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On a small collection of Laophontidae T. Scott (Copepoda: Harpacticoida) from Mexico. I. New species and new records of *Laophonte* Philippi and *Paralaophonte* Lang

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As a continued effort to improve the knowledge of the Mexican harpacticoid fauna, new records and new species have been reported during the last 14 years. This is the first of two contributions in which new species and new records of Laophontidae T. Scott from central and southern Sinaloa State (north-western Mexico) and from the Gulf of Mexico are presented. In this contribution new species and new records of the genera *Laophonte* Philippi (*Laophonte paradduensis* sp. nov., assignable to the *cornuta*-group and closely related to *Laophonte adduensis* Sewell) and *Paralaophonte* Lang (*Paralaophonte pacificaemulator* sp. nov., *Paralaophonte pacificavicinum* sp. nov., *Paralaophonte pacifica* Lang, *Paralaophonte congenera* (Sars) and *Paralaophonte zimmeri* (Douwe)) are provided. *Paralaophonte pacificaemulator* sp. nov., *P. pacificavicinum* sp. nov. and *P. pacifica* are hypothesized to co-occur sympatrically in north-western Mexico.

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Keywords: Copepoda; Harpacticoida; *Laophonte*; *Paralaophonte*; Mexico

Introduction

Harpacticoids have been collected since 1991 within the framework of several projects studying the effects of organic enrichment on the temporal and spatial variation of benthic harpacticoid diversity in north-western Mexico (central and southern Sinaloa State). Additionally, sediment samples were taken from several sites in the Gulf of Mexico to study the impact of offshore oil platforms on soft bottom fauna, and the harpacticoids from these samples were sent to the senior author for identification.

About 56 harpacticoid species have been described or reported in the past (Wilson 1936; Cottarelli 1977; Reid 1990; Zamudio Valdéz and Reid 1990; Fiers 1993, 1997; Suárez-Morales et al. 1996; Palomares et al. 1998; Suárez-Morales and Gasca 1998; López-Salgado and Suárez-Morales 1998; Mielke 2001; Suárez-Morales and Avilés-Torres 2003; Hernández Trujillo et al. 2004; Hendrickx and Fiers 2010). As a continued effort to improve the knowledge of the Mexican harpacticoid fauna, the senior author and several collaborators have been dealing with the description of new species and

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new records of harpacticoid copepods from Mexican systems for the last 14 years. As a result, 45 new records or descriptions of new species (including 10 new species and new records of harpacticoids presented in this special volume of the *Journal of Natural History*) have been documented. Also, more than 90 species of several genera are still pending revision and subsequent description.

This paper is the first of two contributions about new species and new records of laophontids (Copepoda: Harpacticoida) from Mexico and includes the description of one new species of *Laophonte* Philippi, *Laophonte paradduensis* sp. nov., two new species of *Paralaophonte* Lang (*Paralaophonte pacificaemulator* sp. nov. and *Paralaophonte pacificavicinum* sp. nov.) and illustrated records of *Paralaophonte pacifica* Lang, *Paralaophonte congenera* (Sars) and *Paralaophonte zimmeri* (Douwe).

Material and methods

Sediment samples for meiofaunal analyses were taken during a number of sampling campaigns to study the effects of organic enrichment and the impact of offshore oil platforms on harpacticoid copepods from the south-eastern Gulf of California and the Gulf of Mexico, respectively. Sediment samples were sieved through 500-μm and 40-μm sieves and benthic copepods were separated from the rest of the meiofauna with a stereomicroscope at 40 × magnification. Specimens were stored in 70% ethanol. Observations and drawings at a magnification of 1000 × were made from whole and dissected specimens mounted in lactophenol with a Leica compound microscope equipped with phase contrast and a drawing tube. The type material was deposited in the Copepoda collection of the Instituto de Ciencias del Mar y Limnología, Mazatlán Marine Station. The terminology proposed by Huys and Boxshall (1991) for the general description has been adopted. Abbreviations used in the text and tables are: CIII, CIV, CV, third, fourth and fifth copepodites, respectively; P1–P6, first to sixth swimming legs; EXP, exopod; ENP, endopod; P1 (P2–P4) Exp (Enp) 1 (2, 3) denotes the proximal (middle, distal) exopodal (endopodal) segment of P1, P2, P3 or P4; ae, aesthetasc.

Taxonomic account

Family **LAOPHONTIDAE** T. Scott
Subfamily **LAOPHONTINAE** T. Scott
Genus ***Laophonte*** Philippi
Laophonte paradduensis sp. nov.
(Figures 1–6)

Material examined

One dissected female holotype (EMUCOP-020591-02), one dissected female paratype (EMUCOP-020591-01) and one dissected male paratype (EMUCOP-020591-03). Collected from Ensenada del Pabellón lagoon (Sinaloa State, north-western Mexico) (24°19′–24°35′ N, 107°28′–107°45′ W), 2 May 1991, stn. 3 (see Gómez-Noguera and Hendrickx, 1997), brackish, less than 2 m depth, 0.045 μmolN/g, 0.837 μmolC/g, fine sand, coll. S. Gómez.

Type locality

Ensenada del Pabellón lagoon (Sinaloa State, north-western Mexico) (24°19′–24°35′ N, 107°28′–107°45′ W).

Etymology

The specific epithet makes reference to the similarity between *Laophonte adduensis* Sewell and the herein newly described species.

Description

Female. The two specimens were badly damaged during sample processing. Habitus (not shown), fusiform. Total body length measured from tip of rostrum to posterior margin of caudal rami, 585 μm and 619 μm. Rostrum (not shown) fused to cephalic shield, with bilobed tip flanked by pair of sensilla. Genital-double somite distinct dorsally (Figure 1A) and laterally; fused ventrally (Figure 1B), with subtle internal rib indicating former division; genital half with partially crenulated posterior margin dorsally, lateral processes well developed, with a sensillum arising from bulbous structure with small denticles (contrary to spinules, these are not articulated basally), with short spinular row close to outer proximal corners ventrally; second half of genital double-somite as previous somite dorsally, lateral processes well developed but without sensilla, with two medial tube pores and with row of minute spinules along posterior margin ventrally. Fourth urosomite as previous somite, lateral processes well developed, with sensilla arising from bulbous structure as in genital somite. Posterior margin of fifth urosomite completely crenulated dorsally; ventral spinules along posterior margin comparatively larger than in previous somites, with two tube-pores. Anal somite with two dorsal and two ventral pores; margin close to insertion site of caudal rami plain dorsally, with spinules ventrally; anal operculum rounded, crenulated and flanked by two sensilla. Caudal rami (Figure 1A–C) about 2.3 times as long as wide, with seven setae; seta I small, seta II dorsal to and about 4.3 times as long as seta I, seta III situated laterally close to distal outer corner, seta IV arising on distal outer corner and smaller than seta III, seta V longest and without fracture plan, seta VI arising at inner distal corner and as long as seta IV, seta VII situated dorsally on distal fifth and triarticulated at base.

Antennule (Figure 2A) four-segmented; first segment with medial and distal small inner spinules, with small process (arrowed in Figure 2A); process on second segment (arrowed in Figure 2A) comparatively larger than in previous segment, and noticeably smaller than segment width; first and second segments about as long as wide; third segment longest, about three times as long as wide, with several rows of outer denticles (spinules?); fourth segment smallest. Armature formula, I-(1); II-(7) (two setae missing in Figure 2A); III-(10 + ae); IV-(8 + acrothek) (acrothek consisting of two setae and one aesthetasc fused at their bases).

Antenna (Figure 2B). Allobasis with one abexopodal seta, and with inner spinules. Exopod one-segmented, with two lateral (proximal one slender, naked) and two distal elements. Free endopodal segment with inner row of spinules and one outer frill, with two spines and one slender seta laterally, and two strong spines, two geniculate single setae, and one geniculate seta fused to tiny element basally.

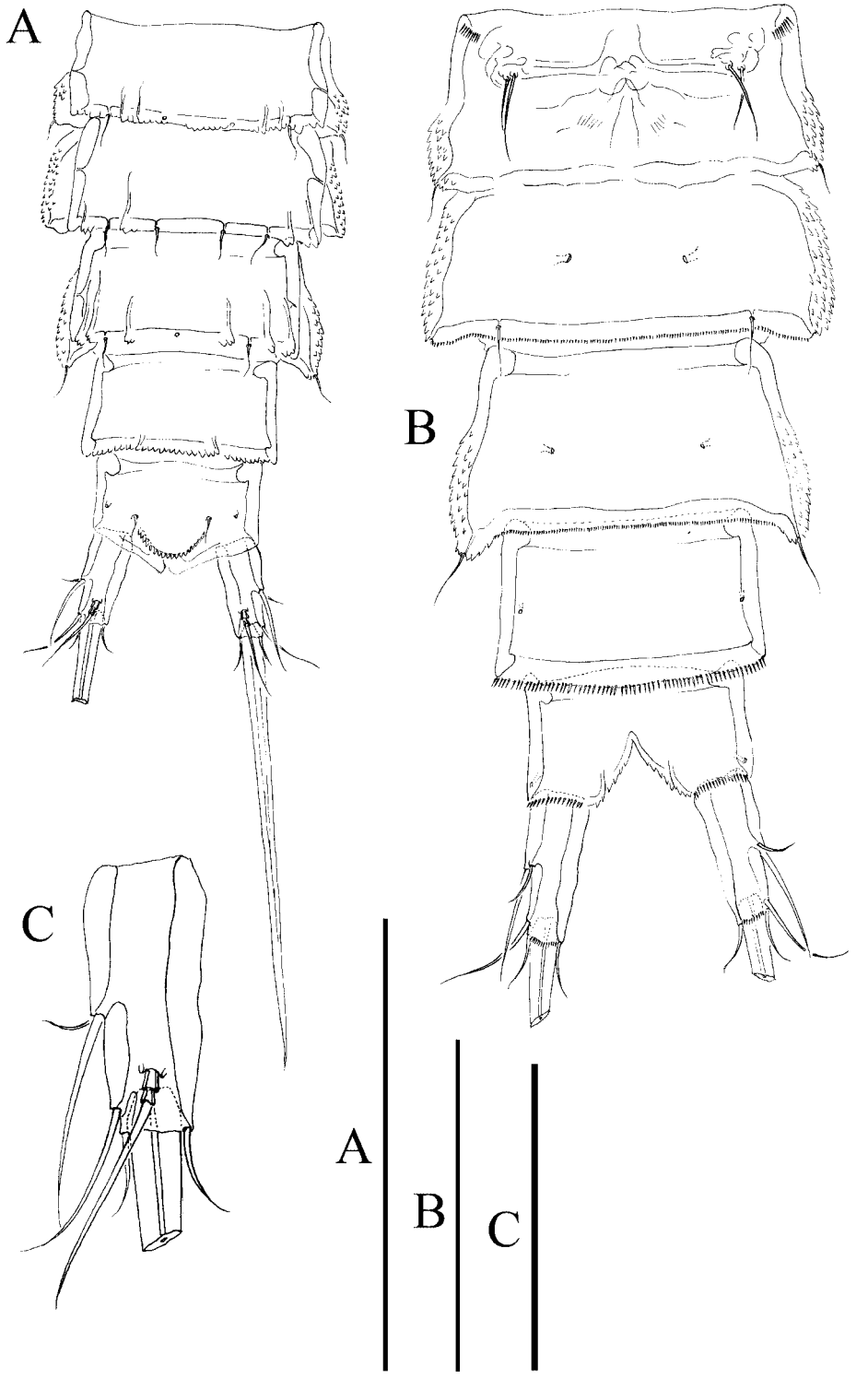

Figure 1. *Laophonte paradduensis* sp. nov., female. (A) Urosome, dorsal (P5-bearing somite omitted); (B) urosome, ventral (P5-bearing somite omitted); (C) left caudal ramus, dorsal. Scale bars: A, 200 μm; B, 100 μm; C, 50 μm.

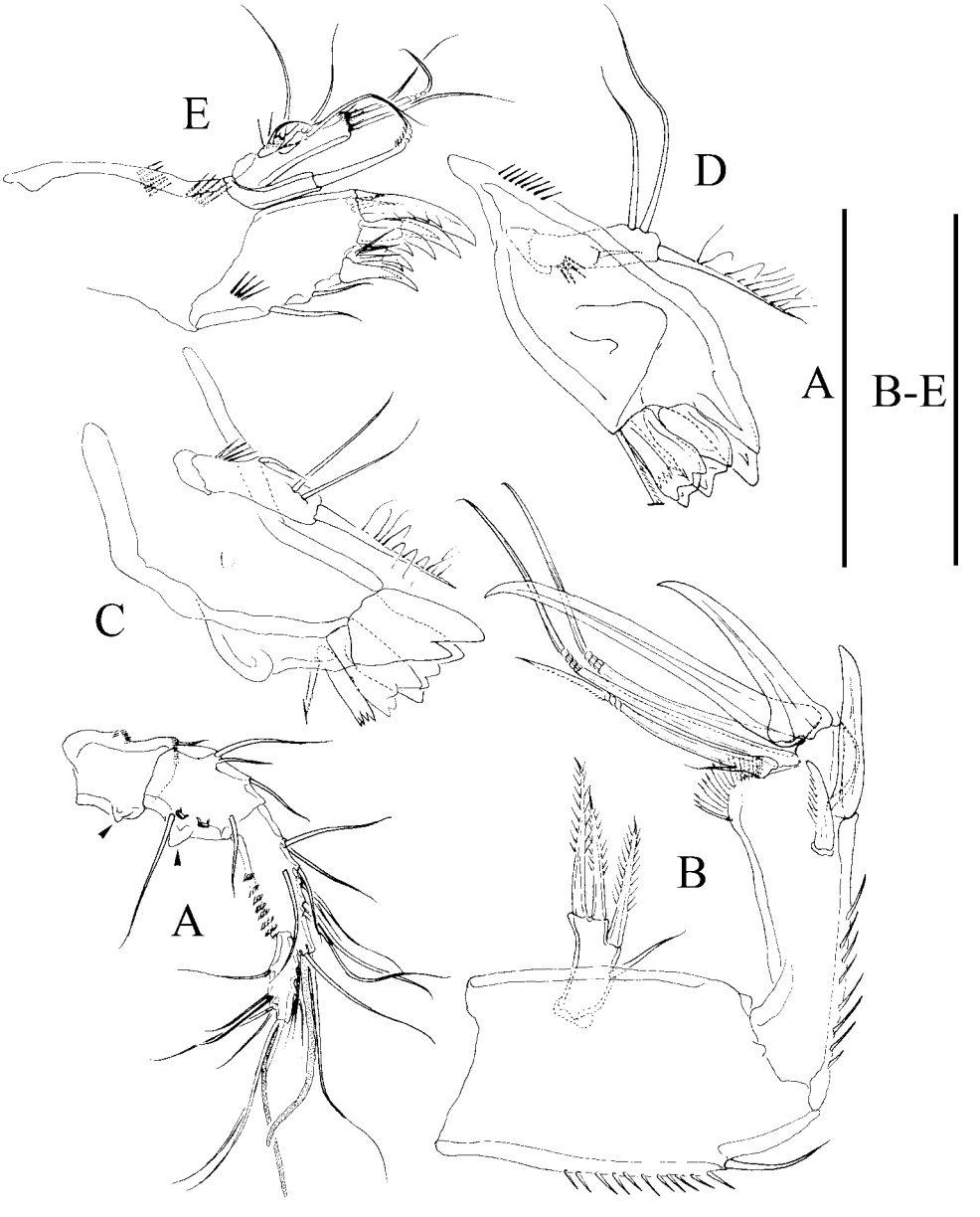

Figure 2. *Laophonte paradduensis* sp. nov., female. (A) Antennule (processes on segments I and II arrowed); (B) antenna; (C, D) mandible; (E) maxillule. Scale bars: A, 100 μm; B–E, 50 μm.

Mandible (Figure 2C, D). Strong gnathobase with bi- and multicuspidate teeth distally, and one pinnate seta laterally. Palp one-segment, with some proximal spinules, and with three lateral setae (proximal one small) and one apical strong element.

Maxillule (Figure 2E). Praecoxal arthrite with five strong apical spines ornamented as shown, two lateral slender setae and some spinules. Coxa with one strong seta. Basis

with three apical elements. Exopod seemingly one-segmented, small, with two seta (one of them very small). Endopod represented by two long setae.

Maxilla (Figure 4A, B). Syncoxa with outer and inner spinules as depicted; with three endites; proximal endite represented by single seta, middle and distal endites with three elements each as figured (one of them fused to endite). Allobasis drawn into strong claw with one accessory seta. Endopod represented by two long setae.

Maxilliped (Figure 4C). Syncoxa with spinular rows as depicted, and with one distal seta. Basis with small spinules along palmar margin. Endopod drawn out into claw with one accompanying seta.

P1 (Figure 3A). Coxa with several spinule rows as figured. Basis with longitudinal rows of spinules on anterior and posterior surface, with naked inner element and pinnate outer spine-like element. Rami two-segmented. Exopod not reaching middle of ENP1; EXP1 about twice as long as wide and about half total length of EXP2, with one outer spine; EXP2 with two outer spines and three geniculate setae apically. Endopod robust and elongate; ENP1 long, about 3.4 times as long as wide, without ornamentation; ENP2 about 1.5 times as long as wide, without spinules, with one small apical seta and one strong claw, the latter about 2.4 times as long as supporting segment.

P2 (Figure 3B). Coxa with spinular rows as figured; distal outer corner produced and furnished with fine spinules. Basis with spinules at base of outer seta and between rami. Exopod three-segmented; EXP1 without, EXP2 with inner seta; EXP3 with three outer spines, two apical and one inner element. Endopod two-segmented, reaching insertion site of inner seta of EXP2; ENP1 with one inner seta; ENP2 with two inner and two apical setae.

P3 (Figure 4D). Coxa and basis as in P2. Exopod three-segmented; first segment without, second segment with inner seta; third segment with three outer spines, two apical and two inner elements. Endopod two-segmented, not reaching insertion site of inner seta of EXP2; ENP1 with one inner seta; ENP2 with three inner, two apical and one outer element.

P4 (Figure 5A). Coxa, basis and exopod as in P3. Endopod barely reaching tip of EXP1; two-segmented; ENP1 with one inner seta; ENP2 with two inner setae, two apical and one outer element.

P5 (Figure 5B) large, with separate rami. Baseoendopodal lobe well developed, elongate, with reticulated surface, and with fine spinules along margins as shown; with five setae plus outer basal seta, the latter arising from short setophore. Exopod ovate, with spinules along inner and outer margin, with six setae.

Genital area as shown in Figure 1B. P6 represented by two subequal setae.

Armature formula of P1–P5 as in Table 1.

Male. The only male specimen was badly damaged during sample processing. Total body length, 600 μm measured from tip of rostrum to posterior margin of caudal rami. Habitus (not shown) as in female, except for separate second and third urosomites, and for comparatively stronger spinules along posterior margin of fourth and fifth urosomites ventrally (Figure 6A).

P1, P2 and P4 as in female.

P3 EXP as in female; P3 ENP dimorphic (Figure 6B), three-segmented, first segment as in female, second segment with inner seta and outer apophysis (the latter

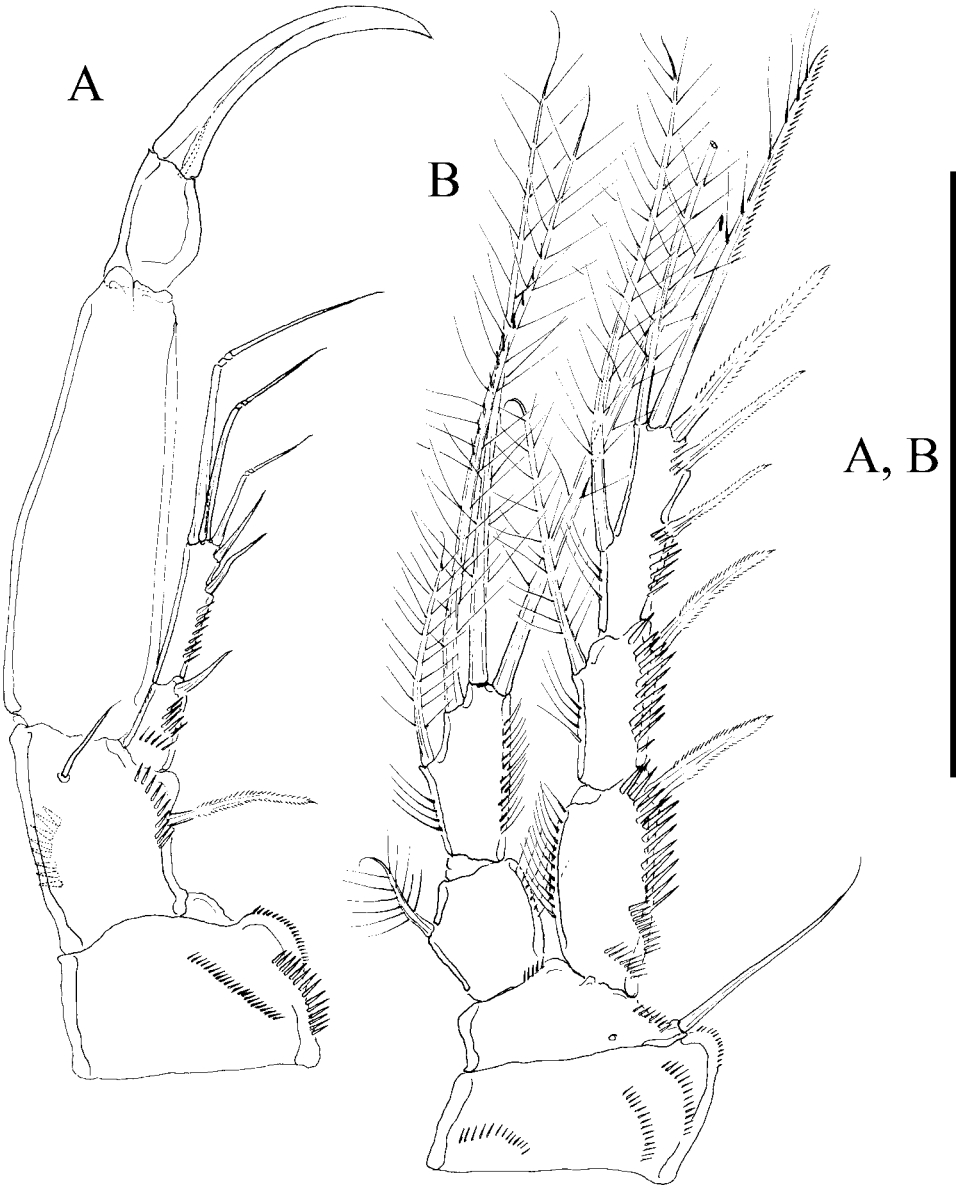

Figure 3. *Laophonte paradduensis* sp. nov., female. (A) P1; (B) P2. Scale bars: A, B, 100 μm.

homologous to outer seta of the female P3 ENP2), third segment with two inner and two apical setae.

Left and right P5 fused (Figure 6C); baseoendopodal lobe poorly developed and fused to exopod, with two setae plus outer basal seta; exopod with four setae.

P6 (Figure 6D) represented by two setae.

