

***Ceciamaralia*, a new genus of Dorvilleidae (Annelida) from deep waters of the Southwest Atlantic Ocean and an insight in its relationship within the family**

Rafael de Oliveira Bonaldo ^{Corresp., 1, 2, 3}, Tatiana M Steiner ^{1, 3}, André R S Garraffoni ^{1, 2}

¹ Department of Animal Biology, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil

² Laboratório de Evolução de Organismos Meiofaunais, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil

³ Laboratório de Biodiversidade Bentônica Marinha, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil

Corresponding Author: Rafael de Oliveira Bonaldo

Email address: rafael.o.bonaldo@gmail.com

Dorvilleidae, Chamberlin, 1919 is a family of Annelida composed of some of the smallest 'polychaete' species, being poorly studied worldwide, with many gaps regarding its diversity. Samples obtained in oceanographic campaigns performed in the Southwest Atlantic Ocean (Brazilian coast) revealed a high number of specimens of dorvilleids, unveiling the hidden diversity of this family. A detailed morphological analysis of these organisms has revealed a new genus, *Ceciamaralia* **gen. nov.**, with two new species, which differs from other Dorvilleidae genera in i) the robust and enlarged pharynx which are frequently everted and ii) unique composition of maxillae, composed of an elongated pair of serrated basal plates and two pairs of free maxillary plates, with the anteriormost having an anterior long and thin spine. *Ceciamaralia lanai* **gen. et sp. nov.** is characterized by the presence of a broad and large dorsal cirrus on a few anterior parapodia and the furcate chaeta in supra-acicular fascicles. On the other hand, *Ceciamaralia nonatoi* **gen. et sp. nov.** presents a geniculate chaeta instead of a furcate, absence of dorsal cirri and, in some specimens, absence of palps. A cladistic analysis supported the monophyly of *Ceciamaralia* **gen. nov.** by four synapomorphies related to the unique morphology of its maxillae and pharynx. This study is one of several recent taxonomic studies to come from the family with the objective to increase the knowledge of Dorvilleidae.

***Ceciamaralia*, a new genus of Dorvilleidae (Annelida) from deep waters of the Southwest Atlantic Ocean and an insight in its relationship within the family**

Rafael de Oliveira Bonaldo^{1,2,3*}, Tatiana Menchini Steiner^{3,4}, André Rinaldo Senna Garraffoni^{2,4}

¹ Programa de Pós-Graduação em Biologia Animal, Instituto de Biologia, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil.

² Laboratório de Evolução de Organismos Meiofaunais, Instituto de Biologia, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil.

³ Laboratório de Biodiversidade Bentônica Marinha, Departamento de Biologia Animal, Instituto de Biologia, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil.

⁴ Departamento de Biologia Animal, Instituto de Biologia, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil.

*Corresponding Author:
Rafael de Oliveira Bonaldo
Rua Bertrand Russell, 1251 - Cidade Universitária, Campinas - SP, Brazil, 13083-865.
Email address: rafael.o.bonaldo@gmail.com

Abstract

Dorvilleidae, Chamberlin, 1919 is a family of Annelida composed of some of the smallest ‘polychaete’ species, being poorly studied worldwide, with many gaps regarding its diversity. Samples obtained in oceanographic campaigns performed in the Southwest Atlantic Ocean (Brazilian coast) revealed a high number of specimens of dorvilleids, unveiling the hidden diversity of this family. A detailed morphological analysis of these organisms has revealed a new genus, *Ceciamaralia* gen. nov., with two new species, which differs from other Dorvilleidae genera in i) the robust and enlarged pharynx which are frequently everted and ii) unique composition of maxillae, composed of an elongated pair of serrated basal plates and two pairs of

free maxillary plates, with the anteriormost having ~~an anterior long and thin~~ spine. *Ceciamaralia lanai* **gen. et sp. nov.** is characterized by the presence of a broad and large dorsal cirrus on a few anterior parapodia and ~~the~~ furcate chaeta in supra-acicular fascicles. On the other hand, *Ceciamaralia nonatoi* **gen. et sp. nov.** presents a geniculate chaeta instead of a furcate, absence of dorsal cirri and, in some specimens, absence of palps. A cladistic analysis supported the monophyly of *Ceciamaralia* **gen. nov.** by four synapomorphies related to the unique morphology of its maxillae and pharynx. **This study is one of several recent taxonomic studies to come from the family with the objective to increase the knowledge of Dorvilleidae.**

Key words: Annelida, Eunicida, ‘Polychaeta’, morphology, new species, new genus, taxonomy, cladistics

Introduction

The Order Eunicida within Annelida comprises ‘polychaetes’ that have an internal jaw apparatus composed of ventral mandibles and dorsal maxillae (Zanol et al., 2021). Some of the smallest eunicid species belong to Dorvilleidae Chamberlin, 1919, a family with varied life-styles, from free-living worms that inhabit unconsolidated and consolidated substrates from the intertidal zones to great depths, to some commensal or parasitic species (Martin & Britayev 2018; Zanol et al., 2021).

Dorvilleidae is characterized mainly by being the only extant group of Eunicida that has ~~the~~ ctenognath-type jaw apparatus: two or four rows of symmetrical or subsymmetrical denticulate maxillary plates, upper comb-like jaws, and an unpaired posterior carrier-like structure (Zanol et al., 2021). Despite the small size of some dorvilleids, a great morphological heterogeneity among species is observed. Body appendages (like prostomial, parapodial and pygidial), important ~~to~~ the identification of species ~~at the first glance~~, present a diversity of sizes and shapes. But a more detailed look reveals ~~the~~ morphological diversity ~~even more~~, not only in smaller structures as the number and shape of chaeta but mainly in the internal jaw apparatus, important for delimiting genera and species of the family (Paxton, 2009).

Currently, Dorvilleidae comprises about 200 species distributed in 32 genera, 13 of them monotypic, including the most recent described *Ikosipodoides* Westheide, 2000. In contrast, the genus *Ophryotrocha* Claparède & Mecznirow, 1869 includes almost $\frac{1}{3}$ of all described species of Dorvilleidae, 48 described since 2000, being a well studied genus including many molecular and phylogenetic studies (Zhang et al., 2023) (Read & Fauchald, 2024).

The relationship among genera and species of Dorvilleidae are also understudied. The broadest cladistic study analyzing the relationship within Dorvilleidae was performed by Eibye-Jacobsen & Kristensen (1994) using genera as terminal ~~taxon~~. A recent cladistic study was conducted to test the monophyly of *Eliberidens* Wolf, 1986, and its relationship with some other genera (de Oliveira Bonaldo et al., 2022). Phylogenetic studies with molecular data of some Dorvilleidae groups were also done, including analysis of *Ophryotrocha* species and *Parougia* (Yen & Rouse, 2020; Kvalø Heggøy, Schander & Åkesson, 2007), but the scarcity of molecular data and viable specimens to extract such data from are an obstacle to ~~advance~~ in this field.

This scarcity of knowledge on species of this family can also be explained by: i) the difficulty to perform sampling in ~~the~~ deep waters; ii) the rarity of some groups in samples and iii) the lack of taxonomists specialized in this group. This knowledge gap on Dorvilleidae is a worldwide barrier, like on the Brazilian coast, where, currently, there are only sixteen species registered: *Dorvillea moniloceras* (Moore, 1909), *D. sociabilis* (Webster, 1879), *Eliberidens forceps* Wolf, 1986, *E. hartmannschroederiae* Hilbig, 1995, *Meiodorvillea hartmanae* Bonaldo, Steiner & Amaral, 2022, *M. jumarsi* Bonaldo, Steiner & Amaral, 2022, *M. minuta* (Hartman, 1965), *M. penhae* Bonaldo, Steiner & Amaral, 2022, *Ophryotrocha puerilis*, Claparède & Mecznirow, 1869, *Pettiboneia sanmatiensis* Orensanz, 1973, *Protodorvillea biarticulata* Day, 1963, *P. kefersteini* (McIntosh, 1869), *Schistomeringos annulata* (Moore, 1906), *S. anoculatus* (Hartman, 1965), *S. longicornis* (Ehlers, 1901), and *S. rudolphi* (delle Chiaje, 1828) (Amaral et al., 2006-2022); six of them recorded in two recent taxonomic studies (de Oliveira Bonaldo, Steiner & Amaral, 2022; de Oliveira Bonaldo et al., 2022).

Oceanographic campaigns performed in the Southwest Atlantic Ocean (Brazilian coast) have revealed specimens of dorvilleids in their samples. Through a detailed morphological analysis of these materials **we unveiled the hidden diversity of this family**. Utilizing methodologies such as light and scanning electron microscopy, here we identified and described a new genus of

Dorvilleidae, *Ceciamaralia* **gen. nov.**, with two new species, *Ceciamaralia lanai* **gen. et sp. nov.** and *Ceciamaralia nonatoi* **gen. et sp. nov.**, that present unique, both external and internal (jaw apparatus), morphological characters.

Materials & Methods

Sampled area

The specimens analyzed were collected in two broad oceanographic campaigns (Environmental Characterization of the Espírito Santo Basin (AMBES) and Assessment of the Environmental Heterogeneity of the Campos Basin (HABITATS) (Lavrado & Brasil 2010)) carried out in Brazilian waters (Southwest Atlantic Ocean). The collections were done between 2008–2012 in depths ranging from 12 to 3301 meters; the organisms were previously fixed in 4% formalin and then preserved in 70% ethanol.

Morphological analysis

The external morphology of the specimens was analyzed in a ~~compound microscope~~ ZEISS Axioscop 2 Plus and drawings were made with ~~camara lucida~~ attached to the microscope. The images were captured with a ZEISS AxioCam MRc attached to the ZEISS Axio Imager M2 and Axio Zoom V.16. All images and figures were edited¹ using Adobe® Photoshop and Inkscape®. To perform the scanning electron microscopy (SEM) specimens were previously immersed in 50%, 60%, 70% ethanol (five min each), 80%, 90%, 95% (15 min each) and in absolute ethanol, in 3 changes (15, 30 and 60 min). Critical point drying (Balzers CPD-30) was performed at 37 °C and 70 BAR followed by gold coating using ~~Sputter Coater~~ SPD-050 (Steiner & Santos, 2004). Stubs were observed in the JEOL JSM-5800 LV scanning electron microscope and images were taken with the software Semafore (v5.2). Critical point drying, gold-coating and SEM analysis were all performed in the Laboratório de Microscopia Eletrônica, Instituto de Biologia, Universidade Estadual de Campinas (LME-IB/UNICAMP).

The jaw apparatus was analyzed on the ZEISS Axio Imager M2 and Axioscop 2 Plus microscopes. Two different methodologies were done: i) place the entire specimens on a drop of Hoyer solution

¹ The letter ‘i’ was skipped from all illustrations to avoid confusion with scale bars of the images.

(trichloroacetaldehyde) or Aquatex® on a slide and coverslip, or ii) place the specimens between slide and coverslip, wait for it to dry and analyze the jaws by tissue transparency (not damaging the specimens, recovering its integrity by putting it back in the ethanol).

Cladistic analysis

To analyze the relationship of *Ceciamaralia* gen. nov. with some morphological similar genera of Dorvilleidae, we performed a cladistic analysis utilizing the character matrix and data developed in the study of de Oliveira Bonaldo et al., (2022), which analyzed the cladistic relationship of the following genera: *Dorvillea* Parfitt, 1866, *Eliberidens* Wolf, 1986, *Gymnodorvillea* Wainwright & Perkins, 1982 *Marycarmenia* Núñez, 1998, *Meiodorvillea* Jumars, 1974, *Pettiboneia* Orensanz, 1973, *Protodorvillea* Pettibone, 1961 and *Schistomeringos* Jumars, 1974. We added five new characters to the matrix (characters 44 to 47) and inserted a new character state on character 41, to fit *Ceciamaralia* gen. nov. (Table 1). We also followed the methodologies of de Oliveira Bonaldo et al. (2022), keeping the characters coded as binary or multistate, being ‘-’ when the character is non-applicable and ‘?’ when the state of the character is unknown. All characters are unweighted. The final matrix comprised 21 species, including the outgroup (*Ninoe jessicae* Hernández-Alcántara, Pérez-Mendoza & Solís-Weiss, 2006) and 47 morphological characters (Table 2).

To edit the character matrix, we used the Mesquite® software (Maddison & Maddison, 2019) and the parsimony analysis was performed through the software TNT® (Goloboff & Morales, 2023), with the heuristic search by the traditional search function starting with 10000 Wagner trees and utilizing the TBR (tree bisection reconnection) algorithm. Finally, to view and edit the resulting tree we used Winclada® software (Nixon, 2002).

Deposition of specimens

The species, SEM stubs and slides, including the type series, were deposited in the Polychaeta Collection (ZUEC-POL) of the Museu de Diversidade Biológica of the Institute of Biology of the Universidade Estadual de Campinas (MDBio - IB/UNICAMP), Campinas, Brazil. Some paratypes were deposited in Brazil: Museu de Zoologia of the Universidade de São Paulo, São Paulo (MZUSP) and Museu Nacional do Rio de Janeiro, Rio de Janeiro, Brazil (MNRJ).

