahia, as well as ecological notes (field observations), are provided for each of the 33 species reported herein. In the material examined section, the state municipalities are listed from north to south. A survey of all previous records of Caridea from Bahia was performed through an exhaustive analysis of literature published through 2011. Unpublished monographs, dissertations, theses, and meeting communications were not included, nor were publications on general biology and fisheries. Comments on taxonomy (including recent taxonomic changes), currently known geographical range, and historical aspects were added where appropriate. The classification adopted here follows De Grave & Fransen (2011). Within each family, species are listed in alphabetical order.

All the material reported in this study is deposited in the crustacean collection of the Museu de Zoologia, Universidade Estadual de Santa Cruz, Ilhéus, Bahia, Brazil (MZUESC). Comparative material was examined at the Muséum national d’Histoire naturelle, Paris, France (MNHN). Drawings were made with the aid of a stereomicroscope equipped with a drawing tube. Carapace length (CL) was measured from the tip of the rostrum to the posterior margin of the carapace. Abbreviations used in the text: (f)—female; (juv)—juvenile; (m)—male; (ni)—sex not identified; (T)—transect; (CL)—carapace length.
FIGURE 1. Location of the study area in southern Bahia, eastern Brazil. Horizontal bars indicate the northern (Cairú) and southern (Mucuri) limits. (CB) Camamu Bay, (RCB) Royal Charlotte Bank, (TSB) Todos os Santos Bay, (CS) outer border of the continental shelf. The main rivers are underlined. Scale bar: 100 km.
Results

Taxonomy

Infraorder Caridea Dana, 1852

Family Palaemonidae Rafinesque, 1815

*Brachycarpus biunguiculatus* (Lucas, 1846)

*Palaemon biunguiculatus* Lucas, 1846: 45, pl. 4, figs. 4–4a.

**Material examined.** 1 m, 05.V.2008, Itacaré, Concha Beach, mouth of Contas River, MZUESC 1202.


**Ecological notes.** The single individual was collected on a sandy bottom in a tide pool together with *Palaemon northropi* (Rankin, 1898), in a salinity of 25 psu (area under influence of the Contas River mouth). Depth range: intertidal to 105 m (Ramos-Porto & Coelho 1998).

**Previous records.** Salvador (Coelho 1969a, as *B. biunguiculatus*); locality not informed (Coelho & Ramos-Porto 1972, as *Brachycarpus* sp.; Ramos-Porto & Coelho 1990, as *B. biunguiculatus*); REVIZEE Program Central Score (18°02′70″S, 37°19′74″W; 16°47′13″S, 38°41′48″W, and 13°38′98″S, 38°45′94″W) (Cardoso 2006, as *B. biunguiculatus*; Ferreira et al. 2010, as *B. biunguiculatus*); REVIZEE Program Central Score (St. C5-2R, C5-13R, and C5-16R) (Serejo et al. 2006, as *B. biunguiculatus*); REVIZEE Program Central Score (16°19′55″S, 38°14′39″W) (Ferreira et al. 2010, as *B. biunguiculatus*).

**Remarks.** In the sampling conducted during the REVIZEE Program Central Score, *B. biunguiculatus* was found at stations with depths ranging from 50 to 100 m (C5-2R, C5-13R, and C5-16R) and at stations C5-4F and C5-7F, to which were attributed much greater depths of 1700 to 1500 m, respectively (Serejo et al. 2006). As the latter depths are far beyond the usual depth limit of this species, it is likely that either collection station or depth attributions in Serejo et al. (2006) were erroneous.

*Cuapetes americanus* (Kingsley, 1878)

*Anchistia americana* Kingsley, 1878: 96.

**Material examined.** 6 m, 8 f, 01.VIII.2008, Cairú, Triana River, Boipeba Island, MZUESC 1264; 4 m, 10 f, 02.VIII.2008, Cairú, Moreré Beach, Boipeba Island, MZUESC 1289; 1 m, 3 f, 02.VIII.2008, Cairú, Moreré Beach, Boipeba Island, MZUESC 1290; 2 f, 02.VIII.2008, Cairú, Moreré Beach, Boipeba Island, MZUESC 1291; 2 m, 4 f, 03.VIII.2008, Cairú, Tassimirim Beach, Boipeba Island, MZUESC 1317; 1 m, 05.V.2008, Itacaré, Concha Beach, mouth of Contas River, MZUESC 1203; 1 f, 1 ni, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 862; 1 m, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 863; 2 m, 3 f, 07.III.2008, Santa Cruz Cabrália, mouth of João de Tiba River (sandstone reef), MZUESC 1151; 2 f, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 896; 2 m, 2 f, 4 juv, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 897; 2 ni, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 898; 3 m, 1 f, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 899; 1 m, 1 f, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 900; 1 m, 1 f, 23.XL2007, Prado, Cumuruxatiba Beach, MZUESC 1060; 1 ni (damaged), 19.III.2007, Nova Viçosa, Pontal da Barra Beach, St. 3, MZUESC 829.

**Distribution.** Western Atlantic—North Carolina to western Gulf of Mexico, West Indies and Brazil (Atol das Rocas, seamounts of North Brazilian Chain, and from Amapá to São Paulo) (Williams 1984, as *Periclimenes americanus*; Ramos-Porto & Coelho 1998, as *P. americanus*).
Ecological notes. In estuaries (under branches on mud bottom), on reefs and rocky shores, under rocks covered with algae and hydrozoans and in rock crevices; in concretions of calcareous algae, among barnacles on jetties and on live coral. Salinity range: 24–39 psu. Depth range: intertidal to 105 m (Ramos-Porto & Coelho 1990, as *P. americanus*).

Previous records. Camamu Bay (Almeida *et al*. 2007b, as Kemponia americana); Salvador (Vieira *et al*. 2012).

**Leander paulensis** Ortmann, 1897

*Leander paulensis* Ortmann, 1897: 192, pl. 1, fig. 14.


Distribution. Western Atlantic—Florida, West Indies, and Brazil (Maranhão to São Paulo) (Ramos-Porto 1986).

Ecological notes. On drifted algae on sandy bottom (shallow subtidal); associated with an unidentified hydrozoan; also, on rocky bottom. Salinity range: 35–38 psu.

Previous records. locality not informed (Ramos-Porto 1986; Ramos-Porto & Coelho 1990); Ilhéus (Almeida *et al*. 2006, 2007a); Camamu Bay (Almeida *et al*. 2007b); Caravelas (Ferreira *et al*. 2010).

**Macrobrachium acanthurus** (Wiegmann, 1836)

*Palaemon acanthurus* Wiegmann, 1836: 150.


Distribution. North Carolina to Texas, Mexico, Cuba, Haiti, Dominican Republic, Puerto Rico, Nicaragua, Panama, Colombia, Venezuela, Suriname and Brazil (Pará to Rio Grande do Sul) (Melo 2003).

Ecological notes. Juveniles were collected in the mangrove of Acuípe River, at low tide, in pools among roots of *Rhizophora mangle*. The specimen from the Almada River estuary, a young female (MZUESC 560) (see Almeida *et al*. 2006), was found among roots of the water hyacinth *Eichhornia crassipes*, and may have been carried there by the river current. In the Patipe River, adult specimens were obtained from plant debris, at a salinity of 9 psu.

Previous records. locality not informed (von Ihering 1897, as *Palaemon acanthurus*; Sawaya 1946, as *M. acanthurus*; Holthuis 1952, as *M. acanthurus*); Ilhéus (Almeida *et al*. 2006, 2008a, as *M. acanthurus*; Ferreira *et al*. 2010, as *M. acanthurus*); Camamu Bay (Almeida *et al*. 2007b, as *M. acanthurus*); Itacaré, Uruçuca and Una (Almeida *et al*. 2008a, as *M. acanthurus*); Mar Grande and Mucuri (Ferreira *et al*. 2010, as *M. acanthurus*).

**Palaemon northropi** (Rankin, 1898)

*Leander northropi* Rankin, 1898: 245, pl. 30, fig. 4.

Material examined. 6 m, 10 f, 01.VIII.2008, Cairú, Triana River, Boipeba Island, MZUESC 1265; 1 m, 3 f, 01.VIII.2008, Cairú, Triana River, Boipeba Island, MZUESC 1266; 4 m, 7 f, 13.XI.2006, Maraú, Ponta do Mutá, MZUESC 769; 4 m, 7 f, 05.V.2008, Itacaré, Concha Beach, mouth of Contas River, MZUESC 1204; 1 m, 4 f, 3 juv, 05.V.2008, Itacaré, Contas River, MZUESC 1213; 1 ni, 10.VIII.2003, Ilhéus, Jairí Beach, Olivença, MZUESC 35; 1 m, 29.IV.2003, Ilhéus, Back-door Beach, Olivença, MZUESC 154; 2 ni, 11.VII.2003, Ilhéus, Back-door Beach, Olivença, MZUESC 216; 4 ni, 11.VII.2003, Ilhéus, Back-door Beach, Olivença, MZUESC 217; 7 ni, 06.V.2004, Ilhéus, Sirihyba Beach, Olivença, MZUESC 329; 14 ni, 10.VII.2004, Ilhéus, Sirihyba Beach, Olivença, MZUESC 330; 1 f, 28.V.2004, Ilhéus, Batuba Beach, Olivença, MZUESC 635; 1 m, 5 f, 09.III.2008, Belmonte, Mojiquiçaba
River, MZUESC 1181; 2 f, 1 juv, 08.III.2008, Santa Cruz Cabrália, João de Tiba River, near Santo André Beach, MZUESC 1168; 2 m, 3 f, 18.III.2007, Mucuri, mouth of Mucuri River, St. 1, MZUESC 798. See also report by Almeida et al. (2006).

**Distribution.** Western Atlantic—Bermuda, West Indies, Central America, northern South America, Brazil (Ceará to Santa Catarina) and Uruguay (Ramos-Porto & Coelho 1990).

**Ecological notes.** In marine and estuarine habitats. Most specimens were collected during low tide in tide pools, on the river edge, under branches, on rocky, sandy and muddy bottoms. Some have been collected together with other palaemonids *Palaemon pandaliformis* (Stimpson, 1871) and *Brachycarpus biunguiculatus*. Salinity range: 12–35 psu.

**Previous records.** locality not informed [Coelho & Ramos 1972, as *Palaemon (Palaeander) northropi*; Ramos-Porto & Coelho 1990, as *P. (P.) northropi*]; Ilhéus [Almeida et al. 2006, as *P. (P.) northropi*].

**Palaemon pandaliformis** (Stimpson, 1871)

*Leander pandaliformis* Stimpson, 1871: 130.

**Material examined.** 28 m, 5 f, 07.V.2008, Canavieiras, Patipe River, MZUESC 1238; 9 m, 18.III.2007, Mucuri, mouth of Mucuri River, St. 1, MZUESC 799. See also report by Almeida et al. (2006).

