Schizopera vietnamica sp. nov. (Copepoda, Harpacticoida, Miraciidae), a new species from the mangrove zone in Vietnam, with a description of new species and a key to species from Oriental region, Sulawesi, and East Asia (#121452)

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Conclusions are well stated, linked to original research question & limited to supporting results.

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Schizopera vietnamica sp. nov. (Copepoda, Harpacticoida, Miraciidae), a new species from the mangrove zone in Vietnam, with a description of new species and a key to species from Oriental region, Sulawesi, and East Asia

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Background. From a sampling of Copepoda in the mangrove zone of the Vu Gia–Thu Bon coastal region of Vietnam, a new species of harpacticoid fauna was discovered. It was found to belong to the genus *Schizopera*, being the first record of the genus for the country. It was named *S. vietnamica* sp. nov.

Methods. Samples were collected in July 2023, using a plankton net. The body parts of the specimens were dissected and mounted on glass slide. Morphological examinations were carried out at 1000× magnification. Habitus and appendages were then drawn using a drawing tube attached to a compound microscope, and final drawings were inked digitally.

Results. The new species differed from all its congeners, according to the combination of the characteristics, which included relative length and chaetotaxy of caudal rami, length of proximal endopodal segment relative to the exopod of the female first swimming legs, armament of the middle and the distal endopodal segment of the second to the fourth swimming legs, segmentation and chaetotaxy of the fifth swimming legs. The new species most resembled *S. neglecta*, based primarily on the loss of inner seta on the proximal endopodal segment of the second to the fourth swimming legs, as well as the shape and hairy ornamentation of the inner margin of caudal rami. The key to the species of the genus in Oriental region, Sulawesi and East Asia was provided.

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Abstract

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Introduction

Research interest in biodiversity patterns of Copepoda has increased rapidly in Vietnam, resulting in the discovery of many new copepod taxa, primarily from subterranean environments.

At present, a total of 16 species ~~was~~ discovered and described from karstic and alluvial aquifers (Dang & Ho, 2001; Brancelj, 2005; Tran & Chang, 2012, 2020; Kołaczyński, 2015; Tran & Hołyńska, 2015; Tran & Brancelj, 2017; Sanoamuang, Boonyanusith & Brancelj, 2019; Tran, Trinh-Dang & Brancelj, 2021; Tran, Nguyen & Brancelj, 2025; Tran, Trinh-Dang, Nguyen & Brancelj, 2025). Among them, eight species include Calanoida and Cyclopoida, belonging to the families Pseudocyclopidae (1 species), Diaptomidae (3 species), and Cyclopidae (3 species), with a new record of *Bryocyclops anninae* Menzel, 1926 from Thien Duong Cave in Central Vietnam, and three new genera from water bodies in caves, including *Nannodiaptomus* Dang & Ho, 2001, *Hadodiaptomus* Brancelj, 2005, and *Pseudograeteriella* Sanoamuang, Boonyanusith & Brancelj, 2019 from water bodies in karst (Dang & Ho, 2001; Brancelj, 2005; Sanoamuang, Boonyanusith & Brancelj, 2019). The remaining seven taxa ~~are~~ Harpacticoida, ~~including~~ representatives of the families Canthocamptinae (2 species), Tachidiidae (1 species), Ameiridae (2 species), Parastenocarididae (2 species), and Phyllognathopodidae (2 species) [Tran & Chang, 2012; Tran, Trinh-Dang & Brancelj, 2021; Tran, Nguyen & Brancelj, 2025; Tran, Trinh-Dang, Nguyen & Brancelj, 2025]. In contrast, the new copepod taxa have never been discovered or described from the tidal flat, even though the habitat is relatively large, accounting for 3,069 square kilometers or about 0.96 percent of the area in the country (Murray et al. 2019).

Schizopera Sars, 1905 is the most diverse taxon of the family Miraciidae Dana, 1846 (Sönmez, Sak & Karaytuğ, 2015), established by Sars (1905) to accommodate *S. longicauda* Sars, 1905 from the Chatham Islands, about 500 nautical miles east of New Zealand (Sars, 1905). ~~In~~ Wells (2007), 85 valid species and subspecies ~~have been listed~~, and 18 species and subspecies were subsequently described from Uzbekistan (2 species), Australia (8 species and subspecies), Colombia (1 species), Japan (1 species), Turkey (1 species), Korea (4 species) and Thailand (1 species) (Mirabdullayev & Ginatullina, 2007; Karanovic & Cooper 2012; Fuentes-Reinés & Gómez, 2014; Karanovic, Kim & Grygier, 2015; Sönmez, Sak & Karaytuğ, 2015; Karanovic & Cho 2016; Watiroyram, Sanoamuang, & Brancelj, 2021). Nevertheless, *S. spinulosa* Mirabdullayev & Ginatullina, 2007 is not accepted, having been recognized as a junior homonym of *S. spinulosa* Sars, 1909. Thus, 104 species and subspecies of the genus have been validated.

The genus *Schizopera* appears to be cosmopolitan, having been frequently encountered in ~~the~~ coastal marine environments worldwide, including marine littoral, ~~estuary,~~ coastal lagoons and the interstitial waters of beaches (Karanovic, 2006). Many species occupy brackish and a various freshwater habitat (Sönmez, Sak & Karaytuğ, 2015). ~~Of~~ which two species flocks have been recognized so far, from Lake Tanganyika (Sars 1909; Gurney 1928; Lang 1948; Rouch & Chappuis 1960) and Western Australia (Karanovic, 2004, 2006; Karanovic & Cooper, 2012; Karanovic & McRae 2013). ~~In the Oriental zoogeographical region and Sulawesi,~~ only 13 species and subspecies have been recorded, mostly in India, Indonesia and Thailand (Table 1). However, the genus has never been recorded in Vietnam.

~~According to the~~ investigation ~~of~~ copepods ~~in~~ the lower reaches of central Vietnam, ~~the~~ new species of the genus *Schizopera* was discovered, representing the first record of the genus for the

country. In this paper, the morphological description and illustration were provided, and the key to species recorded in the Oriental region, Sulawesi, and East Asia was constructed and proposed.

Materials & Methods

Samples were collected from the mangrove area of the Vụ Gia–Thu Bồn River in Quang Nam Province, central Vietnam (Fig. 1), in July 2023, using a plankton net with a mesh size of 50 µm. All materials were immediately fixed in 70% ethanol. In a laboratory, specimens were sorted under a stereomicroscope at 40× magnification; a few of them were then dissected and mounted in a drop of pure glycerol on glass slides and sealed beneath cover slips using transparent nail varnish. The remaining whole specimens were retained in 70% ethanol for reference. The examination of body parts and ornamentations were carried out at 1000× magnification under a Carl Zeiss Axio Lab A1 compound microscope. Habitus and appendages were then drawn using a drawing tube attached to a compound microscope at 400× and 1000× magnifications, respectively. Final drawings were inked digitally using CorelDraw 19.0®.

A description was created, following the terminology of Huys & Boxshall (1991). Abbreviations employed in the description are included ae, aesthetasc; Enp, endopod; Exp, exopod; Exp/Enp-1(-2, -3), proximal (middle, distal) segment of exopod or endopod; P1–P6, the first to the sixth swimming legs. For antennule, a Roman numeral denotes segment, and an Arabic numeral denotes the number of elements.

The type materials are deposited at the Zoological Collection of Duy Tan University (ZC-DTU), Da Nang city, Vietnam.

The electronic version of the published work and nomenclatural acts have been registered in ZooBank. By putting the LSID (Life Science Identifier) behind the prefix http://zoobank.org/, the ZooBank LSID can be resolved and the associated information viewed through any standard web browser. The LSID for this publication is: urn:lsid:zoobank.org:pub:50CEF9AE-6C53-4366-BBD8-98ABE5E2F9FD. The online version of this work is archived and available from the following digital repositories: PubMed Central, Zenodo and CLOCKSS.

Results

Systematics

Order Harpacticoida Sars, 1903

Family Miraciidae Dana, 1846

Subfamily Diosaccinae Sars, 1906

Genus *Schizopera* Sars, 1905

***Schizopera vietnamica* sp. nov.**

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Figs 2–6 (female); 7–9 (male)

Material examined. Adult female holotype (ZC-DTU-COPEPODA-0015), 410 µm long, completely dissected and mounted on a slide in glycerol and sealed with nail vanish, collected from the type locality by plankton net, 10 July 2023. Adult male allotype, 380 µm long,

collection data as for holotype (ZC-DTU-COPEPODA-0016). Paratypes, three adult females and three adult males, collection data as for holotype (ZC-DTU-COPEPODA-0017).

Diagnosis. Female: body moderate, cylindrical. Rostrum distinct. Caudal ramus ca. 1.4 × as long as wide, with ~~hairs~~ on inner margin. Distal exopodal segment of antenna with three apical elements. Coxa of maxillule with one apical spine. Exp and Enp of all swimming legs three-segmented. P1Enp-1 reaching tip of Exp-3, with inner seta. Exp-1, Exp-2 and Enp-1 of P2–P4 without inner seta. Armature complement of Exp-3 and Enp-3, ~~from~~ P1–P4: 4.4.4.4 and 3.4.4.3, respectively. Left and right legs of P5 separated; P5Exp suboval, with six elements; endopodal lobe of baseoendopod reaching mid of Exp, with four setae. P6 reduced to small protuberance with two apical setae on peduncle. Male: P2 with Enp-2 and Enp-3 completely incorporated, with ~~transformed~~ outer subapical seta. P3 with hyaline spine reaching distal 2/3 of distal half of Exp-3. ~~Left and right legs of~~ P5 fused ~~at base~~, with five setae on Exp and two subequal marginal setae on endopodal lobe. P6 reduced to short cuticular bilobate plates ~~and~~ unarmed.

Type locality. The mangrove area of the Vu Gia–Thu Bồn River, Quang Nam Province, Vietnam 15°52'31.0"N 108°22'35.0"E) (Fig. 1).

Etymology. The specific epithet is derived from Vietnam, alluding to the name of the country where the new species was discovered. The name is an adjective in the nominative singular, gender feminine.

Description of adult female. Total body length, measured from tip of rostrum to posterior margin of caudal rami: 370–434 µm (mean = 408 µm, n = 4). Habitus cylindrical, slightly tapering posteriorly (Fig. 2A); preserved specimens colourless. Prosome comprising cephalothorax and three free pedigerous somites; urosome comprising fifth pedigerous somite, genital double-somite (fused genital and first abdominal somites) and three free abdominal somites; prosome/urosome ratio about 1.4 (in dorsal view).