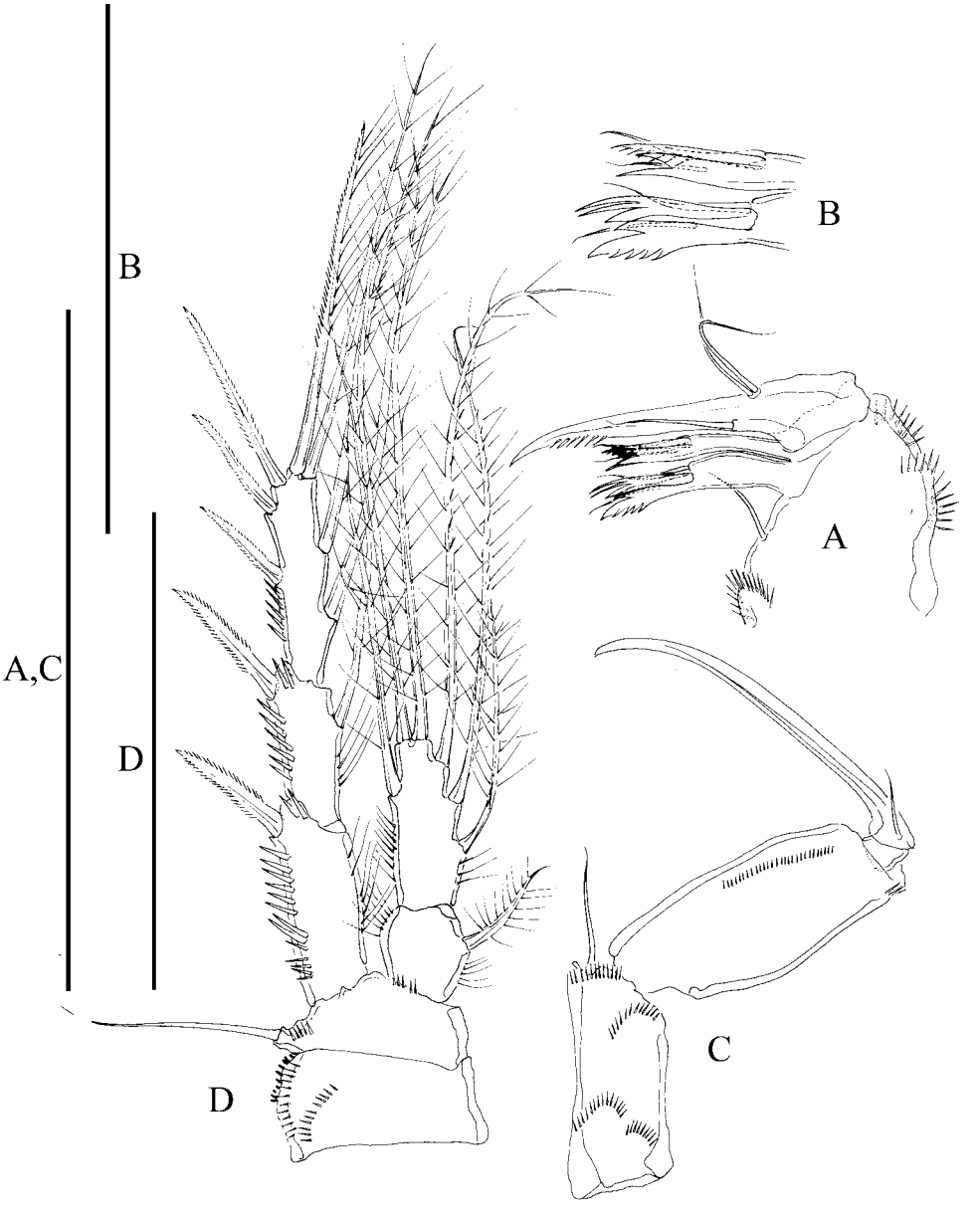

Figure 4. *Laophonte paradduensis* sp. nov., female. (A) Maxilla; (B) maxillary syncoxal enditesa; (C) maxilliped; (D) P3. Scale bars: A, C, 100 μm; B, 50 μm; D, 100 μm.

Remarks

Sewell (1940) described *Laophonte adduensis* based on two females collected from the Maldive Archipelago. In his description, Sewell (1940: 315) described and illustrated the first segment of the female antennule with a "rounded knob-like process", but remained silent about a process on the second segment. Also, Sewell (1940) showed the

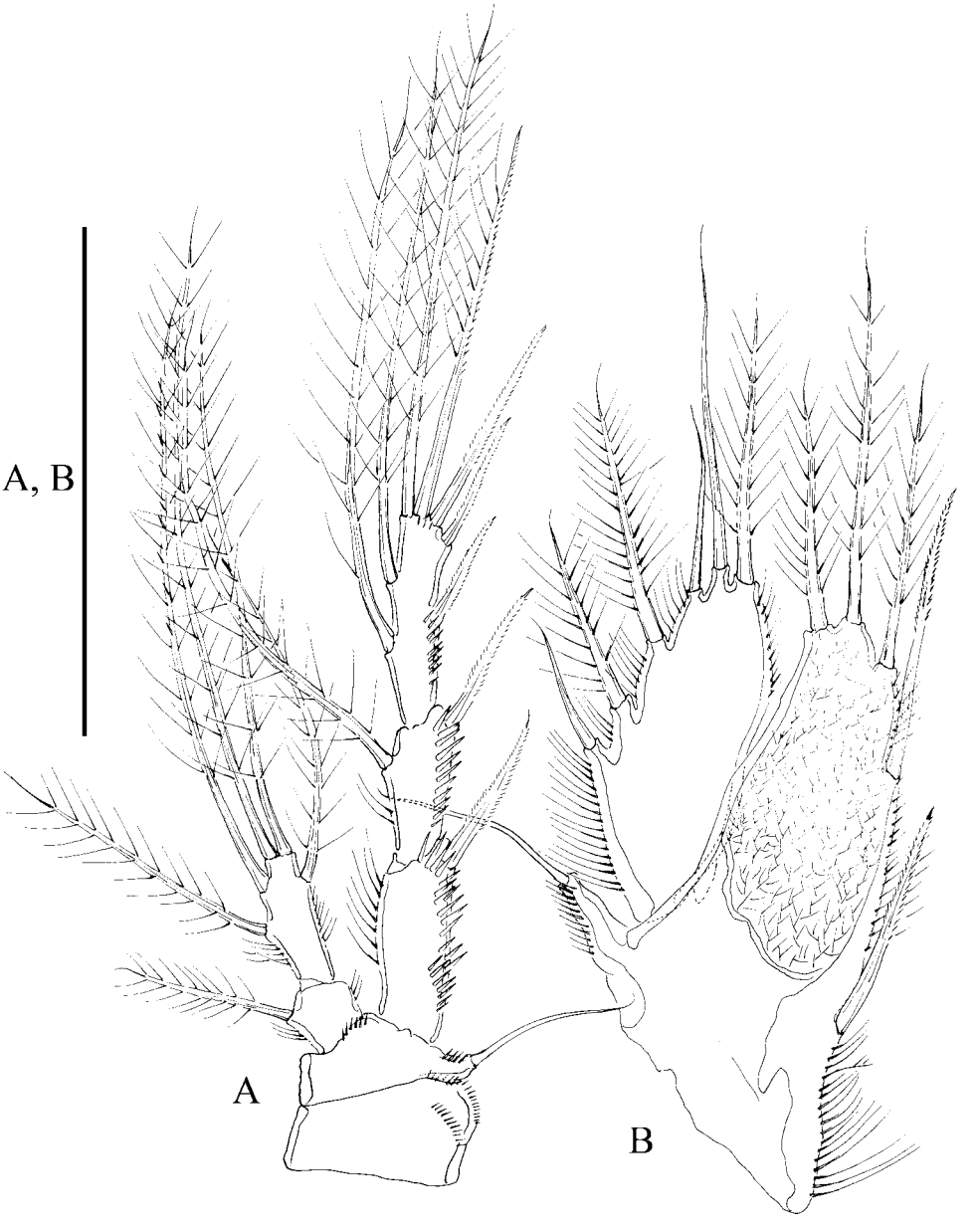

Figure 5. *Laophonte paradduensis* sp. nov., female. (A) P4; (B) P5. Scale bars: A, B, 100 μm.

third segment of the female antennule without any sort of ornamentation. In that same paper, Sewell (1940) made the first attempt to define coherent species groups within the genus *Laophonte*, and united *L. cornuta* Philippi and *L. adduensis* in his group II(iv)(a), defined by the presence of a two-segmented P1 EXP, a four-segmented antennule, and by the presence of six and five setae on the P5 EXP and baseoendopodal lobe, respectively (see also Gómez and Boyko, 2006, for a more detailed account). Nicholls (1941),

Table 1. Armature formula of swimming legs of *Laophonte paradduensis* sp. nov.

	EXP	ENP
P1	I-0;3,2,0	0-0;0,I1,0
P2	I-0;I-1;III,I1,1	0-1;0,2,2
P3	I-0;I-1;III,I1,2	0-1;1,2,3
P4	I-0;I-1;III,I1,2	0-1;1,2,2
P5	6	5 + 1 (basal)

probably unaware of Sewell's (1940) description of *L. adduensis*, subdivided the genus *Laophonte* into five subgenera based mainly on the setation of the female P3 ENP2 (*L.* (*Neolaophonte*) Nicholls, *L.* (*Metalaophonte*) Nicholls, *L.* (*Monolaophonte*) Nicholls, *L.* (*Mesolaophonte*) Nicholls and *L.* (*Laophonte*) Nicholls). Nicholls (1941) defined his *L.* (*Laophonte*) based on the presence of two inner and two apical setae (without outer elements) on P2 ENP2 (except for some species, which show either one outer seta or one inner element), of three inner, two apical and one outer seta on the female P3 ENP2, and a variable armature formula of P4 ENP2. He further subdivided this subgenus into five species groups (*cornuta*-, *typhlops*-, *brevirostris*-, *stromi*- and *mohammed*-groups) and recognized a number of species that did not classify into any of his groups. Among other species, Nicholls (1941) included *L. cornuta* in his *cornuta*-group, which was also defined by the presence of a "spur" on the second antennulary segment and by the female P5 of *cornuta* type. Some years later, Nicholls (1944, 1945) redescribed the female of *L. adduensis* and gave the first description of the male based on material collected by Dr Robert Gurney from Ghardaqa (Red Sea) (Nichols 1944), and from the reef fringing Leander Point in Port Denison (Western Australia) (Nichols 1945). In his papers, Nichols (1944, 1945) confirmed the presence of a small process on the first segment of the female antennule, the lack of any sort of process on the second segment, and the lack of a spur (sic) on the last segment, and observed two small differences in the males from Western Australia and the Red Sea, attributable to geographic variability.

In a third attempt to delimit boundaries between species groups in *Laophonte*, Lang (1944, 1948), seemingly unaware of Nicholls' (1944, 1945) papers, rejected Nicholls' (1941) view and recognized seven species groups, with the *cornuta* group only including *L. cornuta*. Lang (1944, 1948) defined this group by a four-segmented female antennule, with acute thorns on segments I and II, caudal rami twice as long as broad, the two-segmented P1 EXP and P4 ENP, six and five setae on the female P5 EXP and baseoendopod, respectively, and two elements on the male P5 baseoendopod, and by the armature formula presented by Lang (1944, table 2: 32). Some years later, Noodt (1964) described *L. ciliata* Noodt, which he allocated to the *cornuta*-group himself, along with *L. cornuta* and *L. adduensis*. Fiers (1986) added *L. expansa* Fiers and *L. plana* Fiers to the same group, and the last addition has been *L. similicornuta* Gómez and Boyko (Gómez and Boyko 2006).

Certain authors (i.e. Fiers 1986; Huys and Lee 2000) have recognized the polyphyletic status of the genus *Laophonte*, and also suggested removing the *cornuta*-group to a new genus, because this clade can be supported by the presence of two segments

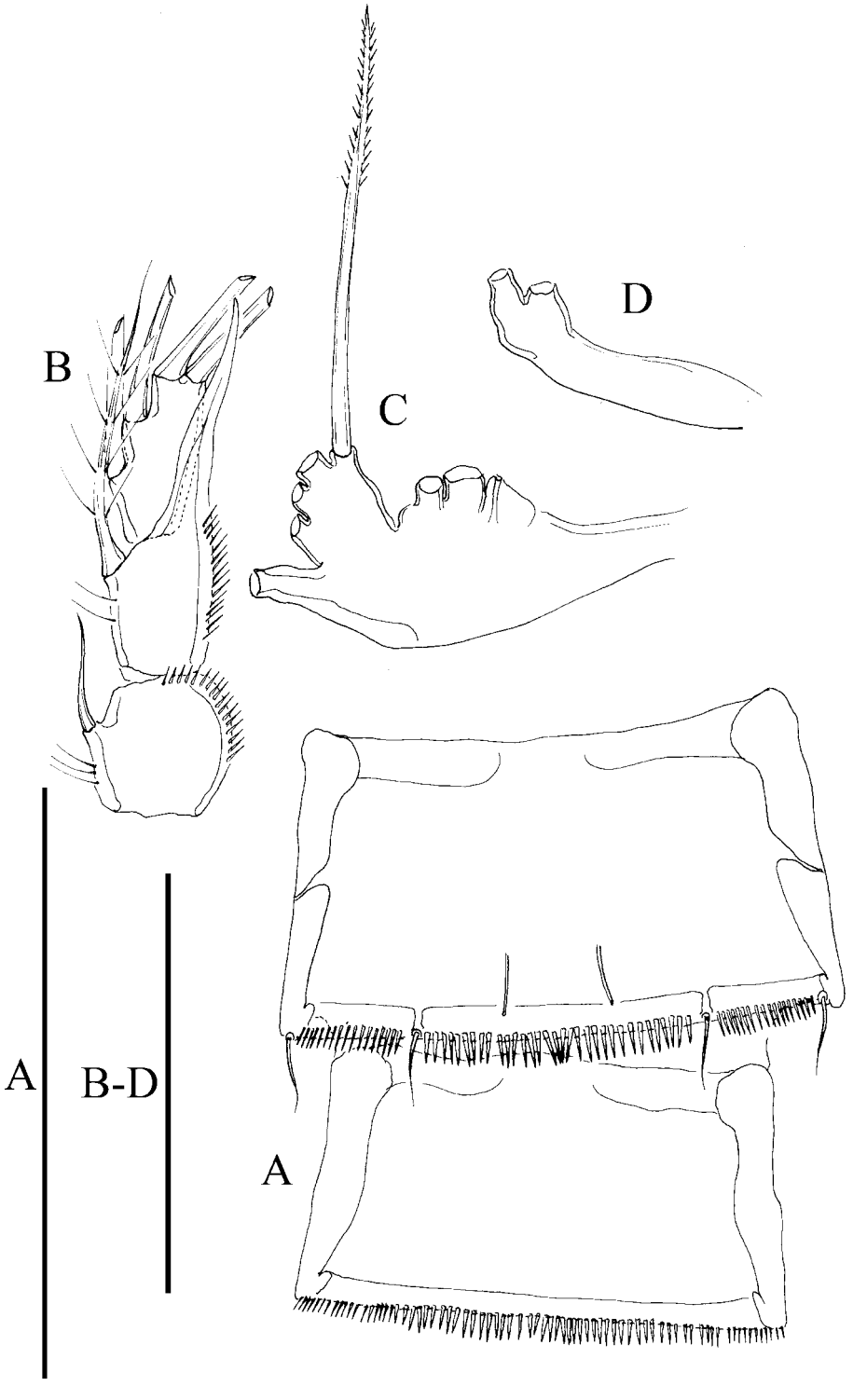

Figure 6. *Laophonte paradduensis* sp. nov., male. (A) Fourth and fifth urosomites, ventral; (B) P3 ENP; (C) P5; (D) P6. Scale bars: A, 100 μm; B–D, 50 μm.

distal to the geniculation of the male antennule and by the presence of only two setae on the maxillulary endopod (Huys and Lee 2000). However this would require re-evaluation, updating diagnoses and reallocation of remaining species to either existing or new genera (Fiers 1986; Huys and Lee 2000).

The female of the new species can be attributed to the *cornuta*-group as defined by Lang (1944, 1948), and it agrees with Huys and Lee's (2000) apomorphy 14 (only two setae on the maxillulary endopod). *Laophonte paradduensis* sp. nov. and *L. adduensis* are unique within the *cornuta*-group by the presence of a small process (smaller than width of segment) on the second segment of the antennule and by the presence of a small lateral seta on the exopod of the antenna (instead of a very strong hook-shaped process on the second segment of the antennule and subequal setae on the exopod of the antenna in the remaining species of the group).

Laophonte adduensis and *L. paradduensis* can be distinguished from each other by the armature formula of the P2 EXP3 (three outer spines in *L. paradduensis*, two in *L. adduensis* and similar to *L. ciliata*), the presence of an acute projection on segment 2 of the female antennule smaller than width of segment in *L. paradduensis* (absent in *L. adduensis*), the relative length of the caudal rami (about 2.3 times as long as wide in *L. paradduensis*, three times as long as wide in *L. adduensis*), the relative length of P3 and P4 ENP (in *L. adduensis* reaching insertion of inner seta of P3 and P4 EXP2, respectively, comparatively shorter in *L. paradduensis*), the relative length of the setae on female P5 EXP and BENP (comparatively longer in *L. paradduensis*), and by the shape of the apophysis on male P3 ENP2 (with an acute small projection of variable size in *L. adduensis*, plain in *L. paradduensis*).

Genus ***Paralaophonte*** Lang
Paralaophonte pacifica Lang
(Figures 7–9)

Material examined

One dissected female (EMUCOP-03). Collected from off Campeche State (19°29′52.74″ N, 91°01′50.04″ W), 16.7 m depth, 55.5% sand, 4% clay, 40.4%, collected in 2002, silt.

Locality

Off Campeche State, Gulf of Mexico (south-eastern Mexico) (19°29′52.74″ N, 91°01′50.04″ W).

Remarks

Lang (1965) described *Paralaophonte pacifica* from Monterey Bay (California). Mielke (1981) found many specimens of *Paralaophonte* in samples taken from various sites in the Galapagos. In a first approach, he suggested a possible close relationship of his

material with *P. dieuzeidei* (Monard), *P. brevirostris* (Claus) and *P. pacifica* and considered Sars' (1908) description of *P. brevirostris* as the reference diagnosis noting that this nominal species might contain other species. He recognized some differences between the Galapagos material, and *P. dieuzeidei* and *P. brevirostris*, and concluded that the population from the Galapagos might well belong to a subspecies of *P. pacifica*, which he named *P. pacifica galapagoensis* Mielke. Almost three decades later, Huys and Lee (2009) suggested a closer relationship of *P. pacifica galapagoensis* with *P. brevirostris*, than to its nominotypical subspecies *P. pacifica pacifica*, and raised it to full species rank based on a number of differences (see Huys and Lee 2009: 22–23). The Mexican material from the Gulf of Mexico is herein attributed to *P. pacifica*. These two species are identical mainly in the presence of a small projection on the female second antennulary segment (Figure 7B), length : width ratio of the caudal rami (Figure 7A), and general shape of the female P5 (Figure 9C). Unfortunately, only one female was found and no comments can be made about the variability of the material herein presented or about the male sexual dimorphism.

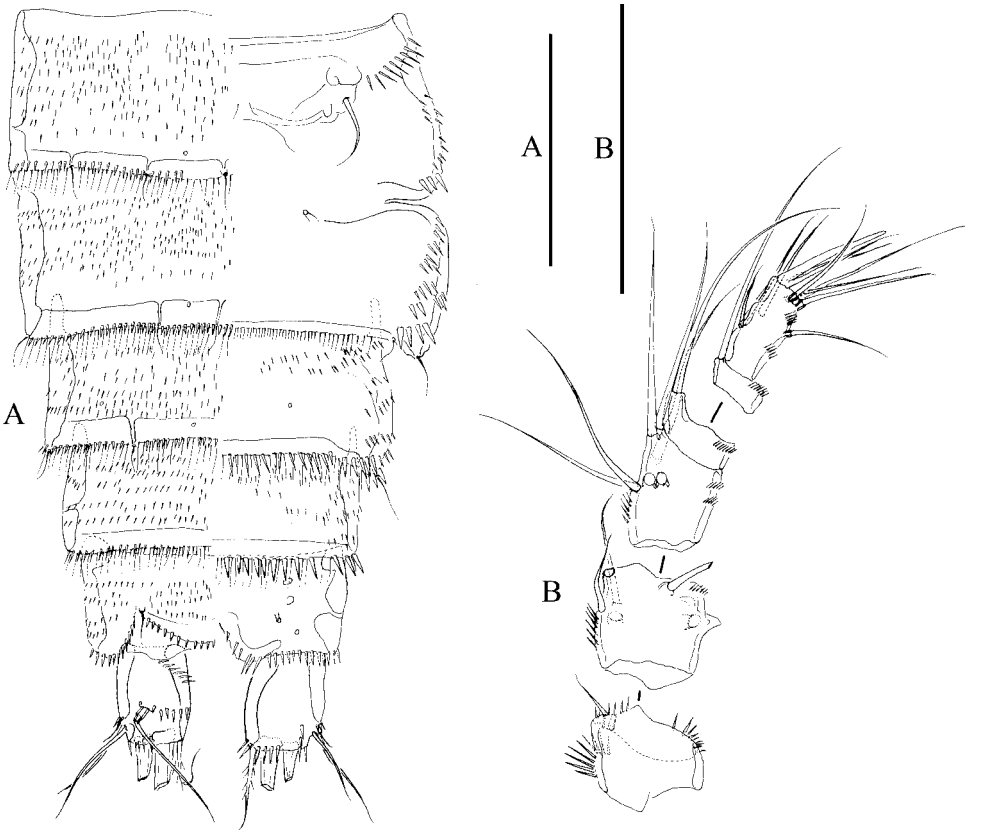

Figure 7. *Paralaophonte pacifica* Lang, female. (A) Urosome, dorsal (left) and ventral (right) (P5-bearing somite omitted); (B) antennule. Scale bars: A, B, 50 μm.

