Ocean and Coastal Research

ORIGINAL ARTICLE
Special Article Collection
Di Domenico, M.; Andriguetto-Filho, J.M. and Lopes, R.M. (Eds)
An ocean of science, worms, and humaneness:
a tribute to Paulo Lana
http://doi.org/10.1590/2675-2824072.23146
ISSN 2675-2824

Polychaetes (Annelida) from Sepetiba Bay (Brazil): an update on species occurrences

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ABSTRACT

Members of several polychaete families inhabit rocky shores, including syllids, serpulids, eunicids, nereidids, and sabellids. The primary studies on consolidated substrates conducted in Sepetiba Bay (Rio de Janeiro, Brazil) date back to 2004, with multiple taxonomic studies having been carried out since then. In this study, we present an updated checklist on polychaetes from hard substrates in Sepetiba Bay, together with an identification key for the species. We also discuss the status and distribution of certain species along the Brazilian coast. *Myrianida pachycera*, *Branchiomma bairdi*, *Branchiomma coheni*, and *Branchiomma conspersum* represent new occurrences in Brazil. We extend the distribution of *Proceraea anopla* to Southeastern Brazil, and report 33 new records for Sepetiba Bay. We identify *Halosydna glabra*, *Oxydromus obscurus*, *Oxydromus pugettensis*, *Marphysa sanguinea*, *Lysidice ninneta*, *Spirobranchus americanus*, *Polydora ciliata*, *Pseudonereis variegata*, *Nereis* cf. *oligohalina*, and *Schistomeringos rudolphi* as requiring taxonomic revision, all of which have been recorded previously in Sepetiba Bay. However, the specimens we examine in this study differ from the original descriptions, indicating that a more comprehensive assessment of the respective species is needed along the Brazilian coast.

Keywords: Polychaeta, Sclerobionts, Rocky shores, Invasive species, New occurrences

INTRODUCTION

Sepetiba Bay, located in southern Rio de Janeiro (Brazil), is a semi-enclosed bay with features that resemble those of a coastal lagoon (Cunha et al., 2006; Kjerfve et al., 2021). The surrounding region has experienced significant environmental impacts from human and industrial activities over recent decades, mainly from an industrial zone in the northern portion of the bay and its three large ports, resulting in noticeable alterations to its physical, chemical, and biological characteristics (Amado-Filho et al., 1999; Molisani et al., 2004; Paraquetti et al., 2004; Carreira et al., 2009; Ferreira, 2010; Gutierrez, 2012).

At the beginning of this century, Sepetiba Bay was chosen as a research area for a large project aimed at understanding the impacts of sea navigation and the introduction of alien species, i.e., the GloBallast Project (Clarke et al., 2004). As part of this initiative, a survey was undertaken

Submitted: 05-Sep-2023
Approved: 09-Feb-2024
Associate Editor: Maikon Di Domenico

on species occurring in the region and being influenced by the Port of Sepetiba. However, polychaetes were underrepresented in that survey, since only the spionid *Polydora ciliata* (Johnston, 1838) was recorded (Clarke et al., 2004).

Subsequent inventories have focused only on soft substrates, with more than 50 polychaete species having been recorded in the bay to date (Bolívar and Lana, 1986; Rebelo, 1987; Bhaud and Petti, 2001; Omena and Creed, 2004; Villac et al., 2004; Rocha et al., 2009; Mattos et al., 2013; D'Elia, 2015). In contrast, polychaete diversity in hard substrates had received much less attention until recently, with >75 species recorded (Carrerette, 2010; Skinner et al., 2012; Schwan, 2013; Brandão and Brasil, 2020; Rodrigues et al., 2020). Despite the higher diversity on hard substrates, sampling effort has been restricted to only a few locations inside the bay.

Although extensive inventories have been conducted on polychaete fauna along the southern and southeastern Brazilian coast, our knowledge of the polychaete fauna in its port regions remains insufficient and requires further comprehensive research. It is worth emphasizing that the available literature on polychaete fauna in Sepetiba Bay is limited, primarily consisting of unpublished works such as conference abstracts, dissertations, and theses (Omena et al., 2006; Silva, 2008; Carrerette, 2010; Amaral et al., 2022; D'elia, 2015; Brandão, 2020; Rodrigues, 2020). Indeed, the only published surveys on polychaetes in Sepetiba Bay are those conducted on soft sediment habitats by Omena and Creed (2004) and Mattos et al. (2013), and even in those, many recorded species were identified only at the family or genus level.

Nevertheless, numerous taxonomic studies have been conducted elsewhere along the Brazilian coast, encompassing descriptions of new species, new reports, redescriptions, and integrative revisions (e.g., Barroso et al., 2010; Magalhães et al., 2014; Silva et al., 2017; Seixas et al., 2021; Álvarez and Budaeva, 2023), some of which focus on Sepetiba Bay (e.g., Álvarez, 2019; Álvarez et al., 2019; Rodrigues et al., 2020). These recent studies have raised doubts about some previously reported polychaete records for Sepetiba Bay. Consequently, a thorough review and reassessment of the validity of many records in the area was warranted.

