



**Redescription of *Penicillicaris pectinimana* (Car, 1884) (Copepoda, Harpacticoida,
Parastenheliidae)**

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Abstract

The main aim of this study is to conduct a taxonomic revision of *Penicillicaris pectinimana* living in the mediolittoral zone of Türkiye. Therefore, numerous specimens of both sexes collected from Mediterranean (25 localities), Aegean (9 localities) and the Black Sea (10 localities) coasts were morphologically reexamined in detail for the first time with the aid of light and scanning electron microscopes. Hundreds of individuals belonging to *Penicillicaris pectinimana* populations collected from different localities were comparatively analysed in terms of inter/intra population variability. In the light of the data obtained in this study, it was revealed that *Penicillicaris pectinimana* has very wide distribution on the coasts of Turkey and it is found in all localities examined. All possible morphological details of both sexes of *Penicillicaris pectinimana* were redescribed for the first time in detail since it was described in 1884.

Keywords: *Parastenhelia*; Taxonomy; Meiofauna; Revision.



***Penicillicaris pectinimana* (Car, 1884) (Copepoda, Harpacticoida, Parastenheliidae)
Redeskrpsiyonu**

Öz

Bu çalışmanın temel amacı Türkiye'nin mediolittoral bölgesinde yaşayan *Penicillicaris pectinimana* türünün taksonomik revizyonunu yapmaktır. Bu yüzden Akdeniz (25 lokalite), Ege (9 lokalite) ve Karadeniz (10 lokalite) sahillerinden toplanmış çok sayıda her iki eşeye ait örnek ışık ve taramalı elektron mikroskopları yardımıyla morfolojik olarak yeniden ilk defa detaylı olarak incelendi. Farklı lokalitelerden toplanmış *Penicillicaris pectinimana* populasyonları populasyon içi ve populasyonlar arası varyasyon açısından karşılaştırmalı olarak analiz edildi. Elde edilen veriler ışığında, *Penicillicaris pectinimana* türünün Türkiye sahillerinde geniş bir yayılışa sahip olduğu ortaya konuldu. *P. pectinimana* türünün tanımlandığı 1884 yılından bu yana ilk kez her iki eşeyinin olası tüm morfolojik ayrıntıları yeniden tanımlandı.

Anahtar Kelimeler: *Parastenhelia*; Taksonomi; Mayofauna; Revizyon.

1. Introduction

The members of family Parastenheliidae are essentially marine, benthic, and mostly inhabit the intertidal zone and also prefer phytal habitats [1]. Taxonomic history of the family had long been very complicated. When Thompson and A. Scott [2] built the genus *Parastenhelia*, they placed it within family Harpacticidae. Later, many authors placed the genus in many other families, respectively, Canthocamptidae [3, 4], Diosaccidae [5], Thalestridae [6]. Then Lang [1] established Parastenheliidae family and assigned *Parastenhelia* as the type genus. Willen [7] transferred the genus *Karllangia* Noodt, 1964 from Ameiridae to Parastenheliidae. Then Gee [8] stated that *Parastenhelia anglica* Norman & T. Scott, 1905 and *Karllangia tertia* Kunz, 1975 are morphologically closely related and he established the genus *Foweya* for these two species. Huys and Mu [9] revalidated *Thalestrella* Monard, 1935 and retrieved it from the synonym list of *Parastenhelia* and they accepted *Karllangia* synonym of *Thalestrella*. Very recently, a pioneering familial review conducted by Huys and Mu [2] who critically evaluated all previous literature, and they determined 10 valid genera and about 30 valid species. In this study, taxonomic identification of extensive materials collected from the mediolittoral zone of Turkish coasts which were previously labelled as *P. spinosa* sensu lato were re-examined and revised according to recent literature [1]. According to Huys and Mu [9], all materials examined in this study actually belonged to *Penicillicaris pectinimana* which has not been recorded since its original description [10]. Here, a redescription of *P. pectinimana* is

made in order to provide a basis for the future comparisons of the species from the other localities.

2. Materials and Methods

Examined specimens were obtained from the harpacticoid collection of zoology department of Mersin University. All materials were collected from phytal habitats along the mediolittoral zone of Turkish coasts (Fig. 1). Dissection and preparation of the specimens were made as described in Kuru and Karaytuğ [11]. Huys et al. [12] were followed for descriptive terminology, abbreviations used in text and figures. Scale bars in all illustrations were in μm . Kaymak and Karaytuğ [13] were followed for examined specimens with Scanning Electron Microscopy (SEM).



Figure 1: Distribution of *Penicillicaris pectinimana* (Car, 1884) based on the examined materials along the Turkish coasts

3. Results and Discussion

3.1. Redescription of *Penicillicaris pectinimana* (Car, 1884)

Systematics: Order Harpacticoida Sars, 1903

Family Parastenheliidae Lang, 1936

Genus *Penicillicaris* Huys and Mu, 2021

Penicillicaris pectinimana (Car, 1884); (Figs. 2-15)

Material Examined: St1, 53♀♀, 15♂♂, 24/11/2007 (N 36° 08.315'; E 35° 54.598'); St2, 32♀♀, 19♂♂, 24/11/2007 (N 36° 14.008'; E 35° 50.220'); St3, 9♀♀, 2♂♂, 07/04/2007 (N 36° 32.089'; E 36° 02.485'); St4, 53♀♀, 8♂♂, 25/11/2007 (N 36° 53.409'; E 35° 56.775'); St5, 25♀♀, 5♂♂, 25/11/2007 (N 36° 51.329'; E 35° 54.389'); St6, 3♂♂, 24/11/2007 (N 36° 15.344'; E 35° 49.028'); St7, 7♀♀, 3♂♂, 24/11/2007 (N 36° 17.204'; E 35° 47.325'); St8, 53♀♀, 11♂♂, 25/11/2007 (N 36° 46.133'; E 35° 46.553'); St9, 3♀♀, 25/11/2007 (N 36° 33.937'; E 35° 19.600'); St10, 2♀♀, 3♂♂, 26/11/2007 (N 36° 30.009'; E 34° 11.322'); St11, 13♀♀, 26/11/2007 (N 36° 27.473'; E 34° 08.647'); St13, 1♂, 10/04/2007 (N 36° 27.570'; E 34° 07.984'); St14, 43♀♀, 11♂♂, 23/09/2011 (N 36°25'9"; E 34°5'30"); St15, 3♀♀, 6♂♂, 27/11/2007 (N 36° 17.829'; E 33° 50.863'); St16, 1♀, 27/11/2007 (N 36° 17.094'; E 33° 49.928'); St17, 1♀, 27/11/2007 (N 36° 16.264'; E 33° 48.842'); St18, 13♀♀, 6♂♂, 27/11/2007 (N 36° 11.453'; E 33° 39.363'); St19, 14♀♀, 4♂♂, 28/11/2007 (N 36° 09.315'; E 33° 26.548'); St20, 18♀♀, 7♂♂, 29/11/2007 (N 36° 05.167'; E 32° 54.354'); St21, 19♀♀, 5♂♂, 14/07/2007 (N 36° 01.959'; E 32° 48.749'); St22, 6♀♀, 2♂♂, 29/11/2007 (N 36° 32.066'; E 32° 02.028'); St23, 6♀♀, 1♂, 01/12/2007 (N 36° 16.467'; E 30° 24.543'); St24, 39♀♀, 10♂♂, 01/12/2007 (N 36° 16,743'; E 30° 08.392'); St25, 6♀♀, 4♂♂, 01/12/2007 (N 36° 12.395'; E 29° 36.087'); St26, 1♀, 10/08/2002 (N 41° 37.569'; E 28° 06.207'); St27, 1♀, 07/07/2001 (N 41° 06.875'; E 30° 41.060'); St28, 7♀♀, 4♂♂, 14/09/2002 (N 41° 50.847'; E 32° 45.177'); St29, 4♀♀, 1♂, 13/09/2002 (N 41° 57.133'; E 34° 23.516'); St30, 1♀, 1♂, 11/09/2002 (N 41° 06.806'; E 37° 43.037'); St31, 2♀♀, 2♂♂, 10/09/2002 (N 41° 00.249'; E 38° 48.473'); St32, 1♀, 10/09/2002 (N 41° 05.677'; E 39° 23.718'); St33, 1♀, 1♂, 10/09/2002 (N 41° 03.152'; E 39° 32.227'); St34, 2♀♀, 1♂, 09/09/2002 (N 41° 01.039'; E 40° 22.165'); St35, 6♀♀, 1♂, 08/09/2002 (N 41° 26.431'; E 41° 27.282'); St36, 2♀♀, 4♂♂, 17/05/2012 (N 36° 33.312'; E 29° 03.378'); St37, 1♀, 16/04/2007 (N 36°43.592"; E 28°07.810"); St38, 4♀♀, 4♂♂, 15/04/2007 (N 36°41.131"; E 27°22.429"); St39, 20♀♀, 11♂♂, 24/05/2012 (N 38°40.153"; E 26°26.008"); St40, 1♀, 1♂, 24/05/2012 (N 38°37.168"; E 26°21.280"); St41, 1♀, 1♂, 24/05/2012 (N 38°20.500"; E 26°27.018"); St42, 9♀♀, 5♂♂, 24/05/2012 (N 38°17.065"; E 26°15.053"); St43, 5♀♀, 3♂♂, 12/07/2001 (N 39°31.603"; E 26°69.143"); St44, 1♀, 23/06/2002 (N 39°37.014"; E 26°62.193").

