

## Description of *Scoloplos maranhensis* sp. nov. (Orbiniidae, Annelida) from tropical Brazilian mangrove

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Received 7 July 2018

Accepted 29 January 2019

Published 25 February 2019

DOI 10.1590/1678-4766e2019009

**ABSTRACT.** A new species of orbiniid, *Scoloplos maranhensis* sp. nov., is described from a tropical mangrove (Quebra Pote, state of Maranhão, Brazil, 02°41.344'S; 44°12.604'W) along with a comparative table with all *Scoloplos* species. The main distinguishing characters of *S. maranhensis* sp. nov. are thorax with 12 chaetigers, neuropodia from first chaetiger, notopodia and neuropodia without papillae, conical branchiae from 12th chaetiger to the end of the body, being larger and more robust in the anterior segments. Thoracic notopodia with seven crenulated capillary chaetae and abdominal notopodia with furcated and capillary chaetae. Thoracic neuropodia rounded with two crenulated capillary chaetae and six slender-smooth hooks, abdominal neuropodia with a post-chaetal lobe and only capillary chaetae. Papillae absent from posterior parapodia; one pair of cirriform anal cirri.

**KEYWORDS.** New species, Polychaeta, Biodiversity, South America.

The family Orbiniidae is characterized by the prostomium shape, number of thoracic segments, localization of the first branchia, shape of the parapodia, the morphology and distribution of chaetae, and the body with two clearly distinct regions: thorax, which is dorsoventrally flattened and muscular, and the abdomen which is more cylindrical and delicate (TAYLOR, 1984). The worms of this family may have a long body with some adults of *Orbinia* reaching up to 300 mm, although other species do not exceed 4 mm in length such as those from the genus *Proscoloplos* (TAYLOR, 1984; SOLÍS-WEISS *et al.*, 2009; DÍAZ *et al.*, 2012). Orbiniids are excavators and deposit feeders, with a worldwide distribution occurring from intertidal to abyssal depths (BLEIDORN, 2005; LÓPEZ *et al.*, 2006; SOLÍS-WEISS *et al.*, 2009; DEAN & BLAKE, 2015). Currently, two subfamilies are recognized Orbiniinae and Microrbiniinae (DÍAZ *et al.*, 2012), encompassing 19 genera and more than 150 species, 26 of which have been recorded from Brazil (BLAKE, 2000; ROUSE & PLEIJEL, 2001; LEÃO & SANTOS, 2016).

The genus *Scoloplos* was described by BLAINVILLE (1828) and belongs to the subfamily Orbiniinae. *Scoloplos* has traditionally been divided in two subgenera, *Scoloplos* (*Scoloplos*) and *Scoloplos* (*Leodamas*) (HARTMAN, 1957; PETTIBONE, 1957; DAY, 1967, 1973; FAUCHALD, 1977; EIBYE-JACOBSEN, 2002). More recently both have been considered two separated genera, although the phylogeny of the group is not completely resolved yet (BLAKE, 2000, 2017; BLEIDORN

*et al.*, 2009; ZHADAN *et al.*, 2015; READ & FAUCHALD, 2018), classification followed here. *Scoloplos* has four or less foot papillae plus stomach papillae, thoracic neuropodial hooks accompanied with capillary chaetae, and branchiae starting from chaetiger 8 or later, while *Leodamas* have numerous hooks in thoracic neuropodia accompanied with few or no capillary chaetae, single thick projecting aciculae in abdominal neuropodia, and branchiae starting before chaetiger 7 (BLEIDORN *et al.*, 2009; ZHADAN *et al.*, 2015). Currently, there are 29 species of *Scoloplos* described, seven of which already recorded from Brazilian coast (AMARAL *et al.*, 2012; READ & BELLAN, 2017). In the present study, we describe an additional species, *Scoloplos maranhensis* sp. nov. from tropical Brazilian mangroves and provide a comparative table of all species of the genus.

### MATERIAL AND METHODS

All material studied was sampled at Quebra Pote mangrove, located in the city of São Luís, Maranhão, Brazil (02°41.344'S; 44°12.604'W; Fig. 1). The mangrove is strongly influenced by tides, with amplitude of up to 8 m (SILVA & ALMEIDA, 2002), and by the direct interference of domestic sewage discharged *in natura*. Four sampling campaigns were performed in November 2013, January 2014, March 2014, and July 2014 using a corer with 10 cm diameter introduced 20 cm depth in the sediment. On each