In this study, we provide an inventory of the polychaete species found on hard substrates in Sepetiba Bay. Our study focuses on their distributions, and we highlight new records and species that require taxonomic revision. We argue that updating the polychaete checklist for the bay is necessary since some species are classified as having an uncertain cosmopolitan distribution, others are newly discovered species, and there are invasive species not previously reported in surveys. Thus, our work significantly contributes to knowledge on the polychaete fauna in Sepetiba Bay, offering insights at a detailed taxonomic level and encouraging further assessments.

METHODS

Study area

Sepetiba Bay (Figure 1) is a water mass of >519 km² located on the south-central coast of Rio de Janeiro State (-22.873580°-23.066662° and -43.542188°-44.166649°). The elongated bay is bordered on the north and east by the cities of Itaguaí, Mangaratiba, and Rio de Janeiro. Marambaia Island forms its southern flank, and it opens in the west to the larger Ilha Grande Bay. The bay can be subdivided into three regions according to environmental parameters: the inner zone – under the influence of rivers, cities, and the industrial zone; the central zone – an intermediary zone hosting an archipelago connecting Itacuruçá to Marambaia influenced both by oceanic water and inner zone waters; and the outer zone more strongly connected to Ilha Grande Bay and the Atlantic Ocean, with more influence from the latter (Azevedo et al., 2006).

Most of the bay is ~5 m deep, apart from a navigation channel of 30 m, where muddy and sandy-muddy sediments are predominant. Despite diverse human activities around the bay, hard substrates and rocky shores are more abundant in the central and outer zones. Tidal variation ranges from 0.3-1.1 m (Borges, 1990; Fiszman et al., 1984; Pessanha et al., 2000).

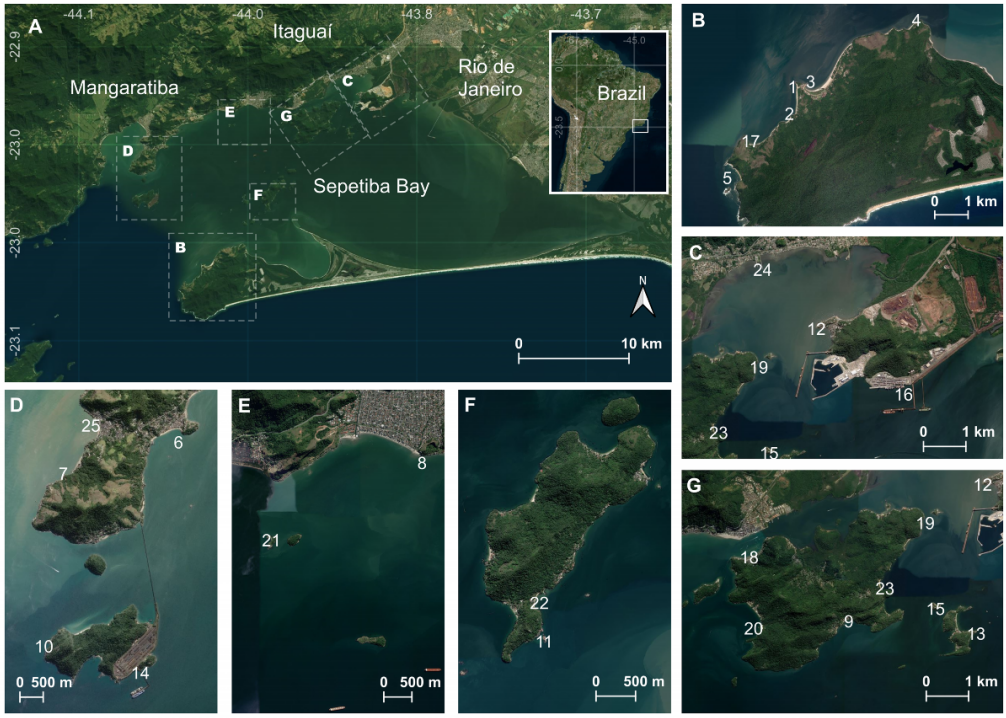

Figure 1. Sampling locations herein considered. Each locality number is represented in Table 2.

