

An annotated catalogue of Echinodermata types in the Museu de Zoologia, Universidade de São Paulo, Brazil

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Abstract. The types of nominal species of Echinodermata in the collection of the Museu de Zoologia, Universidade de São Paulo are catalogued: Holothuroidea (19 species – 16 holotypes, 1 paratype and 2 neotypes) and Ophiuroidea (4 species – 1 neotype and 3 paratypes). Photographs of all the type specimens are given. A brief account of the history of the MZUSP's echinoderm collections is presented.

Keywords. Nomenclature; Scientific collections; Systematics; Type material; Museum studies.

INTRODUCTION

Natural history museums are entrusted to collect and interpret material evidence of our biological heritage, and to impart education and promote awareness of key issues through exhibits to all people irrespective of educational background.

This privileged position comes with the responsibility to organize, preserve, and make natural history specimens and information accessible as a public good. Museum collections are held in trust and it is institutional responsibility "... publish lists of name-bearing types in its possession or custody; and so far, as possible, communicate information concerning name-bearing types when requested." (ICZN, 1999: Recommendation 72F).

Type catalogues are fundamental building blocks for solid taxonomic information, which in turn underpin research programs and conservation projections and programs.

Accordingly, the present catalogue is intended to compile and make available a list of all name-bearing types of Echinodermata in the collections of the Museu de Zoologia, Universidade de São Paulo (MZUSP), scattered over several publications, spanning from 1989 to 2021.

The Echinodermata collection

Taxonomic, temporal, and geographic coverage of collection

The five classes of Echinodermata are represented in the MZUSP's collections (Table 1), but this make up only a fraction of the collections, since there is a growing backlog of yet-to-be-identified specimens.

Most lots in the collection are from Brazil (continental shelf, oceanic islands, and deep waters down to about 1,500 m), although there are collections from other localities, such as the Atlantic coast of North-, Central- and South America, and Africa as well as the Antarctic region.

Physical structure and informatization of records

The material in the collection is stored in sliding steel cabinets (Fig. 1A-B), separated by classes, families, genera, and species arranged in alphabetical order. The specimens are preserved in ethanol (70%) (Fig. 1C). Dry-preserved lots of Asteroidea, Echinoidea and Ophiuroidea are stored in polypropylene (PP) boxes (Fig. 1D). The type collection (Fig. 1E) is separated from the general collection of Echinodermata. Type specimens

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Table 1. Number of orders, families, genera, species, and specimens per classes of Echinodermata in the collections of the Museu de Zoologia, Universidade de São Paulo.

	Asteroidea	Crinoidea	Echinoidea	Holothuroidea	Ophiuroidea	Total
Order	5	1	9	5	5	25
Family	10	1	13	14	22	60
Genera	25	1	21	38	57	142
Species	25	1	21	65	118	230
Specimens	728	24	1,102	1,408	5,884	9,146

are marked with red ribbon. The type collection includes Holothuroidea (80%) and Ophiuroidea (20%). Around 30% of the lots are digitized in electronic sheets (MS Excel® standard) and progressively exported to the software Specify (<https://www.specifysoftware.org>, Access: 08/05/2021). Currently, the collection is under integra-

tion with the Brazilian Biodiversity Information System (SIBBr – <https://www.sibbr.gov.br>, Access: 08/05/2021), a federal initiative aiming to make available online the biodiversity information stored in the collections.

Collections and collectors

Scientists and research programs from various laboratories and institutions have contributed specimens to the collection of Echinodermata of MZUSP, which resulted in broad geographical coverage along the Brazilian tropical and subtropical coasts (bays, estuaries, continental shelf, and oceanic islands) and deep waters.

Luís Roberto Tommasi. Tommasi served for many years at the Instituto Oceanográfico, Universidade de São Paulo (IOUSP). He was the most prolific researcher in Echinodermata in Brazil for many years. After his re-



Figure 1. Physical structure of MZUSP's echinoderm collection: (A-C) Sliding cabinets modules with specimens organized by families, genera, and species in steel drawers; (D-F) Aspects of the non-type dry collection and wet type collection, respectively.

tirement most of his collections (in various states of conservation and management) were transferred to MZUSP, many of his collections were from southeastern Brazil. Many type specimens of the species described by Tommasi were not clearly marked as such, so that unwellcome taxonomic impediments still exist (e.g., Alitto *et al.*, 2019; Martins & Tavares, 2019a).

Maria da Natividade Albuquerque (1937-1995). Nati, as many of her friends knew her, was a professor and researcher at Universidade Santa Úrsula, Rio de Janeiro, and a former PhD student under L.R. Tommasi. She specialized herself in ophiuroids and worked in collaboration with Alain Guille (1937-2001), Muséum national d'Histoire naturelle, Paris. Nati took part in the French-Brazilian oceanographic cruise of the R/V *Marion Dufresne* to Brazil (Tavares, 1999). After her death, the collections of shallow water ophiuroids (mostly) amassed by the *Marion Dufresne*, as well as large collections from northeastern Brazilian coast were transferred to MZUSP.

Cláudio Gonçalves Tiago. Claudio Tiago is currently a researcher at the Center for Marine Biology, Universidade de São Paulo (CEBIMar). Along his career he has contributed specimens to the collection of Echinodermata of MZUSP, mostly from the north coast of the State of São Paulo.

Other collections, too small individually to merit a separate listing of their own, were provided by other scientists and occasional collectors.

Research Programs and Projects

Several Research Programs and Projects contributed collections to MZUSP, including:

- **BIOPLAT** (Van Der Vem *et al.*, 2006; Mendes *et al.*, 2007; Silva *et al.*, 2008; Santi & Tavares, 2009, and references therein): This program aimed at exploring the biodiversity of benthic macrofauna on the southeastern Brazilian coast, with special reference to Guanabara, Sepetiba and Ilha Grande coastal bays. This Research Program is no longer active.
- **GEOMAR**: The Marine Geology and Geophysics GEOMAR Program, which began in 1969, aimed at exploring the geology and geophysics of the Brazilian continental margin. During the dredging operations a wealth of marine organisms were obtained. The study of the GEOMAR collections is scattered over numerous of publications (see for instance Grohmann *et al.*, 2003 and references therein). This Research Program is no longer active.
- **REVIZEE** (Program of Evaluation of the Sustainable Potential of Living Resources in the Economic Exclusive Zone): The REVIZEE was carried out by the Ministry of the Environment and Brazilian Navy with the support of some Brazilian universities, aiming at the survey of the marine biota and its economic potential (Brasil, 2006). This Research Program is no longer active.
- **PROARQUIPELAGO**: This Research Program was begun in June 1996 by the Interministerial Commission for Marine Resources (CIRM) to study the São Pedro and São Paulo Archipelago, a remote group of islets

in the equatorial mid-Atlantic, about 1,100 km from the northeast coast of Brazil. This Research Program is still in progress (Oliveira *et al.*, 2018).