Rostrum distinct, relatively long, triangular with round tip, reaching distal 2/3 of segment II of antennule, with pair of sensilla at distal 2/3 ~~of rostr~~um (Fig. 2A).

Cephalothorax about 1.4 × as long as wide, with a single red nauplius eye in the middle (not shown) and sensillae as shown in Fig. 2A; hyaline frill with smooth margin. Free pedigerous somites with continuous rows of minute spinules on dorsal view and sensillae near posterior margin; hyaline frill on all somite of prosome with smooth margin.

Urosomites 1–4 dorsally with numerous rows of tiny spinules and serrated hyaline frill dorso-laterally and ventrally; surface of urosomites 2–4 with pairs of cuticular pores and sensillae on each somite as shown ~~in~~ Figs. 2A–2D. Genital double-somite (~~Urosomite 2;~~ Figs. 2A, 2C, and 2D) as long as wide; genital complex (Fig. 2D) with one copulatory pore and two small seminal receptacles on both sides. Anal somite (Figs. 2A–2D) with rows of tiny spinules dorso-laterally and ventrally and row of larger spinules on distal margin; inner margin with oblique row of long ~~hairs~~ posterior to anal operculum. Anal operculum (Figs. 2A and 2C) curved ~~crescent-shaped~~, free margin with slim and short ~~hairs~~.

Caudal rami (Figs. 2C and 2D) slightly divergent, tapering posteriorly, about 1.4 × as long as wide; ornament~~ation~~ with row of small spinules and one cuticular pore on dorsal view, with

long hairs along the middle of inner margin and a row of ventral spinules on distal margin. Anterolateral accessory seta (I) absent. Anterolateral seta (II) robust, spiniform, about 0.6 × as long as ramus, inserted at distal 2/3 of ramus. Posterolateral seta (III) smooth, relatively slender, about 0.9 × as long as ramus, inserted near base of seta II. Outer apical seta (IV) smooth, shorter than inner apical seta (V), with breaking plane. Inner apical seta (V) longest, bipinnate, about 4.5 × as long as ramus, with breaking plane. Inner accessory seta (VI) bare, about 0.4 × as long as ramus. Dorsal seta (VII) biarticulated, slender, plumose at tip; located near mid-length of ramus.

Antennule (Fig. 3A) eight-segmented, length approximately half as long as cephalothorax. Aesthetasc on segment IV well developed, reaching tip of segment VIII at about the middle of its length; aesthetasc on segment VIII thin and shorter; both aesthetasc on segments IV and VIII fused with neighbouring seta at base, forming acrothek. Setal formula as follows: I-[1], II-[7], III-[6], IV-[1+acrothek], V-[1], VI-[3], VII-[3], VIII-[4+acrothek].

Antenna (Fig. 3B) comprising coxa, basis, two-segmented Exp and one-segmented Enp. Coxa unornamented. Allobasis about 2.1 × as long as wide, with several short spinules on posterior and ventral view and unipinnate seta on inner margin. Exp-1 with one pinnate subapical seta on inner distal corner; Exp-2 with three apical elements: one minute, smooth inner seta, one bipinnate spine and one thin, bare seta of about same length as spine. Enp about 2.5 × as long as wide; ornamentation with spinules along medial margin; armament with two robust spines and one thin, smooth seta on medial margin and seven apical elements: one geniculate pinnate seta fused with one geniculate seta, three geniculate bare apical setae, one spiniform smooth apical seta on inner corner and one slender, smooth seta near the first mentioned geniculate one.

Mandible (Fig. 3C) with cutting edge of coxa wide, with ten strong chitinized teeth and one unipinnate dorsal seta on gnathobase. Coxa unornamented. Basis with three pinnate setae unequal in length, inserted on inner margin. Enp one-segmented, with two lateral and four apical setae, each seta fused with neighbouring one at its base. Exp very small but distinct segment, with one smooth apical seta.

Maxillule (Fig. 3D) comprising robust praecoxa, coxa, basis, Exp and Enp. Praecoxal arthrite with several spinules laterally; armament with eight strong spines on distal margin (six bare spines and two pinnate spines) and two additional setae positioned on anterior surface. Coxa small, with one strong, curved, bare spine. Basis with one spiniform pinnate seta, two smooth setae and one slender, pinnate seta; ornamentation with spinules along outer margin. Exp small, one-segmented; armament with two bare apical setae. Enp one-segmented, about twice as long as wide, with three smooth apical setae of unequal length.

Maxilla (Fig. 3E) consists of syncoxa, basis and one-segmented Enp. Syncoxa with three endites; two proximal endites with one unipinnate and one bare apical seta; distal endite with two smooth apical setae. Basis drawn-out into strong claw, unilaterally pinnate distally, with two thin, smooth setae near base. Enp small, one-segmented, armed with two bare apical setae.

Maxilliped (Fig. 3F) prehensile. Coxobasis 1.3 × as long as wide, with two unipinnate setae and one pinnate seta on inner distal corner. Enp two-segmented; Enp-1 about 2.3 × as long as wide, ornamented with a row of strong spinules near inner margin and a row of long spinules on

outer margin, armed with two smooth setae on inner margin; Enp-2 with four apical elements: one claw-like, smooth spine and three short, smooth setae of subequal length.

P1–P4 (Figs 4A-6A) with three-segmented rami. Coxa in all swimming legs connected by unornamented intercoxal plate; P2–P4 with intercoxal plates with acute projections on distal margin. Armature formula of P1–P4 as in Table 2.

P1 (Fig. 4A). Coxa with a row of spinules on outer margin. Basis with one inner and one outer pinnate spine. Exp three-segmented, shorter than Enp, with spinules along outer margin in all segments and spinules on distal margin in Exp-1 and Exp-2; Exp-1 with additional row of spinules on anterior surface, with one strong unipinnate outer spine; Exp-2 with one robust unipinnate outer spine; Exp-3 with four elements: two smooth outer spines and two geniculate unipinnate apical setae. Enp three-segmented; Enp-1 about 3.7 × as long as wide, reaching tip of Exp-3, with a row of spinules along inner and outer margin, with one robust, smooth seta inserted at distal 2/3 of Enp-1; Enp-2 relatively short, with several spinules along outer margin and unarmed; Enp-3 about 1.6 × as long as wide and about 1.5 × as long as Enp-2, with three elements: one slim, bare inner seta, one inner, geniculate and pinnate, apical seta, and one outer, unipennate, apical spine.

P2 (Fig. 4B). Coxa with several spinules on anterior surface and near outer margin. Basis with a row of spinules on distal margin, with one strong unipinnate spine on outer margin. Exp with spinules and setulae along outer and inner margin, respectively, in all segments, and with spinules on inner distal corner in Exp-1 and Exp-2; Exp-1 with additional row of strong spinules on anterior surface, with one robust pinnate outer spine; Exp-2 with one robust pinnate outer spine; Exp-3 with four elements: two pinnate apical setae, one pinnate outer spine subapically, and one unipinnate outer spine. Enp reaching tip of Exp-3, with spinules and setulae along outer and inner margin, respectively, in Enp-1 and Enp-2; Enp-1 about 1.5 × as long as wide, with additional row of spinule on inner distal corner, unarmed; Enp-2 with one unipinnate inner seta inserted at distal 2/3 of the segment, with additional row of spinule on inner distal corner; Enp-3 unornamented, with one unipinnate inner seta, two pinnate apical setae and one pinnate outer spine subapically.

P3 (Fig. 5A). Coxa as in P2. Basis with a row of spinules on distal margin, and a thin, smooth outer seta. Exp as in P2, except for the absence of hair on inner margin of Exp-1. Enp reaching distal 2/3 of Exp-3, with spinules along outer margin in all segments and spinules along inner margin in Enp-1 and Enp-2, with additional row of spinules on inner distal corner of Enp-2; Enp-1 about 1.4 × as long as wide, unarmed; Enp-2 with one plumose inner seta; Enp-3 as long as Enp-2, with a row of spinules along outer margin, and armed with four elements: one robust unipinnate inner seta, two pinnate apical setae, one pinnate outer spine subapically.

P4 (Fig. 6A). Coxa unornamented. Basis with one bare outer seta. Exp as in P2 and P3. Enp reaching proximal 1/3 of Exp-3, and ornamentation as in P3, except Enp-3 with additional row of spinules on inner margin; Enp-1 unarmed; Enp-2 with one plumose inner seta; Enp-3 with three elements: two pinnate apical setae, one pinnate outer spine subapically.

P5 (Fig. 6B) with distinct Exp and baseoendopod. Exp suboval ~~in shape~~, as long as wide; with six elements: five pinnate setae and one slender smooth seta, of which the fourth ~~(IV) (from inner to outer)~~ and the fifth ~~(V)~~ shortest, subequal in length, about 1/3 of the outermost seta. Baseoendopod well-developed, reaching ~~mid-length~~ of Exp; ~~ornamentation~~ with several spinules on the outer margin of endopodal lobe; ~~armament~~ with thin bare outer seta and four marginal spiniform ~~setae~~, of which the third ~~(III) (~~from inner to outer~~)~~ longest, innermost seta ~~(I)~~ shortest.

P6 (Fig. 2D) fused and small, forming a simple plate, with one plumose outer seta and one longer smooth inner seta on peduncle.

Description of adult male. Total body length, measured from tip of rostrum to posterior margin of caudal rami: 364–394 µm (mean = 375 µm, n = 4), slightly smaller than female. Habitus, ornamentation, colour and nauplius eye as in female except sexually dimorphic urosome with six somites (genital somite and first abdominal one not fused) (Figs. 7A, 7B, 7C and 7D).

Antennule (Fig. 8B) sexually dimorphic, eight-segmented; approximately half as long as cephalothorax. Aesthetasc on segment ~~IV~~ well developed, reaching tip of segment ~~VIII~~ at about the middle of its length and fused with neighbouring seta at base; that of segment ~~VIII~~ relatively shorter than in the female and fused ~~with neighbouring seta at base,~~ forming acrothek. Setal formula as follows: I-[1], II-[6], III-[3], IV-[12+ae], V-[1], VI-[1], VII-[4], VIII-[4+acrothek].

P1 (Fig. 8A). Coxa ornamented with row spinules along outer margin. Basis with row spinule on outer and distal margin; ~~armament~~ with one pinnate outer spine and obtuse inner spine ~~less~~er sharp than in female. Exp~~.~~ and Enp~~.~~ as in female.

