Biodiversity of Sessile Fauna on Rocky Shores of Coastal Islands in Santa Catarina, Southern Brazil

Janayna L. Bouzon1,*, Frederico P. Brandini2, Rosana M. Rocha1

1Department of Zoology, Federal University of Paraná, Curitiba, 81531-980, Brazil
2Oceanographic Institute, University of São Paulo, Butantã, 05508-120, Brazil

Abstract The epilithic sessile fauna of coastal islands off Santa Catarina, southern Brazil, was analyzed along two 30 m long sublitoral transects. A total of 111 taxa were identified of which 55 are new records for the South Atlantic epilithic assemblages. Exotic sponges, bryozoans and ascidians (Paraleucilla magna, Schizoporella errata, Bugula dentata, Styela plicata respectively) were found at Marine Protected Areas. This paper gives further knowledge on the marine sessile fauna of the coastal islands of southern Brazil for environmental monitoring programs. A more complete list of epilithic species will certainly provide a baseline to detect future environmental changes and local anthropogenic impacts on the biodiversity of southern Brazilian ecosystems.

Keywords Epilithic Fauna, New Records, Brazilian Islands

1. Introduction

The rocky shores off Santa Catarina, southern Brazil, extend for 562 Km bordering the coastline of the mainland and 130 islands scattered from the Babitonga Bay until the southernmost limits of the main Santa Catarina Island[1]. The epilithic community of the sublitoral zones is rich and diverse, mostly dominated by sessile groups[2]. The Marine Biological Reserve of Arvoredo (REBIOMAR), the only Brazilian full marine protected area (MPA) in southern Brazil, occupies a polygon of 17,600 ha to protect sublitoral rocky environments of some islands and few submerged reefs, all fringed with a broad band of subtidal hard bottom communities. This MPA was set up in 1990 to ensure recruitment and recolonization of adjacent areas which are permanently threatened by all kinds of anthropogenic impacts associated with the economic development along Santa Catarina coastal zone[3]. However, the proximity of the islands with the mainland threatens the biodiversity of their rocky habitats subject to the contamination of urban and industrial development in the last decades.

Due to the co-occurrence of a wide variety of organisms and their trophic interactions, including symbiosis, the sessile benthic communities formed a specific rocky ecosystem with great heterogeneity of micro-habitats and, therefore, high biological richness[4,5].

The knowledge of the benthic invertebrate fauna in Brazil remains weak and the number of recorded species is much lower than the world records, reflecting insufficient studies[3]. Studies on the biodiversity of sessile benthic invertebrates in Santa Catarina reports 32 species of Porifera[6-16], 14 Anthoathecata and Leptothecata hydrozoans [17-19], four octocorals [20,21], 34 ascidians [22]. In addition, 14 scleractinians anthozoans recorded at the outer continental shelf[23,24]. From a total of 346 species of bryozoans reported in Brazil, 40 from the Paraná coast, nearby our study site that were, however, never identified for in the epilithic assemblage of Santa Catarina[25].

An important factor to consider is presence and abundance of species considered invasive due to the fact that these organisms interfere in the survivability of other community species[26], plus the ability to generate economic and environmental damage, and in some cases to human health. Invasive organisms can cause marked changes in communities by altering the evolutionary pathway of native species by competitive exclusion site, niche displacement, hybridization, introgression, predation, and possibly extinction[27,28]. Together the introduction of exotic species, degradation and / or transformation of habitat, overexploitation of organisms for consumption or ornaments, are the biggest threats to marine and coastal biodiversity.

