A comparative study of the Bivalvia (Mollusca) from the continental shelves of Antarctica and Brazil

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Abstract: During identification of bivalve molluscs collected in Antarctica, a rich taxonomic bibliography was gathered, stimulating comparisons with the Brazilian malacofauna. We listed a total of 68 and 368 known shallow-water species (less than 200 m depth) from Antarctica and Brazil, respectively, in order to find species, families and superfamilies in common, and to investigate how these malacofaunas differ in regard to these representative groups and their life habits. There are 23 superfamilies absent in Antarctica, but present in Brazil with at least one species; the reverse does not occur, as all superfamilies known from Antarctica are also recorded from Brazil. The number of Brazilian species is higher, being composed of a mixture of taxa from different biogeographical provinces, whereas in Antarctica there are only a few species adapted to its polar conditions, with minor components from elsewhere. Thus, many typical Caribbean species extend into Brazil, belonging to the diverse Arcoidea, Pectinoidea, Lucinoidea, Cardioidea, Veneroidea, and Tellinoidea. Cemented Ostreoidea, Plicatuloidea, Dimyoidea, Spondylidae (Pectinoidea), and Chamoidea are absent from Antarctica, as are wood (Teredinidae, Pholadoidea) and rock borers (Pholadidae, Pholadoidea; Gastrochaenoidea; and Lithophaginae, Mytiloidea). A large number of Brazilian species of infaunal (e.g., Tellinidae, Veneridae, Cardiidae, and Mactroidea) and epifaunal groups (Pectinidae, Mytilidae, and Arcidae) are absent from or poorly represented in Antarctica. Nuculanoidea, Limopsoidea, Lucinoidea, Galeommatoidea, Cyamioidea, and Cuspidarioidea are the richest groups in Antarctica; some of them are also represented by several species in Brazil, albeit in deeper waters. Three species are recorded as living in both places: *Limatula pygmaea* (Limidae), *Lasaea adansoni* (Lasaeidae), and *Gaimardia trapesina* (Gaimardiidae). Through the analysis of these groups from each fauna, it is possible to identify those that are taxonomically diverse in one place or another, and then emphasize them in ecological studies, eventually using them as model or monitoring organisms. The present paper can be a starting point for future discussion on the existing latitudinal gradients along the coast of eastern South America, stimulating studies on changes occurring in the composition of the faunas of bivalves from Brazil, Uruguay, Argentina, and Antarctica.
Keywords: *checklist, shallow waters, brazilian fauna, antarctic fauna.*

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Resumo: Durante a identificação de moluscos bivalves coletados na Antártica, foi reunida uma rica bibliografia taxonômica, estimulando comparações com a malacofauna do Brasil. Assim, listamos um total de 68 espécies conhecidas para águas rasas (menos de 200 m de profundidade) da Antártica e 368 para o Brasil, procurando encontrar espécies, famílias e superfamílias em comum a ambos os locais, e investigando em que essas malacofaunas diferem em relação aos grupos representados e em relação ao hábito de vida das suas espécies. Vinte e três superfamílias não possuem representantes antárticos, mas estão presentes com pelo menos uma espécie brasileira; o oposto não ocorre, pois todas superfamílias que ocorrem na Antártica também são conhecidas para o Brasil. O número de espécies brasileiras é maior, composto por uma mistura de táxons de diferentes províncias biogeográficas, enquanto na Antártica existem somente poucas espécies adaptadas às condições polares, com uma minoria de representantes de fora da Antártica. Dessa forma, muitas espécies típicas do caribe se distribuem até o Brasil, pertencendo aos diversos Arcoidea, Pectinoidea, Lucinoidea, Cardioidea, Veneroidea e Tellinoidea. Cimentantes Ostreoidea, Plicatuloidea, Dimyoidea, Spondylidae (Pectinoidea) e Chamoidea não estão presentes na Antártica, como também não estão perfuradores de madeira (Teredinidae, Pholadoidea) e de rochas (Pholadidae, Pholadoidea; Gastrochaenoidea; e Lithophaginae, Mytiloidea). É notável o grande número de espécies brasileiras de grupos infaunais (exemplos, Tellinidae, Veneridae, Cardiidae e Mactroidea) e epifaunais (Pectinidae, Mytilidae e Arcidae), que são ausentes ou pobremente representados na Antártica. Nuculanoidea, Limopsoidea, Lucinoidea, Galeommatoidea, Cyamioidea e Cuspidarioidea são os grupos mais ricos em espécies antárticas, alguns deles também sendo especiosos no Brasil, entretanto, em maiores profundidades. Três espécies são registradas para ambos os locais: *Limatula pygmaea* (Limidae), *Lasaea adansoni* (Lasaeidae) e *Gaimardia trapesina* (Gaimardiidae). Através de análises dos grupos, é possível apontar aqueles que são taxonomicamente diversos em uma ou outra fauna, e então enfatizá-los em estudos ecológicos, utilizando-os como "organismos monitores" ou modelos. O presente trabalho pode ser um ponto de partida para futuras discussões sobre a ocorrência de um gradiente latitudinal ao longo da costa leste da América do Sul, estimulando trabalhos sobre mudanças que ocorrem na composição das faunas de bivalves do Brasil, Uruguai, Argentina e Antártica.
Palavras-chave: *lista de espécies, águas rasas, fauna brasileira, fauna antártica.*

Introduction

The importance of studies of Antarctic organisms has been recently acknowledged. With recognition of global-scale phenomena such as, for example, those related to climate changes, knowledge of these animals has become essential for better comprehension and proper management of ecosystems, raising questions about their ecology and physiology. These studies are largely dependent on the correct identification of the species, eventually stimulating investigations on taxonomy, systematics, and biogeography.

The Brazilian Antarctic Program (PROANTAR) is contributing to knowledge of the organisms from the South Shetland Islands (an archipelago near the Antarctic Peninsula), especially of those from the coastal areas around King George Island, where the program's scientific activities are now concentrated. Beginning with the first Brazilian expeditions, many molluscs have been collected from this location, and brought for identification by the malacologists of the Instituto de Biociências da Universidade de São Paulo (IBUSP), coordinated by the late Prof. Walter Narchi (Narchi et al. 2002, Domaneschi et al. 2007). Investigations on the biology and anatomy of bivalves were continued by Prof. Osmar Domaneschi and his students (Narchi et al. 2002, Domaneschi et al. 2002, 2007, Passos et al. 2005, 2007, Sartori & Domaneschi 2005, Passos & Domaneschi 2006, 2009, Sartori et al. 2006), who gathered a rich bibliography on these animals, especially on their taxonomy.

Through a series of papers on the Antarctic bivalves, Nicol pointed out some of their peculiar characteristics, such as the high percentage of small-sized species (less than 15.0 mm) (Nicol 1964b, 1966a); the small number of species of some groups that are otherwise well represented in warm shallow waters (venerids, lucinids, tellinids, and cardiids) (Nicol & Gavenda 1964); the lack of shell-attached species (Nicol 1964a); some morphological characters which are common, such as thin and chalky shells, with a lack of bright colors and absence of color patterns and spines, and ornamentation, when present, subdued (Nicol 1965, 1967, 1970); and the low percentage of Antarctic species with infaunal habits (Nicol 1970). Subsequently, the evolutionary history of the Antarctic Bivalvia was analyzed (Crame 1992, 1996, 1997, 2000), as well as other aspects, including biogeography (Crame 1993, Brandt et al. 1999), physiology (e.g., Clarke 1983, Ahn 1997, Peck & Conway 2000, Abele et al. 2001, Heilmayer & Brey 2003), ecology (e.g., Ralph & Maxwell 1977, Stockton 1984, Berkman 1990, Arnaud & Hain 1992, Brey & Hain 1992, Brey et al. 1993, Nigro 1993, Peck & Bullough 1993, Cattaneo-Vietti et al. 1997, 2000, Mercuri et al. 1998, Urban & Mercuri 1998, Chiantore et al. 2003), and reproductive biology (e.g., Richardson 1980, Berkman et al. 1991, Hain & Arnaud 1992, Prezant et al. 1992, Bigatti et al. 2001, Peck et al. 2007, Kang et al. 2009, Passos & Domaneschi 2009). In the present contribution, the faunas of Bivalvia from Brazil and Antarctica were compared, aiming to answer the following questions: At higher taxonomic levels (families, superfamilies), which taxa mostly diverge? Are there species that occur in both places? What are their differences in life habits? And finally, what are the possible causes of these divergences? These questions were investigated here, through examination of the species on the continental shelf, excluding those from deeper waters.