Redescription of female. The description based on a female from St. 19. Body semicylindrical in dorsal view, broadest at posterior margin of cephalothorax, tapering posteriorly, without clear distinction between urosome and prosome (Fig. 2). Total body length from tip of rostrum to posterior margin of caudal rami 428 µm. All somites except penultimate somite with pores and sensillae as figured. Rostrum (Fig. 4A) elongated, reaching to half of second antennular segment and defined at base; triangular with pointed tip; bears a pore and a pair of subapical sensilla. Cephalothorax and P2–P4 pedigerous somites with plain hyaline

frills; urosomites with incised frills around posterior margin (Fig. 3A). Somites bearing P2-P4 with dorsal transverse rows of minute spinules. Somite bearing P5, genital double-somite, second abdominal somite and third abdominal somite with row of spinules around dorsal and dorsolateral posterior margin extending ventrally and laterally. Genital double-somite also with dorsal spinule row midway extending laterally (Fig. 2). Ventral and lateral posterior margin of anal somite and both sides of anal operculum with spinules as figured (Fig. 3E). Semi-circular anal operculum (Fig. 2B) without ornamentation. Long, fine, hair-like extensions around anal frill.

Caudal rami (Figs. 2, 8A) about as long as broad, with transverse spinule row as figured; pore present on dorsal and ventral surfaces; with seven setae. Seta I located ventrally near outer margin; naked and minute; seta II located anterolaterally, naked; seta III relatively long, slender and naked, located at outer distal corner; seta IV located terminally near outer corner, long and bipinnate, bases slightly swollen, with a fracture plane, seta V about two times longer than seta IV, markedly swollen at base, with a fracture plane; seta VI originates from inner subdistal corner, naked and long; seta VII arising from dorsal surface, triarticulated at base.

Antennule (Fig. 4A) 8-segmented; all segments without spinule ornamentation; all setae naked; with aesthetasc on segments 4 and 8; apical acrothek consisting of aesthetasc and two setae. Armature formula as follows: 1-[1], 2-[10], 3-[6], 4-[2 + (1 + ae)], 5-[2], 6-[2], 7-[4], 8-[5 + acrothek].

Antenna (Fig. 4B). Allobasis formed by complete fusion of basis and proximal endopodal segment; abexopodal margin with two rows of spinules and with one spinulose seta, inner margin with two spinules near the base of exopod. Endopod bears scarce spinules laterally at outer margin; bears a small seta and two well developed penicillate spines at lateral margin; four geniculate setae which the longest fused at base to a naked seta, one strong unipinnate spine, one large penicillate spine (penicillate spines showed with arrows in Fig. 3F). Exopod 2-segmented; first segment bears two setae; second segment bears five setae: lateral two setae unipinnate, apical margin with a well-developed unipinnate seta and two naked slender setae (Fig. 3C).

Mandible (Fig. 5A). Coxal gnathobase well developed, with few spinules on surface as figured, cutting edge complex with various multicuspidate teeth, bears a well-developed tooth located at ventral corner, bears a unipinnate short seta at dorsal corner. Basis elongated, bears two plumose setae and one naked seta near inner distal corner and with a spinule row on both posterior and anterior surfaces. Endopod 1-segmented and armatured with two setae laterally

and four setae terminally which of two fused at base. Exopod 1-segmented, small and squarish, with one naked setae and two plumose seta.

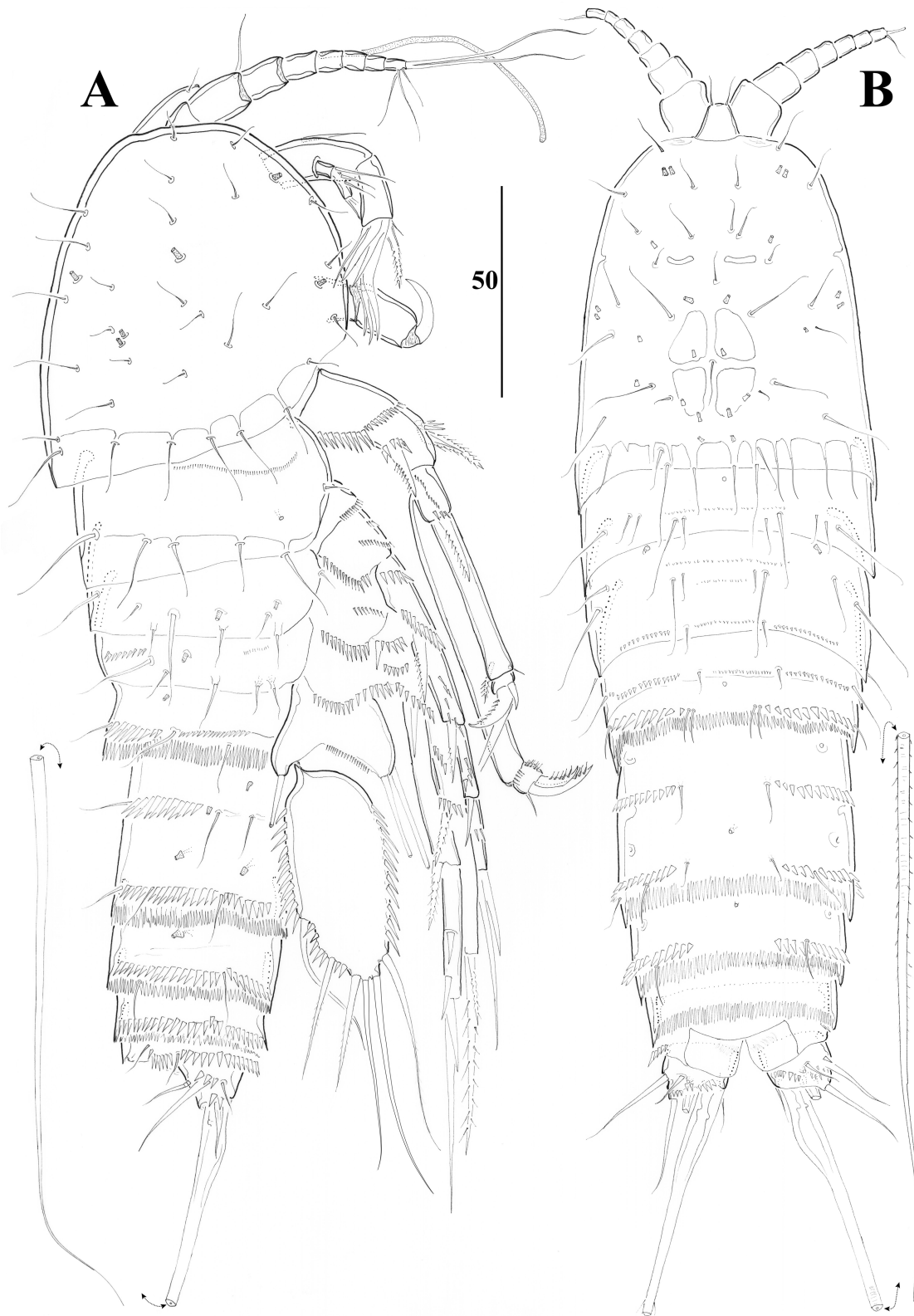


Figure 2: *Penicillaris pectinimana* (Car, 1884), ♀, A, lateral habitus; B, dorsal habitus

