RAFFLES BULLETIN OF ZOOLOGY **73**: 293–303
Date of publication: 16 June 2025
DOI: 10.26107/RBZ-2025-0021
http://zoobank.org/urn:lsid:zoobank.org:pub:EE8A5B77-FBAA-4D11-87ED-A146AC3A986D

A new species of the genus *Phyllognathopus* (Copepoda, Harpacticoida) from central Vietnam

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Abstract. The family Phyllognathopodidae has so far been represented by two species in Southeast Asia. Intensive research on the hyporheic zone of the Suoida stream near Da Nang City, central Vietnam, reveals a rich fauna of Copepoda. As a result, a new species of the genus *Phyllognathopus*, *P. vietnamensis*, new species, was collected. According to the morphological characters of P4 Exp being two-segmented in this genus, *P. vietnamensis* (both males and females were collected) belongs to the *P. chappuisi* group. Both male and female specimens differ from its congeners on armature and the shape of P5, the armament of free margin of anal operculum as well as the shape and position of caudal seta III.

Key words. hyporheic zone, Southeast Asia, stygobites, Phyllognathopodidae, taxonomy, Vietnam

INTRODUCTION

The family Phyllognathopodidae Gurney, 1932 includes 12 species within four genera: *Phyllognathopus* Mrázek, 1893, *Allophyllognathopus* Kiefer, 1967, *Parbatocamptus* Dumont & Maas, 1988, and *Neophyllognathopus* Galassi & De Laurentiis, in Galassi, De Laurentiis & Fiasca, 2011. The most speciose genus is *Phyllognathopus*, which has nine species, two of them with two subspecies each, while the other three genera are monospecific. The genus *Phyllognathopus* comprises *P. camptoides* Božic, 1965, *P. chappuisi* (Delachaux, 1924), *P. fodinatus* (Ziegelmayer, 1923), *P. inexspectatus* Galassi & De Laurentiis, in Galassi, De Laurentiis & Fiasca, 2011, *P. insularis* Chappuis, 1940, *P. paludosus* Mrázek, 1893 (with subspecies *P. coecus brevisetosus* (Daday, 1901) and *P. coecus menzeii* (Chappuis, 1928)), *P. paracamptoides* Božic, 1968, *P. volcanicus* Barclay, 1969, and *P. viguieri* (Maupas, 1892) (with subspecies: *P. vigueri menzeii* (Chappuis, 1928) and *P. vigueri vigueri* (Maupas, 1892) (Wells, 2007; Galassi et al., 2011; Walter & Boxshall, 2023). The position of *P. fodinatus* within the genus is still rather uncertain based on the description of Ziegelmayer (1923) (see also Galassi et al., 2011; Walter & Boxshall, 2024). *Phyllognathopus fodinatus* has some morphological characters described incorrectly and unclearly in male P5, including the position of a basal seta, ornamentation, and armature elements on a baseoendopod, thus, it is excluded from further discussion hereafter.

The genus *Phyllognathopus* is distributed worldwide. Its representatives have been recorded in a variety of habitats, spanning from water bodies rich in organic material to semi-terrestrial microhabitats, such as wet leaf litter or dead wood along water-courses (Reid, 1986; 2001). This paper is the first record of the genus from a hyporheic zone where specimens exhibit characters, i.e., absence of eyes, which are characteristic of subterranean representatives.

Only two species belonging to the family Phyllognathopodidae have so far been known from Southeast Asia: *Neophyllognathopus bassoti* (Rouch, 1972) from the Philippines, and *Phyllognathopus viguieri* (Maupas, 1892) from Thailand (Bruno & Cottarelli, 1999; Boonyanusith & Athibai, 2014). Until now, there has been no record of the genus *Phyllognathopus* from Vietnam (Brancelj et al., 2013; Tran et al., 2021).

In Vietnam, the number of newly described groundwater-dwelling copepods is still low, with 14 species in comparison with Thailand, where more than 40 new species have been described in the last 20 years (Brancelj et al., 2013; Lopez & Papa, 2019; Tran et al., 2021; Watiroyram et al., 2021). In this paper, a new species from the genus *Phyllognathopus* is described. It was collected from the hyporheic zone of a stream in the vicinity of Da Nang City, Vietnam. The study of groundwater-dwelling fauna is part of Vietnam's national project to identify Southeast Asian biodiversity.

Accepted by: Lee Bee Yan

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ISSN 2345-7600 (electronic) | ISSN 0217-2445 (print)