Materials and Methods

Initially, a comparison between the Antarctic and Brazilian bivalves at the species and genus levels appeared to be a very difficult task, in view of the many existing taxonomic debates. Apart from problems related to synonymy, the relationships of some genera are still unresolved, awaiting worldwide revisions. For example, some authors consider that *Tellina* and *Thyasira* are composed by many subgenera (e.g., Mikkelsen & Bieler 2008), while others split them into many genera (e.g., Rios 1994, 2009, Coan et al. 2000). These subjects are not treated here. Although fewer, there are also taxonomic debates at the family and superfamily levels, and to facilitate comparisons, some decisions were taken, as follows.

The family Manzanellidae was considered in a separate superfamily, the Manzanelloidea, apart from the Solemyoidea. Glycymerididae was included within the Arcoidea. Plicatulidae was separated from Dimyidae, each forming its own superfamily, Plicatuloidea and Dimyoidea. One single group, Crassatelloidea, comprises four families (Crassatellidae, Astartidae, Carditidae, and Condylocardiidae), and five others (Galeommatidae, Lasaeidae, Leptonidae, Kelliidae, and Chlamydoconchidae) compose the Galeommatoidea. Trapezidae is placed in Arcticoidea, and Glossidae, Kelliellidae, and Vesicomyidae are grouped in Glossoidea. Cyamiidae, Neoleptonidae, Gaimardiidae, and Sportellidae form the Cyamioidea. Gastrochaenidae was treated in a separate superfamily, the Gastrochaenoidea. The Thracioidea were removed from the Pandoroidea, with the former composed by Thraciidae, Laternulidae, and Periplomatidae, and the latter by Pandoridae and Lyonsiidae. And finally, the septibranch families are grouped into three distinct superfamilies: Poromyoidea (Poromyidae), Cuspidarioidea (Cuspidariidae), and Verticordioidea (Verticordiidae and Lyonsiellidae).

Therefore, with these taxonomic problems in mind, an extensive bibliographic survey was carried out, to list the species recorded from the shelf of the Antarctic and Brazilian coasts, and excluding groups exclusively found in fresh and deep water, or only represented by fossil species. Each species was carefully analyzed as to its bathymetric distribution, and only those recorded from less than 200 meters depth were listed, hence restricting our analysis to the nearshore fauna. For the Antarctic, we included only the species recorded from around the continent and the islands of the Scotia Arc (except South Georgia); species recorded only from other subantarctic islands were excluded. For the Bivalvia living in Antarctica, the main references were Pelseneer (1903), Lamy (1906a, b, 1911), Melvill & Standen (1907), Thiele (1912), Smith (1915), Hedley (1916), Carcelles (1944, 1950, 1953), Carcelles & Williamson (1951), Powell (1951, 1958, 1960), Soot-Ryen (1951), Stuardo (1962), Castellanos (1963), Dell (1964, 1990), Nicol (1966b), Arnaud (1972, 1973), Rabarts & Whybrow (1979), Arnaud et al. (1986, 2001), Mühlenhardt-Siegel (1989), Hain (1990), Villarroel & Stuardo (1998), Linse (1999, 2004, 2006), Forcelli (2000), Narchi et al. (2002), Zelaya & Ituarte (2002, 2006), Griffiths et al. (2003), Passos et al. (2005, 2007), Sartori & Domaneschi (2005), Zelaya (2005, 2009, 2010), Passos & Domaneschi (2006), Aldea et al. (2008, 2009), Aldea & Troncoso (2008), and Troncoso & Aldea (2008). For Brazil, the references were Klappenbach (1965, 1966a, b), Boss (1966, 1968, 1969, 1972), Narchi (1966, 1973, 1974, 1975, 1976, 1985a, b), Matthews & Kempf (1970), Morrison (1971), Penna (1971), Abbott (1974), Marini (1974), Coelho & Campos (1975), Narchi & Domaneschi (1977), Penna-Neme (1978, 1983), Domaneschi (1984, 1985), Avelar & Narchi (1984), Esteves (1984), Penna-Neme & Cruz-Natali (1984), Tenório (1984), Domaneschi & Lopes (1986a, b, 1988/9), Tenório et al. (1986), Guerón & Coelho (1989), Lopes & Narchi (1993), Rios (1994, 2009), Domaneschi & Narchi (1998), Salvador et al. (1998), Simone (1998, 2001, 2008, 2009a, b), Domaneschi & Martins (2002), Leonel et al. (2002), Quast (2003), Soares-Gomes & Pires-Vanin (2003), Allen (2004), Domaneschi & Shea (2004), Meserani et al. (2004), Simone & Chichvarkhin (2004), Absalão & Pimenta (2005), Arruda (2005), Arruda & Domaneschi (2005), Souza et al. (2005), Amaral et al. (2006), Denadai et al. (2006), Simone & Gonçalves (2006), Arruda et al. (2007), Mikkelsen

& Bieler (2008), Oliveira & Absalão (2008), Resgalla et al. (2008), Simone & Cunha (2008a, b), and Simone & Penchaszadeh (2008).

Based on the literature, representative species of each family or superfamily were investigated regarding their life habits, in order to classify them as infaunal (I) or epifaunal (E). Additionally, the infaunal species were also classified as rock/wood borers (Ib) or tube dwellers (It), and the epifaunal as cemented to the substratum (Ec). Some groups are composed of species with different modes of life, and so are very diverse in this respect. These cases were also noted, with some caution in generalizations. For example, among the Arcoida and Limopsoidea, members of some families are epifaunal, living attached by byssus threads (Arcidae, Noetiidae, and Philobryidae); while for other families they are infaunal (Glycymerididae, Limopsidae). In the Mytiloidea, many Mytilinae species are byssally attached, but the Lithophaginae are rock borers. Within the Pectinoidea, species of Spondylidae are sessile, living cemented to the substratum, a life habit very different from the Pectinidae and Propeamussiidae. And finally, Galeommatoidea, Cyamioidea, and Myoidea are highly diverse, with both infaunal and epifaunal species. For this analysis, more general works were consulted (Boss 1982, Mikkelsen & Bieler 2008, Beesley et al. 1998), as well as other papers on some species both from Antarctica and Brazil (cited above).

Results

The Bivalvia known from shallow waters of Antarctica and Brazil are listed as follows, totaling 68 and 368 species, respectively:

1. Species from Antarctica

SUPERFAMILY NUCULOIDEA:

Family Nuculidae: *Nucula falklandica* Preston, 1912.

SUPERFAMILY NUCULANOIDEA:

Family Nuculanidae: *Nuculana inaequisculpta* (Lamy, 1906), *Propeleda longicaudata* (Thiele, 1912), *Yoldiella antarctica* (Thiele, 1912), *Yoldiella valettei* (Lamy, 1906), *Yoldiella sabrina* (Hedley, 1916), and *Yoldiella profundorum* (Melvill & Standen, 1912);

Family Yoldiidae: *Yoldia eightsi* (Couthouy, 1839 in Jay);

Family Siliculidae: *Silicula rouchi* Lamy, 1910.

SUPERFAMILY LIMOPSOIDEA:

Family Limopsidae: *Limopsis marionensis* Smith, 1885, *Limopsis lilliei* Smith, 1915, *Limopsis scotiana* Dell, 1964, *Limopsis scabra* Thiele, 1912, and *Limopsis enderbyensis* Powell, 1958;

Family Philobryidae: *Philobrya sublaevis* Pelseneer, 1903, *Philobrya wandelensis* Lamy, 1906, *Philobrya olstadi* (Soot-Ryen, 1951), *Philobrya capillata* Dell, 1964, *Adacnarca nitens* Pelseneer, 1903, *Adacnarca limopsoides* (Thiele, 1912), *Lissarca miliaris* (Philippi, 1845), and *Lissarca notocardensis* Melvill & Standen, 1907.

Superfamily Mytiloidea:

Family Mytilidae: *Dacrydium albidum* Pelseneer, 1903.

SUPERFAMILY LIMOIDEA:

Family Limidae: *Limatula pygmaea* (Philippi, 1845), *Limatula simillima* Thiele, 1912, *Limatula hodgsoni* (Smith, 1907), and *Limatula ovalis* (Thiele, 1912).