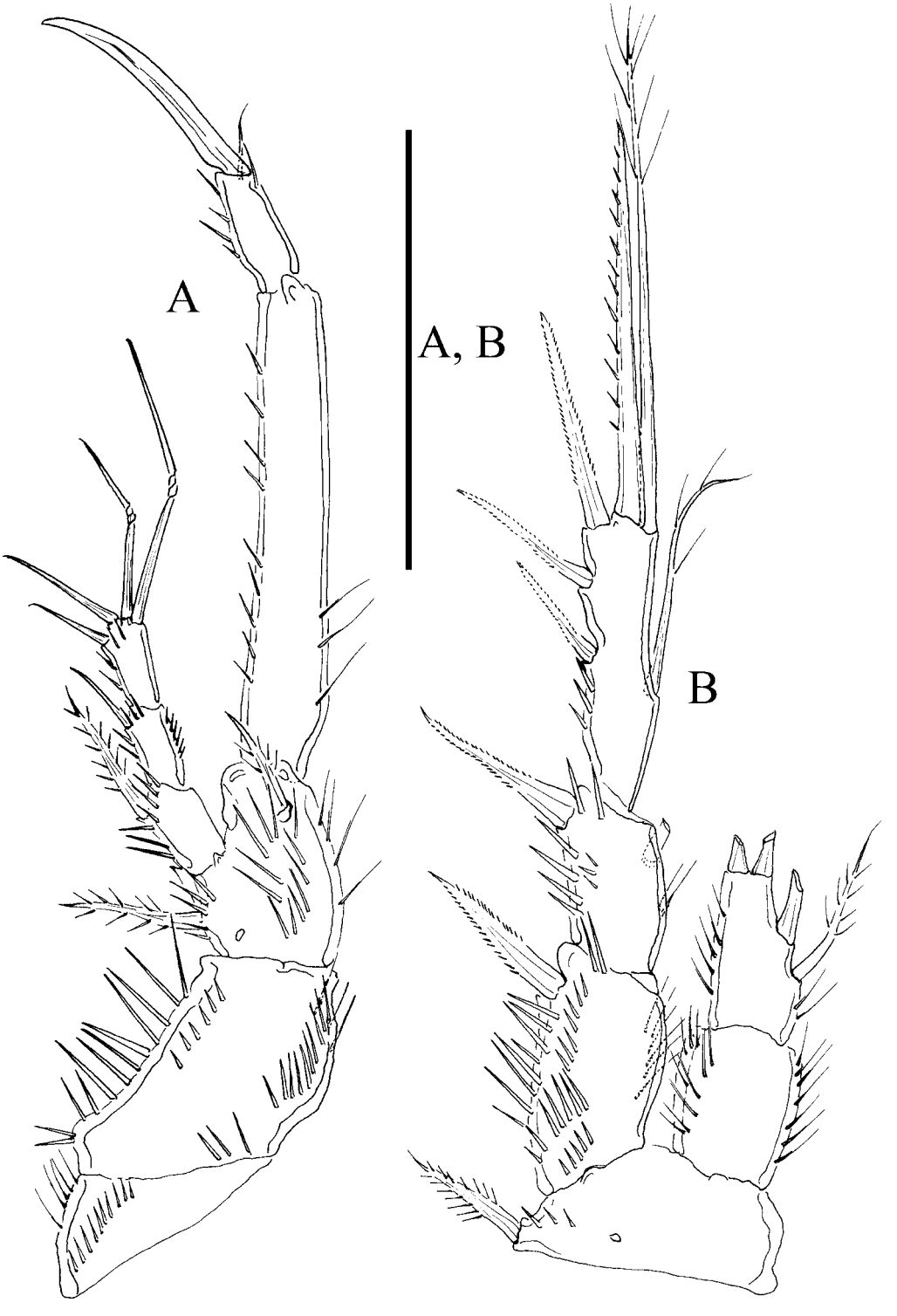

Figure 8. *Paralaophonte pacifica* Lang, female. (A) P1; (B) P2. Scale bars: A, B, 50 μm.

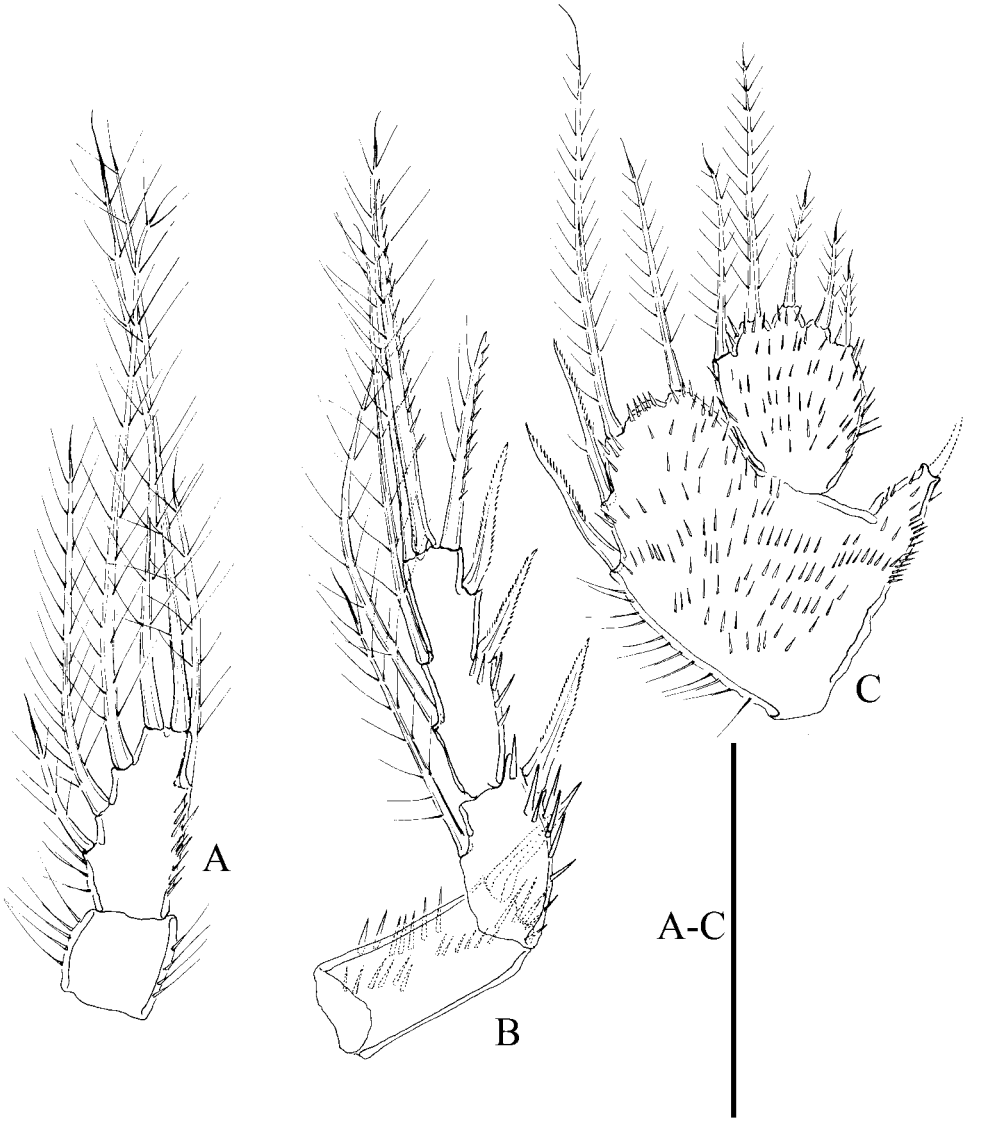

Figure 9. *Paralaophonte pacifica* Lang, female. (A) P3 EXP; (B) P3 ENP; C, P5. Scale bars: A–C, 50 μm.

Paralaophonte congenera (Sars)
(Figures 10–14)

Material examined

Two dissected females (EMUCOP-021205-12, EMUCOP-021205-13) and two females preserved in alcohol (EMUCOP-021205-14, EMUCOP-021205-15). Collected from Urías System (Sinaloa State, north-western Mexico) (23°11′06″ N, 106°25′06″ W), stns.

2, 4 and 5 (see Morales-Serna et al. 2006, for more information regarding organic matter content, chlorophyll *a* content and sediment type), brackish, less than 2 m depth, 2 December 2005, coll. F. N. Morales-Serna, F. E. Vargas-Arriaga and S. Gómez.

Locality

Urías System (Sinaloa State, north-western Mexico) (23°11′06″ N, 106°25′06″ W).

Remarks

So far, the two most widely distributed species of *Paralaophonte* are *P. brevirostris* and *P. congenera* (Lang 1948; Yoo and Lee 1995; Wells 2007; Huys and Lee 2009). The distinction between these two species has been problematic (Huys and Lee 2009). Willey (1935) stated that the only reliable differences between these two species (which he found to co-occur in Bermuda) are the number of segments and the presence/absence of a conical projection on the female second antennulary segment (six-segmented and with a conical projection in *P. brevirostris*, seven-segmented and without or with a very small conical projection in *P. congenera*). In that same paper, Willey (1935) found that the rostrum of his material of *P. brevirostris* (deeply bifid at tip) deviated from the commonly accepted *brevirostris*-type (only slightly bifid), and created the variety *P. brevirostris fissirostris* Willey, which was upgraded to subspecies level by Lang (1965) and subsequently declared invalid by Huys and Lee (2009).

Conversely, Willey (1935) found that the rostrum of his material of *P. congenera* (plain in front, and conical in side view) also deviates from the typical *congenera*-type (with distinctly bilobed tip). Nicholls (1945) had no difficulties in attributing his *Paralaophonte* material to *P. congenera* based on the presence, in his material, of a seven-segmented female antennule without any projection on the second segment, and other characters of the male (even though he noted that the females he found in Australia possess a plain rostrum, whereas that of the males is definitely bilobed).

Similarly, Yeatman (1970) had no difficulty in attributing his material from Chesapeake Bay to *P. brevirostris* based on the presence of a six-segmented female antennule, but without or at most with a small conical projection on the second segment (Yeatman 1970: 34, fig. 50), and he further noted some variability in the armature formula of the third exopodal segment of P3 and P4. Hamond's (1973) material from North Carolina agreed entirely with *P. congenera*, even though he found an acute thorn similar to that described before for *P. brevirostris*. Seemingly, Hamond (1973) relied on the presence of a seven-segmented female antennule to identify the specimens as *P. congenera*. Wells and Rao (1987) found an amazing range of variability in the female antennule of the *P. brevirostris* population from the Andaman and Nicobar Islands. This variability ranged from seven-segmented to the case where the two distal segments are "coalescent with a variably developed trace of the suture", and the second segment being either naked or with a small conical spur. Wells and Rao (1987) noted that Hamond (1972) found some specimens of *P. brevirostris* bearing a seven-segmented female antennule, which could, eventually, lead to confusion with *P. congenera*, and suggested the shape and size of the rostrum and the cephalothorax as the only reliable criteria to separate *P. brevirostris* from *P. congenera*. These two species have been shown to display a wide degree of intra- and/or inter-population variability (Huys and

Lee 2009), and some authors (i.e. Mielke 1981) suggested that such variability could be a reflection of the presence of allopatric or sympatric species.

Even though certain authorities (Wells 2007; Huys and Lee 2009) make a clear distinction between these two species in their respective keys, the identity of *P. brevirostris* and *P. congenera* is blurred and their distinction remains difficult because of the variability in some key characters (i.e. number of segments of the female antennule, presence/absence of a well-developed projection on the second antennulary segment, and shape of the rostrum), and because the variability of one species seems to overlap the variability of the other. In their analysis of the observed variability in some American species of *Cletocamptus* Schmankewitsch, Gómez et al. (2004) observed that the whole range of variability of a species seldom overlaps the range of variability of other species, suggesting that such variability should be under genetic control. As far as evidenced in the literature, the range of variability of *P. brevirostris* overlaps almost entirely the range of variation of *P. congenera*, casting doubts on the validity of separating these two species. Also, it has been suggested that the use of genetic tools (Willey 1935) and a revision of both species based on collections from as wide a geographical range as possible (Hamond 1973) would contribute to a better understanding of their identity.

The Mexican material presented herein is provisionally assigned to *P. congenera*. The morphological variability falls within the range described above and, as done before by others, we relied on the presence of a seven-segmented female antennule bearing a small conical process on the second segment (Figure 11D), the length : width ratio of the caudal rami (Figures 10A, B, 11A–C), and the shape of the female P5 (Figure 12E) to attribute this material to *P. congenera*, even though, the rostrum is only slightly bifid at tip (not shown).

Paralaophonte zimmeri (Douwe)
(Figures 15–20)

Material examined

One dissected female (EMUCOP-090301-189). Collected from Urías System (Sinaloa State, north-western Mexico) (23°11′06″ N, 106°25′06″ W), brackish, less than 2 m depth, 9 March 2001, coll. S. Gómez.

Locality

Urías System (Sinaloa State, north-western Mexico) (23°11′06″ N, 106°25′06″ W).

Remarks

Paralaophonte zimmeri was described by Douwe (1929) from Cette (Mediterranean Sea), while Bodin (1964) reported the species from Marseille, not far from the type locality. The species has also been reported from the Bahamas by Chappuis and Delamare Debouteville (1956). Fiers (1986) questioned the validity of that record, but Suárez-Morales et al. (2006) listed the species in their checklist of Caribbean harpacticoids. The species has also been reported from the West African coast, the

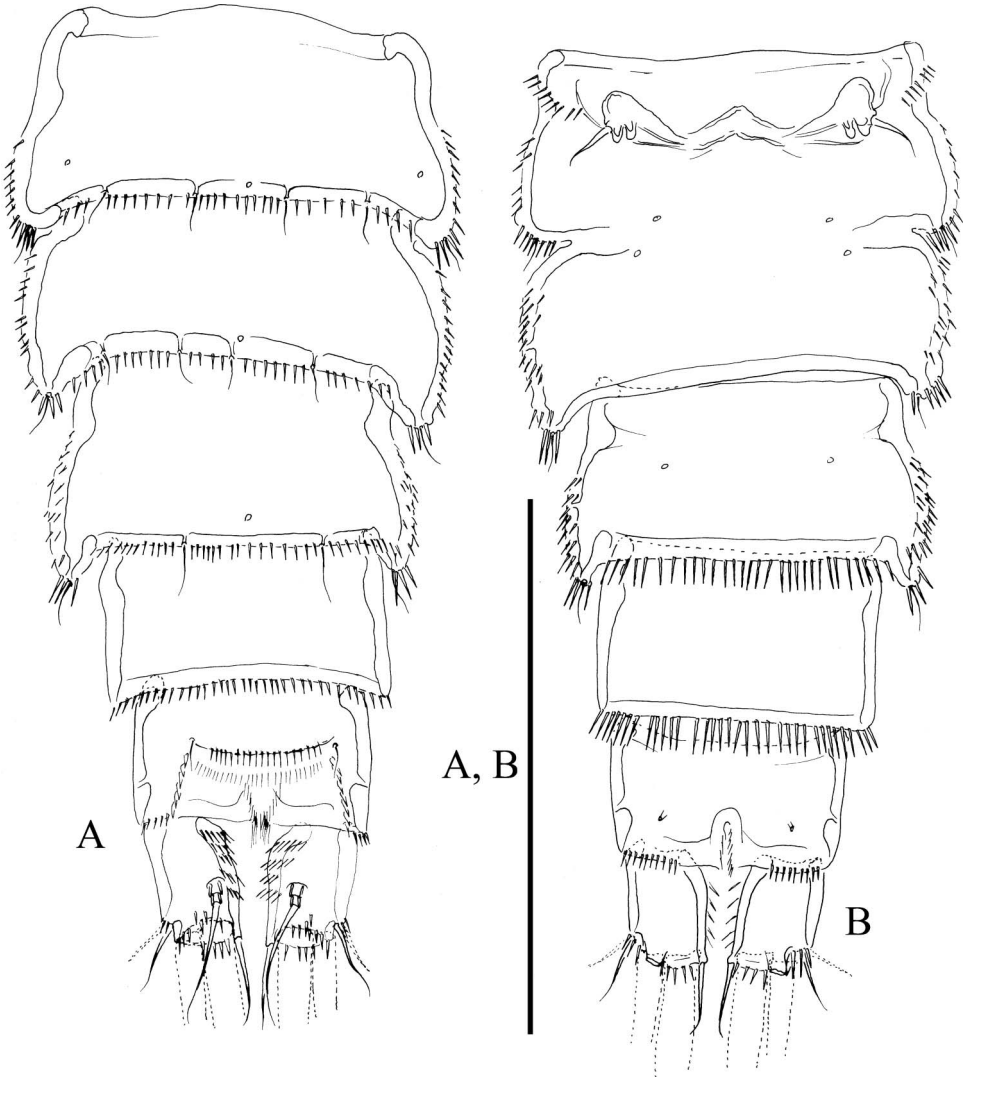

Figure 10. *Paralaophonte congenera* (Sars), female. (A) Urosome, dorsal (P5-bearing somite omitted); (B) urosome, ventral (P5-bearing somite omitted). Scale bars: A, B, 100 μm.

Mediterranean and from the Gulf of Oman (Fiers 1988). The material presented herein agrees with Douwe's (1929) description especially in the length: width ratio of the caudal rami (Figures 15A, B, 16A), number of segments of the female antennule (Figure 17A) and general shape and armature formula of the female P5 (Figure 16C). However, the female antennule of *P. zimmeri* as described by Douwe (1929) possesses an acute projection on the second segment. Wells and Rao (1987) observed a wide range of variability in the female antennule, and it is suggested to provisionally attribute the Mexican material to *P. zimmeri* until the variability of the species is assessed and the male from the Mexican population is described.

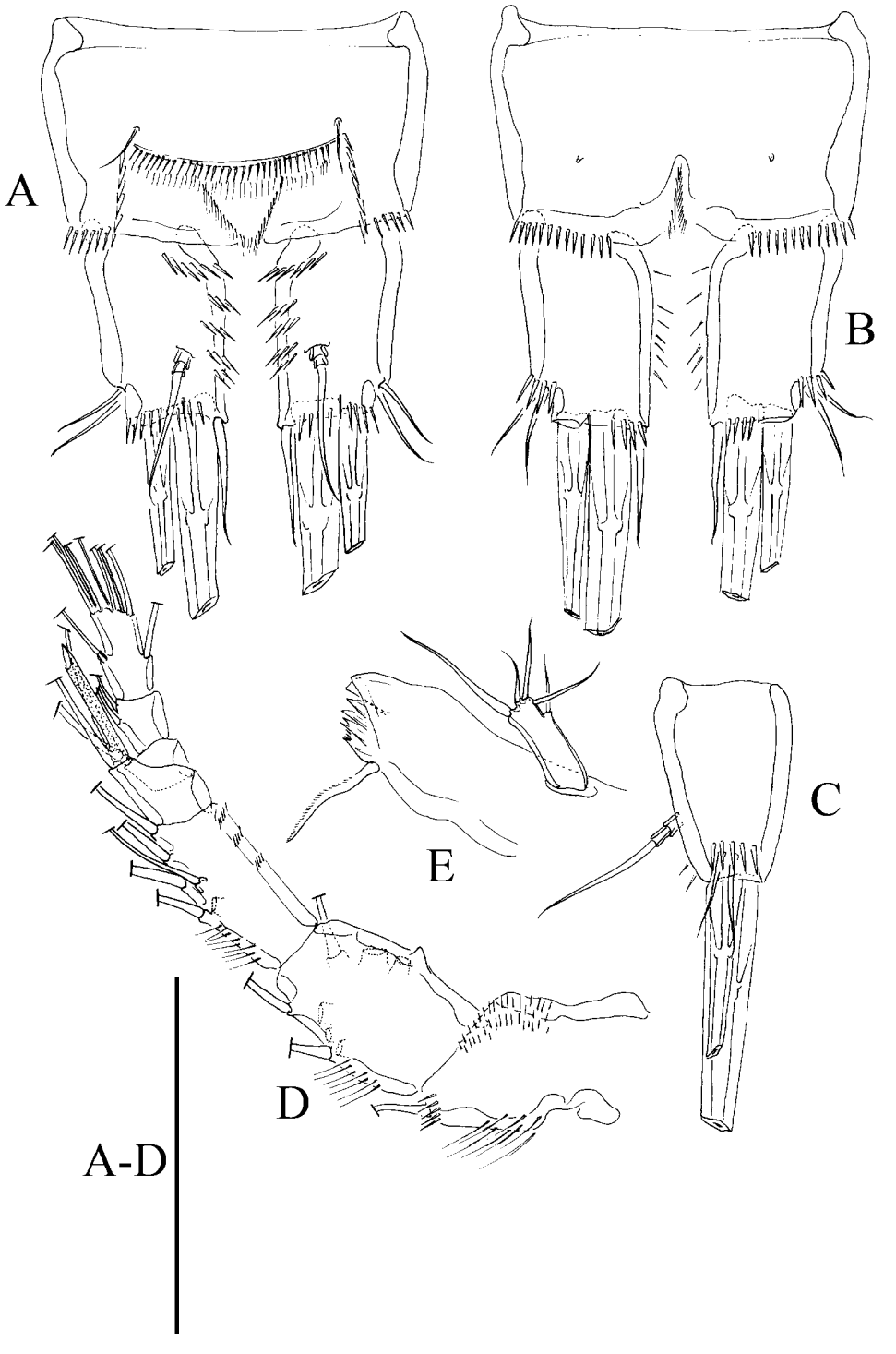

Figure 11. *Paralaophonte congenera* (Sars), female. (A) Anal somite and caudal rami, dorsal; (B) anal somite and caudal rami, ventral; (C) right caudal ramus, lateral; (D) antennule; (E) mandible. Scale bars: A–D, 50 μm.

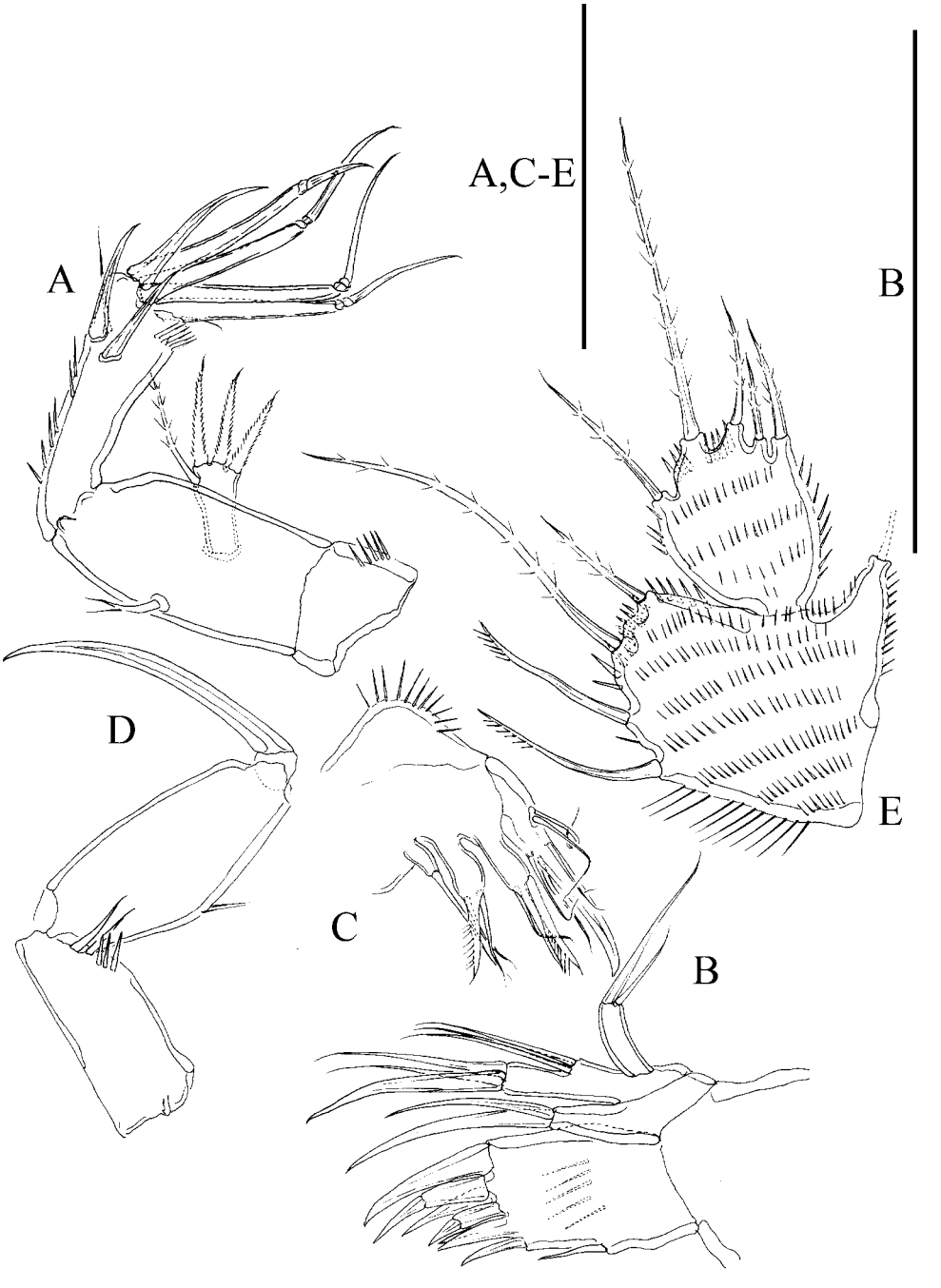

Figure 12. *Paralaophonte congenera* (Sars), female. (A) Antenna; (B) maxillule; (C) maxilla; (D) maxilliped; (E) P5. Scale bars: A, C–E, 50 μm; B, 50 μm.