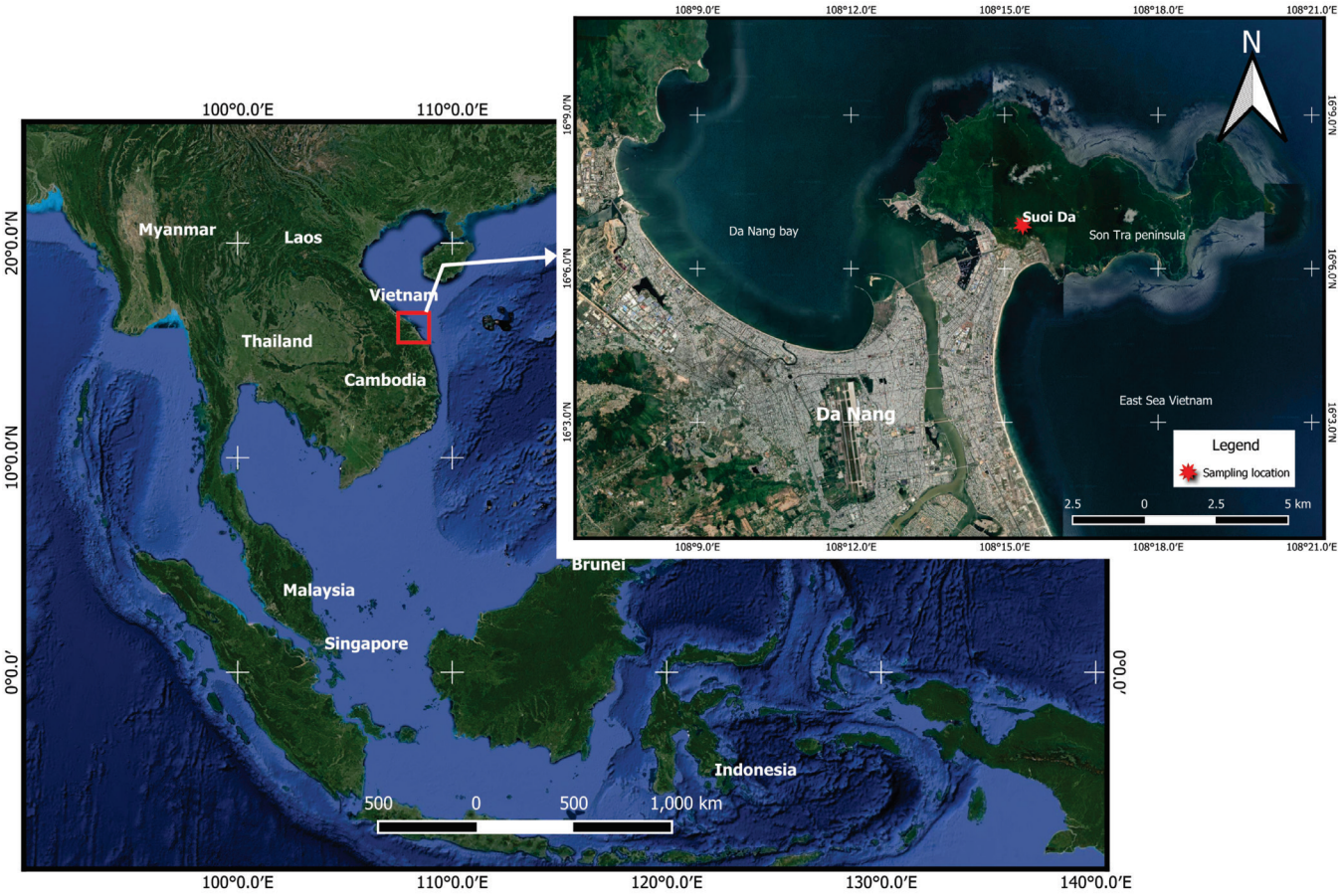

Fig. 1. The sampling location of *Phyllognathopus vietnamensis*, new species, from north-east of Da Nang City, central Vietnam.

MATERIAL AND METHODS

In total, 56 samples were collected from the hyporheic zone along the Suoida stream on the Son Tra peninsula near Da Nang City in the central part of Vietnam during the sampling campaign (Fig. 1). Only one location contained specimens of the new species described here. At the location with the new species, the mean yearly discharge of the stream is < 5 $m^3 s^{-1}$, the water temperature during sampling was 24.5°C, the electric conductivity is 60 µS cm^{-1}, and the pH 6.5. A hole about 100 cm in diameter was dug to the water table using a spade, about one metre from the stream, following the Karaman-Chappuis method (Chappuis, 1954). Water from the hole was filtered using a filtering bottle with a mesh size of 60 µm (Brancelj, 2004). About ten liters of water was filtered. Immediately after collecting, samples were labelled and stored in 4% formalin solution.

Samples were sorted under a 508 Carl Zeiss stereomicroscope at 40× magnification and stored in 70% ethanol prior to further investigation. Several specimens were dissected in pure glycerol under a stereomicroscope at 40–100× magnification. Afterwards, they were mounted on a glass slide in pure glycerol and sealed under a cover glass with transparent nail varnish. Whole specimens were stored in 70% ethanol.

All appendages and body ornamentation were examined at 1,000× magnification under an Axio Lab A1 Carl Zeiss compound microscope. Sensilla and pores patterns on the cephalothorax and somite surfaces were not studied in detail. All drawings were made using the Corel Draw 19.0 graphics program.

All specimens examined in this study are deposited in the Zoological Collection of Duy Tan University, Da Nang City, Vietnam (ZC-DTU). Abbreviations used are as follows: ae = aesthetasc; a.s.l. = above sea level; coll. = collection; Enp = endopod; Exp = exopod; Exp-n/Enp-n = exopod segment n/endopod segment n; P1–P6 = swimming legs 1–6. The descriptive terminology follows Huys & Boxshall (1991) and Boxshall & Halsey (2004).

TAXONOMY

Order Harpacticoida Sars, 1903

Family Phyllognathopodidae Gurney, 1932

Genus *Phyllognathopus* Mrázek, 1893

Phyllognathopus vietnamensis, new species
(Figs. 2–8)

Type locality. Hyporheic zone on the bank of Suoida stream, Son Tra peninsula, Da Nang City, the central part of Vietnam, 16°06′50.9″ N, 108°15′20.6″ E, 40 m a.s.l.