- **PROANTAR**: This is a Brazilian inter-institutional program (Andrade *et al.*, 2018). The research activities carried out by the Instituto Oceanográfico, Universidade de São Paulo, in the PROANTAR started in 1982 (Nonato *et al.*, 1992) and is still in progress.
- **PROTRINDADE**: This Research Program has been carried out in the Trindade and Martin Vaz, a remote archipelago in the southeastern Atlantic, about 1,200 km off the Brazilian coast. The PROTRINDADE Research Program is still in progress (SECIRM, 2017).
- **USARP**: The United States Antarctic Research Program (USARP, currently USAP), which began in 1955, collected marine samples in the vicinity of Antarctica over nearly two decades (Moser & Nicol, 1997, and references therein).

MATERIAL AND METHODS

The list of types of Echinodermata housed at the MZUSP is herein presented according to the systematic

Table 2. Type material in the collections of the Museu de Zoologia, Universidade de São Paulo. Plus or minus symbol indicates presence/absence.

Class	Order	Family	Species	Holotype	Paratype	Neotype	
Apodida	Chiridotidae		<i>Chantalia conandae</i>	+	10	-	
			<i>Gymnopipina ikamiaba</i>	+	5	-	
	Synaptidae		<i>Yemoja brasiliensis</i>	+	4	-	
	Cucumariidae		<i>Cucumaria solangeae</i>	-	5	-	
			<i>Parathyone itapuaensis</i>	+	6	-	
			<i>Euthyonidiella occidentalis</i>	-	-	+	
			<i>Havelockia mansoae</i>	+	-	-	
	Holothuroidea	Dendrochirotrida	Sclerodactylidae	<i>Paulayellus gustavi</i>	+	-	-
				<i>Sclerothyone oloughlini</i>	+	9	-
				<i>Sclerothyone reichi</i>	+	-	-
Phylloporidae			<i>Thyone waltinholi</i>	+	-	-	
			<i>Thyone florianoii</i>	+	2	-	
Psolidae			<i>Psolus vitoriae</i>	-	-	+	
			<i>Psolus thandari</i>	+	-	-	
			<i>Psolus tommasi</i>	+	-	-	
			<i>Psolidium lonchostinum</i>	+	15	-	
			<i>Psolidium nanoplax</i>	+	1	-	
Ophiuroidea	Amphilepidida	Ophiotrichidae	<i>Ophiotrix trindadensis</i>	-	-	+	
			<i>Ophiotrix spiniformis</i>	-	1	-	
			<i>Ophiotrix troscheli</i>	-	2	-	

arrangement proposed by Pawson & Fell (1965) to the Holothuroidea and Stöhr *et al.* (2021) to the Ophiuroidea, followed by the alphabetical order, with detailed information on registration numbers, number of specimens originally available, dimensions of the type specimens and localities data.

Museum abbreviations are as follows: Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP); Museu de Diversidade Biológica – Zoologia, Universidade Estadual de Campinas, Brazil (ZUEC); Museu de Zoologia, Universidade Federal da Bahia, Salvador, Brazil (UFBA), and UFPB ECH Coleção de Echinodermata da Universidade Federal da Paraíba.

RESULTS

The following list comprises a total of 22 types, 19 of which from Holothuroidea (16 holotypes, 1 paratype and 2 neotypes) distributed in two orders, 6 families and 12 genera, and 3 of Ophiuroidea (1 neotype and 2 paratypes), from one order, one family and one genus (Table 2).

Within the family, genera and species are presented in alphabetical order.

Systematic list

HOLOTHUROIDEA

Order Apodida Brandt, 1835

Family Chiridotidae Östergren, 1898

Chantalia conandae Martins & Souto, 2020

Gymnopipina ikamiaba Souto & Martins in Souto *et al.* (2018)

Family Synaptidae Burmeister, 1837

Yemoja brasiliensis (Freire & Grohmann, 1989)

Order Dendrochirotida Grube, 1840

Family Cucumariidae Ludwig, 1894

Cucumaria solangeae Martins & Souto, 2015

Parathyone itapuaensis Martins & Tavares, 2021

Family Sclerodactylidae Panning, 1949

Euthyonidiella occidentalis (Ludwig, 1875)

Havelockia mansoae Martins & Tavares, 2018

Havelockia oranae Martins & Souto, 2018

Havelockia smirnovi Martins, 2019

Paulayellus gustavi Martins & Tavares, 2018

Sclerothyone oloughlini Martins & Tavares, 2019

Sclerothyone reichi Martins & Tavares, 2019

Family Phyllophoridae Östergren, 1907

Thyone waltinholi Martins & Souto, 2018

Thyone floriano Martins & Tavares, 2018

Family Psolidae Burmeister, 1837

Psolus vitoriae Tommasi, 1971

Psolus thandari Martins & Tavares, 2019

Psolus tommasi Martins & Tavares, 2019

Psolidium lonchostinum Martins & Tavares, 2020

Psolidium nanoplax Martins & Tavares, 2020

OPHIUROIDEA

Order Amphilepidida O'Hara, Hugall, Thuy, Stöhr & Martynov, 2017

Family Ophiotrichidae Ljungman, 1867

Ophiotrix trinidadensis Tommasi, 1970

Ophiotrix spiniformis Santana, Manso, Almeida & Alves, 2020

Ophiotrix troscheli Santana, Manso, Almeida & Alves, 2020

Alphabetic list of taxa

HOLOTHUROIDEA

Chantalia conandae Martins & Souto, 2020

Fig. 2A

Chantalia conandae Martins & Souto, 2020: 5-7, figs. 1-2.

Type locality: Ubatuba, São Paulo, Brazil.