SUPERFAMILY PECTINOIDEA:

Family Pectinidae: *Adamussium colbecki* (Smith, 1902);

Family Propeamussiidae: *Cyclochlamys gaussianus* (Thiele, 1912) and *Cyclopecten pteriola* (Melvill & Staden, 1907).

SUPERFAMILY LUCINOIDEA:

Family Lucinidae: *Epicodakia falklandica* Dell, 1964;

Family Thyasiridae: *Thyasira falklandica* Smith, 1885, *Thyasira bongraini* (Lamy, 1910), *Parathyasira dearborni* (Nicol, 1965), *Axinulus antarcticus* Zelaya, 2010, and *Genaxinus debilis* Thiele, 1912 [Observation: Nicol (1966) and Hain (1990) referred *G. debilis* to *G. bongraini*, and Zelaya (2005) noted that its presence is "uncertain" for South Georgia, South Orkneys, and the South Shetlands islands; Aldea et al. (2008) considered this species a synonym of *T. dearborni*].

SUPERFAMILY CRASSATELLOIDEA:

Family Astartidae: *Astarte longirostris* Orbigny, 1846;

Family Carditidae: *Cyclocardia astartoides* (Martens, 1878).

SUPERFAMILY GALEOMMATOIDEA:

Family Lasaeidae: *Lasaea consaguinea* (Smith, 1877), *Lasaea adansoni* (Gmelin, 1791), *Mysella minuscula* (Pfeffer, 1886), *Mysella charcoti* (Lamy, 1906), *Mysella gibbosa* (Thiele, 1912), *Mysella narchii* Passos & Domaneschi, 2006, *Mysella antarctica* (Smith, 1907), *Montacuta nimrodiana* (Hedley, 1911), and *Waldo parasiticus* (Dall, 1876);

Family Kelliidae: *Kellia simulans* Hedley, 1911, *Pseudokellya cardiformis* Smith, 1885, and *Pseudokellya gradata* Thiele, 1912;

Family Leptonidae: *Solecardia antarctica* Hedley, 1911.

SUPERFAMILY CYAMIOIDEA:

Family Gaimardiidae: *Kidderia subquadratum* (Pelseneer, 1903) and *Gaimardia trapesina* (Lamarck, 1819);

Family Cyamiidae: *Cyamiomactra laminifera* (Lamy, 1906), *Cyamiocardium denticulatum* (Smith, 1907), *Cyamiocardium crassilabrum* Dell, 1964, and *Ptychocardia vanhoeffeni* Thiele, 1912;

Family Neoleptonidae: *Neolepton parasiticum* (Dall, 1876).

SUPERFAMILY HIATELLOIDEA:

Family Hiatellidae: *Hiatella meridionalis* Orbigny, 1846.

SUPERFAMILY PANDOROIDEA:

Family Lyonsiidae: *Lyonsia arcaeformis* Martens, 1885.

SUPERFAMILY THRACIOIDEA:

Family Thraciidae: *Thracia meridionalis* Smith, 1885;

Family Laternulidae: *Laternula elliptica* (King & Broderip, 1831).

SUPERFAMILY POROMYOIDEA:

Family Poromyidae: *Poromya adelaidis* (Hedley, 1916).

SUPERFAMILY CUSPIDARIOIDEA:

Family Cuspidariidae: *Cuspidaria infelix* Thiele, 1912, *Cuspidaria kerguelensis* Smith, 1885, *Cuspidaria tenella* Smith, 1907, *Cuspidaria minima* (Egorova, 1993), and *Cuspidaria concentrica* Thiele, 1912.

2. Species from Brazil

SUPERFAMILY SOLEMYOIDEA:

Family Solemyidae: *Solemya patagonica* Smith, 1885 and *Solemya notialis* Simone, 2009 [Observation: Rios (1994, 2009) and Mikkelsen & Bieler (2008) referred *S. notialis* to *S. occidentalis* Deshayes, 1857, which was considered to be restricted to the Florida-Caribbean Region by Abbott (1974)].

SUPERFAMILY MANZANELLOIDEA:

Family Manzanellidae: *Nucinella serrei* Lamy, 1912.

SUPERFAMILY NUCULOIDEA:

Family Nuculidae: *Nucula brasiliana* Esteves, 1984, *Nucula semiornata* Orbigny, 1846, *Nucula venezuelana* Weisbord, 1964 and *Ennucula puelcha* (Orbigny, 1846) [Observation: Abbott (1974) referred *N. semiornata* to *N. crenulata* Adams, 1856, a species recorded by Mikkelsen & Bieler (2008) from "North Carolina to Florida, West Indies, Gulf of Mexico, Caribbean Central America, South America (to Patagonia)"].

SUPERFAMILY NUCULANOIDEA:

Family Nuculanidae: *Nuculana acuta* (Conrad, 1832), *Nuculana cestrota* (Dall, 1890), *Nuculana concentrica* (Say, 1824), *Nuculana larranagai* Klappenbach & Scarabino, 1968, *Nuculana fortiana* Esteves, 1984, *Nuculana platessa* (Dall, 1889), *Adrana electa* (Adams, 1846), *Adrana patagonica* (Orbigny, 1846), and *Adrana tellinoides* (Sowerby, 1823);

Family Malletiidae: *Malletia cumingii* (Hanley, 1860);

Family Yoldiidae: *Yoldia riograndensis* Esteves, 1984, *Orthoyoldia crosbyana* (Guppy, 1882) and *Orthoyoldia scapania* (Dall, 1889);

Family Tindariidae: *Tindaria striata* (King, 1831).

SUPERFAMILY ARCOIDEA:

Family Arcidae: *Arca imbricata* Bruguière, 1789, *Arca zebra* (Swainson, 1833), *Barbatia cancellaria* (Lamarck, 1819), *Barbatia candida* (Helbling, 1779), *Barbatia ectocomata* (Dall, 1886), *Barbatia tenera* (Adams, 1845), *Acar dominguensis* (Lamarck, 1819), *Acar transmar* Simone, 2009, *Anadara brasiliana* (Lamarck, 1819), *Anadara chemnitzi* (Philippi, 1851), *Anadara baughmani* Hertlein, 1951, *Anadara notabilis* (Röding, 1798), and *Lunarca ovalis* (Bruguière, 1789);

Family Noetiidae: *Noetia bisulcata* (Lamarck, 1819) and *Arcopsis adamsi* (Dall, 1886);

Family Glycymeridae: *Glycymeris longior* (Sowerby, 1832), *Glycymeris undata* (Linnaeus, 1758), *Glycymeris tellinaeformis* (Reeve, 1843), *Glycymeris decussata* (Linnaeus, 1758) and *Glycymeris pectinata* (Gmelin, 1790).

SUPERFAMILY LIMOPSOIDEA:

Family Limopsidae: *Limopsis aurita* (Brocchi, 1814), *Limopsis janeiroensis* Smith, 1915, and *Limopsis davinae* Esteves, 1984;

Family Philobryidae: *Cratis antillensis* (Dall, 1881), *Cosa brasiliensis* Klappenbach, 1966, and *Cosa caribaea* Abbott, 1958.

SUPERFAMILY MYTILOIDEA:

Family Mytilidae: *Mytilus edulis platensis* Orbigny, 1846, *Aulacomya ater* (Molina, 1782), *Brachidontes exustus* (Linnaeus, 1758), *Brachidontes solisianus* (Orbigny, 1846), *Brachidontes rodriguezi* (Orbigny, 1846), *Mytella charruana* (Orbigny, 1846), *Mytella guyanensis* (Lamarck, 1819), *Perna perna* (Linnaeus, 1758), *Modiolus americanus* (Leach, 1815), *Modiolus carvalhoi* Klappenbach, 1966, *Amygdalum dentriticum* Muhlfeld, 1811, *Amygdalum sagittatum* Rehder, 1934, *Lioberus castaneus* (Say, 1822), *Crenella decussata* (Montagu, 1808), *Botula fusca* (Gmelin, 1791), *Gregariella coralliophaga* (Gmelin, 1791), *Musculus lateralis* (Say, 1822), *Musculus viator* (Orbigny, 1846), *Lithophaga antillarum* (Orbigny, 1853), *Lithophaga nigra* (Orbigny, 1842), *Lithophaga bisulcata* (Orbigny, 1853), *Lithophaga patagonica* (Orbigny, 1847), and *Myophorceps aristatus* (Dillwyn, 1847) [Observations: Avelar & Narchi (1984) referred *B. exustus* to *B. darwinianus darwinianus* (Orbigny, 1846). Klappenbach (1965) recorded *M. charruana* as *M. falcata* (Orbigny, 1846). Klappenbach (1965) and Rios (1994) referred *C. decussata* to *C. divaricata* (Orbigny, 1846), which was considered a synonym of it by Mikkelsen & Bieler (2008)].