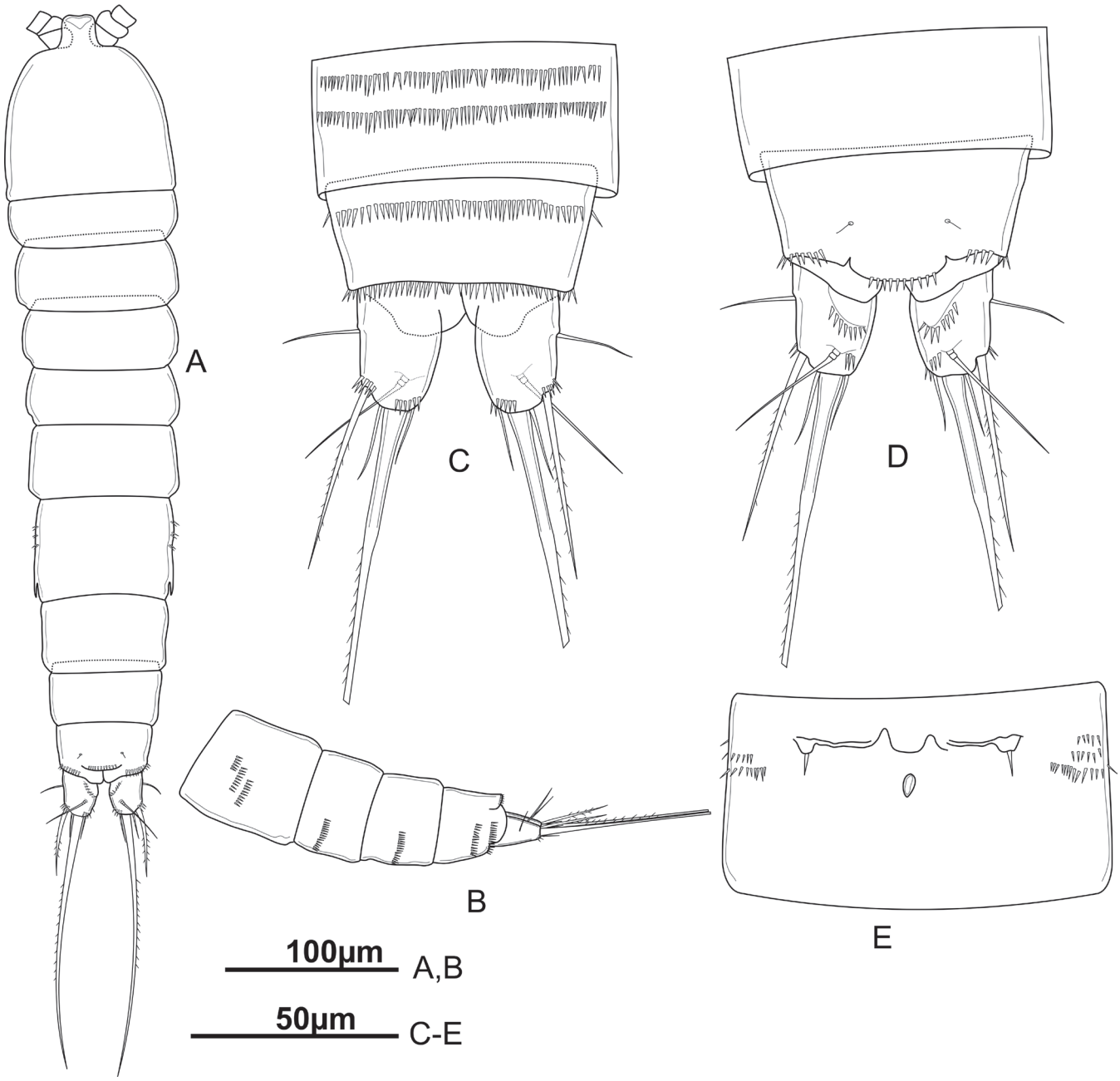

Fig. 2. *Phyllognathopus vietnamensis*, new species, holotype, female (ZC-DTU-COPEPODA-0006). A, habitus, dorsal view; B, urosome, lateral view; C, urosomite 4 and anal somite with caudal rami, ventral view; D, urosomite 4 and anal somite with caudal rami, dorsal view; E, genital double-somite with P6, ventral view.

Material examined. Holotype: adult female, total body length without caudal setae 466 µm, completely dissected, mounted on one slide (ZC-DTU-COPEPODA-0006), hyporheic zone on the bank of Suoida stream, Son Tra peninsula, Da Nang City, Vietnam, 16°06′50.9″ N, 108°15′20.6″ E, 40 m a.s.l, coll. Ngoc-Son Tran, 20 March 2022. Allotype: male, total body length without caudal setae 400 µm, completely dissected, mounted on one slide (ZC-DTU-COPEPODA-0007), same collection data as holotype. Paratypes: 3 males, 10 females (ZC-DTU-COPEPODA-0008), same collection data as holotype.

Description of holotype female. Body length, measured from tip of rostrum to posterior margin of caudal rami, 466µm. Habitus cylindrical, tapering posteriorly; no clear separation between prosome and urosome (Fig. 2A). Naupliar eye and hyaline integumental window not discernable in preserved specimens. Rostrum sub-rectangular in dorsal view, large, surpassing the first segment of antennule (Fig. 2A). First pedigerous somite free and not fused to cephalosome. Genital and first abdominal somites fused, forming genital double-somite (Fig. 2E). Genital double-somite with three rows of small spinules laterally. All somites dorsally with smooth free margin. Genital field simple, with small simple copulatory pore at the middle of somite. Last urosomite with two rows of spinules, anal somite with one row of spinules ventrally. Additional row of spinules on anal somite near base of caudal rami ventrally and laterally; with sensilum

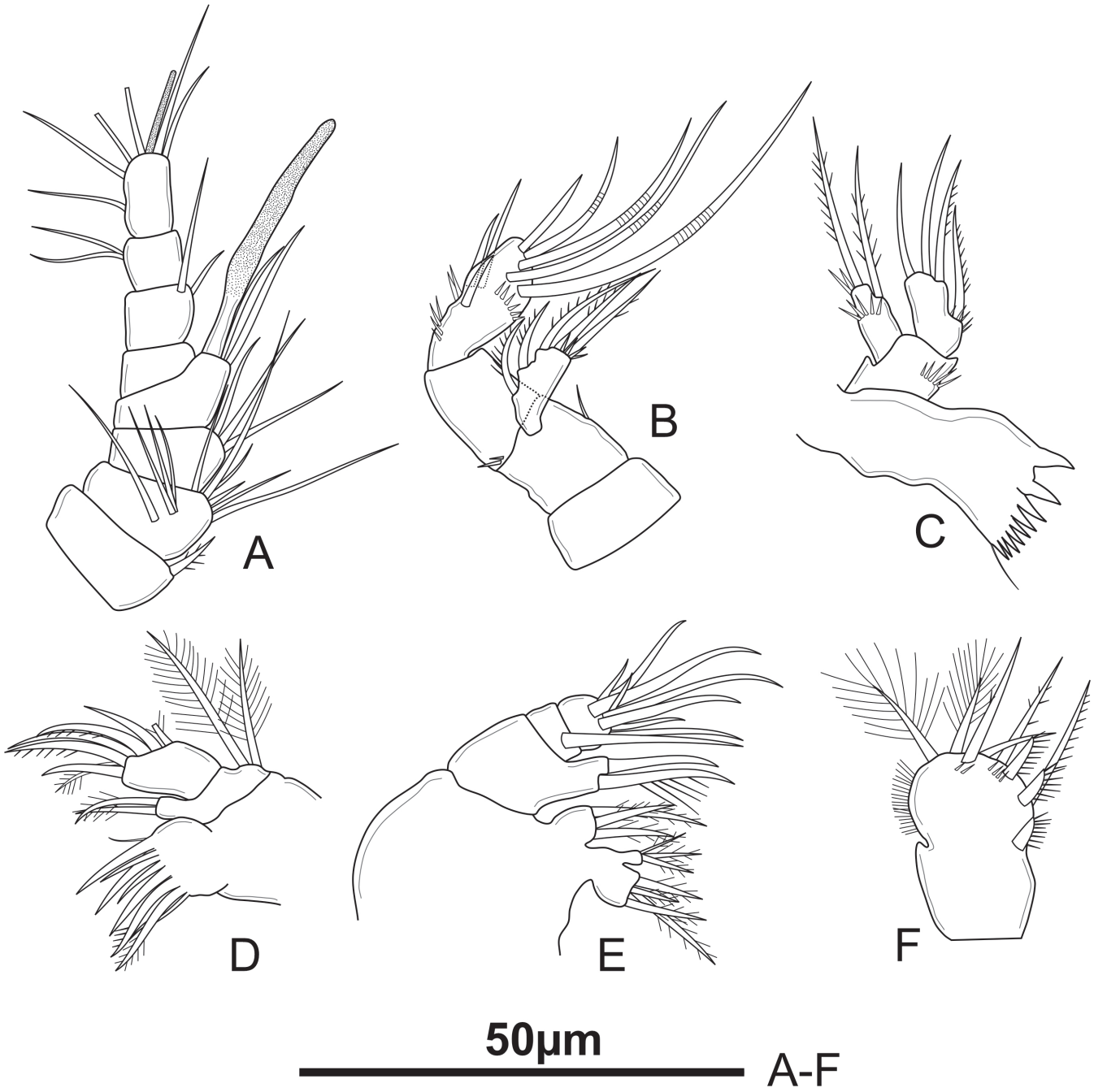

Fig. 3. *Phyllognathopus vietnamensis*, new species, holotype, female (ZC-DTU-COPEPODA-0006). A, antennule; B, antenna; C, mandible; D, maxillule; E, maxilla; F, maxilliped.

on both sides near anal operculum base (Figs. 2B, C). Anal operculum convex, with 10 small spines on free margin (Fig. 2D).