**Distribution.** Cuba, Puerto Rico, Barbados, Trinidad and Tobago, Guatemala, Nicaragua, Panama, Venezuela and Brazil (from Rio Grande do Norte to Rio Grande do Sul, including Minas Gerais) (Melo 2003).

**Ecological notes.** Individuals were collected in estuaries, on sand and mud, under stones, on submerged wood and plant debris and among marginal vegetation. Salinity range: 9–12 psu.

**Previous records.** Ilhéus [Almeida et al. 2006, 2008a, as *Palaemon (Palaemon) pandaliformis*].

**Urocaris longicaudata** Stimpson, 1860

*Urocaris longicaudata* Stimpson, 1860: 39.

**Material examined.** 4 m, 13 f, 13XI.2006, Maraú, Ponta do Mutá, MZUESC 770; 1 m, 14XI.2006, Maraú, Barra Grande (Barra Grande Pier), MZUESC 783; 2 m, 1 f, 23XI.2007, Prado, Cumuruxatiba Beach, MZUESC 1061.

**Distribution.** Western Atlantic—North Carolina to southwest Florida, West Indies to Brazil (Pará to São Paulo) (Williams 1984; Ramos-Porto & Coelho 1998).

**Ecological notes.** Shallow subtidal on drifting algae and seagrass on sand bottom (Maraú) and on *Sargassum* sp. (Prado). Salinity range: 35 psu. Depth range: 0.5 to 72 m (Ramos-Porto & Coelho 1990).

**Previous records.** locality not informed (Coelho & Ramos 1972, as *Periclimenes* sp. B); Abrolhos (Gomes Corrêa 1972, as *Periclimenes longicaudatus*; Vieira et al. 2012, as *Urocaris longicaudata*); Camamu Bay (Almeida et al. 2007b, as *P. longicaudatus*).

**Family Alpheidae** Rafinesque, 1815

**Alpheus cf. armillatus** H. Milne Edwards, 1837 [in H. Milne Edwards, 1834–1840]

Beach, Olivença, MZUESC 178; 2 f, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 864; 1 ni, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 865; 2 m, 4 f, 1 juv, 08.III.2008, Santa Cruz Cabrália, João de Tiba River near Santo André Beach, MZUESC 1169; 2 m, 1 f, 17.V.2007, Porto Seguro, Buranhem River, Municipal Pier of Porto Seguro, MZUESC 924; 3 m, 6 f, 23.XI.2007, Prado, Cumuruxatiba Beach, MZUESC 1062; 1 f, 28.VIII.2007, Caravelas, Caravelas River, St. 1, MZUESC 972; 2 m, 3 f, 28.VIII.2007, Caravelas, Caravelas River, Farol Abrolhos Iate Clube, St. 2, MZUESC 984; 17 m, 8 f, 28.VIII.2007, Caravelas, Caravelas River, Farol Abrolhos Iate Clube, St. 2, MZUESC 985; 3 f, 28.VIII.2007, Caravelas, Caravelas River, Farol Abrolhos Iate Clube, St. 2, MZUESC 986; 1 f, 28.VIII.2007, Caravelas, Caravelas River, Farol Abrolhos Iate Clube, St. 2, MZUESC 987; 2 m, 2 f, 29.VIII.2007, Caravelas, Farol Abrolhos Iate Clube, St. 2, MZUESC 988; 1 m, 30.VIII.2007, Caravelas, Pontal do Sul, MZUESC 1019; 1 f, 28.VIII.2007, Caravelas, Caravelas River, St. 1, MZUESC 1087; 3 m, 6 f, 16 ni, 19.III.2007, Nova Viçosa, Pontal da Barra Beach, St. 2, MZUESC 822. See report by Almeida et al. (2006).

**Distribution.** Western Atlantic—Bermuda, North Carolina to Brazil (Fernando de Noronha, Ceará to Santa Catarina) (Christoffersen 1998).

**Ecological notes.** The specimens were collected on reefs, under rocks, wood debris and rubble, on sand and mud, on *Halimeda* sp., in crevices of dead coral rubble, on jetties (on an unidentified octocoral), in rock crevices, and on calcareous algae concretions. Salinity range: 19–39 psu.

**Previous records.** Abrolhos (Smith 1869, as *A. heterochaelis*; Gomes Corrêa 1972, as *A. armillatus*) [see Christoffersen 1984]; Abrolhos Bank (RAP, St. 36) (Young & Serejo 2005); Ilhéus (Almeida et al. 2006, as *A. armillatus*); Camamu Bay (Almeida et al. 2007b, as *Alpheus cf. armillatus*).

**Remarks.** *Alpheus armillatus* is a large species complex with six nominal species in the eastern Pacific and four nominal species in the western Atlantic, two of them currently seen as synonyms of *A. armillatus* (Anker 2001; Mathews, 2006; Mathews & Anker 2009). However, molecular data suggest the existence of at least 19 distinct ESUs within this complex, including 11 in the western Atlantic (Mathews & Anker 2009). The western Atlantic species of the *A. armillatus* complex are currently being revised (A. Anker, pers. com.). *Alpheus cf. armillatus* was the most abundant alpheid in our samples. Two distinct color patterns of *A. cf. armillatus* indicate existence of at least two species in Bahia.

*Alpheus bouvieri* A. Milne-Edwards, 1878

(Fig. 2A)

**Material examined.** 2 m, 1 f, 02.VIII.2008, Cairú, Moreré Beach, Boipeba Island, MZUESC 1295. See report by Almeida et al. (2006).


**Ecological notes.** Under rocks at the mouth of Cachoeira River (Ilhéus) (Almeida et al. 2006) and in crevices of coral rubble. Salinity range: 39 psu.

**Previous records.** Abrolhos (material in MNRJ and R/V Calypso, St. 84A) (Christoffersen 1979); Ilhéus (Almeida et al. 2006).

**Remarks.** In the western Atlantic, *A. bouvieri* can be easily confused with the amphi-Atlantic *A. agilis* Anker, Hurt & Knowlton, 2009. However, *A. bouvieri* can be separated from *A. agilis* by the absence of spiniform setae on the P3 and P4 ischium, as well as the much more distinct rostral carina (Anker et al. 2009a). Based on these characters, the material from southern Bahia was identified as *A. bouvieri*. The color pattern of *A. bouvieri* consists of transverse brownish bands on the carapace and abdomen and includes a characteristic whitish spot on the mesial surface of the major chela palm (Fig. 2A).
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SHALLOW-WATER CARIDEAN SHRIMPS FROM SOUTHERN BAHIA

FIGURE 2. Alpheid shrimps from southern Bahia, Brazil. (A) *Alpheus bouvieri* A. Milne-Edwards, 1878, male from Cachoeira River, Maramata Beach, Ilhéus. (B) *Alpheus cristulifrons* Rathbun, 1900, ovigerous female from Tassimirim Beach, Cairú. (C) *Alpheus formosus* Gibbes, 1850, male from Tassimirim Beach, Cairú. (D) *Alpheus cf. paracrinitus* Miers, 1881, male from Taipus de Fora Beach, Maraú. (E) *Alpheus cf. rostratus* W. Kim & Abele, 1988, ovigerous female from Taipus de Fora Beach, Maraú. (F) *Salmoneus carvachoi* Anker, 2007, two ovigerous individuals from Maraú River, Maraú.

*Alpheus chacei* Carvacho, 1979

*Alpheus chacei* Carvacho, 1979: 455, figs. 4–6.

**Material examined.** 1 m, 01.VIII.2008, Cairú, Triana River, Boipeba Island, MZUESC 1269; 1 m, 18.VIII.2007, Maraú, Tanque Island, T2, MZUESC 1103.

**Distribution.** Western Atlantic—French Antilles (Guadeloupe) and Brazil (Paraíba to São Paulo) (Christoffersen 1979, as *A. maxilliplanus* Christoffersen 1979; Christoffersen 1984, 1998).

**Ecological notes.** On mud bottoms. Salinity range: 24–31 psu. Depth range: 0–2 m.

**Previous records.** Camamu Bay (Almeida et al. 2007b).
**Alpheus cristulifrons** Rathbun, 1900
(Fig. 2B)

**Alpheus cristulifrons** Rathbun, 1900: 152.

**Material examined.** 1 m, 1 f, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 866.

**Distribution.** Western Atlantic—Florida, Gulf of Mexico, West Indies, Central America, northern South America and Brazil (Atol das Rocas, Fernando de Noronha, Rio Grande do Norte to Rio de Janeiro) (Christoffersen 1998; Anker et al. 2008a).

**Ecological notes.** The present specimens were collected on coral rubble, at a salinity of 39 psu. Typically in hard substrates (coral reef matrix, coral rubble, concretions of coralline algae), occasionally in sponges, typical depth range 1–5 m, exceptionally down to 52 m (Christoffersen 1979; Anker et al. 2008a; Serejo et al. 2006; see also remarks below).

**Previous record:** REVIZEE Program Central Score (St. C5-48R) (Serejo et al. 2006); this record is below the typical depth reported for *A. cristulifrons* and therefore requires confirmation.

**Remarks.** *Alpheus cristulifrons* can be easily recognized by the characteristic frontal margin of the carapace, including the anteriorly broadening orbital hoods and a very short rostrum continued posteriorly by a sharp rostral carina; the ovoid, smooth major chela; the male minor chela with sub-balaeniceps setae on the dactylus; the very stout third and fourth pereiopods, with their meri armed with a strong distoventral tooth (see Anker et al. 2008a); and the unique colour pattern (Fig. 2B). The colour pattern of the Bahian specimens of *A. cristulifrons* matches well that of the Panamanian specimens in Anker et al. (2008a).

**Alpheus estuariensis** Christoffersen, 1984

*Alpheus estuariensis* Christoffersen, 1984: 191, figs. 1–2.

**Material examined.** 4 m, 5 f, 1 ni, 01.VIII.2008, Cairú, Triana River, Boipeba Island, MZUESC 1270; 4 m, 7 f, 6 juv, 08.V.2008, Una, Comandatuba Village, MZUESC 1249; 2 m, 7 f, 3 juv, 06.V.2008, Canavieiras, Pardo River, MZUESC 1219; 1 m, 3 juv, 09.III.2008, Belmonte, Mojiqiçaba River, MZUESC 1182; 2 m, 4 f, 2 ni, 07.III.2008, Santa Cruz Cabrália, mouth of João de Tiba River (sandstone reef), MZUESC 1165; 4 m, 2 f, 07.III.2008, Santa Cruz Cabrália, mouth of Yaya River, MZUESC 1166; 4 m, 4 f, 08.III.2008, Santa Cruz Cabrália, João de Tiba River, near Santo André Beach, MZUESC 1170; 1 ni, 22.XI.2007, Prado, Barra do Cahy, MZUESC 1047; 1 m, 18.III.2007, Mucuri, Mucuri River, St. 1, MZUESC 800. See also report by Almeida et al. (2006).