SUPERFAMILY PTERIOIDEA:

Family Pteriidae: *Pteria colymbus* (Röding, 1798) and *Pinctada imbricata* Röding, 1798 [Observation: Rios (1994) considered *P. colymbus* as a synonym of *P. hirundo* (Linnaeus, 1758); we follow Domaneschi & Lopes (1986a), considering *Pteria colymbus* as valid];

Family Malleidae: *Malleus candeanus* (Orbigny, 1842);

Family Isognomonidae: *Isognomon bicolor* (Adams, 1845) [Observation: Rios (1994) recorded this species as *I. alatus* (Gmelin, 1791), and Mikkelsen & Bieler (2008) listed *I. bicolor*, *I. alatus* and *I. radiatus* (Anton, 1838) occurring in Brazil].

SUPERFAMILY PINNOIDEA:

Family Pinnidae: *Pinna carnea* Gmelin, 1791 and *Atrina seminuda* (Lamarck, 1819).

SUPERFAMILY LIMOIDEA:

Family Limidae: *Lima caribaea* Orbigny, 1853, *Lima scabra* (Born, 1778), *Limaria albicoma* (Dall, 1886), *Limaria inflata* Lamarck, 1819, *Limaria locklini* (Ginty, 1955), *Limatula confusa* (Smith, 1885), *Limatula hendersoni* Olsson & McGinty, 1958, *Limatula pygmaea* (Philippi, 1845), *Limatula laminifera* (Smith, 1885) and *Limea bronniana* Dall, 1886 [Observations: Abbott (1974) referred *L. caribaea* as a subspecies of *L. lima* (Linnaeus, 1758) and Rios (1994) considered that *L. caribaea* is a synonym of *L. lima*; we follow Mikkelsen & Bieler (2008), who considered *L. lima* a species restricted to the Mediterranean Sea. Abbott (1974) recorded that *L. inflata* is often referred to as *L. pellucida* Adams, 1846, which was recorded by Mikkelsen & Bieler (2008) as occurring from "North Carolina to Florida, Bermuda, Bahamas, West Indies, Gulf of Mexico, Caribbean Central America, South America (Brazil)"].

SUPERFAMILY OSTREOIDEA:

Family Gryphaeidae: *Hyotissa macgintyi* (Harry, 1985) [Observation: According to L.R.L. Simone (pers. com.), Rios (2009) referred this species to *Pycnodonte hiotis* (Linnaeus, 1758), which was introduced into the Caribbean Sea, but does not reach the Brazilian coast];

Family Ostreidae: *Ostrea cristata* Born, 1778, *Ostrea equestris* Say, 1834, *Ostrea puelchana* Orbigny, 1842, *Crassostrea rhizophorae* (Guilding, 1828), *Crassotrea virginica* (Gmelin, 1791), *Crassostrea brasiliana* (Lamarck, 1819), and *Lopha frons* (Linnaeus, 1758) [Observation: Rios (1994, 2009) considered that *C. virginica* does not occur in Brazil, but Mikkelsen & Bieler (2008) recorded it from the entire western Atlantic. Rios (1994, 2009) referred *O. brasiliana* as a synonym of *C. rhizophorae*].

SUPERFAMILY PLICATULOIDEA:

Family Plicatulidae: *Plicatula gibbosa* Lamarck, 1801.

SUPERFAMILY DIMYOIDEA:

Family Dimyidae: *Dimya argentea* Dall, 1886.

SUPERFAMILY PECTINOIDEA:

Family Pectinidae: *Amusium papyraceum* (Gabb, 1873), *Chlamys munda* (Reeve, 1853), *Chlamys felipponei* (Dall, 1922), *Chlamys multisquamata* (Dunker, 1864), *Chlamys muscosus* (Wood, 1828), *Chlamys ornata* (Lamarck, 1819), *Chlamys patagonica* (King & Broderip, 1832), *Chlamys sentis* (Reeve, 1853), *Aequipecten tehuelchus* (Orbigny, 1846), *Leptopecten bavayi* (Dauntzenberg, 1900),

Argopecten gibbus (Linnaeus, 1758), *Argopecten noronhensis* (Smith, 1885), *Nodipecten nodosus* (Linnaeus, 1758), *Pecten chazaliei* Dautzenberg, 1900, *Euvola ziczac* (Linnaeus, 1758), and *Cyclopecten subimbrifer* Verrill & Bush, 1897 [Observations: Mikkelsen & Bieler (2008) referred *C. munda* to *Spathochlamys benedicti* (Verrill & Bush, 1897). Rios (2009) considered *S. benedicti* a synonym of *C. munda*];

Family Propeamussiidae: *Similipecten nanus* (Verrill & Bush, 1897) and *Parvamussium pourtalesianum* (Dall, 1886) [Observation: Rios (2009) did not record *S. nanus* from Brazil];

Family Spondylidae: *Spondylus americanus* Hermann, 1781, *Spondylus erinaceus* Reeve, 1856, and *Spondylus ictericus* Reeve, 1856.

SUPERFAMILY ANOMIOIDEA:

Family Anomiidae: *Anomia simplex* Orbigny, 1853 and *Pododesmus rudis* (Broderip, 1834).

SUPERFAMILY LUCINOIDEA:

Family Lucinidae: *Lucina pectinata* (Gmelin, 1791), *Lucina muricata* (Spengler, 1798), *Lucina blanda* (Dall & Simpson, 1901), *Lucina sombrerensis* Dall, 1886, *Callucina keenae* Chavan, 1971, *Codakia costata* (Orbigny, 1842), *Codakia orbicularis* (Linnaeus, 1758), *Codakia orbiculata* (Montagu, 1808), *Codakia pectinella* (Adams, 1852), *Linga amiantus* (Dall, 1901), *Myrtea lens* (Verrill & Smith, 1880), *Miltha childrenae* (Gray, 1824), and *Divaricella quadrisulcata* (Orbigny, 1845) [Observations: Abbott (1974) referred *C. keenae* to *Parvilucina multilineata* (Tuomey & Holmes, 1857) and Rios (1994, 2009) to *Lucina multilineata*, but Mikkelsen & Bieler (2008) pointed out that "*multilineata* Tuomey Holmes, 1857" is an invalid name. Penna-Neme & Cruz-Natali (1984) referred *M. lens* to *Pseudomiltha tixieri* Klein, 1967, which was considered as a synonym of it by Rios (1994, 2009)];

Family Thyasiridae: *Thyasira croulinensis* Jeffreys, 1874 and *Thyasira trisinuata* (Orbigny, 1853);

Family Ungulinidae: *Diplodonta danieli* Klein, 1967, *Diplodonta nucleiformis* Wagner, 1838, *Diplodonta patagonica* (Orbigny, 1842), *Diplodonta punctata* (Say, 1822), *Felaniella candeana* (Orbigny, 1842), *Felaniella vilardeboana* (Orbigny, 1846), *Phlyctiderma semiaspera* (Philippi, 1836), and *Timothynus rehderi* (Altena, 1968).

SUPERFAMILY CRASSATELLOIDEA:

Family Crassatellidae: *Crassatella riograndensis* Vokes, 1973, *Crassatella brasiliensis* (Dall, 1903), *Crassinella lunulata* (Conrad, 1834), *Crassinella marplatensis* Castellanos, 1970, and *Crassinella martinensis* (Orbigny, 1842);

Family Carditidae: *Carditamera floridana* Conrad, 1838, *Carditamera micella* Penna, 1971, *Carditamera plata* (Ihering, 1907), *Cyclocardia moniliata* (Dall, 1902), and *Pleuromeris sanmartini* Klappenbach, 1971 [Observations: Rios (2009) did not record *C. micella* and *C. plata* from the Brazillian coast];

Family Condylocardiidae: *Americuna besnardi* Klappenbach, 1962 and *Carditopsis smithi* (Dall, 1896).