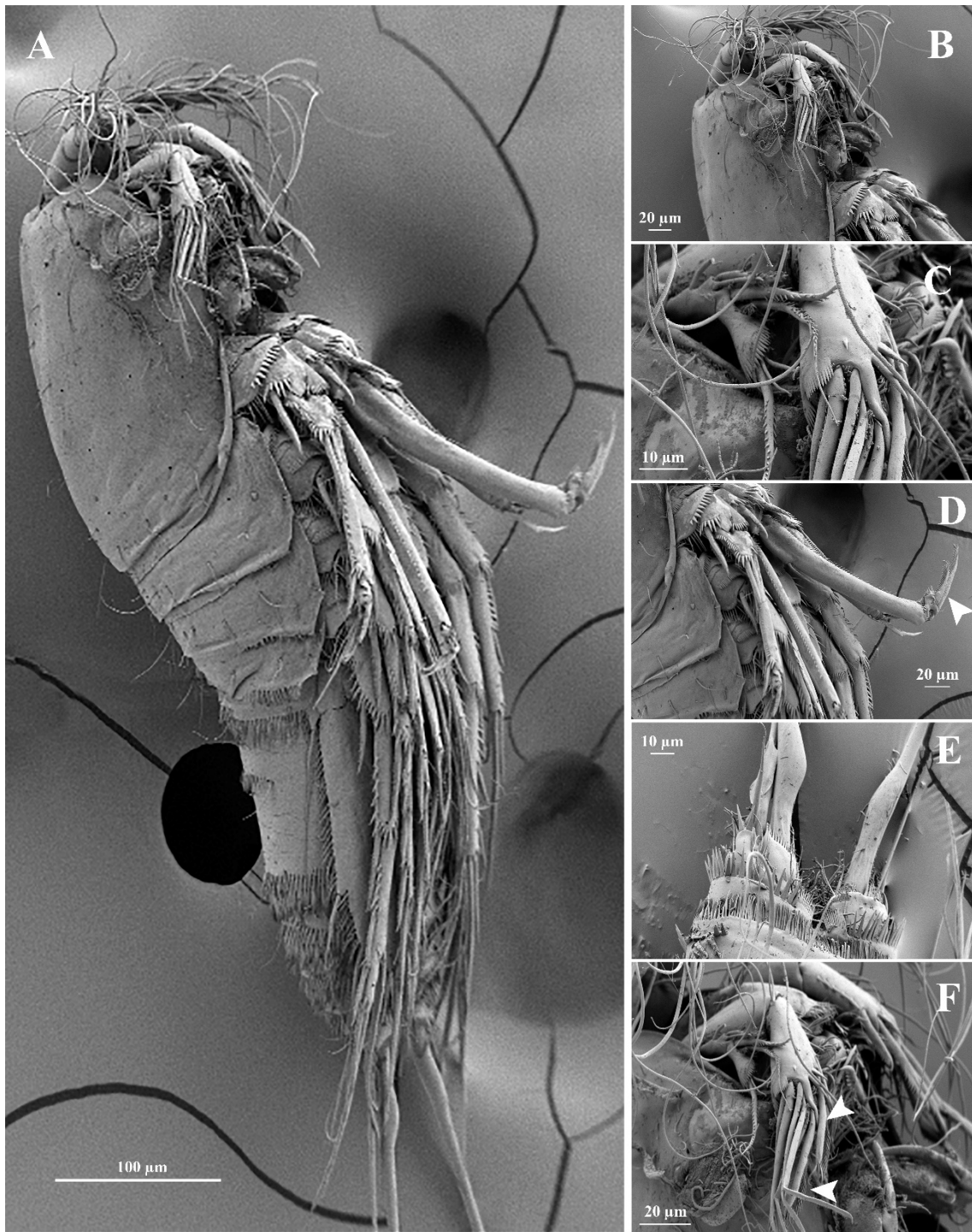


Figure 3: *Penicillicaris pectinimana* (Car, 1884), ♀, A, habitus lateral; B, cephalothorax; C, A2; D, P1; E, caudal rami; F, A2 distal endopod segment (SEM)

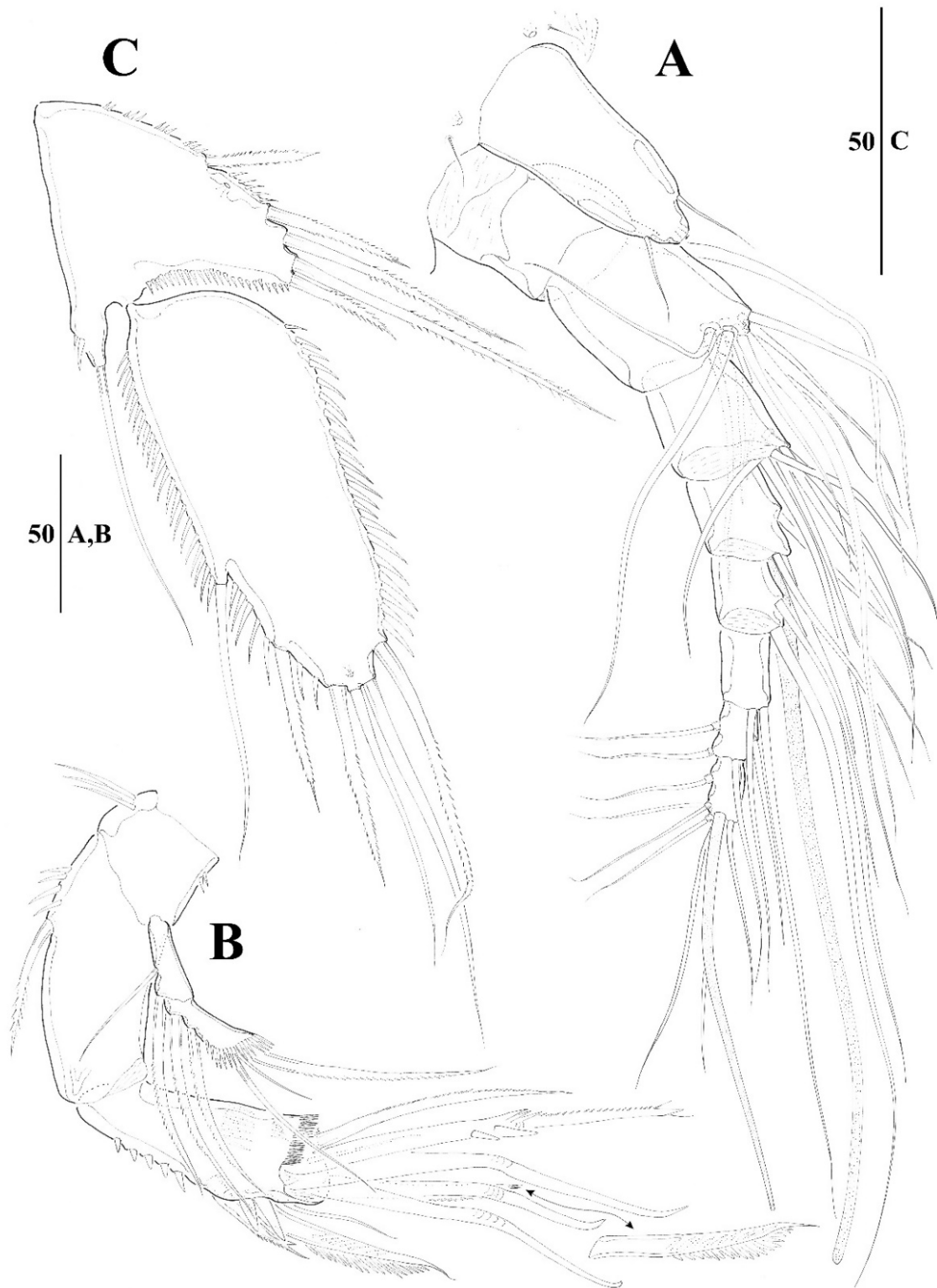


Figure 4: *Penicillicaris pectinimana* (Car, 1884), ♀, A, A1 and rostrum; B, A2; C, P5

Maxillule (Fig. 5B). Arthrite of praecoxa with two long setae on anterior surface and with seven spiniform elements around distal margin and two short elements near inner margin. Coxal endite consists of five setae around distal margin; coxal epipodite represented by a seta. Basis with five setae located around distal margin; rami fused partially to basis, endopod one-segmented, with one naked seta and one plumose seta; 1-segmented exopod with four naked setae.

Maxilla (Fig. 5C). Coxa with several rows of spinules as figured with three endites, proximal endite bilobate with one unipinnate seta and one plumose seta on inner protrusion and two naked setae on outer protrusion; middle endite with two setae, outer endite with three setae; endite of allobasis drawn out into strong, unipinnate spine and with two setae; endopod 1-segmented and well developed with three naked setae.

Maxilliped (Fig. 5D). Syncoxa with three spinule rows and one pinnate seta and one plumose seta on distal margin. Basis with complex row of spinules as figured, with two medial naked setae. Endopod reduced to a strong claw bearing three accessory setae proximally and with teeth along distal inner margin.

P1 (Fig. 6A). Praecoxa small and triangular, with a spinule row along distal margin. Intercoxal sclerite small and unornamented. Coxa with spinule rows along outer margin and medial part of distal margin, and small spinule row on anterior surface as figured (Fig. 3B); a pore located on anterior surface. Basis with two spines, inner spine unipinnate and outer spine bipinnate (spines with flagellated tips); with spinule rows near the base of outer spine, around base of endopod and along inner margin. Exopod with three subequal segments, first segment bears spinule row on outer distal corner and along outer margin and with unipinnate flagellated spine; second segment with spinule row along outer margin and with flagellated spine at outer distal corner; third segment with two penicillate spines, one geniculate seta and one non-geniculate seta and anterolateral edge with a spinule row. Prehensile endopod 2-segmented; proximal segment much longer than exopod, outer lateral margin with spinule row and a short, plumose seta arising from proximal third of the segment; distal segment small, ornamented with few spinules, armed with a minute seta at inner margin and two slightly curved, penicillate spines apically (penicillate spines showed with arrows in Fig. 3D).