**Distribution.** Western Atlantic—Florida, Mississippi to Texas, Cuba, Dominican Republic, Trinidad and Tobago, Curaçao and Brazil (Pará to Paraná) (Christoffersen 1984; Pires et al. 2008).

**Ecological notes.** In estuaries, on mud, in burrows under rocks, debris, among herbaceous vegetation and roots of *Rhizophora mangle*, and in rotting wood. Specimens of *A. estuariensis* were often collected together with unidentified gobiiid fishes (Teleostei: Perciformes) and with the alpheid shrimp *Salmoneus carvachoi* Anker, 2007, suggesting a possible association. Salinity range: 2–38 psu. Depth range: intertidal to 22 m (Christoffersen 1984).

**Previous records.** Ilhéus (Almeida et al. 2006); Camamu Bay (Almeida et al. 2007b).

**Alpheus formosus** Gibbes, 1850
(Fig. 2C)

*Alpheus formosus* Gibbes, 1850: 196.

**Material examined.** 2 m, 3 f, 03.VIII.2008, Cairú, Tassimirim Beach, Boipeba Island, MZUESC 1320; 1 f, 1 ni, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 867; 1 ni, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 868.

**Distribution.** Western Atlantic—Bermuda, North Carolina to Brazil (Atol das Rocas, Fernando de Noronha, Ceará to São Paulo) (Christoffersen 1998; Anker et al. 2008b).
**Ecological notes.** Specimens were collected on coral reefs, from crevices of coral rubble and concretions of calcareous algae. Salinity range: 33–39 psu. Depth range: intertidal to 42 m (Anker et al. 2008b).

**Previous records.** Abrolhos (Gomes Corrêa 1972, as *A. formosus*; Christoffersen 1979, as *A. formosus*); Camamu Bay (Almeida et al. 2007b, as *Alpheus cf. formosus*).

**Remarks.** *Alpheus formosus* differs from the closely related *A. paraformosus* Anker, Hurt & Knowlton, 2008 in the presence of balaeniceps setae on the minor chela fingers in both sexes; the more posteriorly extending orbitorostral grooves; and some details of the color pattern (Anker et al. 2008b; see also Fig. 2C). The latter species is currently known only from the western Caribbean Sea.

**Alpheus heterochaelis Say, 1818**

*Alpheus heterochaelis* Say, 1818: 243.

**Material examined.** See report by Almeida et al. (2006).

**Distribution.** Western Atlantic—North Carolina to Brazil (Bahia) (Christoffersen 1984, Almeida et al. 2006).

**Ecological notes.** Estuaries, in the shallow subtidal (precise depth not recorded). Depth range: intertidal to 9 m (Christoffersen 1984).

**Previous records.** Abrolhos Bank (RAP, St. 4, 34, and 38) (Young & Serejo 2005); Ilhéus (Almeida et al. 2006).

**Remarks.** Many previous records of *A. heterochaelis* from Brazil were based on misidentifications and confusion with *A. armillatus*, *A. bouvieri* and *A. nuttingi* (Schmitt, 1924), among others (Christoffersen 1984). However, according to this author, *A. heterochaelis s. str.* does occur in Brazil, for example, in Pará and Paraíba states. Almeida et al. (2006) extended the southern distribution of *A. heterochaelis* to Ilhéus, Bahia. *Alpheus pontederiae* de Rochebrune, 1883, which also occurs in Brazil (see below), differs from *A. heterochaelis* by the presence of two small prominences on the mesial side of the major chela pollex, and by the distolateral spiniform seta of the uropodal exopod being flanked by two small, acute teeth. The record of *A. heterochaelis* from the Abrolhos Bank (Young & Serejo 2005) is extremely doubtful, since this species is typically found in estuarine habitats.

**Alpheus intrinsecus** Spence Bate, 1888

*Alpheus intrinsecus* Spence Bate, 1888: 557, pl. 100, fig. 1.

**Material examined.** See report by Almeida et al. (2006).

**Distribution.** Western Atlantic—Puerto Rico to Brazil (Piauí to Santa Catarina). Eastern Atlantic—Western Sahara to Gabon (Crosnier & Forest 1966; Christoffersen 1979).

**Ecological notes.** The material reported by Almeida et al. (2006) was collected in estuarine conditions, near the mouth of the Cachoeira River. Depth range: intertidal to 40 m (Christoffersen 1979).

**Previous records.** Challenger Expedition, off Salvador (Spence Bate 1888); Ilhéus (Almeida et al. 2006, 2007a); Camamu Bay (Almeida et al. 2007b).

**Alpheus cf. packardii** Kingsley, 1880

*Alpheus packardii* Kingsley, 1880: 417.

**Material examined.** 2 m, 1 f, 02.VIII.2008, Cairu, Moreré Beach, Boipeba Island, MZUESC 1297; 1 f, 02.VIII.2008, Cairu, Moreré Beach, Boipeba Island, MZUESC 1298; 1 m, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 869.

**Distribution.** Western Atlantic—Bermuda, Virginia to South Carolina, Florida, Gulf of Mexico, Bahamas, Mexico (Quintana Roo and Yucatan), West Indies and Brazil (Atol das Rocos, Fernando de Noronha, Amapá to São Paulo) (Christoffersen 1979, 1998, as *A. normanni* Kingsley, 1878; Martínez-Iglesias et al. 1996, as *A. normanni*).
Ecological notes. Species collected on coral reefs, in crevices of coral rubble and in Halimeda clumps. Salinity = 39 psu. Depth range: intertidal to 70 m (Christoffersen 1979, as A. normanni).

Previous records. Itapagipe (= Itapagipe Peninsula, Salvador) (Christoffersen 1979, as Alpheus normanni); R/V Wladimir Besnard (St. 3770, 17°16.7'S, 39°05'W) (Christoffersen 1979, as A. normanni); R/V Calypso (St. 56, 69, 75, 81–83) (Christoffersen 1979, as A. normanni); Abrolhos Bank (RAP, St. 2 and 38) (Young & Serejo 2005, as A. normanni); Camamu Bay (Almeida et al. 2007b, Alpheus cf. packardii).

Remarks. Kingsley (1878) described A. normanni based on specimens from the Pacific coast of Panama. Two years later the same author described A. packardii based on specimens from Key West, Florida (Kingsley 1880). Chace (1937) compared the eastern Pacific and the western Atlantic (Bermuda) materials of A. normanni and A. packardii and concluded that they are identical morphologically, placing A. packardii in the synonymy of A. normanni. Both Chace (1972) and Christoffersen (1979) continued to treat A. packardii as a junior synonym of A. normanni. Kim & Abele (1988) again compared specimens from the eastern Pacific and western Atlantic (Florida). These authors found consistent morphological differences between the eastern Pacific and western Atlantic specimens, viz. in the fingers of the minor chela, and removed A. packardii from the synonymy of A. normanni. However, the taxonomy of both A. normanni and A. packardii remains unsettled due to the presence of several cryptic taxa in the eastern Pacific and western Atlantic (A. Anker, in study). Thus, it is presently impossible to determine the true identity of the Bahian material.

Alpheus cf. paracrinitus Miers, 1881
(Fig. 2D)

Alpheus paracrinitus Miers, 1881: 365, pl. 16, fig. 6.

Material examined. 1 f, 02.VIII.2008, Cairú, Moreré Beach, Boipeba Island, MZUESC 1296.


Ecological notes. The single specimen was collected in the intertidal zone in crevices of coral rubble, at a salinity of 39 psu.

Previous records. None.

Remarks. The variation in the color patterns as well as preliminary molecular data indicate that A. paracrinitus, previously considered to be a pantropical species (Crosnier & Forest 1966; Chace 1972, 1988; Banner & Banner 1982; Kim & Abele 1988), is in fact a species complex (Knowlton & Mills 1992; Anker 2001; Williams et al. 2001; A. Anker, in study). The single specimen from southern Bahia has narrow reddish transverse bands on the carapace and abdomen and red-brownish-white mottled major chela (Fig. 2D). Its taxonomic identity cannot be established until the entire A. paracrinitus complex is revised (A. Anker, pers. comm.)

Alpheus pontederiae de Rochebrune, 1883

Alpheus Pontederiae de Rochebrune, 1883: 174

Material examined. 2 f, 12.IX.2006, Marãui, Maraú River, MZUESC 1111; 3 m, 4 f, 3 juv, 07.V.2008, Canavieiras, Patipe River, MZUESC 1239; 3 ni, 18.III.2007, Mucuri, Mucuri River, St. 1, MZUESC 801. See also report by Almeida et al. (2006).

Distribution. Western Atlantic—Brazil (Pará, Maranhão, Alagoas, São Paulo, Paraná). Eastern Atlantic—Senegal to Congo (Christoffersen 1984; Almeida et al. 2006).

Ecological notes. Mainly in mangroves and estuaries, on sand-mud bottoms, under rocks and wood; also in beds of the oyster Crassostrea rhizophorae Guilding, 1828. Salinity range: 3–20 psu. Depth range: intertidal to 30 m (Christoffersen 1984).

Previous records. Ilhéus (Almeida et al. 2006).
Remarks. *Alpheus pontederiae* resembles *A. heterochaelis* in the presence of balaeniceps setae on the fingers of the minor chela and by the rounded ventral margin of pollex of larger chela, among other characters (Christoffersen 1984), but differs from the latter species by two characters mentioned in the section on *A. heterochaelis* (see above).

*Alpheus cf. rostratus* W. Kim & Abele, 1988  
(Fig. 2E)

*Alpheus rostratus* W. Kim & Abele, 1988: 51, fig. 21.

**Material examined.** 1 m, 1 f, 01.VIII.2008, Cairú, Triana River, Boipeba Island, MZUESC 1271; 1 f, 03.VIII.2008, Cairú, Tassimirim Beach, Boipeba Island, MZUESC 1321; 6 m, 4 f, 1 juv, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 870.

**Distribution.** *Alpheus cf. rostratus:* Western Atlantic—Brazil (Bahia) (present study). *Alpheus rostratus:* Eastern Pacific—Gulf of California to Colombia (Kim & Abele 1988; Ramos 1995).

**Ecological notes.** On coral reefs, in crevices of rocks and concretions of calcareous algae; also in estuaries (specimens found in palm tree roots on muddy bottom). Salinity range: 24–39 psu.