The electronic version of this article in Portable Document Format (PDF) will represent a published work according to the International Commission on Zoological Nomenclature (ICZN), and hence the new names contained in the electronic version are effectively published under that Code from the electronic edition alone. This published work and the nomenclatural acts it contains have been registered in ZooBank, the online registration system for the ICZN. The ZooBank LSIDs (Life Science Identifiers) can be resolved and the associated information viewed through any standard web browser by appending the LSID to the prefix <http://zoobank.org/>. The LSID for this publication is: urn:lsid:zoobank.org:pub:A1EF2E10-4863-49C1-A2E7-CF80BDFE6249. The online version of this work is archived and available from the following digital repositories: PeerJ, PubMed Central SCIE and CLOCKSS.

Results

Taxonomy

Phylum Annelida, Lamarck 1802

Order Eunicida, Fauchald 1977

Family Dorvilleidae Chamberlin, 1919

Genus *Ceciamaralia* gen. nov.

urn:lsid:zoobank.org:act:22B5ED41-CF25-4A97-8B75-DF336BE1CBE7

Type species: *Ceciamaralia lanai* gen. et sp. nov. described herein.

Etymology: Feminine. The genus name “*Ceciamaralia*” refers to the name Cecília and the surname Amaral from Dr. Antônia Cecília Zacagnini Amaral, a Brazilian researcher who immensely contributed, and still contributes to the enhancement of Annelida knowledge and to the formation of zoologists, taxonomists and ecologists, including the three authors of this paper.

Diagnosis: Prostomium triangular-shaped with anterior margin rounded. One pair of simple antennae, distally clavate, with a long and slender basal portion. One pair of simple, short and

small clavate ventrolateral palps, sometimes absent. Two peristomial rings. First two chaetigers usually enlarged to accommodate the large pharynx. Pharynx enlarged, normally protracted out of the mouth in preserved specimens. First two parapodia slightly shorter and without appendages. Notopodia represented by a large and long dorsal cirri (with a thin notoacacula) present in few anterior parapodia or entirely absent. Ventral cirri short and papilliform present only in few anterior parapodia. Supra-acicular chaetae: capillary and furcate or geniculate. Sub-acicular chaetae: compound heterogomph falcigers with serrated and unidentate blades. Two pairs of clavate pygidial cirri. Jaw apparatus with paired mandibles medially connected and without fused or free teeth on the anterior margin. Maxillae composed by a posterior ligament fused to a pair of long and serrated basal plates, followed by one pair of short and serrated free maxillary plates, and one pair of short anteriormost free maxillary plate with a long thin spine in the anterior margin. Carrier-like structure absent.

Remarks: *Ceciamaralia* **gen. nov.** is well distinguished from other Dorvilleidae genera by: i) maxillae composed by a pair of elongated and serrated basal plates and two pairs of free maxillary plates, the anteriormost with ~~an anterior long and thin~~ spine, ii) its enlarged pharynx which makes the anterior region of the specimens also enlarged when it is retracted; preserved specimens are found usually with pharynx protracted, iii) antennae with a long and slender basal portion and clavate distal end, iv) first two parapodia slightly shorter and without appendages.

The differences of *Ceciamaralia* **gen. nov.** compared to other genera of Dorvilleidae are analyzed in the Discussion section.

Ceciamaralia lanai **gen. et sp. nov. (Figs. 1-4)**

urn:lsid:zoobank.org:act:3E16785F-8EDD-47E7-8CF4-34D5BD1F4062

Diagnosis: One pair of antennae and one pair of palps. Pharynx enlarged making the anterior region enlarged when it is retracted. First two parapodia without appendages. Long and large dorsal cirri with a thin notoacacula present in parapodia 3 to 6-9. Small ventral papilliform cirri present in parapodia 3 to 6-9, eventually extending over 1 or 2 more parapodia. Supra-acicular chaetae: slender capillary and furcate, the latter with small asymmetrical prongs and serrated shaft

in anterior region, smooth with longer straight prongs in posterior region. Sub-acicular chaetae: three compound heterogomph falcigers with short and robust serrated unidentate blades, slightly crescent in size. Maxillae composed by a posterior ligament fused to a pair of long and serrated basal plates, followed by one pair of short and serrated free maxillary plates; and one pair of short anteriormost free maxillary plates with a long, thin spine on the anterior margin.

Type locality: Off Espírito Santo State, Brazil, 39°10'17.35"W, 19°36'26.24"S, 392 m, muddy.

Type specimens: Holotype: ZUEC-POL XXX (39°10'17.35"W, 19°36'26.24"S, 392 m, muddy, 14 Dec 2011); Paratypes: ZUEC-POL XXX (39°10'17.35"W, 19°36'26.24"S, 392 m, muddy, 14 Dec 2011); ZUEC-POL XXX (38°1'8.43"W, 19°34'20.42"S, 450 m, sandy mud, 9 Dec 2011); ZUEC-POL XXX (39°36'8.52"W, 19°49'7.27"S, 158 m, sandy muddy, 14 Jan 2012); ZUEC-POL XXX (3 specimens - 39°30'25.23"W, 19°45'54.56"S, 144 m, muddy, 15 Jan 2012); ZUEC-POL XXX (2 specimens - 39°53'47.1"W, 20°35'16.23"S, 410 m, muddy, 8 Jan 2012); ZUEC-POL (slide, 38°41'18.43"W, 19°34'20.42"S, 450 m, sandy mud, 09 Dec 2011); ZUEC-POL XXX (slide, 39°36'9.34"W, 19°49'6.26"S, 181 m, mud, 29 Jun 2013); ZUEC-POL XXX (slide, 39°30'25.97"W, 19°45'53.43"S, 143 m, muddy, 27 Jun 2013); MZUSP (2 specimens, 39°53'47.1"W, 20°35'16.23"S, 410 m, muddy, 8 Jan 2012); MNRJ (2 specimens, 39°53'47.1"W, 20°35'16.23"S, 410 m, muddy, 08 Jan 2012). SEM Material: (1 stub with 3 specimens - 39°53'47.1"W, 20°35'16.23"S, 410 m, muddy, 8 Jan 2012; 40°14'14.08"W, 21°4'4.56" S, 141 m, sandy, 11 Jul 2013).

Etymology: Masculine. The specific epithet "*lanai*" refers to the surname of Dr. Paulo da Cunha Lana (*in memorian*), a Brazilian polychaetologist who immensely contributed to the increase of knowledge of Annelida in Brazil and worldwide, and was the supervisor of the senior author of this paper.

Description of holotype: Cylindrical body (Fig. 1A). Complete specimen with 46 chaetigers, 4.18 mm long and maximum width of 0.22 mm in the anterior region, excluding parapodia. Anterior region more robust and wider than the rest of the body to accommodate the enlarged pharynx (Fig. 1A). Prostomium triangular-shaped with anterior margin broadly rounded. Ocelli absent. One pair of simple antennae, distally clavate, with a long and slender basal portion, inserted dorsally in the middle of prostomium, with approximately same length of the prostomium (Figs. 1B, 3A and 4A).

One pair of simple, short, and small clavate palps inserted ventrolaterally on the base of prostomium, slightly shorter than 1/2 the length of prostomium (Figs. 1B, 3A,B and 4A). Two peristomial rings without appendages, posterior ring longer and wider than the anterior. (Figs. 1B, 3A,B and 4A,B).

Parapodia cylindrical, small, and ~~barrel-shape~~. First two parapodia smaller than the following, without appendages (Figs. 1B and 4A,B). Anterior region with notopodia represented by a large and long dorsal cirri (with a thin notoacicula) present from the 3^o to the 7^o parapodium, inserted on the base of parapodia; dorsal cirrus reaching approximately 2.5 times the length of parapodium (Figs. 1D, 3B,D and 4D). Ventral cirri short and papilliform inserted in the middle of parapodium and present from the 3^o to the 7^o parapodium (Figs. 1D, 3B,D and 4B,D). Following parapodia slightly larger, longer, and without appendages (Fig 1E, 3E and 4E).

Supra-acicular chaetae: one long, thin and serrated capillary (Fig. 2A,C) and one furcate with subsymmetrical prongs, one slightly shorter and more robust than the other; tip of both prongs blunt (Figs. 2C, 3G and 4G); furcate of first chaetigers with smaller prongs and with prominent serrated shaft below the shorter prong (Figs. 2A,B and 3F). Sub-acicular chaetae: three compound heterogomph facilgers with slightly crescent size, the ventralmost shortest and dorsalmost longest; shafts bifid with a moderately serration in the distal end; short, robust, serrated, and unidentate blades (Figs. 2A-D, 3J and 4F,G). One serrated cultriform chaeta occasionally replacing the ventralmost compound in the last posterior chaetigers (Figs. 3H and 4F).

Posterior region moniliform. Pygidium truncate and shorter than the previous chaetigers. Two pairs of clavate pygidial cirri, dorsal pair rather longer than the length of pygidium and ventral pair half the length of the dorsal (Figs. 1A,C, 3C and 4C).

Paired mandibles medially connected in a region strongly sclerotized; anterior region slightly broader and less sclerotized than the slender posterior region (Figs. 2E,F and 3K). Maxillae composed by one pair of elongated and serrated basal plates with small uniform and sharp teeth in the inner margin, posteriorly fused to a weakly sclerotized posterior elongated ligament. Basal plates anteriorly followed by two pairs of free maxillary plates; first pair with internal margin uniformly serrated and second and anteriormost pair with a long, thin and prominent spine on its anterior margin (Figs. 2E,F and 3L).

Variation: Complete specimens ranging from 2.9 ~~mm~~ to 7.6 mm in length and 33 to 61 chaetigers. All specimens ranging from 0.135 ~~µm~~ to 0.26 µm wide. Dorsal cirri present from 3 to 6-9 ~~chaetiger~~. The presence of ventral cirri usually follows the parapodia in which the dorsal cirrus is present, but in some specimens the ventral cirri can be present in the following one or two parapodia. The presence of the cultriform chaeta is occasional and in some specimens it is absent. The enlarged pharynx is characteristic of the genus and it appears ~~protracted~~ out of the mouth in most preserved specimens (Figs. 3B and 4B) but when it is retracted the specimen presents an enlarged anterior region to accommodate the pharynx (Fig. 1A and 3A).

Location and bathymetrics: Off ~~States~~ of Espírito Santo and Rio de Janeiro, Brazil, 141 - 450 m, substrates: **mud, sandy mud, muddy or sandy.**

Remarks: *Ceciamaralia lanai* **gen. et sp. nov.** presents a unique morphology making it easily differentiated from other dorvilleids, as well as from its congener, *Ceciamaralia nonatoi* **gen. et sp. nov.**, by its large and long dorsal cirri in few anterior chaetigers. Another difference between them is the presence of furcate chaeta in *C. lanai* **gen. et sp. nov.**. The posterior region of specimens is usually moniliform.

***Ceciamaralia nonatoi* gen. et sp. nov. (Figs. 5-7)**

urn:lsid:zoobank.org:act:EFF6CD0C-2071-48A2-915D-6F2F8530A343

Diagnosis: One pair of antennae. One pair of palps, sometimes absent. Pharynx enlarged making the anterior region enlarged when it is retracted. First two parapodia without appendages. Dorsal cirri absent. Small ventral papilliform cirrus present in parapodia 3 to 5-7. Supra-acicular chaetae: slender capillary and geniculate. chaetae: three compound heterogomph falcigers with short and robust serrated unidentate blades, all almost of the same length. Maxillae composed by a posterior ligament fused to a pair of long and serrated basal plates, followed by one pair of short and serrated free maxillary plates, and one pair of short anteriormost free maxillary plates with a long, thin spine on the anterior margin.

Type locality: Off Espírito Santo State, Brazil, 40°12'52.126"W, 21°11'12.073"S, 680 m.