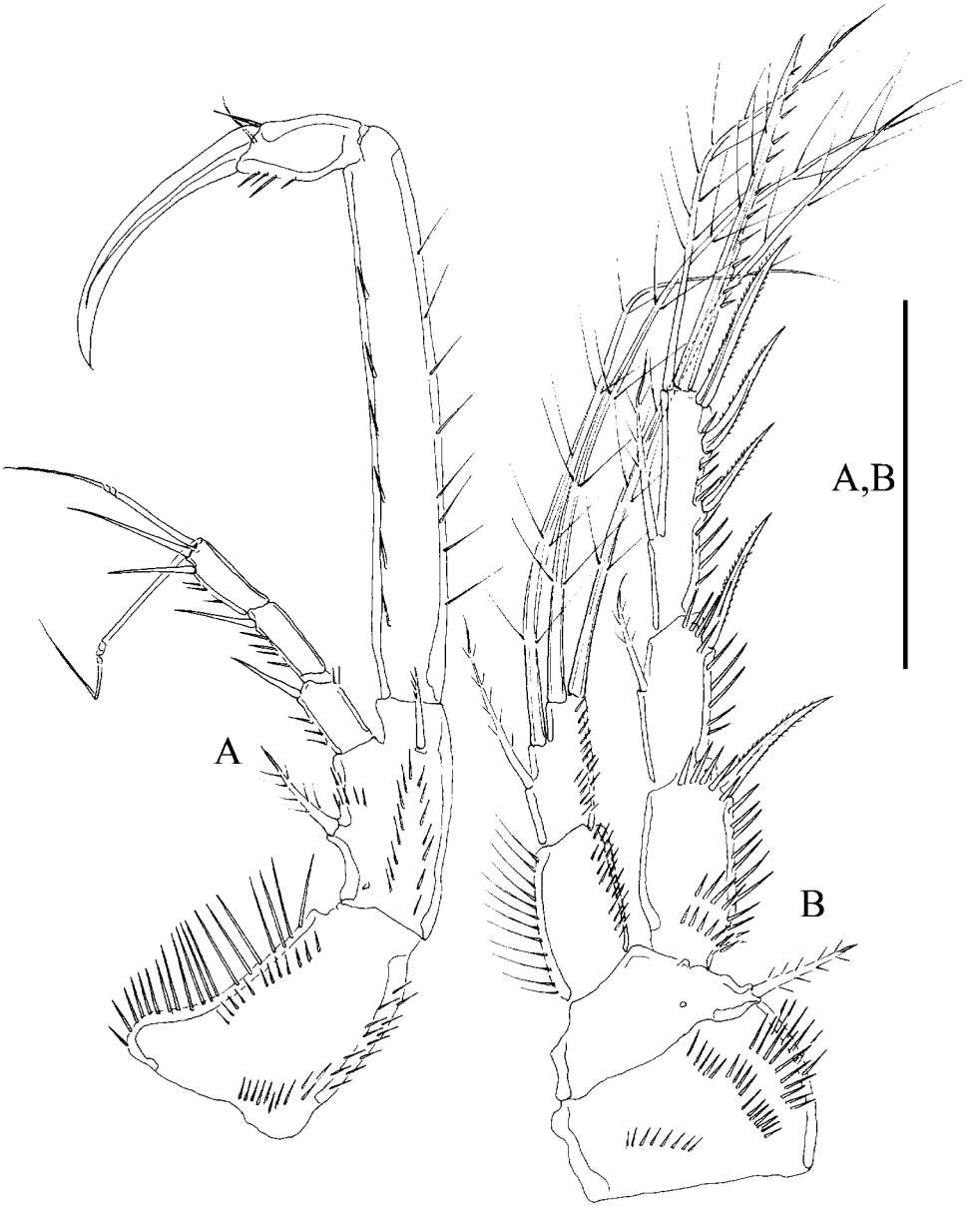

Figure 13. *Paralaophonte congenera* (Sars), female. (A) P1; (B) P2. Scale bars: A, B, 50 μm.

Paralaophonte pacificaemulator sp. nov.
(Figures 21–29)

Material examined

One female holotype (EMUCOP-080205-03), one male allotype (EMUCOP-080205-04) preserved in alcohol. Paratypes preserved in alcohol: one CIV

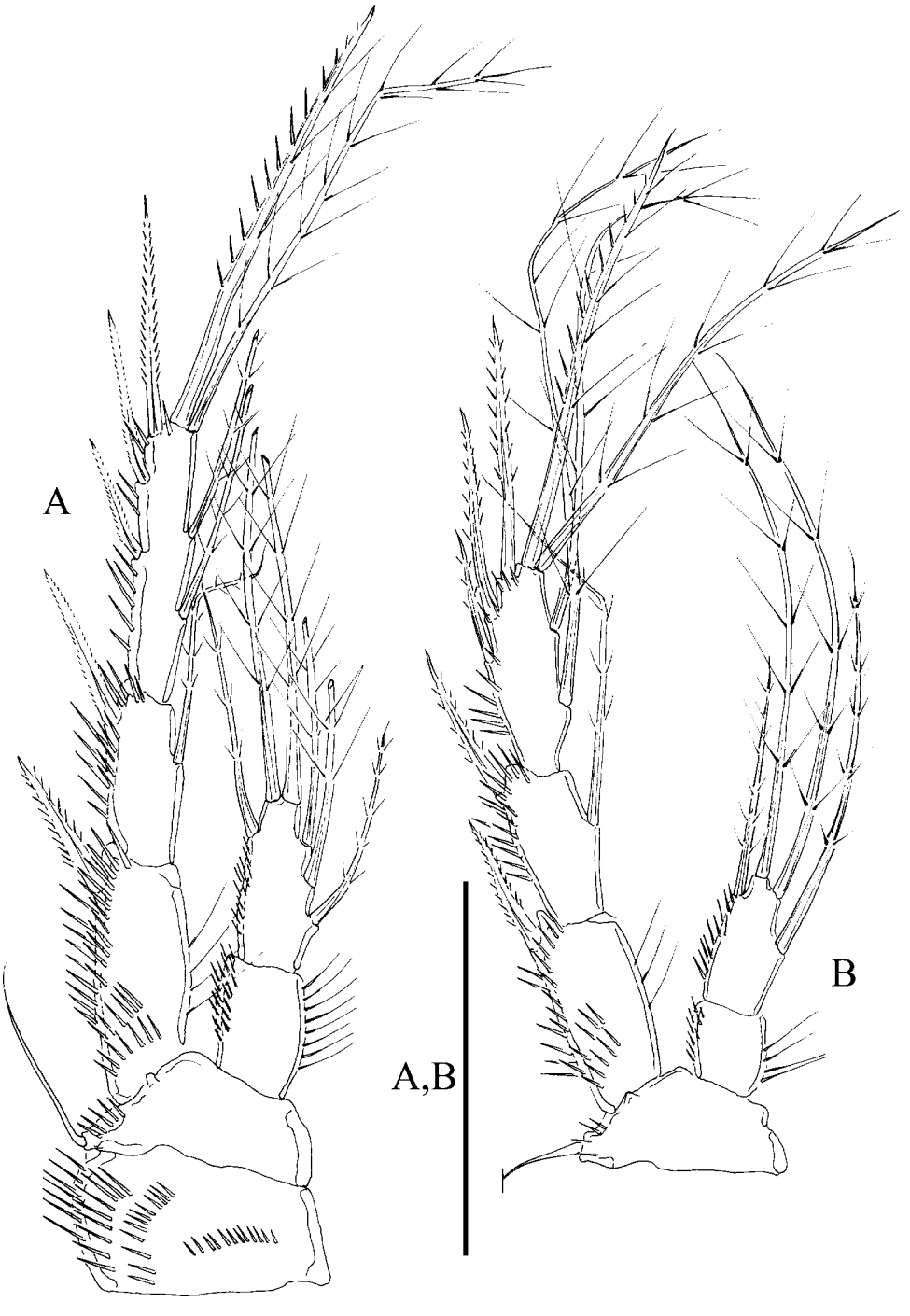

Figure 14. *Paralaophonte congenera* (Sars), female. (A) P3; (B) P4. Scale bars: A, B, 50 μm.

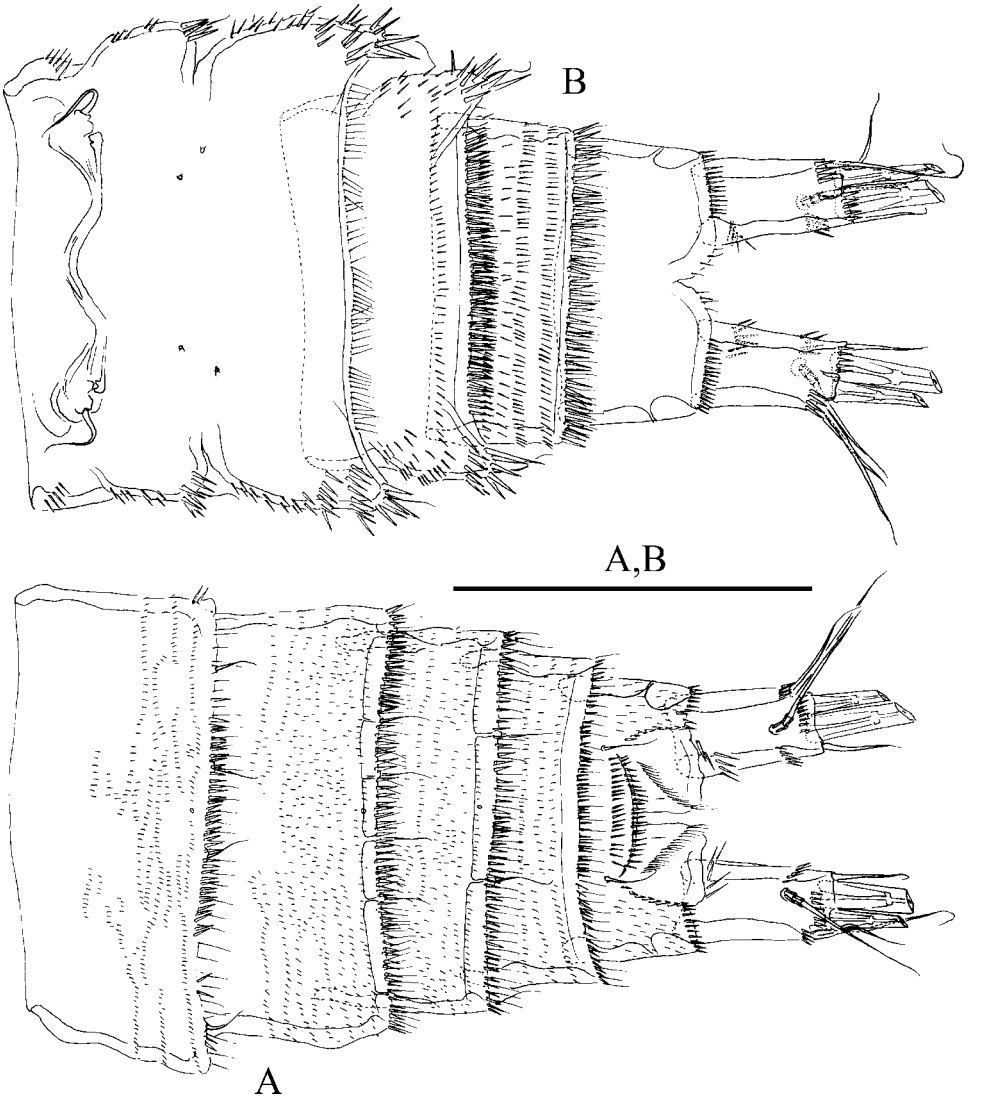

Figure 15. *Paralaophonte zimmeri* (Douwe), female. (A) Urosome, dorsal (P5-bearing somite omitted); (B), urosome, ventral (P5-bearing somite omitted). Scale bars: A, B, 100 μm.

(EMUCOP-080205-19), five adult females, 21 adult males, four CV, and four CIV (EMUCOP-080205-18), two adult females (EMUCOP-080205-17), two adult females and 2 CV (EMUCOP-230691-13), one adult female (EMUCOP-240691-01), four adult females, one adult male, one CIV and four CV (EMUCOP-230691-14), and four adult females, one adult male, one CV and one CIV (EMUCOP-230691-39). Dissected paratypes: seven females (EMUCOP-010591-01, EMUCOP-010591-02, EMUCOP-010591-03, EMUCOP-010591-06, EMUCOP-050205-01, EMUCOP-050205-02, EMUCOP-090301-30), and 12 males (EMUCOP-010591-05, EMUCOP-010591-07,

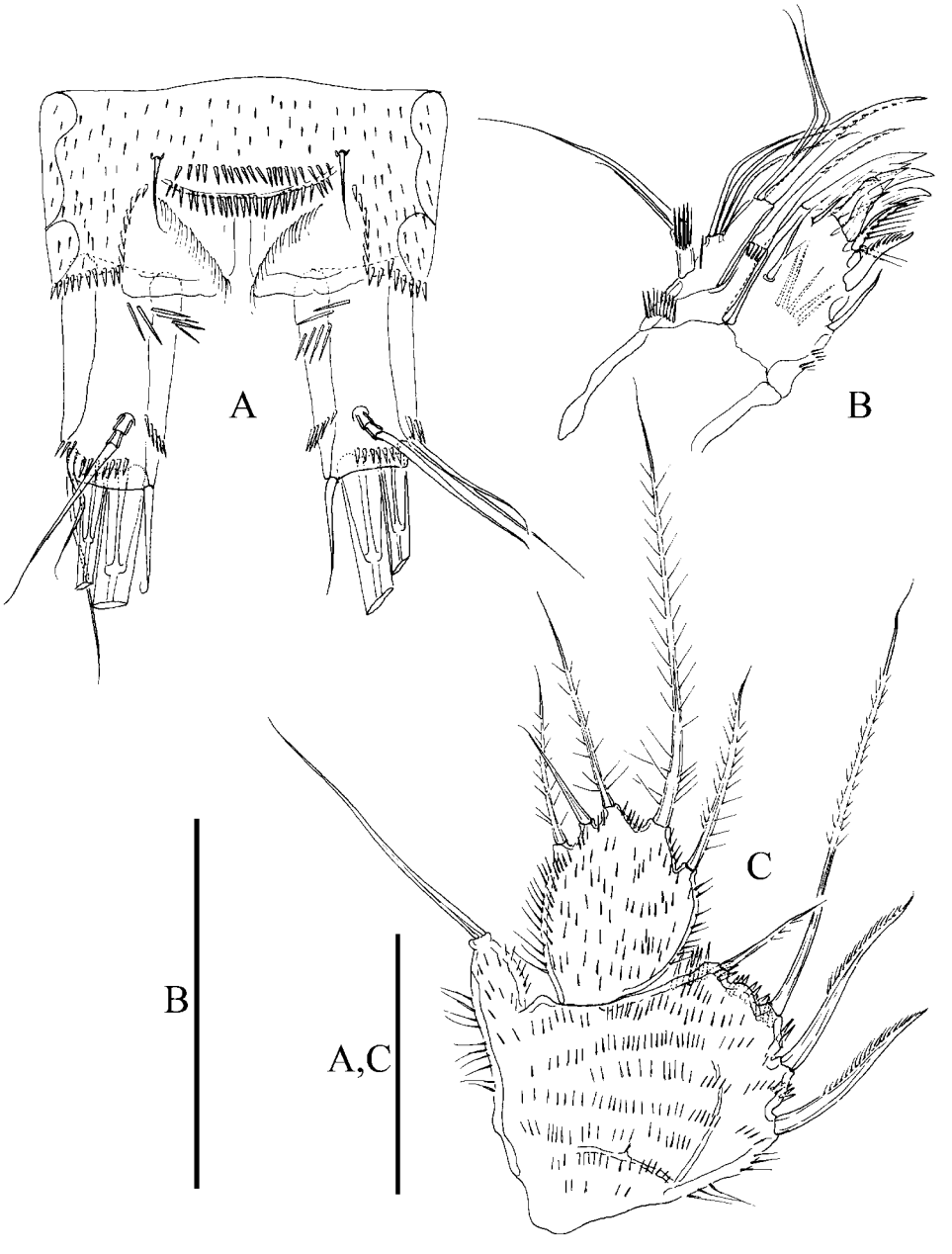

Figure 16. *Paralaophonte zimmeri* (Douwe), female. (A) Anal somite and caudal rami, dorsal; (B) maxillule; (C) P5. Scale bars: A–C, 50 μm.

EMUCOP-010591-08, EMUCOP-010591-09, EMUCOP-010591-10, EMUCOP-010591-11, EMUCOP-020591-04, EMUCOP-040591-04, EMUCOP-050205-05, EMUCOP-050205-06, EMUCOP-090301-29, EMUCOP-090301-35), and one male CV (EMUCOP-010591-04). Collected from Ensenada del Pabellón lagoon (Sinaloa

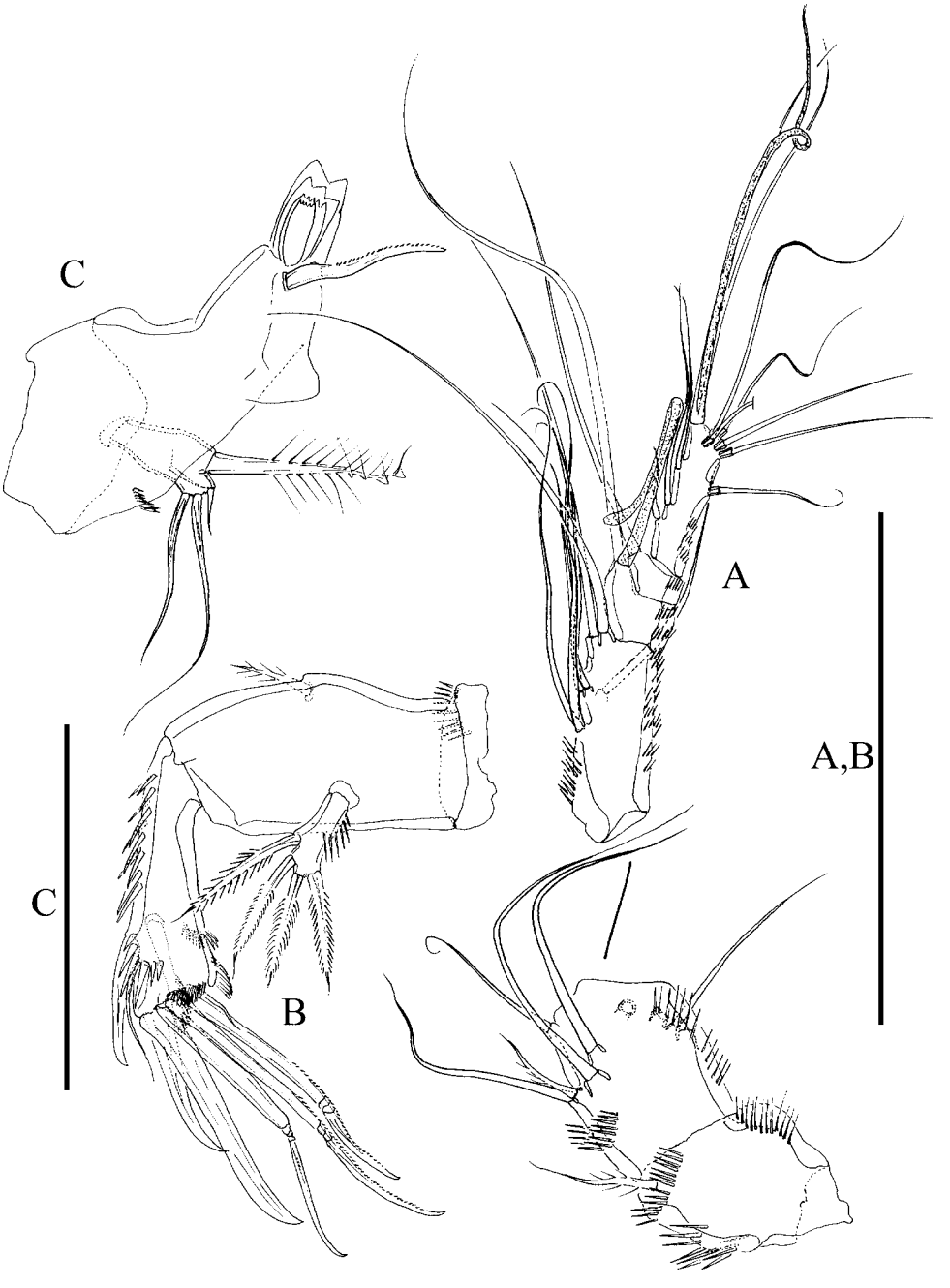

Figure 17. *Paralaophonte zimmeri* (Douwe), female. (A) Antennule; (B) antenna; (C) mandible. Scale bars: A, B, 100 μm; C, 50 μm.

State, north-western Mexico) (24°19′–24°35′ N, 107°28′–107°45′ W), stn. 2, 3, 4, and 14 (see Gómez-Noguera and Hendrickx, 1997, for more information regarding nitrogen and carbon content and sediment type), brackish, less than 2 m depth, 1, 2 and

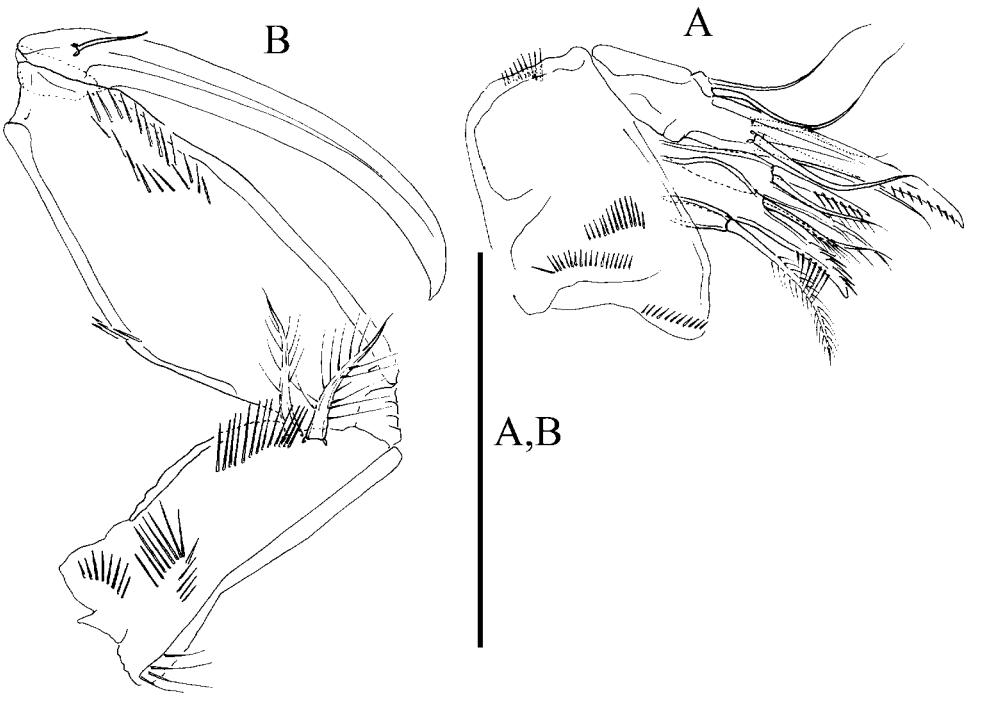

Figure 18. *Paralaophonte zimmeri* (Douwe), female. (A) Maxilla; (B) maxilliped. Scale bars: A, B, 50 μm.

