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First record of the genus *Pseudomesochra* T. Scott (Harpacticoida: Pseudotachidiidae) in the South Atlantic with description of a deep-sea species: *Pseudomesochra longiseta* sp. nov.*

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Abstract

Samples collected during the Sergipe Continental Slope Environmental Characterization Project coordinated by PETROBRAS (The Brazilian Petroleum Company) revealed a new species of the family Pseudotachidiidae Lang, 1936 (Copepoda, Harpacticoida), *Pseudomesochra longiseta* sp. nov. This is the first record of the genus *Pseudomesochra* T. Scott, 1902 for the South Atlantic. *Pseudomesochra longiseta* sp. nov. can be distinguished from all species of the genus *Pseudomesochra* by the presence of four sensilla on the rostrum and a very long terminal "rat-tail" seta on the second segment of the antenna. It shares with *P. tamara* Smirnov, 1946 the addition of one inner seta on the first exopodal segment of the swimming legs 2–4 (P2–P4), a character absent in the remaining species of the genus. *Pseudomesochra longiseta* sp. nov. is the fourth species described within this genus with 2-segmented P2–P4 endopods. The inclusion of the new species in *Pseudomesochra* requires the modification of some autapomorphic characters of the genus, the most important being the presence of four sensilla on the rostrum, a character shared with other Pseudotachidiidae.

Key words: Copepoda, *Pseudomesochra,* taxonomy, continental slope, Sergipe, Brazil

Introduction

Species of the genus *Pseudomesochra* T. Scott, 1902 are ubiquitous in the marine environment, occurring from shallow waters to the abyssal zone. Most of the *Pseudomesochra* species have been described for deep-sea areas (Smirnov 1946; Lang 1948; Bodin 1968; Drzycimski 1968; Coull 1973; Becker & Schriever 1979; Schriever 1982; Willen 1996). At present, *Pseudomesochra* contains nineteen species (including the one described in this paper) and one species *incerta*.

Different opinions existed through time for the systematic position of *Pseudomesochra*. Initially, *Pseudomesochra* was included by authors in the Diosaccidae Sars, 1906 (Lang 1948; Bodin 1968; Drzycimski 1968; Coull 1973; Becker 1974; Becker & Schriever 1979; Schriever 1982). Later on, Willen (1996) translocated *Pseudomesochra* into Paranannopidae Por, 1986. However, according to Willen (2000), *Pseudomesochra* has to be placed into the Pseudotachidiidae as a new subfamily Pseudomesochrinae.

In a general revision of the Thalestridimorpha Lang, 1948, the Pseudotachidiidae Lang, 1936 were raised to family rank and removed from the Thalestridae Sars, 1905, to which they had been previously assigned as a

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subfamily. They do not show the autapomorphies of the Thalestridimorpha, but clearly share those of the higher taxon Podogennonta, because of their distinctive swimming leg 1 (P1). The Pseudotachidiidae can easily be recognized as monophylethic by numerous autapomorphies, such as the shape of the maxillular praecoxal spines and maxillar endite setae, the setation of the maxilliped, the specialized female swimming leg 5 (P5), the presence of large anterior pores on the rostrum, and sexual dimorphisms on the male P2 and P3 (Willen 1999).

This work is a contribution to the knowledge of species composition of the Copepoda Harpacticoida community in the Sergipe continental slope (Brazil) and adds a new member to the deep-sea Pseudotachidiidae.

Material and Methods

The sample containing the specimen of *Pseudomesochra* was obtained at 492 m depth on the continental slope of Sergipe, Northeastern Brazil, on 21st April 2002 (NE2002-C1) during the Oceanographic Campaign that aimed to characterize the environmental conditions and communities of the deep sea.

The sediment samples were obtained using a modified USNEL SPADE CORER MKI box-corer, designed to collect 0.25m^2 of sediment subdivided into 25 subsamples. For each core, 3 subsamples of 10 cm x 10 cm width (area of 0.01m^2) and 5 cm length were used for meiofauna collection. Each sample was fixed in 10% formalin buffered with borax.

In the laboratory, copepods were transferred to 70% alcohol and glycerine. The *Pseudomesochra* specimen was sorted with the aid of a Leica MZ 12.5 stereomicroscope.

The female holotype of *Pseudomesochra longiseta* sp. nov. selected for description was drawn from the dorsal and lateral side before dissection. The dissected parts were mounted in glycerine on slides. Drawings were made with the aid of a camera lucida on a Leica DMR microscope equipped with differential interference contrast (DIC) at 1000x magnification.

Abbreviations used in the text: A1—antennule, A2—antenna, md—mandible, mxl—maxillula, mx—maxilla, mxp—maxilliped, enp—endopod, exp—exopod, enp/exp1–3—first to third segment of enp/exp, FR—Furcal rami, P1–P5—swimming legs 1–5.

Pseudomesochra longiseta sp. nov.

Material. The holotype (18835 MZUSP = 29 slides) is deposited in the Museum of the University of São Paulo (MZUSP), Brazil. Female holotype was registered at station 6 (11°29'42"S 037°09'41"W), depth 492 m.

Etymology. The species name *longiseta* refers to the very long terminal “rat-tail” seta present on the second segment of the Exp A2.

Description of female Holotype. Habitus (Fig. 1). Total body length measured from anterior tip of rostrum to posterior margin of telson: 0.63 mm. Including the furcal rami: 0.73 mm. There is a distinct separation between broad prosome and smaller urosome; spinules, sensilla and pores are distributed dorsally and laterally on cephalothorax and abdomen. Anal somite broken, with outer spinules and one pair of sensilla.

Rostrum (Fig. 2) very large and broad; two pairs of sensilla located medially and subapically; pore on dorsal surface.

Antennule (Fig. 2) 5-segmented. First segment broader than long, trapezoid in shape, with several spinules and 1 “rat-tail” seta. Second segment nearly square in shape, all setae of “rat-tail” shape. Third segment smallest, all setae of “rat-tail” shape. Fourth segment on its outer margin elongate, forming a protrusion which bears an aesthetasc accompanied by 2 “rat-tail” setae, and with 3 additional “rat-tail” setae. Fifth segment long, terminally with small aesthetasc, and with 13 setae, 7 of which “rat-tailed”. Setal formula: 1/1; 2/10; 3/8; 4/5 + aesthetasc; V (13 + aesthetasc).