279 **Type specimens:** Holotype: ZUEC-POL XXX (40°12'52.126"W, 21°11'12.073"S, 680 m 04 Feb
 280 2009). Paratypes: ZUEC-POL XXX (40°12'52.126"W, 21°11'12.073"S, 680 m 04 Feb 2009);
 281 ZUEC-POL XXX (2 specimens, 40°1'55.373"W, 21°47'26.771"S, 780 m, 06 Feb 2009), ZUEC-
 282 POL XXX (3 specimens, 41°18'33.045"W, 23°39'21.880"S, 692.7 m, 28 Jan 2009); ZUEC-POL
 283 XXX (2 specimens 40°26'37.449"W, 22°33'35.143"S, 401 m, 31 Jan 2009); ZUEC-POL XXX
 284 (40°26'40.289"W, 22°33'33.805"S, 393.4 m, 11 Jul 2008); ZUEC-POL XXX (40°17'33.343"W,
 285 22°25'59.389"S, 387.1 m, 31 Jan 2009); ZUEC-POL XXX (40°5'18.066"W, 21°44'21.493"S, 401.6
 286 m, 07 Jul 2008); ZUEC-POL XXX (3 specimens - 39°30'4.65"W, 19°46'34.99"S, 428 m, muddy,
 287 14 Jan 2012); ZUEC-POL (slide - 40°2'13.825"W, 21°47'26.324"S, 730.5 m, 28 Jun 2008);
 288 MZUSP XXX (41°18'33.045"W, 23°39'21.880"S, 692.7 m, 28 Jan 2009); MZUSP XXX
 289 (40°12'52.126"W, 21°11'12.073"S, 680 m, 04 Feb 2009); MNRJ XXX (38°41'19.8"W,
 290 19°34'20.47"S, 449 m, mud, 30 Jun 2013); MNRJ XXX (40°1'45.543"W, 22°19'45.730"S, 701.7
 291 m, 30 Jan 2009); MNRJ XXX (40°26'37.585"W, 22°33'35.276"S, 400 m, 31 Jan 2009) ZUEC-
 292 POL XXX (3 specimens, 40° 2' 13,825" W, 21° 47' 26,324" S, 730.5 m, 28 Jun 2008). SEM
 293 Material: ZUEC-POL XXX (one stub with three specimens 40°2'13.825"W, 21°47'26.324"S, 730.5
 294 m, 28 Jun 2008 / 40°12'52.126"W, 21°11'12.073"S, 680 m, 04 Feb 2009 / 39°30'4.65"W,
 295 19°46'34.99"S, 428 m, muddy, 14 Jan 2012).

296 **Etymology:** Masculine. The specific epithet “*nonatoi*” refers to the surname of Dr. Edmundo
 297 Ferraz Nonato (*in memoriam*), one of the greatest Brazilian naturalists and oceanographer who was
 298 the pioneer of Brazilian polychaetology, responsible for the formation and inspiration of
 299 generations of zoologists.

300 **Description of holotype:** Cylindrical body (Fig. 5A). Complete specimen with 55 chaetigers, 6.27
 301 mm long and maximum width of 0.41 mm in the anterior region (0.25 µm in the posterior region),
 302 excluding parapodia. Anterior region more robust and wider than the rest of the body to
 303 accommodate the enlarged pharynx (Fig. 5A). Prostomium triangular-shaped with anterior margin
 304 broadly rounded. Ocelli absent. One pair of simple antennae, distally clavate, with a long and
 305 slender basal portion, inserted dorsally in the middle of prostomium, with approximately same
 306 length of the prostomium (Figs. 5B,C, 6A,B, 7A,B). One pair of simple, short, and small clavate
 307 palps inserted ventrolaterally on the base of prostomium, slightly shorter than 1/2 the length of

prostomium (Fig. 1B). Two peristomial rings without appendages, posterior ring wider and longer than the anterior (Figs. 5B,C, 6A,B and 7A,B).

Parapodia cylindrical, small and barrel-shaped. First two parapodia smaller than the following, without appendages (Figs. 5B, 6A and 7B). Dorsal cirri absent in all parapodia. Ventral cirri short and papilliform inserted in the middle of the parapodium and present from the 3^o to the 6^o parapodium (Figs. 5E, 6D and 7B,C). Following parapodia slightly larger, longer and without appendages (Figs. 6E and 7D).

Supra-acicular chaetae: one long, thin and serrated capillary (Figs. 5F and 7F,G) and one geniculate chaeta with distal region robust and slightly serrated (Figs. 5F,G 6F and 7C,F). Sub-acicular chaetae: three compound heterogomph falcigers with almost equal length, being the ventralmost slightly shorter; shafts bifid with a subtle serration in the distal end; short, robust, serrated and unidentate blades (Figs. 5F,G, 6G,H and 7E,G). One serrated cultriform chaeta occasionally replacing the ventralmost compound in the last posterior chaetigers (Figs. 5G, 6J and 7C).

Posterior region moniliform. Pygidium truncate and shorter than the previous chaetigers. Two pairs of clavate pygidial cirri; dorsal pair rather longer than the length of pygidium and ventral pair half the length of the dorsal (Figs. 5D, 6C).

Paired mandibles medially connected in a region strongly sclerotized; anterior region slightly broader and less sclerotized than the slender posterior region (Figs. 5J and 6K). Maxillae composed by one pair of elongated and serrated basal plates with small uniform and sharp teeth in the inner margin, posteriorly fused to a weakly sclerotized posterior elongated ligament. Basal plates anteriorly followed by two pairs of free maxillary plates; first pair with internal margin uniformly serrated and second and anteriormost pair with a long, thin and prominent spine on its anterior margin (Figs. 5H,J and 6L).

Variation: Complete specimens ranging from 3.23 to 6.27 mm in length and 46 to 62 chaetigers. A variation within this species, which was observed through the analysis of some specimens, is the presence or absence of palps. *Ceciamaralia nonatoi* sp. nov. has small and fragile palps, but many specimens do not present it (Figs. 5C and 7A,B). The small size of palps and the enlarged pharynx protruded out of the mouth are obstacles to better observe the scar of a possible broken

palp. Therefore, it is debatable if it is a variation or a methodological problem, so we decided to diagnose the species with presence/absence of palps. The ventral cirri are always present, from the parapodia 3 to 5-7. The presence of the cultriform chaeta is occasional and in some specimens it is absent.

Location and bathymetrics: Off States of Espírito Santo and Rio de Janeiro, Brazil, 387.1 - 780 meters deep, substrates: mud or muddy.

Remarks: *Ceciamaralia nonatoi* **sp. nov.** differs from its congener by the absence of dorsal cirri and by the presence of a geniculate chaeta instead a furcate in the supra-acicular fascicle. The variation on the length of the blades of compound chaeta is very subtle, while in *Ceciamaralia lanai* **gen. et sp. nov.** it is more distinguished. The bathymetric distribution is also a difference between the two species. *Ceciamaralia nonatoi* **gen. et sp. nov.** is registered in deeper waters (387.1 - 780 m) than *Ceciamaralia lanai* **gen. et sp. nov.** (141 - 450 m).

Cladistic results

The cladistic analysis resulted in one most parsimonious cladogram from 50,149 rearrangements, with best score (length) of 83 steps, consistency index (ci) of 73, retention index (ri) of 86 (Fig. 7). The cladogram shows the monophyly of *Ceciamaralia* **gen. nov.**, supported by the following synapomorphies: character 41: only two free maxillary plates; character 45: enlarged pharynx/enlarged anterior region; character 46: ventral cirrus present only in few anterior parapodia and character 47: presence of a long and thin spine on the anteriormost maxillary plate.

The inclusion of *Ceciamaralia lanai* **gen. et sp. nov.** and *Ceciamaralia nonatoi* **gen. et sp. nov.**, as well as the addition of four new characters on the matrix of characters in the study of de Oliveira Bonaldo et al., (2022), did not substantially affect the results obtained in the previous study. *Ceciamaralia* **gen. nov.** was placed as a sister group of all other genera analyzed, except *Eliberidens* and *Gymnodorvillea*, by the synapomorphy of the character 22: the chaeta which accompany the capillary in the supra-acicular fascicle does not change along the body.

Discussion

At the first glance, *Ceciamaralia* **gen. nov.** specimens are hard to differentiate from other ~~small sized~~ dorvilleids, but a closer look reveals their specific morphology, which will be discussed below.

Prostomium appendages

Ceciamaralia **gen. nov.** presents a cylindrical and ~~small-size~~ body, with small body appendages and prostomium triangularly shaped, ~~like~~ *Protodorvillea*, *Meiodorvillea*, *Eliberidens*, and *Pettiboneia*. Those genera also appear closely related in ~~cladistics~~ studies (Eibye-Jacobsen & Kristensen, 1994; de Oliveira Bonaldo et al., 2022). *Protodorvillea* has long and biarticulated palps, while *Ceciamaralia* **gen. nov.** has simple, small, clavate and papilliform palps, when present. The palps of *Pettiboneia* are shorter than *Protodorvillea* but are still biarticulated and also longer and larger than the palps of *Ceciamaralia* **gen. nov.** The small clavate palps in *Ceciamaralia* **gen. nov.** are similar to *Meiodorvillea* and *Eliberidens*. The antennae are described here as simple and clavate, as in some Dorvilleidae genera, but, in *Ceciamaralia* **gen. nov.** are unique ~~by~~ having a longer and slender basal portion than the antennae from other genera.

Parapodial appendages

Ceciamaralia **gen. nov.** presents small papilliform ventral cirri only ~~in~~ few anterior parapodia, while *Meiodorvillea* and *Eliberidens forceps* Wolf, 1986 present ~~it in~~ all parapodia, except the ~~first~~, on the other hand, *Eliberidens hartmannschroederiae* Hilbig, 1995 does not have ventral cirri.

Pettiboneia and *Ceciamaralia* **gen. nov.** also share the presence of dorsal cirri ~~in~~ anterior parapodia inserted at the base of parapodia, but they have two evident differences: i) ~~*Ceciamaralia* **gen. nov.**~~, presents the dorsal cirri from parapodium 3 reaching the 9th, while in *Pettiboneia* ~~it is~~ present from parapodium 2 reaching at least the 7th, but in some species ~~it~~ can reach as far as the 25th, as in *Pettiboneia sanmartini* Aguirrezabalaga & Ceberio, 2003; ii) *Ceciamaralia lanai* **gen. et sp. nov.** has ~~a~~ very long and large dorsal cirri, reaching more than three times the length of parapodia, while in *Pettiboneia* ~~it is~~ distinctively slender and shorter. In contrast, *Ceciamaralia nonatoi* **gen. et sp. nov.** does not have dorsal cirri. *Dorvillea* also presents cylindrical dorsal cirri, but they are biarticulated and absent only ~~in~~ the first parapodium.

392 Dorsal cirrus

393 The presence of the dorsal cirri in *Ceciamaralia lanai* **gen. et sp. nov.** generated a debate regarding
 394 the origin of this appendage. It resembles the same structure observed in species of *Pettiboneia*,
 395 *Diaphorosoma* Wolf, 1986 and *Westheideia* Wolf, 1986, but they are named differently. All
 396 species of these genera present this cylindrical appendage inserted at the base of parapodia. In
 397 *Diaphorosoma magnavena* Wolf, 1986 and *Westheideia minutimala* Wolf, 1986, it is described as
 398 a notopodium bearing an internal acicula, and the former having an internal vascular loop, similar
 399 to a branchia. It is important to note that both species also present an appendage described as
 400 branchia inserted distally in neuropodium, also having a vascular loop in *D. magnavena*. The
 401 notopodium in *Pettiboneia* species is described as a dorsal cirrus, also having internal acicula;
 402 some species, like *P. dibranchiata* (Armstrong & Jumars, 1978), also has a distal appendage in the
 403 neuropodium described as branchia, exactly like in *D. magnavena* and *W. minutimala*. Analyzing
 404 the notopodium in specimens of *Ceciamaralia lanai* **gen. et sp. nov.**, it shows a vascularized
 405 tissue and an acicula barely visible, so we decided to describe it as a dorsal cirrus because of its
 406 position and by what it is described as in the literature. But it is important to evidence the
 407 similarities with a branchia mainly because of the presence of vascular tissue and size of the
 408 structure.

409 Chaetae

410 The presence and format of furcate and geniculate chaeta shows a great diversity in Dorvilleidae.
 411 Of the two species of *Ceciamaralia* **gen. nov.**, *C. lanai* **gen. et sp. nov.** has furcate chaeta, while
 412 *C. nonatoi* **gen. et sp. nov.** has geniculate chaeta. This variation can also be observed in species
 413 of *Meiodorvillea*, *M. minuta* possesses furcate and *M. apalpata* possesses geniculate, while *M. penhae*
 414 and *M. jumarsi* present both types. The blades of compound chaeta of *Ceciamaralia* **gen. nov.** are
 415 smaller, straighter and more robust than species of other genera in which the dorsalmost compound
 416 chaeta can be very long and spiniger.

417 Jaw apparatus

418 The jaw apparatus of *Ceciamaralia* **gen. nov.** presents a distinct and specific morphology differing
 419 from all other species of the family. *Protodorvillea* and *Dorvillea* present a broad and robust jaw
 420 apparatus with a maxillae composed by strong basal plates, carrier-like structure and four rows of

many robust maxillary plates. The maxillae of *Pettiboneia* and *Meiodorvillea* is smaller presenting only two rows of similar maxillary plates (species of *Pettiboneia* has some poorly sclerotized additional plates and they lack basal plates). On the other hand, the maxillae of *Eliberidens* does not have maxillary plates at all, it is composed only of superior and inferior long basal plates. The jaw apparatus of *Ceciamaralia* **gen. nov.** presents the posterior ligament fused to only one pair of long and serrated basal plates followed anteriorly by two maxillary plates, and the anteriormost presenting a long and thin distinct spine.

