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Amended Diagnosis and Description of a New Species of the Genus *Troglophonte* Huys & Lee, 2000 (Copepoda, Harpacticoida, Laophontidae)

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Abstract: A new species of the monotypic genus *Troglophonte* Huys & Lee, 2000 (Harpacticoida, Laophontidae) was discovered among the interstitial samples collected from the Kumada Coast in the Sea of Marmara. The new species can be distinguished from the type species *T. spelaea* (Chappuis, 1938) by the following characters: (i) female 6-segmented antennule, (ii) P3 exp terminal segment with 7 setae, (iii) female P5 exopodal lobe with 5 setae, (iv) female P5 baseoendopod with 3 setae on endopodal lobe, (v) surface ornamentation of swimming legs, (vi) male P5 baseoendopod distal seta ornamentation, and (vii) male P5 exopod setal ornamentation. The type material of *T. spelaea* does no longer exist and its diagnosis is concise. Therefore, the generic diagnosis has been updated to include the characters displayed by the new species. Additionally, a phylogenetic analysis including other genera related to the *Troglophonte* was conducted using parsimony. The results obtained from the phylogenetic analysis were generally consistent with the previous studies.

Keywords: Taxonomy, Sea of Marmara, biodiversity, interstitial.

Troglophonte Huys & Lee, 2000 (Copepoda, Harpacticoida, Laophontidae) Cinsinin Değiştirilmiş Diyagnozu ve Yeni Bir Türünün Deskripsiyonu

Öz: Marmara Denizi'nde bulunan Kumada Sahili'nden toplanan kumiçi örneklerinde monotipik *Troglophonte* Huys & Lee, 2000 (Harpacticoida, Laophontidae) cinsine ait yeni bir tür bulundu. Yeni tür *T. spelaea* (Chappuis, 1938)'dan şu karakterler ile ayırtedilebilir; (I) dişi antenül 6 segmentli, (ii) P3 ekzopod terminal segmenti 7 setalı, (iii) dişi P5 ekzopodal lobu 5 setalı, (iv) dişi P5 bazeoendopodunda endopodal lop 3 setalı, (v) yüzme bacaklarının yüzey ornamentasyonu, (vi) erkek P5 bazeoendopod uç setalarının ornamentasyonu, (vii) erkek P5 ekzopod setalarının ornamentasyonu. *T. spelaea*'nın tip materyalleri artık mevcut değildir ve diyagnozu kısadır. Bu nedenle, yeni türün karakterleri ile cins diyagnozu güncellenmiştir. Ek olarak, *Troglophonte* cinsinin yakın ilişkili cinsler ile filogenetik analizi parsimony metodu ile gerçekleştirilmiştir. Filogenetik analizlerden elde edilen sonuçlar genel olarak daha önce yapılan çalışmalarla tutarlıdır.

Anahtar kelimeler: Taksonomi, Marmara Denizi, biyoçeşitlilik, kumiçi.

1. Introduction

Chappuis (1938) originally described *Laophonte spelaea* (Chappuis, 1938) from caves in southern Italy. These caves, located in the Apulia district, include Abisso, La Zinzulusa and Grotta dei Diavoli and typically exhibiting salinity levels that approach freshwater with alterations arising from the influence of marine tides penetrating the cave systems. Subsequent research (Ruffo, 1949; Pesce, 1985; Rouch, 1986) categorized *L. spelaea* as a stygobiont species, suggesting it originated from a marine ancestor that successfully adapted to subterranean freshwater habitats.

Chappuis' (1938) original description is very brief and lacks important details, covering only few morphological aspects such as the segment number of the antennule, armature of the male P3 and P5, and the armature of the female P5. Illustrations are provided for the male P2-P3 endopod and P5 as well as for both rami of the female P4. Unfortunately, Chappuis (1938) did not provide specific details regarding the arrangement of setae on the endopodal lobe of the female P5 and there exists uncertainty about the setal count (5 or 6) on the exopod of the female P5.

Lang (1944; 1948) subsequently assigned *L. spelaea* to the genus *Esola* Edwards, 1891 but did not provide an explicit rationale for this classification. Lang's use of an outer spine on P2 endopod distal segment as a diagnostic trait for the genus *Esola* is problematic since this character is common to all genera of the subfamily Esolinae except for the genus *Mourephonte* Jakobi, 1953 (Huys & Lee, 2000). Therefore, this plesiomorphic character does not serve as a reliable basis for establishing relationships among these genera.

Lang (1944; 1948) also divided the genus *Esola* into two groups: the '*longicauda*-group' and the '*spelaea* group'. The primary criteria for this division were (i) the armature of the P3 in both sexes and (ii) the number of setae on the male P5 endopodal lobe. According to Lang, the *spelaea*-group is monotypic including only *E. spelaea*. Key distinguishing features of the *spelaea*-group include (i) the presence of 2 setae on the male P5 endopodal lobe (whereas the *longicauda*-group typically exhibits 1 or 0 seta(e)), (ii) a reduced number of spines on the exopod of P3 (with exp-3 bearing only 2 outer spines), and (iii) differences in the P3 endopod, with female enp-2 possessing 2 inner setae, male enp-2 lacking an inner seta, and male enp-3 bearing 3 setae.

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Huys and Lee (2000) fixed *Esola spelaea* as the type species (by original designation) of a new genus, *Troglophonte* Huys & Lee, 2000, asserting that it did not align with any of the existing laophontid genera and they noted specific morphological characteristics that initially suggested an affinity with the monotypic genus *Bathyesola* Huys & Lee, 2000. However, Huys and Lee (2000) also pointed out significant differences between *T. spelaea* and *Bathesola compacta*, including (i) the presence of an inner seta on enp-1 of P3-P4, (ii) the presence of only 2 inner setae on enp-2 of P3, and (iii) a more primitive armature formula on the exopod of P4. Additionally, *B. compacta*, identified from the North Fiji Ridge at a depth of 2,765 meters, exhibited ecological differences compared to *E. spelaea*, providing additional justification for its reallocation to a distinct genus (Huys & Lee, 2000).

The aims of this study are to describe a new species in the genus Troglophonte, to amend the diagnosis of the genus, and to investigate the consistency of this study with previous revisions by conducting phylogenetic analysis using the parsimony algorithm between the genera that are closely related to the genus Troglophonte.

2. Material and Methods

Specimens of *Troglophonte lampsakosiensis* sp. nov. were collected from the Kumada shore on the Biga Peninsula (Çanakkale, Türkiye) on February 19, 2017. Interstitial samples were obtained from the mediolittoral zone of the shore using the Karaman-Chappuis method (Delamare Deboutteville, 1954). The filtered samples were then placed in polypropylene containers and fixed with a 4% formalin solution. Individuals were carefully extracted from detritus using a modified paintbrush under a PHYWE SMZ stereomicroscope. Subsequently, they were placed on cavity slides for subsequent identification. Individuals were mounted on the slides using lactophenol medium and for observations, broken coverslip glass fibers were used in sandwich slide preparations. This method allowed for the rotation and examination of specimens from various angles, facilitating the identification process (Karaytuğ & Sak, 2006). Identification was conducted using an Olympus BX-50 DIC (differential interference contrast) microscope. All drawings were made using a camera lucida attached to this microscope. Dissections were performed under a CX-21 light microscope and the drawing process was completed using a Wacom Cintiq Pro 13 drawing tablet. Various ecological parameters, including water temperature, pH, dissolved oxygen, salinity, and electrical conductivity, were measured using a YSI 556MPS portable device. Descriptive terminology followed the guidelines provided by Huys & Boxshall (1991) and Huys et al. (1996). Lang (1948; 1965), Wells (2007), Huys & Lee (2000), and other relevant literature sources were consulted for species identification. Specimens were deposited in the collection of the Balıkesir University Zoology Museum, Faculty of Arts and Sciences, Department of Biology, in Türkiye.

2.1. Taxa and character sets

The analysis conducted in this study builds upon the taxa and characters employed by Huys and Lee (2000) in their comprehensive revision of the genus *Esola*. Their data matrix consisted of 25 characters and 21 taxa, resulting in the construction of a strict-consensus tree derived from 84 most parsimonious trees.