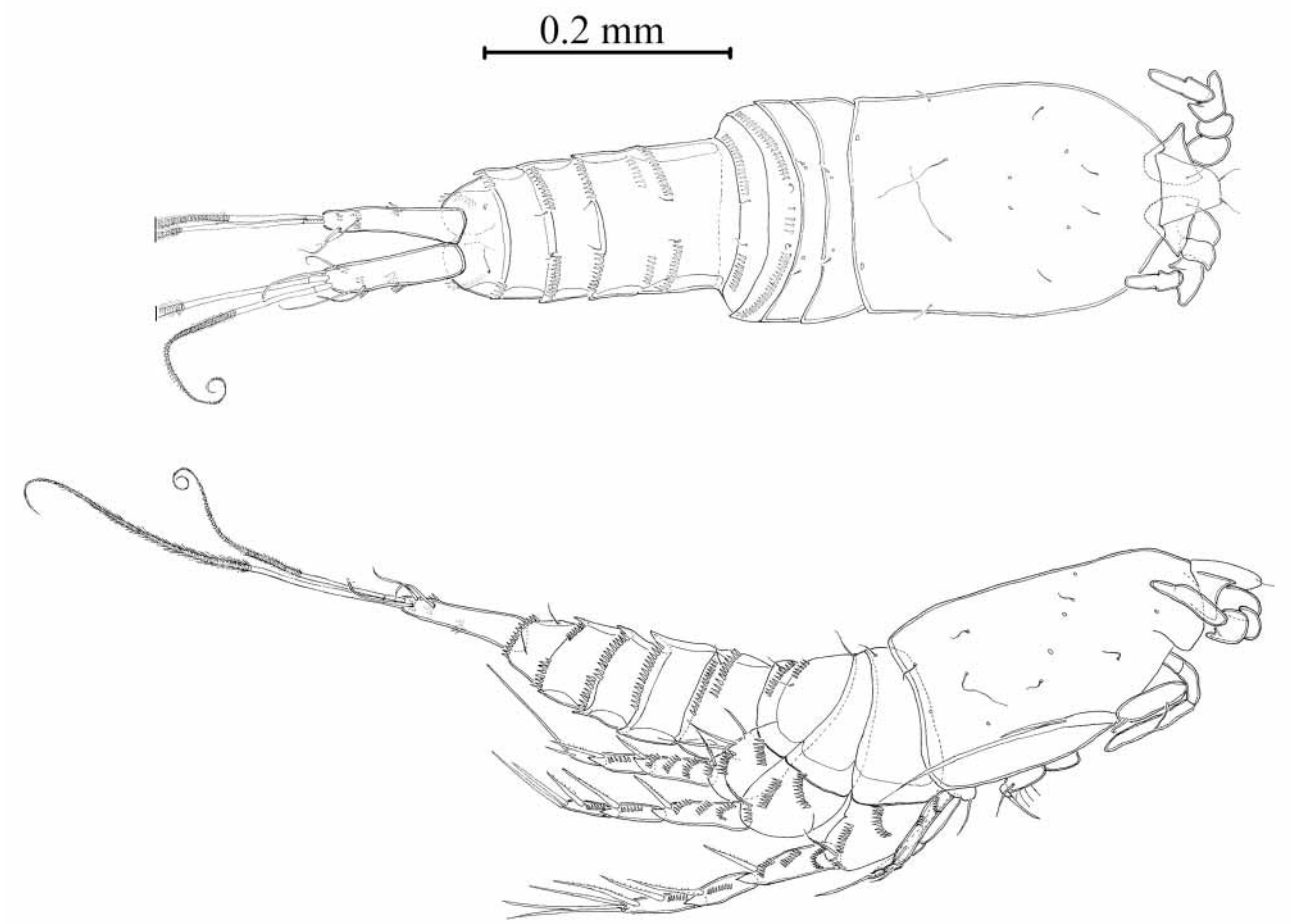

FIGURE 1. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. Habitus, lateral and dorsal sides.

Antenna (Fig. 3) allobasis with spinules and 1 pinnate seta on outer margin. Exp 2-segmented. Exp1 basally with 1 pinnate seta and several spinules, terminally with 1 bare seta. Exp2 proximally with small tube pore and 1 small bare seta, terminally with 1 bare seta and 1 very long "rat-tail" seta bearing a long tube pore on its distal part. Enp2 with several rows of spinules, 3 "rat-tail" setae on outer margin, and terminally with 6 "rat-tail" setae (all broken).

Furcal rami (Fig. 4) four times longer than broad. Setae I–V bipinnate. Seta I very small, located on the proximal half of the outer margin; II on distal half of outer margin; III subterminally on outer margin; IV and V well developed, "rat-tail" shaped, inserting terminally; seta VI bipinnate; seta VII triarticulate, bare. Spinules present on the outer, inner and terminal margin of the FR.

Mandible (Fig. 5). Corpus large. Gnathobase with bi- and tridentate slender teeth; 1 long, pinnate seta on the inner side. Palp biramous; basis with rows of spinules and 4 setae (1 pinnate and 3 bare); exp and enp 1-segmented, enp long and slender, bigger than exp, with 3 lateral setae. Exp with spinules, 6 bare setae and 1 seta.

Maxillula (Fig. 6). Praecoxal arthrite with 9 apical spines and 2 surface setae. Coxal endite with 5 bare setae. Basis armed with 7 slender bare setae. Exp with 2 bare and 1 pinnate setae; Enp with 2 bare setae.

Maxilla (Fig. 7). Syncoxa with 2 rows of spinules and 3 endites. Proximal endite with few spinules, terminally with 3 setae. Middle endite with 1 uniplumose and 2 pinnate spines (one spine with terminal tube pore). Distal endite with 1 bare, 1 plumose, and 1 pinnate spine terminally. Enp not clearly defined at base, with 4 bare setae; syncoxa and basis fused, terminally with 1 strong spine, 1 small and 1 longer terminal seta.

Maxilliped (Fig. 5). Syncoxa and basis each with several spinules and 1 bare seta. Enp fused with seta, forming a bipinnate claw, which bears 1 additional bare seta.