Worldwide, the rate of degradation of natural coastal habitats has been faster than conservation initiatives. In Brazil the actual legal framework that supports conservation policies along the coast is poorly supported by ecological data[3]. This study aims to contribute for a better knowledge of the marine biodiversity in the State of Santa Catarina, with emphasis on cnidarians and bryozoans, in order to provide technical support for marine conservation in southern Brazil.
2. Study Area

The region is in a transitional belt of latitudes between tropical and temperate regions, on the western boundary of the South Atlantic basin. Oceanographic conditions off southern Brazilian coast are strongly affected by the seasonal north-south displacement of the Subtropical Convergence. Onshore bottom intrusions of the oceanic South Atlantic Central Water (ACAS) along the Santa Catarina continental shelf in summer are due to north winds-induced Ekman transport of surface waters offshore, decreasing water temperatures at the bottom. In winter, winds are predominantly from south. They transport subantarctic waters of lower salinities, strongly affected by the outflow of the La Plata River. The hydrographic environment is therefore very dynamic during the annual cycle[29,30]. This affects the composition and the seasonal dynamics of regional epilithic assemblages[31,3].

The hard bottom of the islands is relatively shallow but physically heterogeneous, consisting of rounded rocks arranged in a delicate slope toward the sandy bottom. Large rocks form caves and walls up to about 15 m deep. The sublitoral cliffs at REBIOMAR, may extend beyond 30 m depth.

3. Fieldwork

Table 1. Characteristics of the Sampling Sites, Dives and Sampling Periods

| Islands          | Sites               | Dives | Date       |
|------------------|---------------------|-------|------------|
| Graças           | Paz Island          | 2     | 02.04/2008 |
| Tamboretes       | In between islands  | 1     | 03.04/2008 |
| South coast      |                     | 1     | 03.04/2008 |
| Galés            | Naufragio da Lili   | 2     | 07.03/2008 |
| Saco do Brás     |                     | 2     | 08.03/2008 |
| Deserta          | North site          | 2     | 05.04/2008 |
| Arvoredo         | Saco d'Água         | 2     | 19.04/2008 |
| Saco do Capim    |                     | 2     | 02.04/2008 |
| Saco do Capim    |                     | 1     | 19.04/2008 |
| Campeche         | North site          | 2     | 22.01/2008 |
| South site       |                     | 2     | 14.01/2008 |
| South site       |                     | 1     | 16.04/2008 |
| Três Irmãs       | Imã do Meio         | 1     | 17.04/2008 |
| Moleques do Sul  | South coast         | 2     | 06.01/2008 |
| Submerged rocky reef |               | 2     | 08.01/2008 |
|                  |                     | 1     | 17.04/2008 |
| Total            |                     |       | 26         |

Benthic assemblages were surveyed during 26 scuba dives between January and May 2008 (Table 1) along two subtidal transects at 6 and 15 m, in the following islands: Paz (Graças Archipelago, at 26°10’S; 48°29’W), Tamboretes (26°22'S; 48°31'W), Deserta, Galés, Arvoredo as part of the MPA of Arvoredo (from 27°11’ to 27°16’S; and 48°19’ to 48°24’W), Campeche (27°42’S; 48°27’W), Moleques do Sul Archipelago (27°51’S; 48°26’W) and Três Irmãs (27°50’S; 48°31’W) (Figure 1).

The taxonomic composition and quantitative data on the epilithic community were analyzed from manual collections of individual and pieces of colonial groups, with additional non-destructive photographic records were taken with digital camera Sony DSC-W90. Seven dives were exclusively dedicated to the inventory of hydrozoans, bryozoans and ascidians. The collected animals were anesthetized with menthol and fixed in formalin 4%, except sponges that were fixed in 70% ethanol, for later identification in the laboratory.

All taxa were examine under stereomicroscope and separated in taxonomic groups to send to experts for identification. The Porifera specimens were deposited in the scientific collection of Rio Grande do Sul Zoo-Botanic Foundation. Cnidarians, bryozoans and ascidians were deposited in the scientific collection of Department of Zoology, Federal University of Paraná, Curitiba, Brazil (DZUP).
4. Results

We have recorded 111 taxa belonging to the phyla Porifera, Cnidaria, Bryozoa, Entoprocta and Chordata (subphylum Tunicata, class Ascidiacea), distributed in 54 families, of which 27 taxa could not be identified at the specific level. The most representative groups were the Cnidaria with 38 hydrozoans and 11 anthozoans, followed by ascidians with 32 taxa, 18 sponges, 11 Bryozoa species and Entoprocta with only one not identified species (Table 2). Representatives of dominant sessile groups indentified during the sampling surveys can be seen in the photographic panels of Figures 2a (sponges), 2b (cnidarians) and 2c (ascidians and bryozoans).