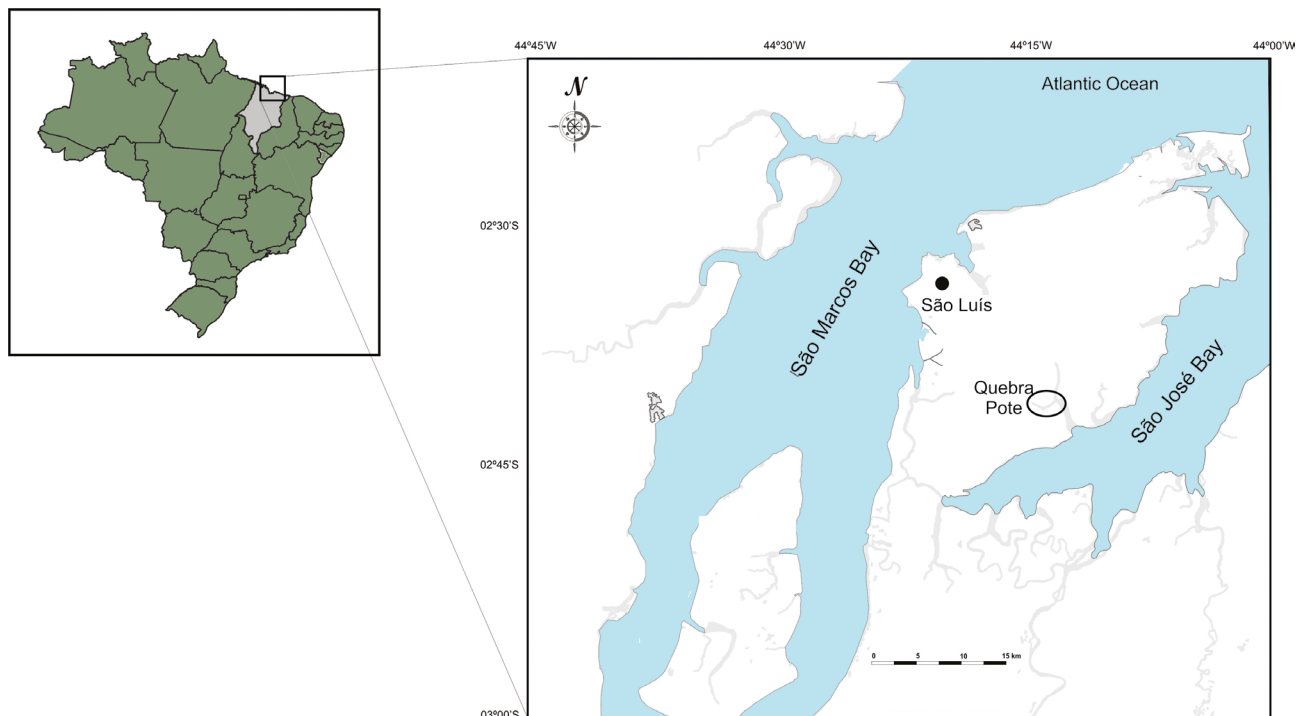


Fig. 1. Type locality of *Scoloplos maranhensis* sp. nov., Quebra Pote Mangrove, Maranhão, Brazil.

occasion samples were taken in the lower, intermediate and upper mesolittoral. The material sampled was fixed in 4% formalin, and in laboratory washed in 0.5 mm pore diameter sieves and preserved in 70% ethanol.

Descriptions were based on external morphology, mostly from anterior and median part of the body where most of the diagnostic characters are found. Descriptions followed the classical taxonomic style, following the terminology adopted by LEÃO & SANTOS (2016). In addition, the description included body length, always relating to the number of segments. The median width was measured including the parapodia but excluding the chaeta. To better visualization of the papillae, the Shirlastain A<sup>®</sup> dye was used in some individuals. Type material was deposited at the “Coleção de Invertebrados Paulo Young” (CIPY) from Universidade Federal da Paraíba.

## RESULTS AND DISCUSSION

### *Scoloplos maranhensis* sp. nov.

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(Figs 2-12)