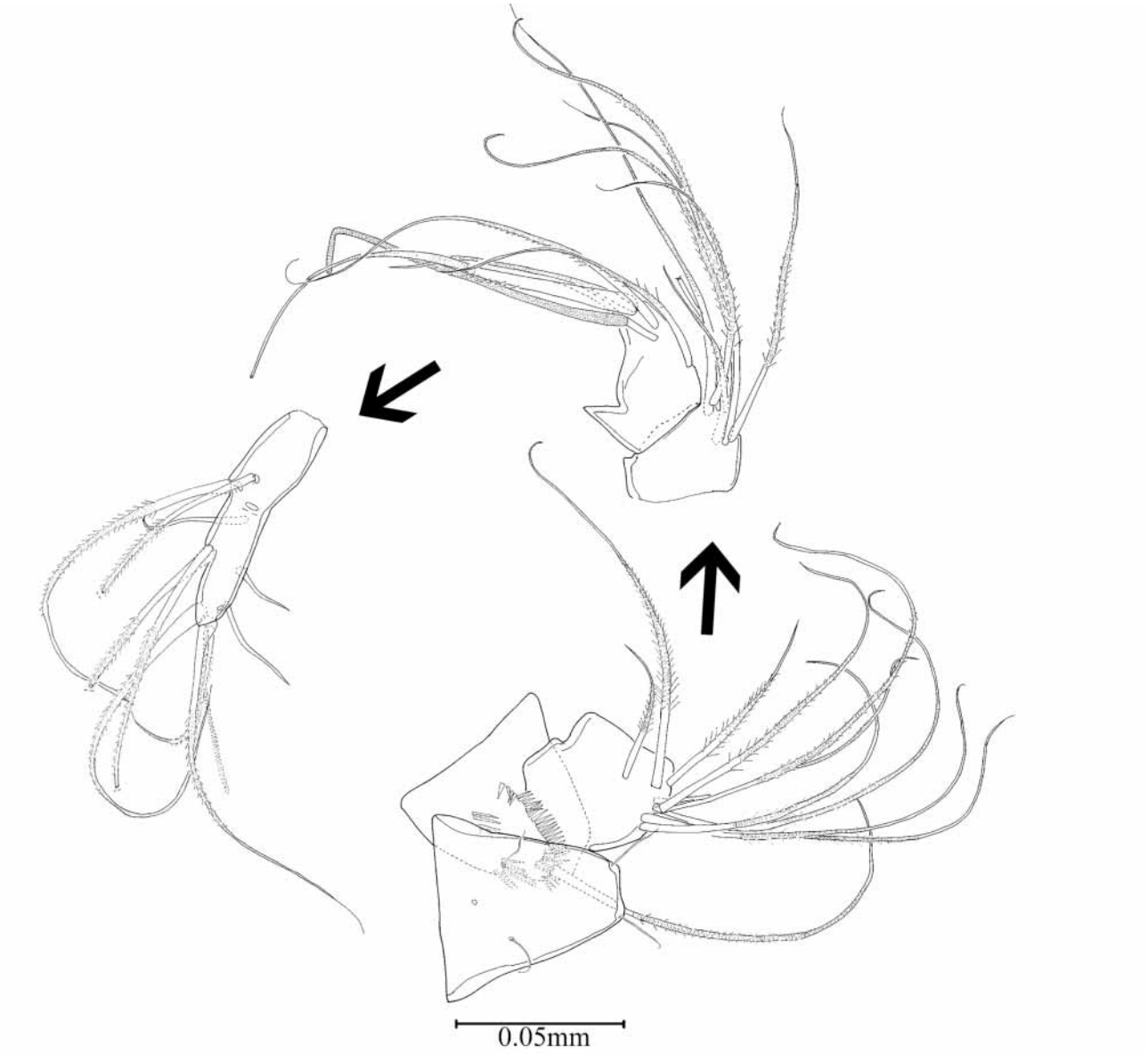

FIGURE 2. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. A1 and rostrum.

P1 (Fig. 8). Coxa and basis with spinules on distal margins. Basis with 2 pores and 1 inner seta, outer seta broken. Exp 3-segmented, enp 2-segmented. Exp1 longer than exp2 and exp3 combined. Exp1 and exp2 with outer pinnate spine. Exps1–3 with outer spinules; exp1 additionally with inner spinules; exp2 with inner plumose seta; exp3 with 2 terminal and 2 outer "rat-tail" setae. Enp1 and enp2 with outer spinules. Inner seta of enp1 with asymmetrical ornamentation. Enp2 with 2 inner setae, terminally with 2 "rat-tail" setae.

P2–P4 (Figs. 9, 10, 11). Swimming legs with pronounced intercoxal sclerite. Coxa of P4 broken at outer margin, with rows of spinules and with pore; intercoxal sclerite with "U" inverted in form and terminal spinules. Coxae and intercoxal sclerites of remaining swimming legs not drawn. Bases with 1 outer pinnate seta, spinules on margins, and 1 or 2 pores. Exps 3-segmented, enps 2-segmented; exps longer than enps, with pores on the segments. Exps1 and 2 with 1 inner asymmetric seta and 1 outer pinnate spine; P2 exp3 with 1 asymmetric and 1 naked inner seta, 1 asymmetric seta, 1 pinnate terminal seta, and 3 outer pinnate setae; P3 exp3 with 1 asymmetric and 1 pinnate inner setae, 2 asymmetric terminal setae and 3 outer pinnate setae; P4 exp3 with 2 pinnate inner setae, 1 "rat-tail", 1 asymmetric terminal setae and 3 outer pinnate setae. Enps1 and 2 with spinules on the outer margin and between the segments. Enps1 with inner asymmetric seta; Enp2 with

small spinules on the middle of the segment. Enps2 with 2 inner asymmetric setae, 1 small pinnate and 1 asymmetric terminal setae, and 1 outer pinnate seta. For comparison of ornamentation of swimming legs see Tab. 1

P5 (Fig. 12) exp broken. Enp with 2 terminal and 2 inner pinnate setae.