P2 (Fig. 9A) sexually dimorphic. Coxa with several spinules on anterior surface. Basis with robust unipinnate outer spine and a row of tiny spinules on distal margin. Exp ~~with~~ three-segmented, ~~equipped~~ as in female. Enp two-segmented; Enp-1 about 1.5 × as long as wide, with a row of setul~~ae~~ along inner margin. Enp-2 and Enp-3 completely ~~incorporated to each another~~ and outer distal corner produced into long, blunt spiniform process slightly longer than transformed outer apical spine; ~~armament~~ with one smooth inner seta, and three apical ~~and subapical~~ elements: one outer subapical seta transformed into smooth spiniform element with spike at tip, one inner subapical seta slender and smooth, subequal in length to the outer one, and one apical seta elongate and unipinnate on the distal half.

P3 (Fig. 9B) sexually dimorphic, ~~equipped~~ as in ~~P3 of~~ female except for the anterior surface of Exp-3 with enlarged tubular pore, representing hyaline spine: swollen at base and remarkably tapering distally, inserted at the middle and close to inner margin, reaching distal 2/3 of distal half of Exp-3.

P4 as in female.

P5 (Fig. 8~~B~~) Exp and baseoendopod ~~well~~ separated. Exp suboval, as long as wide, with five marginal elements of which the second ~~(II) (~~from inner to outer~~)~~ longest, pinnate ~~seta~~, and the fourth ~~(IV)~~ shortest, smooth ~~seta~~; length ratio of marginal seta to the innermost ~~one from the~~ first ~~(I)~~ to the fifth ~~(V) is respectively~~: 1: 2.5: 2.2: 0.6: 1.2. ~~Baseoendopod~~ with a row of spinules on outer margin ~~of endopodal lobe~~, with one thin, bare outer seta and two robust pinnate setae of unequal length ~~on endopodal lobe~~.

P6 (Fig. 7D) represented by a pair of small and short ~~cuticular~~ plates ~~forming unarmed bilobate~~.

~~Variation~~. While the inner seta is absent in P3Enp-1 of holotype, a female paratype has one pinnate inner seta ~~on the segment of~~ the left P3 (Fig. 5B).

Discussion

Differential diagnosis and remarks

According to Lang (1965), the new species belongs to the genus *Schizopera*, because it exhibits a combination of the following characteristics:

1) The presence of a hyaline spine on the male P3 Enp-3,
2) Uniform transformation of the inner spine on the male P1 basis,
3) Characteristic features of the female genital area,
4) Loss of the proximal outer spine on the Exp-3 of P1–P4,
5) Antenna with allobasis and two-segmented Exp.

The combination of these characteristics has been proposed as the evidence of the monophyletic relatedness of the genus, although the presence of the hyaline spine is not specific to it, having been found in *Eoschizopera* Wells & Rao, 1976~~,~~ too (Wells and Rao 1976). Some authors have defined the spine as an enlarged tubular pore (e.g., Karanovic 2006; Karanovic & McRae, 2013; Karanovic, Kim & Grygier, 2015).

To date, 104 species and subspecies have been validated, excluding new species. Of these, the loss of inner seta in both the Exp-2 and the Enp-1 of P2–P4 in the new species is shared by only four species. They are *S. bozici* Lang, 1965 reported from California and the Saint-Philippe of the La Réunion (approximately 750 kilometers eastward of Madagascar); *S. noodti* Rouch, 1962 described from Buenos Aires, Argentina; *S. akolos* Karanovic & Cooper, 2012 from the Yilgarn region, Western Australia; and *S. gangneungensis* Karanovic & Cho, 2016 from Korea (Rouch, 1962; Bozic, 1964, 1969; Lang, 1965; Wells, 2007; Karanovic & Cooper, 2012; Karanovic & Cho, 2016). The new species considerably differs from them~~, based on~~ the relative length and the chaetotaxy of caudal rami, the length of the female P1Enp-1 relative to Exp, the ~~armament~~ of Enp-2 and Enp-3 of P2–P4, and ~~the~~ segmentation and ~~the~~ chaetotaxy of P5 (Table 2). Among them, the Vietnamese *Schizopera* most resembles *S. noodti*~~, sharing the characteristics of~~ the segmentation and the ~~armament~~ of P5, the length of P1Enp-1 relative to Exp, and the ~~armament~~ of Enp-2 of P2–P4. However, the new species is easily distinguishable from *S. noodti* based on the following characteristics: (1) the length/width ratio of caudal rami is about 1.4 in the new species, but approximately 2.2 in *S. noodti*; (2) the setal formula of Enp-3 of P2–P4 is 4.4.4 in the new species, but 4.3.2 in *S. noodti* ~~(Rouch 1962)~~.

From a geographical viewpoint, the genus is predominantly marine. Most species were discovered in coastal areas around the world. However, only 14 species and subspecies have been reported from the Oriental geographical region and Sulawesi, including new species (Table 1). Of these taxa, ~~the Vietnamese~~ *~~Schizopera~~* shares ~~characteristics of~~ the shape and ~~the~~ ornamentation of the inner margin of caudal rami (i.e., the caudal rami are about 1.5 times as long as wide, with ~~hairs~~ on the inner margin) with five taxa, which include *S. clandestina, S.*

knabeni, S. longirostris, S. neglecta, S. tobae tobae and *S. t. wolterecki* (Daday, 1901; Chappuis, 1931; Akatova, 1935; Brehm & Chappuis, 1935; Gómez & Vargas-Arriaga, 2008), but only *S. neglecta* possesses the characteristic of the loss of inner seta in Enp-1 of P2–P4 (Akatova, 1935), resembling that of the new species. Furthermore, the inner seta is absent in the Enp-1 of P3–P4 in the new species, but present in the P3Enp-1 in all the mentioned congeners. In addition, the inner seta is present on the P4Enp-1 in *S. clandestina, S. knabeni, S. tobae tobae* and *S. tobae wolterecki*. Because Daday (1901) did not describe or illustrate the characteristics of P4Enp-1, a comparison of the armament of the P4Enp-1 could not be achieved between the new species and *S. longirostris*.

The new species most resembles *S. neglecta* Akatova, 1935 described from the Caspian Sea and later reported from the Black Sea, the Mediterranean, the East China Sea and Korea (Akatova, 1935; Jakubisiak, 1938; Por, 1964; Monchenko, 1967; Apostolov, 1973; Shen et al., 1978; Chang, 2009), based mainly on the loss of inner seta on Enp-1 of P2–P4 and the shape and hairy ornamentation of caudal rami. However, the new species is easily distinguishable from *S. neglecta* by the absence of an inner seta on the Exp-2 of P2–P4, which is present in *S. neglecta*. Furthermore, the P1Enp-1 reaches the distal margin of P1Exp-3 in the new species rather than just the middle of P1Exp-3 in *S. neglecta* (Akatova, 1935; Jakubisiak, 1938; Por, 1964; Monchenko, 1967; Apostolov, 1973; Shen et al., 1979).

If compared to the morphology of the species recorded in the Oriental region, the loss of inner seta in Exp-2 of P2–P4 has been recorded in three species, which include *S. crassispinata* described from Madagascar, *S. spinifer* from India, and the new species. However, the new species is distinguished from *S. crassispinata* and *S. spinifer* based on the loss of inner seta on Enp-1 of P2–P4 and the difference in the segmentation of P1Enp. The P1Enp is three-segmented in the new species, but two-segmented in *S. crassispinata* and *S. spinifer*. In addition, caudal seta V of the female and two innermost seta on the baseoendopod of the female P5 are developed to the plumose seta and the pinnate spiniform elements in the new species, respectively, but the seta is transformed to the swollen smooth element in *S. crassispinata* and the pectinate spines in *S. spinifer* (Chappuis, 1954; Wells & Rao, 1987). The loss of inner seta on Enp-1 of P2–P4 has been observed in *S. consimilis* from Lake Tanganyika (Sars 1909; Wells 2007), but the new species is differentiated from it, based mainly on the relative length of caudal rami and P1Enp-1, which is about 1.4× as long as wide and reaches the distal margin of the Exp, in the new species, respectively, whereas it is about twice as long as wide and reaches beyond the distal margin of the Expin *S. consimilis*, respectively.

Previously, Watiroyram, Sanoamuang & Brancelj (2021) described *S. paktaii* from a cave in southern Thailand. The authors considered *S. validior* Sars, 1909 from Lake Tanganyika (Africa) as the closet relative of the Thai *Schizopera*. Morphological examination, based on the original description of *S. validior*, has shown a close affinity between the new species and *S. validior* according to the similarity of the shape and the ornamentation of the inner margin of caudal rami as well as the armament of the female P5. However, the former and latter can be easily differentiated from each other by the armament of the Exp-2 and Enp-1 of P2–P4 and the shape

of the P1Enp-3. The inner seta ~~of~~ the Exp-2 and ~~the~~ Enp-1 of P2–P4 is lost in the new species, but present in *S. validior* (Sars, 1909).

Comparing the morphology of the new species and the species not recorded in Wells (2007) has shown that ~~characteristic of~~ the loss of inner seta in Exp-2 of P2–P4 has not only been observed in *S. gangneungensis,* but also in *S. setulosa* Mirabdullayev & Ginatullina 2007 from Uzbekistan. Nevertheless, the new species is differentiated from *S. setulosa* by the loss of inner seta ~~in~~ Enp-1 of P2–P4 and the ~~presence of the~~ setal formula of Enp-3 of P2–P4 4.4.3 ~~rather than~~ 4.3.2 in *S. setulosa*.

Diversity pattern

While the number of specialists, who proposed the new species of Copepoda in Vietnam is considered low (15) (see Tran et al. 2025 for the list of taxa and the author of the contribution), the discovery of a large amount of new copepod taxa within a short period might not only indicate the growing interest in the diversity of Copepoda (Boonyanusith, Brancelj & Sanoamuang, 2024) but also the high diversity of the fauna ~~in~~ Vietnam (Tran et al., 2025). Of 16 newly described copepod species, 13 were discovered and described from the country within the last 13 years.

Following the perspective of Daharveng & Bedos (2000), who utilized supra-specific units (e.g., genus, family, order and so on) to assess differences in diversity patterns across regions ~~considered~~, the examination of the list of newly described species in Vietnam reveals a high proportion of copepods that are considered descendants of marine ancestors. Among the 16 newly described species, five belong to the genera *Boholina* Fosshagen, 1989 in Fosshagen & Iliffe, 1989 (Pseudocyclopidae), *Microarthridion* Lang, 1944 (Tachidiidae), *Nitokra* Boeck, 1865 (Ameiridae), and *Schizopera* (Miraciidae) (Tran & Chang, 2012, 2020; Tran et al. 2025). They are considered the descendants of marine ancestors because their members or close phylogenetic relatives are predominantly ~~in~~ marine or coastal environments. A similar pattern can be observed in southern and eastern Thailand, where all the newly described taxa in continental water habitats can be classified as ~~a~~ freshwater representative of the marine-ancestral relatives. These include *Boholina*, *Schizopera*, *Rangabradya* Karanovic, 2001 (Ectinosomatidae), *Onychocamptus* Daday, 1903 (Laophontidae), and *Cletocamptus* (Canthocamptidae) (Boonyanusith et al., 2018; Boonyanusith, Wongkamhaeng & Athibai, 2020; Boonyanusith & Athibai, 2021; Watiroyram, Sanoamuang & Brancelj, 2021; Boonyanusith & Wongkamhaeng 2023).