**Previous records.** None.

**Remarks.** This species is morphologically close to *A. cf. paracrinitus* but differs from it in the color pattern. *Alpheus cf. rostratus* has wide transverse bands on the carapace and abdomen and a pair of dark dorsal spots on the third abdominal somite (see Figs. 2D and 2E for comparison). A similar color pattern exists in the eastern Pacific *A. rostratus*, which belongs to the *A. paracrinitus* complex (A. Anker, pers. comm.). Some minor morphological differences were noted between *A. cf. rostratus* and *A. rostratus*, based on the original description and figures (Kim & Abele 1988). For example, *A. cf. rostratus* differs from *A. rostratus* by the more strongly produced distodorsal margin of the antepenultimate article of the third maxilliped. In *A. cf. rostratus*, the distolateral tooth of the scaphocerite extends slightly beyond the anterior margin of the blade, and the cleft between the blade and the tooth is approximately 1/3 of the total length of the scaphocerite. In contrast, in *A. rostratus*, the distolateral tooth of the scaphocerite extends conspicuously beyond the anterior margin of the blade, and the cleft between the blade and the tooth slightly less than 1/2 of the total length of the scaphocerite. In *A. rostratus*, the tooth on the ventromesial carina of the antennular peduncle is concave, whereas in *A. cf. rostratus*, the anterior margin of this tooth is nearly straight. These differences, if shown to be valid and consistent, suggest that the Bahian material may belong to a new species close to *A. rostratus*. However, only a taxonomic revision of the entire *A. paracrinitus* complex will clarify the identity of *A. cf. rostratus* and *A. cf. paracrinitus*. Therefore, all records of *A. paracrinitus* from Brazil (Christoffersen 1998) need to be treated with a lot of caution.

*Automate cf. evermanni* Rathbun, 1901  
(Fig. 3)

*Automate evermanni* Rathbun, 1901: 112, fig. 22.

**Material examined.** 1 f, 23.XI.2007, Prado, Cumuruxatiba Beach, MZUESC 1063.


**Ecological notes.** The single specimen from Bahia was collected from a burrow of unidentified host (or perhaps its own burrow, see Dworschak & Coelho 1999), in fine sand in the intertidal zone, at a salinity of 35 psu. Although primarily a shallow-water species (less than 50 m), *A. evermanni* has been recorded from as deep as 250 m (Rathbun 1901; Crosnier & Forest 1966; Dworschak & Coelho 1999).

**Previous records.** None.
FIGURE 3. Automate cf. evermanni Rathbun, 1901, female (CL=3.3 mm) (MZUESC 1063), Cumuruxatiba Beach, Prado, state of Bahia, Brazil. (A) head and cephalic appendages, dorsal view; (B) head and cephalic appendages, lateral view. Scale bars: A = 0.5 mm; B = 1 mm.
Remarks. *Automate evermanni* may be a species complex (A. Anker, pers. comm.). The present specimen has several appendages missing, including both chelipeds. However, it was possible to distinguish it from the two other western Atlantic species, viz. *A. dolichognatha* De Man, 1888 (also a species complex) and *A. rectifrons* Chace, 1972 (Chace 1972; Christoffersen 1998), based on the configuration of the frontal region (Fig. 3A).

*Leptalpheus axianassae* Dworschak & Coelho, 1999

(Fig. 4)


Material examined. 1 m, 1 ni, 05.V.2008, Itacaré, Contas River, MZUESC 1214.

Distribution. Western Atlantic—Florida and Brazil (Pernambuco and São Paulo) (Dworschak & Coelho 1999; Anker et al. 2006).

Ecological notes. The present specimens were collected from burrows of unknown hosts in the muddy intertidal zone, at a salinity of 30 psu. The species is considered to be a commensal of *Axianassa australis* Rodrigues & Shimizu, 1992 (Gebiidea: Axianassidae) (Dworschak & Coelho 1999; Anker et al. 2006). Several specimens of *Lepidophthalmus siriboia* Felder & Rodrigues, 1993 (Axiidea: Callianassidae) were collected at the same site, but none was caught together with *L. axianassae*.

Previous records. None.

Remarks. This first record of *L. axianassae* from Bahia fills a significant gap in the species distribution in Brazil, which extends from Pernambuco to São Paulo. The species is easily recognizable by the short antennular peduncles (with articles slightly longer than wide) (Fig. 4A) and the presence of only one large, triangular, obtuse tooth on the cutting edge of the major chela pollex (Fig. 4C, D; see also Dworschak & Coelho 1999, p. 480, fig. 18). Another important feature of *L. axianassae*, viz. the presence of a small tubercle on the eyestalks, was not observed to avoid damage of the rare material.

*Leptalpheus aff. forceps* Williams, 1965

(Fig. 5A–D)

Material examined. 1 m, 07.V.2008, Canavieiras, Patipe River, MZUESC 1240.

Comparative material. *L. forceps* (Fig. 5E–G), 1 m, 1 f, 21.IV.2004, North Bridge, Fort Pierce, Florida, USA, MNHN-Na-15682.

Distribution. Western Atlantic—Brazil (Bahia) (present study).

Ecological notes. The single specimen was collected from a burrow of unknown host in mud, at a salinity of 3 psu.

Previous records. None.

Remarks. The specimen collected (CL=2.7 mm) was compared with *L. forceps* from Florida. The Bahian specimen differed from the Florida specimens in the dentition of the major chela (cf. Figs. 5D, G) and in the proportions of the articles of the antennular peduncle (cf. Figs. 5A, E). More material of this possibly undescribed species is needed to confirm its identity.

*Salmoneus carvachoi* Anker, 2007

(Fig. 2F)

*Salmoneus carvachoi* Anker, 2007: 27, fig. 3.

Material examined. 1 ni, 01.VIII.2008, Cairú, Triana River, Boipeba Island, MZUESC 1272; 1 f, 18.VIII.2007, Marãtã, Tanque Island, T2, MZUESC 1108; 2 ni, 08.V.2008, Una, Comandatuba Village, MZUESC 1250; 2 ni, 06.V.2008, Canavieiras, Pardo River, MZUESC 1220; 1 ni, 08.III.2008, Santa Cruz Cabrália, João de Tiba River, near Santo André Beach, MZUESC 1171.
FIGURE 4. Leptalpheus axianassae Dworschak & Coelho, 1999, male (CL=5.9 mm) (MZUESC 1214), Contas River, Itacaré, state of Bahia, Brazil. (A) head and cephalic appendages, dorsal view; (B) head and cephalic appendages, lateral view; (C) right major chela, ventrolateral view; (D) right major chela, distal portion, mesial view; (E) left minor chela, dorsal view. Scale bars: A, B, E, F = 1 mm; C, D = 0.5 mm.
FIGURE 5. (A–D) *Leptalpheus* aff. *forceps* Williams, 1965, young male (CL=2.7 mm) (MZUESC 1240), Patipe River, Canavieiras, state of Bahia, Brazil. (A) head and cephalic appendages, dorsal view; (B) head and cephalic appendages, lateral view; (C) left major chela, ventral view; (D) left major chela, lateral view. (E–G) *Leptalpheus* *forceps* Williams, 1965, male (E, F) and ovigerous female (G) (CL not measured) (MNHN-Na-15682), Fort Pierce, Florida, USA. (A) head and cephalic appendages, dorsal view; (B) head and cephalic appendages, lateral view; (C) major chela, lateral view. Scale bars: A, B, E, F = 1 mm; C, D = 0.5 mm.
**Synalpheus apioceros** Coutière, 1909

*Synalpheus apioceros* Coutière, 1909: 27, fig. 9.

**Material examined.** 2 f, 2 ni, 07.III.2008, Santa Cruz Cabrália, mouth of João de Tiba River (sandstone reef), MZUESC 1152; 1 f, 28.VIII.2007, Caravelas, Caravelas River, Farol Abrolhos Iate Clube, St. 2, MZUESC 988; 62 ni, 28.VIII.2007, Caravelas, Caravelas River, St. 1, MZUESC 1088; 2 f, 8 ni, 19.III.2007, Nova Viçosa, Pontal da Barra Beach, St. 3, MZUESC 830.

**Distribution.** Western Atlantic—southern Florida to Suriname, western Gulf of Mexico and Brazil (seamounts of North Brazilian Chain, Amapá to Santa Catarina) (Chace 1972; Christoffersen 1998; Coelho Filho 2006).

**Ecological notes.** In the intertidal, on reefs, under rocks and wood, and on jetties (on octocorals and among barnacles). Salinity range: 31–37 psu.

**Previous records.** *Synalpheus cf. apioceros*—Almeida *et al.* (2007b), Camamu Bay.

**Remarks.** *Synalpheus apioceros* is morphologically somewhat variable and may require a taxonomic revision based on both morphology and DNA (A. Anker, pers. comm.). The material from Bahia matches the description of *S. apioceros* in Coutière (1909).

**Synalpheus cf. brevicarpus** (Herrick, 1891)

*Alpheus saulcyi* var. *brevicarpus* Herrick, 1891: 384 (? part.); pl. 4, figs. 1–3; pl. 21, figs. 1–4, 8, 9; pl. 22, figs. 1, 2, 4–10, 12–16; pl. 23, figs. 1–8; pl. 24, figs. 1, 3.

**Material examined.** 1 ni, 07.III.2008, Santa Cruz Cabrália, mouth of João de Tiba River (sandstone reef), MZUESC 1153.

**Distribution.** Western Atlantic—Bermuda, Florida, Bahamas, West Indies, Panama and Brazil (Ceará to Rio Grande do Sul) (Christoffersen 1979, 1998; Bezerra & Coelho 2006). The Eastern Pacific records correspond to *S. digueti* Coutière, 1909 (which also corresponds to multiple species) (A. Anker, pers. comm.).

**Ecological notes.** The single Bahian specimen was collected on a sandstone reef, under a rock covered with hydrozoans and algae, at a salinity of 36 psu.

**Previous records.** R/V Calypso (St. 84 and 89) (Christoffersen 1979, as *Synalpheus brevicarpus*).

**Remarks.** *Synalpheus brevicarpus* is a transisthmian species complex, which includes *S. brevicarpus sensu* Herrick, 1891, *S. brevicarpus guerini* Coutière, 1909, *S. digueti* Coutière, 1909, as well as several undescribed species (A. Anker, in study).

**Synalpheus fritzmuelleri** Coutière, 1909

*Synalpheus fritzmülleri* Coutière, 1909: 35, fig. 18.

Distribution. Western Atlantic—Bermuda, Carolinas, Florida, northern Gulf of Mexico (Texas), Mexico (Veracruz, Quintana Roo), Colombia (Providencia), West Indies, Venezuela and Brazil (São Pedro and São Paulo Archipelago, Pernambuco to Santa Catarina). Central Atlantic—Ascension and Saint Helena Islands. Records from the eastern Pacific (e.g., Tres Marias Archipelago, Mexico) refer to other species (Christoffersen 1979, 1998; Holthuis et al. 1980; Manning & Chace 1990; A. Anker, pers. comm.).