Data survey and sampling:

This work encompasses two study efforts. First, we acquired data from the literature on samplings of rocky shores around Sepetiba Bay to compile a list of species records. To do so, we searched online databases (PUBMED, GOOGLE SCHOLAR, SCIELO, WEB OF SCIENCE), the Research Rabbit platform, museum databases (Table 1), and unpublished works using the following keywords: Polychaeta, Polychaetes, Poliqueta, Poliquetas, Poliquetos, Annelida, Sepetiba Bay, and Baía de Sepetiba. We also searched using specific polychaete family names. Whenever information on sampling location for a species was available, it was mapped, otherwise the species was not attributed to a specific location inside the bay. Second, we conducted fieldwork at 25 points across Sepetiba Bay (Figure 1, Table 2). Maps of the sampled locations were constructed using Google Earth satellite images in the Quantum GIS software program with the HCMGIS extension plugin. Our sampling campaigns always occurred at low tide to facilitate greater access to the rocky shores and hard substrates. At each sampling site, we searched for polychaetes on hard substrate (natural or artificial), among oyster and mussel banks, within algae tufts, and on reefs of Sabellariidae polychaetes. Whenever possible, the worms were relaxed using magnesium chloride (MgCl2) diluted in tap water to the same salinity as seawater, before fixing the specimens either in 92% ethanol or in 10% formalin solution. In the latter case, the specimens were subsequently transferred from the fixative solution to 75% ethanol for storage.

Polychaete identification was achieved using respective literature for the identification of families and genera in Brazil (Amaral and Nonato, 1996) and in the Caribbean (León González et al., 2021). For species identification, we used specific literature for each genus. In some cases, we used the identification manuals for species from the southern and southeastern regions of Brazil, namely those by Amaral et al. (2006) and Steiner et al. (2021). All species names herein conform to those considered valid in the World Polychaete Database (https://marinespecies.org/polychaeta).

Table 1. Online database used for this study (all websites were checked for availability on the day the manuscript was submitted)

Acronyms	Online address
Google Scholar	http://scholar.google.com
PubMed	https://pubmed.ncbi.nlm.nih.gov
Research Rabbit	https://researchrabbitapp.com
Scielo	https://www.scielo.br
Web of Science	https://www.webofscience.com/wos/author/search
Gbif - MNUFRJ	https://www.gbif.org/dataset/559917d6-f709-4482-82ef-97e76a815cc9
Cria – ZUEC Pol	https://specieslink.net/col/ZUEC-POL
Catalog of Brazilian Polychaetes	https://intranet.ib.unicamp.br/intranet/polychaeta/_apresentacao.php
Nonatobase	http://nonatobase.ufsc.br
Plataforma de Bioinvasão	https://bioinvasaobrasil.org.br/

Table 2. Sampling locations conducted within Sepetiba Bay in this study.

Station #	Location (names are in Portuguese)	Latitude	Longitude
1	Marambaia Island (Grande Beach – north zone)	-23.057600	-43.991322
2	Marambaia Island (Grande Beach – south zone)	-23.065909	-43.992040
3	Marambaia Island (Suja Beach)	-23.057897	-43.987914
4	Marambaia Island (Sitio Beach)	-23.040918	-43.955672
5	Marambaia Island (Sino Beach)	-23.084736	-44.008669
6	Ibicuí Beach	-22.962747	-44.024539
7	Ribeira Beach	-22.971215	-44.048846
8	Muriqui Beach	-22.930310	-43.940225
9	Itacuruçá Island (Águas Lindas Beach)	-22.948081	-43.885258
10	Guaíba Island	-23.003806	-44.052595
11	Jaguanum Island (Estopa Beach)	-23.012647	-43.930364
12	Madeira Island	-22.919111	-43.854483
13	Martins Island	-22.950693	-43.855983
14	Guaíba Island Harbour	-23.009266	-44.033175
15	Cabras Island	-22.945434	-43.865333
16	Itaguaí Harbour	-22.932026	-43.836153
17	Marambaia Island (Pescaria Velha Beach)	-23.073223	-44.004903
18	Itacuruçá Island (Flexeira Beach)	-22.934982	-43.907813
19	Itacuruçá Island (Gato Beach)	-22.927251	-43.867719
20	Itacuruçá Island (Grande Beach)	-22.948655	-43.905166
21	Duas Irmas Island	-22.943762	-43.966515
22	Jaguanum Island (Catita Beach)	-23.008527	-43.931704
23	Itacuruçá Island (Quatiquara Beach)	-22.941587	-43.877503
24	Coroa Grande Beach	-22.906587	-43.866803
25	Mangaratiba (Saco Beach)	-22.960892	-44.042248

Our checklist follows Rouse et al. (2022) in subdividing Annelida into two clades, i.e., Subclass Errantia and Subclass Sedentaria. For each subclass, names are organized in alphabetical order according to their respective Orders. Then, under each Order, families, genera, and species are also presented in alphabetical order. For each species, we recorded information such as type locality and local distribution—based on data from NONATOBASE (Pagliosa et al., 2014), SiBBr (https://www.sibbr.gov.br/), and the e-Catalog of Brazilian Polychaetes (Amaral et al., 2006-2022)—, as well as notes on their respective potential taxonomical issues. We recorded the habitat type where a species had been found (occurrences) in Sepetiba Bay, together with respective references. In this checklist, numbers represent the list of sampling locations presented in Table 2 and illustrated in Figure 1.