Based on geographical and evolutionary perspectives, some authors have suggested the influence of the proximity to the sea (i.e., the relatively short distance between a given area and the coastline), which significantly contributes to the high species richness of stygobiotic and troglobiotic fauna (i.e., more than 25 obligate subterranean species) in various karst systems, such as the Salukkan Kallang–Tanette Cave System in Indonesia, the Dinaric Karst System in Europe, and the Hon Chong Karst in Vietnam (Deharveng & Bedos, 2012; Zagmajster et al., 2014; Deharveng et al., 2023; 2024). This indicates the influence of geographical location on the composition of faunal communities. Regarding Vietnam, the country occupies the easternmost edge of mainland Southeast Asia, stretching approximately 1,600 kilometers from north to south,

bordered by about 3,400 kilometers of coastline along the Pacific Ocean and the Gulf of Thailand (Marine Corps Intelligence Activity, 2005). A global remote sensing analysis has identified 3,069 square kilometers of tidal flats, making Vietnam the third-largest intertidal zone in Southeast Asia, after ~~only~~ Indonesia and Myanmar (Murray et al., 2019). The geographic features of the country can play a critical role in shaping the high diversity of copepod lineages, many of which ~~are descended from~~ marine ancestors. Furthermore, brackish environments, which serve as transitional zones between marine and continental systems ~~and function as~~ adaptive zones for continental invasion (Lee & Bell, 1999), have been well documented as a site of radiation and ~~the~~ speciation of marine-derived lineages (Lee, 1999). Thus, a high number of ~~the~~ Copepoda, that have evolved from ~~the~~ marine-ancestral lineages would be expected in Vietnam.

Key to *Schizopera* ~~species and subspecies~~ recorded in Oriental region, Sulawesi and East Asia

Throughout the last two decades, 18 species and subspecies of *Schizopera* ~~were~~ described. Seven species were described from various countries across East and Southeast Asia, including Japan (*S. abei* Karanovic, Kim & Grygier, 2015), Korea (*S. daejinensis* Karanovic & Cho, 2016, *S. yeonghaensis* Karanovic & Cho, 2016, *S. gangneungensis* Karanovic & Cho, 2016, and *S. sindoensis*; Karanovic & Cho, 2016), Thailand (*S. paktaii*), and Vietnam (*S. vietnamica* sp. nov.) (Karanovic, Kim & Grygier, 2015; Karanovic & Cho, 2018; Watiroyram, Sanoamuang & Brancelj 2021, this study). The discovery reflects a growing interest in the biodiversity of Copepoda in the coastal environments of these regions. Accordingly, a key to the species of *Schizopera* recorded in the Oriental region, Sulawesi, and East Asia is provided below, based primarily on female morphological characteristics. The key also includes *S. brustini*, as Fiers (1986) suggested the species may occur in (at least) the Indian Ocean.

1 - P1Enp two-segmented……(2)

- P1Enp three-segmented……(5)

2 - ~~Setal formula of inner seta on~~ Exp-2 of P2–P4 ~~as 0.0.0~~……(3)

- ~~Setal formula of inner seta on~~ Exp-2 of P2–P4 ~~as 1.1.1~~……(4)

3 - P5Exp and basesoendopod with five and three marginal setae/spines, respectively; caudal rami about 1.1 times as long as wide, with seta V transformed ~~to~~ swollen smooth element; ……***S. crassispinata*** [Madagascar]

- P5Exp and basesoendopod with six and four marginal setae/spines, respectively; caudal rami about 1.2 times as long as wide, with seta V normally developed…… ……***S. spinifer*** [Katchal Island (Nicobar Islands)]

4 - P5Exp with six marginal setae; caudal rami about 1.5 times as long as wide, with short spinule ornamentation on inner margin; setal formulae of Enp-1 and Exp-2 of P2–P4 as 1.0.1 and 0.0.1, respectively .....…***S. monardi*** [the area ~~where~~ is probably in Montenegro]

- P5Exp with five marginal setae; caudal rami about twice as long as wide, with long spinule ornamentation on inner margin; setal formulae of Enp-1 and Exp-2 of P2–P4 as 1.1.1 and

0.1.1, respectively; P1Enp-1 reaching mid of Exp-3; caudal seta IV setiform, well surpassing breaking plane of seta V……..…..….***S. brusinae*** [*sensu* Kunz (1974), France]

5 - P4 with two-segmented Enp; caudal rami about twice as long as wide, inner margin naked; caudal seta IV setiform and short, shorter than seta VI; P1Enp-1 reaching tip of Exp-2; setal formula of P2–P4 0.1.1…….***S. abei*** [Lake Biwa (Japan)]

- P4 with three-segmented Enp…….…….…….…(6)

6 - P5Exp fused to baseoendopod, with five marginal setae; caudal rami with spinule ornamentation on inner margin; setal formulae of Exp-2 and Enp-1 of P2–P4 as 0.0.0……...
…….……..***S. gangneungensis*** [Korea]

- P5Exp fused to baseoendopod, with six marginal setae…….…….……(7)

- P5Exp free, with five marginal setae…….…….…….(8)

- P5Exp free, with six marginal setae……..…….(11)

7 - Setal formula of inner seta on Exp-2 of P2–P4 as 0.0.0……..….***S. daejinensis*** [Korea]

- Setal formula of inner seta on Exp-2 of P2–P4 as 1.1.1…….....***S. yeonghaensis*** [Korea]

8 - Setal formula of Enp-1 of P2–P4 as 0.0.0; P1Enp-1 surpassing tip of Exp; caudal seta IV setiform, considerably surpassing breaking plane of seta V…….……..
…….....…...***S. consimilis*** [Lake Tanganyika (Africa)]

- Setal formula of Enp-1 of P2–P4 as 0.1.1……..……..(9)

9 - Caudal rami about 1.5 times as long as wide, with long spinule ornamentation on inner margin ……...…...…...***S. brusinae*** [*sensu* Fiers (1986), New Guinea]

- Caudal rami at least about 1.8 times as long as wide, with ~~hairy~~ ornamentation on inner margin……..……..……(10)

10 - Caudal seta IV spiniform and short, reaching or slightly surpassing breaking plane of seta V……..... ***S. brusinae*** [*sensu* Petkovski (1954), Croatia; *sensu* Apostolov (1973), Bulgaria]

- Caudal seta IV setiform, considerably surpassing breaking plane of seta V…….…...
……...……..……..….***S. paktaii*** [Thailand]

11 - All P2, P3 and P4 without inner seta on Enp-1……...…….……...…...…(12)

- Either P2 and P3 or P3 and P4 with inner seta on Enp-1…….……..…….…...(14)

12 - All P2, P3 and P4 without inner seta on Exp-2……..….***S. vietnamica*** **sp. nov.** [Vietnam]

- ~~Setal formula of~~ Exp-2 of P2–P4 ~~1.1.1~~.……..…..……...……(13)

13 - Setal formula of Enp-3 of P2–P4 4.4.3…..…….***S. neglecta*** [*sensu* Akatova (1935), Russia; *sensu* Por (1964), Israel; *sensu* Shen et al, (1979), China; *sensu* Chang (2009), Korea; and *sensu* Apostolov (1973), Bulgaria]

- Setal formula of Enp-3 of P2–P4 4.3.3……...***S. neglecta*** [*sensu* Monchenko (1967), Romania]

14 - P2 and P3 with inner seta on Enp-1; P1Enp-1 surpassing tip of Exp……...
……..……...……..……***S. longirostris*** [New Guinea; Thailand]

- P3 and P4 with inner seta on Enp-1.……..……..……(15)

15 - Setal formula of Exp-3 of P2–P4 4.4.5; setal formula of Enp-3 of P2–P4 5.5.3……..
……..….***S. indica*** [India]

- Setal formula of Exp-3 of P2–P4 4.4.4 or 4.3.4; setal formula of Enp-3 of P2–P4 3.4.3, 4.4.3 or 4.5.3……..……..(16)

16 - ~~Setal formula of inner seta on~~ Exp-2 of P2–P4 1.0.0; setal formula of Enp-3 of P2–P4 4.5.3……..….***S. clandestina*** [*sensu* Arlt (1983), Baltic Sea (German)]

- ~~Setal formula of inner seta on~~ Exp-2 of P2–P4 0.0.1…….…….. ***S. sindoensis*** [Korea]

- ~~Setal formula of inner seta on~~ Exp-2 of P2–P4 1.1.1…….…….……..(17)

17 - Setal formula of Enp-3 of P2–P4 3.4.3.... ***S. clandestina*** [*sensu* Klie (1923), Germany]

- Setal formula of Enp-3 of P2–P4 4.4.3……..…….……..…..….(18)

18 - Caudal rami without ~~hairs~~ on inner margin; P1Enp-1 reaching tip of Exp-2…….…. ……..……..***S. subterranea*** [Italy; Thailand]

- Caudal rami without ~~hairs~~ on inner margin; P1Enp-1 reaching tip of Exp-3….……(19)

- Caudal rami with ~~hairs~~ on inner margin; P1Enp-1 reaching tip of Exp-2 at least but not surpassing tip of Exp-3……..……..……(20)

- Caudal rami with ~~hairs~~ on inner margin; P1Enp-1 surpassing tip of Exp……..……(21)

19 - Caudal rami about 1.5 times as long as wide……....***S. tobae tobae*** [Sumatra, Java (Indonesia)]

- Caudal rami about 1.7–1.8 times as long as wide……..……..……. ……***S. tobae wolterecki*** [Sulawesi (Malaysia)]

20 - Caudal rami about 1.5–2 times as long as wide……....***S. clandestina*** [*sensu* Apostolov (1973), Bulgaria; *sensu* Chang (2009), Korea; *sensu* Shen et al. (1979), China]

- Caudal rami as long as wide…….……***S. clandestina brevicauda*** [Germany]

21 - P1Enp-3 about twice as long as wide.…….…...……***S. knabeni*** [America; Mexico]

- P1Enp-3 about three times as long as wide…….***S. clandestina*** [*sensu* Noodt (1953), Germany]

Conclusions

Schizopera vietnamica sp. nov. was described based on specimens collected from the mangrove zone in the Vu Gia–Thu Bon coastal region, Quang Nam Province, central Vietnam. The species is distinguished by a unique combination of morphological characters, including the relative length and chaetotaxy of the caudal rami, the length of the first endopodal segment relative to the exopod of the female first swimming leg, the armature of the second and third endopodal segments of the second to fourth swimming legs, and the segmentation and chaetotaxy of the fifth swimming leg. The new species most resembles *S. neglecta*, primarily due to the loss of the inner seta on the first endopodal segment of the second to fourth swimming legs and ~~the~~ shape and ~~hairy~~ ornamentation along the inner margin of the caudal rami. Due to the high diversity of copepods ~~descended from~~ marine ancestors in Vietnam, proximity to the sea has been suggested as a key factor influencing the diversity patterns of copepod fauna in the country.