Ecological notes. Reefs and generally hard bottoms, under rocks covered with algae and hydrozoans, in tide pools, in rock crevices, in concretions of calcareous algae, in sabellarid reefs, on jetties among barnacles, etc. Salinity range: 28–41 psu. Depth range: intertidal to 75 m (Christoffersen 1979).

Previous records. locality not informed (Coutière 1909, as Synalpheus fritzmüleri elongatus Coutière, 1909). “Continental Platform” (= Plataforma, Salvador, Hartt Explorations) (Christoffersen 1979, as S. fritzmuelleri), Salvador, Itaparica Island and Abrolhos (R/V Calypso, St. 85) (Christoffersen 1979, as S. fritzmuellerii); Ilhéus (Almeida et al. 2006); Camamu Bay (Almeida et al. 2007b, as Synalpheus cf. fritzmuelleri).

Remarks. Synalpheus fritzmuelleri is morphologically quite variable and may require a more thorough study integrating both morphology and DNA (A. Anker, pers. comm.).

Synalpheus ul (Rios & Duffy, 2007)
(Figs. 6–8)


Material examined. 1 m, 30.X.2004, Camamu Bay, trawl, St. 4 (13°54′06″S; 39°00′22″W), MZUESC 709.

Distribution. Western Atlantic—Belize, Panama, Jamaica, Curacao, Barbados and Brazil (state of Bahia, Camamu Bay) (Hultgren et al. 2010, 2011; present study).


Previous records. Camamu Bay [Almeida et al. 2007b, as Synalpheus cf. pandionis, in part (lot MZUESC 709, erroneously referred to as ovigerous female, p. 16, figs. 3B, C, G and p. 17, fig. 4)].

Remarks. Almeida et al. (2007b) reported S. cf. pandionis from Camamu Bay, Bahia, based on two specimens, thus extending the southern range of the S. pandionis complex. However, a reanalysis of this material following the publication of Rios & Duffy (2007) revealed that neither of the two specimens of S. cf. pandionis represents S. pandionis s. str. One of them has all the diagnostic characters of S. ul, originally described from Belize and Panama (Rios & Duffy 2007). The scaphocerite of the Bahian specimen of S. ul has a distinct blade (Fig. 7G) similar to that of S. pandionis. However, it differs from S. pandionis in having unequal spiniform setae on the posterior margin of the telson, with the lateral pair being shorter than the mesial pair (Fig. 6D); these setae are subequal in length in S. pandionis. In S. ul, the distolateral tooth of the uropodal exopod is adjacent to the preceding spiniform seta (Figs. 6E, F) (vs. more separated and with a small lobe between them in S. pandionis); and the mesial protuberance (erroneously referred as lateral side in Rios & Duffy 2007) on the base of the major chela pollex, characteristic of S. pandionis, is absent (Fig. 7F). Synalpheus ul also resembles S. hoetjesi Hultgren, Macdonald & Duffy, 2010, but differs from it by the presence of a scaphocerite blade (20–75% the length of scaphocerite vs. absent or vestigial in S. hoetjesi) (Fig. 7G), the shape of the distal superior margin on the major chela (gently sloping in S. ul vs. bulging over the accessory tooth in S. hoetjesi) (Figs. 7A, B), and the thickness of the spiniform
FIGURE 6. *Synalpheus ul* (Ríos & Duffy, 2007), male (CL=4.7 mm) (MZUESC 709), Camamu Bay, state of Bahia, Brazil. (A) head and cephalic appendages, dorsal view; (B) head and cephalic appendages, lateral view; (C) abdomen, lateral view; (D) telson, dorsal view; (E) left exopodite of the uropod, dorsal view; (F) right exopodite of the uropod, dorsal view; (G) left major chela, lateral view. Scale bars: A–C = 1 mm; D, E = 0.5 mm; F = 2 mm.
FIGURE 7. Synalpheus ul (Ríos & Duffy, 2007), male (CL=4.7 mm) (MZUESC 709), Camamu Bay, state of Bahia, Brazil. (A) left major chela, distal portion, lateral view; (B) left major chela, distal portion, mesial view; (C) right minor chela, lateral view; (D) right minor chela, distal portion, mesial view; (E) right minor chela, dorsal view; (F) pollex of left major chela, ventral view; (G) right basicalate, dorsal view. Scale bars: A–C, E = 1 mm; D, F, G = 0.5 mm.
FIGURE 8. Synalpheus ul (Ríos & Duffy, 2007), male (CL=4.7 mm) (MZUESC 709), Camamu Bay, state of Bahia, Brazil. (A) right pereiopod 2, lateral view; (B) right pereiopod 3, lateral view; (C) right pereiopod 3, distal portion, lateral view; (D) right pereiopod 4, lateral view; (E) right pereiopod 4, distal portion, lateral view; (F) right pereiopod 5, lateral view; (G) right pereiopod 5, distal portion, lateral view. Scale bars: A, B, D, F = 1 mm; C, E, G = 0.5 mm.
setae on the posterior margin of the telson (mesial subequal to lateral in *S. ul* vs. mesial larger than lateral in *S. hoetjesi*). The present record of *S. ul* from Bahia, the first for Brazil and the southwestern Atlantic Ocean, significantly extends the southern range of this species.

**Family Hippolytidae Spence Bate, 1888**

**Hippolyte obliquimanus** Dana, 1852

*Hippolyte obliquimanus* Dana, 1852: 24.

**Material examined.** 2 ni, 10.VII.2004, Ilhéus, Sirihyba Beach, Olivença, MZUESC 501; 3 m, 4 f, 09.III.2008, Belmonte, Mojiçucaba Beach, MZUESC 1186; 1 f, 16.V.2007, Santa Cruz Cabrália, Coroa Vermelha Beach, MZUESC 872; 1 m, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 902; 15 ni, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 903; 3 m, 9 f, 1 ni, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 904; 2 m, 3 f, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 905; 1 m, 1 f, 23.XI.2007, Prado, Cumuruxatiba Beach, MZUESC 1064; 1 m, 6 f, 23.XI.2007, Prado, Cumuruxatiba Beach, MZUESC 1065; 1 f, 23.XI.2007, Prado, Cumuruxatiba Beach, MZUESC 1066.

**Distribution.** Western Atlantic—North Carolina, Florida, West Indies, Venezuela and Brazil (Paraíba to Rio de Janeiro) (Ramos-Porto & Coelho 1993, as *H. curacaoense* Schmitt, 1924; d’Udekem d’Acoz 1997).

**Ecological notes.** On coral and rocky reefs, in tide pools, on green, brown and red algae. Salinity range: 35–41 psu.

**Previous records.** Itacaré, Porto Seguro and Nova Viçosa (d’Udekem d’Acoz 1997); Camamu Bay (Almeida et al. 2007b).

**Remarks.** d’Udekem d’Acoz (1997) placed *Hippolyte exilirostratus* Dana, 1852 and *H. curacaoensis* Schmitt, 1924, both previously cited from Brazil (Coelho & Ramos 1972; Christoffersen 1998), in the synonymy of *H. obliquimanus*.

**Latreutes parvulus** (Stimpson, 1871)

*Rhynchocyclus parvulus* Stimpson, 1871: 124.

**Material examined.** 1 f, 18.IX.2004, Ilhéus, Cachoeira River, St. 8, Pontal, trawl, MZUESC 589; 1 f, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 906; 1 f, 17.V.2007, Porto Seguro, Mutá Beach (coral reef), MZUESC 907; 2 m, 8 f, 29.VIII.2007, Caravelas, Caravelas River, Barra de Caravelas, St. 4, MZUESC 1007; 6 f, 1 ni, 29.VIII.2007, Caravelas, Caravelas River, Barra de Caravelas, St. 4, MZUESC 1008.

**Distribution.** Western Atlantic—New Jersey, USA, to Buenos Aires, Argentina. Eastern Atlantic—Western Sahara to Congo (Christoffersen 1982).

**Ecological notes.** Collected mainly on algae (red and brown). Salinity range: 38–39 psu. Depth range: intertidal to 124 m (Christoffersen 1982).

**Previous records.** Salvador (Christoffersen 1982); Camamu Bay (Almeida et al. 2007b).

**Lysmata cf. intermedia** (Kingsley, 1878)

*Hippolysmata intermedia* Kingsley, 1878: 90.

**Material examined.** 1 f, 1 ni, 03.VIII.2008, Cairu, Tassimirim Beach, Boipeba Island, MZUESC 1323.

**Distribution.** Western Atlantic—Florida Keys to Trinidad and Tobago, Curaçao and Brazil (Pernambuco to Rio de Janeiro) (Christoffersen 1998; d’Udekem d’Acoz 2000; Almeida et al. 2007b).

**Ecological notes.** Material from Boipeba Island was collected on a reef, within crevices of calcareous algae concretions, at a salinity of 33 psu.
Previous records. Camamu Bay (Almeida et al. 2007b, as Lysmata cf. intermedia).

Remarks. Lysmata intermedia is a species complex (Anker et al. 2009b). Almeida et al. (2007b) reported some differences between L. cf. intermedia from Camamu Bay, Bahia, and topotypical specimens of L. intermedia (d’Udekem d’Acoz 2000). The main difference observed (here confirmed by the analysis of two additional individuals) was in the number of articles in the P2 carpus (23–25, more commonly 23 in L. cf. intermedia vs. 25–31, more commonly 28–30 in L. intermedia). Other small differences were observed in the number of articles in the P2 merus and in the spinulation of the P3–P5 merus and propodus, suggesting that this material belongs to a hitherto undescribed species.

Merguia rhizophorae (Rathbun, 1900)

Hippolyssmata rhizophorae Rathbun, 1900: 153, pl. 8, fig. 9.

Material examined. 1 ni, 22.XI.2007, Prado, Barra do Cahy, MZUESC 1048. See also report by Almeida et al. (2006).

Distribution. Western Atlantic—Panama, Suriname and Brazil (Piauí to Bahia). Eastern Atlantic—Niger delta in Nigeria (Chace 1972; Bruce 1993; Christoffersen 1998; Almeida et al. 2006).

Ecological notes. The present specimen was collected intertidally under a rock, at salinity of 15 psu. Merguia rhizophorae was also collected in the mangrove of Mamoã River, at low tide, in decomposing branches of Rhizophora mangle (see Almeida et al. 2006).

Previous records. Ilhéus (Almeida et al. 2006).

Remarks. Almeida et al. (2006) extended the known Brazilian geographic range of M. rhizophorae from the state of Alagoas to Ilhéus in southern Bahia (Mamoã River, 14°35’05.6”S; 39°03’10.5”W). The Barra do Cahy specimen represents only a minor southward range extension (17°00’45.0”S; 39°10’21.0”W) of this species. A photograph of an adult individual of M. rhizophorae from southern Bahia (Ilhéus) was provided by Almeida et al. (2006).