Caudal rami parallel; each ramus sub-cylindrical, slightly tapering towards the end; about 1.3 times as long as wide; six armature elements: two lateral, three apical, one dorsal (Figs. 2C, D). Ramus with a row of spinules at about ½ of its length, oriented from dorsal side to inner margin. Additional row of spinules close to insertion of dorsal seta (VII) laterally on inner margin. Anterolateral accessory seta (I) not discernable. Anterolateral seta (II) smooth, about ⅔ length of caudal ramus, inserted at ⅓ length of caudal ramus. Posterolateral seta (III) long, pinnate, inserted at distal outer corner of caudal ramus, about 2.5 times as long as seta II, with few spinules close to its insertion. Outer terminal seta (IV) smooth, 0.7 times as long as caudal ramus. Inner terminal seta (V) unipinnate distally, strong, about 3.5 times as long as seta (III), without fracture plane. Terminal accessory seta (VI) shortest, smooth. Dorsal seta (VII) articulated, inserted at ¾ length of caudal ramus, slightly longer than caudal ramus.

Antennule with eight-segmented, stout, not reaching middle of cephalosome (Fig. 3A). Segment I with strong spiniform seta. Aesthetasc on segment IV large, long, surpassing tip of apical segment; aesthetasc on apical segment short and slim. Armature formula: 1, 10, 3, 2+ae, 0, 2, 2, 6+ae.

Table 1. Armature formula of swimming legs of *Phyllognathopus vietnamensis*, new species (inner-outer seta/spine; inner-apical-outer seta/spine; Arabic numerals represent setae, Roman numerals represent spines).

Swimming legs	Coxa	Basis	Exp			Enp		
			1	2	3	1	2	3
P1	0-0	I-I	0-I	0-I	1-1, I-I	0-0	1-0	1-1, I-0
P2	0-0	0-I	0-I	0-I	0-1, I-II	0-0	1-0	0-2, I-0
P3	0-0	0-1	0-I	0-I	0-2-II	0-0	0-0	0-2, I-0
P4	0-0	0-1	0-I	0-3-0		0-0	0-3-0	

Antenna comprising coxa, basis, one-segmented Exp and two-segmented Enp. Coxa unarmed, about 0.5 times as long as wide (Fig. 3B). Basis about 0.9 times as long as wide, with one spinule on outer margin. Exp about twice as long as wide, with five elements: two short unipinnate setae laterally, one unipinnate seta subapically, two unipinnate setae apically. Enp-1 with few spinules on proximal outer margin. Enp-2 with two rows of spinules on inner margin at ¼ and ½ of its length; a transverse row of spinules at 3/4 of its length dorsally; three spines, unequal in length at ½ length of segment along outer margin; short bare spine and four geniculate setae, unequal in length, apically.

Mandible comprising coxa, basis, one-segmented Exp and one-segmented Enp. Coxa large, elongated; gnathobase with row of sharp chitinised teeth decreasing in size toward distal corner, accompanied by seta on distal corner (Fig. 3C). Basis with inner spinule row. Exp with a transversal row of spinules at ⅔ length of segment and few spinules sub-apically; one plumose seta laterally, one unipinnate seta apically. Enp with unipinnate seta subapically; three unipinnate setae unequal in length apically.

Maxillule with arthrite incorporated into praecoxa with nine elements: five smooth spiniform setae, one bipinnate seta, one unipinnate seta, one smooth seta and one thin seta distally (Fig. 3D). Endite small, with two spiniform pinnate setae. Basis with two plumose setae on outer margin. Exp and Enp fused, with seven spiniform setae: three strong, smooth, two unpinnate, two plumose.

Maxilla short, robust; syncoxa with three endites, with four, three and three robust spiniform setae on proximal to distal ones, respectively (Fig. 3E). Basal endite with two robust curved spiniform setae, one smooth and one with several long spinules on inner margin. Enp two-segmented; Enp-1 with robust bare seta, Enp-2 with eight elements: five robust setae and three thin setae.

Maxilliped one-segmented, with nine elements: two plumose, one pinnate and two bare setae apically; one long and three short stout unipinnate spines subapically; row of spinules on inner margin (Fig. 3F).

P1–P3 with three-segmented Exp and Enp; P4 with two-segmented Exp and Enp; intercoxal sclerites (couplers) with concave free margin, unornamented. P1–P3 praecoxa with a row of spinules on outer distal corner. P1–P3 coxae with two sets of spinules each, unequal in size; P4 coxa unornamented. Armature formula of P1–P4 as in Table 1.

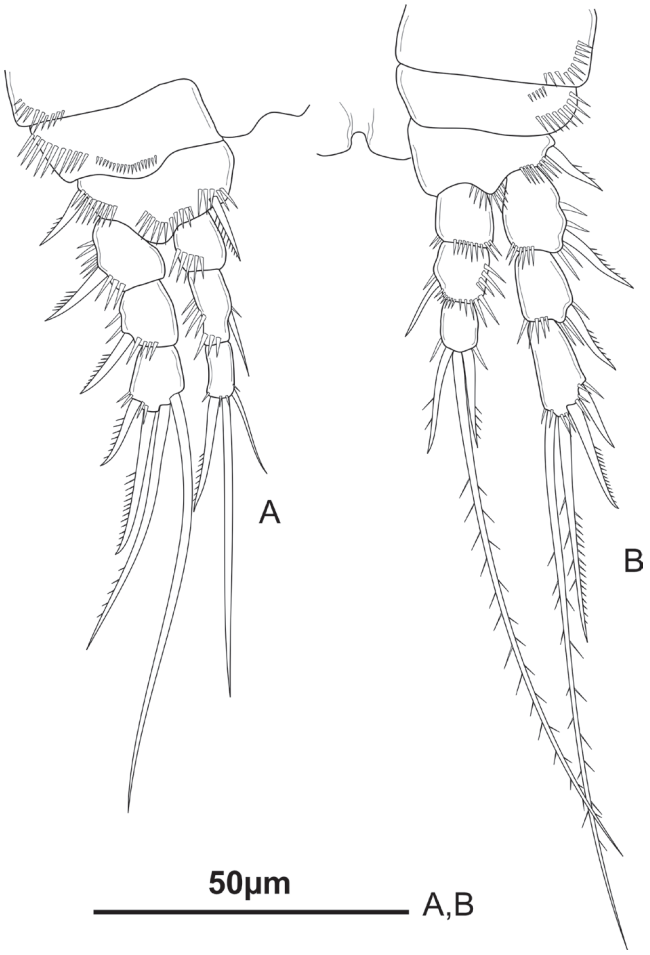

Fig. 4. *Phyllognathopus vietnamensis*, new species, holotype, female (ZC-DTU-COPEPODA-0006). A, P1; B, P2.