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Figure 1

~~The sampling location~~ of ~~the new~~ ~~*Schizopera*~~ ~~species,~~ *S. vietnamica* sp. nov. Vu Gia–Thu Bon River, Quang Nam province, Vietnam.

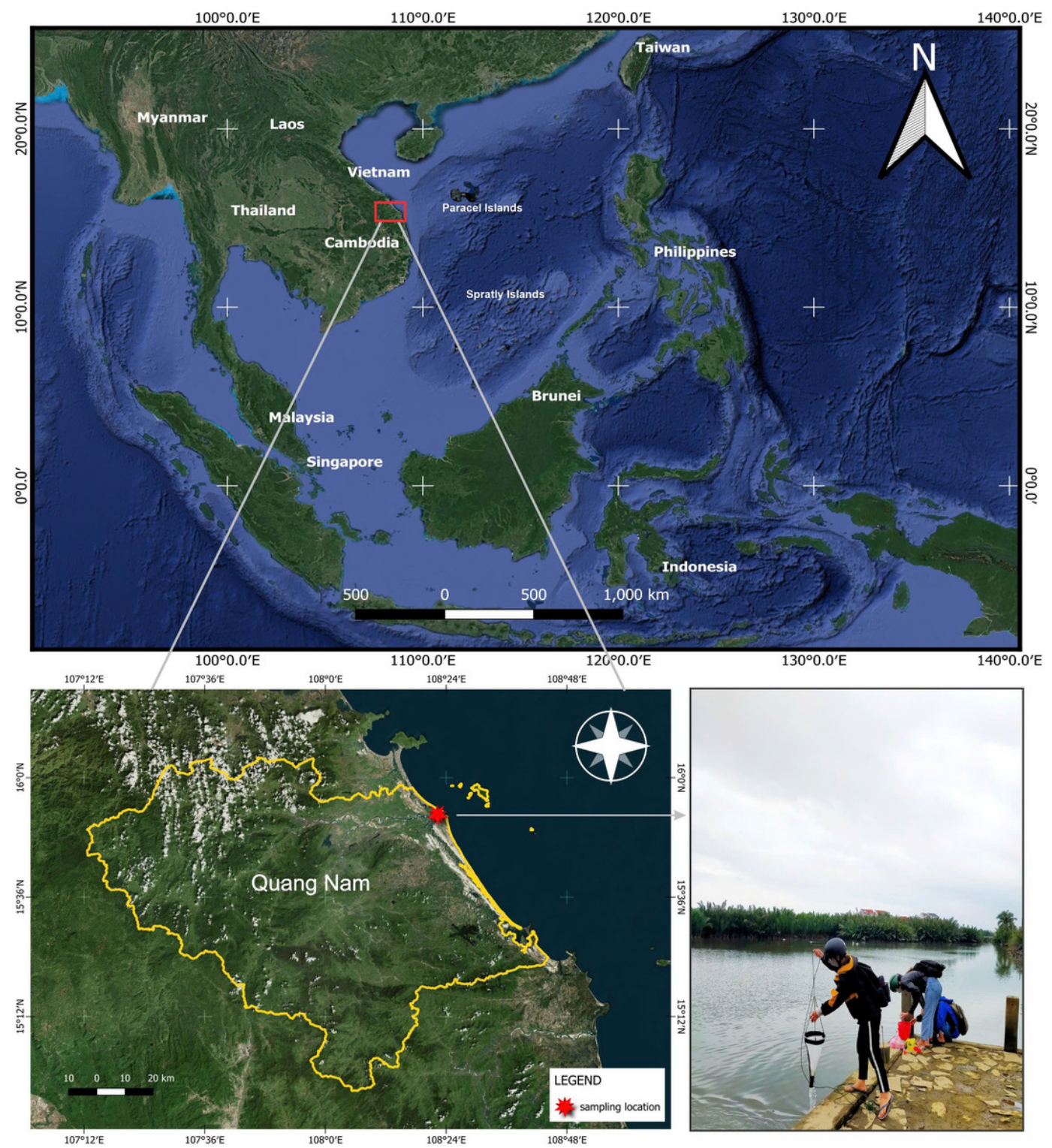
100°0.0′E
110°0.0′E
120°0.0′E
130°0.0′E
140°0.0′E
20°0.0′N
10°0.0′N
0°0.0′
N
Taiwan
Myanmar
Laos
Vietnam
Thailand
Paracel Islands
Cambodia
Philippines
Spratly Islands
Brunei
Malaysia
Singapore
Indonesia
500 0 500 1,000 km
107°12′E
107°36′E
108°0′E
108°24′E
108°48′E
16°0′N
15°36′N
15°12′N
Quang Nam
10 0 10 20 km
LEGEND
sampling location

Figure 2

Schizopera vietnamica sp. nov. Female, holotype (ZC-DTU-COPEPODA-0015).

(A) Habitus, dorsal view. (B) Urosomites 2–4 and anal somite, lateral view. (C) Urosomites 2–4 and anal somite, dorsal view. (D) Urosomites 2–4 and anal somite, ventral view.

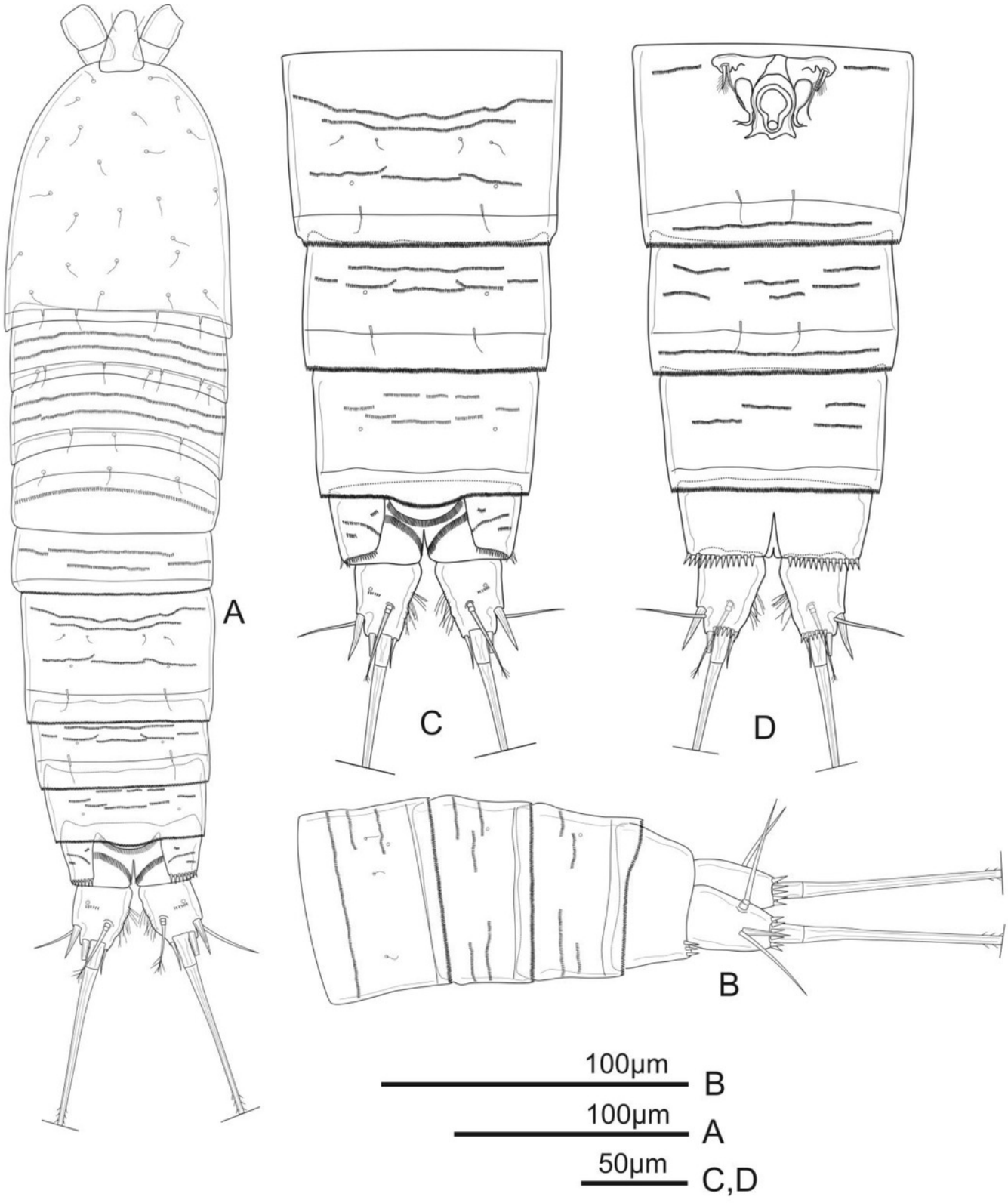
A
C
D
B
100μm
B
100μm
A
50μm
C,D

Figure 3

Schizopera vietnamica sp. nov. Female, holotype (ZC-DTU-COPEPODA-0015).

(A) Antennule. (B) Antenna. (C) Mandible. (D) Maxillule. (E) Maxilla. (F) Maxilliped.

