This is an Accepted Manuscript of an article published by Taylor & Francis in *Marine Biology Research* on 19 August 2020, available online: https://doi.org/10.1080/17451000.2020.1758946.

A new species of *Pantopipetta* (Pycnogonida: Austrodecidae) from the North Pacific, with a note on the palp articulation

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Acknowledgments

We thank Asako K. Matsumoto and Hiroshi Namikawa for the opportunity to join cruise KT-09-2; Captain Shoichi Suzuki and the crew of R/V *Tansei-maru*, Yukihiko Nakano of Marine Work Japan, and researchers aboard for support during the cruise; Tomomi Kaneko and Yoshie Takahashi for providing literature; and Matthew H. Dick for reviewing the manuscript and editing our English.

Funding

No funding.

ABSTRACT

We describe a new pycnogonid species, *Pantopipetta lenis* sp. nov., collected from 141–152 m depth in southern Japan, North Pacific Ocean. *Pantopipetta lenis* closely resembles *Pantopipetta auxiliata* and *Pantopipetta oculata* in having auxiliary claws on the legs, but differs from them in lacking dorsodistal tubercles on the lateral processes, having first short distal article of palp shorter than combined length of other three short distal articles, having one slight dorsal tubercle on the coxa 1 of legs, having a short dorsal tubercle on the coxa 3 of legs, and lacking a long dorsodistal tubercle on the

femur of legs. The palp base (the short article-like structure proximal to the longest palp article) in *P. lenis* is articulated with the cephalon, i.e., it is actually an article. Although the palp base has been regarded as a lateral process of the cephalon, it is the first article of the palp in *P. lenis*.

KEYWORDS

Chelicerata, Pantopoda, Stiripasterida, sea spider, Ogasawara

Introduction

Austrodecidae is the sole family in the suborder Stiripasterida, with species distinguished from those in other pycnogonid families by having a slender, tube- or pipette-shaped proboscis with distal annulation. Austrodecidae now comprises two genera, *Austrodecus* Hodgson, 1907 and *Pantopipetta* Stock, 1963, with the oviger in *Austrodecus* having six or fewer articles (absent in males of several species) and that in *Pantopipetta* having 10 articles and a terminal claw (Child 1994).

Pantopipetta is widely distributed geographically and vertically, having been reported from all oceans except the Arctic (Figure 1), and from depths of 66–6675 m (Stock 1968; Turpaeva 1971). *Pantopipetta* is a relatively rare pycnogonid genus (Hedgpeth and McCain 1971). It currently contains 15 species (Turpaeva 1993; Child 1994; Stock 1994), eight of which have not been reported since their original description.

Among regions, the North Pacific Ocean has the fewest records of *Pantopipetta*. Only the putatively cosmopolitan species *Pantopipetta longituberculata* (Turpaeva, 1955) has been reported from the region, from five sites in the Kuril-Kamchatka Trench at depths of 4850–6675 m (Turpaeva 1955, 1971; Nakamura et al.

2007; Figure 1). During a cruise of the R/V *Tansei-maru* (Japan Agency for Marine-Earth Science and Technology, JAMSTEC) around the Ogasawara Islands, southern Japan, North Pacific, two male *Pantopipetta* individuals were collected from depths of 141–152 m. Detailed morphological observation revealed that they are an undescribed taxon, which we describe here.

Material and methods

Pycnogonids were collected by biological dredge during cruise KT-09-2 of R/V *Tansei-maru* in 2009, and fixed and preserved in 99% ethanol. Appendages were detached from the trunk by using chemically sharpened tungsten needles, mounted on glass slides in glycerin, and observed with an Olympus BX51 microscope. Body parts were observed with a Nikon SMZ 1500 microscope. Digital images were taken with an Olympus OM-D E-M1 Mark II digital camera equipped with a Zhong Yi Optics FREEWALKER super-macro lens (whole body) or the camera attached to the BX51 via Micronet NY-1S and NY1SMOFA adapters (appendages). Illustrations were prepared with CLIP STUDIO PAINT PRO ver. 1.6.6 (CELSYS, Japan) and Adobe Illustrator CS6 from draft line drawings made using a drawing tube. Morphological terminology follows Child (1979), except that the term ‘article’ is used instead of ‘segment’ for all appendages. The formula for the number of compound spines on the strigilis follows Stock (1968) (e.g., the formula ‘3:2:1:1’ indicates that oviger articles 7–10 have three, two, one, and one spines, respectively). Measurements were made axially (dorsally for the trunk; laterally for the palp, proboscis, ocular tubercle, abdomen, and legs) and are presented in millimetres. Measurements for congeners were obtained from original descriptions or measured from original illustrations. Trunk length was measured from the palp insertion to the base of the abdomen, and trunk width as the width of the