P1 basis with short robust unipinnate spine on inner and outer margins, accompanied with several rows of spinules unequal in size on outer and distal margins (Fig. 4A). Exp as long as Enp. Exp-1–Exp-3 as long as wide, with row of spinules on outer distal margin decreasing in size from segments I to III. Exp-3 without geniculate setae apically, with one long and smooth inner seta, one unpinnate seta and one spine apically, one unipinate outer spine. Enp-1 as long as wide,

with several strong spinules on outer distal margin. Enp-2 slim, about twice as long as wide; inner margin with bare spiniform seta at ½ of its length. Enp-3 about 1.5 times as long as wide, with three elements: one thin, smooth inner seta; one smooth seta longer than Enp and one unipinnate spine about 0.4 length of seta, apically.

P2 basis with short robust unipinnate spine on outer margin; row of several spinules on outer and distal margins (Fig. 4B). Exp about 1.3 times longer than Enp. Exp-1 and Exp-2 slightly longer than wide. Exp-3 1.5 times as long as wide. Exp-1 and Exp-2 with strong unipinnate spine; several strong spinules on outer margin and several smaller spinules at distal inner corner each. Exp-3 with two subapical spines, unequal in length, one smooth, one unipinate; two long setae apically, inner one about twice length of Exp. Enp-1–Enp-3 as long as wide. Enp-3 with long soft seta apically, as long as apical seta on Exp-3, accompanied with one short unipinnate spine and one short unipinnate seta.

P3 basis with smooth outer spiniform seta, accompanied with row of robust spinules at its base (Fig. 5A). Exp-1 as long as wide, with strong unipinnate outer spine longer than segment bearing it; row of spinules on outer and distal margin equal in size. Exp-2 about 1.3 times as long as wide. Exp-3 1.5 times as long as wide; inner apical seta soft, about 2.5 times as long as Exp, accompanied with unipinnate seta of about ⅓ of its length and two subapical spines. Enp-1–Enp-3 as long as wide, with row of spinules on distal margin, unequal in length. Enp-3 with three elements apically: one short pinnate seta, one middle pinnate seta about three times as long as Enp, one short spine.

P4 basis with long soft bare outer seta, as long as Exp (Fig. 5B). Exp as long as Enp; both rami much shorter than in P1–P3, two-segmented. Exp-1 as long as wide, with few strong spinules on distal margin; strong outer spine. Exp-2 about 1.5 times as long as wide; three apical plumose setae apically, unequal in length. Enp-1 as long as wide, with row of spinules distally. Enp-2 with three short stout setae apically: one smooth and two plumose, unequal in length.

P5 Exp and baseoendopod fused, each with a row of spinules on distal margin (Fig. 5C). Exp slightly surpassing baseoendopod. Baseoendopod with long soft seta on outer margin and shorter one on inner margin. Exp with four setae apically, unequal in length; second seta from inner margin longest, outermost seta shortest, about 0.4 times length of second seta.

P6 with simple plate, with one short, bare spiniform seta on each side of genital pore (Fig. 2E).

Description of allotype male. The body length is shorter than that of a female; measured from tip of rostrum to posterior margin of caudal rami, 400 µm. Habitus shape and ornamentation of rostrum and caudal rami as in female. First pedigerous somite free, not fused with cephalosome (Fig. 6A). Anal somite with two rows of spinules ventrally and laterally (Fig. 6B, C, D). Anal operculum convex, not

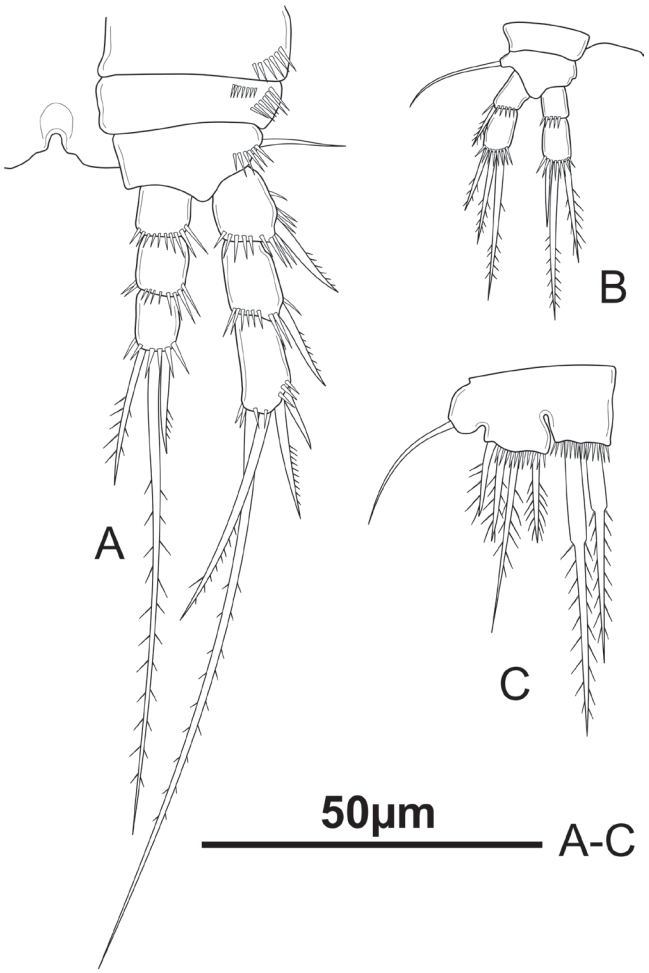

Fig. 5. *Phyllognathopus vietnamensis*, new species, holotype, female (ZC-DTU-COPEPODA-0006). A, P3; B, P4; C, P5.

reaching distal end of anal somite, with a row of 11 small spines on distal margin. Mouthparts, P1, P2, P3, and P4 similar to those of female.

Antennule with eight-segmented, stout, not reaching middle of cephalothorax (Fig. 7A). Segments V and VI slightly sclerotised (Fig. 7A). Aesthetasc on segment IV large, long, surpassing tip of apical segment; aesthetasc on last segment short and slim. Armature formula: 1, 9, 4, 4+ae, 1, 1, 4, 9+ae.