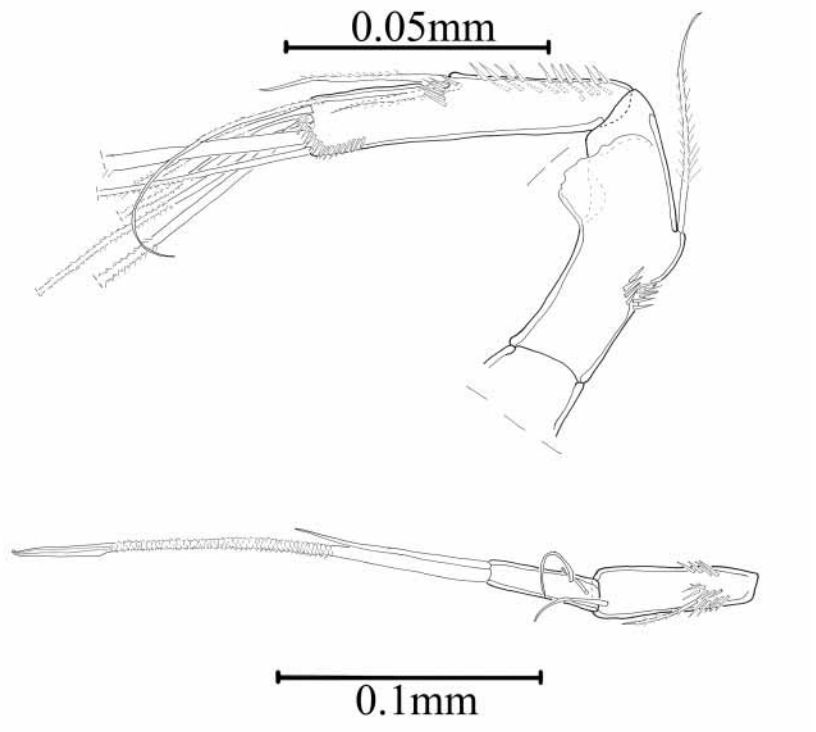

FIGURE 3. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. A2.

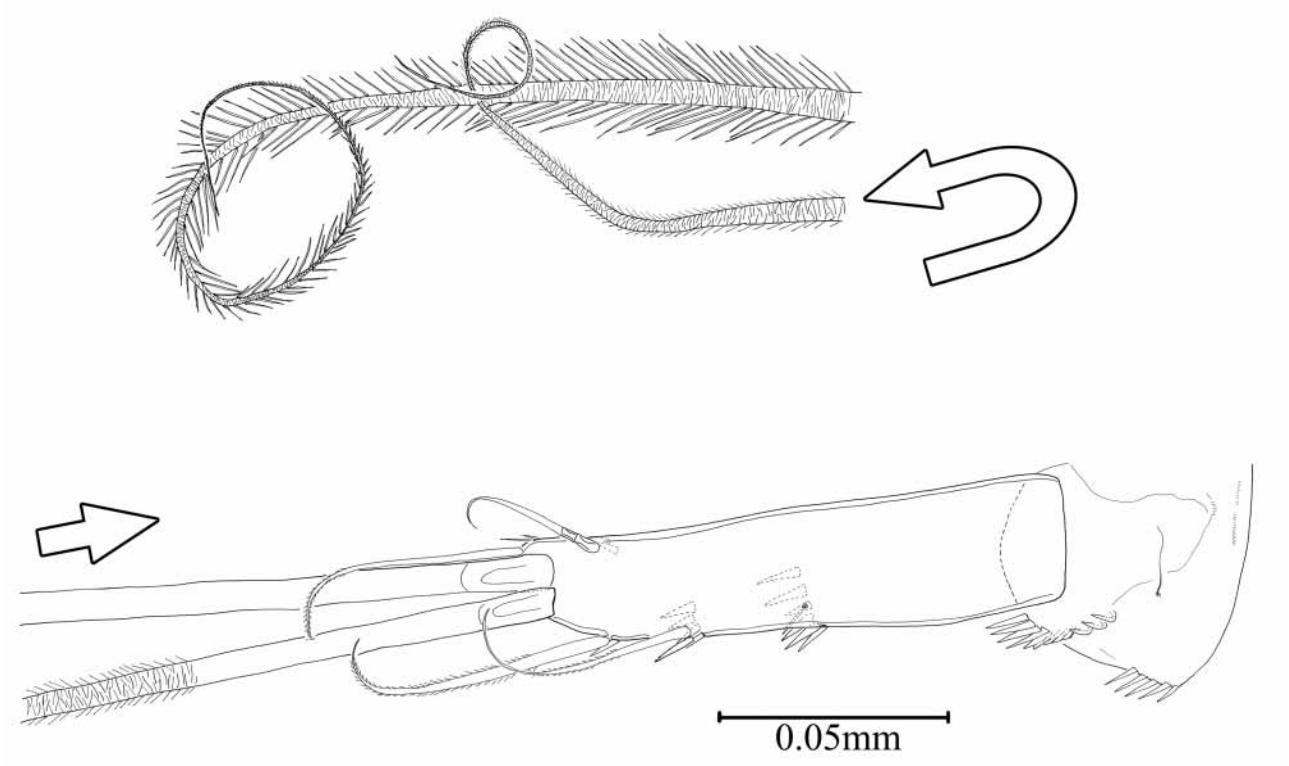

FIGURE 4. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. FR.

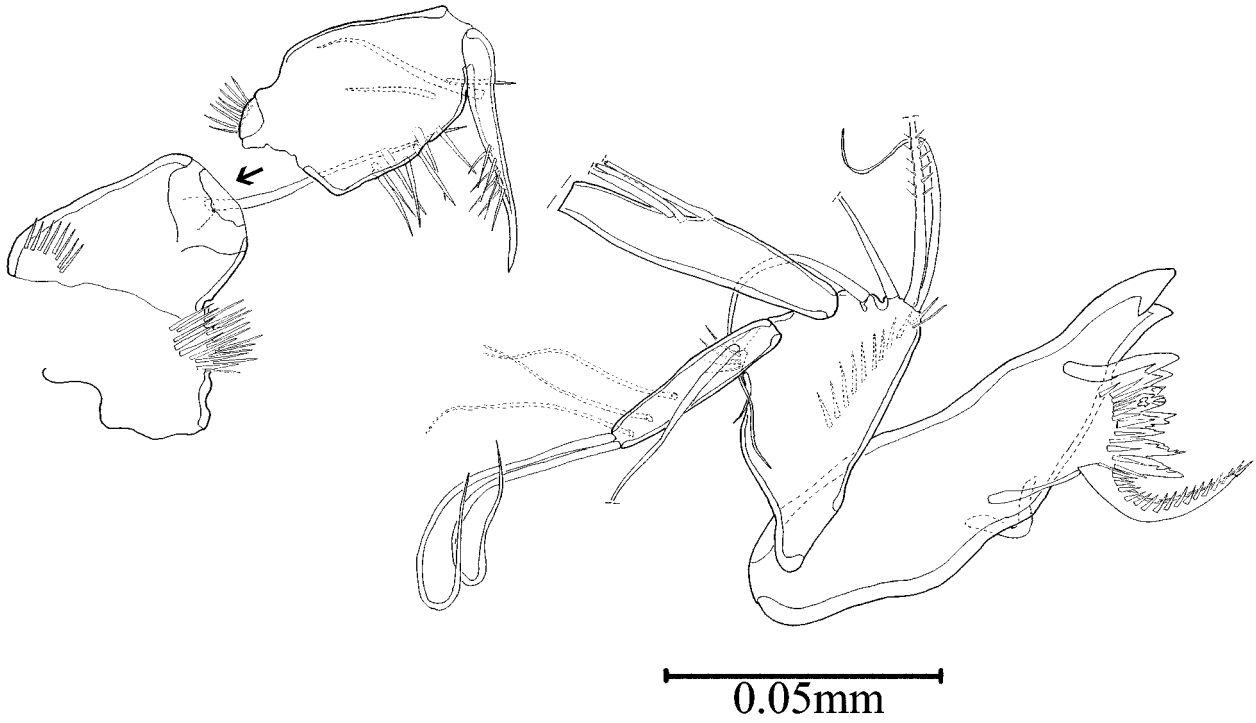

FIGURE 5. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. Md and mxp.