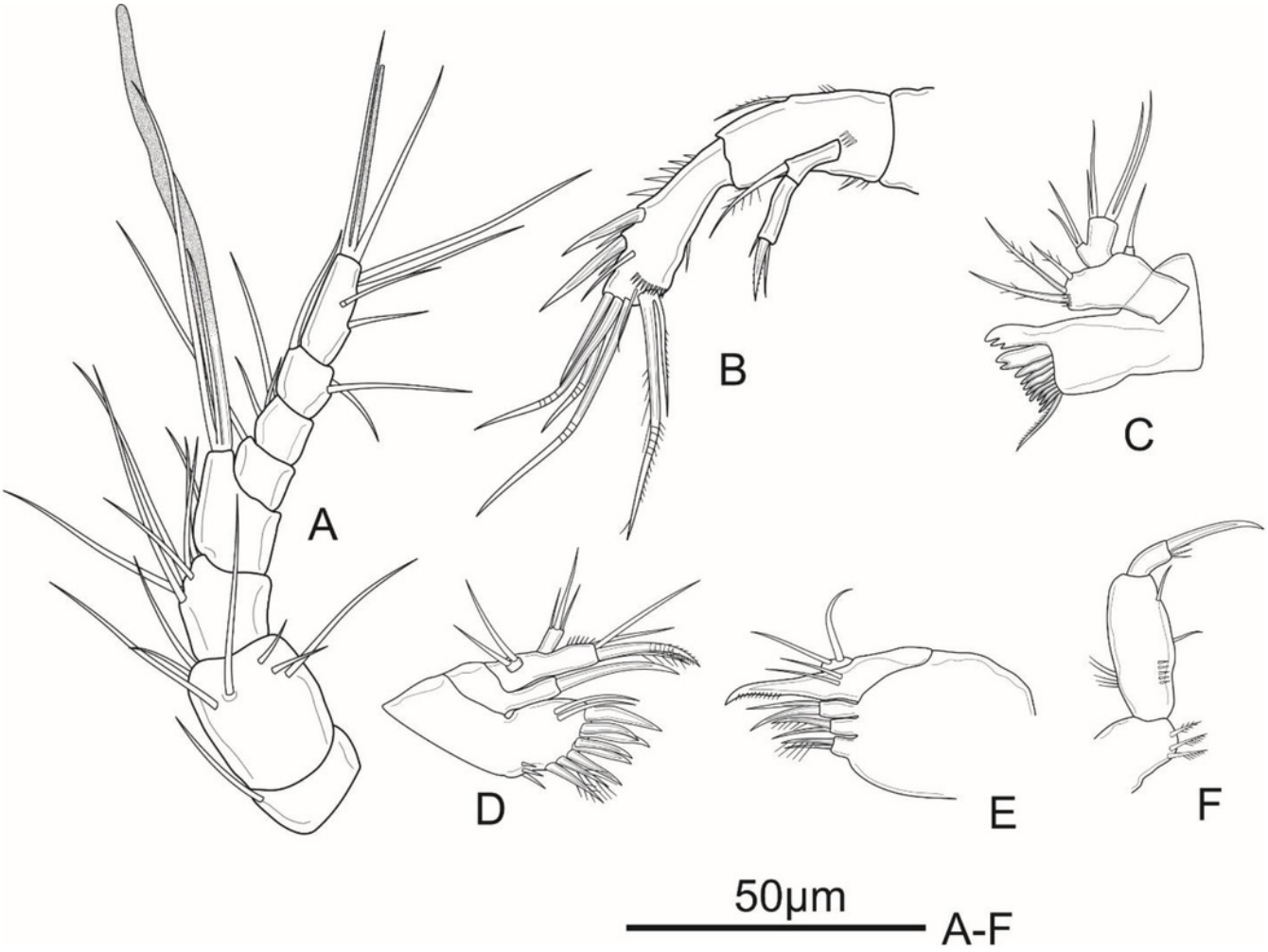

Figure 4

Schizopera vietnamica sp. nov. Female, holotype (ZC-DTU-COPEPODA-0015).

(A) P1. (B) P2.

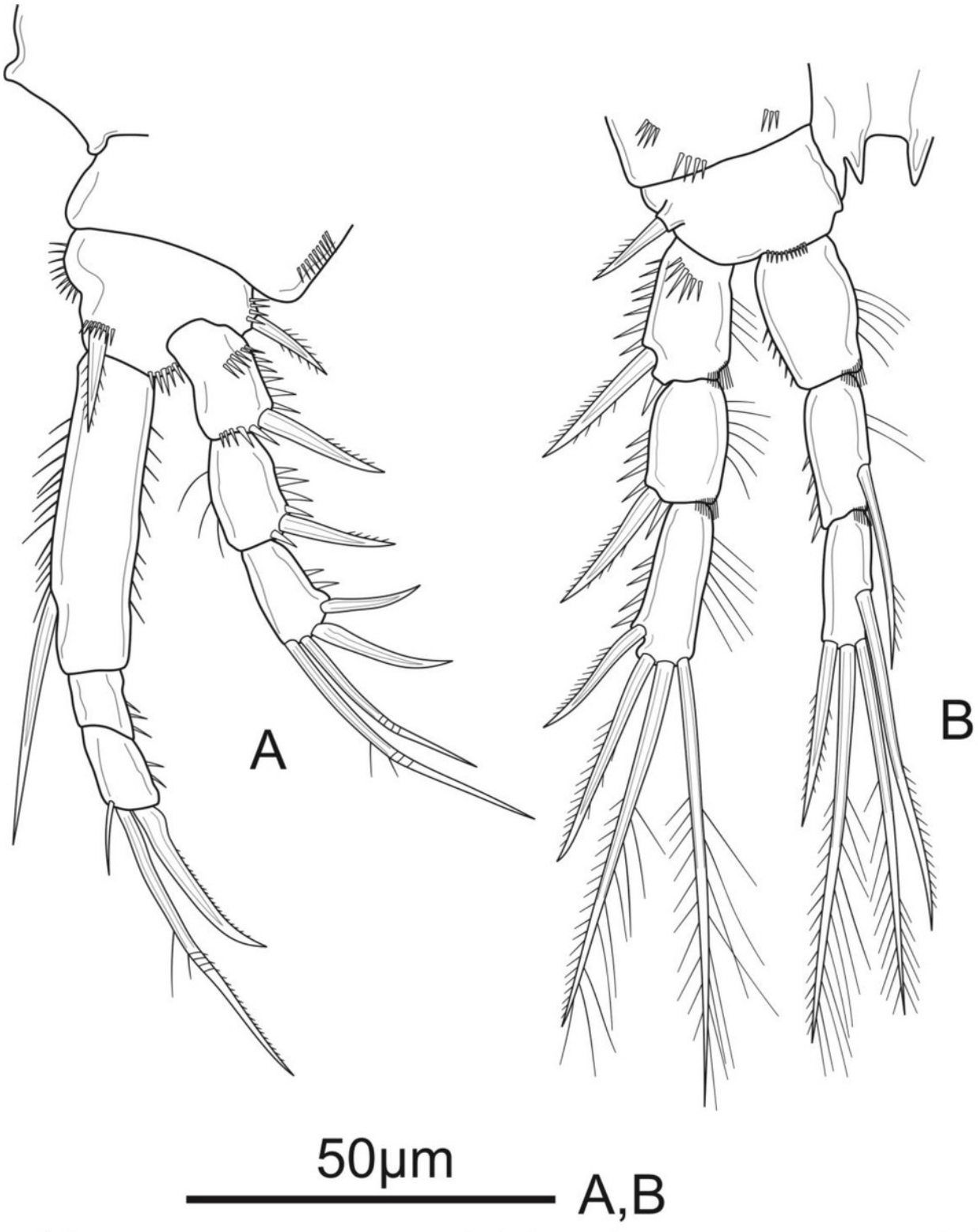
A
B
50µm
A,B

Figure 5

Schizopera vietnamica sp. nov. Female.

(A) P3, holotype (ZC-DTU-COPEPODA-0015). (B) Left P3, paratype (ZC-DTU-COPEPODA-0017).

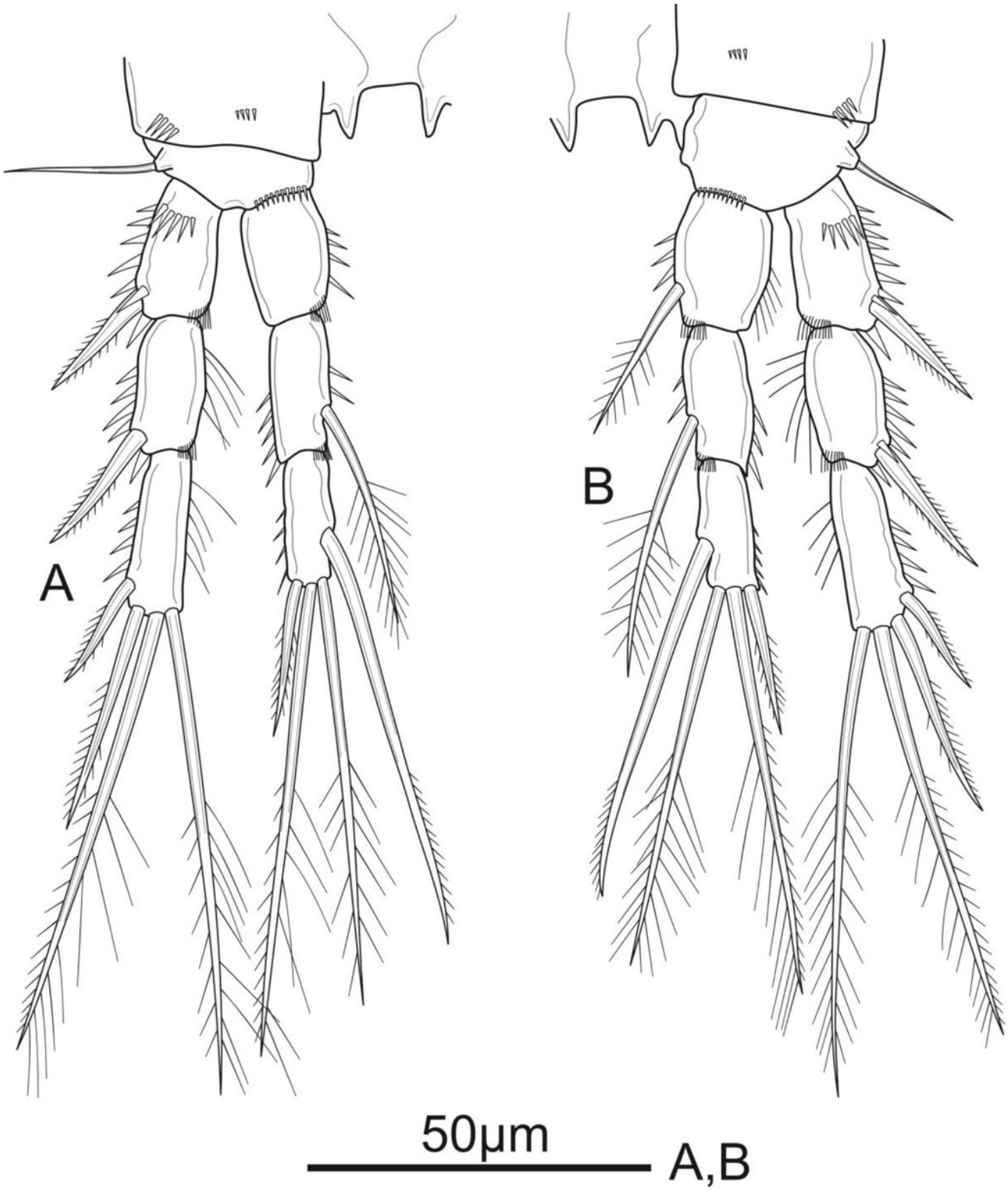
A
B
50µm
A,B

Figure 6

Schizopera vietnamica sp. nov. Female, holotype (ZC-DTU-COPEPODA-0015).