SUPERFAMILY CHAMOIDEA:

Family Chamidae: *Chama congregata* Conrad, 1833, *Chama floridana* Lamarck, 1819, *Chama macerophylla* Gmelin, 1791, *Chama sarda* Reeve, 1847, *Chama sinuosa* Broderip, 1835, *Pseudochama radians* (Lamarck, 1819), *Arcinella arcinella* (Linnaeus, 1767), *and Arcinella brasiliana* (Nicol, 1953).

SUPERFAMILY GALEOMMATOIDEA:

Family Galeommatidae: *Parabornia palliopapillata* Simone, 2001;

Family Lasaeidae: Lasaea adansoni (Gmelin, 1791);

Family Kelliidae: *Kellia suborbicularis* (Montagu, 1803);

Family Leptonidae: *Lepton cema* (Narchi, 1966);

Family Chlamydoconchidae: *Chlamydoconcha avalvis* Simone, 2008 [Observation: Rios (2009) did not record this species from the Brazillian coast].

SUPERFAMILY ARCTICOIDEA:

Family Trapezidae: *Coralliophaga coralliophaga* (Gmelin, 1791).

SUPERFAMILY GLOSSOIDEA:

Family Glossidae: *Meiocardia agassizzii Dall, 1889;*

Family Vesicomyidae: *Vesicomya albida* (Dall, 1889).

SUPERFAMILY CYAMIOIDEA:

Family Gaimardiidae: *Gaimardia trapesina* (Lamarck, 1819);

Family Sportellidae: *Basterotia quadrata* (Hinds, 1843).

SUPERFAMILY CARDIOIDEA:

Family Cardiidae: *Trachycardium magnum* (Linnaeus, 1758), *Trachycardium muricatum* (Linnaeus, 1758), *Trachycardium manueli* Prado, 1993, *Papyridea semisulcata* (Gray, 1825), *Papyridea soleniformis* (Bruguière, 1789), *Trigoniocardia antillarum* (Orbigny, 1853), *Americardia media* (Linnaeus, 1758), *Nemocardium peramabile* (Dall, 1881), *Nemocardium tinctum* (Dall, 1881), *Laevicardium brasilianum* (Lamarck, 1819), and *Laevicardium pictum* (Ravenel, 1861) [Observations: Arruda (2005) considered *T. manueli* as a valid species, but Rios (2009) recorded it as a synonym of *T. muricatum*. Abbott (1974) referred *L. brasilianum* as *L. laevigatum*, which is considered a synonym of it by Rios (2009)];

SUPERFAMILY VENEROIDEA:

Family Veneridae: *Ventricolaria foresti* Fischer-Pietti & Testud, 1967, *Ventricolaria rigida* (Dillwyn, 1817), *Ventricolaria strigillina* (Dall, 1902), *Gouldia cerina* (Adams, 1845), *Chione cancellata* (Linnaeus, 1767), *Chione subrostrata* (Lamarck, 1818), *Chione intapurpurea* (Conrad, 1849), *Chione pubera* (Bory Saint-Vicent, 1827), *Chione latilirata* (Conrad, 1841), *Chione paphia* (Linnaeus, 1767), *Anomalocardia brasiliana* (Gmelin, 1791), *Clausinella gayi* (Hupe, 1854), *Protothaca antiqua* (King & Broderip, 1832), *Protothaca pectorina* (Lamarck, 1818), *Tivela foresti* Fischer-Piette & Testud, 1967, *Tivela fulminata* (Valenciennes, 1827), *Tivela mactroides* (Born, 1778), *Tivela ventricosa* (Gray, 1838), *Tivela isabelleana* (Orbigy, 1846), *Transenella cubaniana* (Orbigny, 1853), *Transennella stimpsoni* Dall, 1902, *Pitar fulminatus* (Menke, 1828), *Pitar palmeri* (Fischer-Pietti & Testud, 1967), *Pitar rostratus* (Koch, 1844), *Pitar circinatus* (Born, 1778), *Pitar cordatus* (Schwengel, 1951), *Amiantis purpuratus* (Lamarck, 1818), *Callista maculata* (Linnaeus, 1758), *Callista eucymata* (Dall, 1890), *Transenpitar americana* (Duello-Jurado, 1951), *Eurhomalea exalbida* (Dillwyn, 1817), *Dosina concentrica* (Born, 1778), *and Cyclinella tenuis* (Récluz, 1852) [Observation: Abbott (1974) referred *Chione subrostrata* as a synonym of *C. cancellata*, which was considered by Mikkelsen & Bieler (2008) as restricted to the Florida Keys (southeastern United States) and the eastern Caribbean];

Family Petricolidae: *Petricola lapicida* (Gmelin, 1791), *Petricola stellae* Narchi, 1975, *Choristodon robustus* (Sowerby, 1834), and *Cooperella atlantica* Rehder, 1943 [Observation: Abbott (1974) referred *Choristodon robustus* to *Rupellaria typica* (Jonas, 1844), and Narchi (1974) and Rios (1994, 2009) to

Petricola typica; Mikkelsen & Bieler (2008) considered *R. typica* as a synonym of *R. robustus*].

SUPERFAMILY TELLINOIDEA:

Family Tellinidae: *Tellina radiata* Linnaeus, 1758, *Tellina petitiana* Orbigny, 1846, *Tellina iheringi* Dall, 1900, *Tellina diantha* Boss, 1964, *Tellina euvitrea* Boss, 1964, *Tellina exerythra* Boss, 1964, *Tellina gibber* Ihering, 1907, *Tellina probina* Boss, 1964, *Tellina sybaritica* Dall, 1881, *Tellina versicolor* Kay, 1843, *Tellina americana* Dall, 1900, *Tellina alternata* Say, 1822, *Tellina angulosa* Gmelin, 1791, *Tellina lineata* Turton, 1819, *Tellina nitens* Adams, 1845, *Tellina punicea* Born, 1778, *Tellina trinitatis* (Tomlin, 1929), *Tellina vespuciana* Orbigny, 1842, *Tellina aequistriata* Say, 1824, *Tellina alerta* Boss, 1964, *Tellina juttingae* (Altena, 1965), *Tellina martinicensis* Orbigny, 1853, *Tellina persica* Dall & Simpson, 1901, *Tellina sandix* Boss, 1968, *Tellina listeri* Röding, 1798, *Strigilla carnaria* (Linnaeus, 1758), *Strigilla gabbi* Olsson & McGinty, 1958, *Strigilla producta* Tryon, 1870, *Strigilla mirabilis* (Philippi, 1841), *Strigilla pisiformis* (Linnaeus, 1758), *Macoma cleryana* (Orbigny, 1846), *Macoma biota* Arruda & Domaneschi, 2006, *Macoma pseudomera* Dall & Simpson, 1900, *Macoma tenta* (Say, 1834), *Macoma constricta* (Bruguière, 1792), *Macoma brevifrons* (Say, 1834), *Macoma tageliformis* Dall, 1900, *Macoma uruguayensis* (Smith, 1885), *Macoma mitchelli* Dall, 1895, *Cymatoica orientalis* (Dall, 1890), and *Temnoconcha brasiliana* (Dall, 1921) [Observation: Boss (1966), Tenório (1984), Arruda (2005), and Amaral et al. (2006) considered *T. iheringi* as a valid species, but Rios (1994, 2009) recorded it as a synonym of *T. petitiana*];

Family Donacidae: *Donax gemmula* Morrison, 1971, *Donax hanleyanus* Philippi, 1842, *Donax striatus* Linnaeus, 1767, *Donax denticulatus* Linnaeus, 1758, and *Iphigenia brasiliana* (Lamarck, 1818);

Family Psammobiidae: *Asaphis deflorata* (Linnaeus, 1758), *Gari linhares* Simone, 1998, *Heterodonax bimaculatus* (Linnaeus, 1758), *Sanguinolaria sanguinolenta* (Gmelin, 1791), and *Sanguinolaria cruenta* (Lightfoot, 1786);