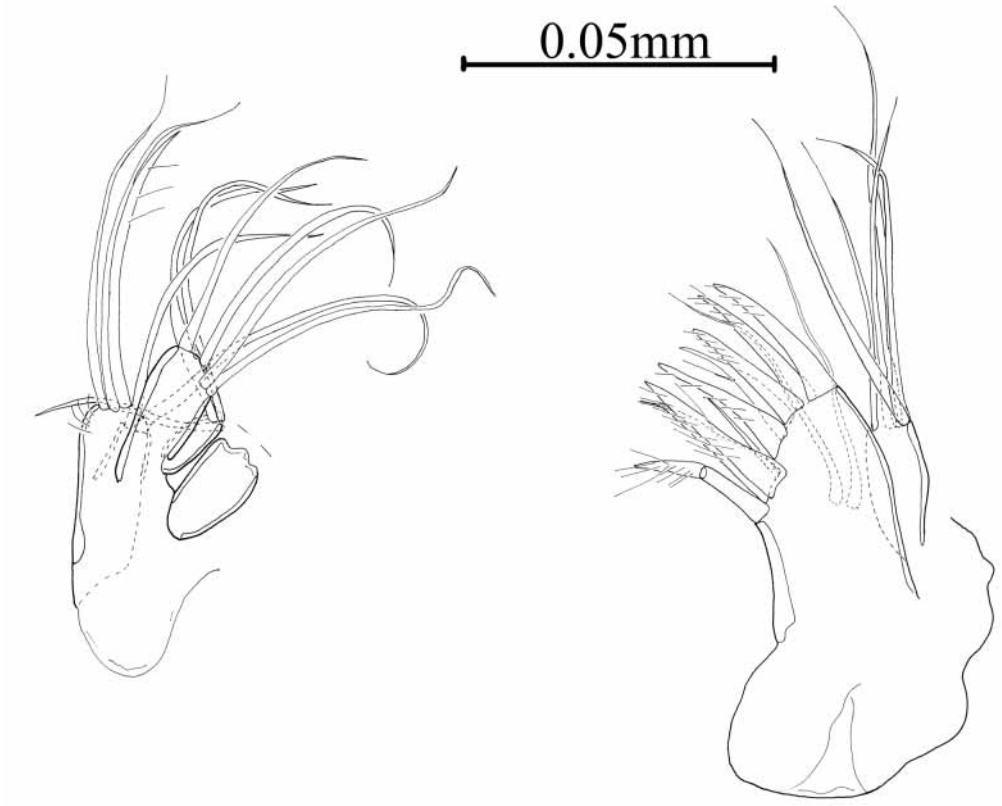

FIGURE 6. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. Mxl.

FIGURE 7. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. Mx.

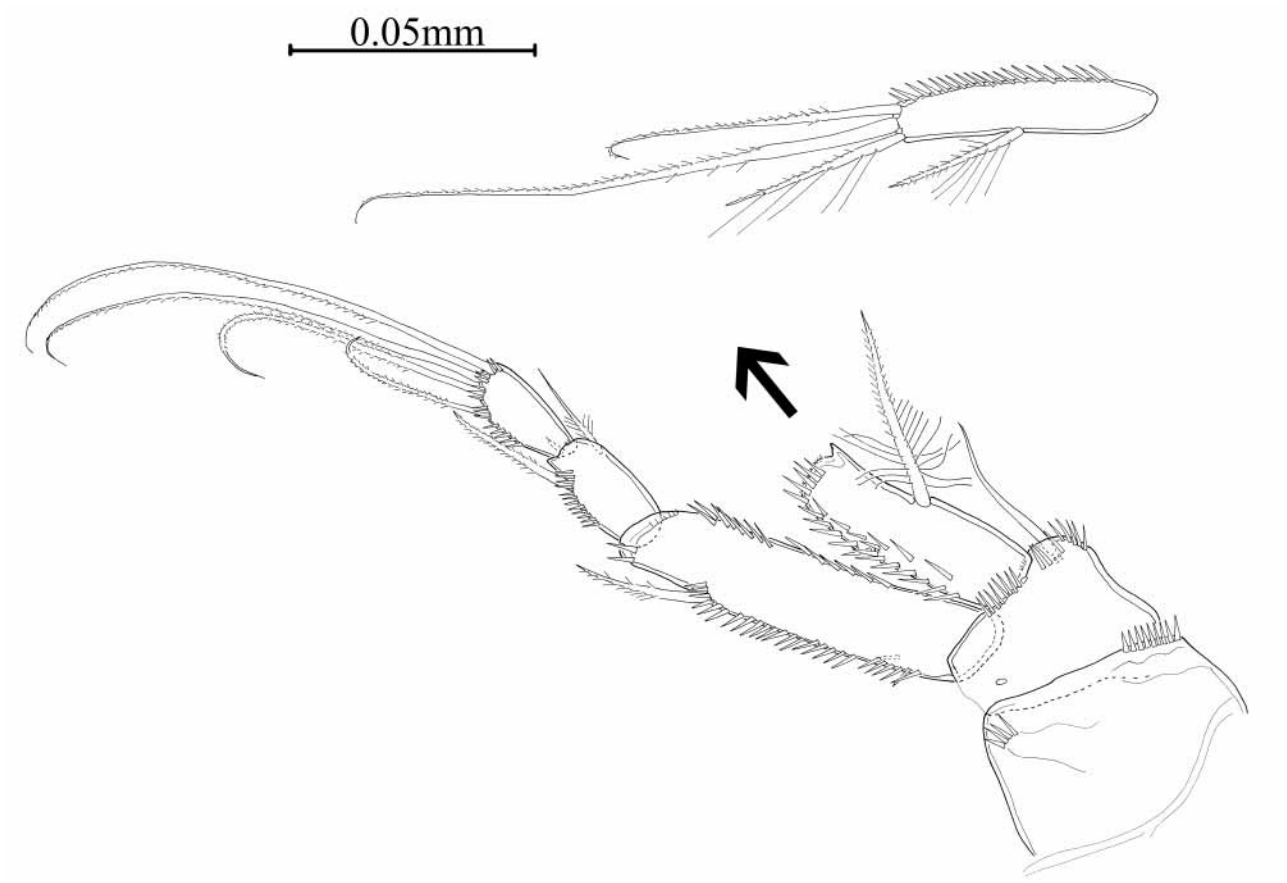

FIGURE 8. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. P1.