We explored the status of non-native species based on publications (Lopes, 2009; Rocha et al., 2013; Teixeira and Creed, 2020) and online platforms for the Brazilian coast, namely BioInvasão Marinha (https://bioinvasaobrasil.org.br/), Instituto Hórus (2016), and World Register of Introduced Marine Species (https://www.marinespecies.org/introduced/index.php). Species were assigned as native, non-native (contained, established, detected), or invasive species based on Lopes (2009) and Teixeira and Creed (2020). In the event of discrepancies in status, the most recent publication was considered. Following Teixeira and Creed (2020), we disregarded cryptogenic and similar species categories.

A key to all the polychaete species within each family is also provided.

RESULTS

This study represents the first exhaustive checklist of polychaetes from hard substrates on the Brazilian coast. In total, we report 108 species from 70 genera (78 also considering species solely identified to genus rank), representing 20 families. A comprehensive account of all of them, including their distribution within Sepetiba Bay and elsewhere along the Brazilian coast, as well as remarks on species identification, is available in the Supplementary Material. Species richness between the subclasses Errantia and Sedentaria was similar, with 51 species belonging to Subclass Sedentaria and 54 to Subclass Errantia, with a further three species not assigned to either subclass. The family displaying the greatest species diversity in Sepetiba Bay was Syllidae (16 species in 9 genera, with Genus *Syllis* being the most speciose). Serpulidae was the second most diverse family in the bay, encompassing five genera, with Genus *Spirobranchus* and Genus *Hydroides* each having four species. Other infrequent families were Sigalionidae, Chrysopetalidae, and Phyllodocidae, each represented by only one species, and Oenonidae and Sabellariidae by only two species each. Notably, only 25% of the polychaete species in our Sepetiba Bay checklist are native, with the remaining 75% of species displaying broader distributions in the Atlantic Ocean and even from other oceans. We discuss "problematic" species with a cosmopolitan distribution in remarks presented in the Supplementary Material section.

We sampled at 25 locations across the three zones of Sepetiba Bay: 15 in the outer zone (Figure 1 B, D, E, F), 7 in the central zone (Figure 1C, G), and 3 in the inner zone (Figure 1C). The outer zone proved to hold the richest species diversity, with 88 species, of which 29 were found only in this region. A total of 66 species were found in the central zone, of which six were recorded exclusively there. The inner zone displayed the lowest species richness, with 31 taxa recorded, three of them only being found there; one is common to two regions and 27 in all three regions. Of the 108 species reported for the bay, 27 occur in all three zones, 32 have been recorded in both the outer and middle zones, and only one has been recorded in both the middle and inner zones. The nereidids (5 species), sabellids (4 species), and serpulids (4 species) are the groups occurring more broadly across the bay. Note that all the above-cited numbers correspond to a combination of our sampling efforts and data obtained from the literature (Silva, 2008; Carrerette, 2010). Of the 108 species we cite herein, only 11% are represented both in the previous literature and in our samples. Below, the key summarizes the list of species occurring in Sepetiba Bay. Dubious records are not included

in this section (see instead the Supplementary Material). Authorities on all species names and the respective references have also been excluded from the key (this information is provided in the Supplementary Material).

Key to the Polychaete species from Sepetiba Bay*

Polynoidae

1. Lateral antennae emerging on the anterior edge of prostomium.....2
- Lateral antennae emerging under the prostomium.....4
2. More than 13 pair of scales.....*Halosydnella australis*
- With 12 or 13 pair of scales .....3 (*Lepidonotus*)
3. Palps smooth.....*L. brasiliensis*
- Palps papillate.....*L. caeruleus*
4. Prostomium without cephalic peaks, neurochaetae all unidentate.....*Eunoe serrata*
- Prostomium with cephalic peak, neurochaetae uni- and bidentate.....5
5. Cephalic peaks well developed, noto and neurochaetae spinose.....*Harmothoe*
- Cephalic peaks small, almost inconspicuous, noto and neurochaeta with few spines or serration on the external margin.....6
6. Dorsal cirri of two different kind and sizes.....
.....*Malmgreniella variegata*
- All dorsal cirri long and inflated distally.....
.....*Malmgrenia lunulata*

Sabellariidae

1. Middle opercular paleae cover the inner ones.....
.....*Phragmatopoma caudata*
- Middle opercular paleae not cover the inner ones.....
.....*Sabellaria wilsoni*