Family Semelidae: *Semele bellastriata* (Conrad, 1937), *Semele casali* Doello-Jurado, 1949, *Semele proficua* (Pulteney, 1799), *Semele purpurascens* (Gmelin, 1791), *Semele nuculoides* (Conrad, 1841), *Abra aequalis* (Say, 1822), *Abra lioica* (Dall, 1881), *Abra uruguayensis* (Pilsbry, 1897), *Cumingia coarctata* Sowerby, 1833, *Ervilia concentrica* (Holmes, 1858), *Ervilia nitens* (Montagu, 1808), and *Ervilia subcancellata* Smith, 1885 [Observation: Rios (2009) considered *E. concentrica* and *E. subcancellata* as synonyms of *E. nitens*];

Family Solecurtidae: *Solecurtus cumingianus* (Dunker, 1861), *Solecurtus sanctaemarthae* Orbigny, 1846, *Tagelus plebeius* (Lightfoot, 1786), and *Tagelus divisus* (Spengler, 1794);

SUPERFAMILY SOLENOIDEA:

Family Solenidae: *Solen tehuelchus* Orbigny, 1843 and *Solen obliquus* Spengler, 1794;

SUPERFAMILY MACTROIDEA:

Family Mactridae: *Mactra isabelleana* Orbigny, 1846, *Mactra marplatensis* Doello-Jurado, 1918, *Mactra patagonica* Orbigny, 1846, *Mactra fragilis* Gmelin, 1791, *Mactra iheringi* Daft, 1897, *Mactra petiti* Orbigny, 1846, *Mactra janeiroensis* Smith, 1915, *Mactrellona alata* (Spengler, 1802), *Mulinia cleryana* (Orbigny, 1846), *Anatina anatina* (Spengler, 1802), and *Raeta plicatella* (Lamarck, 1818) [Observation: Rios (2009) referred *Mactra marplatensis* as a synonym of *M. isabelleana*];

Family Mesodesmatidae: *Mesodesma mactroides* Deshayes, 1854.

SUPERFAMILY DREISSENOIDEA:

Family Dreissenidae: *Mytilopsis leucophaeta* (Conrad, 1831).

SUPERFAMILY MYOIDEA:

Family Myidae: *Sphenia antillensis* Dall & Simpson, 1901;

Family Corbulidae: *Corbula caribaea* Orbigny, 1842, *Corbula lyoni* Pilsbry, 1897, *Corbula patagonica* Orbigny, 1846, *Corbula tryoni* Smith, 1880, *Corbula cymella* Dall, 1881, *Corbula dietziana* Adams, 1852, *Corbula cubaniana* Orbigny, 1853, *Corbula operculata* Philippi, 1849, and *Corbula tarasconii* Arruda, Domaneschi, Francisco & Barros, 2007 [Observation: Rios (2009) did not record *C. tarasconii* from the Brazilian coast].

SUPERFAMILY HIATELLOIDEA:

Family Hiatellidae: *Hiatella solida* (Sowerby, 1834) and *Panopea abbreviata* Valenciennes, 1839 [Narchi (1973) and Domaneschi & Narchi (1998) recorded *H. solida* from Brazil, but Rios (1994, 2009) referred it to *H. arctica* (Linnaeus, 1767). Simone & Penchaszadeh (2008) suggested that the Brazilian species is distinct from the European *H. arctica* and the Chilean *H. solida*, and Mikkelsen & Bieler (2008) noted that "recent studies on Brazilian specimens of *H. arctica* show strong evidence of more than one species"].

SUPERFAMILY GASTROCHAENOIDEA:

Family Gastrochaenidae: *Gastrochaena hians* (Gmelin, 1791), *Gastrochaena ovata* Sowerby, 1834, and *Spengleria rostrata* (Spengler, 1783).

SUPERFAMILY PHOLADOIDEA:

Family Pholadidae: *Pholas campechiensis* Gmelin, 1791, *Barnea lamellosa* (Orbigny, 1946), *Barnea truncata* (Say, 1822), *Cyrtopleura costata* (Linnaeus, 1758), *Cyrtopleura lanceolata* (Orbigny, 1846), *Martesia striata* (Linnaeus, 1758), *Martesia fragilis* Verrill & Bush, 1890, *Martesia cuneiformis* (Say, 1822), and *Netastoma darwini* (Sowerby, 1849);

Family Teredinidae: *Teredo navalis* Linnaeus, 1758, *Teredo bartschi* Clapp, 1923, *Teredo fulleri* Clapp, 1924, *Teredo furcifera* Martens, 1894, *Teredo johnsoni* Clapp, 1924, *Teredo mindanensis* Bartsch, 1923, *Lyrodus floridanus* (Bartsch, 1922), *Lyrodus massa* (Lamy, 1923), *Lyrodus pedicellatus* (Quatrefages, 1849), *Neoteredo reynei* (Bartsch, 1920), *Bankia carinata* (Gray, 1827), *Bankia gouldi* Bartsch, 1908, *Bankia campanellata* Moll & Roch, 1931, *Bankia destructa* Clench & Turner, 1946, *Bankia bagidaesis* Roch, 1929, *Bankia cieba* Clench & Turner, 1946, *Bankia fimbriatula* Moll & Roch, 1931, *Bankia rochi* Moll, 1931, *Nausitora fusticula* (Jeffreys, 1860), *Nototeredo knoxi* (Bartsch, 1917), and *Psiloteredo healdi* (Bartsch, 1931) [Observations: Abbott (1974) considered *L. floridanus* as a synonym of *L. pedicellatus*, and Rios (1994, 2009) did not record *P. healdi* from Brazil].

SUPERFAMILY PHOLADOMYOIDEA:

Family Pholadomyidae: *Panacca arata* (Verrill & Smith, 1881).

SUPERFAMILY PANDOROIDEA:

Family Pandoridae: *Pandora brasiliensis* Sowerby, 1874 and *Pandora bushiana* Dall, 1886;

Family Lyonsiidae: *Entodesma alvarezi* Orbigny, 1846, *Entodesma beana* (Orbigny, 1853), and *Entodesma patagonica* (Orbigny, 1846) [Observation: Abbott (1974) recorded *E. alvarezi* as *Lyonsia hyalina* Conrad, 1831, which was considered as a synonym of it by Rios (1994, 2009)].

SUPERFAMILY THRACIOIDEA:

Family Thraciidae: *Thracia similis* Couthouy, 1839 and *Cyathodonta semirugosa* (Reeve, 1859);

Family Periplomatidae: *Periploma compressa* Orbigny, 1846.

SUPERFAMILY POROMYOIDEA:

Family Poromyidae: *Poromya cymata* Dall, 1889, *Poromya granulata* (Nyst & Westendorp, 1839), and *Poromya elongata* Dall, 1886.

SUPERFAMILY CUSPIDARIOIDEA:

Family Cuspidariidae: *Cuspidaria braziliensis* Smith, 1915, *Cuspidaria platensis* Smith, 1915, *Cuspidaria rostrata* (Spengler, 1793), *Cardiomya cleryana* (Orbigny, 1846), *Cardiomya ornatissima* (Orbigny, 1853), and *Cardiomya striata* (Jeffreys, 1876).

SUPERFAMILY VERTICORDIOIDEA:

Family Verticordiidae: *Verticordia fischeriana* Dall, 1881, *Trigonulina ornata* Orbigny, 1853, and *Spinosipella tinga* Simone & Cunha, 2008 [Observation: Rios (2009) did not record *T. ornata* from Brazil].

In Table 1, all known extant superfamilies of marine Bivalvia are listed, including two (Trigonioidea and Clavagelloidea) that are recorded neither from Antarctica or Brazil. The mode of life and the total number of species counted for each taxa from both places are also shown.

There are 23 superfamilies that do not have Antarctic members, but are represented by at least one species in Brazil: Solemyoidea, Manzanelloidea, Arcoidea, Pterioidea, Pinnoidea, Ostreoidea, Plicatuloidea, Dimyoidea, Anomioidea, Chamoidea, Arcticoidea, Glossoidea, Cardioidea, Veneroidea, Tellinoidea, Solenoidea, Mactroidea, Dreissenoidea, Myoidea, Gastrochaenoidea, Pholadoidea, Pholadomyoidea, and Verticordioidea. The reverse does not occur, as all superfamilies occurring in Antarctica are also known from Brazil. Absent from Antarctica are the Arcoidea, Veneroidea, Tellinoidea and Pholadoidea (see also Figure 1), groups that comprise 42% of the total number of species recorded from Brazil. Mytiloidea is also characteristically rich in Brazilian coastal waters (23 species), but nearly absent from Antarctica (only one). Nuculanoidea, Limopsoidea, Galeommatoidea, and Cyamioidea are the superfamilies best represented in Antarctica (Table 1, Figure 1), comprising 60% of the total number of species. At the family level, the Antarctic harbors relatively more species of Philobryidae (8), Thyasiridae (5), Lasaeidae (9), Cyamiidae (4) and Cuspidariidae (5), groups that are represented by only a few species from shallow waters of Brazil. Only three species are recorded from both regions: *Limatula pygmaea* (Limidae), *Lasaea adansoni* (Lasaeidae), and *Gaimardia trapesina* (Gaimardiidae).