segment at the narrowest portion of the trunk. Our specimens have been deposited in the Invertebrate Collection of the Hokkaido University Museum (ICHUM), Japan.

Taxonomy

Family Austrodecidae Stock, 1954

Genus *Pantopipetta* Stock, 1963

Pantopipetta Stock, 1963: 334. Type species: *Pipetta weberi* Loman, 1904.

Amended diagnosis, based on Child (1994)

Austrodecids with trunk usually lacking dorsomedian tubercles; lateral processes almost always very long, slender; palp with 3 or 4 short distal articles not arranged in a subchelate structure; oviger 10-articulated in both sexes, with strigilis, short denticulate spines, and terminal claw.

Remarks

Child (1994) suggested that the palp base (the short article-like structure proximal to the longest palp article) is a lateral process of the cephalon; he thus treated the longest palp article as the first palp article. In our *Pantopipetta* specimens, however, the palp base is articulated with the cephalon (see the Remarks section for the species description below) and is actually an article, indicating that the palp base is the first palp article, and the longest article is the second palp article. Due to the difference in our and Child's (1994) interpretations of the palp articulation, we did not include in the amended diagnosis the number of articles in the palp, but only the number of short distal articles.

Pantopipetta lenis sp. nov.

[New Japanese name: Tofushi-suikuchi-umigumo]

(Figures 2, 3)

Material examined

Holotype: male (ICHUM6038; trunk length 0.59), 5 slides and 1 vial; 27°02.942′N 142°07.166′E to 27°02.948′N 142°07.251′E, Stn TW02-04, west of Chichijima Island, Ogasawara Islands, northwestern Pacific, 141–152 m depth, 19 March 2009, collected by Keiichi Kakui.

Paratype, 1 male (ICHUM6039; trunk length 0.55), 3 slides and 1 vial; same collection information as for holotype.

Diagnosis

Trunk segments 2–4 short (length/width ratios 1.1, 0.9, and 1.9); ocular tubercle with swollen tip; lateral processes without dorsodistal tubercle; palp with four short distal articles; coxa 1 of legs with slight dorsodistal tubercle; coxa 3 of legs with short (length 0.5 times coxa-3 width), triangular dorsal tubercle; femur of legs lacking dorsodistal tubercle; propodus of legs with auxiliary claw.

Description of male, based on holotype

Trunk (Figures 2A, B; 3A) fully segmented; segments 2–4 short. Lateral processes long, separated by about own basal diameter, without dorsodistal tubercle. Ocular tubercle (Figure 2A, a1) tall, erect, with swollen tip; four tiny eyes present. Proboscis pipette annulated (not illustrated). Abdomen longer than trunk-segment 4, with pair of subposterior setae.

Palp (Figures 2C, c1; 3B, C) 8-articulated. Article 4 with two strong, curved spines. Articles 5–8 (= 4 short distal articles) each with several distal setae.

Oviger (Figure 2D, d1) with 10 articles and terminal claw. Article 4 with middle tubercle. Articles 7–10 with compound spines in formula 4:3:3:4.