Serpulidae

1. Operculum present.....2
- Operculum absent.....9
2. Operculum divided in two sections, a basis formed by fused radii and an upper verticil .....(*Hydroides*)
- Operculum entire, not subdivided.....6
3. Verticil like arrow with 2-3 pairs of lateral spinules, central teeth.....*H. elegans*
- Spines of verticil without lateral spinules.....4
4. Verticil spines with T-shaped ending.....*H. dirampha*
- Verticil spines with distinct dorsal spines.....5
5. Dorsal spines incurving inward, ventral spines incurving outward.....*H. dianthus*
- All spines curving inward, one of the dorsal spines more protuberant.....*H.* cf. *brachyacantha*
6. Peduncular wings present on proximal peduncle.....7
.....(*Spirobranchus*)
- Peduncular wings absent, flattened peduncle.....
..... *Metavermilia acanthophora*
7. Operculum with distal concave plate, like a funnel.....
.....*S. lirianeae*
- Operculum with spines on the endplate.....8
8. Peduncular wings with digitate processes; operculum with 4 groups of spines .....*S. tetraceros*
- Peduncular wings triangular, with round tip; operculum with two dorsolateral and one central spines.....
.....*S. giganteus*
9. Collar chaetae limbate only, radiolar crown with 18-20 radioles per lobe, rounded process.....*Protula balboensis*
- Collar chaetae limbate and fin-and-blade, radiolar crown with 2 pairs of radioles per lobe; subdistal cell groups of radioles .....*Salmacina ceciliae*

Sabellidae

1. Stylodes present.....2 (*Branchiomma*)
- Stylodes absent.....6
2. All stylodes digitiforms.....3
- Slylodes of another kind.....4
3. Macrostylodes present.....*B. patriota*
- Macrostylodes absent.....*B. luctuosum*
4. Macrostylodes strap-like.....*B. bairdi*
- Macrostylodes another kind.....5
5. Most stylodes with distal parts broader than their bases ..... *B. coheni*
- Two or three pairs of tongue-like stylodes in distal half of radioles.....*B. conspersum*
6. Interramal eyespot present....7.....(*Pseudobranchiomma*)
- Interramal eyespot absent.....8
7. Body short, crown with around 4 units of pigmentation .....*P. paraemersoni*
- Body long, crown with around 10-19 units of pigmentation .....*P. paulista*
8. Compound eyes present.....9
- Compound eyes absent.....10
9. Compound eyes forming odd protuberances, arranged in bands, on outer margins of radioles...(*Pseudopotamilla*)
- Compound eyes present in the subdistal region of the radioles .....(*Acromegalomma*)
10. Ocelli arranged in longitudinal rows on the radioles .....
.....*Notaulax circumspiciens*
- Eyespots otherwise organized...*Parasabella microphtalma*

Terebellidae

1. Thoracic uncini in single rows.....2 (*Streblosoma*)
- Thoracic uncini in double rows in some chaetigers .....
.....4 (Terebellinae)
2. Uncurved uncini.....*S. bairdi*
- Uncini in curved rows.....3
3. Uncini in curved rows from the 13 segment onwards....
.....*S. hesslei*
- Uncini in curved rows from the 15-16 segment onwards
.....*S. porchatensis*
4. Three pairs of branchiae.....*Terebella leslieae*
- Two pairs of branchiae.....5

* Taxa authorities are cited in the checklist (Supplementary Material).

5. Lateral wings absent.....6 (*Nicolea*)
- Lateral wings present.....7
6. Segment 1 forming a ventral lobe below the lower lip... .....*N. ceciliae*
- Segment 1 not forming a ventral lobe below the lower lip .....*N. venustula*
7. Lateral wings in three segments.....*Pista alonsae*
- Lateral wings in two segments.....8
8. Lateral wings on segments 3 and 4....*Lanice conchilega*
- Lateral wings on segments 1 and 3 or 2 and 3...9 (*Loimia*)
9. Ventral shields extending to segment 12.....*L. medusa*
- Ventral shields extending to segment 14 or 15..... .....*L. brasiliensis*

Nereididae

1. All paragnaths a single type, conical or pectinates.....2
- Paragnaths of three different types.....5
2. All paragnaths pectinate.....*Platynereis dumerilii*
- All paragnaths conical.....3
3. Notopodial homogomph falcigers present in posterior chaetigers.....*Nereis riisei*
- Notopodial homogomph falcigers absent.....4
4. Dorsal ligule on posterior segments expanded..... .....*Alitta succinea*
- Dorsal ligule not expanded.....*Neanthes ceciliae*
5. Superior notopodial lobes greatly expanded in posterior chaetigers.....6 (*Pseudonereis*)
- Superior notopodial lobes not expanded in any chaetigers.....8 (*Perinereis*)
6. Area V without paragnaths.....*Pseudonereis* sp A.
- One conical paragnath on are V.....7
7. Nuropodial postchaetal lobe absent.....*P. palpata*
- Neuropodial postchaetal lobe present.....*P. variegata*
8. One paragnath on area I.....*P. anderssoni*
- Three paragnaths on area I.....*P. ponteni*