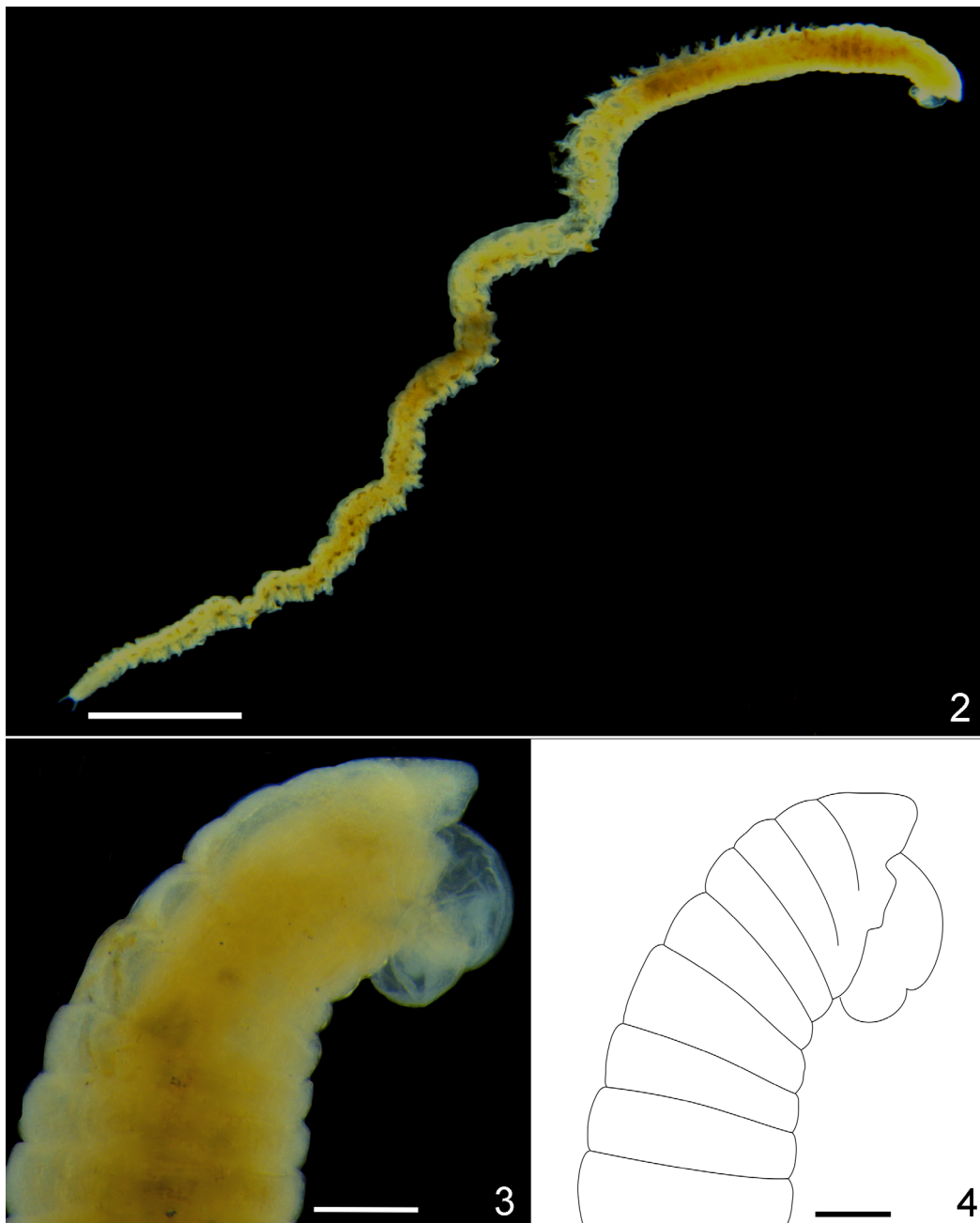
Type material. Holotype, Mangrove from Quebra Pote, São Luís, state of Maranhão, Brazil (02°41.344'S; 44°12.604'W), 09 January 2014 (CIPY – 1730).

Paratypes. A total of 11 paratypes, length ranging from 1.4 to 0.2 mm and number of segments from 10 to 80. Quebra Pote mangrove, Brazil (02°41.344'S; 044°12.604'W): 05 November 2013, (1 paratype, CIPY - 1731); 07 January 2014;

(2 paratypes, CIPY - 1732); 03 September 2014 (6 paratypes, CIPY 1733); 28 September 2012 (2 paratypes, CIPY 1734).

Diagnosis. Thorax with 12 segments, chaetae appearing since the first segment. Notopodia and neuropodia without papillae. Conical branchiae from chaetiger 12 to the end of the body. Branchiae larger and more robust in the anterior segments. Each branchial pair located on median dorsal part. Cirriform post-chaetal notopodial lobes, inconspicuous at first, but long from chaetiger 3. Thoracic notopodia with seven crenulated capillary chaetae, neuropodia with two crenulated capillaries and six slender-smooth hooks. Abdominal notopodia with crenulated capillary and furcate chaetae and and neuropodia crenulated capillary chaetae.