Thor manningi Chace, 1972


Material examined. 1 f, 03.VIII.2008, Cairú, Tassimirim Beach, Boipeba Island, MZUESC 1324.

Distribution. Western Atlantic—Bermuda, North Carolina to Brazil (seamounts of the North Brazilian Chain, Fernando de Noronha, Ceará to São Paulo). Central Atlantic—Ascension Island (Manning & Chace 1990; Christoffersen 1998; Coelho Filho 2006).

Ecological notes. The single specimen examined was collected in a concretion of calcareous algae, at a salinity of 33 psu. Depth range: intertidal to 42 m (Chace 1972).

Previous records. None.

Remarks. The first illustrations of T. manningi from Brazil were provided by Almeida et al. (2008b). The present specimen agrees well with the previously reported material.

Superfamily Processoidea Ortmann, 1896

Family Processidae Ortmann, 1896

Ambidexter symmetricus Manning & Chace, 1971

(Fig. 9)

Ambidexter symmetricus Manning & Chace, 1971: 3, figs. 1–2.
FIGURE 9. *Ambidexter symmetricus* Manning & Chace, 1971, male (CL=4.2 mm) (MZUESC 1110), Tanque Island, Maraú, state of Bahia, Brazil. (A) head and cephalic appendages, dorsal view; (B) head and cephalic appendages, lateral view; (C) right third maxilliped, lateral view; (D) right pereiopod 1, lateral view; (E) left pereiopod 1, lateral view. Scale bars: A–C = 1 mm; D, E = 0.5 mm.
**Material examined.** 1 ni, 18.VIII.2007, Maraú, Tanque Island, T2, MZUESC 1106; 1 m, 17.VIII.2007, Maraú, Tanque Island, T3, MZUESC 1110.

**Distribution.** Western Atlantic—Florida to Brazil (Pernambuco to Santa Catarina) (Christoffersen 1998).

**Ecological notes.** The material examined was collected at a depth of 0.8–1 m and salinity 31–32 psu. The type of bottom was not recorded.

**Previous records.** None.

**Remarks.** An identification key to the Brazilian Processidae was provided by Almeida & Bezerra (2011). *Ambidexter* Manning & Chace, 1971 is readily recognized by the chelate first pereiopods (vs. only one, usually the right, of the first pereiopods chelate in *Processa* Leach, 1815 and *Nikoides* Paulson, 1875) (Manning & Chace 1971).

**Discussion**

With the addition of *Alpheus* cf. *paracrinitus*, *A.* cf. *rostratus*, *Automate* cf. *evermanni*, *Leptalpheus* aff. *forceps*, *L. axianassae*, *Salmoneus carvachoii*, *Synalpheus al*, *Thor manningi* and *Ambidexter symmetricus*, 64 species of caridean shrimps are currently reported from shallow (0–100 m) marine and brackish waters of Bahia (Smith 1869; Spence Bate 1888; von Ihering 1897; Coutière 1909; Coelho 1969a; Coelho & Ramos 1972; Gomes Corrêa 1972; Christoffersen 1979, 1982; Ramos-Porto 1986; Ramos-Porto & Coelho 1990; Udekem d’Acoz 1997; Guterres et al. 2005; Cardoso 2006; Coelho et al. 2006; Rhyne & Lin 2006; Serejo et al. 2006; Almeida et al. 2006, 2007a, 2007b; Fransen & Almeida 2009; Laubenheimer & Rhyne 2010; Almeida & Bezerra 2011; Vieira et al. 2012; this study). If only the southern part of the state is considered (Cairú to Mucuri), the total number of species known from this area is 57.

**TABLE 1.** Caridean shrimps found in southern Bahia and the northern and southern limits of their geographic range in the western Atlantic Ocean.

<table>
<thead>
<tr>
<th>Species</th>
<th>Northern Limit</th>
<th>Southern Limit</th>
<th>Reference from Bahia</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Gnathophyllum americanum</em></td>
<td>Florida</td>
<td>Bahia</td>
<td>Coelho &amp; Ramos (1972, as <em>Gnathophyllum sp.</em>)</td>
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<td><em>Ancylomenes pedersoni</em></td>
<td>North Carolina</td>
<td>Espírito Santo</td>
<td>Vieira et al. (2012)</td>
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</tr>
<tr>
<td><em>Brachycarpus bianguiaculatus</em></td>
<td>Amapá</td>
<td>Espírito Santo</td>
<td>Coelho (1969)</td>
<td></td>
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<td><em>Cuapetes americanus</em></td>
<td>North Carolina</td>
<td>São Paulo</td>
<td>Almeida et al. (2007b, as <em>Kempenia americana</em>)</td>
<td></td>
</tr>
<tr>
<td><em>Holthuisaeus bermudensis</em></td>
<td>Florida</td>
<td>Bahia</td>
<td>Serejo et al. (2006, as <em>Periclimenaeus bermudensis</em>)</td>
<td></td>
</tr>
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<td><em>Leander tenuicornis</em></td>
<td>Newfoundland</td>
<td>Bahia</td>
<td>Ramos-Porto (1986)</td>
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<td><em>Macrobrachium acanthurus</em></td>
<td>North Carolina</td>
<td>Rio Grande do Sul</td>
<td>von Ihering (1897, as <em>Palaemon acanthurus</em>)</td>
<td>Freshwater species</td>
</tr>
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<td><em>Nematopalaeon schmitti</em></td>
<td>Guiana</td>
<td>São Paulo</td>
<td>Almeida et al. (2007a)</td>
<td></td>
</tr>
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<table>
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<tr>
<th>Species</th>
<th>Northern Limit</th>
<th>Southern Limit</th>
<th>Reference from Bahia</th>
<th>Observations</th>
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<td>São Paulo</td>
<td>Fransen &amp; Almeida (2009)</td>
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<td><em>Palaemon northropi</em></td>
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<td>Uruguay</td>
<td>Coelho &amp; Ramos [1972, as <em>Palaemon</em> (Palaeanoder) northropi]</td>
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<tr>
<td><em>Palaemon pandaliformis</em></td>
<td>West Indies</td>
<td>Rio Grande do Sul</td>
<td>Almeida <em>et al.</em> [2006, as <em>Palaemon</em> (Palaemon) pandaliformis]</td>
<td>Freshwater species</td>
</tr>
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<td><em>Periclimenes yucatanicus</em></td>
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<td>Bahia</td>
<td>Ramos-Porto &amp; Coelho (1990)</td>
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<td><em>Urociris longicaudata</em></td>
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<td>São Paulo</td>
<td>Coelho &amp; Ramos (1972, as <em>Periclimenes</em> sp. B)</td>
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<td><strong>Family Alpheidae</strong></td>
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<td>Espírito Santo</td>
<td>Christoffersen (1979)</td>
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<td><em>Alpheus cf. armillatus</em></td>
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<td>Santa Catarina</td>
<td>Smith (1869, as <em>Alpheus heterochaelis</em>)</td>
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<td><em>Alpheus bouvieri</em></td>
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<td>Rio Grande do Sul</td>
<td>Christoffersen (1979)</td>
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<td><em>Alpheus chacei</em></td>
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<td>São Paulo</td>
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<td><em>Alpheus cristalifrons</em></td>
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<td>Rio de Janeiro</td>
<td>Serejo <em>et al.</em> (2006)</td>
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<td><em>Alpheus estuariensis</em></td>
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<td>Paraná</td>
<td>Almeida <em>et al.</em> (2006)</td>
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<td><em>Alpheus cf. floridanus</em></td>
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<td>Rio Grande do Sul</td>
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<td><em>Alpheus formosus</em></td>
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<td>São Paulo</td>
<td>Gomes Corrêa (1972)</td>
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<td><em>Alpheus heterochaelis</em></td>
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<td>Bahia</td>
<td>Almeida <em>et al.</em> (2006)</td>
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<td>Santa Catarina</td>
<td>Spence Bate (1888)</td>
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<td>Gutieres <em>et al.</em> (2005)</td>
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<td>São Paulo</td>
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<td>This study</td>
<td><em>Alpheus paracrinus</em> species complex; identity of the material unknown</td>
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<td><em>Alpheus pontederiae</em></td>
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<td>Paraná</td>
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<td>?</td>
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<td>Christoffersen (1979)</td>
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<td>Rio Grande do Sul</td>
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<td>?</td>
<td>This study</td>
<td>Status unknown, possible new species</td>
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### TABLE 1. (Continued)