Cladistic

The scarcity of knowledge of Dorvilleidae impacts its phylogenetic analysis. But some studies were performed to elucidate relationships within the family; the most comprehensive were a cladistic one carried out by Eibye-Jacobsen & Kristensen (1994) where they utilized all known genera of Dorvilleidae at that time as terminal taxa. Even with slow progress molecular data is already aiding in the clarification of phylogenetic relationships of dorvilleids, mainly *Ophryotrocha* (Heggøy, Schander & Åkesson, 2007), which is the genus with more sequence data. The gap in molecular data of other genera of the family opens space to specific cladistic studies with morphological data like Pleijel & Eide (2007), de Oliveira Bonaldo et al., (2022) and this present one. Those studies aid not only the current knowledge of the relationship of some taxa but also keep subsidizing data and results to future studies and discussion about the Dorvilleidae.

Ceciamaralia **gen. nov.** morphologically resembles other small-sized dorvilleids presented in the cladistics analysis by de Oliveira Bonaldo et al., 2022 hence we included both new species described here in that study. The new genus appeared as monophyletic by the specific synapomorphies discussed here, which ranked it as a new genus, mainly the unique maxillae with only two maxillary plates, being the anteriormost presenting a specific long and thin spine and the enlarged pharynx making the anterior region enlarged when it is retracted, which is not observed in others species of the family. The results of de Oliveira Bonaldo et al., 2022 placed *Meiodorvillea* as a sister group of all other genera presented in the analysis except *Eliberidens* and *Gymnodorvillea*. The inclusion of the *Ceciamaralia* **gen. nov.** species and the new characters in the analysis did not affect the previous relationship results among the genera and the monophyly of them.

450 *Present and future*

451 The incentive towards taxonomic studies and projects resulted in the first description of a new
 452 genus of Dorvilleidae in almost 25 years, presented here. Dorvilleids present a great morphological
 453 diversity, but **its taxonomic knowledge** is still limited by the reasons mentioned before and the lack
 454 of incentive for taxonomist studies. This incentive is very important to aid researchers to better
 455 comprehend and classify those organisms, because their identification and description is not an
 456 easy task.

457 The study of small annelids has some obstacles like the difficulty to collect and identify them, but
 458 with the continuous increase of scientific advancements and the development of new techniques
 459 and tools, researchers can perform new and more detailed analyses of those unidentified species.
 460 These studies increase not only the systematic knowledge of the species but also reveal the great
 461 hidden biodiversity of the group.

462 In Brazil only sixteen species were registered before the present study, but this number does not
 463 reflect the true diversity of this family on the Brazilian coast. The lack of knowledge and difficulty
 464 of collecting them highlight the importance of museum collections since they preserve the
 465 organisms previously described and also keeps unidentified organisms, which can hold many
 466 biological and ecological information aiding in several fields of study, mainly taxonomy and
 467 ecology. The specific identification of the organisms reveals ~~records and~~ occurrences of them
 468 aiding in biogeographical studies and **ecological patterns subsidizing data of potential distribution**
 469 (Budaeva et al., 2024). Morphological analysis can reveal new or different characters and
 470 structures supporting a refined description, reveal new species and aid the understanding of the
 471 phylogenetic relationship of the species of the group, as was demonstrated in the present study.
 472 That is why the formation of taxonomists is important as well as encouraging them to identify,
 473 describe and study those neglected groups, enhancing the discovery of their biodiversity and
 474 knowledge.

475 This study is a partial result obtained through the current Ph.D thesis of the first author, which is
 476 focused on the taxonomic study of Dorvilleidae; preliminary morphological analysis of museum
 477 materials indicates several new registers of the family for the Brazilian coast and also potential
 478 new species to the family. In addition, we highlight the importance of the effort to collect new and

fresh organisms in view of the fact that they can provide current biodiversity data and can also provide more accurate genetic information through molecular studies, since some groups like the Dorvilleidae ~~family~~ present a huge gap in those data.

Key to species of *Ceciamaralia* gen. nov.

- 1a) Presence of a long and large dorsal cirri in parapodia 3 to 7-9 and furcate chaeta in supra-acicular fascicle..... *Ceciamaralia lanai* **gen. et sp. nov.**
- 1b) Absence of dorsal cirri and presence of geniculate chaeta in the supra-acicular fascicle..... *Ceciamaralia nonatoi* **gen. et sp. nov.**

Acknowledgements

We would like to thank all people involved in the collection of the material (projects AMBES and HABITATS) and also the MDBio for providing access to it. We would like to ~~thank~~ the access to equipment and assistance provided by the Electron Microscope Laboratory (LME/UNICAMP). We also thank Dr. Yasmina Shah Esmaeili for providing language revision. Finally we also thank all funding agencies.

Funding Statement

This study was financed by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001 to Rafael de Oliveira Bonaldo; Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq (301551/2019-7) and The São Paulo Research Foundation - FAPESP (2018/10313-0).

References

- 503 Aguirrezabalaga F, Ceberio A. 2003. Dorvilleidae (Polychaeta) from the Capbreton Canyon (Bay
504 of Biscay, NE Atlantic) with the description of *Pettiboneia sanmartini* sp. nov. *Cahiers de Biologie*
505 *Marine* 44(1), 41-48.
- 506 AMARAL ACZ, NALLIN SAH, STEINER TM, FORRONI TO, GOMES-FILHO D, ARAÚJO
507 GR, FREITAS R, COSTA CAO, RUTA C, GOMES KRE, BONALDO RO. 2006-2022. Catálogo
508 das espécies de Annelida “Polychaeta” do Brasil. (available from:
509 [http://www.ib.unicamp.br/museu_zoologia/files/lab_museu_zoologia/Catalogo_Polychaeta_Ama](http://www.ib.unicamp.br/museu_zoologia/files/lab_museu_zoologia/Catalogo_Polychaeta_Amaral_et_al_2022.pdf)
510 [ral_et_al_2022.pdf](http://www.ib.unicamp.br/museu_zoologia/files/lab_museu_zoologia/Catalogo_Polychaeta_Amaral_et_al_2022.pdf) (accessed in 28 July 2023).
- 511 Armstrong JW, Jumars PA. 1978. Branchiate Dorvilleidae (Polychaeta) from the North Pacific.
512 *Bulletin, Southern California Academy of Sciences*, 77(3), 133-138.
- 513 Martin D, Britayev TA. 1998. Symbiotic polychaetes: review of known species. In: Ansell A,
514 Gibson R, Barnes M, Press U. eds. *Oceanography and Marine Biology: an annual review*. 35(36),
515 217-340.
- 516 Budaeva N, Agne S, Ribeiro PA. et al. 2024. Wide-spread dispersal in a deep-sea brooding
517 polychaete: the role of natural history collections in assessing the distribution in quill worms
518 (Onuphidae, Annelida). *Front Zool* 21, 1. <https://doi.org/10.1186/s12983-023-00520-0>.
- 519 Chamberlin RV. 1919. The Annelida Polychaeta. *Memoirs of the Museum of Comparative Zoology*
520 *at Harvard College*. 48: 1–514. <https://doi.org/10.5962/bhl.title.49195>
- 521 Claparède E, Mecznirow E. 1869. Beiträge zur Kenntnis der Entwicklungsgeschichte der
522 Chaetopoden. *Zeitschrift für wissenschaftliche Zoologie*. 19, 163–205.
- 523 Day JH. 1963. The polychaete fauna of South Africa. Part 8: New species and records from grab
524 samples and dredging. *Bulletin of the British Museum (Natural History), Series Zoology*. 10(7):
525 381–445.
- 526 de Oliveira Bonaldo R, Menchini Steiner T, Zacagnini Amaral AC. 2022. Revision of
527 *Meiodorvillea* Jumars, 1974 (Annelida: Dorvilleidae) including descriptions of three new species
528 from the Southwestern Atlantic Ocean. *Plos one*, 17(3), e0264081.
- 529 de Oliveira Bonaldo R, Steiner TM, Garraffoni ARS, Amaral ACZ. 2022. First record of the genus
530 *Eliberidens* (Annelida: Dorvilleidae) from the Southwestern Atlantic Ocean and cladistic analysis
531 of the genus. *Zoologischer Anzeiger*. 301, 115-126.
- 532 delle Chiaje S. 1828. Memorie sulla storia e notomia degli animali senza vertebre del Regno di
533 Napoli. *Stamperia della Società Tipografica Napoli*. 3: 1–232.
- 534 Ehlers E. 1901. Die Polychaeten des magellanischen und chilenischen Strandes. Ein faunistischer
535 Versuch. Festschrift zur Feier des Hundertfünfzigjährigen Bestehens des Königlich-

- 536 Gesellschaft der Wissenschaften zu Göttingen, Abhandlungen der Mathematisch-Physikalischen
537 Klasse. 1–232, 25 plates.
- 538 Eibye-Jacobsen D, Kristensen RM. 1994. A new genus and species of Dorvilleidae (Annelida,
539 Polychaeta) from Bermuda, with a phylogenetic analysis of Dorvilleidae, Iphitimidae and
540 Dinophilidae. *Zool Scr.* 23(2): 107–131.
- 541 Fauchald K. 1977. The polychaete worms. Definitions and keys to the orders, families and genera.
542 *Natural History Museum of Los Angeles County, Science Series.*
- 543 Goloboff PA, Morales ME. 2023. TNT version 1.6, with a graphical interface for MacOS and
544 Linux, including new routines in parallel. *Cladistics*, 39(2), 144-153. DOI 10.1111/cla.12524.
- 545 Hartman O. 1965. Deep-water benthic polychaetous annelids off New England to Bermuda and
546 other North Atlantic areas. *Occasional Papers of the Allan Hancock Foundation.* 28: 1–384.
- 547 Hernández-Alcántara P, Pérez-Mendoza AY, Solís-Weiss V. 2006. Description of three new
548 species of *Ninoe* and *Cenogenus* (Polychaeta: Lumbrineridae) from the Mexican Pacific. *Scientia*
549 *Marina*, 70(S3), 81-90.
- 550 Hilbig B. 1995. A new polychaete *Eliberidens hartmannschroederiae* sp. n. Polychaeta
551 Dorvilleidae from the US Atlantic continental slope. *Mitt. Hambg. Zool. Mus. Inst.* 92 (April), 85–
552 88.
- 553 Jumars PA. 1974. A generic revision of the Dorvilleidae (Polychaeta), with six new species from
554 the deep North Pacific. *Zool. J. Linn. Soc.* 54(2): 101–135. [https://doi.org/10.1111/j.1096-](https://doi.org/10.1111/j.1096-3642.1974.tb00794.x)
555 [3642.1974.tb00794.x](https://doi.org/10.1111/j.1096-3642.1974.tb00794.x).
- 556 Kvalø Heggøy K, Schander C, Åkesson B. 2007. The phylogeny of the annelid genus
557 *Ophryotrocha* (Dorvilleidae). *Marine Biology Research*, 3(6), 412-420.
558 <https://doi.org/10.1080/17451000701695361>.
- 559 Lamarck JBD. 1802. Discours d’Ouverture, Prononcé le 27 floréal An 10, au Muséum d’Histoire
560 naturelle. Recherches sur l’organisation des corps vivans. *Bulletin Scientifique de la France et de*
561 *la Belgique*, 483-517.
- 562 Lavrado HP, Brasil ACS. 2010. In: Lavrado, H.P., Brasil, A.C.S. (Eds.), Biodiversidade da região
563 oceânica da Bacia de Campos: Macrofauna, p. 232. Rio de Janeiro, SAG Serv.
- 564 Maddison WP, Maddison DR. 2019. Mesquite: a Modular System for Evolutionary Analysis.
565 Version 3.61, 2019.
- 566 McIntosh WC. 1869. On the structure of the British nemerteans, and some new British annelids.
567 *Trans. R. Soc. Edinb.* 25 (2), 305–433.