Description. The holotype is a complete specimen with 57 segments, 3.0 mm length, 0.1 mm wide. Body long, very slender and tapered at the posterior end (Fig. 2). Prostomium conical, longer than wide (Fig. 3). Eyes, antennae and tentacular cirri absent, nuchal organs present but not visible (Fig. 3). Peristomium as a single achaetous ring, similar in length to segment 1. Undivided smooth proboscis covered with diffusely distributed rounded small papillae (Figs 3, 4). Thorax dorsoventrally flattened with 12 chaetigers, widest in the middle part. Slight transition from thorax to abdomen from segment 12. All parapodia biramous, present from the first chaetiger. Abdominal neuropodia rounded, notopodia with one dorsal lamella and all ventral lamella absent. Thoracic notopodia and neuropodia without papillae. Branchiae conical, on median-dorsal position, beginning from the 12<sup>th</sup> segment and continuing through the body. Branchiae at first long and robust, becoming thinner towards the posterior end. Cirriform post-chaetal notopodial lobes inconspicuous at first, but long from chaetiger 3; neuropodia

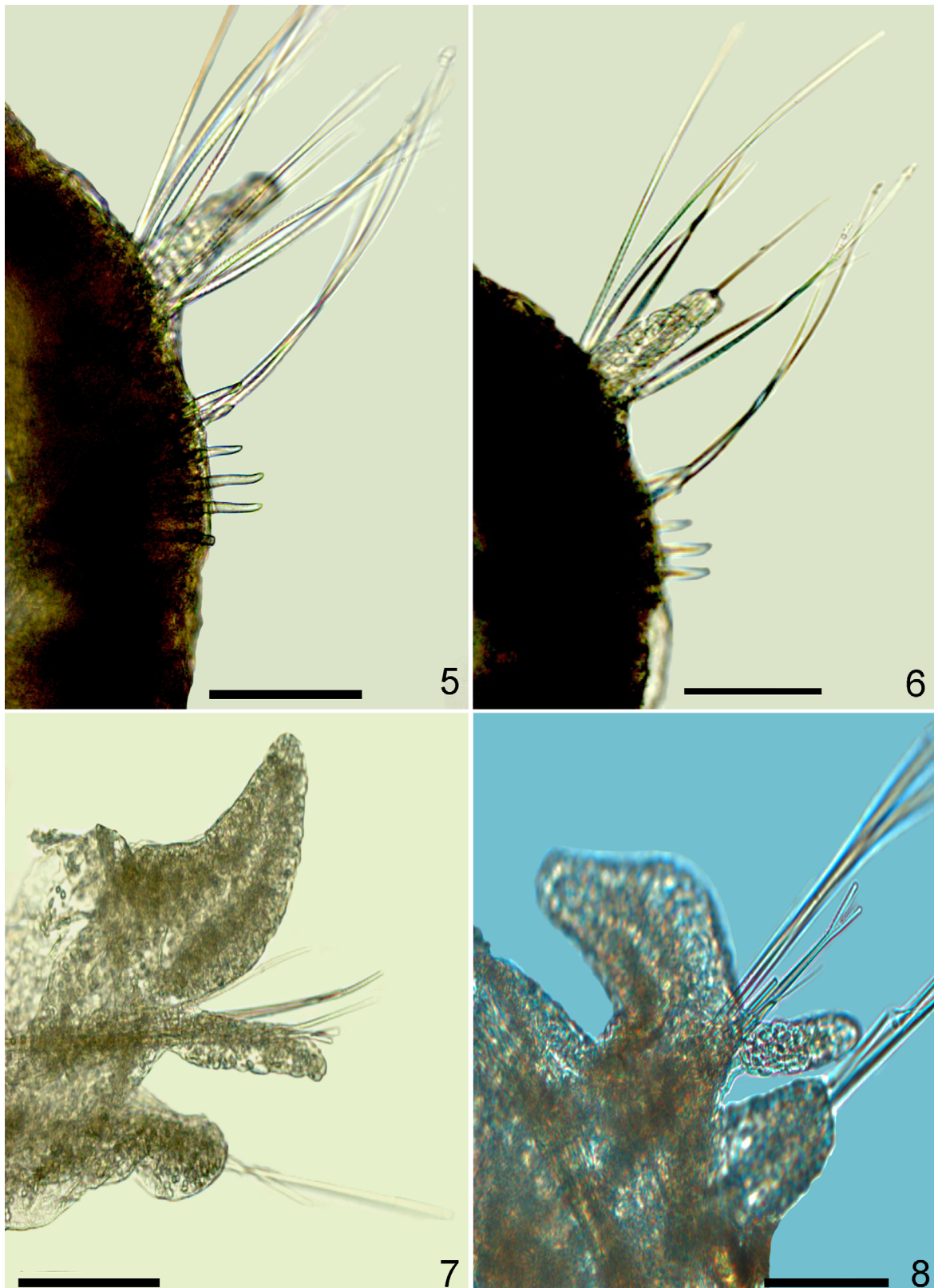


Figs 2-4. *Scoloplos maranhensis* sp. nov., holotype: 2, general view; 3, 4, detail of the anterior region with the prostomium and the smooth proboscis. Scales: Fig. 2: 2 mm; Figs 3, 4: 0.5 mm.

rounded on thoracic chaetigers and with a developed lobe in abdominal chaetigers. Thoracic notopodia with crenulated capillaries (Figs 5, 6, 9, 10) and abdominal notopodia with crenulated capillaries and furcated chaetae with unequal ends and internally hairy (Figs 7, 8, 10). Thoracic neuropodia rounded with two crenulated capillaries chaetae, one single neuropodial acicular spine in the segments and six slender, smooth hooks (Figs 5, 6, 11); abdominal neuropodia with post-chaetal lobe and only crenulated capillaries (Fig. 7). Anal papillae absent. Pygidium with one pair of cirriform anal cirri (Fig. 12).