P2-P4 (Figs. 6B, 7). Triangular praecoxa, bears a spinule row along distal margin. Coxa with two transverse spinule rows and a pore on anterior surface. Basis rectangular, bears a spinule row near proximal inner corner, fine spinular row located distally between insertions of rami, and scarce spinules near the base of outer seta with a pore on outer distal corner near the

base of outer seta, outer basal seta naked in P3-P4 (outer basal seta bipinnate spine with flagellated tip on P2). Rami 3-segmented, slender; endopods reaching distal segment of exopods. All segments with large spinule rows along outer lateral margin. P2-P3 enp-1 with small unipinnate inner seta (well developed on P4 enp-1); P2-P4 enp-2 with one unipinnate seta. P2 enp-3 with one inner plumose seta, two distal plumose seta and one pinnate seta on outer margin. P3-P4 enp-3 with two inner plumose setae (the inner proximal seta is unipinnate on P3 enp-3), two distal plumose setae and one outer pinnate seta. P2-P3 exp-1 with small and naked inner seta, P4 exp-1 without inner seta. P2 exp-3 inner side with one plumose seta, P3 exp-3 inner side with two plumose setae and one small naked seta, P4 inner side exp-3 one plumose, one unipinnate and one small naked seta; distal margin of P2-P4 exp-3 with one plumose seta and one semispinulose seta; outer margin of P2-P4 exp-3 with three pinnate spines. Armature formulae of swimming legs are as follows:

	Exopod	Endopod
P1	0.1.022	1.111
P2	1.1.123	1.1.121
P3	1.1.323	1.1.221 ♂ 1.1.02+apophysis
P4	0.1.323	1.1.221 ♂ 1.1.021

P5 (Fig. 4C). Rami separate, baseoendopods not fused medially. Endopodal lobe small extending only to the base of exopod, trapezoid; with five bipinnate setae and few spinules around base of outer basal seta; with a pore between proximal two setae; with spinules along the inner margin and distal margin. Exopod about twice longer than maximum width; very narrow basal portion of exopod articulates; with row of spinules along inner and outer margins; bears six setae: two bipinnate setae and one naked seta along outer margin, two naked setae apically, and one long, bipinnate inner seta.

P6 (Fig. 8A) cover genital aperture, bears three setae: two short and naked inner setae and one long plumose outer seta.

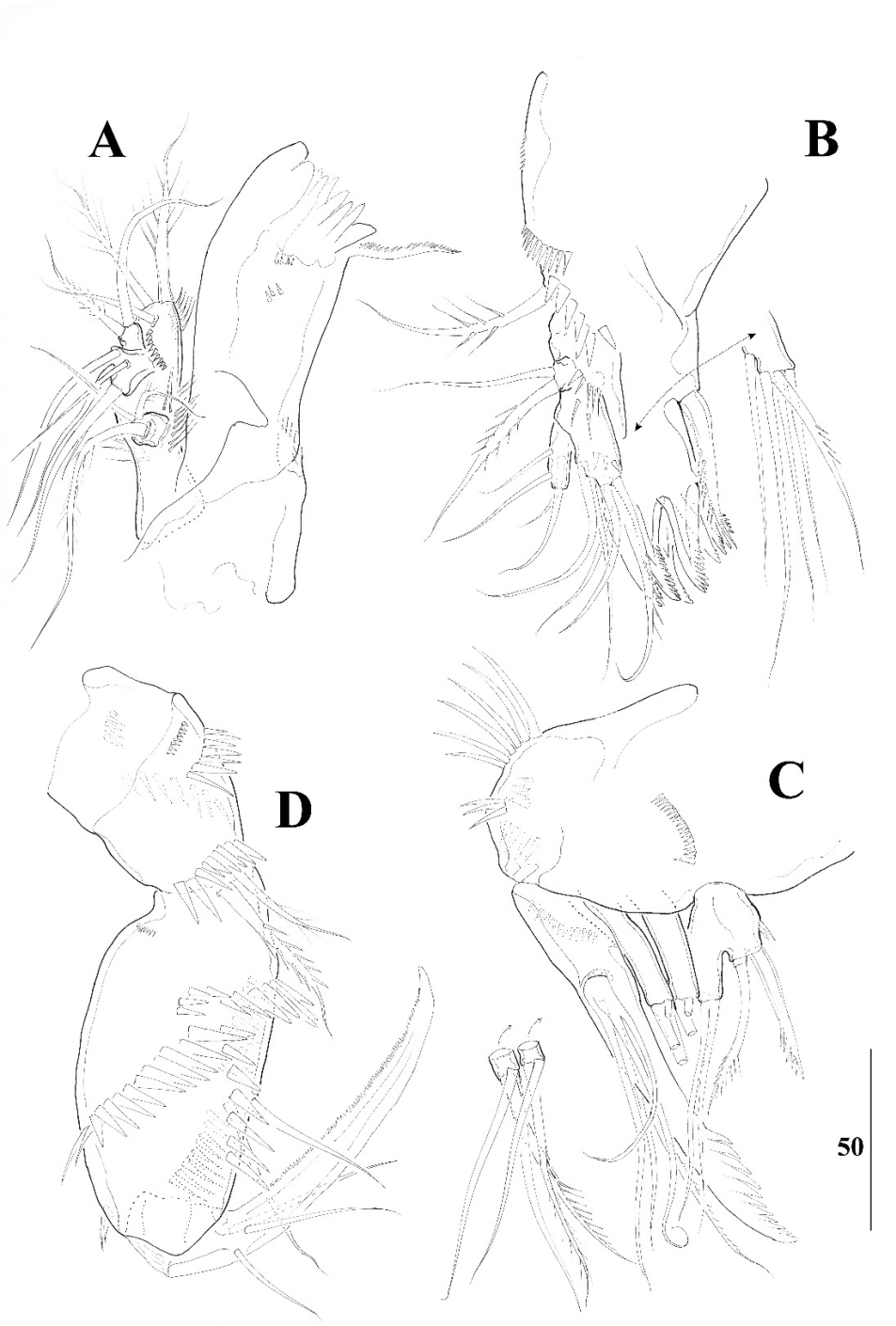


Figure 5: *Penicillicaris pectinimana* (Car, 1884), ♀, A, mandible; B, maxillule; C, maxilla; D, maxilliped