In this study, we have updated the data matrix by incorporating additional characters. Specifically, characters from *Esola wellsi*, *Corbulaseta pacifica*, *Corbulaseta tokiokai*, and *Troglophonte lampsakosiensis* sp. nov., which were described subsequent to the previous study, have been included in the revised matrix. Additionally, we examined the setal formulas of swimming legs for taxa within the matrix. Notably, characters related to female P3 and P4 were deemed significant and were consequently integrated into the matrix to enhance subsequent analytical processes. In addition to the 25 characters given in Huys and Lee (2000), 26, 27 and 28 characters mentioned in Table 1 were added in this study.

With these modifications, the matrix used for phylogenetic analysis encompasses a total of 28 morphological characters and 25 taxa. The added characters employed in the phylogenetic analysis are detailed in Table 1. Within the complete data matrix (Table 2), plesiomorphic characters have been coded as "0", apomorphic characters as "1", and further derived characters as "2". It is worth noting that only the characters 15 and 22 exhibit multistep states.

Table 1. 26 - 28 Characters added to data matrix of Huys & Lee (2000) and used in the phylogenetic analysis. Character states in square brackets are apomorphic alternatives.

26	Female P3 exp-3 with 2 inner setae [with 1 seta]
27	Female P3 enp-2 with 3 inner setae [with 2 setae]
28	Female P4 enp-1 with inner seta [absent]

2.2. Phylogenetic analysis

Phylogenetic analysis was conducted using TNT ver. 1.6 (Goloboff & Morales, 2023) employing a Traditional search approach, commencing with Wagner Trees. Implied weights were set to k=12 following Goloboff et al. (2018). All characters were considered additive and branches lacking sufficient support were collapsed (Rule 3).

3. Results

3.1. Strict-consensus tree

The analysis of the data matrix resulted in the generation of 60 trees with the best score (TBR) of 1.865. The strict-consensus tree derived from this analysis is depicted in Figure 1 and common synapomorphies observed on the phylogenetic tree were noted.

Genus *Troglophonte* Huys & Lee, 2000

Amended Diagnosis. Laophontidae. Body cylindrical; posterior margin of cephalothorax wider. Integument of cephalothorax and body somites with ornamentation representing spinules and setules. Rostrum large, bell-shaped, defined at base. Caudal rami not modified, short and slightly rectangular.

Sexual dimorphism in antennule, urosomal segmentation, P3 endopod, P5 and P6.

Table 2. Morphological data matrix summarizing character states [Based on Huys & Lee (2000) with new characters (26-28) and taxa added from Gómez & Boyko (2006), Fuentes-Reinés et al. (2021) and present study].

Taxon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Applanola hirsuta	1	1	1	1	0	0	1	1	1	0	1	0	0	1	1	1	0	1	1	0	0	1	1	0	1	0	0	0
Archesola hamondi	0	0	0	0	0	0	0	?	1	0	1	0	0	1	1	0	0	0	0	?	?	0	?	1	1	0	0	0
Archesola longiremis	0	0	0	0	?	0	0	?	?	0	1	0	0	?	1	0	0	?	0	?	?	0	?	1	1	0	0	0
Archesola typhlops	0	0	0	0	0	0	0	1	1	0	1	0	0	1	1	0	0	0	0	1	0	0	1	1	1	0	0	0
Archilaophonte maxima	0	0	0	0	0	0	1	1	0	0	0	0	?	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
Bathyesola compacta	1	0	0	0	0	0	0	?	1	0	1	?	0	1	1	0	0	1	0	?	?	0	?	0	1	1	0	1
Corbulaseta bulligera	1	0	0	0	0	0	1	1	1	0	1	0	0	1	1	1	0	1	0	0	0	1	1	0	1	0	0	1
Corbulaseta pacifica	1	0	0	0	0	?	1	?	1	0	1	?	0	1	1	1	0	1	0	?	?	1	?	0	1	0	0	1
Corbulaseta tokiokai	1	0	0	0	0	?	1	?	0	0	1	?	0	1	1	1	0	1	0	?	?	1	?	0	1	0	0	1
Esola bulbifera	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0
Esola canalis	1	1	1	1	1	1	1	?	1	1	1	?	1	1	1	1	0	1	0	?	?	1	?	0	1	0	0	0
Esola galapagoensis	?	?	?	1	?	1	1	1	?	1	1	1	?	1	1	1	1	1	0	0	0	1	1	0	1	0	0	1
Esola lobata	?	?	?	1	1	1	1	1	1	1	1	?	?	?	?	1	0	1	0	0	0	1	1	0	1	0	0	1
Esola longicauda	1	1	1	1	?	1	1	1	1	1	1	1	1	?	1	1	1	1	0	0	?	1	1	0	1	0	0	0
Esola profunda	1	1	1	1	1	1	1	?	1	1	1	?	1	1	1	1	0	1	0	?	?	1	?	0	1	0	0	1
Esola vervoorti	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	1	0	1	0	0	1
Esola wellsi	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0	0	0	1	1	0	1	1	0	0
Mourephonte longiseta	1	1	0	1	?	?	?	1	1	0	1	0	0	1	1	1	0	1	?	0	0	?	1	0	?	?	?	1
Onychocamptus	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	1	0	1	1	0	0	2	1	0	0	1	0	1
spec. *sensu* Chislenko (1967)	?	?	?	0	?	?	?	1	?	0	1	0	?	?	?	0	0	?	0	1	0	?	1	1	?	0	0	0
spec. *sensu* Mielke (1997)	?	?	?	1	?	1	1	?	1	1	1	?	?	?	?	1	1	1	0	?	?	1	?	0	1	0	0	1
Troglophonte lampsakosiensis sp. nov.	0	0	0	0	0	0	1	1	1	0	1	0	0	1	1	0	0	0	0	0	1	2	1	0	1	0	1	0
Troglophonte spelaea	?	?	0	0	?	0	0	?	?	?	1	?	?	?	?	0	0	?	0	0	1	1	1	0	?	1	1	0
Laophonte cornuta-group	0	0	0	0	0	0	1	1	0	0	0	0	0	1	2	1	0	1	1	0	0	0	0	0	0	0	0	0
OTHER LAOPHONTIDAE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0	1	0	1

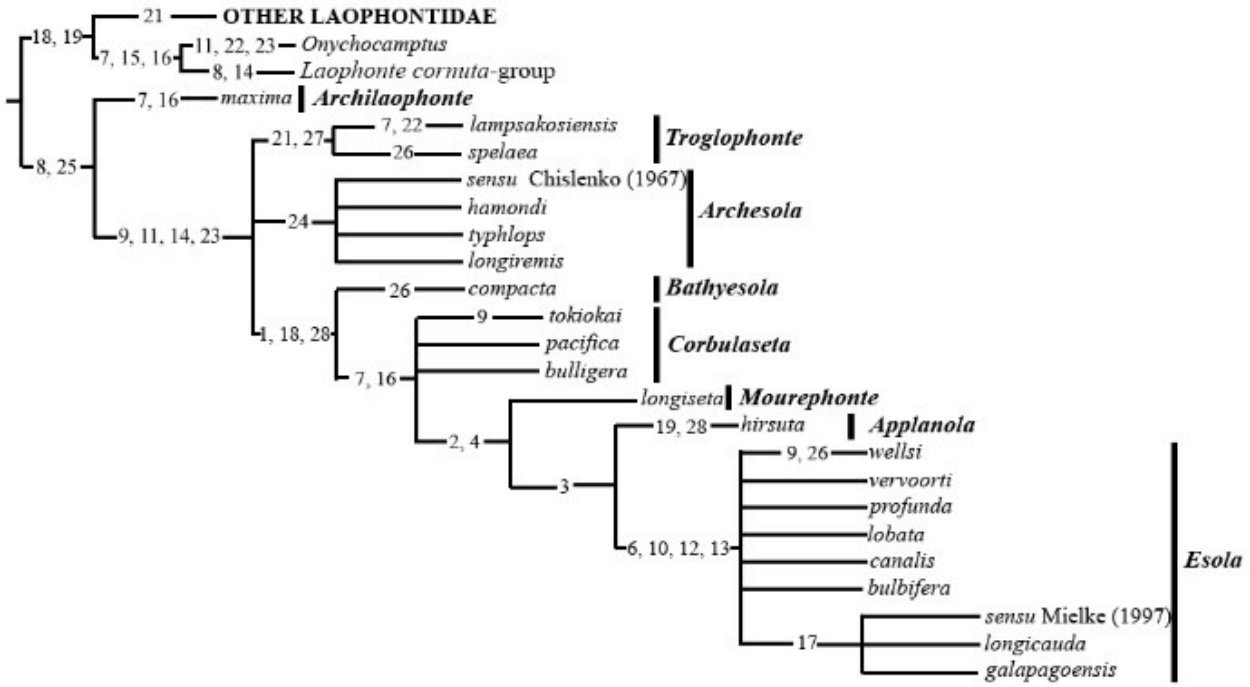

Figure 1. Strict-consensus tree of 60 trees produced by TNT ver. 1.6. Numbers show synapomorphic character states.