Figure 2a. Taxa of sponges of the Santa Catarina coastal islands. Porifera: (A) Guitarra sepia, (B) Dragmacidon reticulatum, (C) Suberites aurantiacus, (D) Połmasta janeirensis, (E) Tedania ignis, (F) Clionacelata

Fifty five taxa are new records for Santa Catarina, which account for 50% of all specimens recorded. New records of species occurred for all phyla, but mainly in the Class Hydrozoa and the Phylum Bryozoa with 31 and 10 species, respectively. Five new Porifera, 4 Anthozoa and 5 ascidians were identified. The hydrozoans Lafoeina tenuis[32], Antennella secondaria[33], Sertularella rugosa[34] and Hincksella cylindrica[35], and the sea squirt Didemnum cf. calliginosum[36] have their geographic distribution expanded for the South Atlantic (Table 3).

Figure 2b. Taxa of cnidarians of the Santa Catarina coastal islands. (A) Eudendrium carneum, (B) Parazoanthus sp., (C) Palythoa cariborum, (D) Carjioa rieisei, (E) Corynactis sp., (F) Astrangia rathbuni

Figure 2c. Taxa of ascidians and bryozoans of the Santa Catarina coastal islands. Ascidiae: (A) Didemnum granulatum, (B) Lissoclinum perforatum, (C) Diplosoma listerianum, (D) Distaplia bermudensis, (E) Euhedema vitrea; Bryozoa: (F) Schizoporella errata

Table 2. Taxa identified from the Sublitoral Rocky Habitats of Santa Catarina Coastal Islands