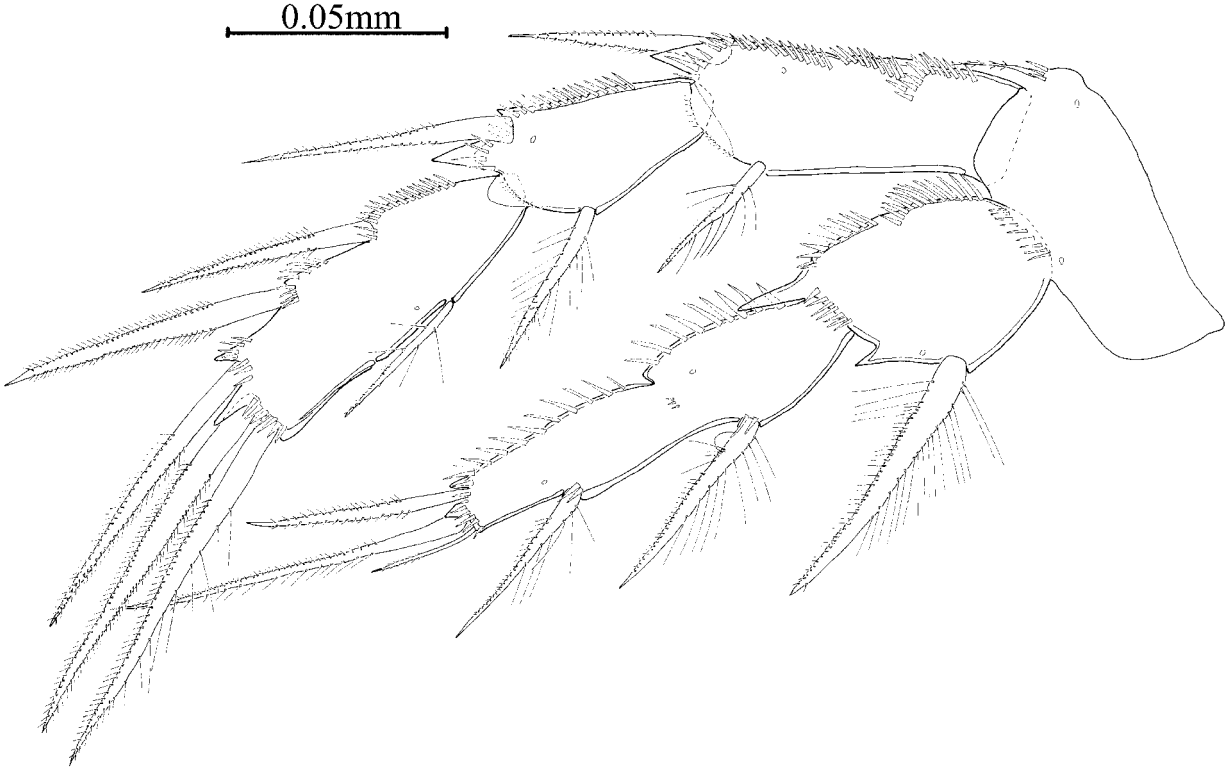

FIGURE 9. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. P2.

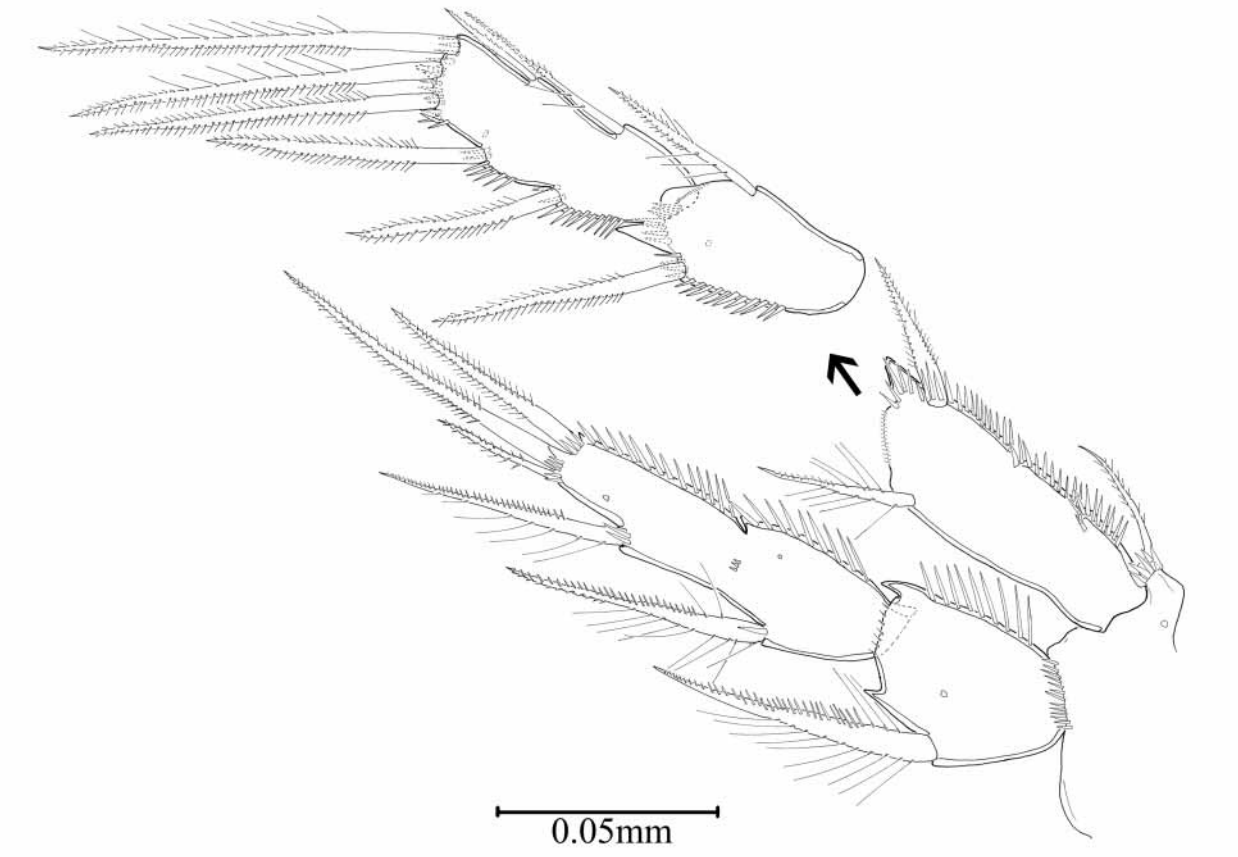

FIGURE 10. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. P3.