Type material: *Holotype* – MZUSP 1896: 40 mm long, Ubatuba, São Paulo, Brazil, iii.1987. *Paratypes* – MZUSP 697: 8 specimens, 25-40 mm long, same collection data as holotype; MZUSP 698: 2 specimens, 40-50 mm long, Baleeiro beach (23°49'S, 45°25'W), São Sebastião, São Paulo, Brazil, 21.vii.1995.

Distribution: Ubatuba and São Sebastião, São Paulo, Brazil.

Cucumaria solangeae Martins & Souto, 2015

Fig. 2B

Cucumaria solangeae Martins & Souto, 2015: 370-373, figs. 7-8.

Type locality: Pituba beach (13°00'S, 38°27'W), Salvador, Bahia, Brazil, intertidal.

Type material: *Holotype* – UFBA 650: 40 mm long, Pituba beach (13°00'S, 38°27'W), Salvador, Bahia, Brazil, intertidal, 01.ii.1994. *Paratype* – MZUSP 286-290: 4 specimens, 20-40 mm long; UFBA 1750: 1 specimen, 20 mm long; ZUEC-HOL 21-22: 2 specimens, 20-30 mm long. Paratypes with same collection data as holotype.

Distribution: Pituba beach, Salvador, Bahia, Brazil.

Parathyone itapuaensis Martins & Tavares, 2021

Fig. 2C

Parathyone itapuaensis Martins & Tavares, 2021: 246-248, figs. 1-4.

Type locality: Itapuã beach (12°57'S, 38°21'W), Salvador, Bahia, Brazil, intertidal.

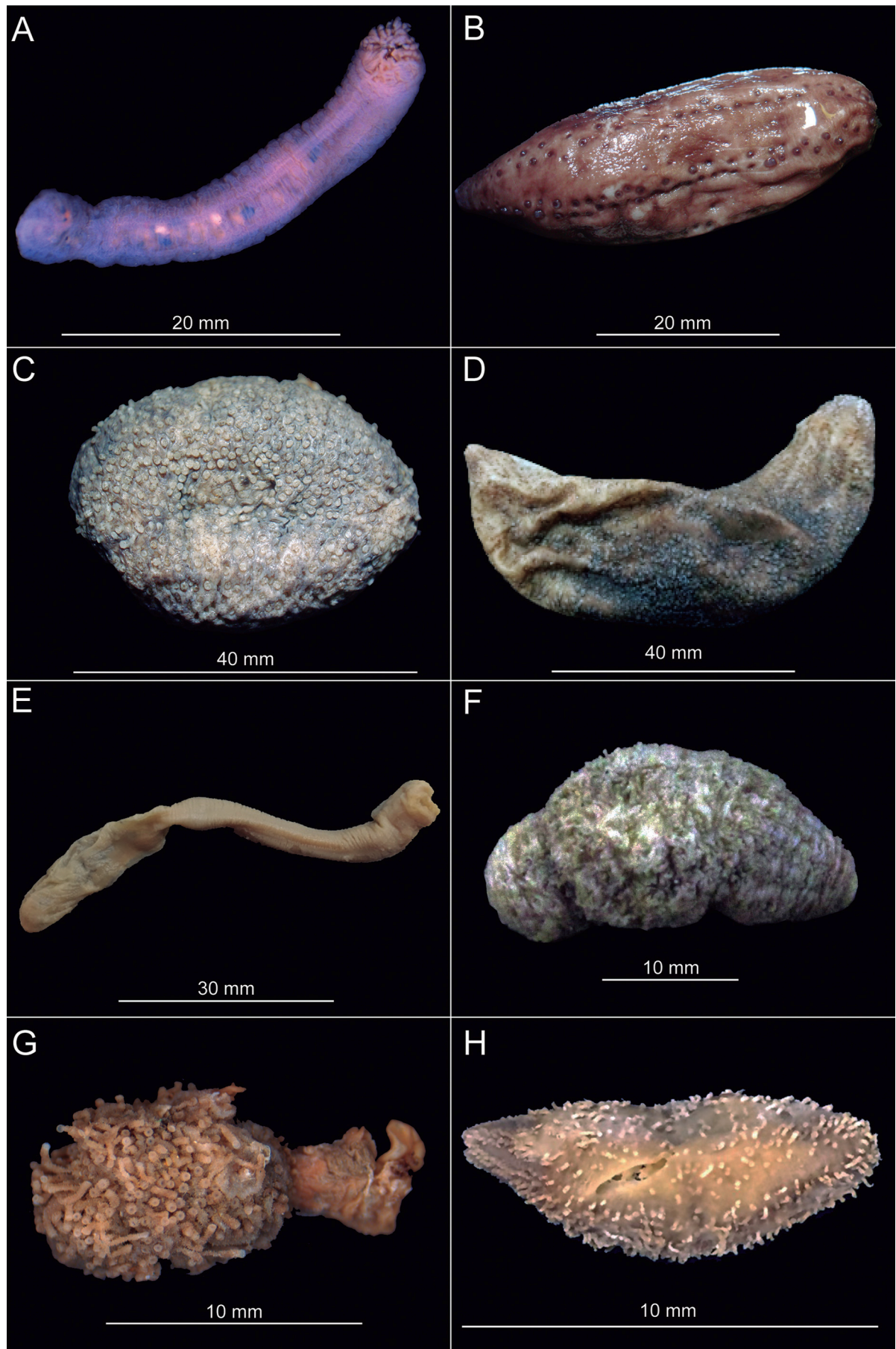


Figure 2. Type specimens. (A) *Chantalia conandae* (MZUSP 1896, holotype); (B) *Cucumaria solangeae* (MZUSP 286, paratype); (C) *Parathyone itapuaensis* (MZUSP 2089); (D) *Euthyonidiella occidentalis* (MZUSP 1139, neotype); (E) *Gymnopipina ikamiaba* (MZUSP 1514, holotype); (F) *Havelockia mansoae* (MZUSP 1525, holotype); (G) *Havelockia oraneae* (MZUSP 1636, holotype) and (H) *Havelockia smirnovi* (MZUSP 1352, holotype).