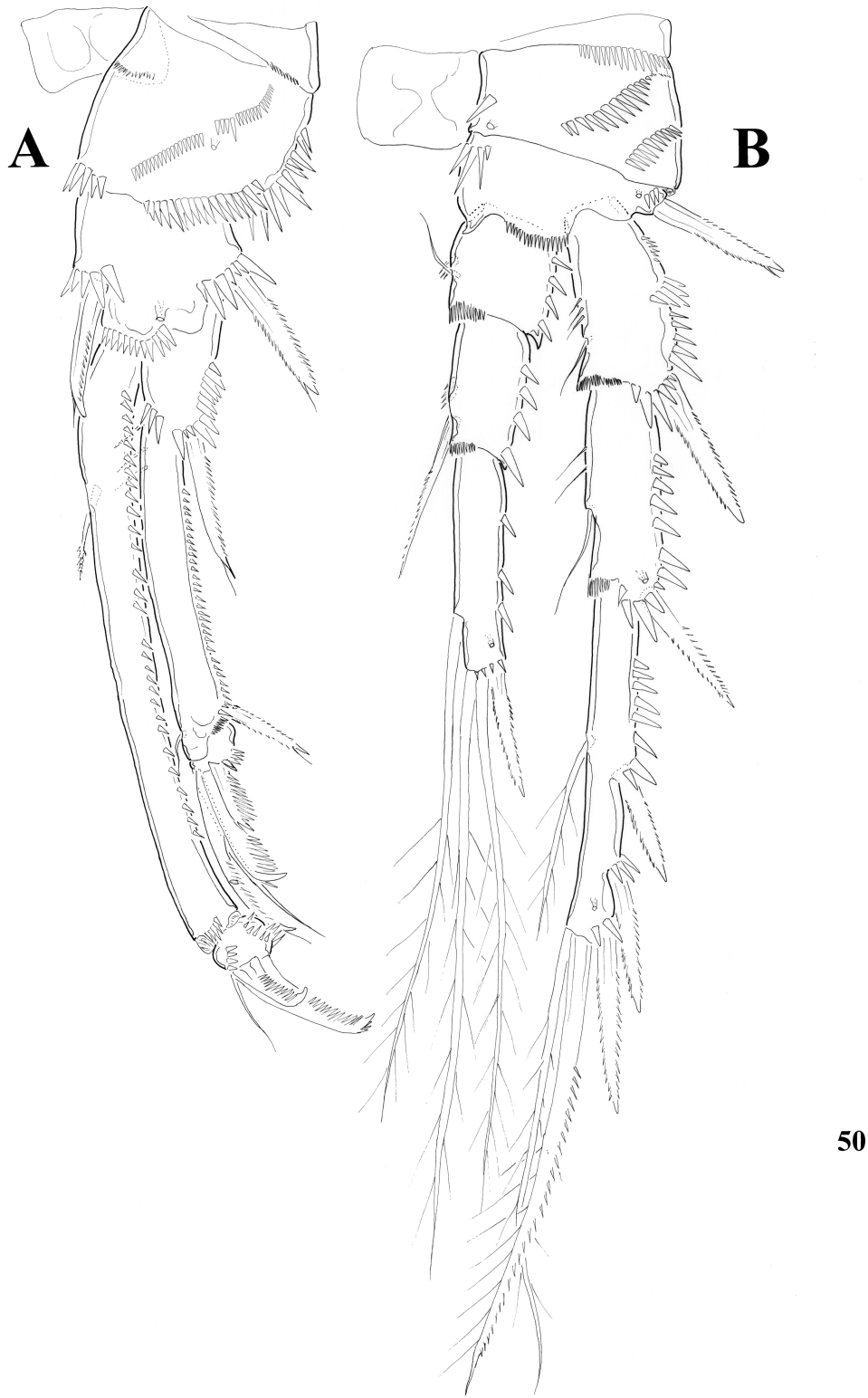


Figure 6: *Penicillaris pectinimana* (Car, 1884), ♀, A, P1; B, P2

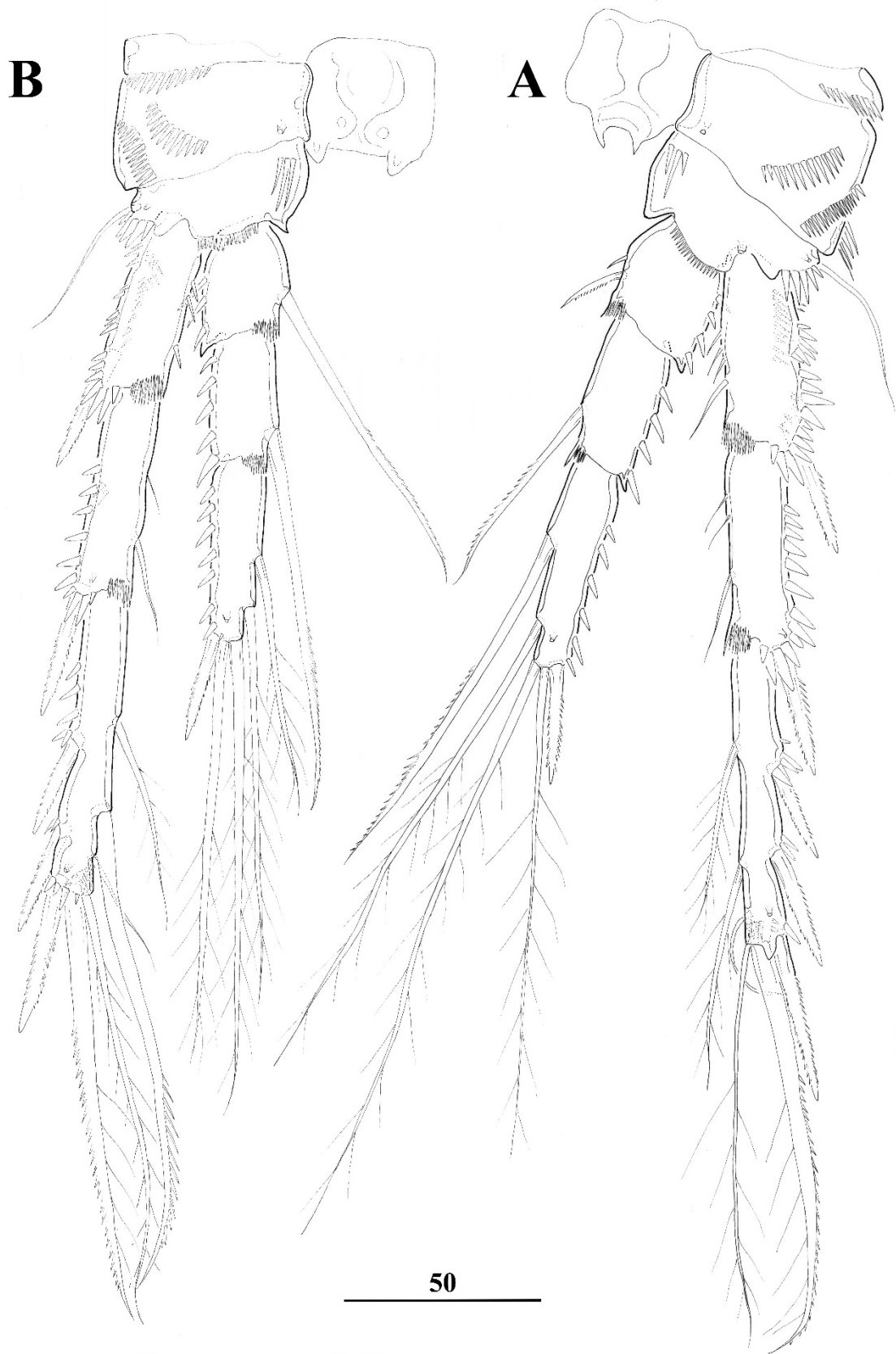


Figure 7: *Penicillicaris pectinimana* (Car, 1884), ♀, A, P3; B, P4

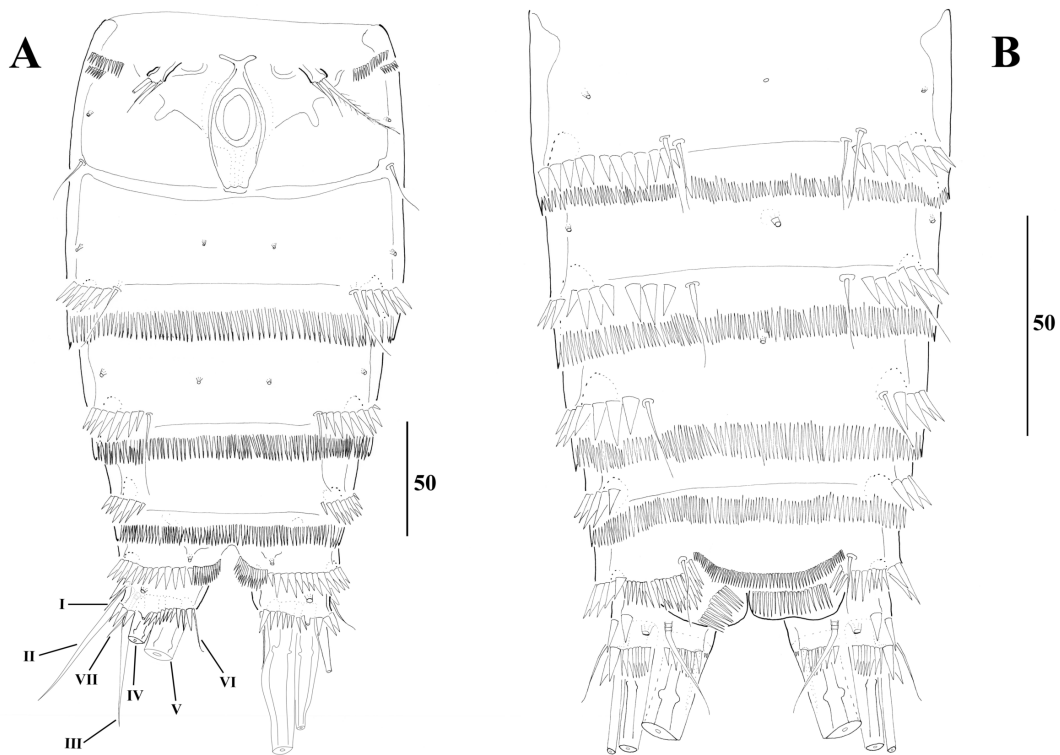


Figure 8: *Penicillicaris pectinimana* (Car, 1884), A, ♀, urosome ventral; B, ♂, urosome dorsal

Description of male. The description based on a male from St. 19. Body slightly smaller than female (Figs. 9, 10), length 362 μm . Sexual dimorphism observed in antennule, urosomal segments, length of some spinule rows P1, P2–P4 endopods, P5, P6 and caudal setae IV–V. Genital and first abdominal somites not fused (Fig. 8B). Ornamentation of urosome somites except for transverse continuous spinule row on ventral surfaces of second and third abdominal somites very similar to female (Fig. 15B). Caudal rami setae IV and V not swollen at base.