Antennule slender; 6 or 7-segmented in female; first segment without spinous process along posterior margin; segment 4 with aesthetasc fused at base to seta. Antennary exopod with 4 setae; allobasis with abexopodal seta. Maxilliped slender; syncoxa with 2 setae; endopodal claw elongate and slender.

P1 exopod 3-segmented with 4 setae on exp-3; endopod prehensile, long, and 2-segmented; enp-1 without inner seta, enp-2 with straight claw and minute seta. P2-P4 exopods 3-segmented; P2 basis with moderately long and setiform outer element. P2-P4 exp-2 inner seta reduced. P2-P4 endopods 2-segmented with 5 setae on enp-2, except for P3 endopod ♂ being 3-segmented with 3 elements on enp-3. Setal formula as follows (Table 3):

Table 3. Troglophonte Huys & Lee, Setal formula of swimming legs.

	Exopod	Endopod
P1	0.0.022	0.020
P2	0.1.123	1.221
P3	0.1.1(2)23	1.221 [♂: 1.0.120]
P4	0.1.223	1.221

P5 ♀ rami separated. Exopod relatively long and reaching proximal margin of seventh somite, bearing 5 or 6 setae; baseoendopod with well developed, trapezoid endopodal lobe bearing 3 or 4 setae. P5 ♂ endopodal lobe trapezoid; bearing 1 vestigial spine.

P6 ♀ forming develop opercula; each with a naked seta and tube-pore. P6 ♂ with 1 apical and 1 inner, bare setae.

Type Species. *Laophonte spelaea* Chappuis,1938 = *Troglophonte spelaea* (Chappuis, 1938) [by original designation; *cf.* Huys & Lee, 2000]

Material Examined. (a) Chappuis' (1938) type material no longer exists. (b) *Troglophonte lampsakosiensis* sp. nov.

***Troglophonte lampsakosiensis* sp. nov.**

Type Locality. 40.38310° N, 26.71025° E, Kumada Shore, North of Biga Peninsula, Lapseki, Çanakkale (Türkiye), interstitial. Accompanying harpacticoid fauna: 3 ♀♀ and 1 ♂ of *Klieonychocamptus adriaticus* (Petkovski, 1954) (Laophontidae) and 2 ♀♀ of *Ectinosoma soyeri* Apostolov, 1975 (Ectinosomatidae).

Ecological Parameters. Water pH 8.00, dissolved O_2 6.25 mg/lt, salinity 26.31 ppt, water temperature 7.98 ^oC, electrical conductivity 28.02 ms.

Type Material. Holotype ♀ dissected on 6 slides. Paratype ♂ dissected on 6 slides. Paratype ♀ dissected on 3 slides. 2 ♀♀ and 1 ♂ preserved in 70% alcohol. Deposited in the collection of Balıkesir University Zoology Museum (BUZM), Faculty of Arts and Sciences, Department of Biology, in Türkiye.

Etymology. The species name "*lampsakosiensis*" is derived from the type locality. The "Lapseki" region is situated on the Anatolian side, at the confluence of the Sea of Marmara and the Dardanelles. In early historical periods, this region was referred to as "Lampsakos".

Description.

Female. Body (Fig. 2) subcylindrical. Surface of cephalothorax dorsally and laterally covered with a pattern of sparse sensilla and minute spinules as figured. Posterior margin of cephalothorax and other body somites with row of setules and minute spinules as figured.

Body length from anterior margin of rostrum to posterior margin of caudal rami 320 µm (mean = 331 µm; n = 4). Maximum width 130 µm (mean = 132 µm; n = 4) measured at posterior margin of cephalothorax.

Rostrum (Fig. 2) large, bell-shaped, defined at base; with pair of sensillae near anterior tip.

Genital double-somite (Fig. 2) as wide as remainder of urosome; original segmentation marked by bilateral constrictions; with row of minute spinules dorsally and laterally in anterior half; ventral surface with tube-pores as figured and without ornamentation; posterior margin with spinules dorsally, laterally, and ventrolaterally. Genital field (Fig. 7) as figured; located near anterior margin; copulatory pore moderate size.

Second abdominal somite (Fig. 2) with spinular ornamentation along distal margin as figured. Penultimate somite as wide as anal somite; without any sensilla. Anal operculum with crescent- shaped spinular row flanked by paired sensillae. Posterior margin of anal somite with spinules ventrally and laterally.

Caudal rami (Fig. 3A, B; Fig. 6) widely separated; rectangular, slightly longer than width; spinular ornamentation as figured; seta I small, setae II-III bare, setae IV and V pinnate with fracture planes, and fused at base (Fig. 3C), seta IV slightly longer than body length (Fig. 2A), setae VI bare; setae VII tri-articulated and bare.

Antennule (Fig. 4A). Slender, distinctly 6-segmented, without spinous process on first and second segments. First segment with spinular ornamentation on distal and inner margins and with a seta at inner distal corner. Second segment longest, with 1 plumose and 7 bare setae. Third segment long, with 6 setae on inner edge. Fourth segment short, with naked seta and aesthetasc fused basally with 1 seta. Fifth segment small and with naked seta. Sixth segment with 9 setae and with apical acrothek consisting of 2 setae and aesthetasc. Setal formula: 1-[1]; 2-[8]; 3-[6]; 4-[1 + (1 + ae)]; 5-[1]; 6-[9 + acrothek].

Antenna (Fig. 4B). Coxa with spinules along both inner and outer margins. Allobasis rectangular, with pinnate abexopodal seta. Exopod elongated, with 1 inner, 2 apical and 1 outer pinnate setae; with longitudinal row of minute spinules. Endopod with a longitudinal row of spinules along abexopodal margin, 2 spines, a slender naked seta. Distal armature consisting of 4 geniculate setae, 1 naked seta and 1 pinnate spine; with 2 spinular frills near outer apical margin.

Labrum (Fig. 4C) bell-shaped, with clusters of long spinules bilaterally.

Mandible (Fig 4D). Gnathobase with coarse teeth and a unipinnate seta at dorsal corner. Mandibular palp 1-segmented with both rami incorporated into basis; basis

with 3 setae; exopod represented by 1 unipinnate seta; endopod represented by 3 bare setae.

Maxillule (Fig 4E) difficult to observe. Praecoxa with a spinular row on outer subdistal margin. Praecoxal arthrite with 6 spine-like elements and a naked seta around distal margin. Coxal endite with 2 apical setae. Basal endite with 1 unipinnate and 2 naked setae apically. Exopod reduced and represented by 1 naked seta. Endopod with 1 unipinnate and 1 naked setae.

Maxilla (Fig. 4F) comprising syncoxa, allobasis and endopod. Syncoxa with 2 endites; proximal endite with 2 unipinnate setae; distal endite with 2 bare setae. Allobasis modified into a strong curved spine with 2 accessory armature setae posteriorly. Endopod completely incorporated into basis, represented by 4 setae.

Maxilliped (Fig. 4G) slender, comprising syncoxa, basis and endopod. Syncoxa with 2 pinnate setae. Basis elongated without ornamentation. Endopod 1-segmented, bearing long and slender claw, 1 accessory seta and a tube-pore.

P1 (Fig. 5A). Coxa with spinules along outer margin and transversal spinular row on anterior surface. Basis with pinnate outer and inner spine; spinular ornamentation as figured. Exopod 3-segmented; exp-1 with pinnate outer seta and spinular row on outer and inner margins; exp-2 with bare outer seta and spinules along inner and outer margins; exp-3 with 2 bare outer setae, 2 geniculate setae apically and spinules along outer margin. Endopod 2-segmented; enp-1 unarmed, with long spinules along inner margin and longitudinal row of small spinules on anterior surface; enp-2 with an accessory seta, straight and naked apical spine, and few spinules along outer margin.