Type material: *Holotype* – MZUSP 2089: 40 mm long, Itapuã beach (12°57'S, 38°21'W), Salvador, Bahia, Brazil, intertidal, 21.iv.2011. *Paratype* – UFBA 631: 1 specimen, 40 mm long, same collection data as holotype; UFPB ECH 438: 1 specimen, 40 mm long, (07°04'S; 34°49'W), João Pessoa, Paraíba, Brazil; MZUSP 2103: 5 specimens, 10-25 mm long, Ubatuba, São Paulo, Brazil.

Distribution: Paraíba, Bahia and São Paulo (Brazil).

***Euthyonidiella occidentalis* (Ludwig, 1875)**

Fig. 2D

Thyonidium occidentale Ludwig, 1875: 119-120.

Phyllophorus occidentalis – Deichmann, 1930: 148, pl. 18.

Phyllophorus (Urodemella) occidentalis – Heding & Panning, 1954: 164, fig. 76.

Euthyonidiella dentata – Cherbonnier, 1961: 611-613, fig. 1.

Euthyonidiella occidentalis – Martins & Souto, 2015: 363-368, figs. 1-4 [neotype designation].

Type locality: Suriname (*Thyonidium occidentale*) and Bahia, Brazil (*Euthyonidiella occidentalis*).

Type material: *Neotype* – MZUSP 1139: 80 mm long, Itapuã beach (12°57'S, 38°21'W), Salvador, Bahia, Brazil, intertidal, 12.i.2014.

Distribution: U.S.A. (Florida), Caribbean Sea (Antigua, Aruba, Barbados, Puerto Rico, Trinidad and Tobago), Suriname and Brazil (Paraíba to Rio de Janeiro).

Remarks: In a taxonomic review of the dendrochirotrids, Martins & Souto (2015) considered the taxon *Phyllophorus occidentalis* as more properly fitting the diagnosis of the genus *Euthyonidiella*, proposing the re-assignment of the species. Concurrently, *Euthyonidiella dentata* Cherbonnier, 1961 was recognized as a junior synonym of *E. occidentalis*.

***Gymnopipina ikamiaba* Souto & Martins, 2018**

Fig. 2E

Gymnopipina ikamiaba Souto & Martins, 2018: 2, figs. 1-2.

Type locality: São Sebastião, São Paulo, Brazil.

Type material: *Holotype* – MZUSP 1514: 65 mm long, São Sebastião, São Paulo, Brazil, iii.1956. *Paratypes* – MZUSP 1515: 5 specimens, 20-25 mm long, same collection data as holotype.

Distribution: São Sebastião, São Paulo, Brazil.

***Havelockia mansoae* Martins & Tavares, 2018**

Fig. 2F

Havelockia mansoae Martins & Tavares, 2018: 539-540, figs. 5-6.

Type locality: Santos, São Paulo, Brazil.

Type material: *Holotype* – MZUSP 1525: 30 mm long, Santos, São Paulo, Brazil, 03.x.1967.

Distribution: Santos, São Paulo, Brazil.

***Havelockia oraneae* Martins & Souto, 2019**

Fig. 2G

Havelockia oraneae Martins & Souto, 2019: 1128-1130, figs. 1-2, Table 1.

Type locality: Todos os Santos Bay (13°02'S, 38°37'W), Salvador, Bahia, Brazil.

Type material: *Holotype* – MZUSP 1636: 12 mm long, Todos os Santos Bay (13°02'S, 38°37'W), Salvador, Bahia, Brazil, 16 m, 05.iv.1997. *Paratype* – MZUSP 1637: 1 specimen, 70 mm long, same collection data as holotype. UFBA 1641: 1 specimen, 10 mm long, Guarajuba beach (12°45'S, 38°05'W), Camaçari, Bahia, Brazil, 26 m, 20.vii.2005.

Distribution: Todos os Santos Bay, Salvador, Bahia, Brazil.

***Havelockia smirnovi* Martins, 2019**

Fig. 2H

Havelockia smirnovi Martins, 2019: 7-9, figs. 4-5.

Type locality: Ilha Anchieta, Ubatuba, São Paulo, Brazil.

Type material: *Holotype* – MZUSP 1352: 12 mm long, Ilha Anchieta (23°33'S, 45°04'W), Ubatuba, São Paulo, Brazil, 05.ii.1964. *Paratype* – MZUSP 1885: 1 specimen, 15 mm long, Itapuã beach (12°57'S, 38°21'W), Salvador, Bahia, Brazil, intertidal, 05.iv.2011.

Distribution: Northeast to Southeast coast of Brazil (Bahia to São Paulo).

***Paulayellus gustavi* Martins & Tavares, 2018**

Fig. 3A

Paulayellus gustavi Martins & Tavares, 2018: 161-163, figs. 3-4.

Type locality: Gulf of Panama, Panama.