(A) P4. (B) P5.

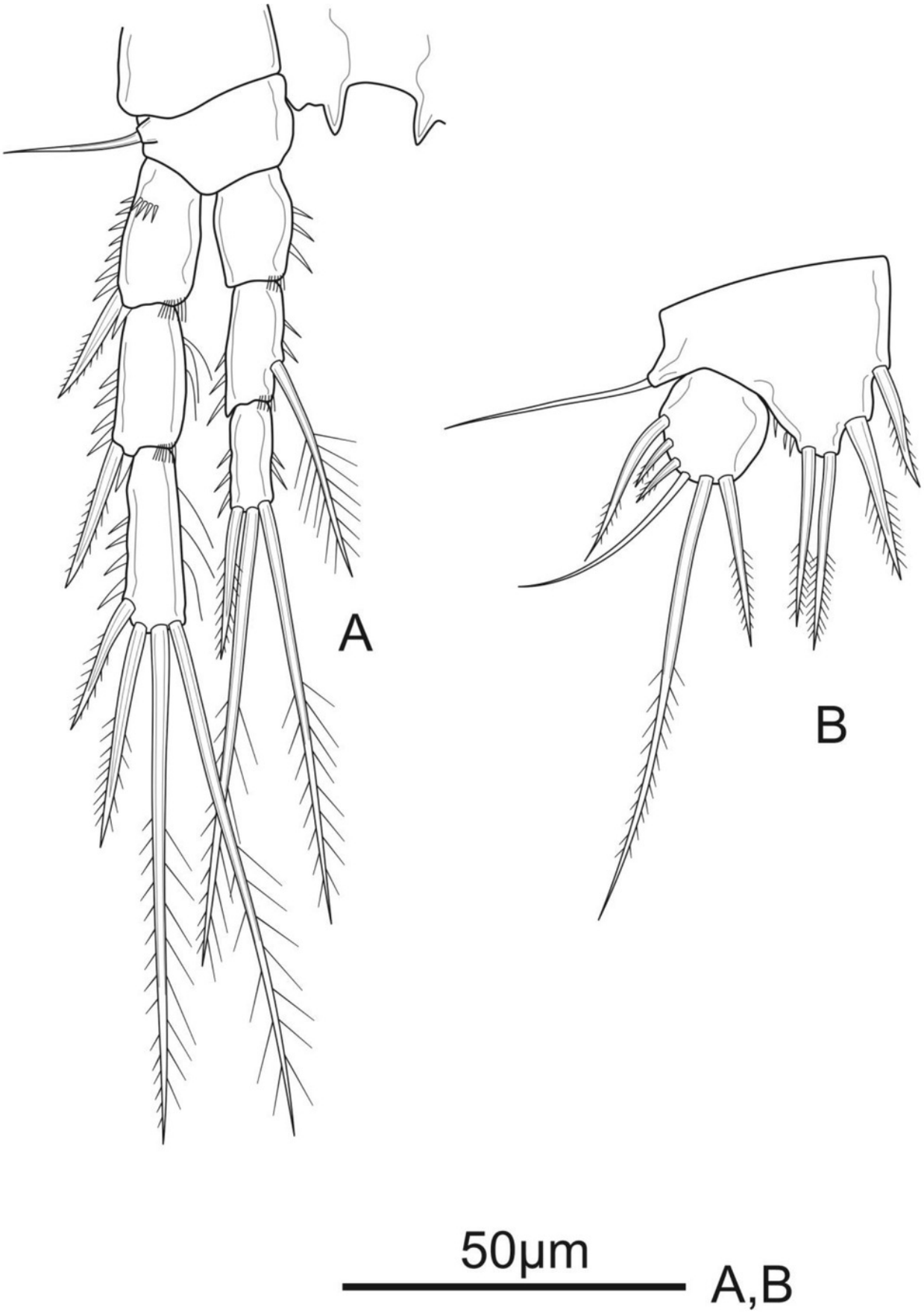
A
B
50µm
A,B

Figure 7

Schizopera vietnamica sp. nov. Male, (A) paratype (ZC-DTU-COPEPODA-00 17) and (B –D) allotype (ZC-DTU-COPEPODA-00 16).

(A) Habitus, dorsal view. (B) ~~Urosomites 2–5 and anal somite~~ , lateral view. (C) ~~Urosomites 2–5 and anal somite~~ , dorsal view. (D) ~~Urosomites 2–5 and anal somite~~ , ventral view.

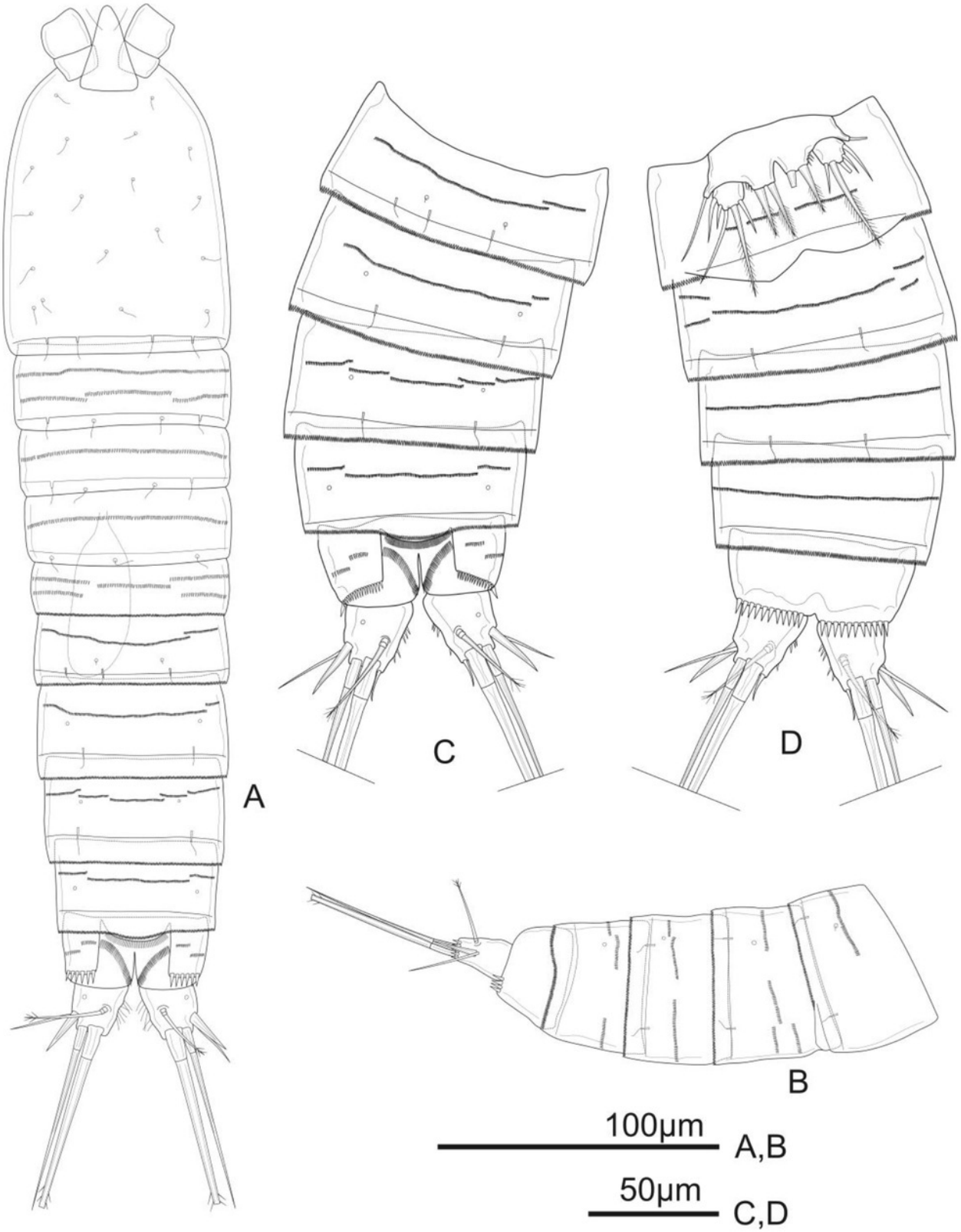
A
C
D
B
100µm
A,B
50µm
C,D

Figure 8

Schizopera vietnamica sp. nov. Male, allotype (ZC-DTU-COPEPODA-0016).

(A) P1. (B) Antennule. (C) P5.