Syllidae

1. Ventral cirri absent.....2 (Autolytinae)
- Ventral cirri present.....3
2. Doral cirri cylindrical.....*Proceraea anopla*
- Dorsal cirri clavate to foliose.....*Myrianida pachycera*
3. Palps fused for at least half of the length..... .....*Exogone breviantennata*
- Palps not fused, if fused only basally.....4 (Syllinae)
4. Only simple chaetae.....*Haplosyllis rosenalessoae*
- Compound chaetae present.....5
5. Middorsal tooth attached posteriorly...*Opisthosyllis brunnea*
- Middorsal tooth attached anteriorly.....6
6. Pharynx armed with a trepan of teeth....*Trypanosyllis zebra*
- Pharynx with a central tooth, trepan absent.....7
7. Modified falcigers present, with recurved blades, hook-like.....*Branchiosyllis exilis*
- Modified falcigers absent.....8 (*Syllis*)
8. Pseudoespinerous chaetae present.....*S. beneliahue*
- Pseudoespigerous chaetae absent.....9
9. Posterior parapods with inflate aciculae.....10
- Posterior parapods with inflate aciculae otherwise...12
10. Ypsiloid chaetae absent.....*S. garciai*
- Mid chaetigers with ypsiloid chaetae.....11
11. Mid body parapods with 2-3 chaetae each.....*S. gracilis*
- Mid body parapods with 3-5 chaetae each...*S. magellanica*
12. Dorsal cirri with 7 to 9 articles.....13
- Dorsal cirri with 16-30 articles.....14
13. Falcigers sub-bidentate to unidentate.....*S. armillaris*
- Falcigers bidentate.....*S. pseudoarmillaris*
14. Distal teeth of falcigers same sized.....*S. corallicola*
- Distal teeth of falcigers unequal.....*S. westheidei*

Hesionidae

1. Body as large as high; eight pairs of tentacular cirri..... .....*Hesione picta*
- Body larger than higher; six pairs of tentacular cirri..... .....2 (*Oxydromus*)
2. Notopodia with 1-10 chaetae per bundle....*O. pugettensis*
- Notopodia without notochaetae.....*O. obscurus*

Eunicidae

1. One to three prostomial appendages only (palps absent).....2
- Five prostomial appendages present (3 antennae and 2 palps).....4
2. Peristomial cirri present.....*Leodice rubra*
- Peristomial cirri absent.....3 (*Lysidice*)
3. Anterior border of prostomium with a notch; three antennae.....*L. ninetta*
- Anterior border of prostomium rounded; one antenna... .....*L.* cf. *hebes*
4. Peristomial cirri absent.....5 (*Marphysa*)
- Peristomial cirri present.....6
5. Neurochaetae only compound spinigers..... .....*M. sanguinea* (complex)
- Neurochaetae with compound spiniger and falcigers... .....*M. formosa*
6. Branchiae present.....*Eunice ornata*
- Branchiae absent.....7 (*Nicidion*)
7. Limbate chaetae shorter than remaining; antennae without articulations.....*N. cariboea*
- Limbate chaetae longer than remaining; antennae irregularly articulated.....*N. insularis*

Lumbrineridae

1. Only simple hooded hooks.....*Scoletoma tetraura*
- With simple and compound hooded hooks..... .....2 (*Lumbrineris*)
2. Maxillae-III tridentate.....*L. inflata*
- Maxillae-III with four teeth.....*L.* cf. *albifrons*

Oenonidae

- Antennae absent. Dorsal cirri small (inconspicuous in some specimens), globose.....*Arabella aracaensis*
- Antennae present (three); large dorsal cirri..*Oenone fulgida*

Dorvilleidae

1. Dorsal cirri absent; palps long (more than 3x the antennae length).....*Protodorvillea kefersteini*

- Dorsal cirri present; palps as long as antennae or twice its length.....2
2. Dorsal cirri up to posterior region of body; palps as long as antennae.....*Schistomeringos rudolphi*
- Dorsal cirri only on anterior half of body; palps longer than antennae.....*Pettiboneia* cf. *sanmatiens*

Spionidae

1. Chaetiger 5 with strongly modified chaetae.....2
- Chaetiger 5 without modified chaetae..... .. ..*Prionospio heterobranchia*
2. Nuchal tentacle absent; palps without pigmentation...3
- Nucal tentacle present; palps with transversal black bars.....*Polydora neocaeca*
3. Prostomium entire; caruncle prolonging to chaetiger 2-3.....4
- Prostomium bifid; caruncle prolonging to chaetiger 6.... .....*Dipolydora socialis*
4. Branchiae present on chaetigers 2, 3, and 7..... .....*Boccardiella ligerica*
- Branchiae numerous, begins on chaetiger 7..... .....*Polydora websteri*