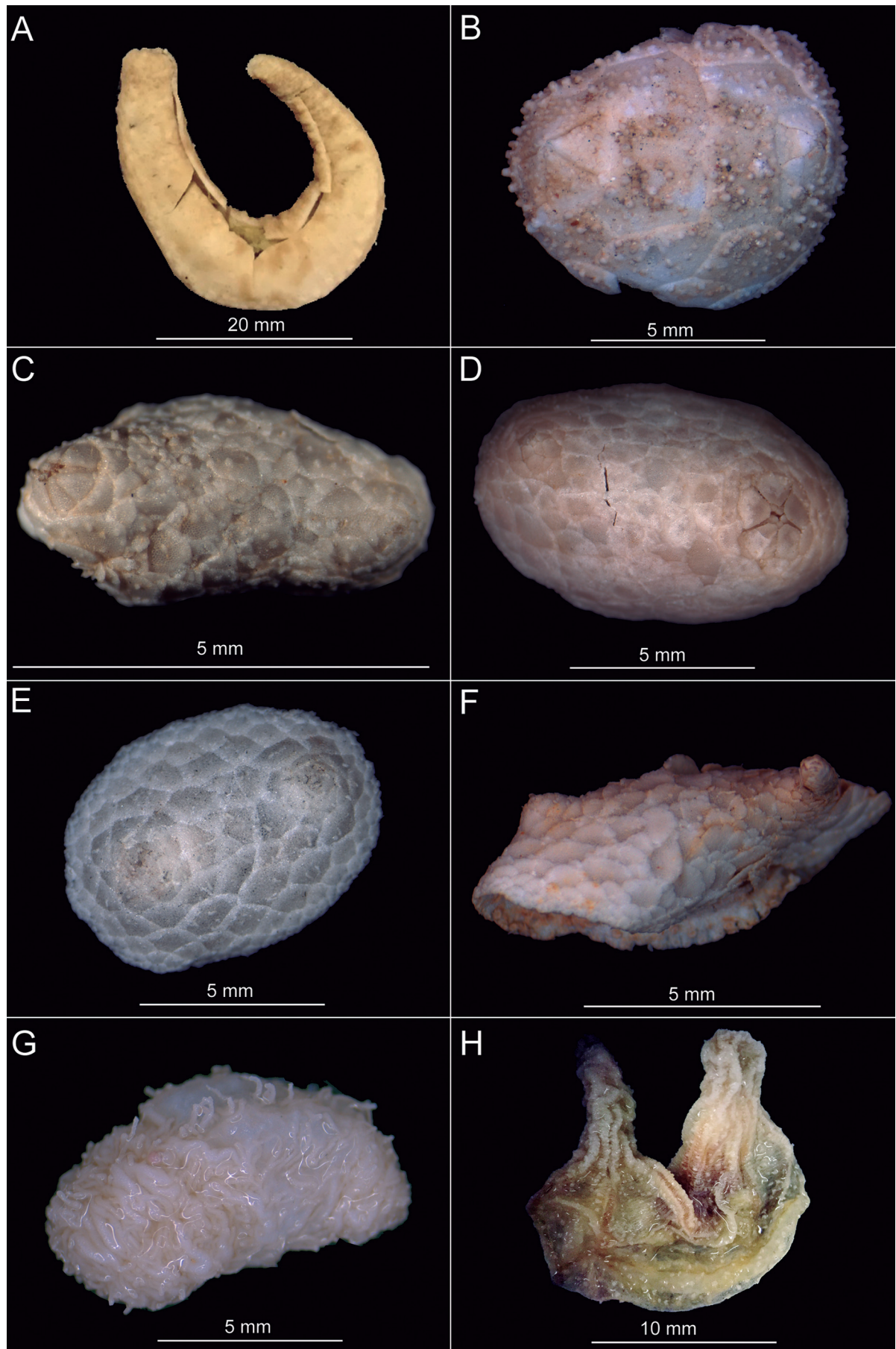


Figure 3. Type specimens. (A) *Paulayellus gustavi* (MZUSP 1619, holotype); (B) *Psolus vitoriae* (MZUSP 1632, holotype); (C) *Psolus thandari* (MZUSP 593, holotype); (D) *Psolus tommasi* (MZUSP 583, holotype); (E) *Psolidium lonchostinum* (MZUSP 744, holotype); (F) *Psolidium nanoplax* (MZUSP 589, holotype); (G) *Sclerothyone oloughlini* (MZUSP 1884, holotype); (H) *Sclerothyone reichii* (MZUSP 1644, holotype).

Type material: *Holotype* – FLMNH 4550: 50 mm long, Gulf of Panama, Panama. *Paratype* – MZUSP 1619: permanent slides of body wall ossicles, same collection data as holotype.

Distribution: Gulf of Panama, Panama.

***Psolus vitoriae* Tommasi, 1971
Fig. 3B**

Psolus vitoriae Tommasi, 1971: 4, figs. 11-12.
Psolus vitoriae – Martins & Tavares, 2019a: 533-536, figs. 1-2, Table 1 [neotype designation].

Type locality: Ilha da Vitória, São Paulo, Brazil.

Type material: *Neotype* – MZUSP 1632: 8 mm long, Ilha da Vitória, São Paulo, Brazil, 50-100 m, 01.ii.1968.

Distribution: Southeastern coast of Brazil (São Paulo, Rio de Janeiro and Rio Grande do Sul).

***Psolus thandari* Martins & Tavares, 2019
Fig. 3C**

Psolus thandari Martins & Tavares, 2019a: 538-542, figs. 5-6, Table 1.

Type locality: Campos Basin, Rio de Janeiro, Brazil.

Type material: *Holotype* – MZUSP 593: 5.7 mm long, Campos Basin (21°41'S, 40°20'W), Rio de Janeiro, Brazil, 44 m, xii.1991 to i.1992. *Paratypes* – MZUSP 1634: 3 specimens, 4.5-5 mm long, same collection data as holotype.

Distribution: Campos Basin, Rio de Janeiro, Brazil.

***Psolus tommasi* Martins & Tavares, 2019
Fig. 3D**

Psolus tommasi Martins & Tavares, 2019a: 536-538, figs. 3-4, Table 1.

Type locality: São Paulo, Brazil.

Type material: *Holotype* – MZUSP 583: 12 mm long, São Paulo (24°20'S, 44°09'W), Brazil, 258 m.

Distribution: São Paulo, Brazil.

***Psolidium lonchostinum* Martins & Tavares, 2020
Fig. 3E**

Psolidium lonchostinum Martins & Tavares, 2020: 2-5, figs. 1-3.

Type locality: Rio Grande do Sul, Brazil.

Type material: *Holotype* – MZUSP 744: 8.3 mm long, Rio Grande do Sul (33°41'S, 51°32'W), Brazil, 200 m, 02.iv.1998. *Paratypes* – MZUSP 743: 7 specimens, 7-7.5 mm long, São Paulo (24°20'S, 44°09'W), Brazil, 258 m, 10.i.1998; MZUSP 591: 8 specimens, 6-8.2 mm long, São Paulo (24°20'S, 44°09'W), Brazil, 258 m, 10.i.1998.

Distribution: Southeastern coast of Brazil (São Paulo and Rio Grande do Sul).

***Psolidium nanoplax* Martins & Tavares, 2020
Fig. 3F**

Psolidium nanoplax Martins & Tavares, 2020: 6, figs. 4-5.

Type locality: Campos Basin, Rio de Janeiro, Brazil.

Type material: *Holotype* – MZUSP 589: 11 mm long, Campos Basin (21°41'S, 40°20'W), Rio de Janeiro, Brazil, 44 m, xii.1991 to i.1992. *Paratypes* – MZUSP 592: 1 specimen, 8.5 mm long. Same collection data as holotype.

Distribution: Campos Basin, Rio de Janeiro, Brazil.