The mode of life for each superfamily is also shown in Table 1. In Antarctica, both infaunal (Nuculanoidea, Limopsidae, Thyasiridae, Cyamiidae, Cuspidariidae) and epifaunal (Philobryidae, Limidae) groups are diverse in number of species; but there are not members of the groups that are essentially sessile, living cemented to the substratum (Ostreoidea, Plicatuloidea, Dimyoidea, Spondylidae, Anomioidea, Chamoidea) or as wood or rock borers (Pholadoidea, Gastrochaenoidea, and species of Mytilidae and Petricolidae). In Brazil, the infaunal superfamilies are very well represented, including the Veneroidea, Tellinoidea and Lucinoidea; but wood borers (Pholadoidea) and epifaunal groups (Arcoidea, Mytiloidea, Pectinoidea) are also very diverse (Figure 1).

Table 1. Superfamilies of marine Bivalvia, with the number of species recorded from Antarctic and Brazilian shallow waters of the continental shelf (<200 m depth). The life habits are classified as epifaunal (E) and infaunal (I), and further as cemented (Ec) and boring (Ib) or tube dwellers (It). See comments in the text for those superfamilies classified with two types of life habits.

Tabela 1. Superfamílias de bivalves marinhos, com o número de espécies registradas para águas rasas da plataforma continental (<200 m de profundidade) da Antártica e do Brasil. Os modos de vida são classificados em epifaunal (E) e infaunal (I), e também como cimentados ao substrato (Ec), perfuradores (Ib) ou construidores de tubos (It). Ver comentários no texto para as superfamílias classificadas com dois modos de vida.

		Number of species	
Superfamilies	**Life habits**	**Antarctic**	**Brazil**
Solemyoidea	I	0	2
Manzanelloidea	I	0	1
Nuculoidea	I	1	4
Nuculanoidea	I	8	14
Arcoidea	E / I	0	20
Limopsoidea	E / I	13	6
Mytiloidea	E / Ib	1	23
Pterioidea	E	0	4
Pinnoidea	I	0	2
Limoidea	E	4	10
Ostreoidea	Ec	0	8
Plicatuloidea	Ec	0	1
Dimyoidea	Ec	0	1
Pectinoidea	E / Ec	3	21
Anomioidea	E	0	2
Trigonioidea	I	0	0
Lucinoidea	I	6	23
Crassatelloidea	I	2	12
Chamoidea	Ec	0	8
Galeommatoidea	E / I	13	5
Arcticoidea	I	0	1
Glossoidea	I	0	2
Cyamioidea	E / I	7	2
Cardioidea	I	0	11
Veneroidea	I	0	37
Tellinoidea	I	0	67
Solenoidea	I	0	2
Mactroidea	I	0	12
Dreissenoidea	E	0	1
Myoidea	E / I	0	10
Hiatelloidea	I	1	2
Gastrochaenoidea	Ib	0	3
Pholadoidea	Ib	0	30
Pholadomyoidea	I	0	1
Pandoroidea	I	1	5
Thracioidea	I	2	3
Poromyoidea	I	1	3
Cuspidarioidea	I	5	6
Verticordioidea	I	0	3
Clavagelloidea	It	0	0
Total		68	368

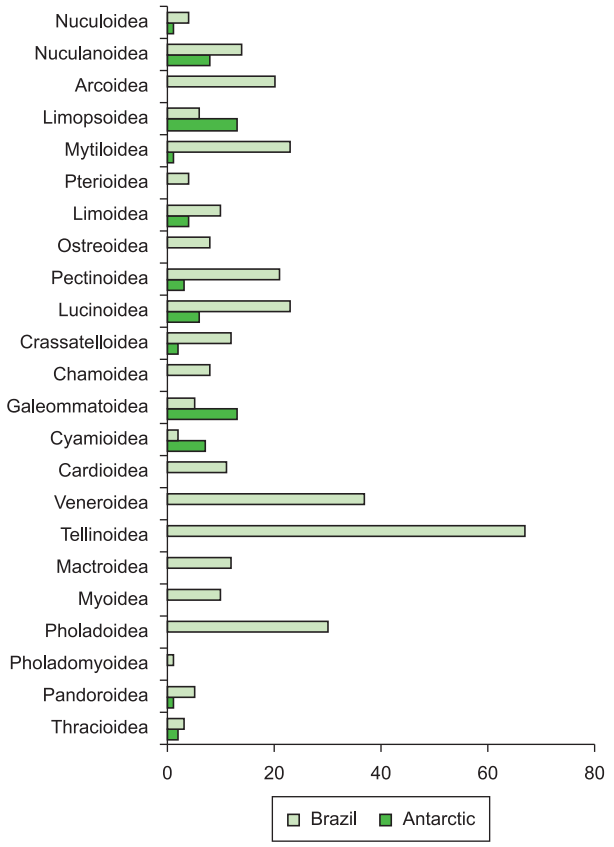

Figure 1. Main superfamilies of marine Bivalvia, with the number of species recorded from the Antarctic and Brazilian continental shelves (<200 m depth).

Figura 1. Principais superfamílias de bivalves marinhos, com o número de espécies registradas para águas da plataforma continental da Antártica e do Brasil (<200 m de profundidade).

Discussion

The total number of coastal Brazilian species is about five times the number recorded from the Antarctic, a proportion that appears to be unbalanced, as the latter has a more extensive coast related to the larger area of its continent. This can be explained in different ways, for example, by the greater homogeneity of the Antarctic marine environment, in general terms; whereas in Brazil there are different conditions along its coast. The Brazilian fauna is composed of a mixture of taxa from different provinces, with a strong contribution from the Caribbean region, which is considered a tropical high-diversity focus of marine bivalves (Crame 2000). From the Caribbean, many species of typical shallow-water groups have spread southward as far as the north/northeast Brazilian coast, for example the Arcoidea (e.g., *Barbatia cancellaria* and *Glycymeris decussata*), Pectinoidea (e.g., *Pecten chazaliei*, *Spondylus americanus,* and *S. erinaceus*), Lucinoidea (e.g., *Lucina muricata*), Cardioidea (e.g., *Trigoniocardia antillarum* and *Nemocardium peramabile*), Veneroidea (e.g., *Chione intapurpurea*, *Transenella cubaniana*, and *Pitar cordatus*), and Tellinoidea (e.g., *Tellina euvitrea*, *T. probrina*, *T. sybaritica*, *T. americana*, *T. vespuciana*, *T. persica*, *Strigilla gabbi*, *S. mirabilis*, *Cymatoica orientalis*, *Donax striatus*, *D. denticulatus,* and *Cumingia coarctata*). On the southernmost coast, the bivalve fauna has a different composition, with a subtropical subset more typical of the Argentinean-Magellanic province, including *Solemya patagonica*, *Tindaria striata*, *Mytilus edulis platensis*, *Brachidontes rodriguezi*, *Chlamys felipponei*, *Clausinella gayi*, *Protothaca antiqua*, *Transenpitar americana*, *Eurhomalea exalbida*, *Mactra patagonica*, *Barnea lamellosa*, *Netastoma darwini*, *Pandora brasiliensis*, *Entodesma patagonica,* and *Thracia similis*. The Antarctic fauna, on the other hand, is composed mainly by circumantarctic species, adapted to a characteristic polar environment, with only a few members from other biogeographical provinces. Here, only some Magellanic species extend southward through the islands of the Scotia Arc into shallow waters of Antarctica, such as *Nucula falklandica*, *Lissarca miliaris*, *Epicodakia falklandica*, *Thyasira falklandica*, *Waldo parasiticum*, *Kidderia subquadratum,* and *Hiatella meridionalis*.