Antennule (Fig. 11) indistinctly 10-segmented, haplocer; geniculation positioned between segments 6–7 with four segments distal to it (Fig. 12C); aesthetasc on segments 5 and 10; all setae naked; thorn-like six modified elements on segment 6 (showed with arrow on Fig. 12A–B) and bud-like two elements on segment 7 (showed with arrow on Fig. 12D). Armature formula as follows: 1-[1], 2-[10], 3-[4], 4-[4], 5-[5+ 1 plumose spine + (1 + ae)], 6-[2 + 6 modified spines], 7-[1 + 2 modified spines], 8-[1], 9-[4], 10-[6 + acrothek].

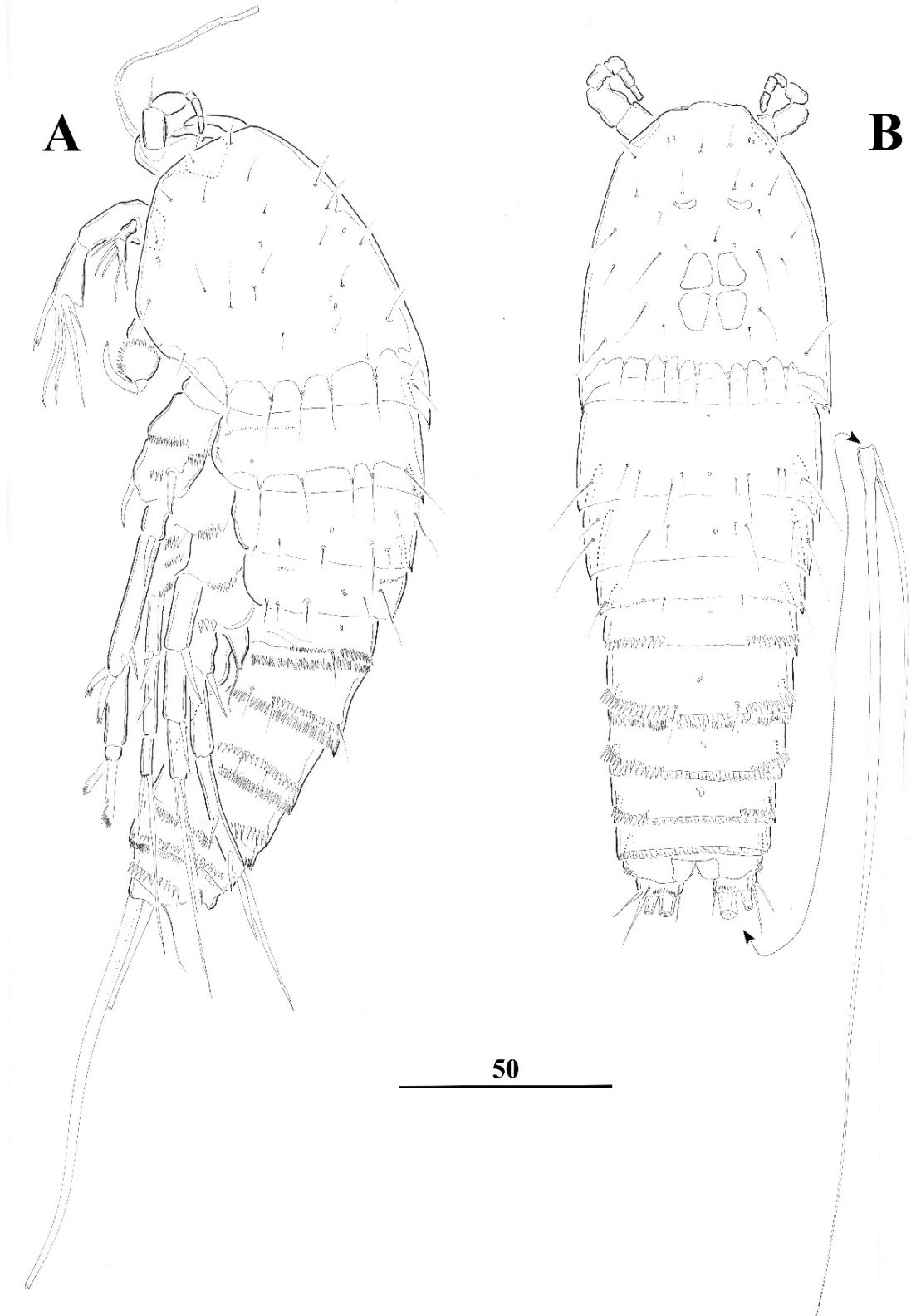


Figure 9: *Penicillicaris pectinimana* (Car, 1884), ♂, A, lateral habitus; B, dorsal habitus

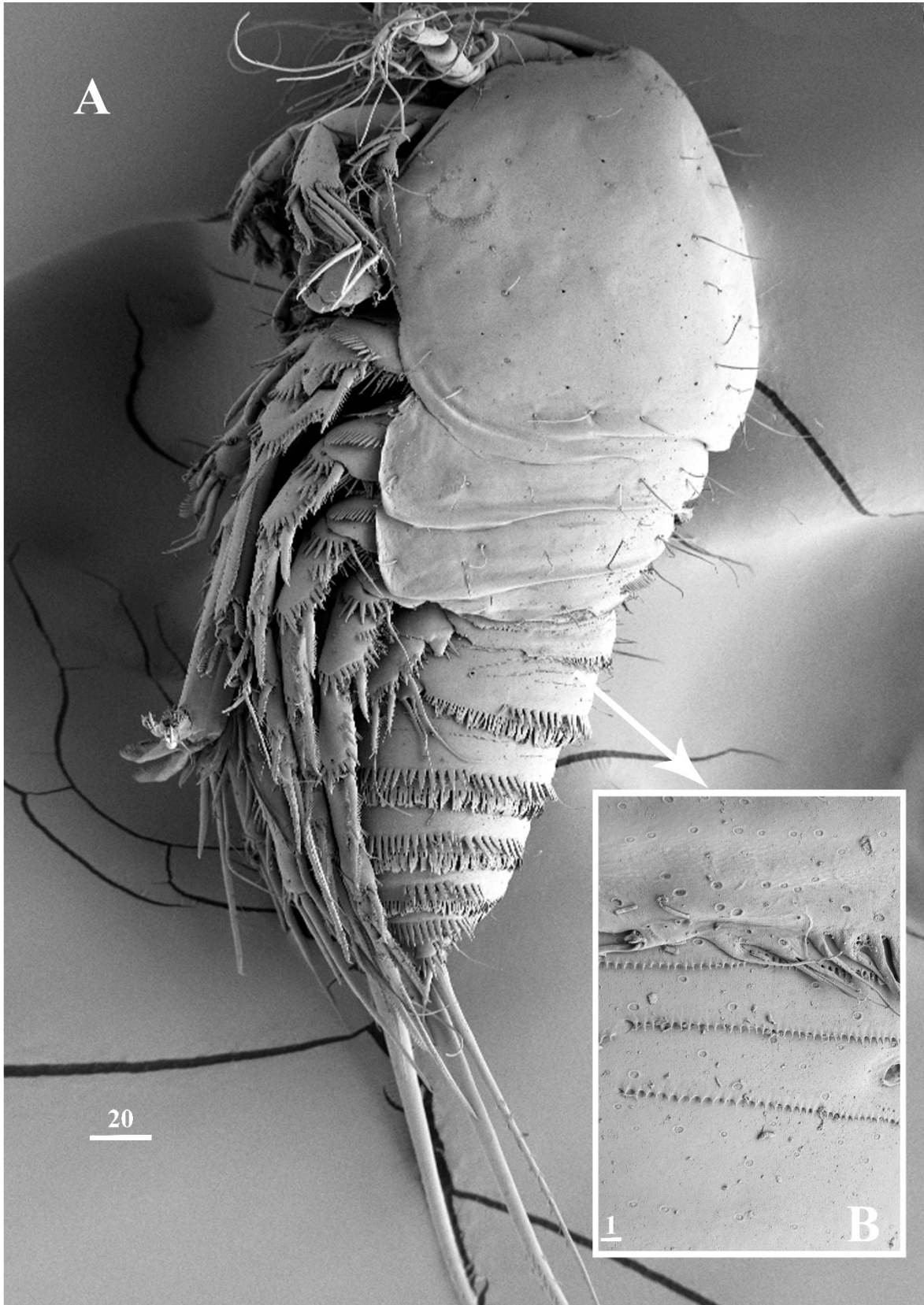


Figure 10: *Penicillicaris pectinimana* (Car, 1884), ♂, A, lateral habitus; B, hyaline frill and surface ornamentation of somite 5 (SEM)