Amphinomidae

1. Caruncle reaching third chaetiger; neurochaetae of various forms.....*Eurythoe complanata*
- Caruncle absent; arborescents branchiae from the third chaetiger.....*Hipponoe gaudichaudi*

Cirratulidae

1. With a pair of broad dorsal palps only.....2
- With two groups, or series, of numerous tentacular filaments through body.....5
2. Brachiae restricted to a few anterior chaetigers..... .....3 (*Dodecaceria*)
- Branchiae present in other regions of the body.....4
3. Laterally inserted palps.....*D. pacifica*
- Dorsally inserted palps.....*D. concharum*
4. Chaetae modified into bidentate hooks..... .....*Cauleriella* cf. *capensis*
- Chaetae modified into acicular spines...*Chaetozone setosa*
5. Branchiae of variable position (near the notopodium on anterior segments and more dorsally on posterior segments.....6 (*Timarete*)
- Branchiae position stable, always near the notopodium on all segments of the body.....*Cirriformia tentaculata*
6. Preserved specimens with dark brown lateral strips on appendages .....*T. punctata*
- Preserved specimens without dark brown pigmentation on appendages.....*T. caribous*

Orbiniidae

1. Thoracic neuropodia with capillary chaetae only.....2
- Thoracic neuropodia including uncini and subuluncini.. .....*Naineris aurantiaca*
2. Ventral groove and notches absent.....*Naineris setosa*
- Ventral groove and notches present.....*Naineris lanai*

Capitellidae

1. Five or more chaetigers with capillary chaetae only..... .....*Rashgua lobatus*
- First four chaetigers with capillary chaetae only..... .....*Capitella neoaciculata*

DISCUSSION

In this study, we provide the first comprehensive checklist on polychaetes occurring on hard substrates in Sepetiba Bay, presenting both a key and a critical overview of its species. Notably, we uncovered dubious records of presumed widely distributed species. For example, the *Capitella capitata* complex was recently reviewed in Brazil (Silva et al., 2017), and authors concluded that none of the Brazilian records correspond to *C. capitata*. This species is restricted to Greenland, the type locality, so the records of *C. capitata* in Sepetiba Bay are incorrect. Similarly, we recommend revisions for the records of the following species: *Halosydna glabra*, *Oxydromus obscurus*, *Oxydromus pugettensis*, *Marphysa sanguinea*, *Lysidice ninneta*, *Eunice cariboea*, *Spirobranchus americanus*, *Polydora ciliata*, *Pseudonereis variegata*, and *Nereis cf. oligohalina*. All of these records present questionable taxa due to being far from their native distributions, typically occuring under different environmental conditions, displaying morphological differences to the original taxonomic description. We record, for the first time on the Brazilian coast, the sabellids *Branchiomma bairdi*, *B. conspersum*, and *B. coheni*, as well as the syllid *Myrianida pachycera*. Moreover, the syllid *Proceraea anopla* is recorded for the first time in southeastern Brazil.

Introductions of non-native marine species have increased in recent decades (Teixeira et al., 2020), mainly due to human activities, such as shipping and aquaculture (Campbell et al., 2017). Bays that host ports and waterway terminals, such as Sepetiba Bay, often harbor several exotic species that are carried by encrustation on vessels, intensive marine traffic, or ocean rafting (Rocha et al., 2013; Bumbeer and Rocha, 2016). In total, we detected 68 non-native species, disregarding dubious records. Only nine of those 68 species have been recorded in previous surveys, i.e., *Hydroides* cf. *brachyacantha*, *Hydroides dianthus*, *Hydroides*

dirampha, *Hydroides elegans*, *Spirobranchus giganteus*, *Spirobranchus tetraceros*, *Bocardiella ligerica*, *Branchiomma luctuosum*, and *Alitta succinea* (Lopes, 2009; Rocha et al., 2013; Teixeira et al., 2020; Casares et al., 2023; Rius et al., 2023). Most of these non-native records are attributable to polychaete families frequently cited as being exotic, such as the Serpulidae, Sabellidae, and Spionidae (Zenetos et al., 2005; Lopes, 2009; Zenetos et al., 2010; Rocha et al., 2013; Teixeira et al., 2020).

Some of the species recorded in this work warrant further taxonomic attention due to morphological similarities with other closely-related species, potentially promoting misidentifications in previous or future studies. For instance, the genus *Branchiomma* was frequently recorded in our survey (five species). Stylode shape among Brazilian specimens of *Branchiomma* is diverse and can be difficult to differentiate, so particular caution is advised to avoid misidentifications based on this structure. *Branchiomma luctuosum* was considered exotic in previous works (Lopes, 2009) and, recently, its classification was raised to invasive (Teixeira and Creed, 2020). We record *Branchiomma bairdi* for the first time in Sepetiba Bay, which requires monitoring given that this species is known for its impressive invasive potential and may represent up to 85% of sabellid density in Pacific populations (Tovar-Hernández and Yáñez-Rivera, 2012). Accordingly, it is crucial to increase monitoring for exotic and highly invasive *B. bairdi*, as well as their closely-related *B. coheni* and *B. conspersum* on the Brazilian coast to ensure expansions to new localities can be detected and their invasive impacts can be evaluated.