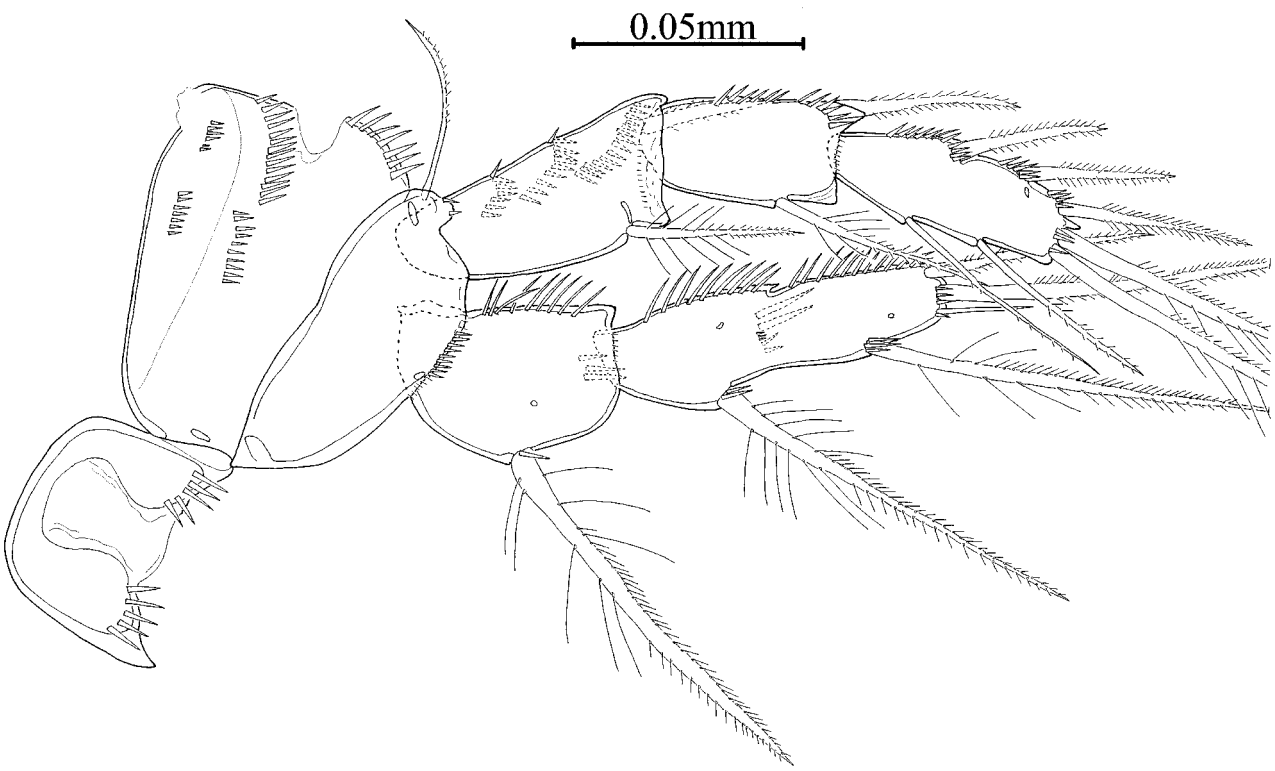

FIGURE 11. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. P4.

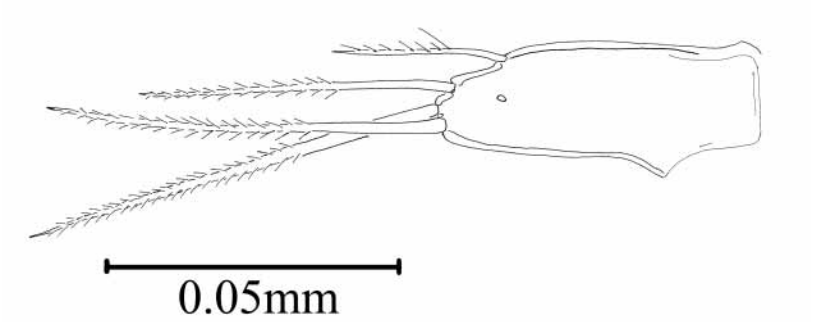

FIGURE 12. *Pseudomesochra longiseta* sp. nov., holotype female from Sergipe, Brazil. P5.

Discussion

Most of the *Pseudomesochra* species were described in the deep-sea from 200 to 3,950 m depth (Smirnov 1946; Lang 1948; Bodin 1968; Drzycimski 1968; Coull 1973; Becker & Schriever 1979; Schriever 1982; Willen 1996). However, there are some occurrences in shallow waters, e.g., *P. tamara* Smirnov, 1946 (60 m) and *P. media* Sars, 1911 (20 m) (Lang 1948). They have an average body length of about 0.6 mm, normally not exceeding 1.4 mm. The new species described herein was found in a depth of 492 m on muddy sediments, at a temperature of 6.8 ºC and salinity 34.4 psu. This is the first record of the genus *Pseudomesochra* for Northeastern Brazil and the first register of a deep-sea species of this genus for the Southern Atlantic Ocean.