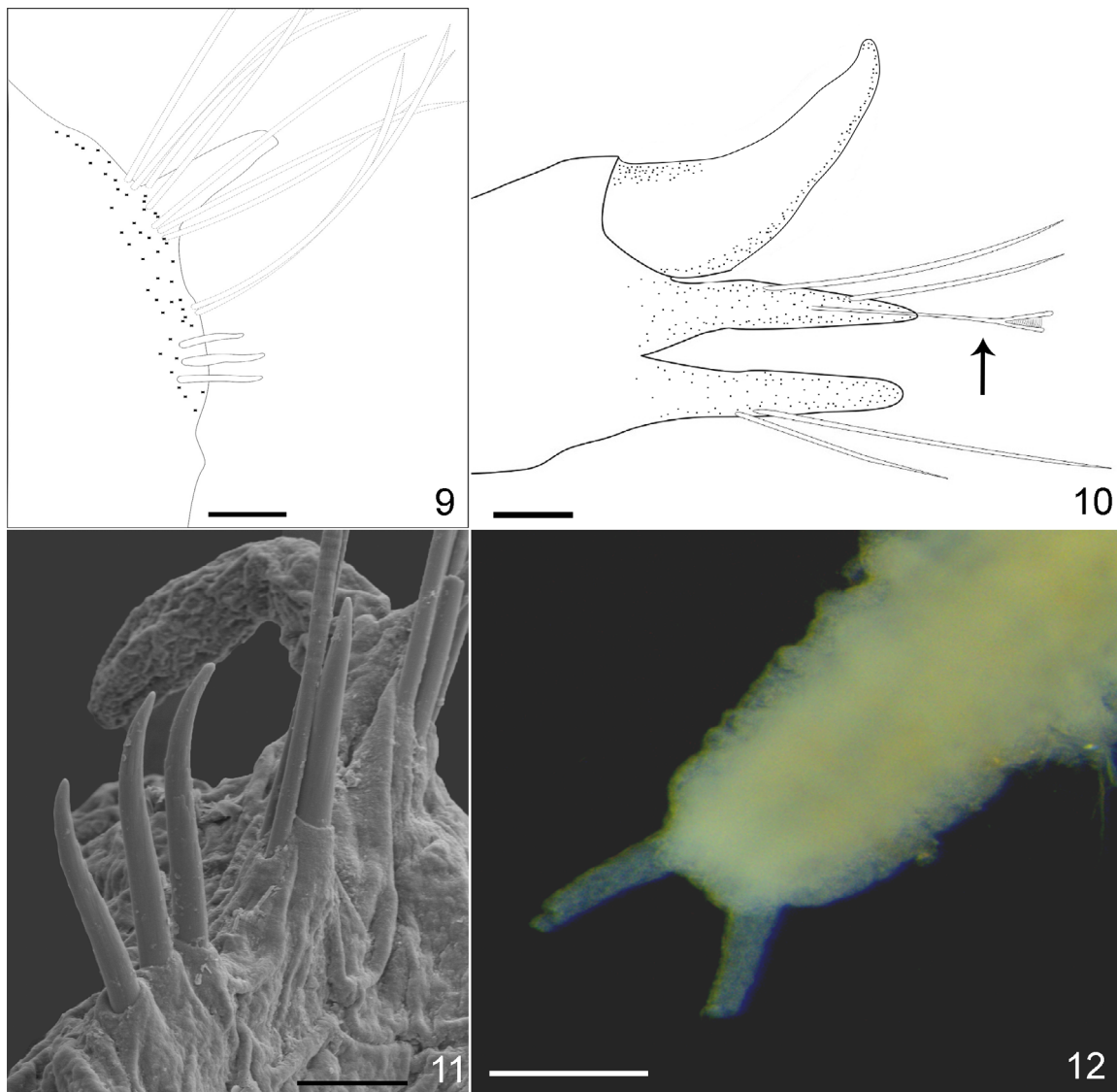
Color. Preserved specimens are yellowish opaque.