4 May 1991, 23 and 24 June 1991; from Urías System (Sinaloa State, north-western Mexico) (23°11′06″ N, 106°25′06″ W), stn. 1, 2, 7, and 9 (see Morales-Serna, Gómez, and Bustos-Hernández 2006, for more information regarding organic matter content, chlorophyll *a* content and sediment type), brackish, less than 2 m depth, 9 March 2001, 5 and 8 February 2005, coll. S. Gómez (Ensenada del Pabellón lagoon) and F. N. Morales-Serna, F. E. Vargas-Arriaga and S. Gómez (Urías System).

Type locality

Urías System (Sinaloa State, north-western Mexico) (23°11′06″ N, 106°25′06″ W).

Other localities

Ensenada del Pabellón lagoon (Sinaloa State, north-western Mexico) (24°19′–24°35′ N, 107°28′–107°45′ W).

Etymology

The specific epithet *pacificaemulator* (*pacifica* after *P. pacifica;* Latin, *æmulor*, to emulate) makes reference to the strong resemblance to *P. pacifica*.

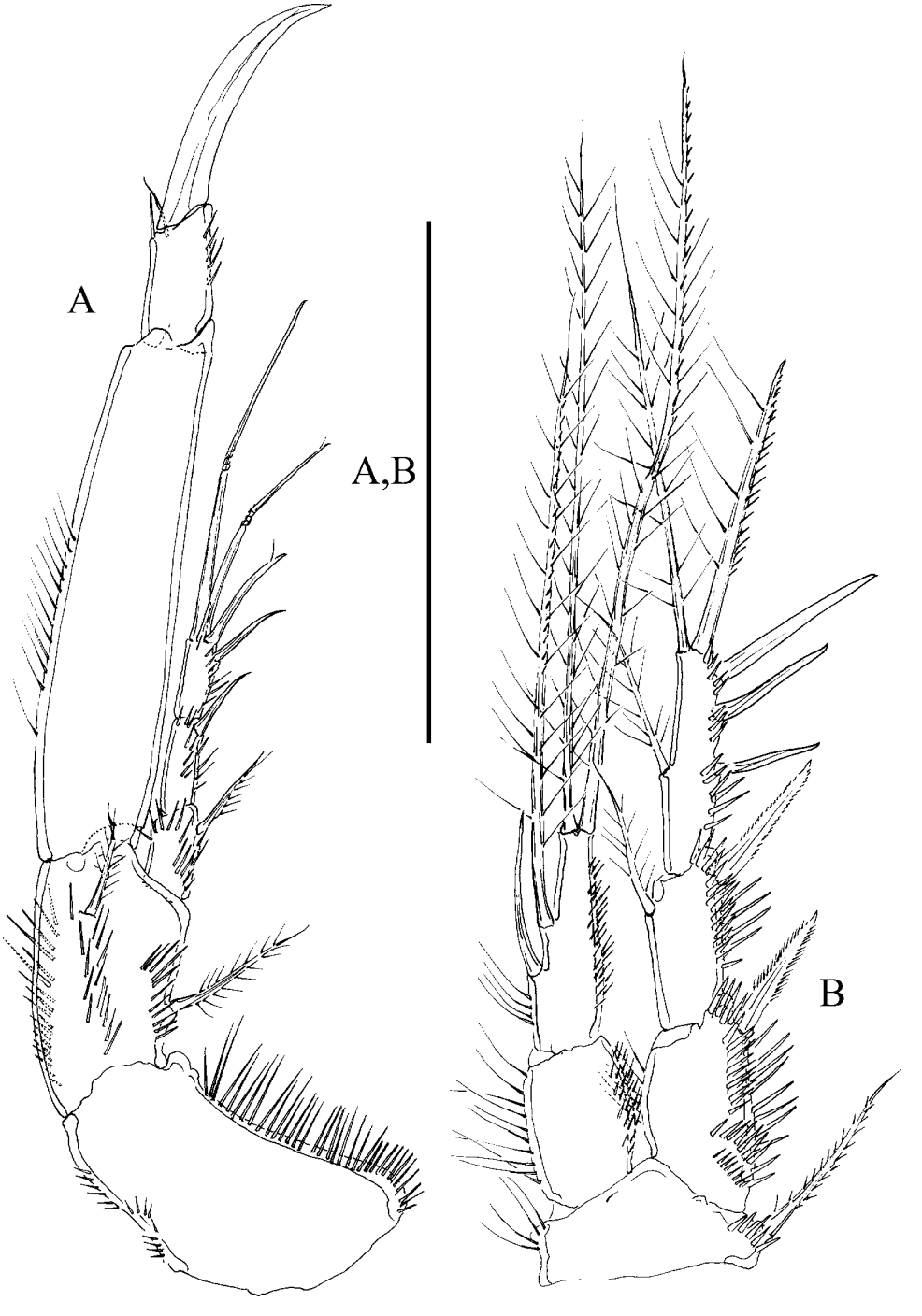

Figure 19. *Paralaophonte zimmeri* (Douwe), female. (A) P1; (B) P2. Scale bars: A, B, 100 μm.

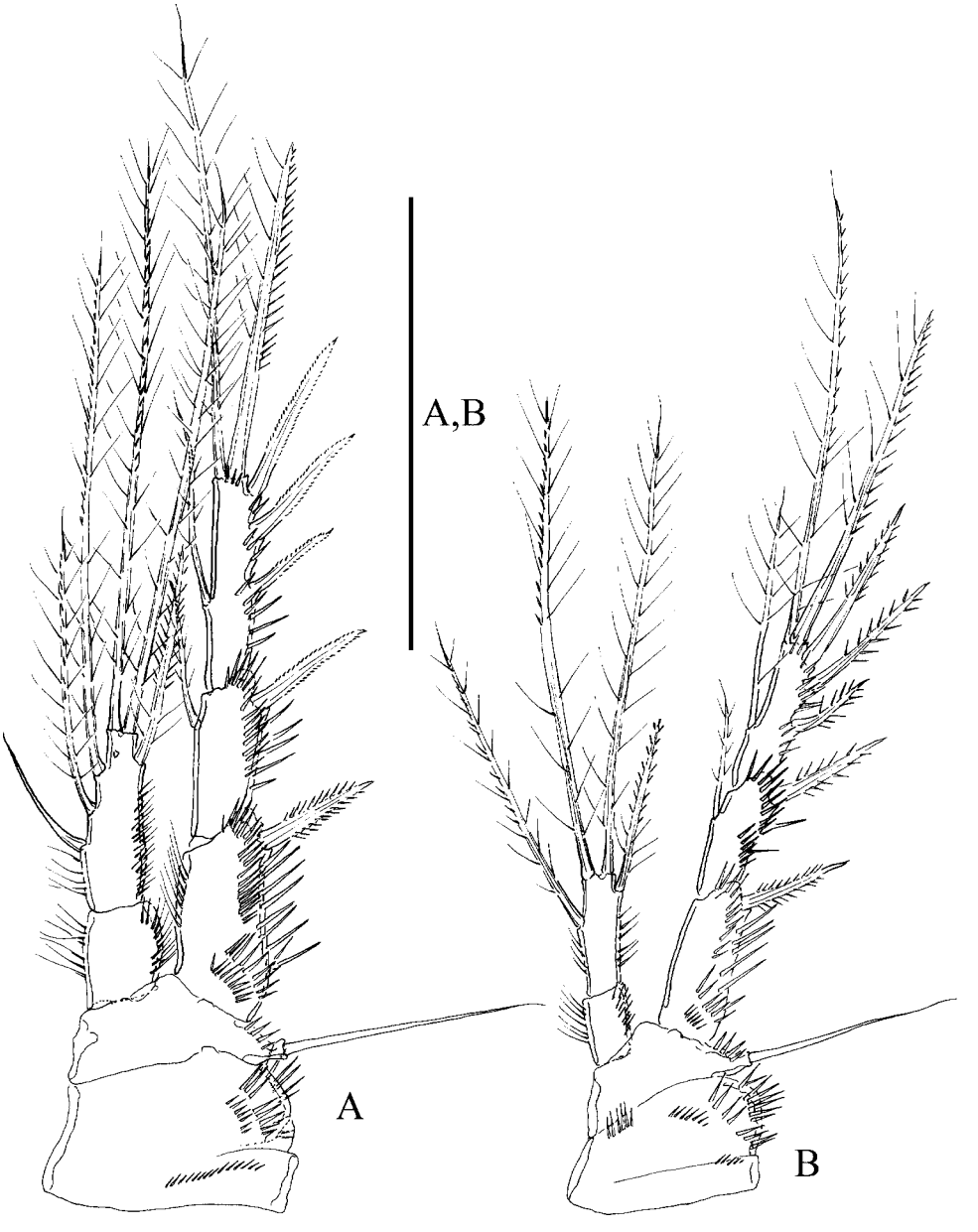

Figure 20. *Paralaophonte zimmeri* (Douwe), female. (A) P3; (B) P4. Scale bars: A, B, 100 μm.

Description

Female. Habitus fusiform (Figure 21A, B). Total body length measured from tip of rostrum to posterior margin of caudal rami ranging from 405 μm to 480 μm (mean = 447 μm; $n = 9$). Rostrum fused to cephalic shield, triangular, with bilobed tip flanked by pair of sensilla. Cephalothorax dorsally and laterally as shown

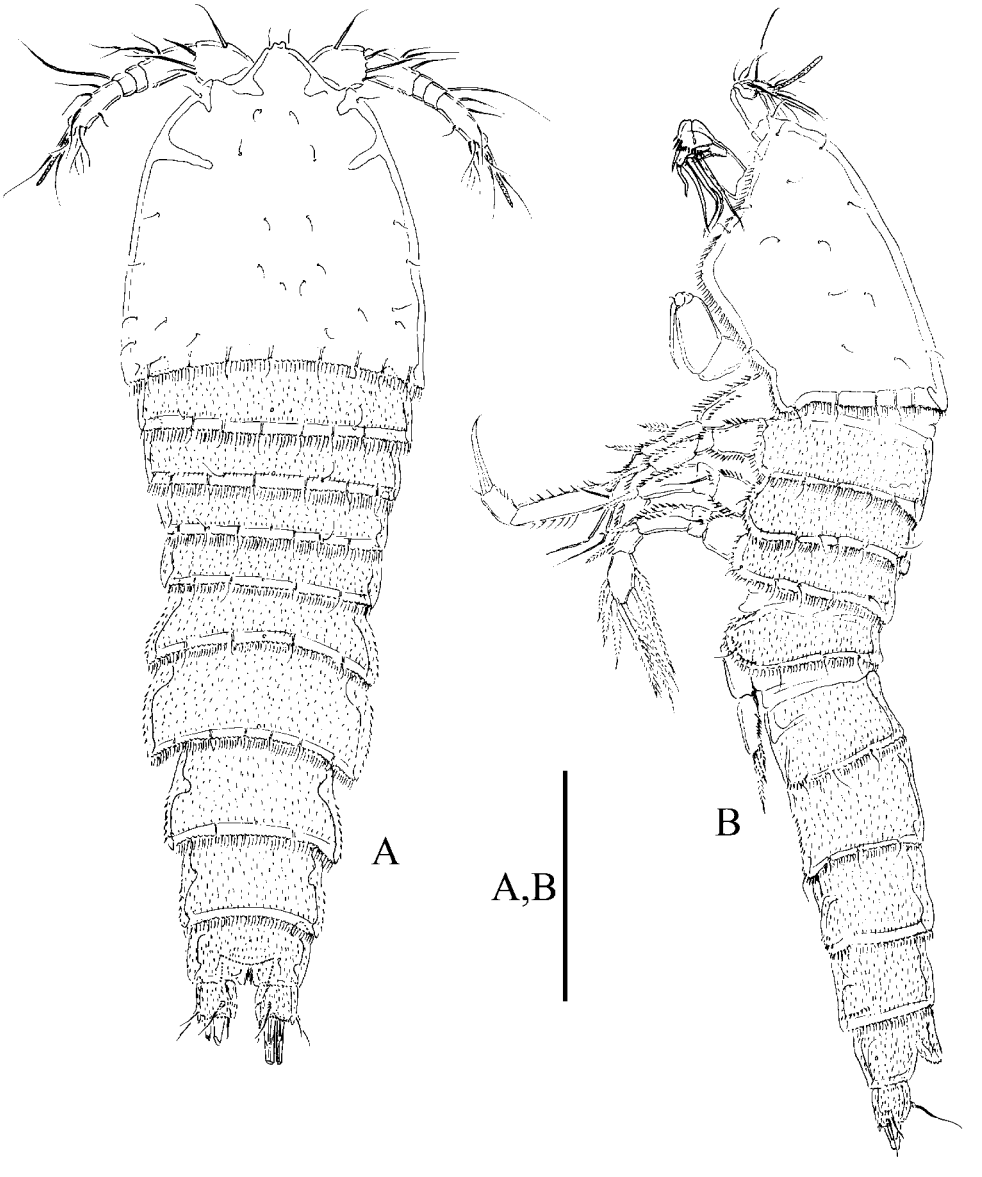

Figure 21. *Paralaophonte pacificaemulator* sp. nov., female. (A) Habitus, dorsal; (B) habitus, lateral. Scale bars: A, B, 100 μm.

(Figure 21A, B), with posterior margin minutely serrate dorsally, with setules along posterior margin dorsally and laterally. P2–P5-bearing somites covered by tiny spinules, with posterior margin minutely serrate, with setules along posterior margin dorsally and laterally. Genital double-somite distinct dorsally and laterally (Figure 21A, B); fused ventrally (Figure 22A); both somites of the genital double-somite with posterior margins minutely serrate and ornamented as previous somites dorsally and laterally, with lateral expansions moderately developed (Figures 21A, 22A), and with

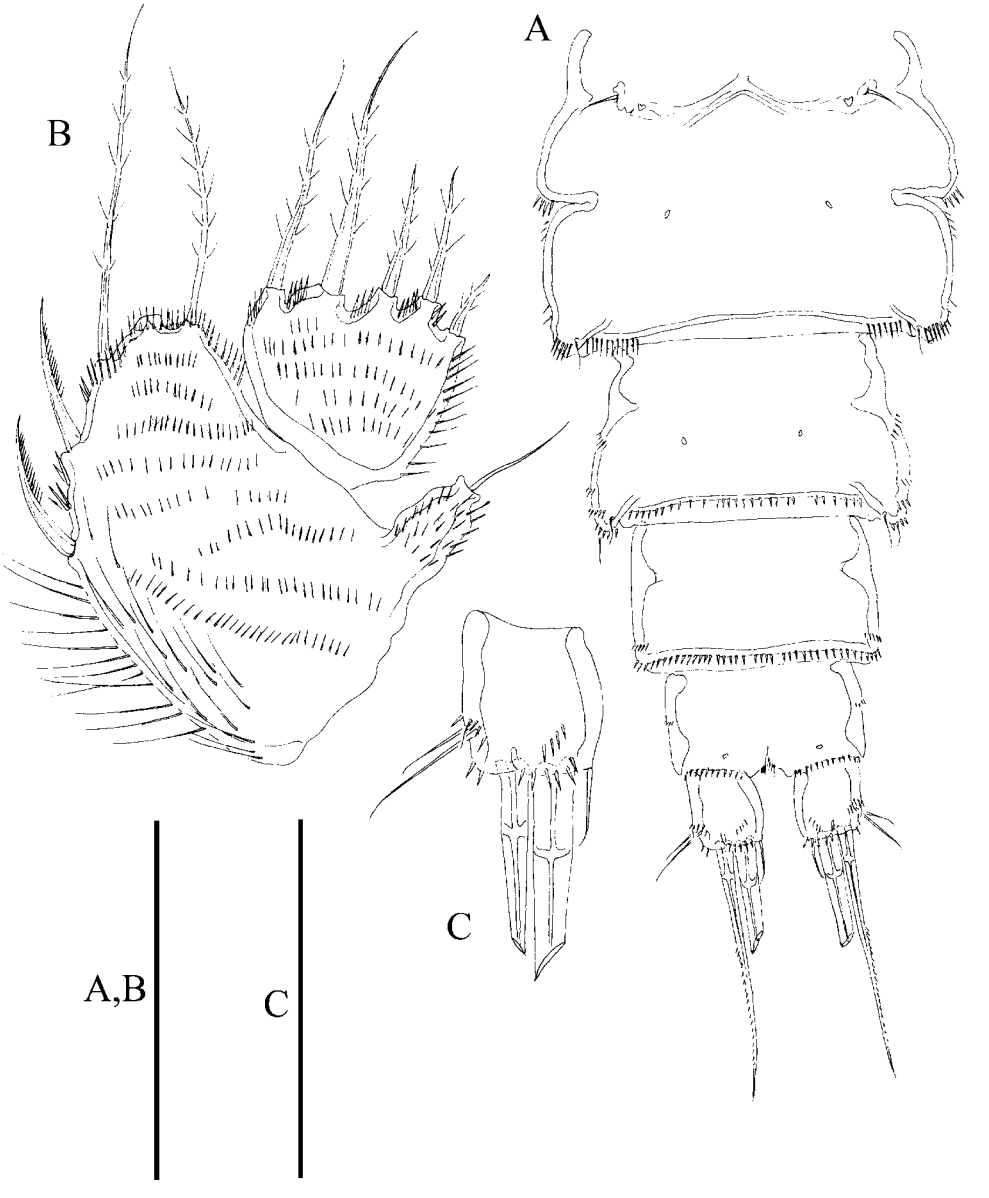

Figure 22. *Paralaophonte pacificaemulator* sp. nov., female. (A) Urosome, ventral (P5-bearing somite omitted); (B) P5; (C) right caudal ramus, ventral. Scale bars: A, B, 50 μm; C, 100 μm.

sets of spinules; posterior half of genital double-somite with set of spinules close to posterior corner ventrally. Fourth and fifth urosomites as previous somites dorsally; fourth urosomite with, fifth urosomite without lateral expansions; both urosomites with setules (very fine spinules?) along posterior margin. Anal somite (Figures 21A, B, 22A, 26C, D) covered with tiny spinules dorsally and laterally, with spinules along posterior margins dorsally and ventrally; rounded anal operculum with minutely serrate

posterior margin and flanked by pair of sensilla. Caudal rami (Figures 21A, B, 22A, C, 26C, D) about 1.2 times as long as wide; covered with tiny spinules dorsally and laterally and with rows of stronger spinules ventrally; with seven elements; seta I very small, inserted ventrally to seta II, the latter about three times longer, both inserted laterally on distal fourth; seta III longer than seta II and situated almost at the same level, ventral to seta II and posterior to seta I; seta IV pinnate; seta V longest; seta VI arising from inner distal corner, nearly as long as seta II; seta VII situated dorsally, on the distal third of the inner margin, triarticulated.

Antennule (Figure 23A) six-segmented; first segment with medial and distal inner rows of spinules, without process; second segment with some inner spinules proximally, with blunt conical outer process; third segment with inner spinules proximally and with some transverse rows of minute spinules along outer margin medially and distally; fourth and fifth segments small, each with outer spinular row; sixth segment elongate, about three times as long as wide, with outer spinular row proximally. Armature formula, I-(1); II-(8); III-(7); IV-(2 + ae); V-(1); VI-(9 + acrothek) (acrothek consisting of two setae and one aesthetasc fused basally).

Antenna (Figure 23B). Coxa with some spinules as depicted. Allobasis with one small, unipinnate abexopodal seta, and with inner row of spinules proximally. Exopod one-segmented, with two lateral (proximal one longer, bare, slender) and two distal elements. Free endopodal segment with inner row of spinules, with two outer frills, laterally with two spines and a slender seta, and apically with two strong spines, two geniculate single setae and one geniculate seta fused to tiny element basally.

Mandible (Figure 23C). Strong gnathobase with bi- and multicuspidate teeth distally and one pinnate seta laterally. Palp one-segment, with five seta (one basal, one exopodal, three endopodal).

Maxillule (Figure 23D). Arthrite with some spinules as depicted, with five strong apical spines and some spinules, and one lateral element. Coxa with some proximal spinules, with two setae. Basis with three apical elements (one of them stronger). Exopod one-segmented, elongate, with two setae. Endopod small, one-segmented, with three setae.

Maxilla (Figure 23E). Syncoxa with outer and inner spinules as shown; with three endites; proximal endite with one seta, middle and distal endites each with three elements as figured (one of them fused to endite basally). Allobasis drawn into strong claw with three accessory setae. Endopod represented by two long setae.

Maxilliped (Figure 23F). Syncoxa with spinular rows as depicted, with two distal setae. Basis with small outer spinules. Endopod drawn out into claw with one accompanying seta.

P1 (Figure 24A). Coxa with several spinule rows as figured. Basis with longitudinal rows of spinules, with inner and outer spine-like element. Exopod three-segmented, reaching to slightly below the middle of ENP1. Endopod two-segmented, elongate; ENP1 long, about 6.7 times as long as wide, with inner setules and outer spinules; ENP2 about twice as long as wide, with outer and apical spinules, with one small apical seta and one strong claw, the latter about 1.7 times as long as supporting segment.

P2 (Figure 24B). Praecoxa with transverse row of outer spinules. Coxa with spinular rows as figured. Basis with spinules at base of outer, spine-like seta. Exopod three-segmented; EXP1 without, EXP2 with inner seta; EXP3 with three outer spines, two apical and one inner element. Endopod two-segmented, reaching slightly beyond

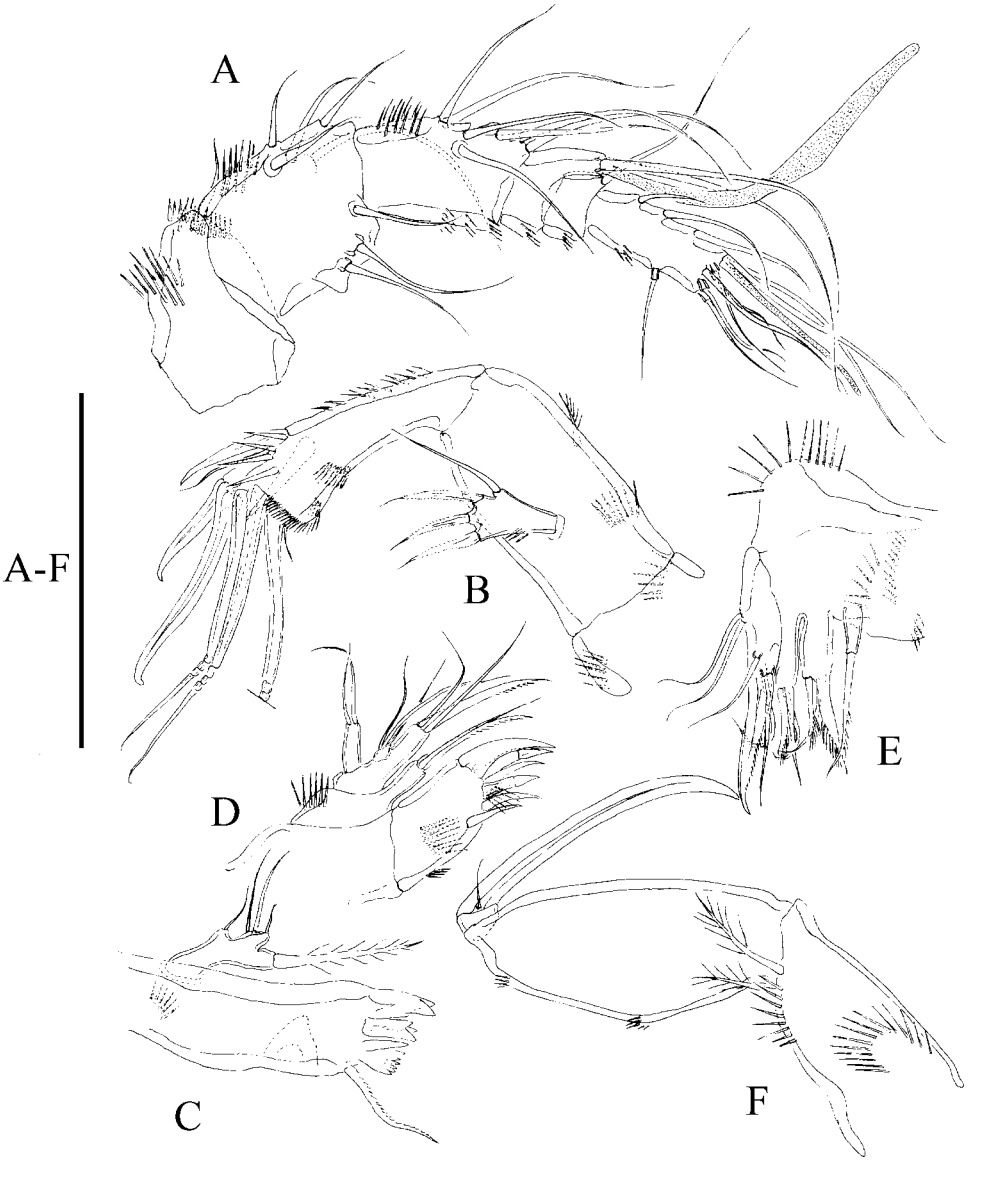

Figure 23. *Paralaophonte pacificaemulator* sp. nov., female. (A) Antennule; (B) antenna; (C) mandible; (D) maxillule; (E) maxilla; (F) maxilliped. Scale bars: A–F, 50 μm.

insertion site of inner seta of EXP2, ENP1 as long as EXP1; ENP1 without armature; ENP2 with two inner (proximalmost smaller) and two apical setae.