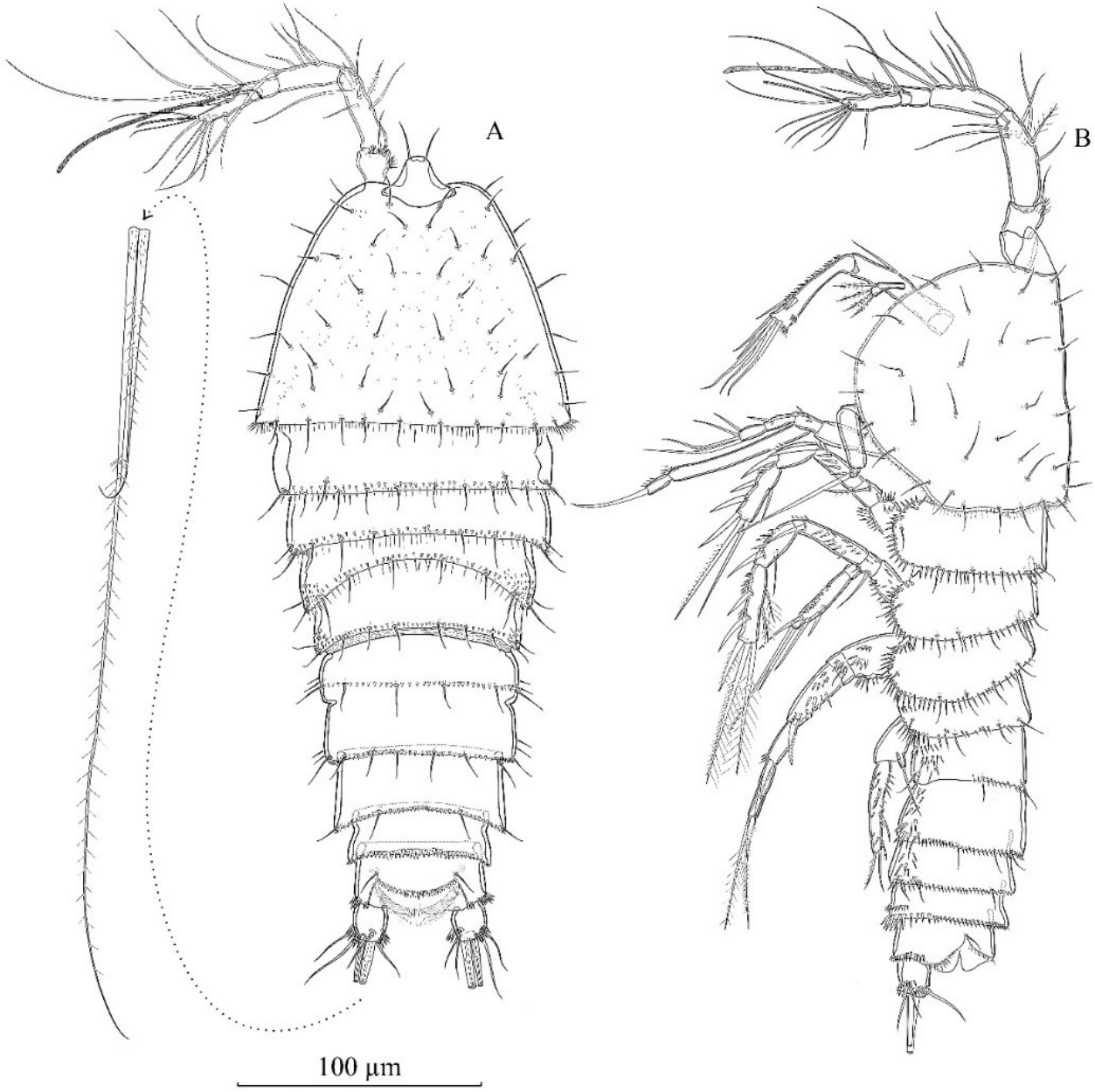

Figure 2. *Troglophonte lampsakosiensis* sp. nov. (♀). A. Habitus, dorsal. B. Habitus, lateral.

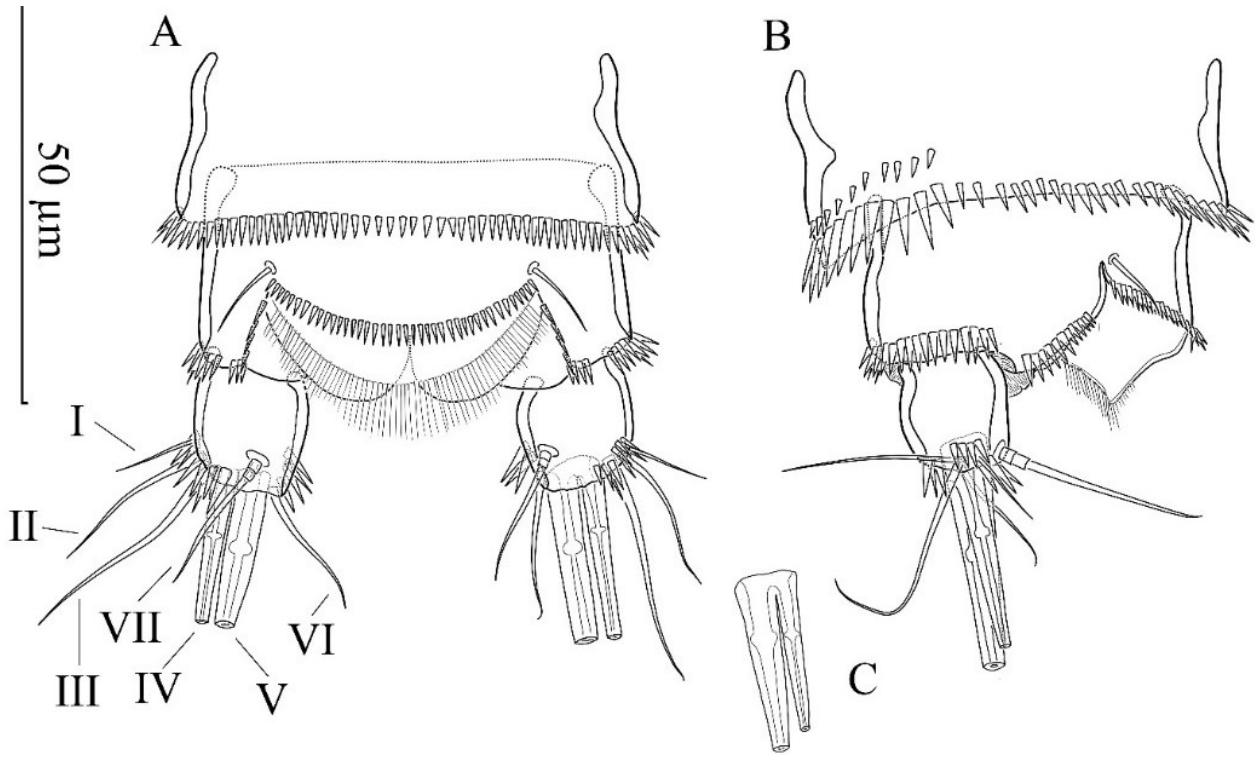

Figure 3. *Troglophonte lampsakosiensis* sp. nov. (♀). A. Anal somite and caudal rami, dorsal. B. Anal somite and caudal rami, lateral. C. Basal portions of caudal ramus setae IV and V.

P2-P4 (Fig 5B-D). P2 (Fig. 5B) praecoxa rectangular with spinular row along distal and outer margins (P3 and P4 praecoxa not observed); P2 and P4 coxa rectangular with spinular row on outer margin, P3 coxa elongated with spinules as figured. P2-P4 basis rectangular with spinules on inner margin, outer basal seta ornamented spinules at base, setulose (P2), naked (P3 and P4). P2-P4 3-segmented exopods and 2-segmented endopods, spinular ornamentation of exopod segments as figured. Exp-1 with pinnate outer distal seta, exp-2 bearing 1 inner seta and outer distal seta, exp-3 with 1 inner seta (P2), 2 inner seta (P3 and P4), with 1 inner, 2 apical elements and 2 outer spines (P2), 2 distal setae, 3 outer spines. P2-P4 endopod spinular ornamentation as figured. Enp-1 with 1 bipinnate inner seta. Enp-2 with 2 inner, 2 distal and 1 outer bipinnate setae. Setal formula as follows (Table 4):

Table 4. *Troglophonte lampsakosiensis* sp. nov., Setal formula of swimming legs.