***Sclerothyone oloughlini* Martins & Tavares, 2019
Fig. 3G**

Sclerothyone oloughlini Martins & Tavares, 2019b: 379-380, figs. 2-3, Table 1.

Type locality: Ilhabela, São Paulo, Brazil.

Type material: *Holotype* – MZUSP 1884: 10 mm long, Ilha bela, São Paulo, Brazil, (23°46'S, 43°00'W), 150 m, 02.ix.1970. *Paratypes* – MZUSP 1889: 2 specimens, 4-6 mm long, same collection data as holotype; MZUSP 1887: 4 specimens, 3-5 mm long, Cabo Frio (23°36'S, 43°23'W), Rio de Janeiro, Brazil, 475 m, 04.ix.1970; MZUSP 1888: 3 specimens, 5-10 mm long, Campos Basin (21°20'S, 40°15'W), Rio de Janeiro, Brazil, 185 m, xii.1991 to i.1992.

Distribution: São Paulo and Rio de Janeiro, Brazil.

***Sclerothyone reichi* Martins & Tavares, 2019
Fig. 3H**

Sclerothyone reichi Martins & Tavares, 2019b: 376-378, figs. 1, Table 1.

Type locality: São Paulo, Brazil.

Type material: *Holotype* – MZUSP 1644: 30 mm long, São Paulo (24°07'S, 44°42'W), Brazil, 101 m, 11.i.1998.

Distribution: São Paulo, Brazil.

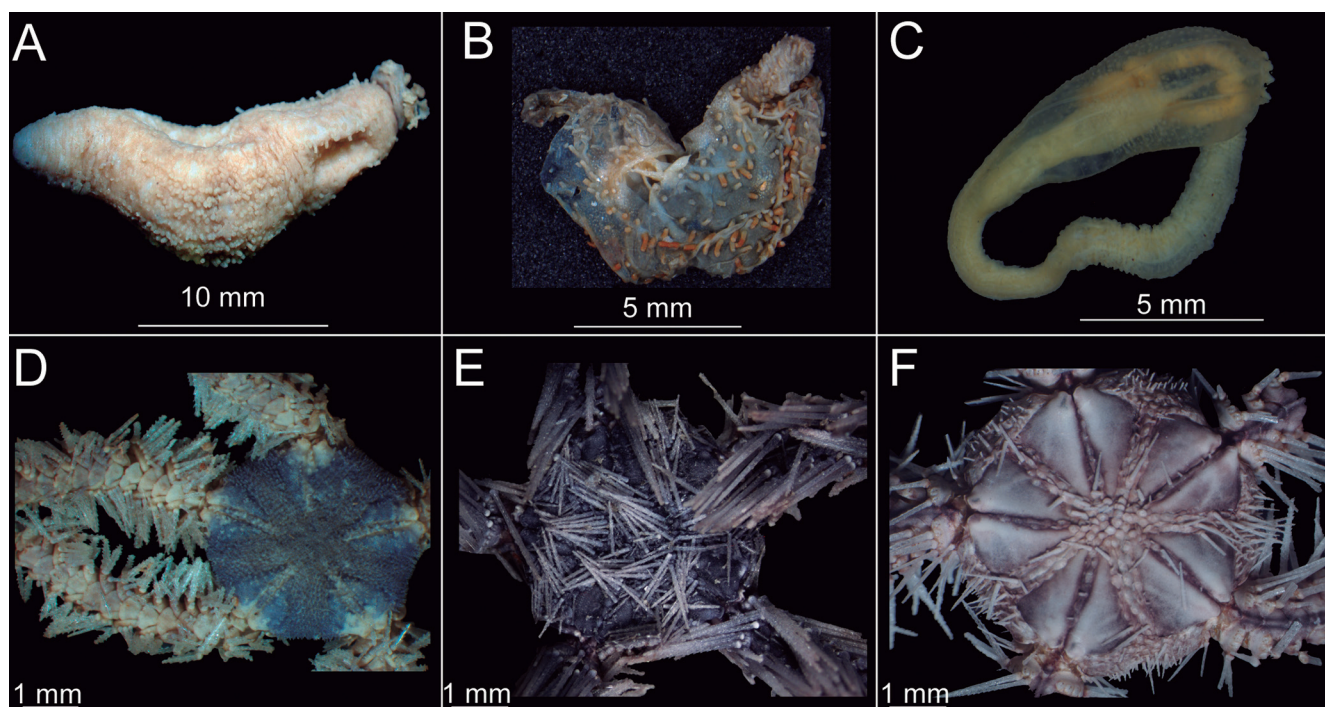


Figure 4. (A) *Thyone waltinhoi* (MZUSP 1635, holotype); (B) *Thyone florianoii* (MZUSP 1351, holotype); (C) *Yemoja brasiliensis* (MZUSP 1025, holotype); (D) *Ophiothrix trinidadensis* (MZUSP 1425, neotype); (E) *Ophiothrix spiniformis* (MZUSP 2709, paratype) and (F) *Ophiothrix troscheli* (MZUSP 2708, paratype). Photographs: D, by R. Alitto; E, F by A. Santana.

***Thyone waltinhoi* Martins & Souto, 2019**

Fig. 4A

Thyone waltinhoi Martins & Souto, 2019: 1128-1133, figs. 3-5, Table 2.

Type locality: Itapuã beach, Salvador, Bahia, Brazil.

Type material: *Holotype* – MZUSP 1635: 30 mm long, Itapuã beach (12°57'S, 38°21'W), Salvador, Bahia, Brazil, intertidal, under rocks, 15.v.1991.

Distribution: Itapuã beach, Salvador, Bahia, Brazil.

***Thyone florianoii* Martins & Tavares, 2018**

Fig. 4B

Thyone florianoii Martins & Tavares, 2018: 535-538, figs. 3-4.

Type locality: São Sebastião, São Paulo, Brazil.

Type material: *Holotype* – MZUSP 1351: 15 mm long, São Sebastião, São Paulo, Brazil, 01.ii.1986. *Paratype* – MZUSP 1529: 2 specimens, 100 mm long, same collection data as holotype; MZUSP 1516: 2 specimens, 20-25 mm long, Ilha Anchieta, Ubatuba, São Paulo, Brazil, 11 m, 15.ii.1964.

Distribution: São Paulo, Brazil.