According to Willen (1996), the genus *Pseudomesochra* presently includes 18 species and 1 species *incerta* (*P. perplexa* Bodin, 1968). *Pseudomesochra longiseta* sp. nov. is the 19th registered species (Table 1). Initially, within the Diosaccidae, *Pseudomesochra* has always been placed close to the *Stenhelia-Delavalia* group. However, a closer look reveals a lot of differences between *Pseudomesochra* and this group (Willen

1996), indicating their different phylogenetic origin. Willen (1996) thus removed *Pseudomesochra* from the Diosaccidae and placed it in the Paranannopidae as a new subfamily: Pseudomesochrinae T. Scott, 1902. Reviewing the Thalestridimorpha, Willen (1999; 2000) raised Pseudotachidiidae Lang, 1936 to family rank and included within this family four subfamilies: Paranannopinae; Donsiellinae; Pseudotachidiinae; and Pseudomesochrinae. According to Willen (1996), the genus *Pseudomesochra* is characterized by the following autapomorphies: 1) modified "rat-tail" setae outwardly curved on furca; 2) inner terminal setae of enps and exps of swimming legs and antenna "rat-tailed"; 3) characteristic spinule ornamentation on the maxilliped; 4) P1 enp2 terminal armature consisting of outer short claw-shaped setae, mid longer one and an inner long "rat-tail" seta; 5) P1 exp3 with only 4 setae/spines (1 outer spine missing); 6) both rami of P5 fused in a characteristic way; 7) relatively smooth setae on the female antennule; and 8) the presence of only two sensilla on the rostrum.

TABLE 1. Summary of P1–P4 setal formulae of *Pseudomesochra* (adapted from Coull 1973).

Pseudomesochra	P1		P2		P3		P4	
	Exp	Enp	Exp	Enp	Exp	Enp	Exp	Enp
longiseta sp. nov.	0.1.022	1.121	1.1.223	1.221	1.1.223	1.221	1.1.223	1.221
gertwilleni Willen, 1996	0.0.022	0.121	0.1.213	1.1.121	0.1.213	1.1.121	0.1.213	1.1.121
laptevensis Willen, 1996	0.1.022	0.121	0.1.313	1.1.221	0.1.413	1.1.121	0.1.413	1.1.121
meridianensis Willen, 1996	0.0.022	1.121	0.1.313	1.1.221	0.1.413	1.1.221	0.1.413	1.1.121
scheibeli Schriever, 1982	0.1.022	0.121	0.1.222	1.1.221	0.1.322	1.1.221	0.1.322	1.1.121
abyssalis Becker & Schriever, 1979	0.0.022	1.121	0.1.222	1.1.221	0.1.322	1.1.211	0.1.322	1.1.111
beckeri Becker & Schriever, 1979	0.0.022	1.121	0.1.222	1.1.221	0.1.322	1.1.211	0.1.322	1.1.111
minor Becker, 1974	0.0.022	1.121	0.1.223	1.1.221	0.1.223	1.1.221	0.1.123	1.1.221
gemina Coull, 1973	0.1.022	0.121	0.1.223	1.1.221	0.1.323	1.1.121	0.1.323	1.1.121
aberrans Bodin, 1968	0.1.022	0.121	0.1.222	1.1.221	0.1.322	1.1.221	0.1.322	1.1.121
? perplexa Bodin ,1968	0.0(?).022	1.121	0.1.222	1.1.mod	0.1.322	1.1.120	0.1.222	1.1.120
tatianae Drzycimski, 1968	0.1.022	0.121	0.1.223	1.1.221	0.1.323	1.1.211	0.1.323	1.1.211
tamara Smirnov, 1946	0.1.022	1.121	1.1.223	1.121	1.1.323	1.221	1.1.223	1.221
similis Lang, 1935	0.1.022	0.121	0.1.223	1.1.221	0.1.323	1.1.221	0.1.323	1.1.221
divaricata (Sars, 1911)	0.0.022	0.121	0.1.023	1.221	0.1.023	1.221	0.1.023	1.221
latifurca (Sars, 1911)	0.1.022	0.121	0.1.123	1.1.121	0.1.123	1.1.121	0.1.123	1.1.111
media (Sars, 1911)	0.1.022	1.121	0.1.323	1.1.121	unknown	1.1.221	unknown	
*crispata (*Brady, 1910)	0.0.022	0.121	unknown					
longifurcata T. Scott, 1902	0.0.022	0.121	0.1.123	1.221	0.1.023	1.221	0.1.023	1.1(2)21
brucei (T. & A. Scott, 1901)	0.0.022	1.121	unknown				0.1.323	1.1.121

Pseudomesochra longiseta sp. nov. clearly belongs to Pseudomesochrinae. It shares with most *Pseudomesochra* species the following apomorphies: modified "rat-tail" setae outwardly curved on furca; inner terminal setae on exps P1 and P4 and on the antenna "rat-tailed"; characteristic spinule ornamentation on the maxilliped; P1 exp3 with only 4 setae; and rami of P5 fused. Contrary to other *Pseudomesochra* species, *P. longiseta* sp. nov. presents 4 sensilla on the rostrum, a plesiomorphic characteristic commonly found in the family Pseudotachidiidae. The absence of "rat-tail" inner terminal setae on the enps and on some exps of the swimming legs is not frequent in *Pseudomesochra*, but secondary losses of these setae on enps also occur in *P. laptevensis* Willen, 1996 and in *P. aberrans* Bodin, 1968. The terminal armature of P1 enp2 presents a differ-

ent arrangement in *P. longiseta* sp. nov. but with the presence of characteristic "rat-tail" setae.

Pseudomesochra longiseta sp. nov. is the fourth described species with 2-segmented endopods of P2–P4 (other species are *P. longifurcata* T. Scott, 1902, *P. divaricata* Sars, 1911 and *P. tamara*). *Pseudomesochra longiseta* sp. nov. and *P. tamara* can be distinguished from all other species of the genus *Pseudomesochra* by the maintenance of one inner seta on exp1 of P2–P4. *Pseudomesochra longiseta* sp. nov. is easily distinguished from *P. tamara* due to the presence of a 3-segmented A2 exp in the latter species. Other differences, compared to *P. tamara*, include the reduction of one inner seta on P3 exp3, and the maintenance of one additional inner seta on P2 enp2.

Pseudomesochra longiseta sp. nov. is also the only species within the genus presenting a very long terminal "rat-tail" seta with tube pore on A2 exp2.

Considering the autapomorphies of the genus *Pseudomesochra* cited by Willen (1996), one major amendment should be considered after the description of *P. longiseta* sp. nov., the exclusion of the "2 sensilla on the rostrum" characteristic.

Several important variations found among *Pseudomesochra* species, such as the different segmentation patterns in P2–P4 enps and A2 exp, or the different number of rostral sensilla, still point to the need of a major revision. Unfortunately, most species were described a long time ago and without enough detail. Thus, revision studies must wait until more new descriptions or re-descriptions for the known species have been completed.

Acknowledgements

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