Antenna comprising coxa, basis, one-segmented Exp and two-segmented Enp (Fig. 7B). Coxa unarmed, about 0.3 times as long as wide. Basis about 0.6 times as long as wide, with few spinules on inner margin. Exp with five elements: three unipinnate robust setae laterally, one smooth and one unipinnate setae apically. Enp-1 distinctly separated from basis, with several spinules on inner margin. Armament of Enp-2 as in female but with more robust elements.

P5 Exp and baseoendopod fused, Exp well overreaching baseoendopod; each with a row of robust spinules on distal margin. Baseoendopod with long soft seta on outer margin; strong pinnate seta on inner corner (Fig. 8A). Exp with five pinnate setae: innermost and outermost short and thin; middle one longest and robust, about 3.2 times as long as Exp.

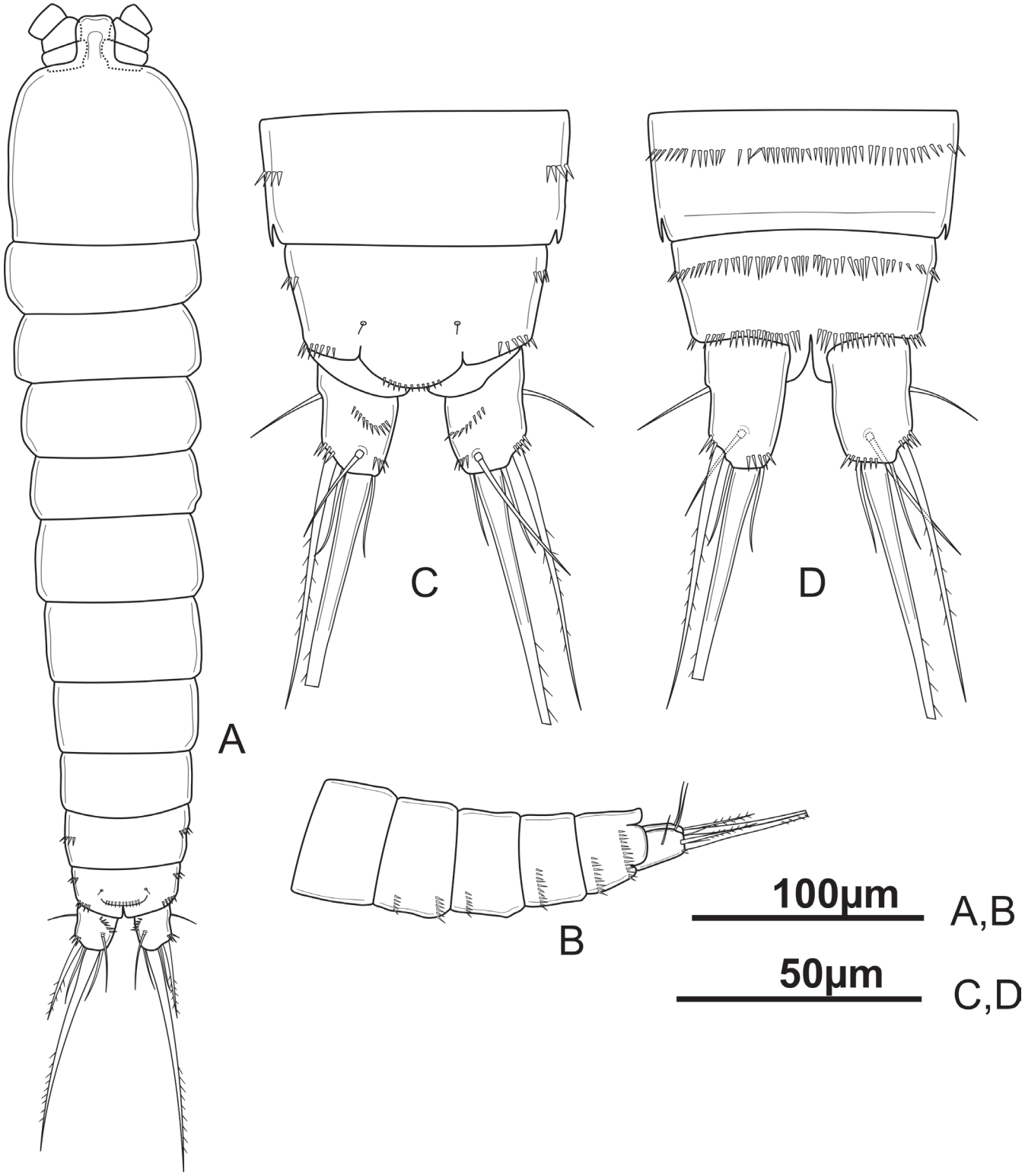

Fig. 6. *Phyllognathopus vietnamensis*, new species, allotype, male (ZC-DTU-COPEPODA-0007). A, habitus, dorsal view; B, urosomites 2–5 and anal somite with caudal rami, lateral view; C, urosomite 5, anal somite and caudal rami, dorsal view; D, urosomite 5, anal somite and caudal rami, ventral view.

P6 simple, forming a single lamellar plate, with notch medially and three elements: two spiniform pinnate setae apically, unequal in length, one smooth bare seta laterally (Fig. 8B).

Variations. Body length ranged from 466 to 588 µm; mean = 525 µm in female (n = 5) and from 392 to 402 µm; mean = 394 µm in males (n = 3). Anal operculum with ten to twelve short spines in females on free margin but no variability in males.

Etymology. The new species is named after Vietnam, where the species was found for the first time. The species epithet, *vietnamensis* is derived from "Vietnam". The name is used as a noun in apposition.