***Yemoja brasiliensis* (Freire & Grohmann, 1989)**

Fig. 4C

Leptosynapta brasiliensis Freire & Grohmann, 1989: 720, figs. 1-6.

Yemoja brasiliensis – Martins & Souto, 2020: 15-18, figs. 9-10.

Type locality: Praia Vermelha beach, Rio de Janeiro, Rio de Janeiro, Brazil.

Type material: *Holotype* – MZUSP 1025: 20 mm long, Praia Vermelha beach (22°57'S, 43°9'W), Rio de Janeiro, Rio de Janeiro, Brazil, 1-4 m, 26.xii.1988. *Paratype* – MZUSP 1022-1024: 5 specimens, 15-30 mm long, same collection data as holotype.

Distribution: Rio de Janeiro, Brazil.

Remarks: Based on the examinations of the type material Martins & Souto (2020) described a new genus to allocate the species *Leptosynapta brasiliensis*. The monotypic genus includes the species *Yemoja brasiliensis* (Freire & Grohmann, 1989).

OPHIUROIDEA

***Ophiothrix trinidadensis* Tommasi, 1970**

Fig. 4D

Ophiothrix trinidadensis Tommasi, 1970: 61-62, figs. 60-61.

Ophiothrix trinidadensis – Alitto *et al.*, 2019: 13-18, figs. 7-8 [neotype designation]; Santana *et al.*, 2020: 57-58, figs. 5.

Type locality: Trindade Island, Espírito Santo, Brazil.

Type material: Neotype – MZUSP 1425: 5.8 dd (disc diameter), Enseada dos Portugueses (20°29'5"S, 29°19'15"W), Trindade Island, Espírito Santo, Brazil, 12 m, 15.iii.2013.

Distribution: Brazilian oceanic islands: São Pedro and São Paulo and Trindade and Martin Vaz Islands. Northeastern to Eastern Brazil.

Ophiothrix spiniformis
Santana, Manso, Almeida & Alves, 2020
Fig. 4E

Ophiothrix spiniformis Santana, Manso, Almeida & Alves, 2020: 63-64, figs. 8-9.

Type locality: Paranaguá, Paraná, Brazil.

Type material: Paratype – MZUSP 02709: 1 specimen. Paranaguá (23°49'S, 45°24'W), Paraná, Brazil, 1 m, 20.xii.2014.

Distribution: Paraná, Brazil.

Ophiothrix troscheli
Santana, Manso, Almeida & Alves, 2020
Fig. 4F

Ophiothrix troscheli Santana, Manso, Almeida & Alves, 2020: 67-69, figs. 12-13.

Type locality: Cananéia, São Paulo, Brazil.

Type material: Paratypes – MZUSP 1521: 1 specimen; MZUSP 02708: 1 specimen. Cananéia (25°11'S, 44°57'W), São Paulo, Brazil, 168 m, 2000.

Distribution: Rio de Janeiro, São Paulo and Santa Catarina, Brazil.

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REFERENCES

- Alitto, R.A.S.; Amaral, A.C.Z.; de Oliveira, L.D.; Serrano, H.; Seger, K.R.; Guilherme, P.D.B.; Di Domenico, M.; Christensen, A.B.; Lourenço, L.B.; Tavares, M & Borges, M. 2019. Atlantic West *Ophiothrix* spp. in the scope of integrative taxonomy: Confirming the existence of *Ophiothrix trinidadensis* Tommasi, 1970. *PLoS ONE*, 14(1): e0210331. <https://doi.org/10.1371/journal.pone.0210331>.
- Andrade, I.O.; Mattos, L.F.; Cruz-Called, A.C. & Hillebrand, G.R.L. 2018. *O Brasil na Antártica: a importância científica e geopolítica do PROANTAR no entorno estratégico brasileiro*. Texto para Discussão/Instituto de Pesquisa Econômica Aplicada IPEA. 54p.
- Brasil. 2006. Ministério do Meio Ambiente. *Programa REVIZEE: avaliação do potencial sustentável de recursos vivos na zona econômica exclusiva: relatório executivo/MMA*. Brasília, MMA, Secretaria de Qualidade Ambiental. 280p.
- Cherbonnier, G. 1961. Deux nouvelles espèces d'holothuries dendrochirotes des côtes Brésiliennes. *Bulletin Muséum National Histoire Naturelle Paris*, 2 Série, 33(6): 611-615.
- Deichmann, E. 1930. The holothurians of the western part of the Atlantic Ocean. *Bulletin of the Museum of Comparative Zoology at Harvard College*, 71(3): 1-226.
- Freire, C.A.O. & Grohmann, P.A. 1989. *Leptosynapta brasiliensis*: a new species of synaptid holothurian (Echinodermata) from a sandy beach in southeastern Brazil. *Revista Brasileira de Zoologia*, 6(4): 719-723. <https://doi.org/10.1590/S0101-81751989000400018>.
- Grohmann, P.A.; Nogueira, C.C. & Silva, V.M.A.P. da 2003. Hydroids (Cnidaria, Hydrozoa) collected on the continental shelf of Brazil during the Geomar X Oceanographic Operation. *Zootaxa*, 299: 1-19.
- Heding, S.G. & Panning, A. 1954. Phylloporidae: eine Bearbeitung der Polytentaculaten Dendrochiroten Holothurien des Zoologischen Museums in Kopenhagen. *Spolia Zoologische Musei Hauniensis*, 13: 7-209.
- International Commission on Zoological Nomenclature (ICZN). 1999. *International Code of Zoological Nomenclature*. 4. ed. London, The International Trust for Zoological Nomenclature. xxix + 306p.
- Ludwig, H.L. 1875. *Thyonidium occidentale* n. sp. *Arbeiten Zoologische Zootomischen Institut Würzburg*, 2: 119-120.
- Martins, L. 2019. Ontogenetic variation of the ossicles in *Pseudothyone belli* (Ludwig, 1887) with a description of a new Sclerodactylidae (Echinodermata: Holothuroidea: Dendrochirotida) from Southwestern Atlantic. *Marine Biology Research*, 15(7): 434-443.
- Martins, L. & Souto, C. 2015. Taxonomic review of four western Atlantic dendrochirotid (Holothuroidea) with the description of a new Brazilian cucumariid species and designation of neotypes. *Zootaxa*, 3919(2): 362-374. <https://doi.org/10.11646/zootaxa.3919.2.8>.
- Martins, L. & Souto, C. 2019. Taxonomic remarks on *Havelockia* and *Thyone* (Echinodermata: Holothuroidea: Dendrochirotida), with descriptions of