	Exopod	Endopod
P1	0.0.022	0.020
P2	0.1.123	1.221
P3	0.1.223	1.221 [♂: 1.0.120]
P4	0.1.223	1.221

P5 (Fig. 6) biramous, baseoendopods not fused medially. Baseoendopod with well-developed trapezoid endopodal lobe, extending to halfway down the exopod; spinular ornamentation as figured (4 spinules on the outer median part of anterior surface not observed in dissected paratype); armature consisting of 2 pinnate setae along inner margin, a tube-pore and 1 bare seta apically, outer basal seta naked. Exopod elongated and rectangular; spinular ornamentation as figured; with 1 inner pinnate seta, 1 apical naked seta and 3 pinnate setae on outer margin.

P6 (Fig. 7) reduced to a small plate; with a tube-pore and 1 naked seta.

Male. Body (Fig. 8A) length from anterior margin of rostrum to posterior margin of caudal rami 309 µm (mean = 315 µm; n = 2). Maximum width 111 µm (mean = 112 µm; n = 2) measured at posterior margin of cephalothorax. Body covered with similar pattern of setules and spinules in female. Cephalothorax wider than body somites; covered with sparse pattern of sensilla. Caudal rami similar to female, setae IV and V as figured (Fig. 8B).

Sexual dimorphism in body length (approximately 309 µm), antennule, urosomal segmentation, P3 endopod, P5 and P6.

Antennule (Fig. 8C) subchirocer, 7-segmented with geniculation between segments 5 and 6. First segment with spinules as figured and 1 seta on inner margin, without spinous process. Second segment longest; bearing 1 plumose and 8 bare setae. Third segment with 6 naked setae. Fourth segment small, with 2 naked setae. Fifth segment with 1 bipinnate spine, 3 bare spines, 1 bipinnate seta, 7 naked setae and an aesthetasc fused with 1 long bare seta. Sixth segment with 1 naked seta and 3 spines. Seventh segment with 7 bare setae and an acrothek. Setal formula as follows: 1-[1]; 2-[9]; 3-[6]; 4-[2]; 5-[8 + (1 + ae)]; 6-[1]; 7-[7 + acrothek].

P1, P2, P3 exopod and P4 (Fig. 9A, B, D) similar to female condition.

P3 endopod (Fig. 9C) 3-segmented; enp-2 with inner tube-pore, without inner seta, spinule ornamentation and short apophysis on outer margin; enp-3 shortest segment, with a tube-pore located medially, 1 inner and 2 apical bipinnate setae.

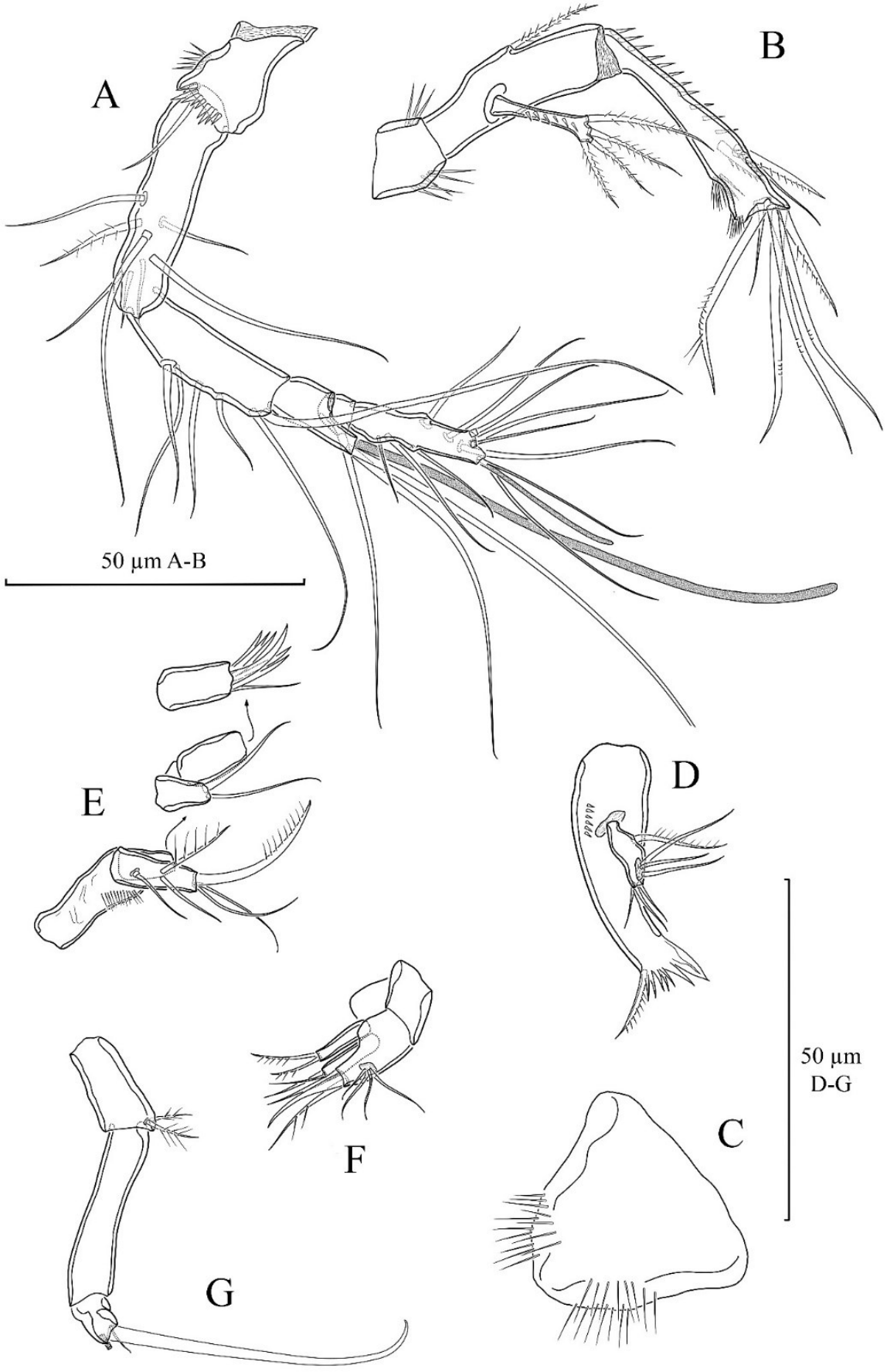

Figure 4. *Troglophonte lampsakosiensis* sp. nov. (♀). A. Antennule, dorsal. B. Antenna. C. Labrum. D. Mandible. E. Maxillule (Paratype). F. Maxilla. G. Maxilliped.