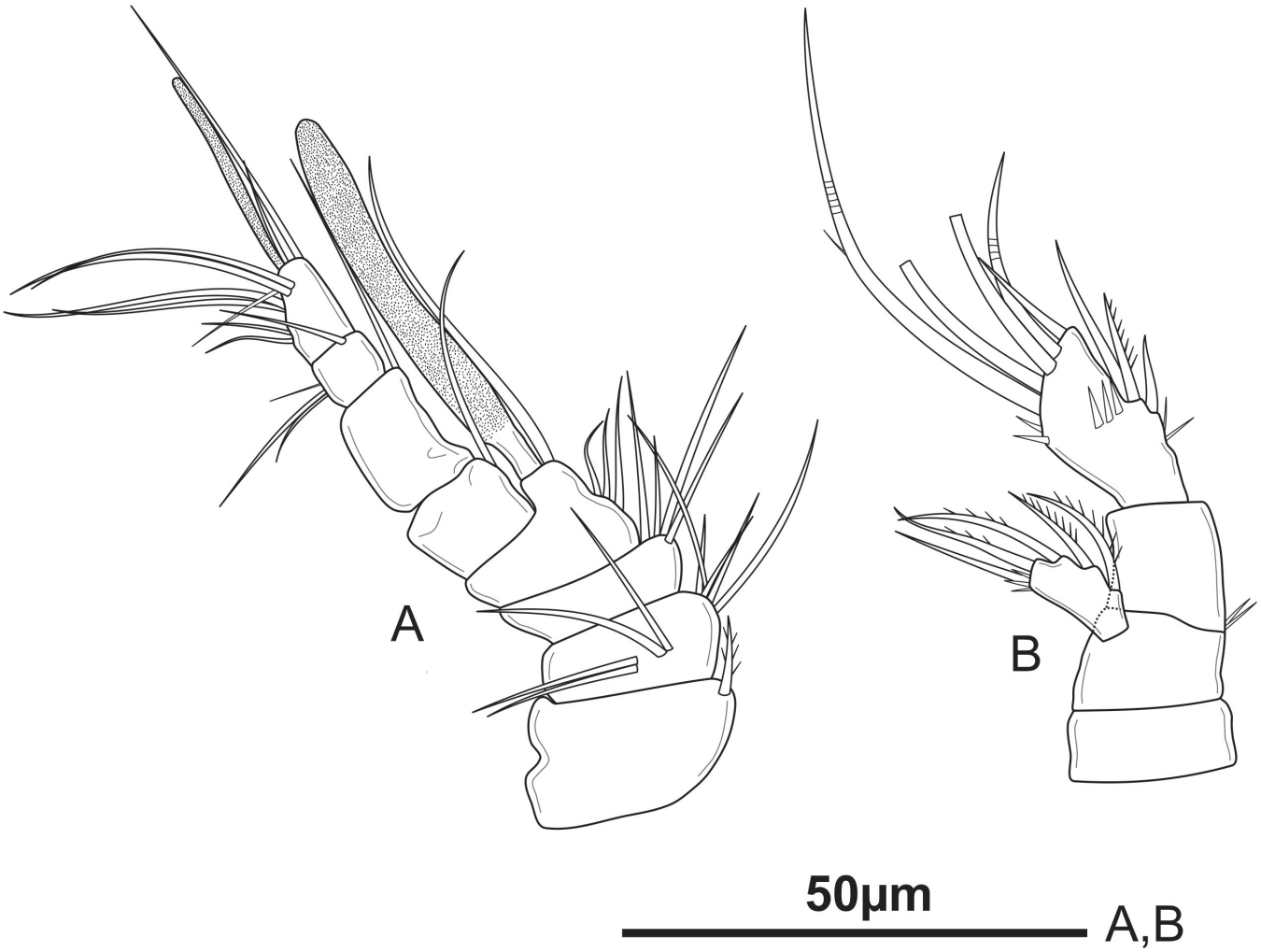

Fig. 7. *Phyllognathopus vietnamensis*, new species, allotype, male (ZC-DTU-COPEPODA-0007). A, antennule; B, antenna.

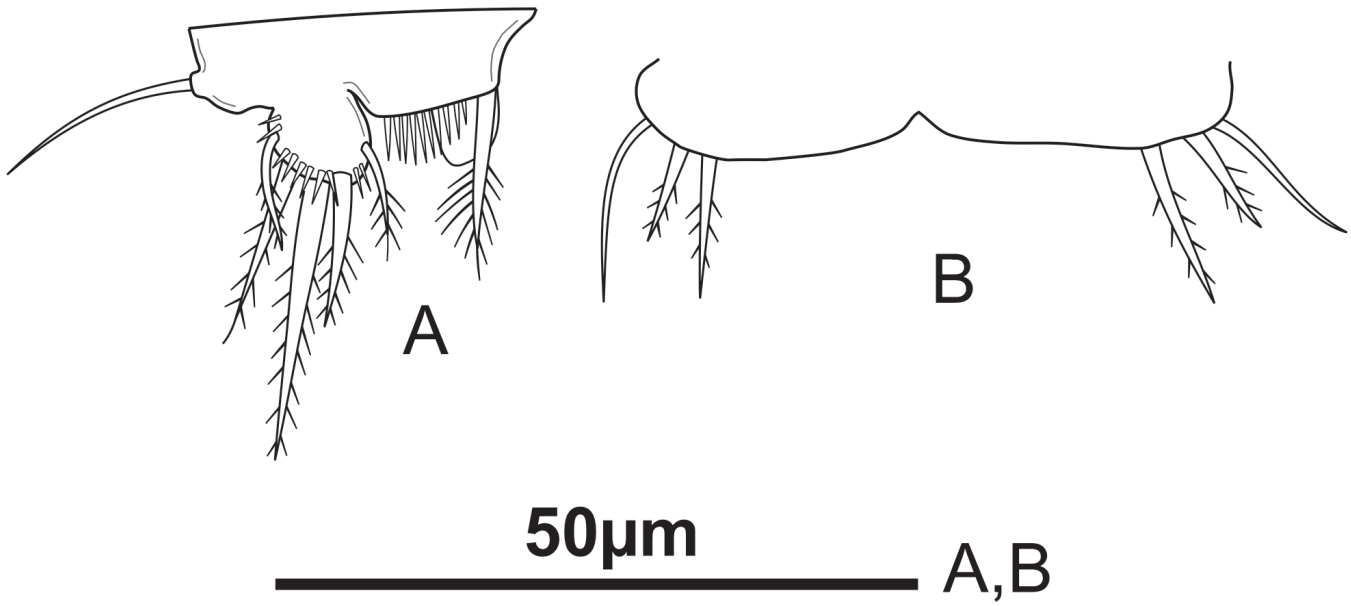

Fig. 8. *Phyllognathopus vietnamensis*, new species, allotype, male (ZC-DTU-COPEPODA-0007). A, P5; B, P6.

DISCUSSION

The habitat preference of the new species is not yet clear, i.e., whether it is epigean or hypogean, but specimens of the new species were so far collected only from the hyporehic zone of a river. They expressed no presence of a discernible naupliar eye (i.e., a pigmented eye) in preserved specimens. Based on the one-event sampling and absence of naupliar eye within collected specimens, we designated them as stygobitic representatives. However, additional sampling on surface water in the benthic zone could provide new information and could potentially change the species' ecological status from stygobitic to stygophilic.