- two new species from the Brazilian coast. *Journal of the Marine Biological Association of the United Kingdom*, 99(5): 1127-1134. <https://doi.org/10.1017/S0025315418001078>.
- Martins, L. & Souto, C. 2020. Taxonomy of the Brazilian Apodida (Holothuroidea), with the description of two new genera. *Marine Biology Research*, 16(4): 219-255. <https://doi.org/10.1080/17451000.2020.1761027>.
- Martins, L. & Tavares, M. 2018. New species of the genera *Havelockia* and *Thyone* (Echinodermata: Holothuroidea) and first record of *T. crassidisca* from the southwestern Atlantic Ocean. *Zootaxa*, 4407(4): 553-542. <https://doi.org/10.11646/zootaxa.4407.4.5>.
- Martins, L. & Tavares, M. 2019a. Two new species of *Psolus* Oken from Brazil (Holothuroidea: Psolidae), with neotype designation and redescription of *Psolus vitoriae* Tommasi, 1971, and a key to the southwestern Atlantic and Magellanic species. *Zootaxa*, 4563(3): 531-546. <https://doi.org/10.11646/zootaxa.4563.3.7>.
- Martins, L. & Tavares, M. 2019b. Two new species of *Sclerothyone* from the southwestern Atlantic Ocean, with a key to genera and species of Sclerothyoninae (Holothuroidea: Dendrochirotida: Sclerodactylidae). *Zootaxa*, 4658(2): 375-382. <https://doi.org/10.11646/zootaxa.4658.2.11>.
- Martins, L. & Tavares, M. 2020. First Record of Psolid Sea Cucumber *Psolidium* (Holothuroidea: Dendrochirotida: Psolidae) from the Brazilian Coast, with the Description of Two New Species. *Zoological Studies*, 59: 2-11. <https://doi.org/10.6620/ZS.2020.59-2>.
- Martins, L. & Tavares, M. 2021. A new species of *Parathyone* (Holothuroidea: Dendrochirotida: Cucumariidae) from northeastern Brazil, with a key to species. *Zootaxa*, 4985(2): 245-252. <https://doi.org/10.11646/zootaxa.4985.2.7>.
- Mendes, C.L.T.; Tavares, M & Soares-Somes, A. 2007. Taxonomic sufficiency for soft-bottom sublittoral mollusks assemblages in a tropical estuary, Guanabara Bay, Southeast Brazil. *Marine Pollution Bulletin*, 54(4): 377-384.
- Moser, W.E. & Nicol, J.C. 1997. The National Museum of Natural History. *Antarctic Journal*, 32(3) 11-16.
- Nonato, E.F.; Petti, M.A.V.; Paiva, P.C. de & Brito, T.A.S. 1992. Programa Antártico Brasileiro: amostragem de organismos bentônicos realizadas nas seis primeiras expedições (1982 a 1988), com participação do N/Oc. "Prof. W. Besnard". *Relatórios do Instituto Oceanográfico da Universidade de São Paulo*, 32, 1-12.
- Oliveira, J.E.L.; Viana, D.L. & Souza, M.A.C. de (Orgs.). 2018. *Arquipélago de São Pedro e São Paulo: 20 anos de pesquisa*. Universidade Federal do Rio Grande do Norte. 263p.
- Pawson, D.L. & Fell, H.B. 1965. A revised classification of the *Dendrochirotida* holothurians. *Breviora*, 214: 1-7.
- Santana, A.; Manso, C.L.C.M.; Almeida, A.C.S. & Alves, O.F.S. 2020. Taxonomic review of *Ophiothrix* Müller & Troschel, 1840 (Echinodermata: Ophiuroidea) from Brazil, with the description of four new species. *Zootaxa*, 4808(1): 051-078. <https://doi.org/10.11646/zootaxa.4808.1.3>.
- Santi, L. & Tavares, M. 2009. Polychaete assemblage of an impacted estuary, Guanabara Bay, Rio de Janeiro, Brazil. *Brazilian Journal of Oceanography*, 57(4): 287-303.
- Secretaria da Comissão Interministerial para os Recursos do Mar (SECIRM). 2017. *PROTRINDADE: Programa de Pesquisas Científicas na Ilha da Trindade*. 10 anos de pesquisas. Brasília, SESIRM. 200p.
- Silva, L.F.B.; Tavares, M.; Soares-Gomes. 2008. A. Taxonomic sufficiency for soft-bottom sublittoral mollusks assemblages in a tropical estuary, Guanabara Bay, Southeast Brazil. *Revista Brasileira de Zoologia*, 25(4): 617-623.
- Souto, C.; Martins, L. & Menegola, C. 2018. Giving up on elaborate dermal ossicles: a new genus of ossicleless Apodida (Holothuroidea). *Journal of the Marine Biological Association of the United Kingdom*, 98(7): 1685-1688. <https://doi.org/10.1017/S0025315417001084>.
- Stöhr, S.; O'Hara, T. & Thuy, B. (Eds.). 2021. *World Ophiuroidea Database*. Available: <https://doi.org/10.14284/358>. Access: 19/02/2021.
- Tavares, M. 1999. The cruise of the Marion Dufresne off the Brazilian coast: account of the scientific results and list of stations. *Zoosystema*, 21: 597-605.
- Tommasi, L.R. 1970. Os ofiuroides recentes do Brasil e de regiões Vizinhas. *Contribuições Avulsas do Instituto Oceanográfico, Universidade de São Paulo, série Oceanografia Biológica*, 20: 1-146.
- Tommasi, L.R. 1971. Equinodermes do Brasil. I. Sobre algumas novas espécies e outras pouco conhecidas, para o Brasil. *Boletim do Instituto Oceanográfico, São Paulo*, 20: 1-21.
- Van Der Vem, M.; Soares-Gomes, A.; Tavares, M. 2006. Taxocene of Crustacea at a Highly Impacted Bay: Guanabara Bay, Southeastern Brazil. *Journal of Coastal Research*, 39: 1135-1139.