| Classification | Taxa | Gra | Tam | Gal | Arv | Des | Cam | Mal | Imn |
|----------------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| PORIFERA       |      |     |     |     |     |     |     |     |     |
| Clionaidae     | Clionacelata Grant, 1826 | x   | x   | x   | x   |     |     |     |     |
| Family          | Genus                                      | Species                           | Reference                      |
|-----------------|--------------------------------------------|-----------------------------------|--------------------------------|
| Suberitidae     | *Suberites aurantiacus*                    | (Duchassaing & Michelotti, 1864)   |                                |
| Polymastiidae   | *Polymastia janeirensis*                   | (Boury-Ennault, 1973)             |                                |
| Trachycladidae  | *Trachycladus*                             |                                   |                                |
| Axinellidae     | *Dragmacidon reticulatum*                  | (Ridley & Dendy, 1886)            |                                |
| Dietyonellidae  | *Scopalia ruetzleri*                       | (Wiedenmayer, 1977)              |                                |
| Microcionidae   | *Arcanus*                                  |                                   |                                |
| Mycalidae       | *Mycale (Carnia) microsignatosa* Amond, 1927 |                                   |                                |
| Graphiidae      | *Guitarra segis Lemer, Hajdu, Custodio & van Soest, 2004 |                                |
| Coelosphaeridae | *Lissodendris isodictialys* (Carter, 1882) |                                   |                                |
| Tedaniidae      | *Tudania insignis* (Duchassaing & Michelotti, 1864) |                                |
| Chalinidae      | *Haliconia mammillaris* Mothes & Lerner, 1994 |                                |
|                 | *Halicona*                                 |                                   |                                |
| Amphoriscidae   | *Paraleucilla magna* Klaubau, Monteiro & Borojevic, 2004 |                                |
| Clathrinidae    | *Clathrina aurea* Solé-Clavé, Klaubau, Boury-Ennault, Borojevic & Thope, 1991 |                                |
|                 | *Clathrina coniger* Klaubau & Borojevic, 2001 |                                |
| CNIDARIA        | *Pemmaria*                                 |                                   |                                |
| HYDROZOA        | *Bameria vestita* Wright, 1859             |                                   |                                |
| Pavonariidae    | *Bougainvillia muscosa* (Allman, 1863)     |                                   |                                |
| Eudendriidae    | *Eudendrium*                               |                                   |                                |
|                 | *Eudendrium carneum* Clarke, 1882           |                                   |                                |
|                 | n. id.                                     |                                   |                                |
| Aglaopheniidae  | *Agkophenia latecarinata* Allman, 1887     |                                   |                                |
| Macrorynchidae  | *Macrorynchia philippina* Kirchpauer, 1872 |                                   |                                |
|                 | *Macrorynchia*                             |                                   |                                |
| Campanulinidae  | *Lafoenia amianensis* Millard & Bouillon, 1973 |                                |
|                 | *Lafoenia tenuis* G. O. Sars, 1874         |                                   |                                |
| Haleciidae      | *Halecium dyssymetrum* (Billard, 1929)     |                                   |                                |
| Halopteridae    | *Antonella secundaria* (Gmelin, 1791)      |                                   |                                |
|                 | *Hakoperis bucki* (Bale, 1884)             |                                   |                                |
|                 | *Hakoperis polymorpha* (Billard, 1913)     |                                   |                                |
| Kirchpaueriidae | *Pyrothea mirabilis* Allman, 1883           |                                   |                                |
|                 | *Filellium serratum* Clarke, 1879           |                                   |                                |
|                 | *Filellium*                                |                                   |                                |
| Plumulariidae   | *Monostegias quadridentis* (McCready, 1859) |                                   |                                |
|                 | *Monostegia margaretta* Nutting, 1900      |                                   |                                |
| Sertulariidae   | *Idiella pristis* Lamouroux, 1816           |                                   |                                |
|                 | *Dynamena quadridens* (Ellis & Solander, 1786) |                                |
|                 | *Dynamena distichu* Bose, 1802             |                                   |                                |
|                 | *Dynamena dalmasi* Versluys, 1899          |                                   |                                |
|                 | *Thuaria desmosides* Torrey, 1822          |                                   |                                |
|                 | *Sertularella tenella* Alder, 1856         |                                   |                                |
|                 | *Sertularella nigosa* Linnaeus, 1758       |                                   |                                |
|                 | *Diaphasia digitalis* Busk, 1852           |                                   |                                |
|                 | *Diaphasia tropical* Nutting, 1904         |                                   |                                |
|                 | *Sertularia distans* Lamouroux, 1816       |                                   |                                |
|                 | *Sertularia marginata* Kirchpauer, 1864    |                                   |                                |
|                 | *Sertularia kleboulo* Busk, 1852           |                                   |                                |
|                 | *Sertularia turbinata* Lamouroux, 1816     |                                   |                                |
| Syntheeciidae   | *Hinckellia cylindrica* (Bale, 1888)       |                                   |                                |
| Halopteridae    | *Halopteris diaphana* Heller, 1868         |                                   |                                |
| Campanulariidae | *Campanularia hirski* Alder, 1856          |                                   |                                |
|                 | *Clytia cf. guncilis* Sars, 1850           |                                   |                                |
|                 | *Obelia dichotoma* Linnaeus, 1758          |                                   |                                |
| ANT HIZOA       | *Carioia rissei* (Duchassaing & Michelotti, 1860) |                                |
| Clavulariidae   | *Heterogorgia uatunani* Castro, 1990       |                                   |                                |
| Paramuriceidae  | *Lepanogorgia panicua* Milne-Edwards & Haine, 1857 |                                |
| Gorgoniidae     | *Eltellia ekonga* (Pallas, 1766)           |                                   |                                |
| Rhizangiidae    | *Astrangia rathbuni* Vaughan, 1906         |                                   |                                |
| Caryophylliidae | *Phyllangia americana* Milne Edwards & Haine, 1849 |                                |
| Zoanthidae      | *Cryptopalythoa variabilis* Duerden, 1896 |                                   |                                |
The Porifera *Arcanus* sp., the Hydrozoa *Macrorhynchia* sp. and *Filileum* sp., the anthozoans genus *Corynactis* of the order Corallimorpharia, and the bryozoans genera *Alcyonidium*, *Cabearea*, *Celleporaria* and *Crisulipora* are also new records for the Santa Catarina coastal assemblage, expanding their geographic limits.