P3 (Figure 25A). Praecoxa as in P2. Coxa and basis as in P2, except for slender and bare basal seta of P3. Exopod three-segmented; EXP1 without, EXP2 with inner seta; EXP3 with three outer spines, two apical and two inner elements. Endopod two-segmented, reaching insertion site of inner seta of EXP2; ENP1 without armature; ENP2 with three inner setae, two apical and one outer element.

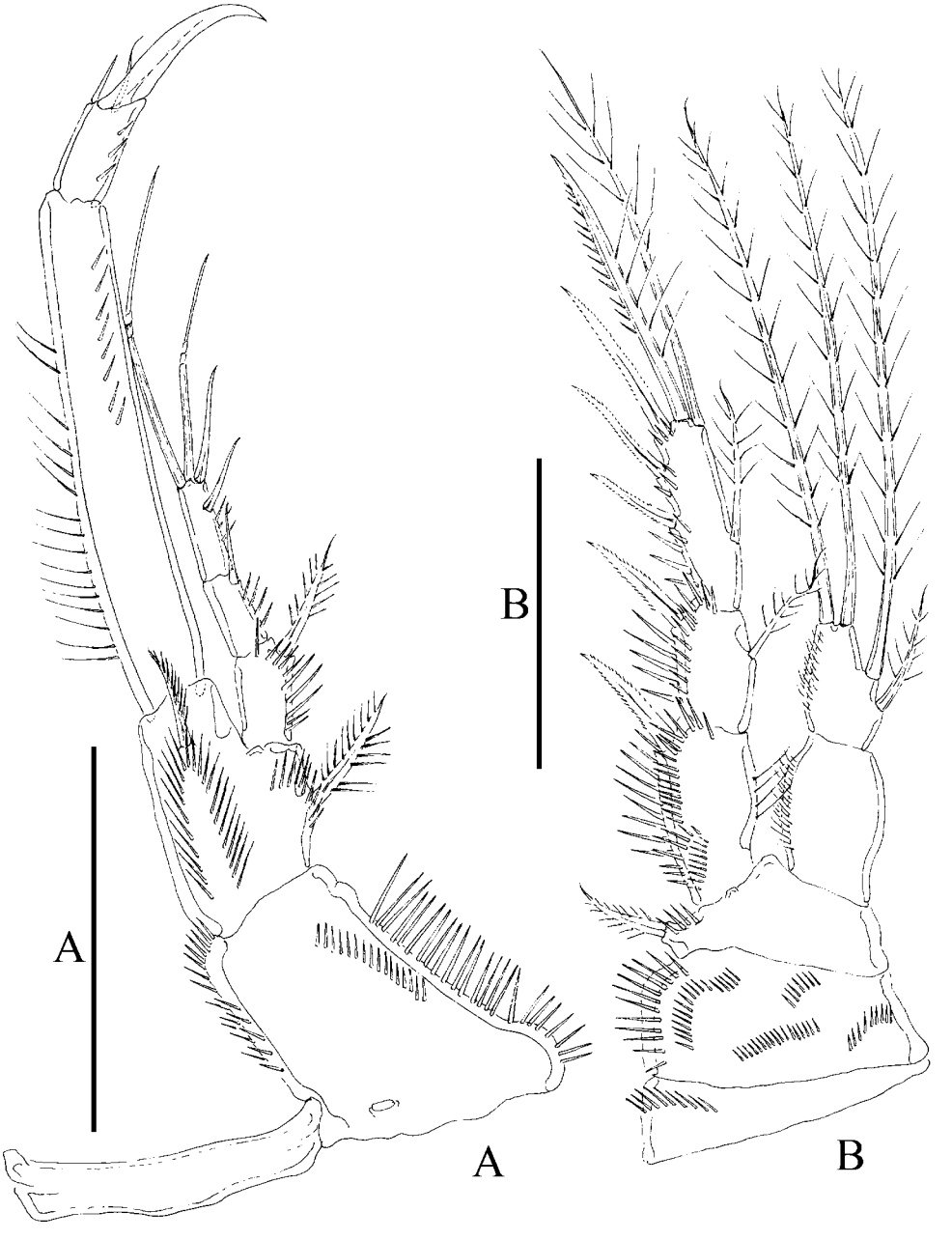

Figure 24. *Paralaophonte pacificaemulator* sp. nov., female. (A) P1; (B) P2. Scale bars: A, B, 50 μm.

P4 (Figure 25B). Praecoxa, coxa, basis and exopod as in P3 (though P4 EXP3 somewhat different in general shape). Endopod two-segmented, barely reaching distal margin of EXP1; first segment without armature; second segment with one inner seta, two apical and one outer element.

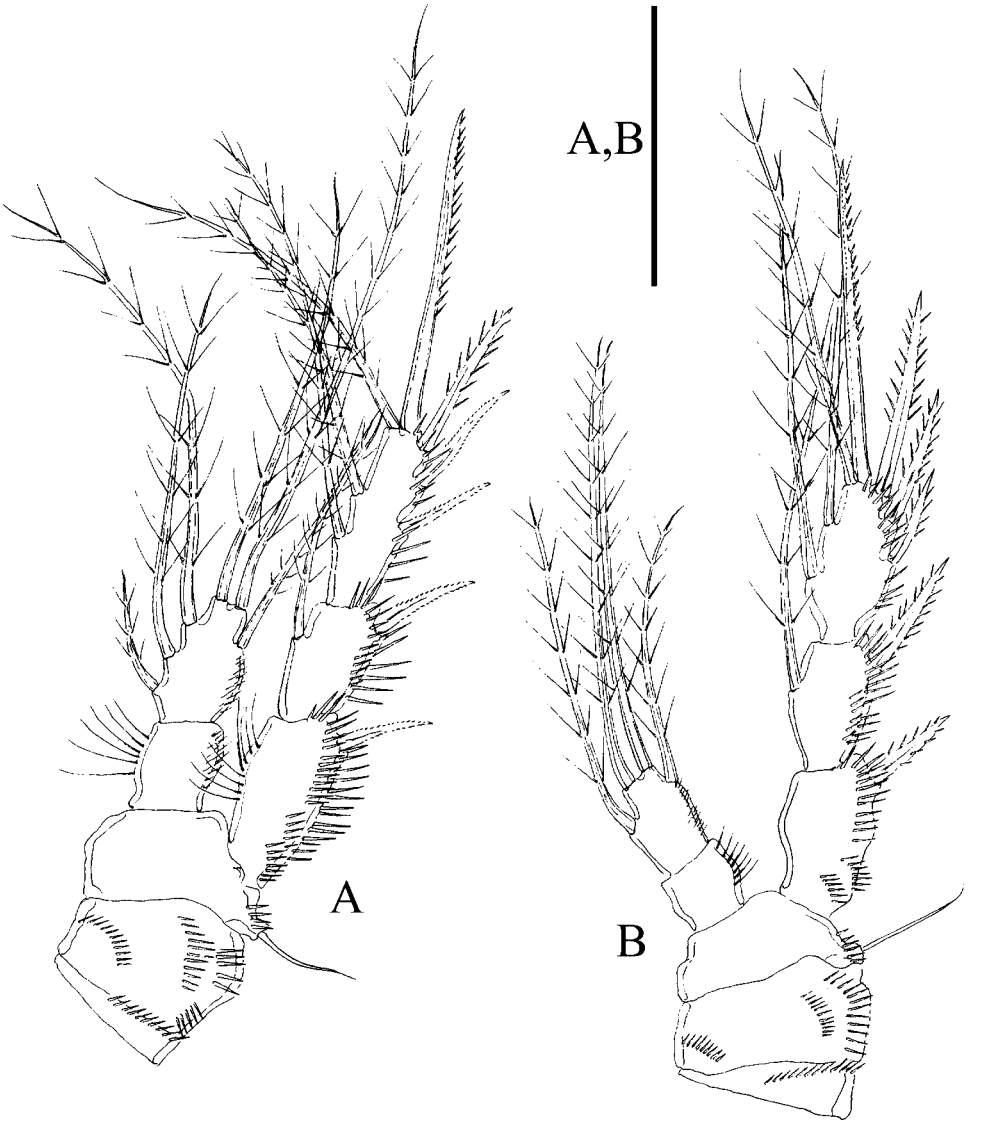

Figure 25. *Paralaophonte pacificaemulator* sp. nov., female. (A) P3; (B) P4. Scale bars: A, B, 50 μm.

P5 (Figure 22B) large, with separate rami. Baseoendopodal lobe well developed, not reaching tip of EXP, with spinules as shown; with four setae; outer basal seta arising from short setophore. Exopod broad, covered with spinules, with five setae, outermost smallest (about half length of adjacent seta).

P6 (Figure 22A) represented by one seta.

Armature formula of P1–P5 as in Table 2.

Table 2. Armature formula of swimming legs of *Paralaophonte pacificaemulator* sp. nov.

	EXP	ENP
P1	I-0;I-0;II,2,0	0-0;0,I1,0
P2	I-0;I-1;III,I1,1	0-0;0,2,2
Female P3	I-0;I-1;III,I1,2	0-0;1,2,3
Male P3	I-0;I-I;II,II,1II	0-0;apophysis-0;0,2,2
P4	I-0;I-1;III,I1,2	0-0;1,2,1
Female P5	5	4 + 1 (basal)
Male P5	5	1 + 1 (basal)

Male. Habitus (Figures 26A, B, 27A, B) as in female except for separate second and third urosomites ventrally, and for coarser and more abundant spinules on third, fourth and fifth urosomites ventrally (Figure 28A). Urosome more slender than in female. Anal somite and caudal rami (Figure 26C, D) as in female. Total body length ranging from 420 μm to 470 μm measured from tip of rostrum to posterior margin of caudal rami (mean = 447 μm; $n = 13$).

Antennule (Figure 28A) eight-segmented, subchirocer; second segment with conical outer process; sixth segment with two acute projections. Armature formula difficult to define: I-(1); II-(9);III-(6);IV-(1);V-(10 + ae);VI-(0);VII-(1);VIII-(8 + acrothek). Acrothek consisting of two setae and one aesthetasc fused basally.

Antenna, mandible, maxillule, maxilla and maxilliped (not shown) as in female.

P1 (Figure 28B) as in female.

P2 EXP as in female. P2 ENP (Figure 28C) dimorphic, two-segmented, distalmost inner seta modified as depicted.

P3 (Figure 29A) dimorphic. Exopod three-segmented, segments more robust than in female; first segment without, second segment with one, third segment with two inner spines; all setae and spines very strong and without ornamentation except for pinnate inner element of EXP2; relative length of spines on EXP3 as depicted. Endopod three-segmented; ENP1 without armature; ENP2 with outer apophysis reaching beyond ENP3, the latter with two inner and two apical setae.

P4 (Figure 29B) as in female except for exopodal segments more strongly developed, and for comparatively stronger and more spinulose outer spines, outer apical element of EXP3, and shorter inner seta of EXP2 in male. Endopodal segments comparatively much larger than in female.

Left and right P5 fused (Figure 29C); baseoendopodal lobe with one seta plus outer seta of basis; exopod with five setae (innermost considerably stronger).

P6 (Figure 29D) represented by two plates, each bearing one outer slender seta and one inner strong spine-like element.

Remarks

See Remarks for *P. pacificavicimum* sp. nov.

Paralaophonte pacificavicinum sp. nov.
(Figures 30–37)

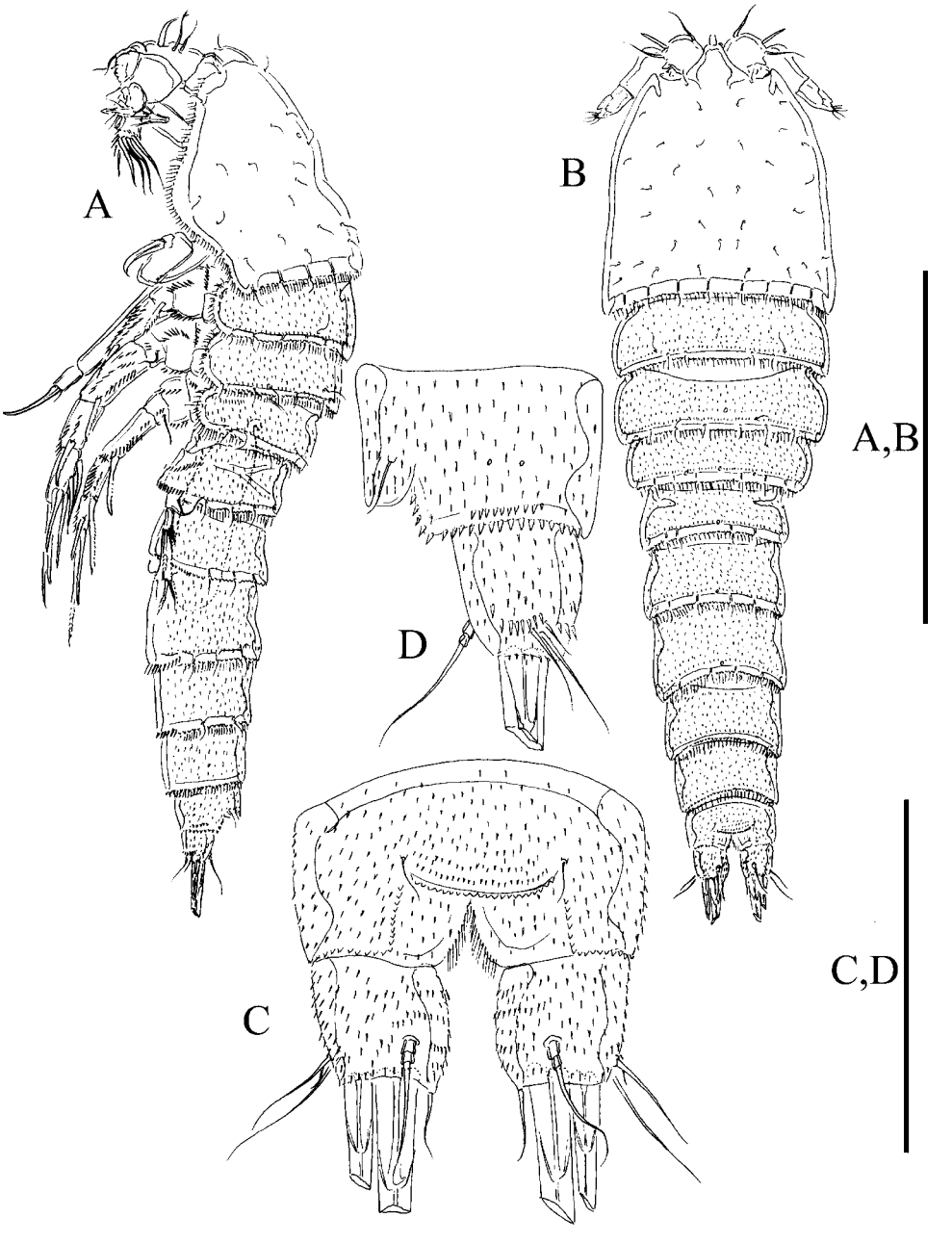

Figure 26. *Paralaophonte pacificaemulator* sp. nov., male. (A) Habitus, lateral; (B) habitus, dorsal. *Paralaophonte pacificaemulator* sp. nov., female. (C) Anal somite and caudal rami, dorsal; (D) anal somite and right caudal ramus, lateral. Scale bars: A, B, 200 μm; C, D, 50 μm.

Material examined

One female holotype (EMUCOP-021205-04) and one male allotype (EMUCOP-021205-05) preserved in alcohol. Paratypes preserved in alcohol: two females and

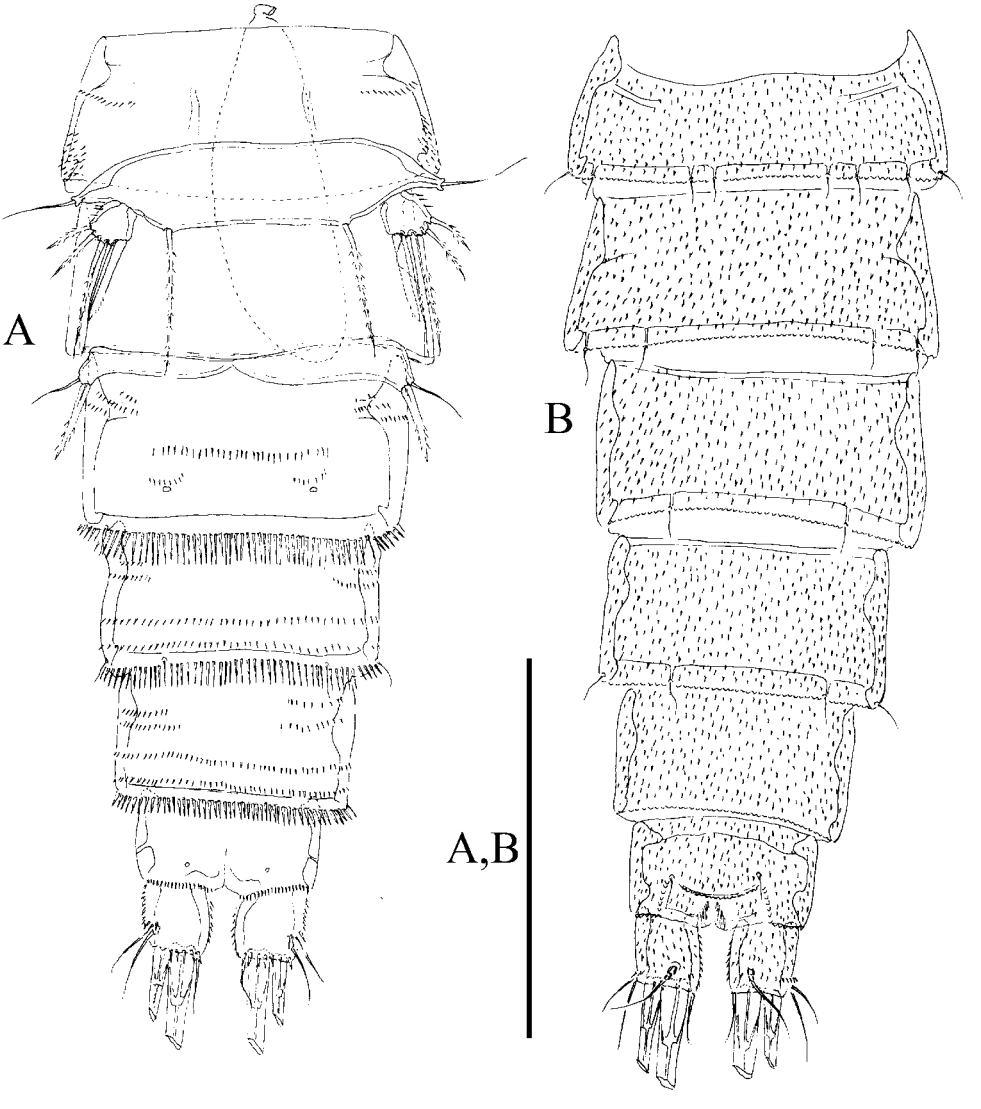

Figure 27. *Paralaophonte pacificaemulator* sp. nov., male. (A) Urosome, ventral; (B) urosome, dorsal. Scale bars: A, B, 100 μm.

two males (EMUCOP-020591-05), one female and four males (EMUCOP-021205-06), one female and one male (EMUCOP-080205-20), one adult male (EMUCOP-080205-21), four females (EMUCOP-080205-22), two males (EMUCOP-090301-36), three females and two males (EMUCOP-090301-37), and two females (EMUCOP-160506-01). Dissected paratypes: three males (EMUCOP-021205-07, EMUCOP-021205-08, EMUCOP-090301-38), four females (EMUCOP-021205-09, EMUCOP-021205-10, EMUCOP-021205-11, EMUCOP-090301-47), and one CIII (EMUCOP-090301-46). Collected from Ensenada del Pabellón lagoon (Sinaloa State, north-western Mexico) (24°19′–24°35′ N, 107°28′–107°45′ W), stn. 3 (see Gómez-Noguera and Hendrickx

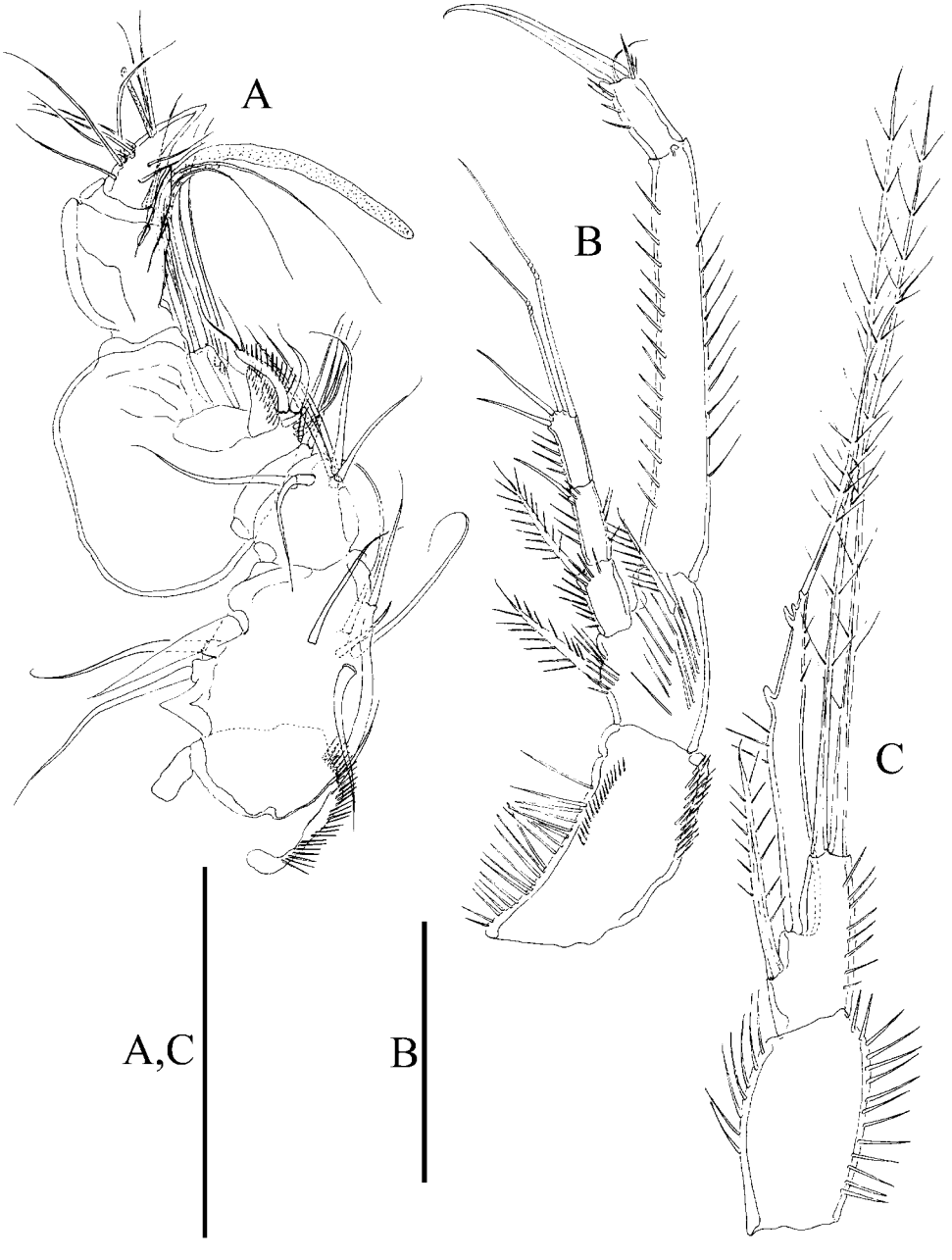

Figure 28. *Paralaophonte pacificaemulator* sp. nov., male. (A) Antennule; (B) P1; (C) P2 ENP. Scale bars: A–C, 50 μm.