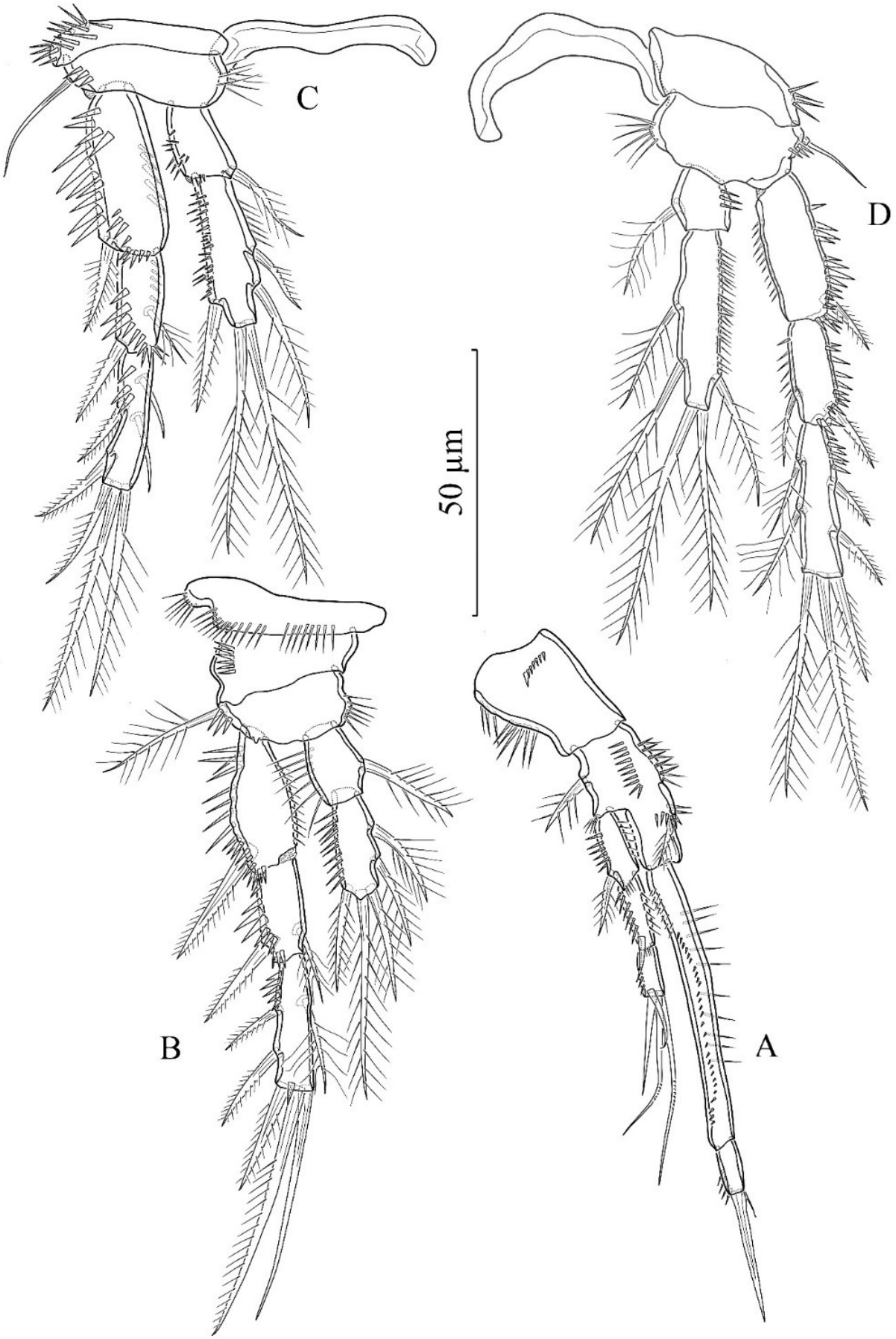

Figure 5. *Troglophonte lampsakosiensis* sp. nov. (♀). A. P1. B. P2. C. P3. D. P4.

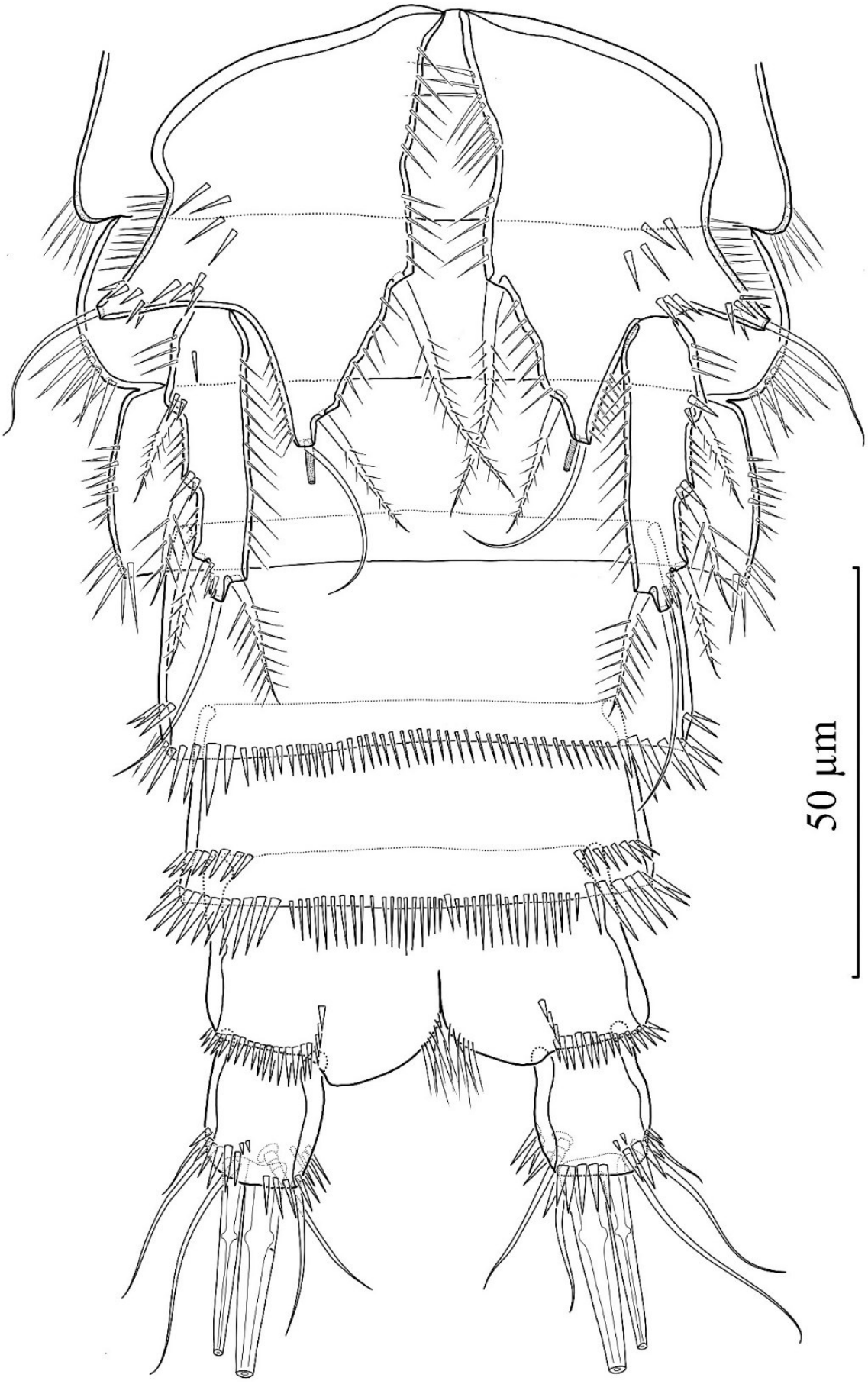

Figure 6. *Troglophonte lampsakosiensis* sp. nov. (♀). Urosome, including P5, ventral.

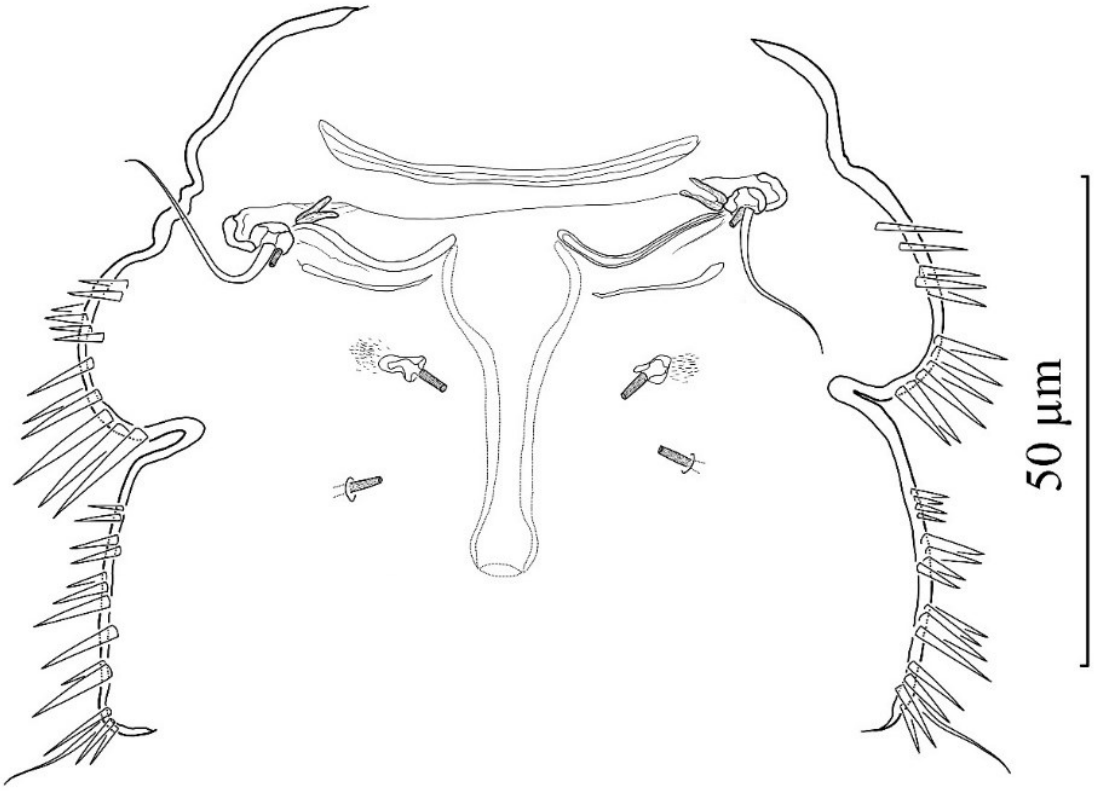

Figure 7. *Troglophonte lampsakosiensis* sp. nov. (♀). Genital field, including P6 (Paratype), ventral.