Remarks. *Scoloplos maranhensis* sp. nov. can be clearly placed in the genus *Scoloplos* due to the position of the branchiae and the presence of thoracic neuropodial hooks accompanied with capillary chaetae (BLAKE, 2000; ZHADAN *et al.*, 2015). The main distinctive characters of *S. maranhensis* sp. nov. is the thoracic notopodia with seven crenulated capillary chaetae, neuropodia with two crenulated capillaries and six slender-smooth hooks. Only four species may have 12 thoracic segments with branchiae first appearing on the 12<sup>th</sup> segment: *Scoloplos texana* Maciolek & Holland,



Figs 5-8. *Scoloplos maranhensis* sp. nov., anterior view of parapodium of the paratype: 5, parapodium 7, capillary notopodial chaetae and crenulate neuropodial chaetae; 6, Parapodium 7, notopodial lobe; 7, parapodium 18; 8, parapodium 30, furcate chaetae. Scales: Figs 5, 6: 0.1 mm; Fig. 7: 0.2 mm; Fig. 8: 0.05 mm.





Figs 9-12. *Scoloplos maranhensis* sp. nov.: 9, crenulate chaetae; 10, furcate chaetae (black arrow); 11, detail the smooth hooks; 12, detail of posterior region with the pygidial cirri. Scales: Figs. 9, 10: 0.1 mm; Fig. 11: 0.01 mm; Fig. 12: 0.5 mm.

1978 from Gulf of Mexico, *Scoloplos intermedius* (Hartman, 1965) from New England, *Scoloplos armiger* (Müller, 1776) from Denmark and *Scoloplos suroestense* Blake, 2017 from Punta Suroestense, Chile Bay (Tab. I). However, in all these three species both characters are variable (HARTMAN, 1965; MACIOLEK & HOLLAND, 1978; MACKIE, 1987; BLAKE, 2017), while in all the 12 specimens of *S. maranhensis* sp. nov. examined here the thorax had exactly 12 chaetigers long and the branchiae always first appeared in this last thoracic segment (Tab. I). *Scoloplos armiger* also always have 12 thoracic segments (UEBELACKER & JOHNSON, 1984) likewise *S. maranhensis* sp. nov., however they differ in the position of the first branchiae, in the 10<sup>th</sup> and 12<sup>th</sup> segment respectively (Tab. I). Other characteristics differing these species from *S. maranhensis* sp. nov. include: i) the prostomium shape,

conical in *S. maranhensis* sp. nov. and pointed and/or triangular in the others; ii) the absence of anal cirri in *S. suroestense*; iii) the presence of papillae in *S. armiger* and *S. intermemdius*; and iv) the chaetal arrangement of *S. texana* including, for instance, serrated hooks in the neuropodia from thoracic chaetae which are smooth in *S. maranhensis* sp. nov. (Tab. I and references therein).

**Etymology.** The species was named in reference to Maranhão, the State with the largest coastline from Brazil form where *S. maranhensis* sp. nov. was found.

**Habitat.** Muddy mangrove substrate with temperature between 25.7 and 27.8°C and salinity between 11 and 30.

**Geographical distribution.** Atlantic Ocean, Brazil, Quebra Pote Mangrove, São Luís, Maranhão State (02°41.344'S; 044°12.604'W).

Tab. I. Main characters of currently known *Scoloplos* species.