- 568 Moore JP. 1906. Additional new species of Polychaeta from the North pacific. In: *Proceedings of*
569 *the Academy of Natural Sciences of Philadelphia*, vol. 58, pp. 217–260.
- 570 Moore JP. 1909. Polychaetous annelids from Monterey Bay and San Diego, California. *Proc Acad*
571 *Nat Sci Phila.* 61: 235–295. <https://doi.org/10.5852/ejt.2021.736.1251>.
- 572 Nixon KC. 2002. WinClada Ver. 1.00. 08. Published by the Author, Ithaca, NY.
- 573 Núñez J. 1998. *Marycarmenia lysandrae*, a new genus and interstitial species (Polychaeta:
574 Dorvilleidae) from Madeira. *Bull. Mar. Sci.* 62 (1), 115–119.
- 575 Orensanz JM. 1973. Los anelidos poliquetos de la provincia biogeografica Argentina. III.
576 Dorvilleidae. *Physis Seccion A Los oceanos y sus organismos*. 32(85): 325–342.
- 577 Parfitt E. 1866. Description of a *Nereis* new to science. *Zoologist*. 21: 113–114.
- 578 Paxton H. 2009. Phylogeny of Eunicida (Annelida) based on morphology of jaws. *Zoosymposia*.
579 2 (1), 241–264. <https://doi.org/10.11646/zoosymposia.2.1.18>.
- 580 Pettibone MH. 1961. New species of polychaete worms from the Atlantic Ocean, with a revision
581 of the Dorvilleidae. *Proceedings of the Biological Society of Washington*, 74(19), 167-186.
- 582 Pleijel F, Eide R. 1996. The phylogeny of *Ophryotrocha* (Dorvilleidae: Eunicida: Polychaeta).
583 *Journal of Natural History*. 30(5), 647-659. <https://doi.org/10.1080/00222939600770361>.
- 584 Read G, Fauchald K. 2024. World Polychaeta database. Dorvilleidae Chamberlin, 1919. Accessed
585 through: World Register of Marine Species. Available at
586 <https://www.marinespecies.org/aphia.php?p=taxdetails&id=971> (accessed 31 Jan 2024).
- 587 Steiner TM, Santos CSG. 2004. A new species of *Neanthes* (Annelida, Polychaeta, Nereididae)
588 from Brazil, and some remarks on *Neanthes bruaca* Lana & Sovierzoski, 1987. *Beaufortia*. 54 (2),
589 39–57.
- 590 Wainwright SC, Perkins TH. 1982. *Gymnodorvillea floridana*, a new genus and species of
591 Dorvilleidae (Polychaeta) from Southeastern Florida. *Proc. Biol. Soc. Wash.* 95 (4), 694–701.
- 592 Webster HE. 1879. The Annelida Chaetopoda of the Virginian coast. *Transactions of the Albany*
593 *Institute*. 9: 202–269.
- 594 Westheide W. 2000. *Ikosipodoides seychellensis*, a new genus and species of interstitial
595 polychaetes (Dorvilleidae) from the island of Mahé, Indian Ocean. *Cahiers de biologie marine*,
596 41(1), 19-24.
- 597 Wolf PS. 1986. Four new genera of Dorvilleidae (Annelida: Polychaeta) from the Gulf of Mexico.
598 *Proc Biol Soc Wash.* 99(4): 616–626.

- 599 Yen NK, Rouse GW. 2020. Phylogeny, biogeography and systematics of Pacific vent, methane
600 seep, and whale-fall *Parougia* (Dorvilleidae: Annelida), with eight new species. *Invertebrate*
601 *Systematics*, 34(2), 200-233.
- 602 Zanol J, Carrera-Parra LF, Steiner TM, Amaral ACZ, Wiklund H, Ravara A, et al. 2021 The
603 Current State of Eunicida (Annelida) Systematics and Biodiversity. *Diversity* 13(2): 74.
604 <https://doi.org/https://doi.org/10.3390/d13020074>.
- 605 Zhang D, Zhou Y, Yen N, Hiley AS, Rouse GW. 2023. *Ophryotrocha* (Dorvilleidae, Polychaeta,
606 Annelida) from deep-sea hydrothermal vents, with the description of five new species. *European*
607 *Journal of Taxonomy*, 864, 167-194.

Figure 1

Ceciamaralia lanai gen. et sp. nov., light microscopy.

(A) complete specimen. (B) anterior region, dorsal view. (C) pygidium, ventral view. (D) parapodia from anterior region, ventral view. (E) parapodium from posterior region, frontal view. *Abbreviations:* an: antennae, pa: palps, pr: peristomial rings, vpc: ventral pygidial cirrus, dpc: dorsal pygidial cirrus, dc: dorsal cirrus, vc: ventral cirrus. *Scale bars:* (A) 200 μm . (B) 50 μm . (C,D,E) 20 μm .

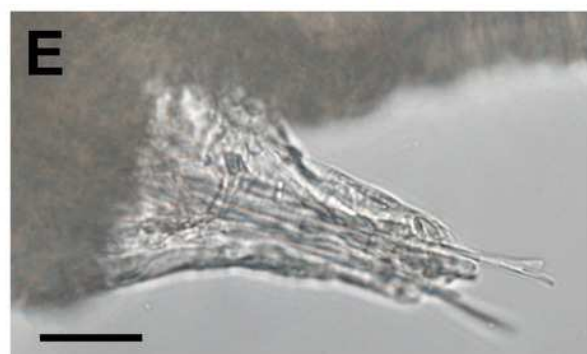
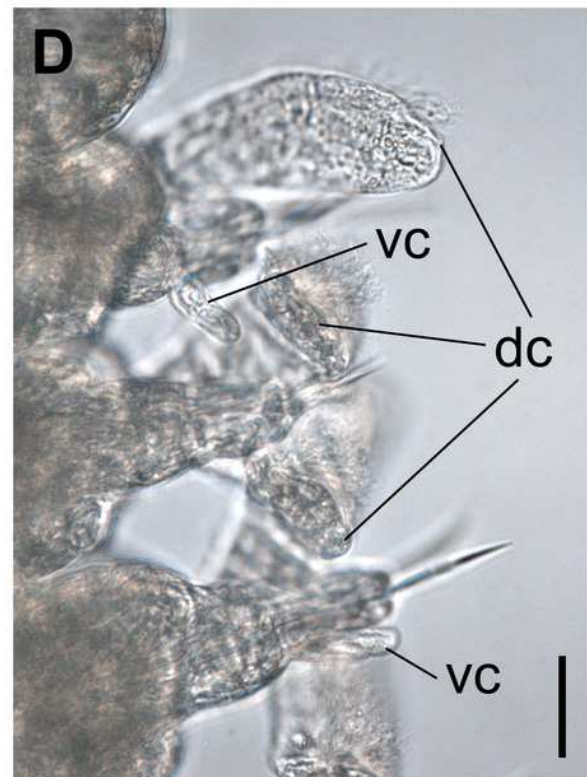
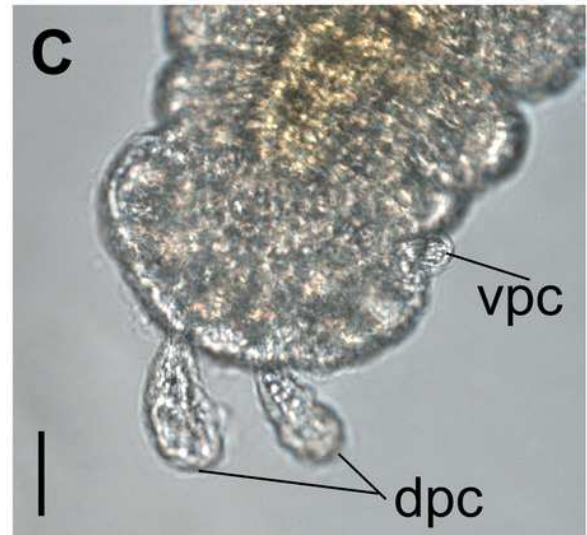
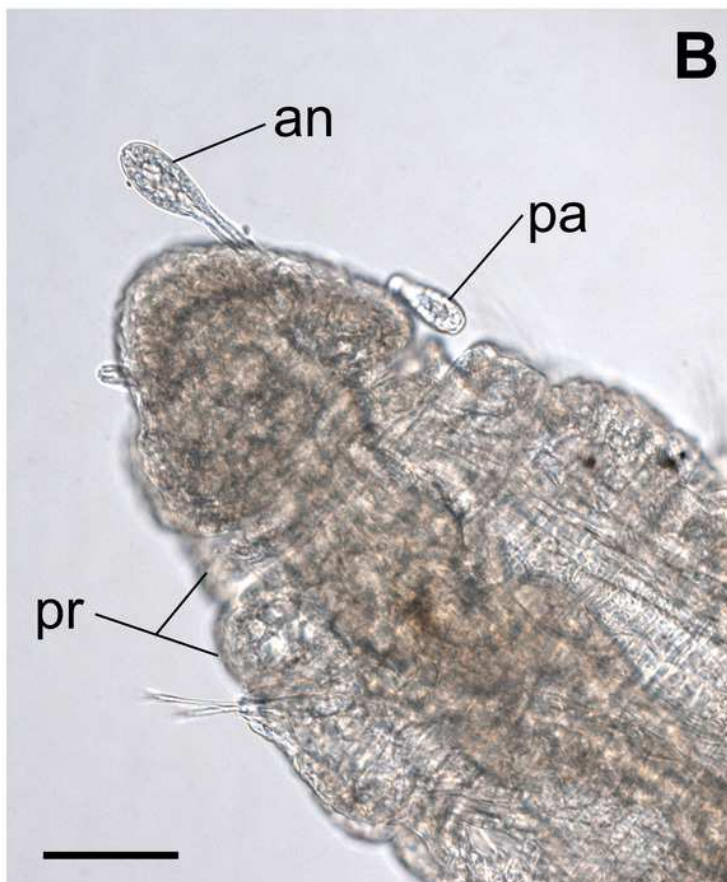
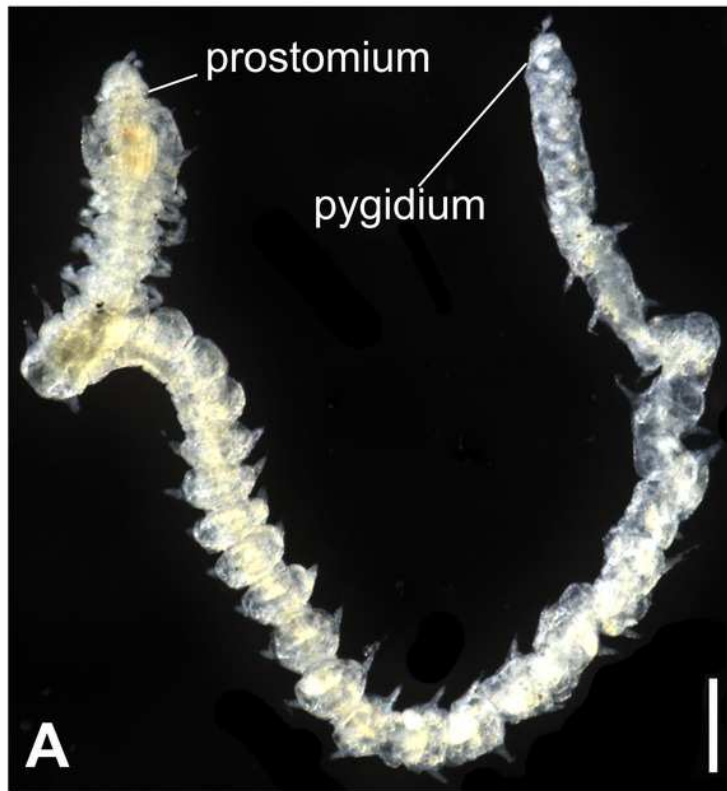


Figure 2

Ceciamaralia lanai gen. et sp. nov., light microscopy.

(A,B) chaetae from anterior region. (C) chaetae from posterior region. (D) sub-acicular compound chaetae. (E) jaw apparatus. (F) jaw apparatus (DIC). *Abbreviations*: fc: furcate chaeta, cp: compound chaeta, cap: capillary chaeta, md: mandible, sp: spine, amp: anteriormost maxillary plate, fmp: free maxillary plate, bp: basal plate, lig: ligament. *Scale bars*: (A-F) 10 μ m.