<table>
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<th>Species</th>
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<th>Reference from Bahia</th>
<th>Observations</th>
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<td>Salmoneus carvachoi</td>
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<td>Paraná</td>
<td>Almeida <em>et al.</em> [2007b, as <em>Salmoneus cf. ortmanni</em>]</td>
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<td>Bahia</td>
<td>Coelho <em>et al.</em> (2006)</td>
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<td>Santa Catarina</td>
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<td>Possible species complex, with more than one species involved in the study area; identity of the material unknown</td>
</tr>
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<td>Gomes Corrêa (1972, as <em>Synalpheus longicarpus</em>)</td>
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<td>North Carolina</td>
<td>Santa Catarina</td>
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<td>Christoffersen (1979)</td>
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<td>Sao Paulo</td>
<td>Spence Bate (1888, as <em>Alpheus minus</em>)</td>
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<td>Synalpheus sanctithomae</td>
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<td>Christoffersen (1979)</td>
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<td>Rio de Janeiro</td>
<td>Coutière (1909)</td>
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<td>Bahia</td>
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<td>Uruguay</td>
<td>Almeida <em>et al.</em> (2007a)</td>
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<td>Hippolyte obliquimanus</td>
<td>North Carolina</td>
<td>Rio de Janeiro</td>
<td>d’Udekem d’Acoz (1997)</td>
<td>-</td>
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<tr>
<td>Latreutes fucorum</td>
<td>New Foundland</td>
<td>Bahia</td>
<td>Coelho &amp; Ramos (1972)</td>
<td>-</td>
</tr>
<tr>
<td>Latreutes parvulus</td>
<td>New Jersey</td>
<td>Argentina</td>
<td>Christoffersen (1982)</td>
<td>-</td>
</tr>
<tr>
<td>Lysmata ankeri</td>
<td>Florida</td>
<td>Rio de Janeiro</td>
<td>Rhyne &amp; Lin (2006)</td>
<td>-</td>
</tr>
<tr>
<td>Lysmata bahia</td>
<td>Panama</td>
<td>Sao Paulo</td>
<td>Rhyne &amp; Lin (2006)</td>
<td>-</td>
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<tr>
<td>Lysmata radii</td>
<td>Bahia</td>
<td>Rio de Janeiro</td>
<td>Laubenthal &amp; Rhyne (2010)</td>
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<tr>
<td>Merguia rhizophorae</td>
<td>Panama</td>
<td>Bahia</td>
<td>Almeida <em>et al.</em> (2006)</td>
<td>-</td>
</tr>
<tr>
<td>Thor manningi</td>
<td>North Carolina</td>
<td>Sao Paulo</td>
<td>This study</td>
<td>-</td>
</tr>
<tr>
<td>Tozeuma carolinense</td>
<td>Massachusetts</td>
<td>Sao Paulo</td>
<td>Coelho &amp; Ramos (1972)</td>
<td>-</td>
</tr>
<tr>
<td>Trachy caris restricta</td>
<td>Florida</td>
<td>Espirito Santo</td>
<td>Coelho &amp; Ramos (1972)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Family Processidae</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ambidexter symmetricus</td>
<td>Florida</td>
<td>Santa Catarina</td>
<td>This study</td>
<td>-</td>
</tr>
<tr>
<td>Nikoides Schmitti</td>
<td>North Carolina</td>
<td>Bahia</td>
<td>Almeida &amp; Bezerra (2011)</td>
<td>-</td>
</tr>
<tr>
<td>Processa bermudensis</td>
<td>North Carolina</td>
<td>Paraná</td>
<td>Christoffersen (1979)</td>
<td>-</td>
</tr>
<tr>
<td>Processa brasiliensis</td>
<td>Pernambuco</td>
<td>Espirito Santo</td>
<td>Christoffersen (1979)</td>
<td>-</td>
</tr>
<tr>
<td>Processa fimbriata</td>
<td>North Carolina</td>
<td>Rio de Janeiro</td>
<td>Christoffersen (1979)</td>
<td>-</td>
</tr>
</tbody>
</table>
A more accurate zoogeographical analysis of the shallow-water carideans from Bahia is difficult at present, mainly because of several factors. Some areas or habitats, such as estuarine mud bottoms, crevices of living and dead corals, conglomerates of calcareous algae and sponges, remain underexplored. The geographical ranges of some recently described species, e.g., *Lysmata ankeri* Rhyne & Lin, 2006, *L. rauli* Laubenheimer & Rhyne, 2010, and *Neopontonides brucei* Fransen & Almeida, 2009, are poorly known. Many carideans, in particular many pontoniines and alpheids, are difficult to collect because of their small size and (ecologically) cryptic or symbiotic life habits; this is especially true for numerous infaunal Alpheidae. Finally, the existence of a number of (morphologically) cryptic species complexes in the Alpheidae (Anker 2001; Anker et al. 2008a, 2008b, 2008c, 2009a; Mathews & Anker 2009), some of them under study (see above), currently does not allow a more precise picture of the actual diversity in this group.

Following the longitudinal patterns of distribution proposed by Melo (1985), species with amphi-Atlantic (n=10), amphi-American (n=2), Circumtropical (n=5) and western Atlantic or western + central Atlantic (n=45) distributions are represented in the study area (excluding freshwater species *Macrobrachium acanthurus* and *Palaemon pandaliformis*). Several species that were previously considered to be widely distributed and highly variable morphologically are species complexes (Anker 2001); some of them have been resolved recently (e.g., Anker et al. 2008a; 2008b, 2008c, 2009a).

In the western Atlantic, Bahia is considered to be part of the Brazilian Province (Coelho & Ramos 1972; Coelho et al. 1978; Boschi 2000). The majority of the western Atlantic species occurring in Bahia have Antillean (n=18) or Carolinian (n=17) distribution patterns, according to Melo (1985). Because of the similar climate with a low annual thermal gradient, the Brazilian Province shares a large number of species with the Antillean Province. However, the total number of species in the Caribbean region is much higher (almost double) than that in the Brazilian Province including the Guyanas (Boschi 2000).

Among the Antillean, Carolinian and Virginian species present in Bahia (n=37), approximately 70% (n=26) have disjunct distributions, i.e., with a gap, usually in the Guyana region (Guyanas, Amapá, and Pará). This region has predominantly soft bottoms (mud and sand), and is strongly influenced by freshwater discharge from major rivers of the Equatorial region (Coelho 1969b; Coelho & Ramos 1972). Gaps in species ranges may be due to their ecology, i.e. species missing in the Guyanas may not be adapted to oceanographic conditions resulting from too much freshwater in the coastal areas. However, gaps may be also due to undersampling (which is true for the Guyanas and northern states of Brazil) or poor taxonomic resolution.

Almost half of the marine shallow-water carideans of Bahia have their southern limits of distribution somewhere between Bahia and Rio de Janeiro (Table 1). For brachyuran crabs (see Almeida & Coelho 2008), this pattern suggests that Bahia constitutes a transition zone between the Brazilian and Paulista zoogeographic provinces. A similar analysis for caridean shrimps should be attempted in the future, however, only after filling major gaps in taxonomic and biogeographic knowledge of this diverse group.

Acknowledgements

The authors are indebted to FAPESB (Fundação de Amparo à Pesquisa do Estado da Bahia) (PPP0073/2010) and to the Universidade Estadual de Santa Cruz (00220.1100.590) for providing financial support to the project “Diversidade de Crustáceos Decápodos Marinhos e Estuarinos do Sul da Bahia, Brasil”; to Dr. Petrônio A. Coelho (in memoriam) for supervising AOA’s doctoral thesis; to Gabriel B. G. Souza, Felipe S. Gudinho and Leandro S. Oliveira for their invaluable support in the field activities; to Dr. Janet W. Reid for assistance with the English text; to Dr. Danièle Guinot and Regis Cleva for their assistance during AOA’s visit of the MNHN. CLAS thanks CAPES for financial support (Scholarship Grant number: 5428/10-6). LEAB thanks PNPD/CAPES and FACEPE (BCT) for financial support. Collecting permits in Bahia were granted by IBAMA (Instituto Brasileiro do Meio-Ambiente e dos Recursos Naturais Renováveis). The authors are also indebted to Dr. Arthur Anker and Dr. Juan A. Baeza for the criticisms that greatly improved the manuscript.
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Ortmann, A. (1897) Os camarões da água doce da America do Sul.


Milne-Edwards, A. (1878) Description de quelques espèces nouvelles de Crustacés provenant du voyage aux îles du Cap-Vert


Miers, E.J. (1881) On a collection of Crustacea made by Baron Hermann-Maltzan at Goree island, Senegambia.


Ortmann, H. von. (1897) Os camarões de água doce do Brazil.


APPENDIX 1. List of species by collection station during the projects conducted in southern Bahia from 2003 to 2008.


List of stations (in alphabetical order):

<table>
<thead>
<tr>
<th>Locality/Station</th>
<th>Coordinates</th>
<th>Species collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acuípe River, St. 2, after bridge of highway BA-001</td>
<td>15°05'21.8&quot;S; 38°59'56.4&quot;W</td>
<td><em>Alpheus pontederiae</em></td>
</tr>
<tr>
<td>Acuípe River, St. 3</td>
<td>15°04'53.6&quot;S; 39°00'13.8&quot;W</td>
<td><em>Macrobrachium acanthurus, Palaemon pandaliformis</em></td>
</tr>
<tr>
<td>Acuípe River, St. 5, Acuípe River tributary</td>
<td>15°04'58.6&quot;S; 38°59'53.4&quot;W</td>
<td><em>Alpheus pontederiae</em></td>
</tr>
<tr>
<td>Almada River, St. 2 mouth of Almada River</td>
<td>14°46'27.2&quot;S; 39°03'14.8&quot;W</td>
<td><em>Alpheus cf. armillatus, Palaemon northropi</em></td>
</tr>
<tr>
<td>Almada River, St. 4 at bridge of Ilhéus-Itacaré highway</td>
<td>14°45'07.5&quot;S; 39°03'51.2&quot;W</td>
<td><em>Macrobrachium acanthurus</em></td>
</tr>
<tr>
<td>Back-door Beach, Olivença</td>
<td>14°55'52&quot;S; 39°00'59&quot;W</td>
<td><em>Palaemon northropi</em></td>
</tr>
<tr>
<td>Batuba Beach, Olivença</td>
<td>14°56'32.8&quot;S; 39°00'43.3&quot;W</td>
<td><em>Palaemon northropi</em></td>
</tr>
<tr>
<td>Cachoeira River, St. 4 trawl</td>
<td>14°48'15.6&quot;S; 39°04'22.3&quot;W</td>
<td><em>Alpheus heterochaelsis, Alpheus pontederiae, Leander paulensis</em></td>
</tr>
<tr>
<td>Cachoeira River, St. 6 trawl</td>
<td>14°48'49.9&quot;S; 39°03'19&quot;W and 14°48'51.5&quot;S; 39°02'28.1&quot;W</td>
<td><em>Alpheus intrinsecus</em></td>
</tr>
<tr>
<td>Cachoeira River, St. 7, Lomanto Junior Bridge, trawl</td>
<td>14°48'57.3&quot;S; 39°02'30.5&quot;W</td>
<td><em>Leander paulensis</em></td>
</tr>
<tr>
<td>Cachoeira River, St. 8, Pontal, trawl</td>
<td>14°48'10&quot;S; 39°02'12.3&quot;W</td>
<td><em>Alpheus cf. armillatus, Alpheus intrinsecus, Latreutes parvulus, Leander paulensis, Synalpheus fritzmueller</em></td>
</tr>
<tr>
<td>Jairí Beach, Olivença</td>
<td>14°58'42.8&quot;S; 39°00'06.8&quot;W</td>
<td><em>Palaemon northropi</em></td>
</tr>
<tr>
<td>Mamoã River</td>
<td>14°35'05.6&quot;S; 39°03'10.5&quot;W</td>
<td><em>Alpheus estuariensis, Mergui rhizophorae</em></td>
</tr>
<tr>
<td>Parque Municipal da Boa Esperança, Ribeirão Iguape</td>
<td>14°47'01.3&quot;S; 39°03'49.6&quot;W</td>
<td><em>Alpheus pontederiae</em></td>
</tr>
<tr>
<td>Maramata Beach</td>
<td>14°48'28.7&quot;S; 39°01'33.3&quot;W</td>
<td><em>Alpheus bouvieri, Palaemon northropi</em></td>
</tr>
<tr>
<td>Santana River, St. 3 Trawl</td>
<td>14°50'35.8&quot;S; 39°02'45.1&quot;W</td>
<td><em>Alpheus heterochaelsis</em></td>
</tr>
<tr>
<td>Santana River, St. 4 Trawl</td>
<td>14°50'14.4&quot;S; 39°02'39.2&quot;W</td>
<td><em>Leander paulensis</em></td>
</tr>
<tr>
<td>Sirihyba Beach, Olivença</td>
<td>14°57'32.5&quot;S; 39°00'21.5&quot;W</td>
<td><em>Alpheus cf. armillatus, Hippolyte obliquimanus, Palaemon northropi</em></td>
</tr>
</tbody>
</table>