A thorough revision of the family Phyllognatophidae was recently published by Galassi et al. (2011). The genus *Phyllognathopus* is divided into three groups based on the number of P4 Exp segments following Galassi et al (2011) (see Table 2): I) the *P. paracamptoides* group with one-segmented P4 Exp (*P. paracamptoides* Božic, 1968); II) the *P. chappuisi* group with two-segmented P4 Exp (*P. chappuisi* (Delachaux, 1924), *P. camptoides* Božic, 1965, *P. insularis* Chappuis, 1940, and *P. inexspectatus* Galassi & De Laurentiis, in Galassi, De Laurentiis & Fiasca, 2011), and III) the *P. viguieri* group with three-segmented P4 Exp (*P. viguieri* (Maupas, 1892), *P. paludosus* Mrazek, 1893, and *P. volcanicus* Barclay, 1969). According to the listed characteristics, *P. vietnamensis*, new species, belongs to the *P. chappuisi* group.

Within the *P. chappuisi* group, members share morphological characters with congeners in P4 Exp being two-segmented. However, *P. vietnamensis*, new species, is clearly distinct from other members of the group by: I) P4 Enp-2 with three apical elements in both sexes (Fig. 5B) (versus two in *P. inexspectatus* Galassi & De Laurentiis, in Galassi, De Laurentiis & Fiasca, 2011); II) 10–12 small spines on free margin of anal operculum in both sexes (Figs. 2D, 6C) (versus five strong spines in *P. camptoides* Božic, 1965; cilia-like spinules in *P. insularis* Chappuis, 1940; smooth in *P. chappuisi* (Delachaux, 1924)); III) female posterolateral seta (III) not transformed (Figs. 2C, D) (versus posterolateral seta (III) transformed into a stout seta in *P. inexspectatus* Galassi & De Laurentiis, in Galassi, De Laurentiis & Fiasca, 2011)); IV) Exp lobe of female's P5 longer than baseoendopod (Fig. 5C) (versus equal in *P. camptoides* Božic, 1965 and shorter in *P. inexspectatus* Galassi & De Laurentiis, in Galassi, De Laurentiis & Fiasca, 2011 and in *P. insularis* ; Chappuis, 1940); V) female P5 Exp with four setae (Fig. 5C) (versus three setae in *P. camptoides* Božic, 1965*;* VI) male P5 baseoendopod with one strong pinnate seta (Fig. 8A) (versus absent in *P. chappuisi* (Delachaux, 1924)); VII) male P5 Exp with five setae (Fig. 8A) (versus six setae in *P. camptoides* Božic, 1965).

Key to species of the genus *Phyllognathopus* Mrázek, 1893 based on females

1. P4 Exp two-segmented.....2
– P4 Exp three-segmented.....6
2. P4 Enp-2 with two apical elements..... .....*Phyllognathopus inexspectatus* Galassi & De Laurentiis, in Galassi, De Laurentiis & Fiasca, 2011
– P4 Enp-2 with three apical elements.....3
3. Free margin of anal operculum with four strong spines..... .....*Phyllognathopus camptoides* Božic, 1965
– Free margin of anal operculum smooth or with small spinules.....4
4. The second inner seta being the longest seta on P5 Exp ....*Phyllognathopus insularis* Chappuis, 1940
– The third inner seta being the longest seta on P5 Exp.....5
5. Free margin of anal operculum smooth ....*Phyllognathopus chappuisi* Delachaux, 1924
– Free margin of anal operculum with (10-12) small spines..... .....*Phyllognathopus vietnamensis*, new species.
6. Free margin of anal operculum with (10-16) small spines..... .....*Phyllognathopus paludosus* Mrázek, 1893
– Free margin of anal operculum smooth 7
7. Outermost seta of P5 Exp inserted apically..... .....*Phyllognathopus viguieri* (Maupas, 1892)
– Outermost seta of P5 Exp inserted subapically 8
8. Caudal ramus posterolateral seta III being long, spiniform shape; P4 Exp two-segmented..... .....*Phyllognathopus volcanicus* Barclay, 1969
– Caudal ramusi posterolateral seta III being long, pinnate shape; P4 Exp one-segmented..... .....*Phyllognathopus paracamptoides* Božic, 1968

AUTHORS' CONTRIBUTION

Material was sampled by NS Tran and TTV Nguyen. Dissection of specimens and illustrations was done by NS Tran and TTV Nguyen. Draft was prepared by NS Tran and TTV Nguyen. AB contributed to detailed description of specimens and the final version of illustrations and text.

ACKNOWLEDGEMENTS

This research was funded by Funds from the Ministry of Education and Training, Vietnam; grant number B2022-DNA-13 for Vietnamese authors. Senior researcher (AB) was supported by the Slovenian Research Agency (ARIS) through P1-0255 program. We would like to express our grateful to anonymous reviewers who contributed to the improvement of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Table 2. Morphological characters of the *Phyllognathopus* species including characters of females and males, respectively.

Characters	*Phyllognathopus paracamptoides* Božic, 1968	*Phyllognathopus chappuisi* Delachaux, 1924	*Phyllognathopus camptoides* Božic, 1965	*Phyllognathopus insularis* Chappuis, 1940	*Phyllognathopus inexspectatus* Galassi & De Laurentiis, in Galassi, De Laurentiis & Fiasca, 2011	*Phyllognathopus vietnamensis*, new species	*Phyllognathopus viguieri* (Maupas, 1892)	*Phyllognathopus paludosus* Mrázek, 1893	*Phyllognathopus volcanicus* Barclay, 1969
References	Božic, 1968	Delachaux, 1924	Božic, 1965	Chappuis, 1940	Galassi et al., 2011	This article	Maupas, 1892	Mrázek, 1893	Barclay, 1969
Anal operculum free margin	6 strong spines	smooth	4 strong spines	cilia-like spinules	22 strong spinules	10-12 small spines	smooth	10-16 small spines	smooth
Number of setae on distal P4 Enp	2	3	3	3	2	3	3	3	3
Number of segments in P4 Exp and Enp	2/1	2/2	2/2	2/2	2/2	2/2	3/2	3/2	3/2
Caudal ramus length/ width	about 1.5	unknown	about 1.4	about 2.4	about 1.9	about 1.6	about 1.5	about 1.3	about 2.2
Female									
Caudal ramus posterolateral seta III	long, pinnate	unknown	long, unipinnate	short, smooth	short, stout, spiniform	long, pinnate	short, stout, spiniform	long, stout, spiniform	long, spiniform
P5 length ratio Exp/ baseoendopod	Exp longer than Enp	unknown	equal in length	Exp shorter than Enp	Exp shorter than Enp	Exp longer than Enp	equal in length	equal in length	equal in length
Number of setae on P5 Exp	4	4	3	4	4	4	4	4	4
Position of the longest seta on P5 Exp from outward	fourth	unknown	third	second	third	third	third	third	fourth
Male									
Number of setae on P5 Exp	unknown	5	6	6	unknown	5	6	6	6

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