1997, for more information regarding nitrogen and carbon content and sediment type), brackish, less than 2 m depth, 2 May 1991; from Urías System (Sinaloa State, northwestern Mexico) (23°11′06″ N, 106°25′06″ W), stn. 3, 4, 5, and 9 (see Morales-Serna

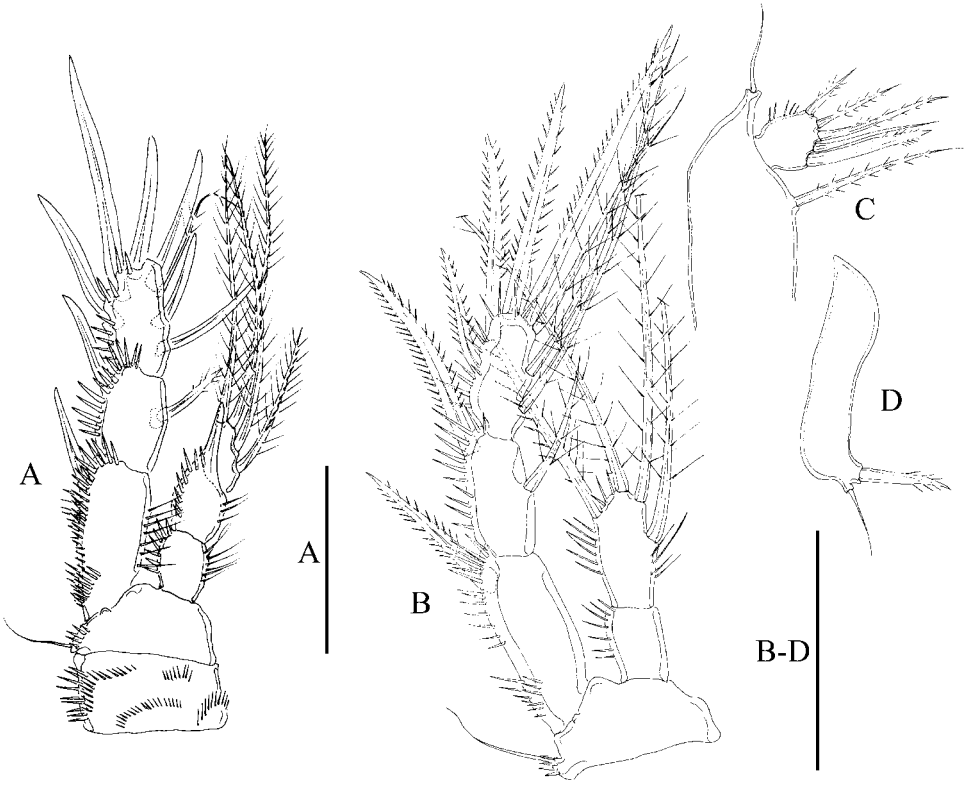

Figure 29. *Paralaophonte pacificaemulator* sp. nov., male. (A) P3; (B) P4; (C) P5; (D) P6. Scale bars: A–D, 50 μm.

et al. 2006, for more information regarding organic matter content, chlorophyll *a* content and sediment type), brackish, less than 2 m depth, 9 March 2001, 2 December and 8 February 2005, coll. S. Gómez (Ensenada del Pabellón lagoon) and F. N. Morales-Serna, F. E. Vargas-Arriaga and S. Gómez (Urías System).

Type locality

Urías System (Sinaloa State, north-west Mexico) (23°11′06″ N, 106°25′06″ W).

Other localities

Ensenada del Pabellón lagoon (Sinaloa State, north-west Mexico) (24°19′–24°35′ N, 107°28′–107°45′ W), off Campeche State, Gulf of Mexico (south-east Mexico) (19°18′55.20″ N, 91°06′59.52″ W).

Etymology

The specific epithet *pacificavicinum* (*pacifica* after *P. pacifica*; Latin, *vicinum*, neighbour) makes reference to the strong resemblance to *P. pacifica*.

Description

Female. Habitus fusiform (Figure 30A, B). Total body length measured from tip of rostrum to posterior margin of caudal rami ranging from 425 μm to 490 μm (mean = 449 μm; $n = 7$). Rostrum fused to cephalic shield, triangular, with bilobed tip flanked by pair of sensilla. Cephalothorax dorsally and laterally as shown (Figure 30A, B), with posterior margin minutely serrate dorsally, with setules along posterior margin dorsally and laterally. P2–P5-bearing somites covered with tiny spinules, with posterior margin minutely serrate, with setules along posterior margin dorsally and laterally. Genital double-somite (Figures 30A, B, 31A, B) distinct dorsally and laterally; fused ventrally; both halves of the genital double-somite with posterior margin minutely serrate, first half with posterior spinules and without setules, second half with setules but without spinules, lateral expansions moderately developed, and with sets of spinules; posterior half of genital-double somite (third urosomite) with spinules along posterior margin ventrally. Fourth and fifth urosomites as previous somite dorsally; fourth urosomite with, fifth urosomite without lateral expansions; both urosomites with small spinules along posterior margin. Anal somite (Figures 31A, B, 32A) covered with tiny spinules dorsally, with spinules along posterior margin dorsally and ventrally; rounded anal operculum with minutely serrate posterior margin and flanked by pair of sensilla. Caudal rami (Figures 31A, B, 32A) about 1.2 times as long as wide; covered with tiny spinules dorsally and laterally, and with stronger spinules ventrally along posterior margin (Figure 31B); with seven elements; seta I very small (arrowed in Figure 32A), situated ventrally to seta II, both situated on distal fifth along lateral margin; seta III longer than seta II and situated almost at the same level, ventrally to seta II and posterior to seta I; seta IV pinnate; seta V longest; seta VI arising from inner distal corner, nearly as long as seta II; seta VII situated dorsally, on the distal third of the inner margin, triarticulated.

Antennule (Figure 33A) six-segmented; first segment with medial and distal inner spinules, without process; second segment with some inner spinules proximally, with acute conical outer process; third segment with some transverse rows of minute spinules along outer margin medially and distally; fourth and fifth segments small, each with spinular outer row; sixth segment elongate, about three times as long as wide, with outer spinular row proximally. Armature formula, I-(1); II-(8); III-(7); IV-(2 + ae); V-(1); VI-(9 + acrothek) (acrothek consisting of two setae and one aesthetasc fused basally).

Antenna (Figure 33B). Allobasis with one small, unipinnate abexopodal seta, and with inner spinules proximally. Exopod one-segmented, with two lateral (proximal one longer, bare and slender) and two distal elements. Free endopodal segment with inner row of spinules, with two outer frills, and with two spines and a slender seta laterally, and apically with two strong spines, two geniculate single setae and one geniculate seta fused to tiny element basally.

Mandible (Figure 33C). Strong gnathobase with bi- and multicuspidate teeth distally and one pinnate seta laterally. Palp one-segment, with five seta (one basal, one exopodal, three endopodal).

Maxillule (Figure 33D). Arthrite with some spinules as depicted, with five strong apical spines and one lateral element. Coxa with two setae. Basis with three apical elements (one of them stronger). Exopod one-segmented, elongate, with two setae. Endopod small, one-segmented, with three setae.

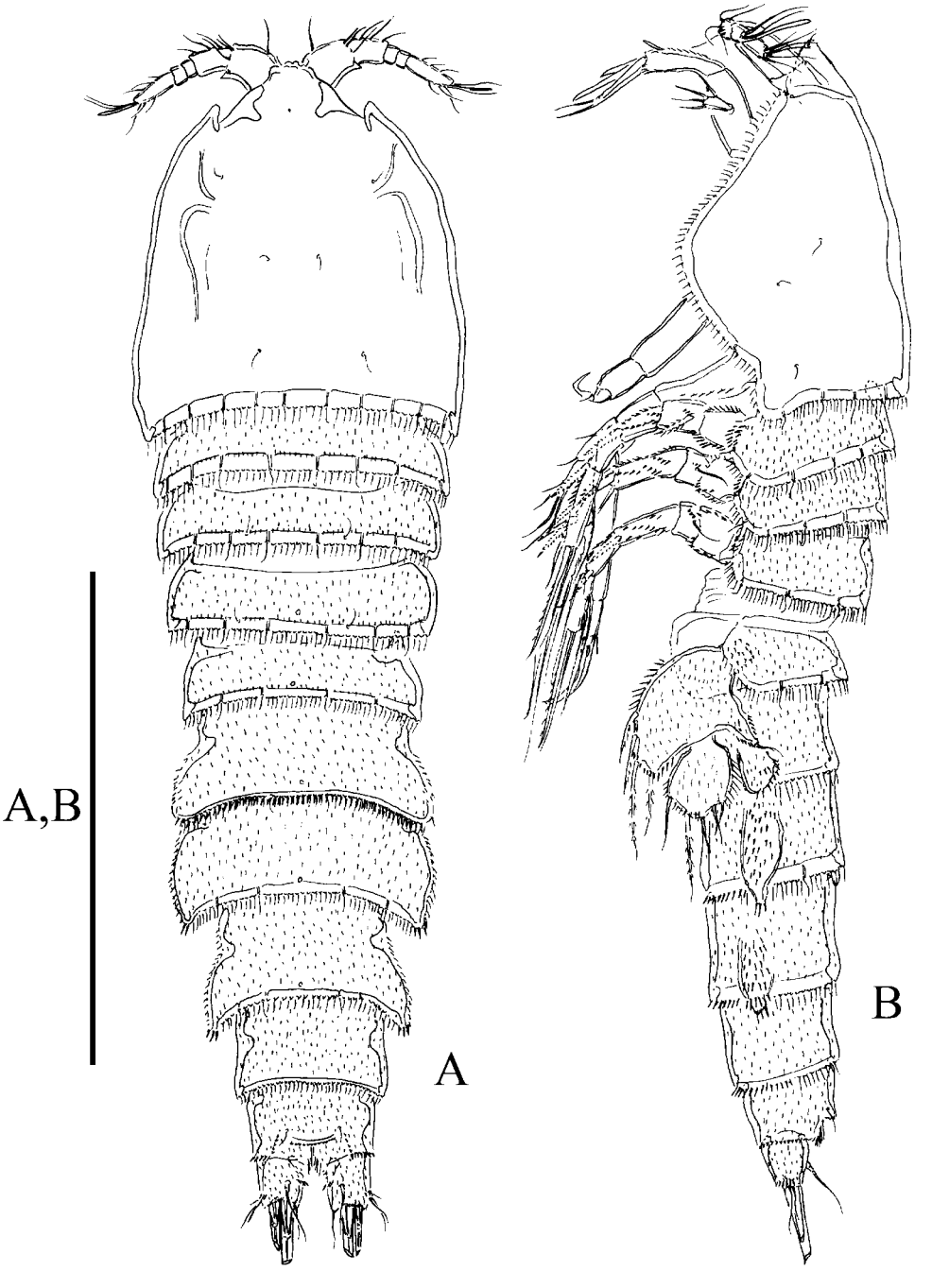

Figure 30. *Paralaophonte pacificavicinum* sp. nov., female. (A) Habitus, dorsal; (B) habitus, lateral. Scale bars: A, B, 200 μm.

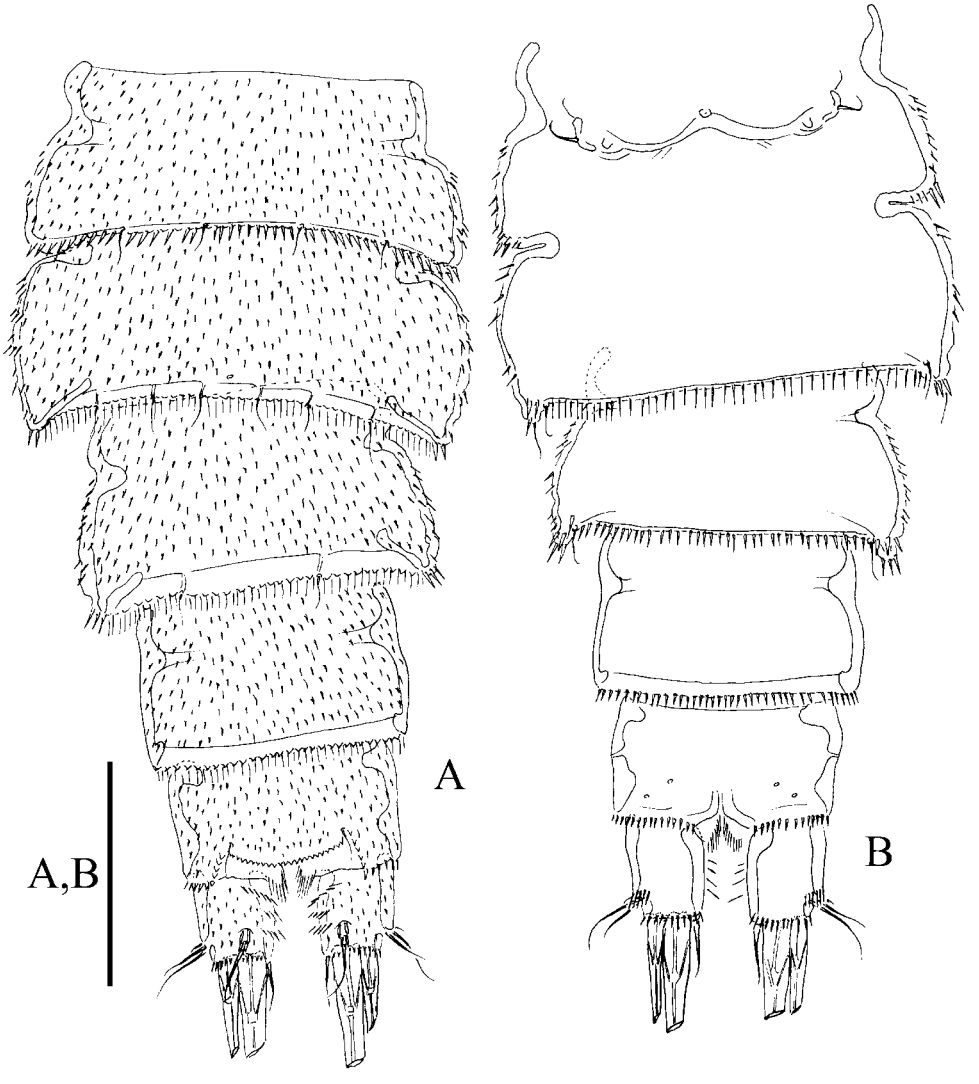

Figure 31. *Paralaophonte pacificavicinum* sp. nov., female. (A) Urosome, dorsal (P5-bearing somite omitted); (B) urosome, ventral (P5-bearing somite omitted). Scale bars: A, B, 50 μm.

Maxilla (Figure 33E). Syncoxa with outer and inner spinules as shown; with three endites; proximal endite with one seta, middle and distal endites with three elements as figured (one of them fused to endite basally). Allobasis drawn into strong claw with three accessory setae. Endopod represented by two setae.

Maxilliped (Figure 33F). Syncoxa with spinular rows as depicted, with two distal setae. Basis with small outer spinules; endopod drawn out into claw with one accompanying seta.

P1 (Figure 34A). Coxa with several spinule rows as figured. Basis with longitudinal row of spinules, with inner and outer spine-like element. Exopod three-segmented, not

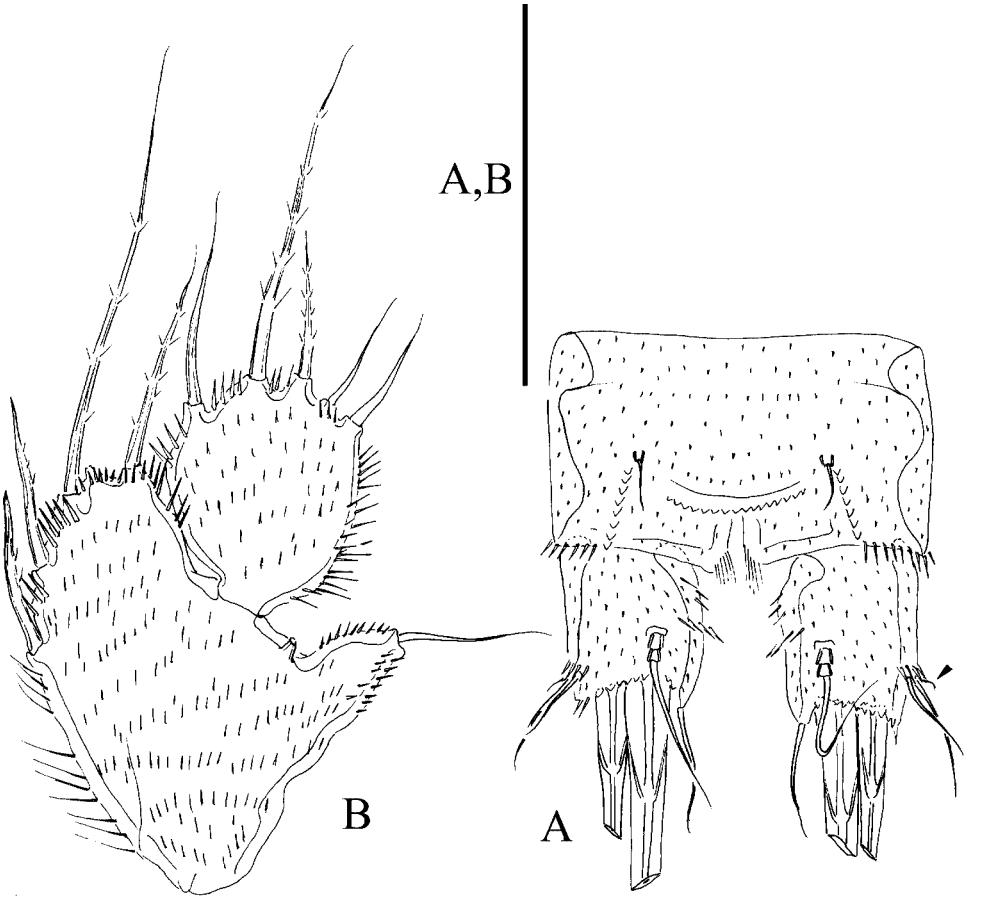

Figure 32. *Paralaophonte pacificavicinum* sp. nov., female. (A) Anal somite and caudal rami (seta I arrowed), dorsal; (B) P5. Scale bars: A, B, 50 μm.

reaching to middle of ENP1. Endopod two-segmented, elongate; ENP1 long, about 6.6 times as long as wide, with inner setules; ENP2 about twice as long as wide, with outer and apical spinules, with one small apical seta and one strong claw, the latter about 2.1 times as long as supporting segment.

P2 (Figure 34B). Praecoxa with transverse row of outer spinules. Coxa with spinular rows as figured. Basis with spinules at base of outer spine-like element. Exopod three-segmented; EXP1 without, EXP2 with inner seta; EXP3 with three outer spines, two apical and one inner element. Endopod two-segmented, reaching insertion site of inner seta of EXP2; ENP1 without armature; ENP2 with two inner (proximalmost smaller) and two apical setae.

P3 (Figure 35A). Praecoxa as in P2. Coxa and basis as in P2, except for slender and bare basal seta. Exopod three-segmented; EXP1 without, EXP2 with inner seta; EXP3 with three outer spines, two apical and two inner elements. Endopod two-segmented, reaching insertion site of inner seta of EXP2; ENP1 without armature; ENP2 with three inner setae, two apical and one outer element.

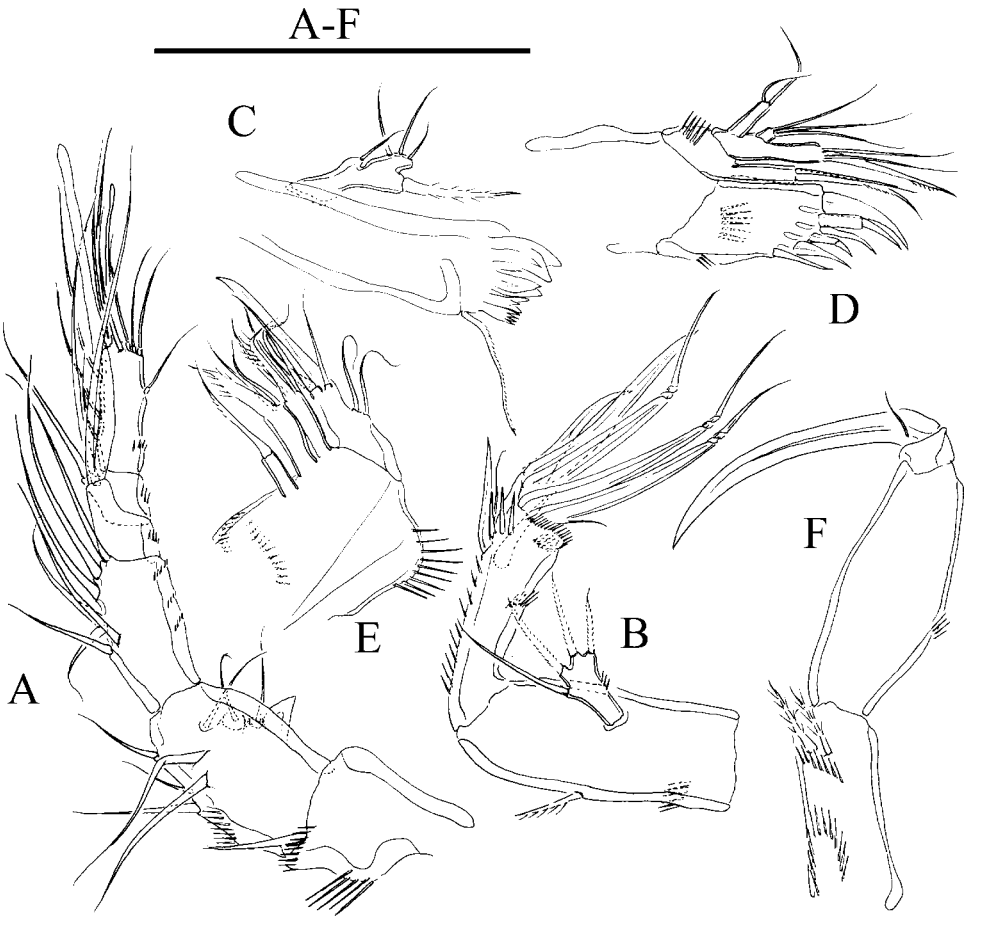

Figure 33. *Paralaophonte pacificavicinum* sp. nov., female. (A) Antennule; (B) antenna; (C) mandible; (D) maxillule; (E) maxilla; (F) maxilliped. Scale bars: A–F, 50 μm.