We found a significant case of species misidentification for the serpulid *Hydroides elegans*. Family Serpulidae accounts for ~15% of non-native species worldwide, with Genus *Hydroides* being the most invasive genus of polychaetes (Çinar, 2013). *Hydroides elegans* is recognized as being invasive in harbors all over the world, including in the North Atlantic, Europe, Caribbean Sea, and Pacific Ocean (Schwan et al., 2016). We found that this species has been misidentified as *H. novergica*, likely due to slight differences in the verticil spines that are key to species identification. Such cases of misidentification can result in incorrect assignments as invasive.

While acknowledging that delimiting species boundaries based on species morphology is problematic, we uncovered cases in which clear morphological dissimilarities were disregarded. Since the first records of the eunicid *Marphysa sanguinea* in Brazil, various specimens sampled thereafter were reported as presenting morphological differences from those of the original description or topotype specimens (Treadwell, 1932; Nonato, 1966). Recently, records from outside the type locality (Devonshire, South England) have been considered questionable (Zanol and Budaeva, 2021). Similarly, records of *Lysidice ninetta*, another eunicid, warrant investigation since some doubt has been cast on the species' worldwide distribution (Iannotta et al., 2009; Carrera-Parra et al., 2011).

The occurrence of the scale worm *Halosydnella australis* along the Brazilian coast requires further investigation. In total, three species of *Halosydnella* have been described from Brazil: *H. brasiliensis* (Kinberg, 1858), *H. fusca* (Müller in Grubbe, 1858), and *H. punctulata* (Grubbe, 1856). The morphological descriptions for all three of these species are poor, and there have been no further records after the original description for the latter two, indicating a need for proper detailed redescriptions. Recently, Barnich et al. (2012) synonymized *H. brasiliensis* with *H. australis* based on morphological differences between the two purported species being in characters observed on different body regions. Notably, many records in Brazil of the polynoid *Halosydna glabra* lack a morphological description. Indeed, the specimen reported by Amaral and Nonato (1982) displays some morphological divergence from the original description by Hartman (1939), mainly in terms of elytral and parapodial appendages, so it is most likely a new species.

We encountered an important issue while conducting this work. Currently, three online platforms assemble data on polychaete species that occur in Brazil, i.e., the Catalog of Brazilian Polychaetes, NonatoBase, and SiBBr. Nevertheless, they present data gaps, so a complete record of species occurrences along the Brazilian coast is

still lacking. These data sources are expected to provide a critical overview of extant data (species occurrences), like that presented herein. We suggest that all three platforms consider combining their resources to strengthen their datasets and better support future research.

The traceability of specimens sampled in previous works also proved another issue for the current work. Many of the specimens have not been deposited in scientific collections, hampering validations of original identifications and representing a potential loss of scientific knowledge. Therefore, we appeal that all specimens be transferred to public scientific collections.

Finally, we note that since the early 2000s, scientific funding agencies and the energy company Petrobras have sponsored diverse projects to survey species diversity along the Brazilian coast. However, all of the major projects were aimed at sampling off the coast of Brazil. Regrettably, important areas such as bays, coastal lagoons, and estuaries have been excluded from these large well-funded research efforts. We highly recommend that monitoring programs be established in Sepetiba Bay and other important sites along the Brazilian coast to assess any changes in the composition of hard substrate communities, potentially deploying DNA sequencing technology to help detect cryptic species and confirm the presence of invasive species. Interdisciplinary management of coastal systems using data derived from voucher specimens obtained via such projects would help measure the interactions between natural and human pressures that drive marine bioinvasions (Ojaveer et al., 2018).

ACKNOWLEDGMENTS

We wish to dedicate this paper to Prof. Paulo Lana, the most influential Brazilian polychaetologist in the international polychaete community. Paulo was the PhD supervisor of A.C.D.S. and R.A. His friendship, sense of humor, and meticulous revisions will always be in our minds and hearts. Our friend Cynthia Santos helped us with information and references on Nereididae species. We are also grateful to all ex-lab members from the “Laboratório de Polychaeta” at UFRRJ who helped with sampling and specimen identification.

AUTHOR CONTRIBUTIONS

R.A.: Conceptualization; Investigation; Methodology; Formal Analysis; Writing – original draft; Writing – review & editing.

V.R.M.; A.R.R.; J.G.R.: Investigation; Methodology; Formal Analysis; Writing – review & editing.

A.C.S.B.: Supervision; Resources; Project Administration; Funding Acquisition; Writing – review & editing.

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