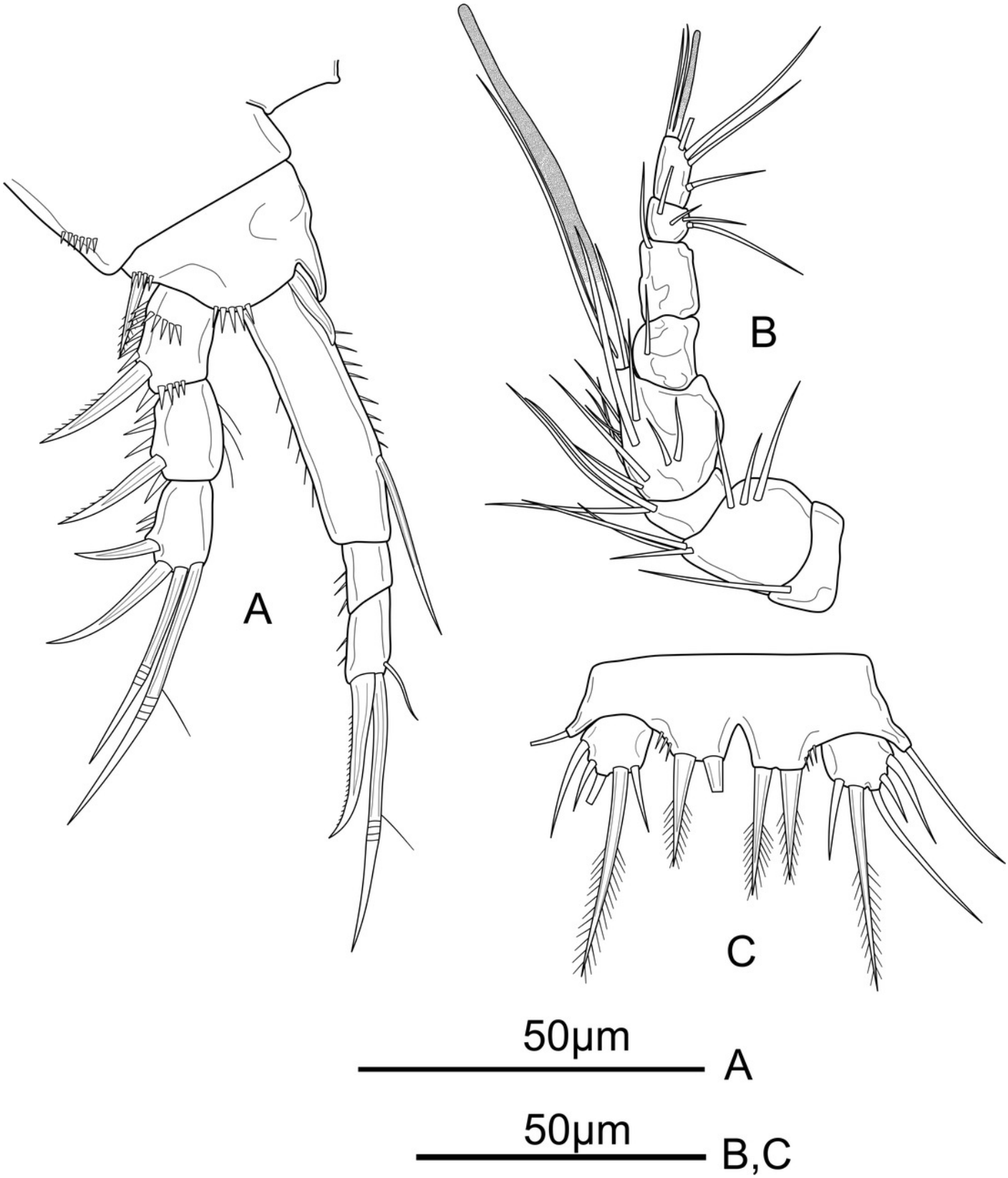
A
B
C
50µm
A
50µm
B,C

Figure 9

Schizopera vietnamica sp. nov. Male, allotype (ZC-DTU-COPEPODA-0016).

(A) P2. (B) P3.

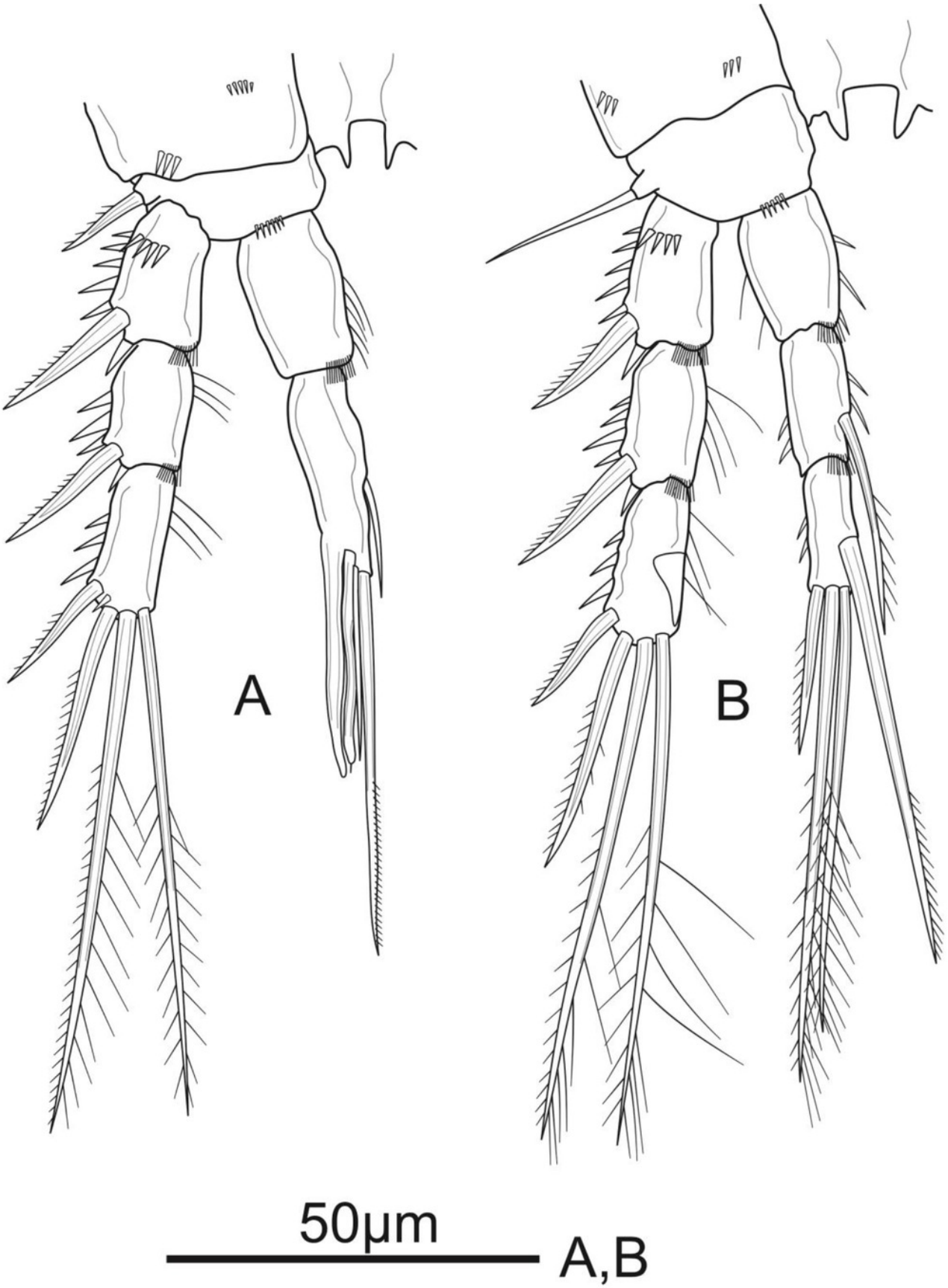
A
B
50µm
A,B

Table 1(on next page)

List of *Schizopera* recorded in Oriental zoogeographical region and Sulawesi.

Taxa	Localities	References
S. clandestina (Klie, 1923)	Guangdong (China)	Chertoprud et al. 2009; Shen et al. (1976)
S. consimilis Sars, 1909	Goutami-Godavari estuary (Andhra Pradesh, India)	Dev Roy and Venkataraman (2018)
S. crassispinata Chappuis, 1954	Waltair (Andhra Pradesh, India)	Dev Roy and Venkataraman (2018)
S. indica Rao & Ganapati, 1969	Lawson's Bay (Andhra Pradesh, India)	Rao and Ganapati, 1969
S. knabeni Lang, 1965	Peninsular of Malaysia	Shafie and Rahim (2021)
S. longirostris (Daday, 1901)	Wat Sabatome (Bangkak) Gulf of Thailand (Thailand)	Daday (1906); Chertoprud et al. (2009); Maiphae and Sa-ardrit (2011)
S. monardi Petkovski, 1955	Goutami Godavari estuarine system (Andhra Pradesh, India)	Dev Roy and Venkataraman (2018)
S. neglecta Akatova, 1935	Xiamen (Fijian); Jiangsu; Tianjin (China)	Shen et al. (1979)
S. paktaii Watiroyram, Brancelj & Sanoamuang, 2021	Cave, about 28 kilometers from Andaman Sea (Thailand)	Watiroyram et al. (2021)
S. spinifer Wells & Rao, 1987	Long Island (Andaman Islands)	Wells and Rao (1987)
S. subterranea Lang, 1948	Gulf of Thailand	Maiphae and Sa-ardrit (2011)
S. tobae tobae Chappuis, 1931	Toba Lake (Sumatra); freshwater bodies (West Java)	Chappuis (1931)
S. tobae wolterecki Brehm & Chappuis, 1935	Lake Towuti (Sulawesi)	Brehm and Chappuis (1935)

1

Table 2(on next page)

Armature formula of female P1–P4 (legend: inner-outer seta/spine; inner-apical-outer seta/spine; Arabic numerals represent number of setae. Roman numerals represent number of spines).

Leg	Basis	Exp			Enp		
		1	2	3	1	2	3
P1	I-I	0-I	0-I	0-2-II	1-0	0-0	1-1,I-0
P2	0-I	0-I	0-I	0-2-II	0-0	1-0	1-2-I
P3	0-1	0-I	0-I	0-2-II	0/1-0	1-0	1-2-I
P4	0-1	0-I	0-I	0-2-II	0-0	1-0	0-2-I

Table 3(on next page)

Morphological differences among five species of *Schizopera*, ~~in which~~ inner seta on both the Exp-2 and the Enp-1 of P2–P4 ~~is absent~~.

Characters	***S. vietnamica* sp. nov.**	***S. bozici***	***S. noodti***	***S. akolos***	***S. gangneungensis***
Female					
Shape and length/width ratio of caudal rami	Conical/~1.4	Conical/~1.5	Conical/~2.2	Conical/~1.0	Conical/~1.4
Ornamentation on inner margin of caudal rami	Hairs along inner margin	Bare	Hairs along inner margin	Transverse row of spinules	Longitudinal row of spinules
Shape of caudal seta II	Spiniform	Setiform	Spiniform	Spiniform	Spiniform
Number of elements on distal segments of Exp of antenna and relative length	2 subequal elements	2 subequal elements	1 long and 2 short setae	2 subequal elements	2 subequal elements
Number of segments of P1Enp	3	3 or 2	3	3	3
Number of segments of P4Enp	3	3	3	2	3
Relative length of Enp-1 to Exp of P1	Distal margin of Exp-3	Distal margin of Exp-3	Distal margin of Exp-3	Distal margin of Exp-2	Middle of Exp-3
Setal formula of Enp-2 of P2–P4	1.1.1	1.0.0 or 1.1.0	1.1.1	1.1.-	1.1.0
Setal formula of Enp-3 of P2–P4	4.4.3	3.3.3 or 4.3.3	4.3.2	4.2.3	4.2.2
Segmentation of P5Exp	Free	Fused	Free	Free	Partly fused
Number of elements on baseoendopod and Exp of P5	4/6	3/5	4/6	4/4	4/5
Male					
Number of segments of P1Enp	3	2	3	3	NA

2