P4 (Figure 35B). Praecoxa, coxa, basis and exopod as in P3 (though P4 EXP3 somewhat different in general shape). Endopod two-segmented, reaching slightly beyond EXP1; ENP1 without armature; ENP2 with one inner seta, two apical and one outer element.

P5 (Figure 32B) large, with separate rami. Baseoendopodal lobe well developed, not reaching to middle of EXP, with spinules as shown; with four setae; outer basal seta arising from short setophore. Exopod covered with spinules, with five setae; two outermost bare elements of equal length.

P6 (Figure 31B) represented by one seta.

Armature formula of P1–P5 as in Table 3.

Male. Habitus (not shown) as in female except for separate second and third urosomites ventrally, and for longer spinules on third, fourth and fifth urosomites ventrally along posterior margin (Figure 36A). Urosome more slender than in female. Total

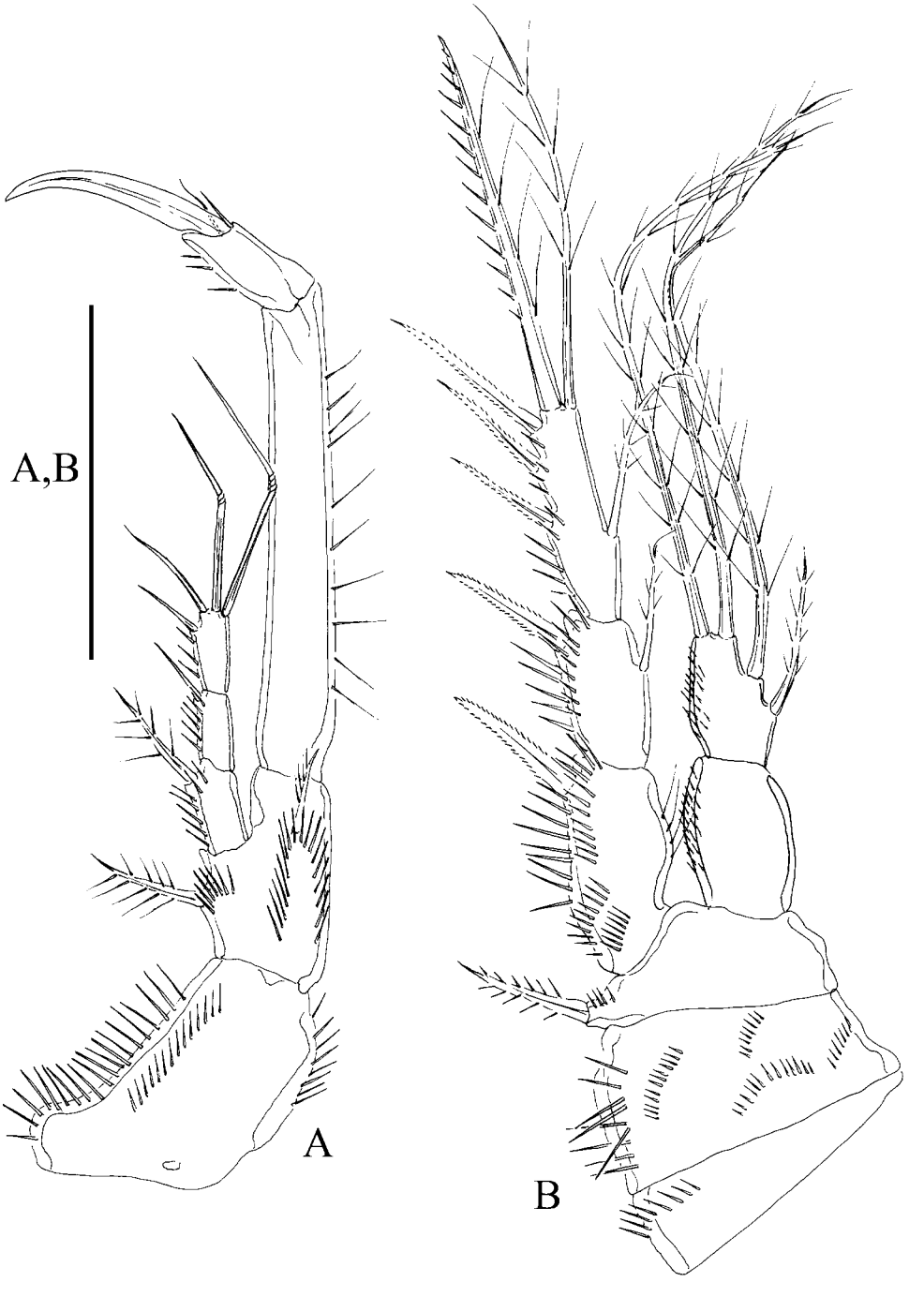

Figure 34. *Paralaophonte pacificavicinum* sp. nov., female. (A) P1; (B) P2. Scale bars: A, B, 50 μm.

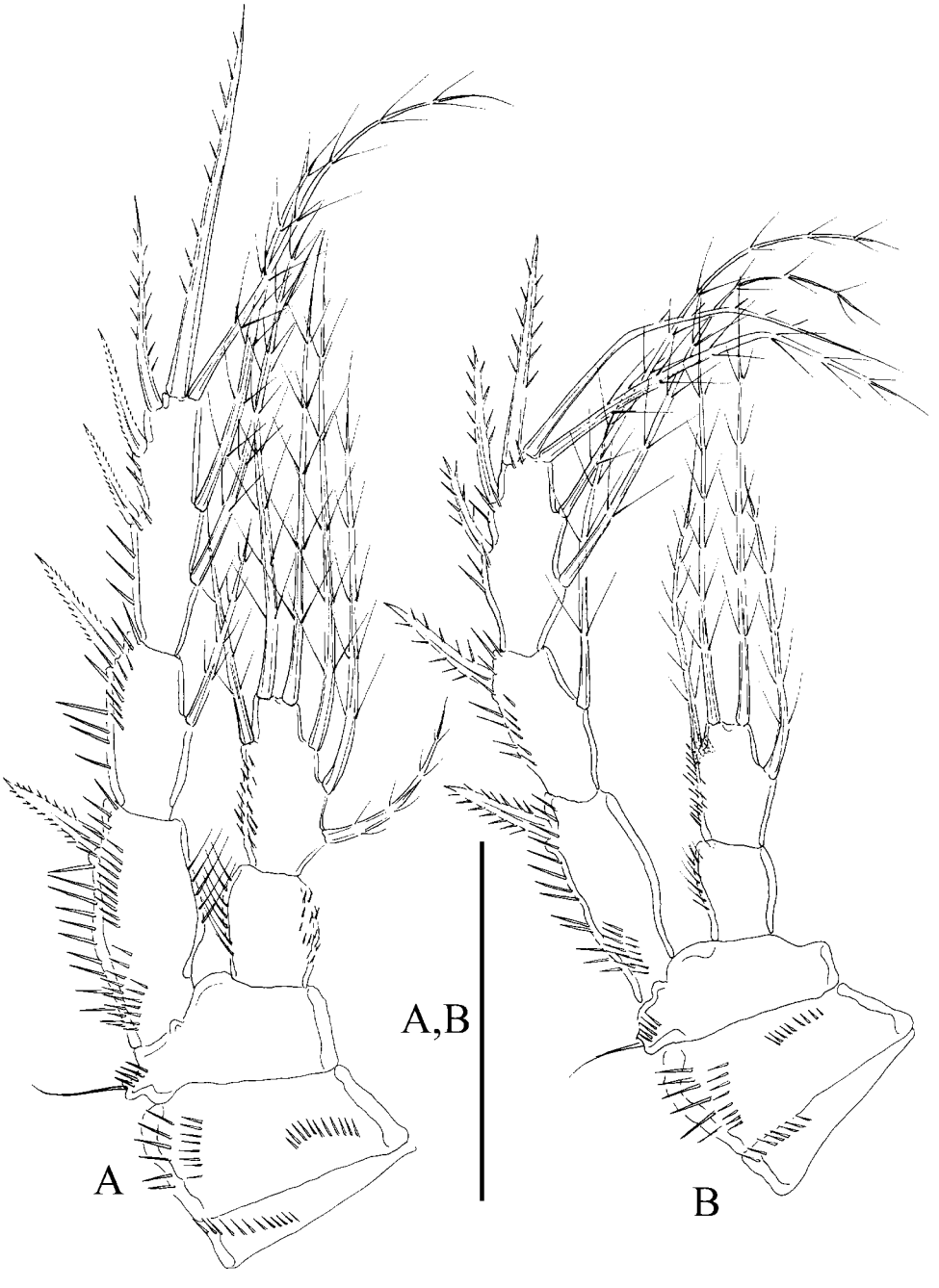

Figure 35. *Paralaophonte pacificavicinum* sp. nov., female. (A) P3; (B) P4. Scale bars: A, B, 50 μm.

Table 3. Armature formula of swimming legs of *Paralaophonte pacificavicinum* sp. nov.

	EXP	ENP
P1	I-0;I-0;II,2,0	0-0;0,I1,0
P2	I-0;I-1;III,I1,1	0-0;0,2,2
Female P3	I-0;I-1;III,I1,2	0-0;1,2,3
Male P3	I-0;I-I;II,II,1II	0-0;apophysis-0;0,2,2
P4	I-0;I-1;III,I1,2	0-0;1,2,1
Female P5	5	4 + 1 (basal)
Male P5	5	1 + 1 (basal)

body length ranging from 350 to 420 μm measured from tip of rostrum to posterior margin of caudal rami (mean = 378 μm; $n = 4$).

Antennule (Figure 37A) eight-segmented, subchirocer; second segment with conical outer process; sixth segment with two acute projections. Armature formula difficult to define: I-(1); II-(9);III-(6);IV-(0);V-(11 + ae);VI-(0);VII-(1);VIII-(8 + acrothek). Acrothek consisting of two setae and one aesthetasc fused basally.

Antenna, mandible, maxillule, maxilla, maxilliped and P1 (not shown) as in female.

P2 EXP (Figure 36B) as in female. P2 ENP (Figure 36B) dimorphic, two-segmented, distalmost inner seta modified as depicted.

P3 (Figure 36C) dimorphic. Exopod three-segmented; segments more strongly developed than in female; EXP1 without, EXP2 with one, EXP3 with two inner elements; setae and spines very strong and without ornamentation except for outer spine on EXP1; relative length of spines on EXP3 as depicted. Endopod three-segmented; ENP1 without armature; ENP2 with outer apophysis reaching beyond ENP3, the latter with two inner and two apical setae.

P4 (not shown) as in female, except for comparatively longer outer spines, longer outer apical element of EXP3 and shorter inner seta of EXP2.

Left and right P5 fused (Figure 37B); baseoendopodal lobe with one seta plus outer seta of basis; exopod with five setae as figured.

P6 (Figure 37C) represented by two plates bearing one outer slender seta and one inner strong spine-like element.

Remarks

The descriptions of *P. pacificaemulator* sp. nov. and *P. pacificavicinum* sp. nov. match *P. pacifica.* In fact, the former two species seem to be closely related to the latter, agree well in almost all characters with Lang's (1965) description of *P. pacifica*, and are hence hypothesized to co-occur sympatrically in north-western Mexico. *Paralaophonte pacificaemulator* sp. nov and *P. pacifica* can be distinguished from each other by the shape of the female P5 EXP (comparatively more elongate in *P. pacifica*; broader in *P. pacificaemulator* sp. nov.), relative length of two inner elements of the female P5 BENP (reaching well beyond baseoendopodal lobe in *P. pacifica*, noticeably shorter in *P. pacificaemulator* sp nov.), and relative length of the female P3 ENP (not reaching the insertion level of the inner seta of P3 EXP2 in *P. pacifica*, reaching slightly beyond

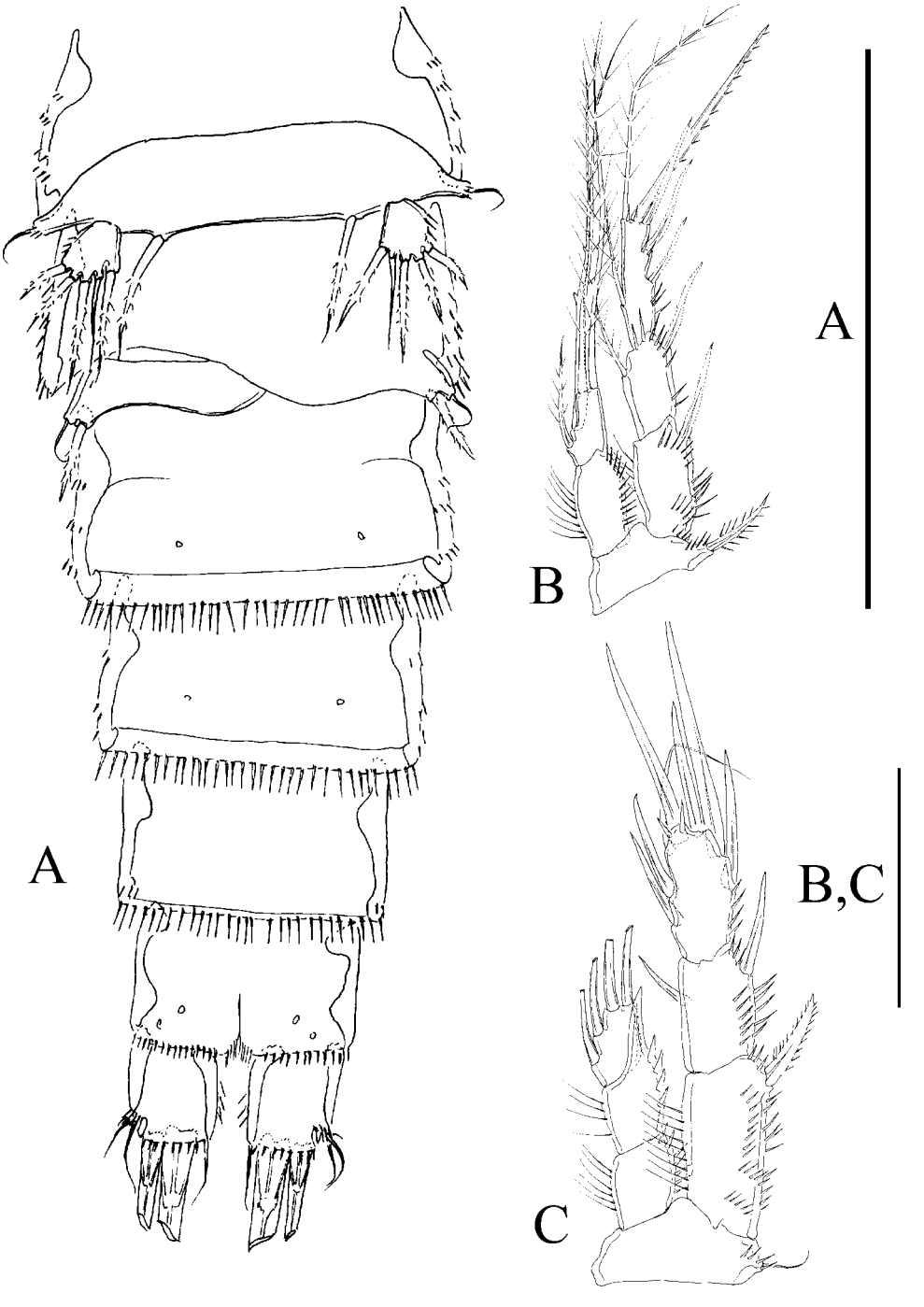

Figure 36. *Paralaophonte pacificavicinum* sp. nov., male. (A) Urosome, ventral; (B) P2; (C) P3. Scale bars: A, 100 μm; B, C, 50 μm.

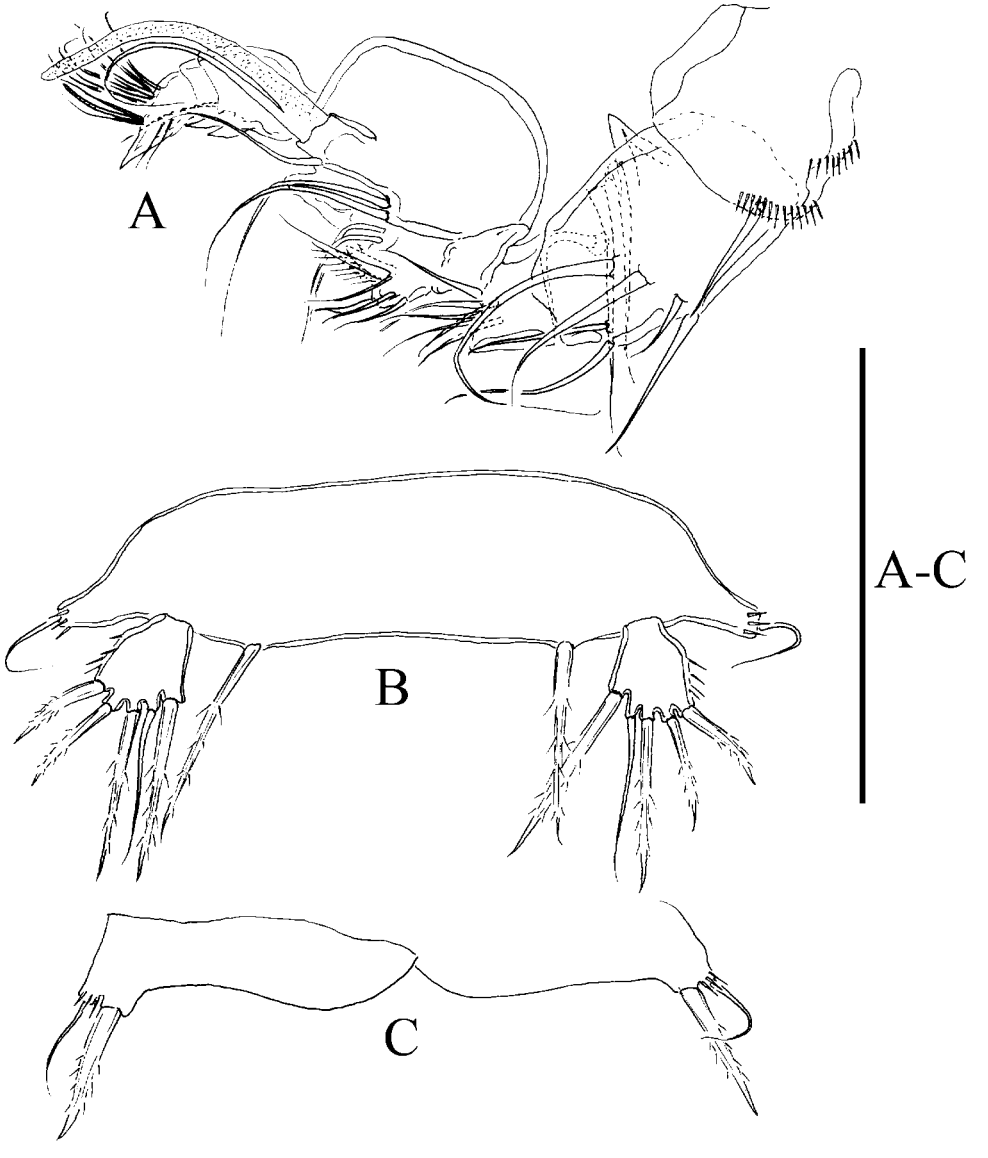

Figure 37. *Paralaophonte pacificavicinum* sp. nov., male. (A) Antennule; (B) P5; (C) P6. Scale bars: A–C, 50 μm.

the insertion site of the same seta in *P. pacificaemulator* sp. nov) and female P4 ENP (reaching the insertion site of the inner seta of P4 EXP2 in *P. pacifica*, barely reaching the tip of P4 EXP1 in *P. pacificaemulator* sp. nov.), relative length of the spines on the male P3 EXP3 (distalmost outer spine stronger than apical spine in *P. pacifica*, both spines equal in *P. pacificaemulator* sp. nov.), relative length of the baseoendopodal seta of male P5 (shorter than exopod in *P. pacifica*, noticeably longer in *P. pacificaemulator* sp. nov.), and relative length of the outer seta of male P6 (longer than inner element

in *P. pacifica*, noticeably shorter in *P. pacificaemulator* sp. nov.). Contrary to *P. pacificaemulator* sp. nov., the female P5 of *P. pacificavicinum* sp. nov and *P. pacifica* as shown in Lang's (1965) description are identical, with only very small differences in relative length of the baseoendopodal and exopodal setae. Also, some differences were observed regarding the relative length of the setae of the mandibular palp, being comparatively shorter in *P. pacificavicinum* sp. nov. *Paralaophonte pacificavicinum* sp. nov. can be distinguished from *P. pacifica* by the relative length of the female P3 ENP (not reaching the insertion level of the inner seta of P3 EXP2 in *P. pacifica*, reaching slightly beyond the insertion site of the same seta in *P. pacificavicinum* sp. nov), relative length of the spines on the male P3 EXP3 (distalmost outer spine as long as the outer apical spine in *P. pacifica*, noticeably shorter in *P. pacificavicinum* sp. nov.), relative length of the baseoendopodal seta of male P5 (shorter than exopod in *P. pacifica*, noticeably longer in *P. pacificavicinum* sp. nov.), and relative length of the outer seta of male P6 (longer than inner element in *P. pacifica*, but slightly shorter in *P. pacificavicinum* sp. nov.).

Paralaophonte pacificaemulator sp. nov. and *P. pacificavicinum* sp. nov. can be distinguished from each other by the shape of the female P5 EXP (comparatively broader in *P. pacificaemulator* sp. nov.), and the relative length of its two outermost setae of the female P5 EXP (equal in *P. pacificavicinum* sp. nov., outermost element noticeably shorter in *P. pacificaemulator* sp. nov.), relative length of the spines of the male P3 EXP3 (distalmost outer spine as long as outer apical spine in *P. pacificaemulator* sp. nov., noticeably shorter in *P. pacificavicinum* sp. nov.), and relative length of the baseoendopodal seta of the male P5 (longer than inner most element of P5 EXP in *P. pacificaemulator* sp. nov., nearly as long as inner most element of P5 EXP in *P. pacificavicinum* sp. nov.). Also, the two acute projections on the sixth segment of the male antennule are comparatively longer in *P. pacificaemulator* sp. nov. than in *P. pacificavicinum* sp. nov.

Acknowledgements

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