List of stations (in alphabetical order):
<table>
<thead>
<tr>
<th>Locality/Station</th>
<th>Coordinates</th>
<th>Species collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belmonte, Mojiçubaba Beach</td>
<td>16°05'10.8&quot;S;</td>
<td><em>Hippolyte obliquimanus</em>, <em>Synalpheus fritzmuelleri</em></td>
</tr>
<tr>
<td></td>
<td>38°56'51.7&quot;W</td>
<td></td>
</tr>
<tr>
<td>Belmonte, Mojiçubaba River</td>
<td>16°05'13.8&quot;S;</td>
<td><em>Alpheus estuariensis</em>, <em>Palaemon northropi</em></td>
</tr>
<tr>
<td></td>
<td>38°56'53.8&quot;W</td>
<td></td>
</tr>
<tr>
<td>Cairú, Moreira Beach, Boipeba</td>
<td>13°36'49.5&quot;S;</td>
<td><em>Alpheus cf. armillatus</em>, <em>A. bouvieri</em>, <em>A. cf. packardi</em>, <em>A. cf. paracrinus</em></td>
</tr>
<tr>
<td>Island</td>
<td>38°54'16.2&quot;W</td>
<td><em>Cupeptes americanus</em></td>
</tr>
<tr>
<td>Cairú, Tassimirim Beach, Boipeba</td>
<td>13°34'49.6&quot;S;</td>
<td><em>Alpheus cf. armillatus</em>, <em>A. formosus</em>, <em>A. cf. rostratus</em>, <em>Cupeptes americanus</em></td>
</tr>
<tr>
<td>Island</td>
<td>38°54'49.4&quot;W</td>
<td><em>Lysmata cf. intermedia</em>, <em>Synalpheus fritzmuelleri</em>, <em>Thor manningi</em></td>
</tr>
<tr>
<td>Cairú, Triana River, Boipeba</td>
<td>13°35'00.6&quot;S;</td>
<td><em>Alpheus cf. armillatus</em>, <em>A. chacei</em>, <em>A. estuariensis</em>, <em>A. cf. rostratus</em>, <em>Cupeptes americanus</em>, <em>Palaemon northeori</em>, <em>Salmoineus carvachi</em></td>
</tr>
<tr>
<td>Island</td>
<td>38°55'49.2&quot;S</td>
<td></td>
</tr>
<tr>
<td>Canavieiras, Pardo River</td>
<td>15°41'33.3&quot;S;</td>
<td><em>Alpheus estuariensis</em>, <em>Salmoineus carvachi</em></td>
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<tr>
<td></td>
<td>38°56'07.0&quot;W</td>
<td></td>
</tr>
<tr>
<td>Canavieiras, Patipe River</td>
<td>15°38'44.8&quot;S;</td>
<td><em>Alpheus estuariensis</em>, <em>Palaemon pandaliformis</em></td>
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<td>38°56'30.2&quot;W</td>
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<td></td>
<td>39°14'49.7&quot;W</td>
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<td>Caravelas, Caravelas River, Farol</td>
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<td>Abrolhos Lade Clube, St. 2</td>
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<tr>
<td>Caravelas, Caravelas River, Barra</td>
<td>17°44'16.3&quot;S;</td>
<td><em>Alpheus cf. armillatus</em>, <em>Leander paulensis</em></td>
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<td>de Caravelas, St. 4</td>
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<td>Caravelas, Pontal do Sul</td>
<td>17°45'05.6&quot;S;</td>
<td><em>Alpheus cf. armillatus</em></td>
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<td></td>
<td>39°11'35.4&quot;W</td>
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<tr>
<td>Itacaré, Concha Beach, mouth of</td>
<td>14°16'31.4&quot;S;</td>
<td><em>Alpheus cf. armillatus</em>, <em>Brachycarpus bianguiculatus</em>, <em>Cupeptes americanus</em>, <em>Palaemon northeori</em></td>
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<td><em>Leptalpheus axianassae</em>, <em>Palaemon northeori</em></td>
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<td>Itacaré, Contas River</td>
<td>14°16'38.2&quot;S;</td>
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<tr>
<td></td>
<td>38°59'41.7&quot;W</td>
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<tr>
<td>Maraú, Barra Grande (Barra Grande)</td>
<td>13°53'26.1&quot;S;</td>
<td><em>Urocaris longicaudata</em></td>
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<td>38°57'09.4&quot;W</td>
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</tr>
<tr>
<td>Maraú, Ponta do Mutá</td>
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<td><em>Leander paulensis</em>, <em>Palaemon northeori</em>, <em>Urocaris longicaudata</em></td>
</tr>
<tr>
<td></td>
<td>38°56'53&quot;W</td>
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</tr>
<tr>
<td>Maraú, Maraú River</td>
<td>14°06'60.2&quot;S;</td>
<td><em>Alpheus pontederiae</em></td>
</tr>
<tr>
<td></td>
<td>39°02'84.7&quot;W</td>
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<tr>
<td>Maraú, Tanque Island, Transect 2</td>
<td>14°00'59.0&quot;S;</td>
<td><em>Alpheus chacei</em>, <em>Ambidexter symmetricus</em>, <em>Salmoineus carvachi</em></td>
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<tr>
<td>Van Veen</td>
<td>38°59'15.6&quot;W</td>
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<tr>
<td>Maraú, Tanque Island, Transect 3</td>
<td>14°00'47.8&quot;S;</td>
<td><em>Ambidexter symmetricus</em></td>
</tr>
<tr>
<td>Van Veen</td>
<td>38°59'00.5&quot;W</td>
<td></td>
</tr>
<tr>
<td>Mucuri, Mucuri River, St. 1 mouth</td>
<td>18°05'633&quot;S;</td>
<td><em>Alpheus estuariensis</em>, <em>A. pontederiae</em>, <em>Palaemon northeori</em>, <em>P. pandaliformis</em></td>
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<td>39°33'113&quot;W</td>
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<tr>
<td>Nova Viçosa, Pontal da Barra</td>
<td>17°53'22.7&quot;S;</td>
<td><em>Alpheus cf. armillatus</em></td>
</tr>
<tr>
<td>Beach, St. 2</td>
<td>39°21'53.5&quot;W</td>
<td><em>Synalpheus fritzmuelleri</em></td>
</tr>
<tr>
<td>Nova Viçosa, Pontal da Barra</td>
<td>17°53'22.7&quot;S;</td>
<td></td>
</tr>
<tr>
<td>Beach, near St. 2</td>
<td>39°21'53.5&quot;W</td>
<td><em>Cupeptes americanus</em>, <em>Synalpheus apioceros</em>, <em>Synalpheus fritzmuelleri</em></td>
</tr>
<tr>
<td>Nova Viçosa, Pontal da Barra</td>
<td>17°53'00.9&quot;S;</td>
<td></td>
</tr>
<tr>
<td>Beach, St. 3, Pier</td>
<td>39°21'48.2&quot;W</td>
<td><em>Cupeptes americanus</em>, <em>Hippolyte obliquimanus</em>, <em>Lateutre parvulus</em>, <em>Synalpheus fritzmuelleri</em></td>
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<tr>
<td>Porto Seguro, Mutá Beach (coral reef)</td>
<td>16°21'52.2&quot;S;</td>
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<tr>
<td></td>
<td>39°00'15.9&quot;W</td>
<td><em>Alpheus cf. armillatus</em></td>
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<tr>
<td>Porto Seguro, Buranhem River,</td>
<td>16°26'48.5&quot;S;</td>
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<tr>
<td>Municipal Pier of Porto Seguro</td>
<td>39°03'40.3&quot;W</td>
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<tr>
<td>Prado, Barra do Cahy</td>
<td>17°00'45.0&quot;S;</td>
<td><em>Alpheus estuariensis</em>, <em>Mergua rhizophorae</em></td>
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<tr>
<td></td>
<td>39°10'21.0&quot;W</td>
<td></td>
</tr>
<tr>
<td>Prado, Cumunuxatuba Beach</td>
<td>17°06'18.6&quot;S;</td>
<td><em>Alpheus cf. armillatus</em>, <em>Automate cf. evermanni</em>, <em>Cupeptes americanus</em>, <em>Hippolyte obliquimanus</em>, <em>Leander paulensis</em>, <em>Urocaris longicaudata</em></td>
</tr>
<tr>
<td></td>
<td>39°10'50.4&quot;W</td>
<td></td>
</tr>
<tr>
<td>Santa Cruz Cabrália, Coroa Ver- melha Beach</td>
<td>16°19'58.5&quot;S;</td>
<td><em>Alpheus cf. armillatus</em>, <em>A. cristalifrons</em>, <em>A. formosus</em>, <em>A. cf. packardi</em>, <em>A. cf. rostratus</em>, <em>Cupeptes americanus</em>, <em>Hippolyte obliquimanus</em>, <em>S. fritzmuelleri</em></td>
</tr>
<tr>
<td>Santa Cruz Cabrália, João de Tiba</td>
<td>39°00'21.5&quot;W</td>
<td></td>
</tr>
<tr>
<td>River, mouth</td>
<td>17°06'18.6&quot;S;</td>
<td><em>Alpheus estuariensis</em>, <em>Cupeptes americanus</em>, <em>Synalpheus apioceros</em>, <em>S. cf. brevicarpus</em>, <em>S. fritzmuelleri</em></td>
</tr>
<tr>
<td>Santa Cruz Cabrália, João de Tiba</td>
<td>39°10'50.4&quot;W</td>
<td></td>
</tr>
<tr>
<td>River, near Santo André Beach</td>
<td>16°15'03.9&quot;S;</td>
<td><em>Alpheus cf. armillatus</em>, <em>A. estuariensis</em>, <em>Palaemon northeori</em>, <em>Salmoineus carvachi</em></td>
</tr>
<tr>
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<td>39°00'54.9&quot;W</td>
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</tr>
<tr>
<td>Santa Cruz Cabrália, Yaya River, mouth</td>
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</tr>
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<td>39°10'50.4&quot;W</td>
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</tr>
<tr>
<td>Una, Comandatuba Village</td>
<td>15°21'09.3&quot;S;</td>
<td><em>Alpheus estuariensis</em>, <em>Salmoineus carvachi</em></td>
</tr>
<tr>
<td></td>
<td>38°59'13.6&quot;W</td>
<td></td>
</tr>
</tbody>
</table>

SHALLOW-WATER CARIDEAN SHRIMPS FROM SOUTHERN BAHIA  
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