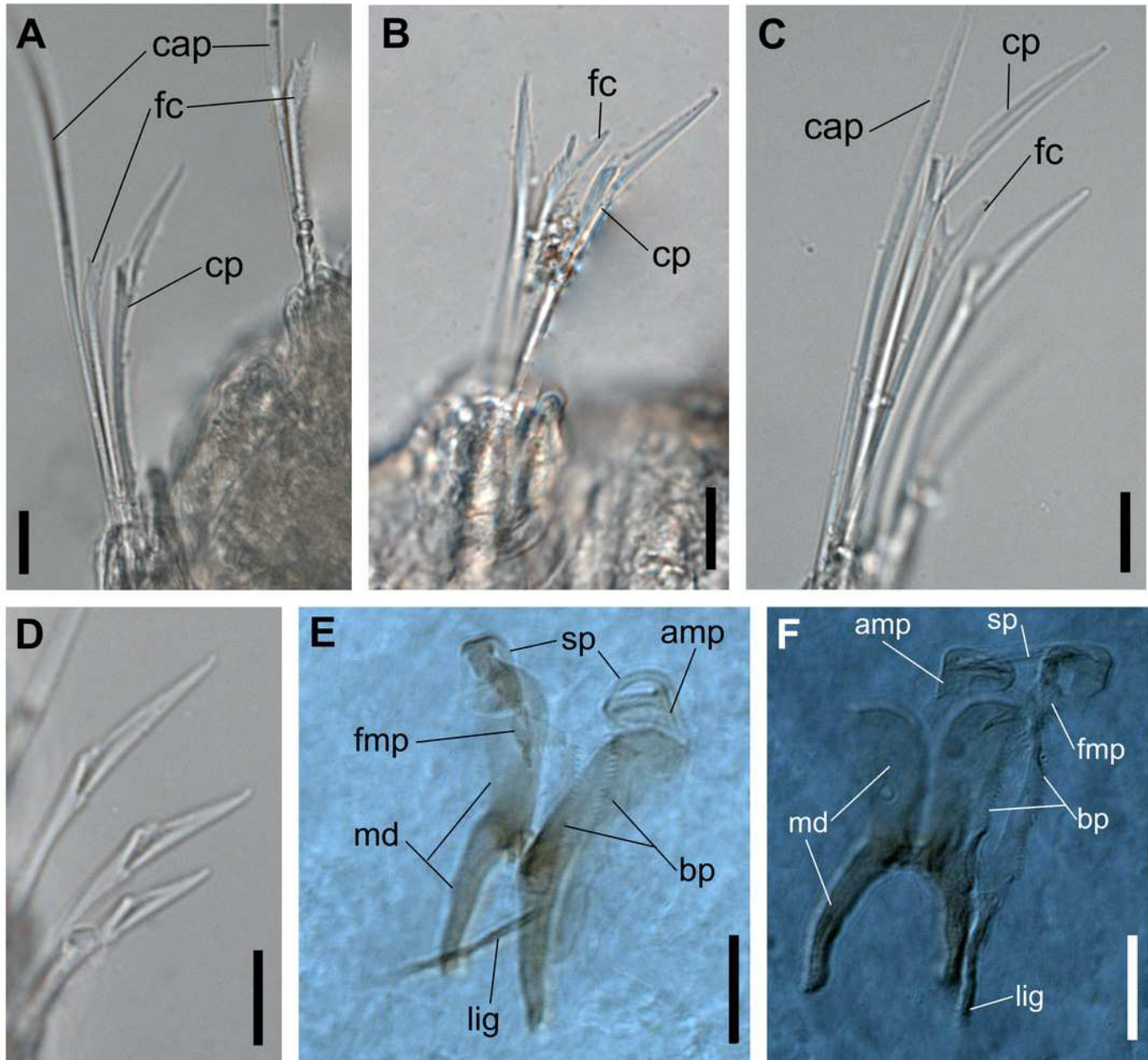


Figure 3

Ceciamaralia lanai gen. et sp. nov., drawings.

(A) anterior region, dorsal view. (B) anterior region, ventral view. (C) pygidium, dorsal view. (D) 7^o parapodium, lateral view. (E) 19^o parapodium, lateral view. (F) furcate chaeta from anterior region (5^o parapodium). (G) furcate supra-acicular chaeta from posterior region (45^o parapodium). (H) cultriform sub-acicular chaeta (43^o parapodium). (J) compound sub-acicular chaeta (5^o parapodium). (K) mandible. (L) maxillae. *Abbreviations*: an: antennae, pa: palps, ph: pharynx, vpc: ventral pygidial cirrus, dpc: dorsal pygidial cirrus, dc: dorsal cirrus, vc: ventral cirrus, sp: spine, amp: anteriormost maxillary plate, fmp: free maxillary plate, bp: basal plate, lig: ligament. *Scale bars*: (A,B,C) 25 µm. (D-E) 15.6 µm. (F,G,H,J,K,L) 6.25 µm.

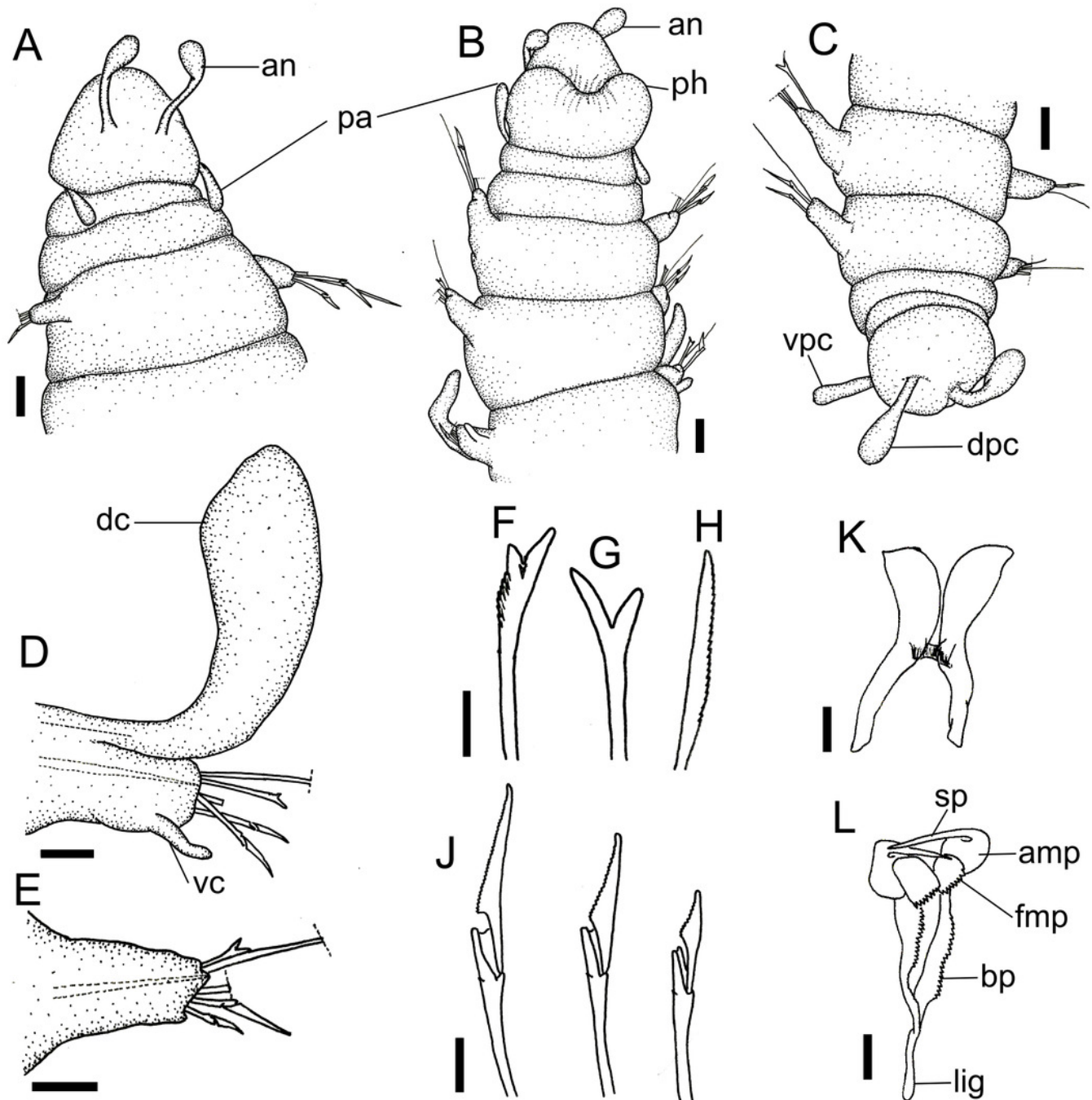


Figure 4

Ceciamaralia lanai gen. et sp. nov., scanning electron microscopy.

(A) anterior region and prostomium, dorsal view. (B) anterior region, ventral view. (C) pygidium ventrolateral view. (D) parapodium from anterior region, ventral view. (E) parapodia from median region, lateral view. (F) sub-acicular chaeta from posterior region. (G) furcate and compound chaeta from median region. *Abbreviations:* an: antennae, pa: palps, pr: peristomial ring, dpc: dorsal pygidial cirrus, vpc: ventral pygidial cirrus, dc: dorsal cirrus, vc: ventral cirrus, ~~pr: peristomial rings~~, ph: pharynx, cc: cultriform chaeta, mcp: median compound chaeta, dcp: dorsalmost compound chaeta, cp: compound chaeta, fc: furcate chaeta. *Scale bars:* (A,C,E) 20 μ m. (B) 50 μ m. (D,F,G) 10 μ m.

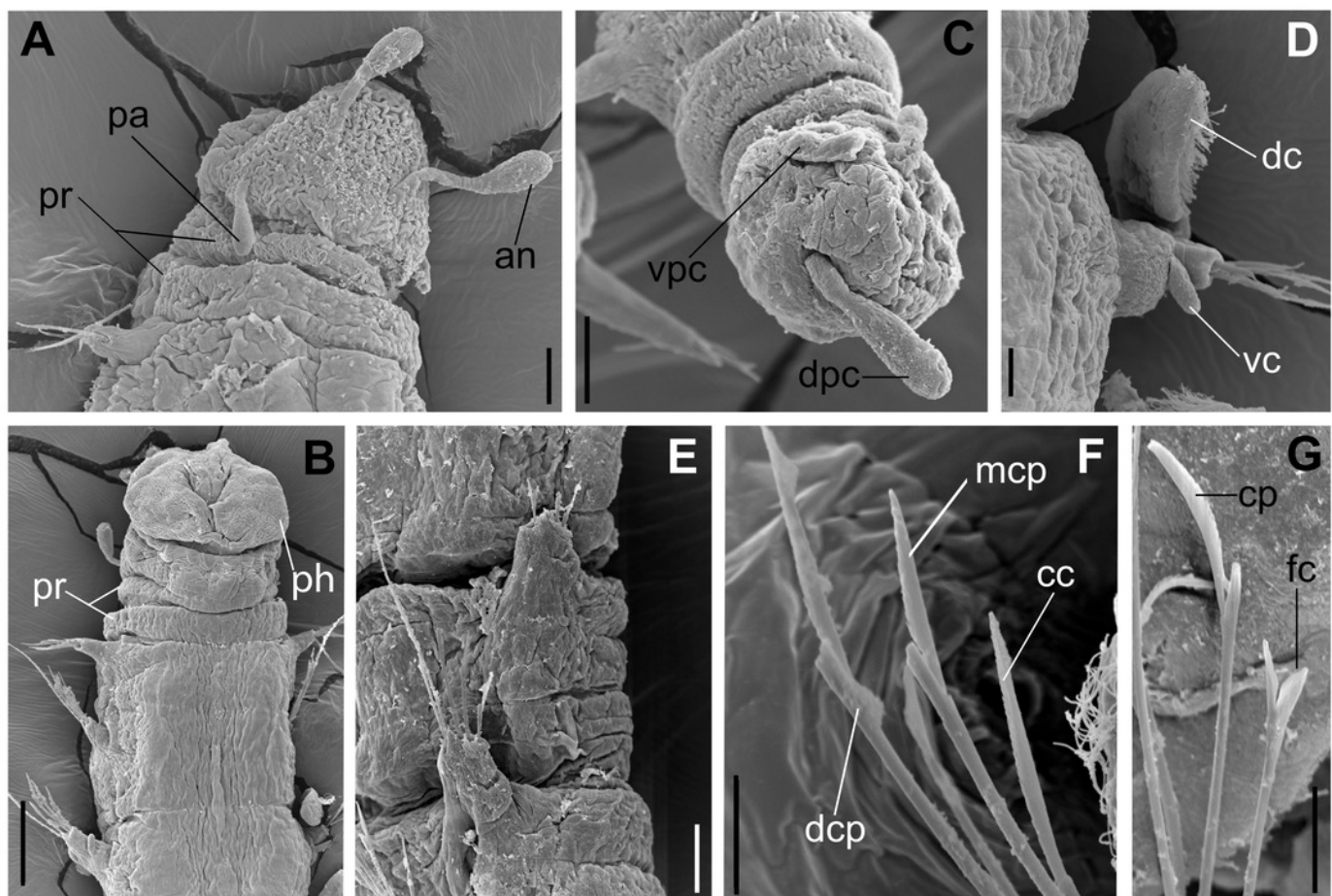


Figure 5

Ceciamaralia nonatoi gen. et sp. nov., light microscopy.

(A) complete specimen. (B) anterior region (specimen with palps), dorsal view. (C) anterior region, dorsal view (specimen without palps). (D) posterior end, pygidium ventrolateral view. (E) parapodium from anterior region, ventral view. (F,G) chaetae. (H,J) jaw apparatus.

Abbreviations: an: antennae, pa: palps, pr: peristomial rings, ph: pharynx, vpc: ventral pygidial cirrus, dpc: dorsal pygidial cirrus, ppr: parapodium from posterior region, vc: ventral cirrus, cap: capillary chaeta, cp: compound chaeta, gc: geniculate chaeta, cc: cultriform chaeta, lig: ligament, sp: spine, bp: basal plate, amp: anteriormost maxillary plate, md: mandible. *Scale bars:* (A) 200 μm . (B,C,D) 50 μm . (E,F,G) 20 μm . (H,J) 10 μm .