Legs (Figure 2E, F, f1) slender. Coxa 1 of legs 1–4 with slight dorsal tubercle. Coxa 3 of legs 1–4 with short (length 0.5 times coxa-3 width), triangular dorsal tubercle. Femur of legs 3 and 4 with conical cement-gland tube ventrally at ca. 0.6 femur length from proximal margin; tube directed ventrodistally, slightly shorter than femur width. Femur and tibia 1 of legs 1–4 with dorsodistal robust seta. Tibia 2 of legs 1–4 with ventral row of setae and mid-dorsal robust seta. Tarsus of legs 1–4 with ventral row of setae. Propodus of legs 1–4 with ventral row of setae and two auxiliary claws; auxiliary claws similar in size, about half of claw length.

Measurements: trunk length 0.59; width across second lateral processes 0.47; proboscis length 0.98; ocular tubercle length 0.98; abdomen length 0.29; length/width of trunk segments 2–4, 0.15/0.13, 0.13/0.14, 0.17/0.09; length of palp articles 1–8, 0.02, 0.47, 0.07, 0.32, 0.05, 0.04, 0.02, 0.02; length of oviger articles 1–10 and terminal claw, 0.04, 0.09, 0.03, 0.19, 0.07, 0.24, 0.08, 0.06, 0.05, 0.07, 0.02; length of leg-1 articles (from coxa 2; including claw), 0.22, 0.08, 0.40, 0.47, 0.38, 0.03, 0.21, 0.08; length of leg-2 articles (ditto), 0.16, 0.06, 0.38, 0.44, 0.35, 0.03, 0.22, 0.10; length of leg-3 articles (ditto), 0.15, 0.08, 0.33, 0.37, 0.33, 0.04, 0.22, 0.08; length of leg-4 articles (ditto), 0.15, 0.07, 0.33, 0.36, 0.31, 0.04, 0.21, 0.09.

Female. Unknown.

Distribution

So far known only from the type locality, west of Chichijima Island, Ogasawara Islands, northwestern Pacific.

Etymology

The specific name is the Latin adjective *lenis* (smooth, gentle, moderate), referring to the lack of dorsal tubercles on the lateral processes and leg femurs, and the short dorsal tubercles on leg coxae 1 and 3.

Remarks

In having auxiliary claws on the legs, *Pantopipetta lenis* sp. nov. closely resembles *Pantopipetta auxiliata* Stock, 1968 from off the eastern coast of South Africa, and *Pantopipetta oculata* Stock, 1968 from the Andaman Islands, but differs from the latter two species as follows: (i) the lateral processes lack dorsodistal tubercles (*P. auxiliata* has one long, knobby tubercle; *P. oculata* lacks tubercles), (ii) first short distal article of palp shorter than the combined length of the other three short distal articles (shorter in *P. auxiliata*; subequal in *P. oculata*), (iii) coxa 1 of the legs has one slight dorsal tubercle (*P. auxiliata* has one long knobby and one short, smooth tubercles; in *P. oculata*, each of legs 1–3 has three long, knobby and one short, smooth tubercles, and leg 4 has one long, knobby tubercle), (iv) the dorsal tubercle on coxa 3 of the legs is short, its length about 0.5 times the coxa-3 width (in *P. auxiliata* and *P. oculata*, the tubercle is longer than the coxa-3 width), and (v) the femur of leg 2 lacks dorsodistal tubercles (that in *P. auxiliata* and *P. oculata* has one long tubercle with a seta) (Stock 1968).

In *Pantopipetta*, the palp base has been interpreted in two ways. Earlier researchers regarded it as the first palp article (e.g., Stock 1981; Arnaud and Child

1988; Turpaeva 1993), and the number of articles of the palp was counted as seven or eight. Child (1994), however, regarded it as a lateral process of the cephalon, noting (1994: p. 82) ‘no suture or segmentation lines at all around their [= palp bases’] root’. This seems to be the currently accepted idea (e.g., Staples 2019), with the number of palp-articles counted as six or seven. In *P. lenis*, however, we found that the palp base is articulated with the cephalon (Figure 3B, C), that is, is actually an article. The similar short article has also been observed in palp-bearing members in families Ammotheidae, Ascorhynchidae, Colossendeidae, Nymphonidae, and Rhynchothoracidae (Stock 1963; Cano-Sánchez and López-González 2016; Lehmann et al. 2014; Staples 2019; also see Ballesteros et al. 2020). These suggest that the palp base should be regarded as the first palp article, following the earlier interpretation. We have no idea whether the palp base in other *Pantopipetta* species is homologous to the first palp article in *P. lenis*. To resolve this issue, the palp base needs to be reexamined in congeners, and data on the development of the palp are needed.