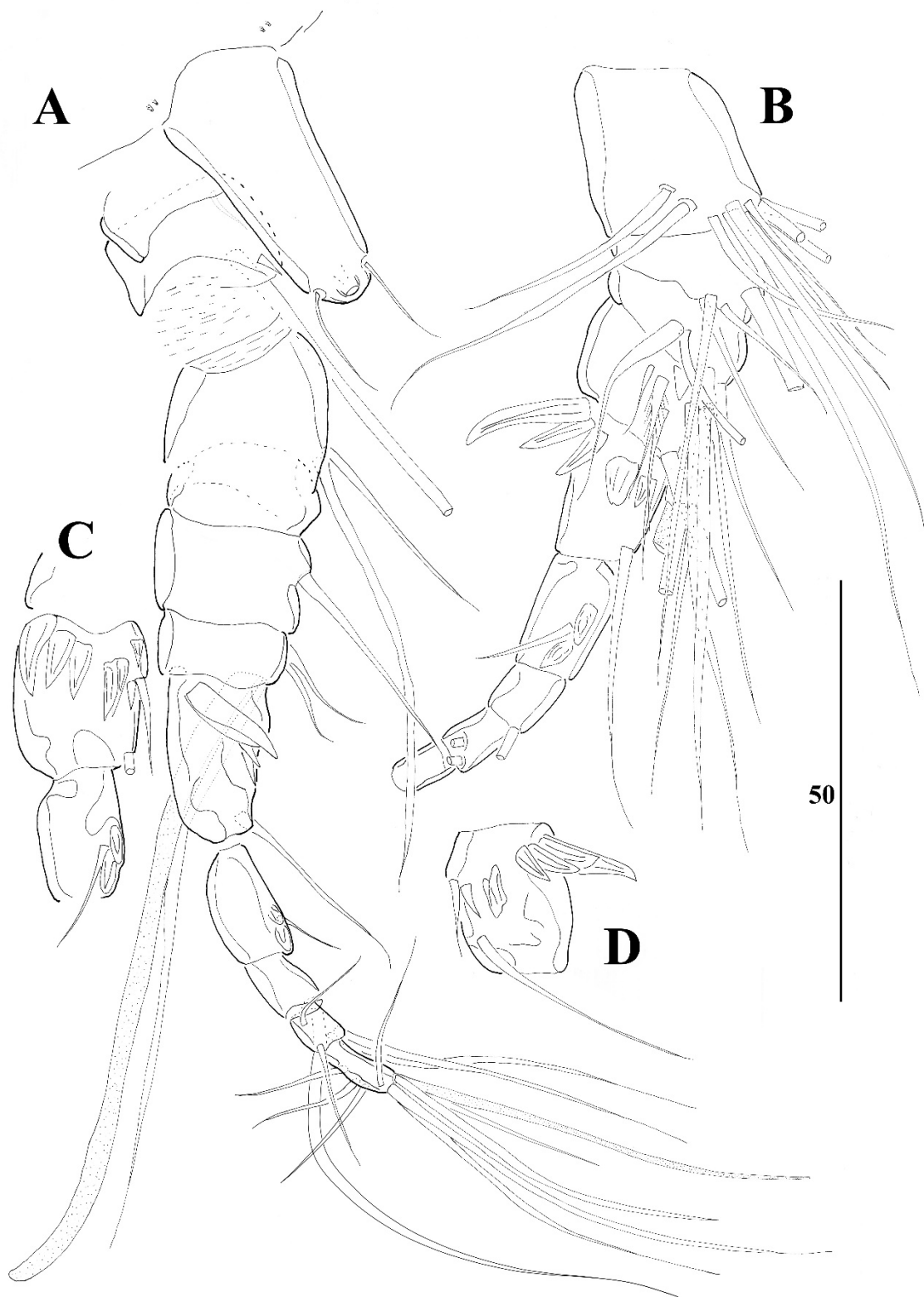


Figure 11: *Penicillicaris pectinimana* (Car, 1884), ♂, A, anterior of A1 and rostrum; B, posterior of A1; C, sixth and seventh segment of A1; D, sixth segment of A1

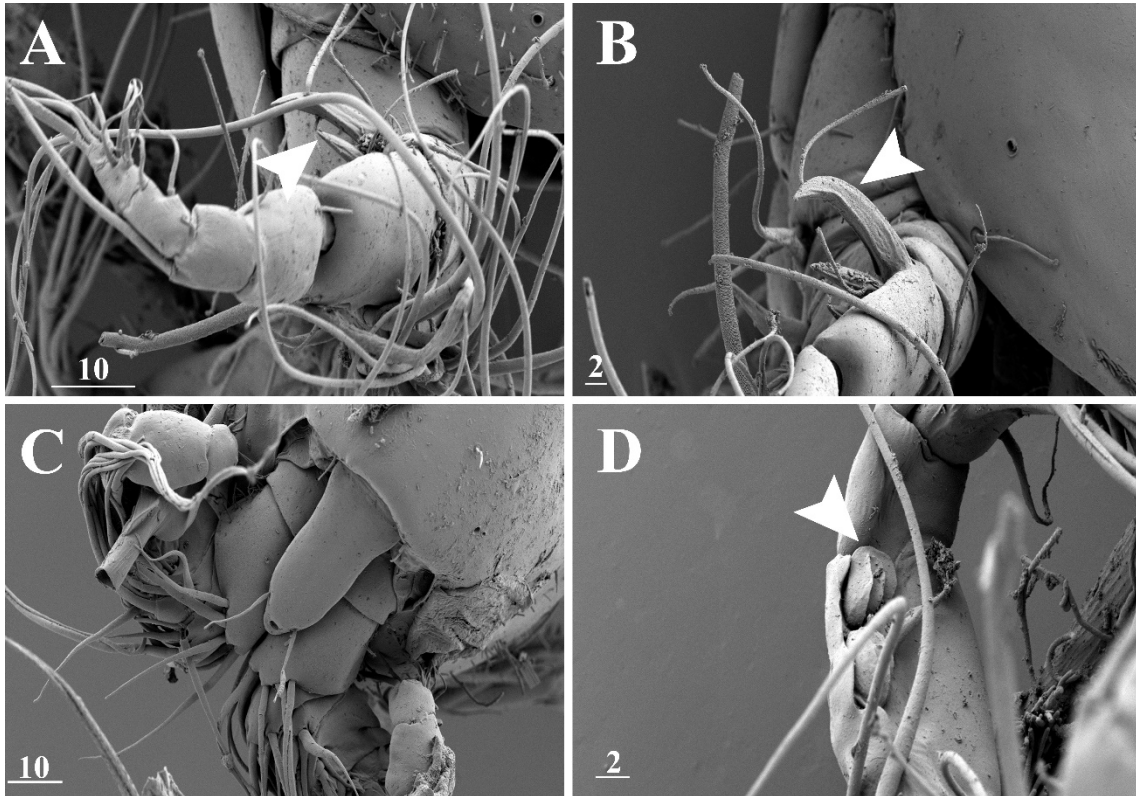


Figure 12: *Penicilliaris pectinimana* (Car, 1884), ♂, A, B, modified spine of A1 sixth segment; C, anterior of A1 and rostrum; D, modified spine of A1 seventh segment (SEM)

P1 (Fig. 13A, B). Similar with female except for precoxal spinule row and basis proximal inner margin spinule row longer than female.

P2 (Fig. 13C). Exopod as in female. Inner seta on enp-3 shorter.

P3 (Fig. 14A, B). Exopod as in female. Enp-3 shorter than that of female, with two plumose setae and apophysis.

P4 (Fig.14C). First inner seta on exp-3 relatively shorter than that of female. Enp-3 without inner seta.

P5 (Fig. 15A). Baseoendopods medially fused forming deeply incised transverse plate. Endopodal lobe with two pores and with spinule rows on distal and outer margins; outer basal seta naked and arising from short setophore, inner lobe with two bipinnate setae at distal margin. Exopod 1-segmented with spinule row along outer margin and with seven setae; proximal outer seta long and naked, the other outer lateral setae bipinnate, one of the distal setae long and naked the other distal seta bipinnate, one of inner seta naked and the other one bipinnate.