The greatest richness of 57 species was observed at Southern Moleques, with 47% of new records. Three hydroid species (*Hincksella cylindrica*, *Antennella secundaria* and *Sertularella rugosa*) and the ascidian *Didemnum cf. calliginosum* are recorded for the first time in the South Atlantic with the southern limit of distribution at the Southern Moleques, south off Santa Catarina island.
Table 3. New Occurrences of the Benthic Fauna of the Santa Catarina Islands and Previous Distribution of Taxa along the Brazilian Coast and the Southwestern Atlantic Ocean

| Taxa | New record | Previous distribution |
|------|------------|-----------------------|
| **PORIFERA** | | |
| Cliona celata Grant, 1826 | Southern Brazil | PE, BA, RJ, SP |
| *Arcana* sp. | Southern Brazil | PE, RJ, SP |
| Lissodendoryx isodictyalis (Carter 1882) | Southern Brazil | PE, SP |
| Paraleuca magna Klautau, Monteiro & Borjevic, 2004 | Southern Brazil | RJ, SP |
| Clathrina confluens Klautau & Borjevic, 2001 | Southern Brazil | RJ |
| **HYDROZOA** | | |
| Bimaria vestita Wright 1859 | Southern Brazil | BA, ES, SP |
| Bougainvillia muscosa (Allman, 1863) | SC | RJ - PR |
| Macrorynchia philippina Kirchenpauer 1872 | Southern Brazil | PE, BA, RJ, SP |
| Macrorynchia sp. | Southern Brazil | PE, BA, RJ, SP |
| Lafoeina aminaeensis (Millard & Bouillon, 1973) | Southern Brazil | PE, RJ |
| Lafoeina enniis G. O. Sars, 1874 | Western South Atlantic | South Florida, Bahamas |
| Halesium dyssymetrum Billard, 1929 | Southern Brazil | ES, SP |
| Antennella secundaria (Gmelin, 1791) | Western South Atlantic | Caribe |
| Haloperis buskii (Bale, 1884) | Southern Brazil | SP |
| Haloperis polypomphila (Billard, 1913) | Southern Brazil | SP |
| Pycnotheca mirabilis (Allman, 1883) | Santa Catarina | RJ, SP |
| Filellum serratum (Clarke, 1879) | Southern Brazil | SE, RJ, ES, Caribe |
| Filellum sp. | Southern Brazil | SE, RJ, ES, Caribe |
| Monostea quadratella (McCraday, 1859) | Southern Brazil | BA - SP |
| Sertularia marginata (Kirchenpauer, 1864) | Southern Brazil | FN, PE, BA - PR |
| Sertularia luctuosa Busk, 1852 | Southern Brazil | ES - SP |
| Idiella pristis Lamouroux, 1816 | Southern Brazil | BA, SP |
| Dynamena quadrimaculata (Ellis & Solander, 1786) | Southern Brazil | BA - SP |
| Dynamena disticha (Bosc, 1802) | SC | FN, PE, BA - RS |
| Thukaria deumoides (Torrey, 1902) | Southern Brazil | Brasil |
| Sertiderella tenella (Alder, 1856) | Southern Brazil | RJ, Caribe |
| Sertiderella gama (Linnaeus, 1758) | Western South Atlantic | Europa, GL to NY, and NE of the OP |
| Diphasia digitalis (Busk, 1852) | Southern Brazil | PE, BA, ES, SP |
| Diphasia tropica Nutting, 1904 | Southern Brazil | ES - SP |
| Dynamena dalmasi (Versluys, 1899) | Southern Brazil | BA, SP |
| Hinckella cylindrica (Bale, 1888) | Western South Atlantic | Caribe |
| Haloperis diaphana (Heller, 1868) | SC | ES, SP, RS |
| Campanularia hincksi Alder, 1856 | SC | Cosmopolitan in shallow waters, except at Ártico |
| Chitya cf. franzii (Sars, 1850) | SC | PE, SP, (ES - PR, RS like C. hemisphaerica) |
| Obelia dichotoma (Linnaeus, 1758) | SC | ES - PR, RS |
| **ANTHOZOA** | | |
| Phyllangia americana Milne Edwards & Haine, 1849 | SC | CE - SP |
| Polythoa caribaeorum (Duchassaing & Michelotti, 1860) | Southern Brazil | CE, FN, Atol das Rocas, ASP, SP, |
| Parazoanthus sp. | Southern Brazil | RJ |
| Corynactis sp. | Southern Brazil | RJ |
| Cliona hemisphaera | BRYOZOAA | |
| Alysia ocellata sp. | SC | ES, SP, PR, RS |
| Amathia sp. | SC | PE, AL, BA, ES, RJ, SP, PR |
| Zoanthron verticillatum (delle Chiaje, 1828) | Southern Brazil | RJ, SP |
| Aetoe anguina (Linnaeus, 1758) | SC | PE, ES, RJ, SP, PR |
| Bogula neritina (Linnaeus, 1758) | SC | RJ, SP, PR |
| Bogula densa (Lamouroux, 1816) | Southern Brazil | PE, ES, RJ |
| Caberea sp. | Southern Brazil | SP, ES |
| Celleporaria sp. | Southern Brazil | PE, BA, ES, SP |
| Schizoporella errata (Waters, 1878) | Southern Brazil | SP |
| Cristulpora sp. | Southern Brazil | SP |
| Didemnum cf. calliginosus Monniot, 1984 | South Atlantic | Caribe |
| Didemnum cineraceum (Suiter, 1898) | Southern Brazil | SP |
| Ascidia tenuis Monniot, 1983 | Southern Brazil | BA, SP |
| Botryllus tubor Rodrigues, 1962 | Southern Brazil | RJ, SP |
| S的情形 monniot, 1972 | SC | SP, PR |