Acknowledgments

We thank Asako K. Matsumoto and Hiroshi Namikawa for the opportunity to join cruise KT-09-2; Captain Shoichi Suzuki and the crew of R/V *Tansei-maru*, Yukihiko Nakano of Marine Work Japan, and researchers aboard for support during the cruise; Tomomi Kaneko and Yoshie Takahashi for providing literature; and Matthew H. Dick for reviewing the manuscript and editing our English.

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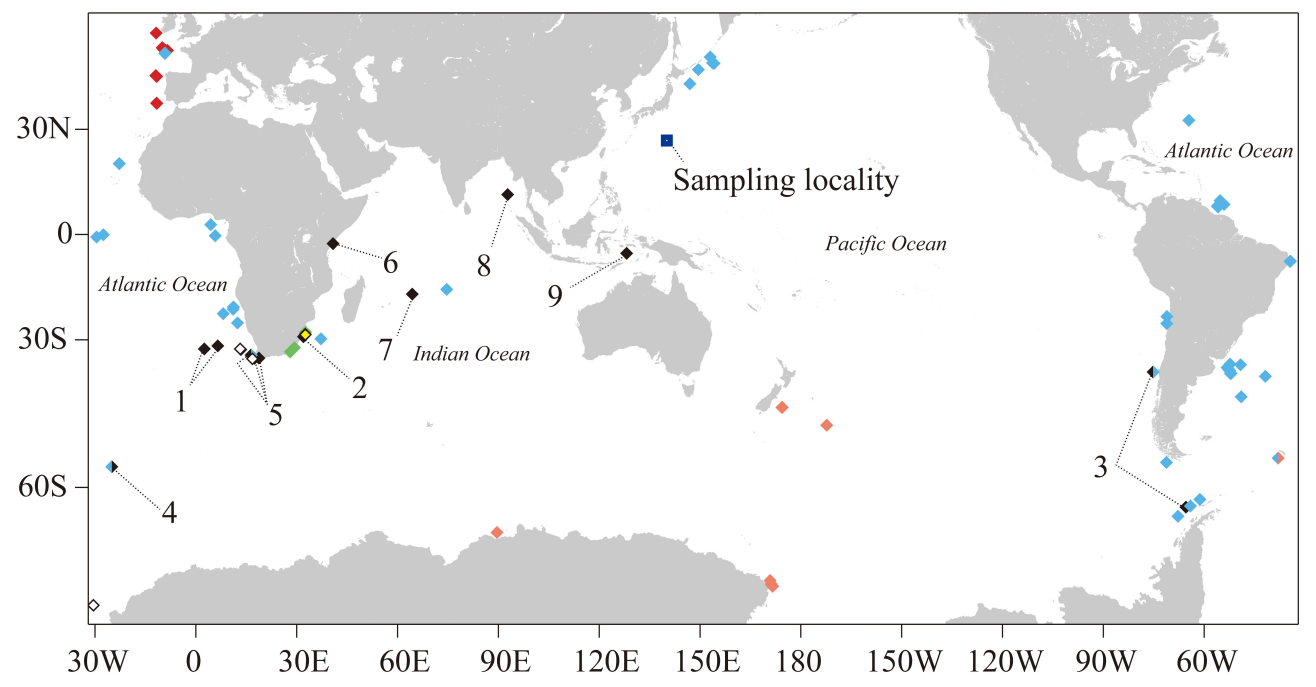
Figure 1. Map showing the global distribution of *Pantopipetta*. Symbols: yellow, *P. armata*; red, *P. armoricana*; orange, *P. australis*; green, *P. bilobata*; white, *P. lata*; light blue, *P. longituberculata*; black, *P. angusta* (1), *P. auxiliata* (2), *P. buccina* (3), *P. brevipilata* (4), *P. capensis* (5), *P. clavata* (6), *P. gracilis* (7), *P. oculata* (8), and *P. weberi* (9). The map and plots were generated with GMT5 software (Wessel et al. 2013). Sources and raw data for the plots are available in Table SI and the Figshare repository (Kakui 2020).