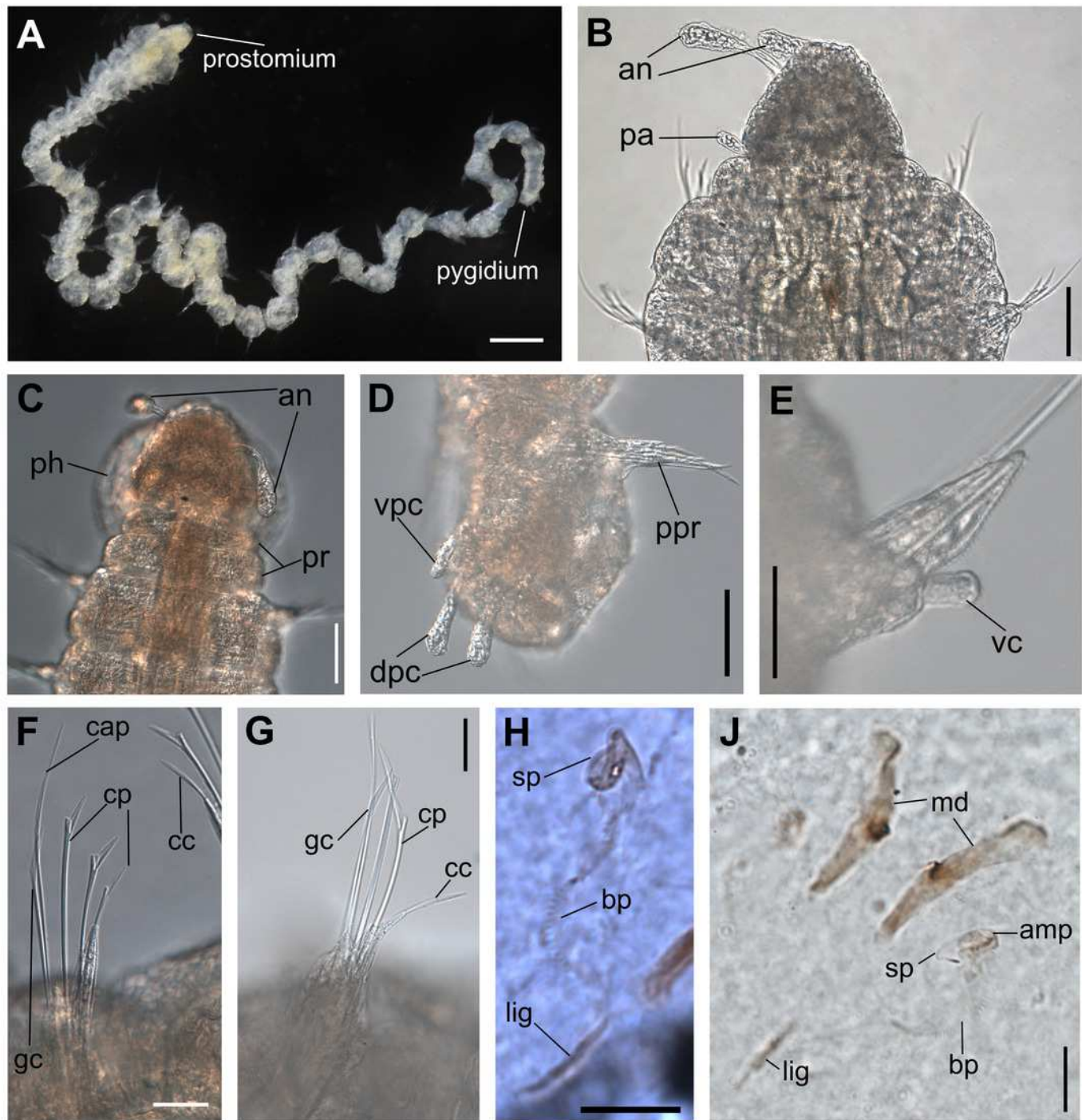


Figure 6

Ceciamaralia nonatoi gen. et sp. nov., drawings.

(A) anterior region and prostomium, dorsal view. (B) anterior region, ventral view. (C) pygidium, ventral view. (D) 4^o parapodium, anterior region. (E) 10^o parapodia, median region. (F) geniculate supra-acicular chaeta. (G) dorsalmost compound sub-acicular chaeta. (H) median compound sub-acicular chaeta. (J) cultriform sub-acicular chaeta. (K) mandible. (L) maxillae. *Abbreviations*: an: antennae, ph: pharynx, dpc: dorsal pygidial cirri, vpc: ventral pygidial cirri, vc: ventral cirri, lig: ligament, bp: basal plate, fmp: free maxillary plate, amp: anteriormost maxillary plate, sp: spine. *Scale bars*: (A,C) 25µm. (B) 31 µm. (D) 15.6 µm. (E) 10 µm. (F,G,H,J) 10 µm. (K,L) 6,25 µm.

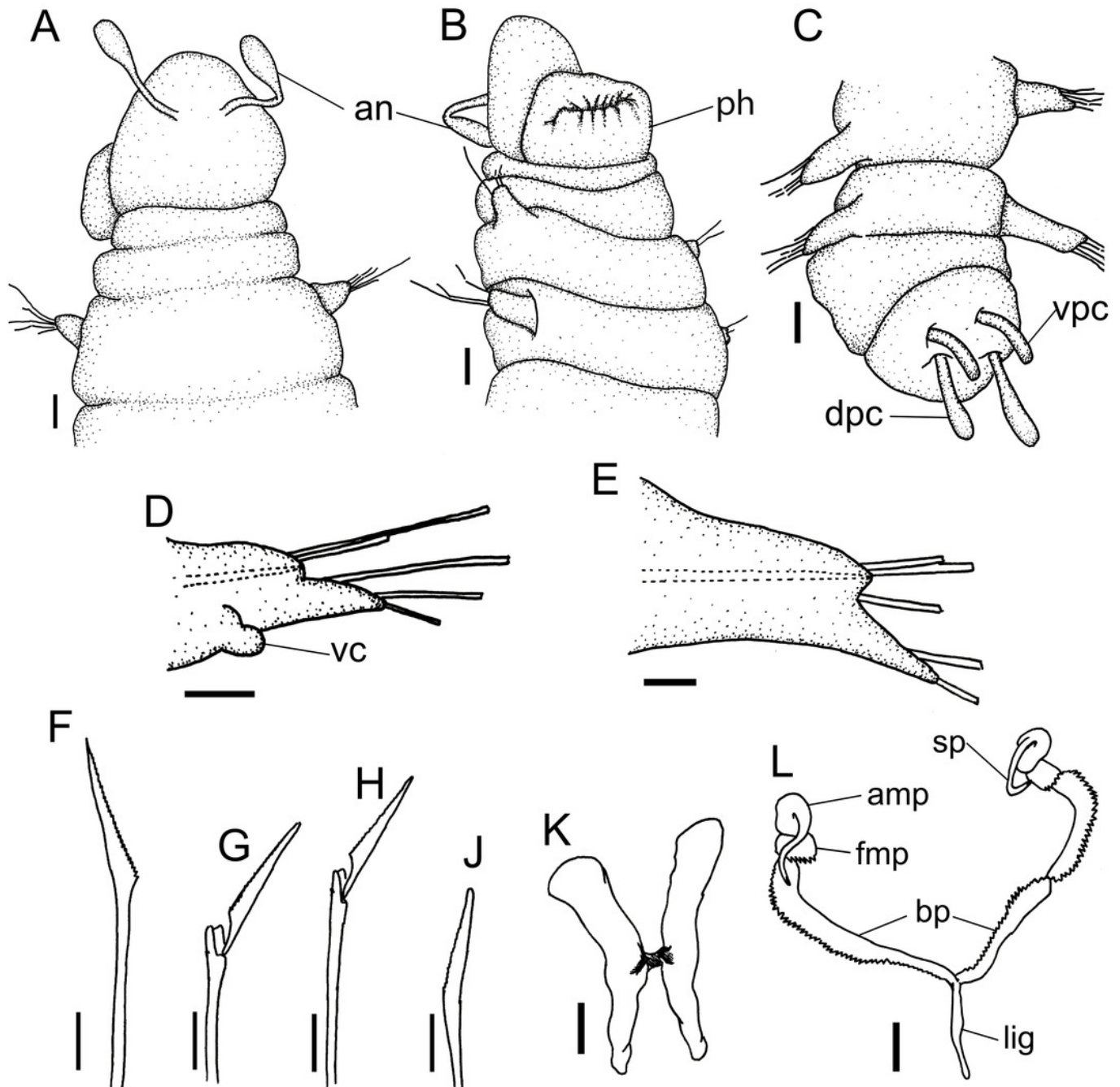


Figure 7

Ceciamaralia nonatoi gen. et sp. nov., scanning electron microscopy.

(A) anterior end, prostomium, dorsal view. (B) anterior end, prostomium, ventral view. (C) parapodia from anterior region, ventral view. (D) parapodia from posterior region. (E) chaetae from posterior region. (F) supra-acicular chaetae. (G) chaetae. *Abbreviations:* an: antennae, pr: peristomial rings, ph: pharynx, vc: ventral cirrus, cc: cultriform chaeta, cp: compound chaeta, cap: capillary chaetae. *Scale bars:* (A,B) 50 μm . (C,D,E,G) 10 μm . (F) 5 μm .

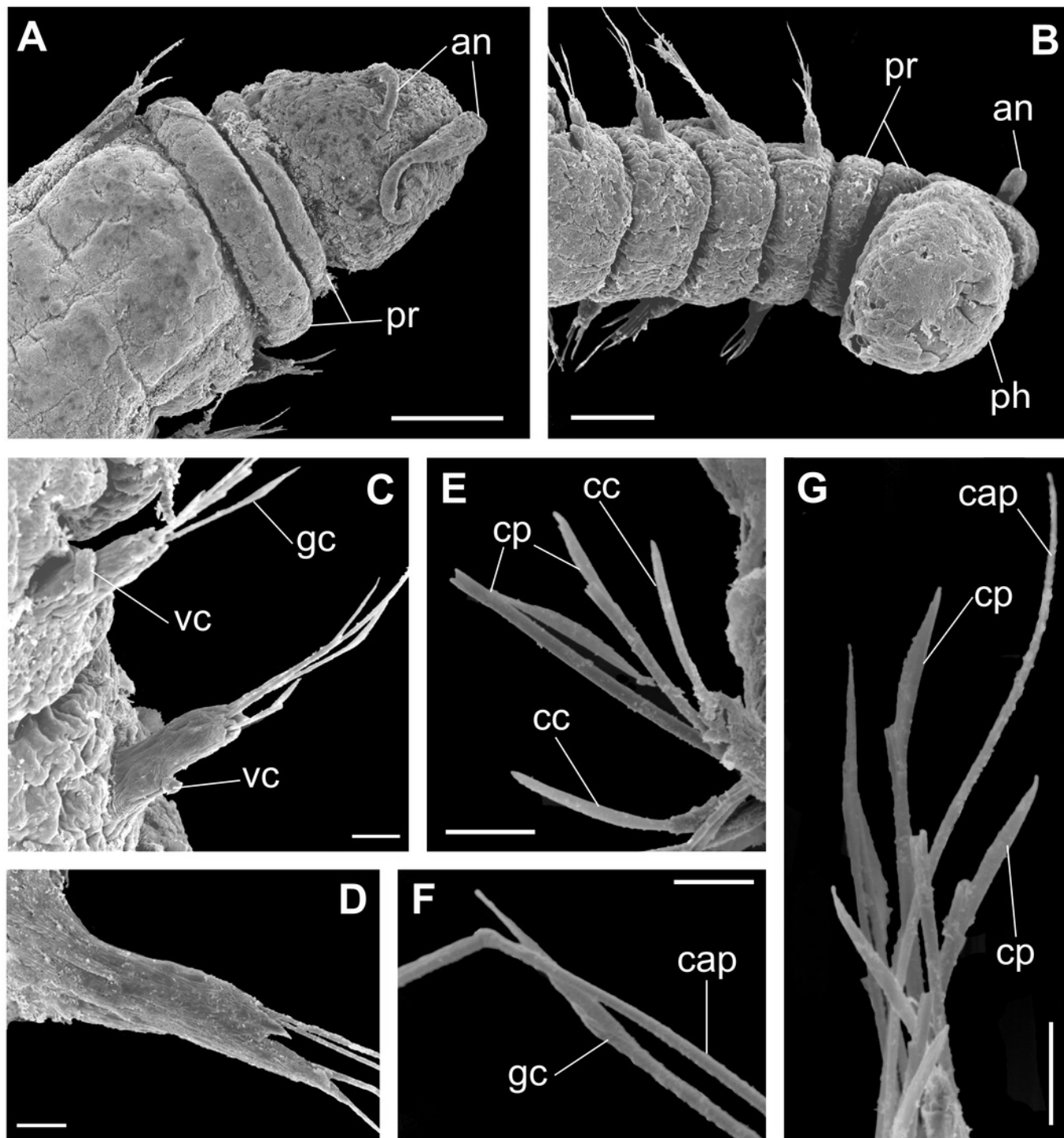


Figure 8

Resulting cladogram highlighting the monophyly of *Ceciamaralia* gen. nov. and its relationship with some Dorvilleidae genera based on the study of de Oliveira Bonaldo et al., (2022).