GL, Greenland; NY, New York; Oc, Ocean; OP, Pacific Ocean; ASP, São Pedro e São Paulo Archipelago; NE, Northeast.
Arvoredo I. was the second in richness (42 species), with 24% of new records. This records percentage low is due probably to the previous samplings in Arvoredo I. The hydrozoan *Lafoeina tenuis*, previously described for southern Florida and the Bahamas[37], was identified in the Arvoredo and Deserta islands. These are their first records for the southwestern Atlantic.

Fifty-four percent of the species identified in the Graças Archipelago were new records, 75% of which are hydrozoans. On the Campeche island 48% are also new records (Figure 3) and all bryozoans recorded here in Santa Catarina island represent also new records for the southern Brazilian coast. Seven taxa of *Cheilostomata* and four *Ctenostomata* were found among all.

![Figure 3](Image 58x408 to 299x558)

**Figure 3.** Species richness and new records of sessile benthic organisms to Santa Catarina state (GRA, Graças; TAM, Tambores; GAL, Galés; ARV, Arvoredo; DES, Deserta; CAM, Campeche ; MSL, Moleques do Sul; I RM, Irmãos). Note: There wasn’t collection effort of the Phylum Porifera in the GRA and TAM islands

5. Discussion

Biodiversity inventory is the first step for understanding ecological processes at coastal or even at broader oceanic scales. The remarkable number of new records of benthic fauna in Santa Catarina islands reveals the lack of taxonomic studies to better access the state of the marine conservation in the southern Brazilian coast. So far we have been unable to identify endangered species, due to the scarcity of data that might indicate even natural fluctuations of sessile invertebrate populations threatened by many anthropogenic impacts such as sedimentation associated with habitat losses at the coast, pollution and overfishing[38,39]. In general, a reef environment exposed to excessive loads of pollutants, responds to changes and often simplify the structure of biological communities[40]. Unfortunately, little is known on the effect of overfishing on the biodiversity in Brazilian subtidal reefs and rocky shores[41,42].