Species	Prostomium shape	Number of thoracic segments	First segment with branchiae	Parapodial papillae	Notopodia			Neuropodia		Anal cirri	Reference
					Thorax chaetae	Abdomen chaetae	Thorax chaetae	Abdomen chaetae			
<i>Scoloplos maranhensis</i> sp. nov.	Conical, longer than wide	12	12	Absent	Crenulated capillaries and furcate with unequal branches	Crenulated capillaries and hooks smooth	Capillary	Pair of cirriform anal cirri	This study		
<i>Scoloplos acmeceps</i> Chamberlin, 1919		21-24	14	Absent	Camerated capillaries furcate	Crenulated capillaries and hooks serrated	Capillaries	Two cirriform anal cirri	UEBELACKER & JOHNSON, 1984		
<i>Scoloplos acutissimus</i> Hartmann-Schröder, 1991	Sharply conical with drawn out tapering tip	14-20 (more commonly 17-19)	Penultimate thoracic chaetiger, usually chaetiger 16-18 (13 in small individuals)	Absent	Capillaries and furcate	with 3-4 Hooks and capillaries	thin capillaries and flail	Two long anal cirri	ZHADAN <i>et al.</i> , 2015		
<i>Scoloplos acutus</i> (Verrill, 1873)	Acutely pointed, with two rather indistinct red spots above	14-17	9-13	Unknown	Crenulated capillaries	Crenulated capillaries; furcate the with hooks with 15-25 teeth	Crenulated capillaries	Long and slender	VERRILL, 1873; JIRKOV, 2001		
<i>Scoloplos agrestis</i> Nonato & Luna, 1970	Long and acuminate	15	16 (1 <sup>st</sup> abdominal)	Absent	Long capillaries	Long acicular and capillaries	long capillaries	Unknown	NONATO & LUNA, 1970		
<i>Scoloplos armiger</i> (Müller, 1776)	Sharply pointed cone	12	10	Present	Capillaries	Capillaries and slender serrated hooks	Capillaries	Unknown	UEBELACKER & JOHNSON, 1984		
<i>Scoloplos bathytatus</i> Blake, 2017	Elongated, pointed on anterior margin; no eyespots, with nuchal slits	11-12	9-10	Unknown	Crenulated capillaries with those of 2 <sup>nd</sup> -5 <sup>th</sup> segments unusually Long	Hooks and crenulated capillaries;	2-3 aciculae	2 dorsolateral anal cirri	BLAKE, 2017		
<i>Scoloplos brevithorax</i> Eibye-Jacobsen, 2002	Elongated triangular, distally very acute, about 1½ times as long as broad	15-17 (juveniles with as few as 13)	6	Absent	Crenulated capillaries and furcated	Crenulated capillaries; with many	3 short anterior posterior capillaries	Unknown	EIBYE-JACOBSEN, 2002		
<i>Scoloplos capensis</i> (Day, 1961)	Sharply pointed, longer than broad	9-17	15	Present	Crenulated capillaries	Three rows of hooks serrate	Crenulated capillaries	Unknown	DAY 1961, 1973		
<i>Scoloplos chrysochaeta</i> Wu, 1962	Conical	16	18	Absent	Crenulated capillaries	Hooks slender, serrated	Crenulated capillaries	Unknown	WU, 1962		

Species	Prostomium shape	Number of thoracic segments	First segment with branchiae	Parapodial papillae	Notopodia			Neuropodia		Anal cirri	Reference
					Thorax chaetae	Abdomen chaetae	Thorax chaetae	Abdomen chaetae			
<i>Scoloplos cryptospingerus</i> Dean & Blake, 2015	Sharply conical	15-17	16-18 (1 <sup>st</sup> abdominal chaetiger)	Absent	Camerated capillaries	Crenulated capillaries	Camerated capillaries, hooks serrate spines with a thin hood	Crenulated capillaries	Unknown	DEAN & BLAKE, 2015	
<i>Scoloplos davi</i> Hartmann-Schröder, 1980	Conical, acute	21-25	8	Present	Crenulated capillary chaetae	Crenulated capillary chaetae and furcate	Hooks smooth or serrated and crenulated capillary	flail chaetae	Two anal cirri	ZHADAN <i>et al.</i> , 2015	
<i>Scoloplos depoorteri</i> Jeldes & Lefevre, 1959	Conical	16-17	Not observed	Absent	Crenulated capillaries	Crenulated capillaries	Hooks serrated and crenulated capillaries	Crenulated capillaries	Unknown	JELDES & LEFEVRE, 1959	
<i>Scoloplos ehlersi</i> Blake, 1985	Elongate	11	21	Absent	Dense fascicles of camerated capillaries	Slender camerated capillaries and 1-2 flail	Dense fascicles of heavy camerated capillaries and short capillaries	1-2 thin, smooth capillaries.	Camerated capillaries and short,	BLAKE, 1985	
<i>Scoloplos intermedius</i> (Hartman, 1965)	Short pointed cone	12-13	10-12	Only in the abdomen	Crenulated capillaries	Crenulated capillaries and furcate	Crenulated capillaries; and serrate hooks with small hood	Crenulated capillaries	Unknown	HARTMAN, 1965; MACKIE, 1987	
<i>Scoloplos juanfermandezensis</i> Rozbaczyllo, Diaz-Diaz & Cataldo, 2017	Sharply conical; without eyespots	16-18	20-28; Dichotomously branching from the 70-80 <sup>th</sup> chaetigers, resulting in up to 6 terminal filaments	Absent	Crenulated capillaries	Crenulated capillaries	J-shaped row of curved serrated hooks with a thin hood open; 3-4 rows of crenulated capillaries	Crenulated capillaries	two large ventral anal cirri	ROZBACZYLO <i>et al.</i> , 2017	
<i>Scoloplos marsupialis</i> (Southern, 1921)	Short, conical, pointed	18-20	11-16	Present	Crenulated capillaries	Crenulated capillaries, accompanied by 2-5 aciculae	Hooks crenulated capillaries; hooks	Weakly crenulated capillaries and 1-2 aciculae	Two cirriform anal long cirri	SOUTHERN, 1921; MACKIE, 1991	
<i>Scoloplos normalis</i> (Day, 1977)	Short, bluntly conical	14-15	15-16 (1 <sup>st</sup> or 2 <sup>nd</sup> abdominal)	sometimes with a small papilla on 13 <sup>th</sup> chaetiger	Crenulated capillaries	Crenulated capillaries and furcate	Crenulated capillaries; hooks	Crenulated capillaries with 2-3 aciculae	Unknown	DAY, 1977; MACKIE, 1987	
<i>Scoloplos pseudosimplex</i> Eiby-Jacobsen, 2002	Not acute, about 1½ times as long as broad, with a dorsal pair of diffuse light-brown spots near posterior border	15 (juveniles with as few as 11)	16, rarely 17	Absent	Crenulated capillaries	Crenulated capillaries	Capillaries; hooks	Capillaries	Unknown	EIBYE-JACOBSEN 2002	
<i>Scoloplos robustus</i> Rullier, 1964	Conical	21	22	Absent	Crenulated capillaries	Crenulated capillaries	Hooks serrated; and robust aciculae	Crenulated capillaries	Unknown	RULLIER, 1964	
<i>Scoloplos sagarensis</i> Misra, 1999	Conical, narrowly pointed	18-20	17-19	Absent	Crenulated capillaries	Crenulated capillaries	rows of crenulate capillaries and 10-12 hooks	2-3 fine capillaries and 1-2 flail with crenulated.	Unknown	MISRA, 1999	