Length of 83, consistency index (ci) of 73 and retention index (ri) of 86. Number above the circles represents the character and the number below represents the character state. Open circles represent homoplasies and closed circles synapomorphies.

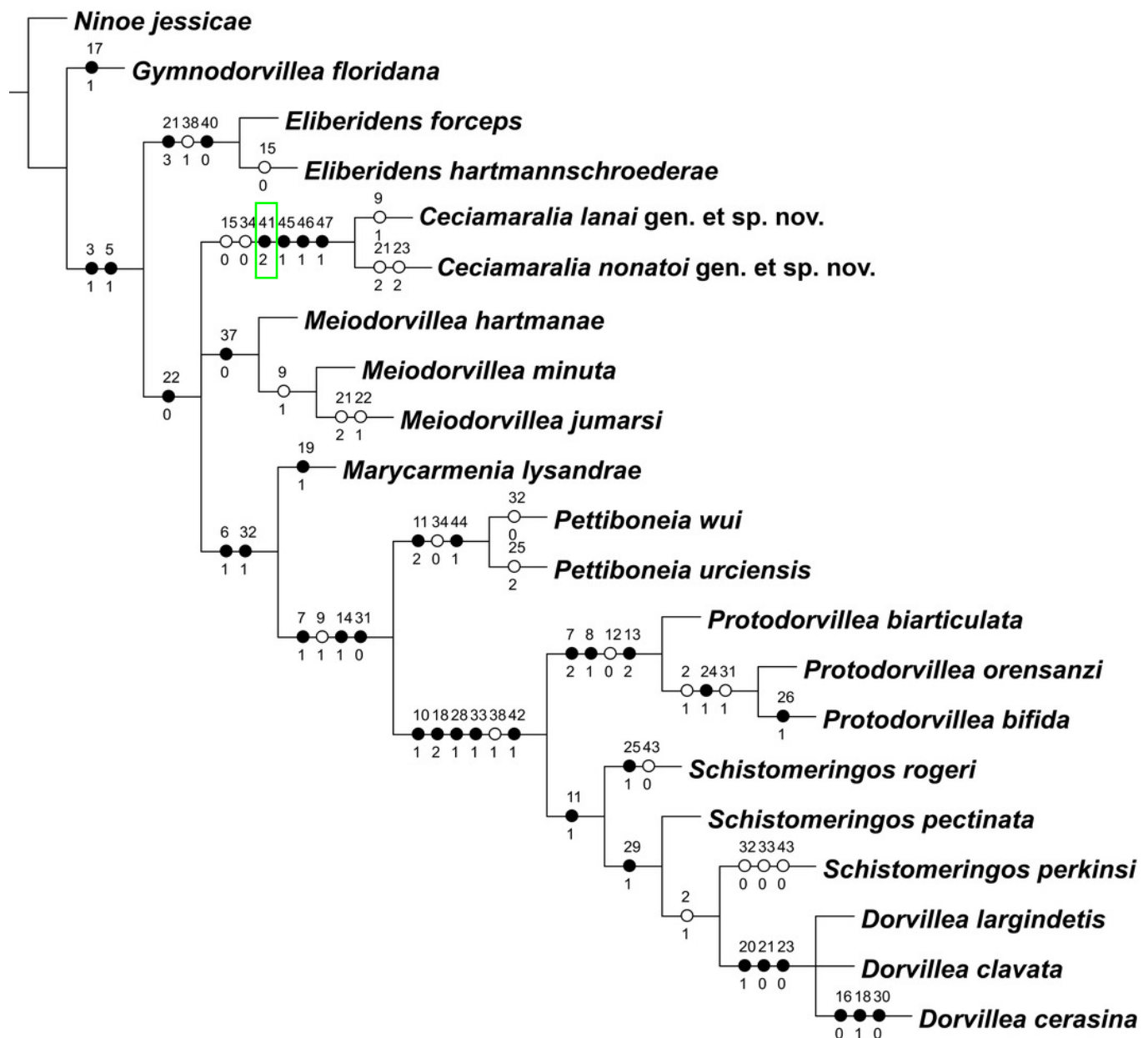


Table 1 (on next page)

List of characters added (44-47) and states of characters modified (41) to the list of characters of the study of de Oliveira Bonaldo et al., (2022) on which the present analysis was based.

1

CHARACTERS	STATES
41. Number of superior free maxillary plates	0: five to thirteen, 1: fourteen or more, 2: one to three
44. Extra row(s) of replacement maxillary plates	0: absent, 1: present
45. Enlarged pharynx/enlarged anterior region	0: no, 1: yes
46. Ventral cirri present only in few anterior parapodia	0: no, 1: yes
47. Long spine in the anteriormost free maxillary plate	0: absent, 1: present.

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

Table 2 (on next page)

Matrix of ~~taxons~~ and characters based on ~~the study of~~ de Oliveira Bonaldo et al., (2022).

The two new species described in the present study and four new characters (44-47) were added. *Ninoe jessicae* remains as the outgroup of the study. '-' indicates that the character is non-applicable and '?' that the character is unknown.

1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Ninoe jessicae</i>	0	0	0	-	0	-	-	0	0	0	-	-	-	0	0	-	2
<i>Pettiboneia wui</i>	0	0	1	0	1	1	1	0	1	0	2	1	0	?	1	2	2
<i>Pettiboneia urciensis</i>	1	0	1	0	1	1	1	0	1	0	2	1	0	1	1	2	2
<i>Gymnodorvillea floridana</i>	0	0	0	-	0	-	-	0	0	0	-	-	-	?	1	1	1
<i>Marycarmenia lysandrae</i>	0	0	1	0	1	1	0	0	0	0	-	-	-	0	1	1	2
<i>Dorvillea largidentis</i>	1	1	1	2	1	1	1	0	1	1	1	1	0	?	1	1	2
<i>Dorvillea clavata</i>	1	1	1	2	1	1	1	0	1	1	1	1	0	1	1	1	2
<i>Dorvillea cerasina</i>	1	1	1	2	1	1	1	0	1	1	1	?	0	1	1	0	2
<i>Schistomeringos rogeri</i>	1	0	1	2	1	1	1	0	1	1	1	?	0	1	1	1	2
<i>Schistomeringos perkinsi</i>	1	1	1	2	1	1	1	0	1	1	1	1	0	1	1	1	?
<i>Schistomeringos pectinata</i>	1	0	1	2	1	1	1	0	1	1	1	1	0	1	1	1	2
<i>Protodorvillea orensanzi</i>	1	1	1	0	1	1	2	1	1	1	0	0	2	1	1	2	2
<i>Protodorvillea bifida</i>	1	1	1	1	1	1	2	1	1	1	0	0	2	1	1	2	2
<i>Protodorvillea biarticulata</i>	1	0	1	1	1	1	2	1	1	1	0	0	2	1	1	2	2
<i>Meiodorvillea minuta</i>	0	0	1	0	1	0	0	0	1	0	0	0	1	0	1	1	2
<i>Meiodorvillea hartmanae</i>	0	0	1	0	1	0	0	0	0	0	-	-	-	0	1	1	2
<i>Meiodorvillea jumarsi</i>	0	0	1	0	1	0	0	0	1	0	0	0	1	0	1	1	2
<i>Eliberidens forceps</i>	0	0	1	0	1	0	0	0	0	0	-	-	-	0	1	1	2
<i>Eliberidens hartmannchroederae</i>	0	0	1	0	1	0	0	0	0	0	-	-	-	0	0	-	2
<i>Ceciamaralia lanai</i> gen. et. sp. nov.	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	1	2
<i>Ceciamaralia nonatoi</i> gen. et sp. nov.	0	0	1	0	?	?	/	0	0	0	-	-	-	0	0	1	2

	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4
<i>Ninoe jessicae</i>	?	?	?	-	-	-	-	-	-	-	-	-	-	-	0	0	?
<i>Pettiboneia wui</i>	0	?	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0
<i>Pettiboneia urciensis</i>	?	0	0	1	0	1	0	2	0	0	0	0	1	0	1	0	0
<i>Gymnodorvillea floridana</i>	0	-	0	1	1	2	0	0	0	0	0	0	1	1	0	0	?
<i>Marycarmenia lysandrae</i>	0	1	0	1	0	1	0	0	0	0	0	0	1	1	1	0	?
<i>Dorvillea largidentis</i>	3	0	1	0	0	0	0	-	-	?	1	1	1	0	1	1	1
<i>Dorvillea clavata</i>	3	0	1	0	0	0	0	-	-	?	1	1	1	0	1	1	1
<i>Dorvillea cerasina</i>	1	0	1	0	0	0	0	-	-	?	1	1	0	0	1	1	1
<i>Schistomeringos rogeri</i>	?	0	0	1	0	1	0	1	0	1	1	0	?	0	1	?	?
<i>Schistomeringos perkinsi</i>	?	?	0	1	0	1	0	0	0	?	1	1	1	0	0	0	1
<i>Schistomeringos pectinata</i>	2	0	?	1	0	1	0	0	0	1	1	1	1	0	1	1	1
<i>Protodorvillea orensanzi</i>	2	0	0	1	0	1	1	2	0	?	1	0	1	1	1	1	1
<i>Protodorvillea bifida</i>	2	0	0	1	0	1	1	0	1	?	1	0	1	1	1	1	1
<i>Protodorvillea biarticulata</i>	?	?	0	1	0	1	0	2	0		1	0	1	0	?	?	?
<i>Meiodorvillea minuta</i>	0	0	0	1	0	1	0	0	0	0	0	0	1	1	0	0	1
<i>Meiodorvillea hartmanae</i>	0	0	0	1	0	1	0	0	0	0	0	0	1	1	0	0	1
<i>Meiodorvillea jumarsi</i>	0	0	0	2	1	1	0	0	0	0	0	0	1	1	0	0	1
<i>Eliberidens forceps</i>	0	0	0	3	1	1	0	0	0	0	0	0	1	1	0	0	1
<i>Eliberidens hartmannchroederae</i>	0	0	0	3	1	1	0	0	0	0	0	0	1	1	0	0	?
<i>Ceciamaralia lanai</i> gen. et. sp. nov.	0	0	0	1	0	1	0	0	0	0	0	0	1	1	0	0	0
<i>Ceciamaralia nonatoi</i> gen. et sp. nov.	0	0	0	2	0	2	0	-	0	0	0	0	1	1	0	0	0

	3	3	3	3	3	4	4	4	4	4	4	4	4
	5	6	7	8	9	0	1	2	3	4	5	6	7
<i>Ninoe jessicae</i>	?	-	-	-	-	-	-	-	-	0	0	0	0
<i>Pettiboneia wui</i>	-	-	-	0	-	1	?	0	-	1	0	0	0
<i>Pettiboneia urciensis</i>	-	-	-	0	-	1	1	0	-	1	0	0	0
<i>Gymnodorvillea floridana</i>	?	0	?	0	-	1	0	0	-	0	0	0	0
<i>Marycarmenia lysandrae</i>	?	0	?	0	-	1	0	0	-	0	0	0	0
<i>Dorvillea largidentis</i>	1	0	1	1	0	1	1	1	1	0	0	0	0
<i>Dorvillea clavata</i>	1	0	1	1	0	1	1	1	1	0	0	0	0
<i>Dorvillea cerasina</i>	?	0	1	1	0	1	1	1	?	0	0	0	0
<i>Schistomeringos rogeri</i>	?	0	1	1	0	1	1	1	0	0	0	0	0
<i>Schistomeringos perkinsi</i>	1	0	1	1	0	1	1	1	0	0	0	0	0
<i>Schistomeringos pectinata</i>	1	0	1	1	0	1	1	1	1	0	0	0	0
<i>Protodorvillea orensanzi</i>	1	0	1	1	0	1	?	1	?	0	0	0	0
<i>Protodorvillea bifida</i>	1	0	1	1	0	1	0	1	1	0	0	0	0
<i>Protodorvillea biarticulata</i>	?	0	?	1	0	1	?	1	?	0	0	0	0
<i>Meiodorvillea minuta</i>	0	0	0	0	-	1	0	0	-	0	0	0	0
<i>Meiodorvillea hartmanae</i>	0	0	0	0	-	1	0	0	-	0	0	0	0
<i>Meiodorvillea jumarsi</i>	0	0	0	0	-	1	0	0	-	0	0	0	0
<i>Eliberidens forceps</i>	0	1	1	1	1	0	-	0	-	0	0	0	0
<i>Eliberidens hartmannchroederæ</i>	?	2	1	1	2	0	-	0	-	0	0	0	0
<i>Ceciamaralia lanai</i> gen. et. sp. nov.	-	0	1	0	-	1	2	0	-	0	1	1	1
<i>Ceciamaralia nonatoi</i> gen. et sp. nov.	-	0	1	0	-	1	2	0	-	0	1	1	1