P5 (Fig. 10A, B) separated, spinular ornamentation as figured. Endopodal lobe of baseoendopod trapezoid, with a pore on inner margin; bearing 1 pinnate seta; outer basal seta naked. Exopod distinct; with a pore on anterior surface and 1 inner, 2 apical and 2 outer, bipinnate setae.

P6 (Fig. 10C) represented by horizontally elongated 2 separated plates, each bearing 1 inner and 1 outer bare setae.

4. Discussion

The genus *Troglophonte* was first proposed by Huys and Lee (2000) in their comprehensive revision of the Esolinae. Its type species, *T. spelaea* shares some morphological characters with that of the genus *Bathyesola* but also differs from it in distinct characters such as the presence of an inner seta on P3-P4 enp-1 and of 2 inner setae on P3 enp-2. Both type species are also ecologically divergent since *B. compacta* was discovered at a depth of 2,765 meters on the North Fiji Ridge while *T. spelaea* was found exclusively in caves in southern Italy. Apomorphic character states defining the genus *Troglophonte* include (i) the absence of an inner seta on P3 enp-2 in the male, and (ii) the presence of 2 setae on P3 enp-2 in the female. The strict-consensus tree generated from the phylogenetic analysis (Figure 1) places *T. lampsakosiensis* sp. nov. within the *Troglophonte* clade. While the overall topology of the consensus trees remains consistent, there are variations in the placement of synapomorphic characters. The genus *Applanola* Huys & Lee, 2000 features a seta on the inner side of P4 enp-1, which differs from the *Esola* genus. Furthermore, previously described genera, including *Esola*, *Applanola*, *Archesola* Huys & Lee, 2000, *Bathyesola* Huys & Lee, 2000, and *Troglophonte* receive support while *Corbulaseta* is not supported by any apomorphy indicating possible paraphyly of the genus (Fig. 1).

Troglophonte lampsakosiensis sp. nov. can be distinguished from *T. spelaea* based on several key characters including (i) 6-segmented antennule in the female, (ii) 7 setae on the terminal segment of P3 exp, (iii) 5 setae on the female P5 exopodal lobe, (iv) 3 setae on the endopodal lobe of the female P5 baseoendopod, (v) differences in the surface ornamentation of the swimming legs, (vi) distinctive ornamentation of the male P5 baseoendopod distal seta, and (vii) specific setal ornamentation on the male P5 exopod.

Considering the ecological data from the sampling station where *T. lampsakosiensis* sp. nov. was discovered, there is a resemblance to the habitat of *T. spelaea*. The seawater salinity at the sampling station of *T. lampsakosiensis* sp. nov. measures 26.31 ppt, whereas the average salinity in marine environments typically hovers around 35 ppt. This discrepancy may suggest that members of *Troglophonte* exhibit a stygobiotic distribution. However, definitive conclusions cannot be drawn with the data available at present. Future research efforts may prove valuable in elucidating the distribution patterns of these species.

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Ethics committee approval: Ethics committee approval is not required for this study

Conflict of interest: The authors declare that there is no conflict of interest.

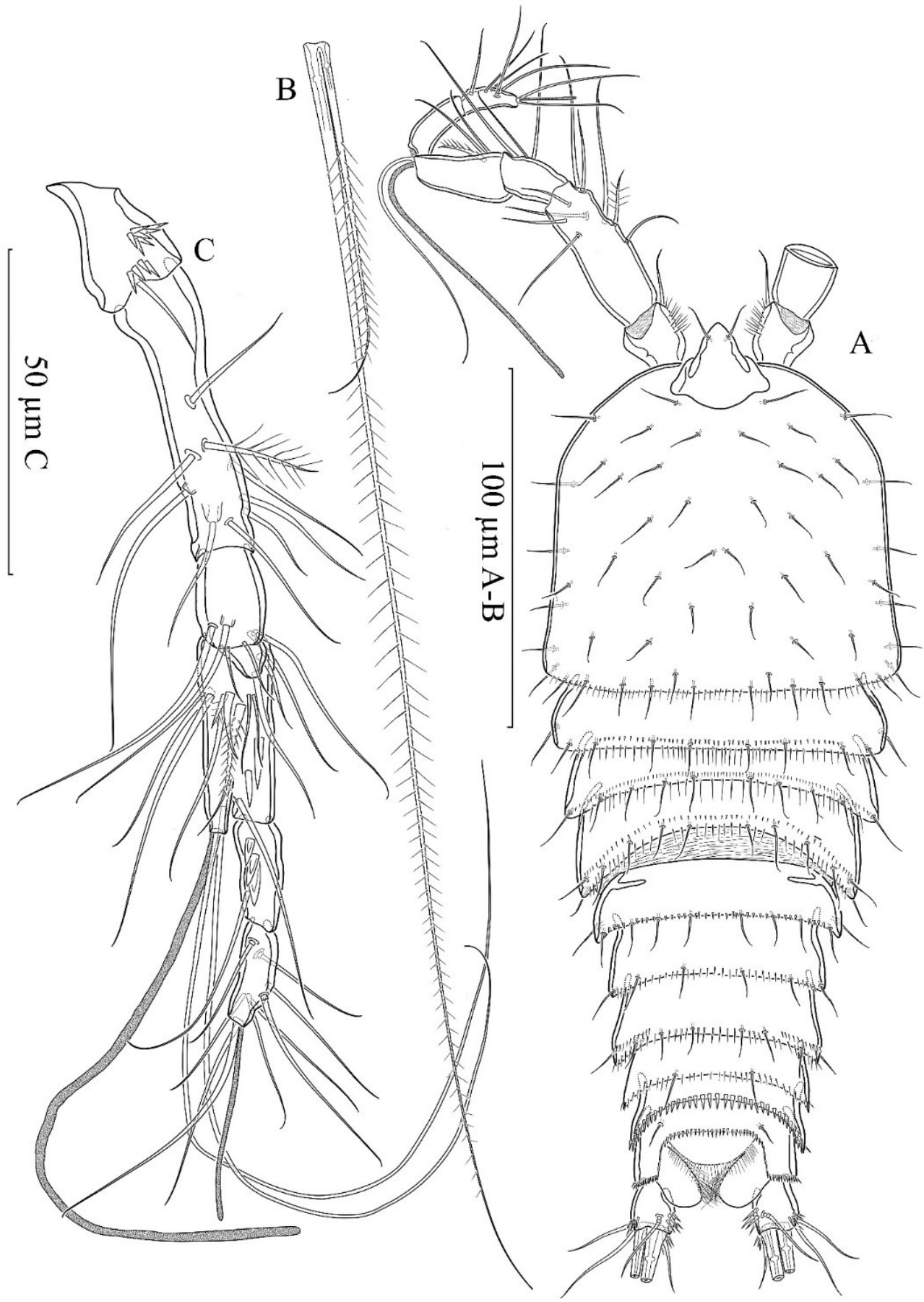

Figure 8. *Troglophonte lampsakosiensis* sp. nov. (♂). A. Habitus, dorsal. B. Caudal ramus setae IV and V. C. Antennule, ventral.