Among the new records for the South Atlantic the sea squirt *Didemnum cf. calliginosum*, originally described by[43] on the Caribbean island of Guadeloupe, has its distributional range extended to the State of Santa Catarina, more exactly on the Campeche I. The ascidian community in Brazil is typically tropical with little overlap with the Argentina and Patagonia fauna[44]. The presence of these species in Santa Catarina state subtropical waters is probably due to the multiple introductions of the species in the southern coast[45,46] where major harbor facilities are located. The lack of historical records prevents us from defining the status of many species that remain cryptogenic, but we believe the development of molecular studies of global scope will reveal invasion of exotic species in the western Atlantic, some of them already recorded in Brazilian waters. According to[47] there are forty species of exotic zoobenthos along the Brazilian coast, twelve of which are sessile animals. In the coastal islands off Santa Catarina four species of his list of exotic zoobenthos were identified. For instance, the invasive sea squirt *Styela plicata* was first recorded to Brazil at Rio de Janeiro[47]. The type specimen was from Philadelphia and some authors consider *S. plicata* as widely distributed species along the warmer coast of Atlantic, Pacific and Indian Ocean and also Mediterranean Sea[48]. Here it was found within the MPA of Arvoredo and Gáes Is. Dense aggregates of this species are formed at the sublittoral of Santa Catarina Is. where each individual takes an elongated shape with a stalk of attachment. In southern Brazil, it is rarely found in the natural environment, preferring strings of mariculture grounds and floating artificial substrates of harbour facilities[49]. Yet, it was first recorded in a natural rocky shore of Santa Catarina.

The calcareous sponge *Paraleucilla magna*[50] has an undefined status about native or exotic species status. *P. magna* has been found along the Brazilian coast and it was found in the Moleques do Sul and Aranhas archipelagos, in the northern coast of the Santa Catarina island (Bouzon, personal observation). She is a cryptogenic specie (Cavalcanti, personal communication), i.e., cause we cannot say whether it is native or exotic specie. It has a full life cycle in nature and evidence of population increase over time, but without apparent environmental or socioeconomic impact. The exotic bryozoan *Schizoporella errata* (Figure 2c) while *Bugula dentata* were commonly found in the islands. The first is an established species and *B. dentata* is present in the natural environment but without further increase in abundance and distribution[46]. However, since we found it in reasonable abundance in the islands of Santa Catarina as well as in the coast off Cabo Frio, Rio de Janeiro the status of this exotic species in Brazil should be reviewed because we considered it considered already established.

Distributional limits of the northern Brazilian tropical sessile fauna were extended southwards in our records. Subtropical provinces of the southeastern and southern Brazil have been regarded as a transitional zone for the temperate fauna of the western Atlantic[51]. However, the study area belongs to the Paulista Province[52] where ca 40% of the records which are also found along other sections of the Brazilian coast were endemic to it. This province extends from the Espirito Santo to Rio Grande do Sul (~ from 22° to 32° S) and is characterized by high incidence of endemic species, and can expect a small difference in species composition across the province, with the predominance of
tropical species to the north and temperate species to the south. Nevertheless, besides low temperatures in southern Brazil during winter time, the lacking of rocky shores further south from Santa Catarina represents an additional barrier for the dispersal of epilithic organism.

The taxonomic analyses of the sessile fauna here described for the southernmost islands off Florianópolis have demonstrated they are equally or even more diverse than the assemblages of the islands of the Arvoredo MPA in the northern coast of Santa Catarina. Hence it should also be protected. This study has improved substantially the knowledge on the marine biodiversity in the coastal zone of Santa Catarina state. We hope it will contribute for the development of a more technically oriented conservation policy for the coastal ecosystems of southern Brazil.

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