Species	Prostomium shape	Number of thoracic segments	First segment with branchiae	Parapodial papillae	Notopodia			Neuropodia		Reference
					Thorax chaetae	Abdomen chaetae	Thorax chaetae	Abdomen chaetae	Anal cirri	
<i>Scoloplos similis</i> Mackie, 1987	Sharply pointed cone	15	12	Present	Crenulated capillaries	Crenulated capillaries	Crenulated capillaries	Crenulated capillaries; weakly crenulate serrated hooks	Unknown	MACKIE, 1987
<i>Scoloplos simplex</i> (Hutchings, 1974)	Conical, pointed	16-18	12	Absent	Capillaries	Capillaries and furcate	Capillaries and hooks serrated	Capillaries	Unknown	HUTCHINGS, 1974
<i>Scoloplos spinigerus</i> Gallardo, 1968	Conical, pointed	16	17	Absent	Crenulated capillaries	Crenulated capillaries and furcate	Crenulated capillaries and hooks smooth curved	Capillaries	Unknown	GALLARDO, 1968
<i>Scoloplos suroestense</i> Blake, 2017	Triangular, pointed anteriorly; 2 ciliated dorsolateral nuchal organs on posterior border	10-15	12-17 (1-2 abdominal segment)	Unknown	Crenulated capillaries	Crenulated capillaries	Hooks and crenulated capillaries	2-3 straight pointed uncini; 3-4 capillaries	Absent	BLAKE, 2017
<i>Scoloplos texana</i> Maciolek & Holland, 1978	Bluntly triangular	11-20	2-4	Absent	Crenulated capillaries	Crenulated capillary and furcate	Crenulated capillary and hooks serrated	Crenulated capillaries	Two cirriform anal cirri	MACIOLEK & HOLLAND, 1978
<i>Scoloplos tumidus</i> Mackie, 1991	Short, sharply conical	16-20	8-9	Unknown	Crenulated capillaries	Crenulated capillaries and furcate	Hooks with hoods, crenulated capillaries	Crenulated capillaries and aciculae	Unknown	MACKIE, 1991
<i>Scoloplos typicus</i> (Eisig, 1914)	Pointed	18-21	15-16	Present in 1 <sup>st</sup> -7 <sup>th</sup> chaetigers	Numerous crenulated capillaries	Crenulated capillaries and furcate	Hooks and crenulated capillaries	Aciculae, crenulated capillaries and flail serrated shafts	Unknown	DAY, 1973
<i>Scoloplos uschakovi</i> Wu, 1962	Conical	14-16	14-16	Present	Crenulated capillaries	Crenulated capillaries	Hooks	Crenulated capillaries	Unknown	WU, 1962
<i>Scoloplos novaehollandiae</i> (Kinberg, 1866)	Conical	19	8-9	Present in 10 <sup>th</sup> chaetiger	Unknown	Unknown	Hook hooded	Crenulated capillaries	Unknown	KINBERG, 1866



**Acknowledgements.** We thank the Brazilian National Research Council CAPES, Universidade Estadual do Maranhão (UEMA), and the Graduate Program in Recursos Aquáticos e Pesca (UEMA). The group Annelida for collaborating in the sending of old references. Dr. Vasily Radashevsky of the National Scientific Center of Marine Biology, Far Eastern Branch of the Russian Academy of Sciences helped translating old descriptions written in Russian. Dr. Hilton Tulio Costi of the Institutional Laboratory of Electronic Microscopy of the Museu Paraense Emílio Goeldi.

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