Figure 2. *Pantopipetta lenis* sp. nov., male, holotype: A, body, dorsal view (annulation not illustrated); a1, distal tip of ocular tubercle, dorsal view; B, body, lateral view (annulation not illustrated); C, left palp (arrowheads, boundary between palp article 1 [= palp base] and cephalon; articulation line not illustrated); c1, distal portion of left palp; D, right oviger; d1, strigilis and terminal claw of right oviger (arrow, broken portion); E, left leg 2 (arrow, disjointed hinge); F, left leg 3 (arrow, cement-gland tube); f1, distal portion of left leg 3.

Figure 3. *Pantopipetta lenis* sp. nov., male, holotype, fixed specimen: A, body, dorsal view, left palp, left legs, ovigers, and distal part of right leg 1 detached; B, proximal portion of left palp showing articulation line between palp article 1 (= palp base) and cephalon; C, proximal portion of left palp, photographed in deeper focus plane than B, showing disjunction of cuticular walls at boundary between palp article 1 and cephalon. Arrowheads indicate boundary between palp article 1 and cephalon. Abbreviations: ce, cephalon, small anterior fragment after dissection; p1, palp article 1.


Sampling locality
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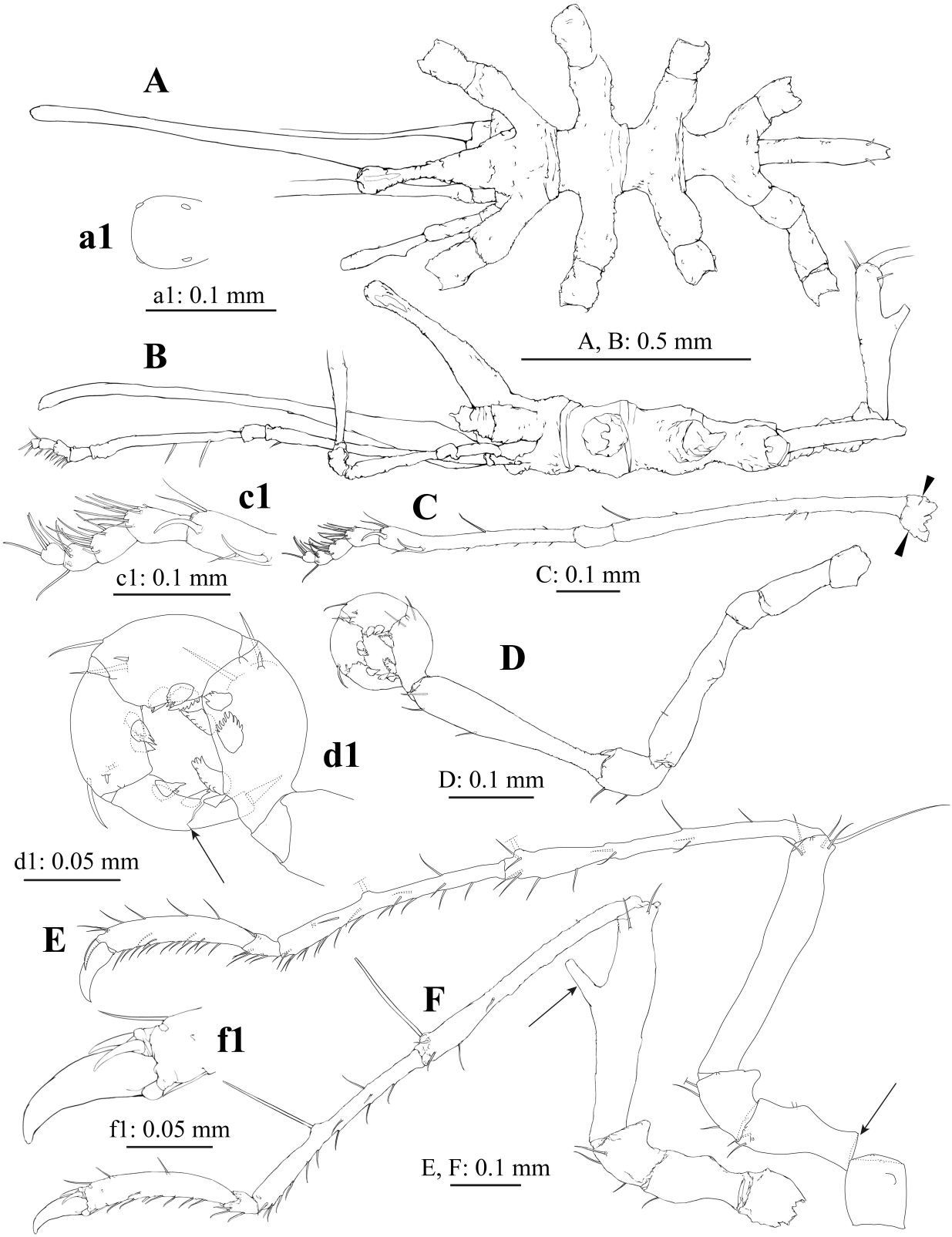
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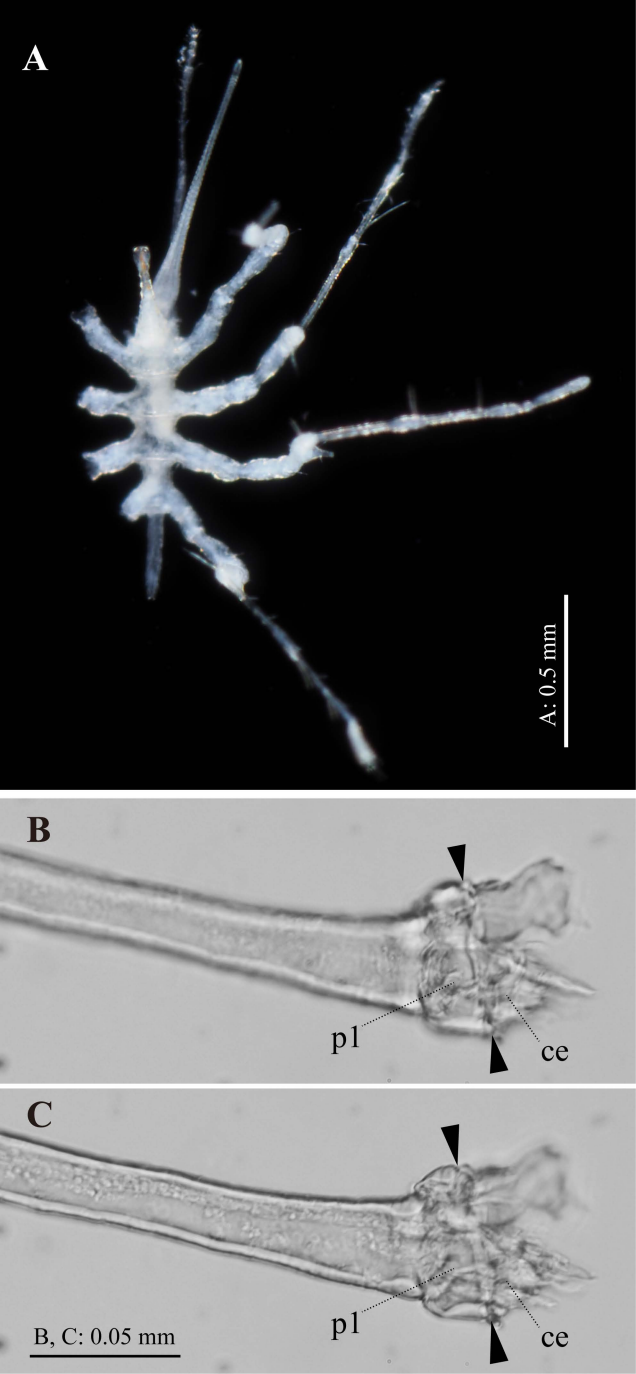
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