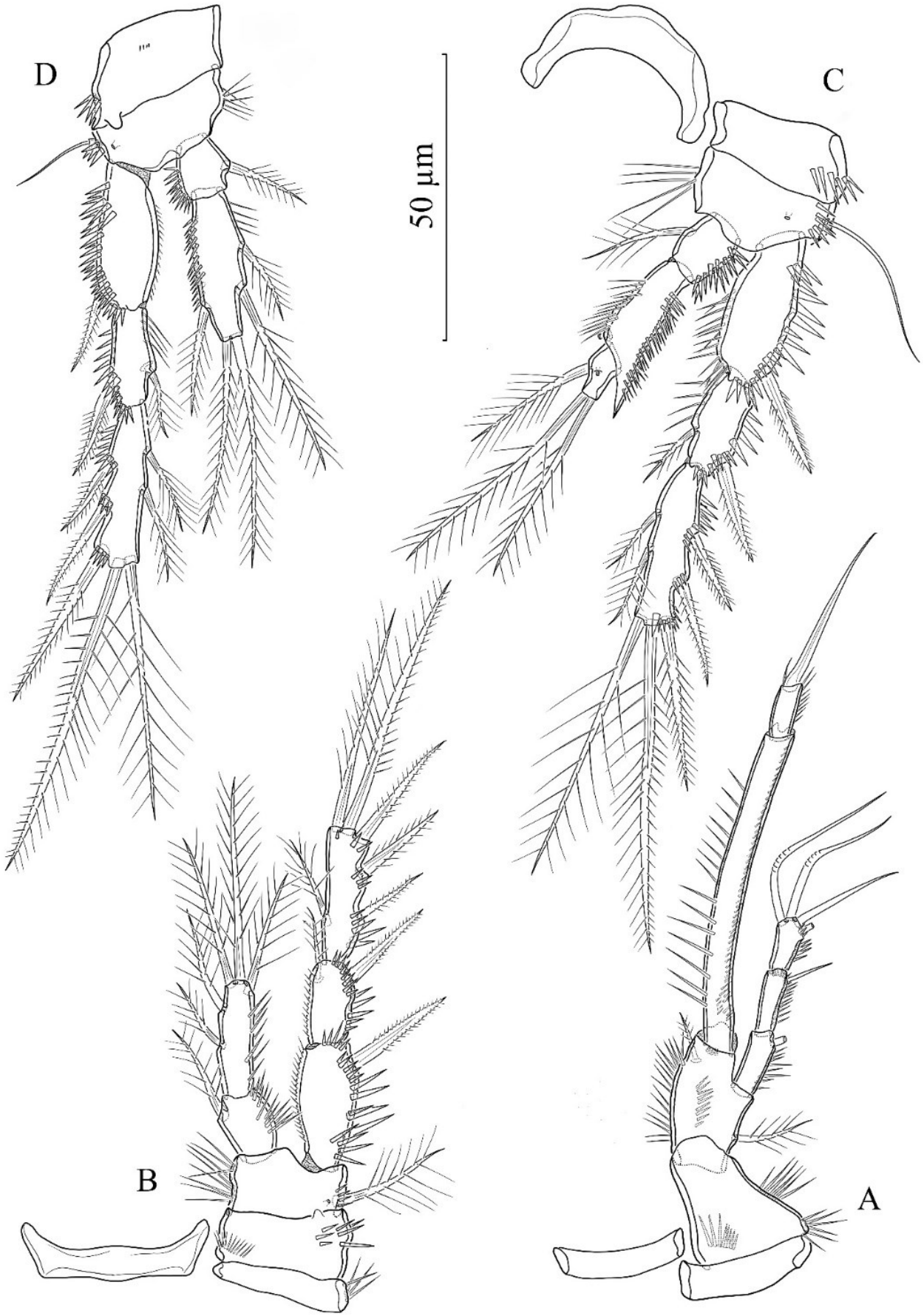

Figure 9. *Troglophonte lampsakosiensis* sp. nov. (♂). A. P1, posterior. B. P2. C. P3. D. P4.

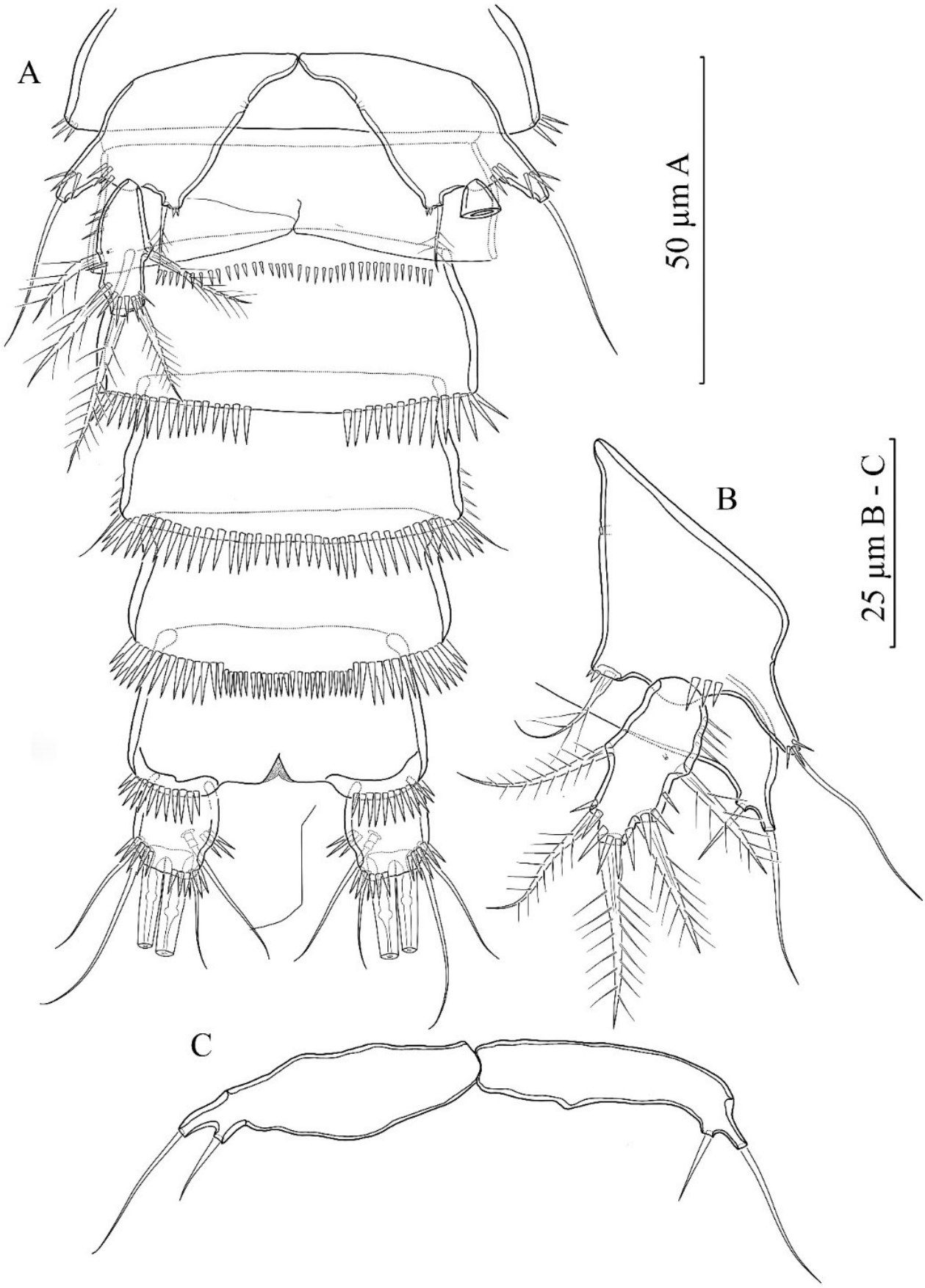

Figure 10. *Troglophonte lampsakosiensis* sp. nov. (♂). A. Urosome, including P5, ventral. B. Left P5. C. P6.

Author Contributions: Conception – A.K., S.S.; Design – A.K., S.S.; Supervision: S.S.; Fund: S.S.; Materials – A.K., S.S.; Data Collection and Processing – A.K.; Analysis Interpretation – A.K.; Literature Review – A.K., S.S.; Writing – A.K., S.S.; Critical Review – A.K., S.S.

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