Comparing the Brazilian and Antarctic environments over a long time scale, the shallow waters of Antarctica have had their typical polar characteristics since the beginning of the Caenozoic, when the ice cap began to form. Since then, the scouring action of breaking ice has severely limited the survival of more sedentary coastal organisms, especially those from the intertidal zone, and probably also excluding sessile forms of life. This may be the cause of the absence of cemented groups of Bivalvia, such as Ostreoidea, Plicatuloidea, Dimyoidea, Spondylidae (Pectinoidea), and Chamoidea. Some species of Ostreoidea were present in Antarctic waters in past times, when conditions were milder (Crame 1996). Since mangroves and coral reefs are lacking in the cold shallow waters of Antarctica, there are no species of bivalves that are commonly associated with these ecosystems, such as wood borers (Teredinidae, Pholadoidea) and coral rock borers (Pholadidae, Pholadoidea; Gastrochaenoidea; and Lithophaginae, Mytiloidea). These clearly distinct conditions of the Antarctic and Brazilian waters also explain why their bivalve faunas are so different in terms of number of species, just related to the absence of important groups in Antarctica which are otherwise very rich in shallow Brazilian waters. Nicol (1967) already pointed out the absence of cemented, wood-boring, and rock-boring bivalves in Antarctica. In contrast, the Brazilian coast has 8 species of Ostreoidea and 30 of Pholadoidea.

Among the infaunal bivalve groups, there are large numbers of Brazilian species of Tellinoidea (67 spp.) and Veneroidea (37 spp.), contrasting with their complete absence in Antarctica. Within the American Quadrant, *Macoma georgiana* Dell, 1964 is the tellinoidean with the most southerly distribution, reaching South Georgia (Zelaya 2005), but not extending into the Scotia Arc and the Antarctic Peninsula. For the Veneroidea, three species are found in Patagonia and probably in the Falklands, but not in Antarctica: *Eurhomalea exalbida* (Dillwyn, 1817), *Gomphina foveolata* (Cooper & Preston, 1910), and *Protothaca antiqua* (King & Broderip, 1832). Powell (1960) noted the complete absence of Veneridae and Tellinidae, and also Cardiidae, from Antarctica. Apart from these infaunal groups, the Mactroidea is also lacking, whereas it is represented by 11 species in Brazil, similarly to the Cardioidea. The explanation for the absence of these important superfamilies in Antarctic waters is completely unknown, but may be related to some physiological or ecological factor, or to their evolutionary history. Crame (2000), for example, suggested that more recent families tend to exhibit stronger latitudinal gradients of diversity, decreasing in number of species from low latitudes toward the poles. According to this author, these gradients can be explained by the origin of some of these groups in tropical and low-latitude regions, which are now in the process of evolutionary radiation to the poles; Tellinidae, Veneridae, and Cardiidae were cited as examples.

Among the epifaunal superfamilies, Pectinoidea is represented by a small number of species in Antarctic shallow waters (only *Adamussium colbecki* and two species of Propeamussiidae), compared with 21 Brazilian species (16 Pectinidae, 2 Propeamussiidae, and 3 Spondylidae). More interesting, however, is the absence of Arcidae, in contrast to the 12 species recorded from Brazil. In fact, this family is represented by only one Antarctic species, *Bathyarca sinuata* (Pelseneer, 1903), which is found in deeper waters (400-2044 m) (Dell 1990, Aldea et al. 2008). Another similar case is Mytilidae, with two

species in Antarctic waters, *Dacrydium albidum* and *D. panamensis* Knudsen, 1970, the former occurring in a wide depth range (122-4636 m), and the latter restricted to deep waters (855-3770 m) (Knudsen 1970, Dell 1990, Aldea et al. 2008, Aldea & Troncoso 2008). For both arcoids and mytiloids (but not for pectinids), Crame (2000) demonstrated that there is a tendency to increased diversity toward higher latitudes, suggesting an ongoing evolutionary radiation from the tropics to the poles, as it was hypothesized for Tellinidae, Veneridae, and Cardiidae.

Although represented by a small number of bivalve species (compared to Brazil), Antarctic shallow waters are rich in some groups, such as Nuculanoidea, Limopsoidea, Lucinoidea, Galeommatoidea, Cyamioidea, and Cuspidarioidea, with three of these even more speciose than in Brazil (Limopsoidea, Galeommatoidea, and Cyamioidea). Nicol (1970) already noted that more than one- third of the number of Antarctic species belongs to the families Limopsidae, Philobryidae, and Cyamiidae. Interestingly, on the Brazilian coast, Nuculanoidea and Cuspidarioidea are more diverse in deeper waters. It has long been known that the Antarctic species of Bivalvia have very extensive depth ranges (Dell 1972, 1990), which is probably related to the glaciations occurred during the Late Caenozoic (Brey et al. 1996). Therefore, a comparison between the Brazilian and Antarctic faunas would be more complete if all the species were included, not only those from shallow waters. Resolution of the many existing taxonomic problems is also desirable, including all the levels (species, genus, families, and so on), especially for Nuculanoidea, Lucinoidea, and Galeommatoidea, which have many species with small shells, few characters, and subtle differences between them, obscuring a probable higher diversity of these groups in both regions. Almost surprisingly, three species of Bivalvia are recorded from both Brazilian and Antarctic shallow waters, which is probably related to taxonomic problems. Anyway, Brazilian malacologists are now in the process of studying deep-water (>1000 m) species of Bivalvia (Domaneschi & Lopes 1990, Absalão et al. 2003, Oliveira & Absalão 2007, 2008, 2009, 2010a, b, Passos & Birman 2009, Simone & Cunha 2008a, b), with the prospect of a more-detailed picture of the entire fauna in the near future.

A simple comparison between two faunas, based only on the number of species, may obscure the ecological importance of some species, especially for the Antarctic shallow-water ecosystem. Clear examples are *Laternula elliptica* and *Adamussium colbecki*, which are very abundant in some locations (e.g., Ralph & Maxwell 1977, Arnaud et al. 1986, Berkman 1990, Nigro 1993, Cattaneo-Vietti et al. 1997, Urban & Mercuri 1998, Mercuri et al. 1998, Passos et al. 2005, Kang et al. 2009), although they belong to groups with few representatives (Thracioidea and Pectinoidea, with two and three species, respectively). There are also species that occur in high-density patches, such as *Mysella charcoti*, *Lissarca miliaris,* and *L. notocardensis* (Richardson 1980, Arnaud et al. 1986, Brey & Hain 1992, Prezant et al. 1992, Brey et al. 1993), and other ones that are rich in biomass, e.g., *Yoldia eightsi* (Peck & Bullough 1993, Peck et al. 2000), which is also ecologically important. Other important characteristics of these faunas may be also neglected when comparisons are restricted to the number of species, such as those related to the shells or to the biology of the constituent species. For example, Antarctic bivalves have in general small-sized (shorter than 15.0 mm), thin, and chalky shells, without bright colors and ornamentation, as noted by Nicol (1964b, 1965, 1966a, 1967, 1970). Probably related to the seasonality of the polar environment, many species of Antarctic Bivalvia have non-pelagic development, incubating their young within the mantle cavity (Hain & Arnaud 1992, Passos & Domaneschi 2009). Knowledge on the biology of Antarctic Bivalvia is still restricted to a few species.

A comparison such as this, between two very different faunas of Bivalvia, has never been made previously. Antarctic and Brazilian environments have abiotic characteristics that are obviously very different, and are strongly linked to divergences in the composition, distribution, and abundance of their living organisms. Only through the analysis of their species´ component species, one can point out groups that are characterized as taxonomically diverse in one fauna or another, and then emphasize studies on their ecology, eventually using them as model or monitoring organisms. This exercise raises important questions for future studies on taxonomy and biogeography as, for example, those related to changes in the composition and bathymetric distribution through a latitudinal gradient, as has been argued for both the northern and southern hemispheres, strongly evidenced by the bivalve faunas of Bivalvia (Stehli et al. 1967, Crame 2000). Crame (2000) stressed some of the determining factors in these gradients, such as the geographical distribution of coral reefs, which provide microhabitats for a more diversified fauna. He also stressed that the Brazilian fauna is incompletely understood, and therefore an existing gradient in the western Atlantic must be carefully analyzed. The present contribution aims to start this discussion for the eastern South American coast, stimulating studies on changes occurring in the composition and characteristics of the bivalve faunas from Brazil, Uruguay, Argentina, and Antarctica.

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