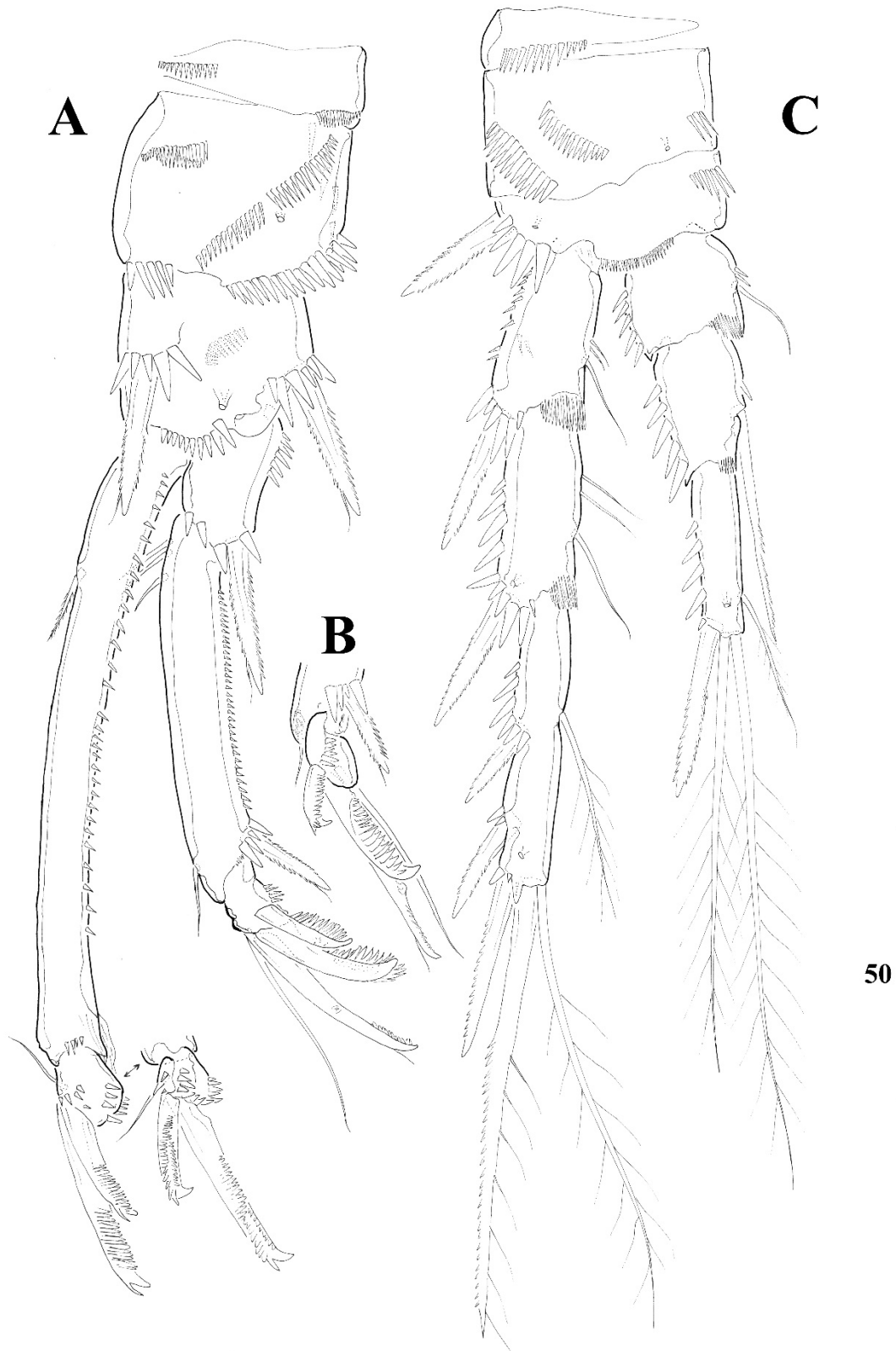


Figure 13: *Penicilliaris pectinimana* (Car, 1884), ♂, A, P1; B, distal segment of P1 exopod; C, P2

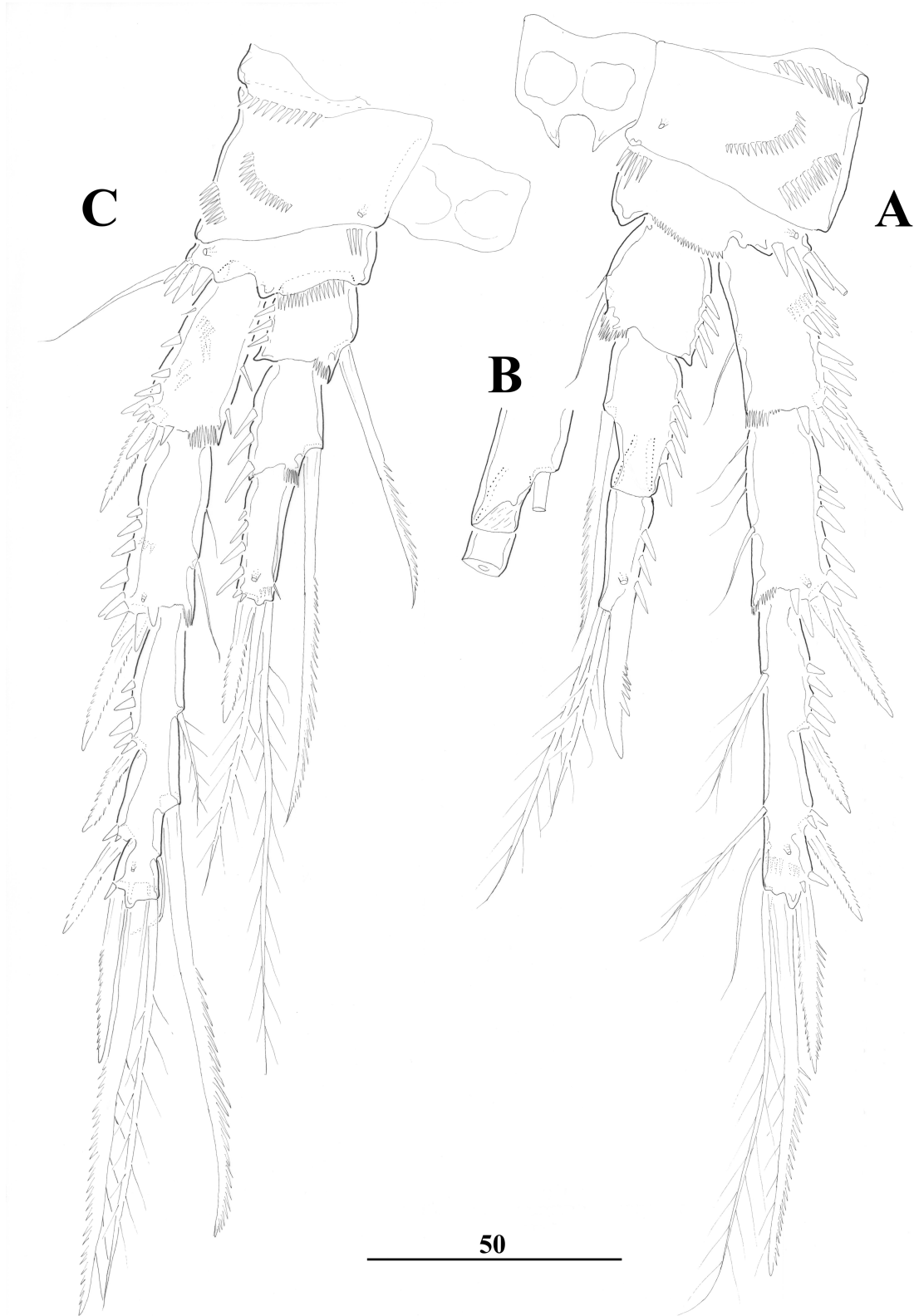


Figure 14: *Penicillicaris pectinimana* (Car, 1884), ♂, A, P3; B, second and third segment of P3 endopod; C, P4

P6 (Fig. 15B) reduced to a small plate on each side, covers genital aperture. Bears two naked setae and one bipinnate seta, middle seta nearly two times longer than other two setae.



Figure 15: *Penicillicaris pectinimana* (Car, 1884), ♂, A, P5; B, ventral of abdomen and P6

Variability. One male from St3 had three setae on P2 enp-3. A female from St. 41 had seven setae on one side of P5 exp but six on other side of P5 exp. A female from St. 69 had seven setae on one pair of P4 exp-3. Males from St. 26, St. 49, St. 72 and all materials from the Black Sea coast had four setae on P4 exp-3. A female from St. 53 had four setae on P5 baseoendopod and a male had no inner seta on P3 enp-3.

The present specimens clearly belong the genus *Penicillicaris* according to the following characters i) female P3-P4 enp-2 with inner seta, ii) P1 exopodal segments subequal in length (second segment markedly longer than the first and the third), iii) penicillate elements on distal endopod segment of antenna, iv) penicillate spine on P1 exp-3 and enp-2, v) ♂ P3 enp with apophysis [9]. The specimens morphologically most closely related to *P. pectinimana* (see Table 1) which was originally described as *Thalestris pectinimana* by Car [10] from a single female specimen collected from the vicinity of Trieste, north-eastern Italy. Huys and Mu [9] removed the species from the synonymy of *Parastenhelia spinosa* and transferred it to the newly erected genus *Penicillicaris*. Only female habitus in lateral view, antennule, antenna, maxilliped, P1 rami distal segments and P5 were illustrated in the original description of *P. pectinimana*. The morphological comparisons of the materials of this study with the original description of *P. pectinimana* by Car [10] has revealed that the only significant difference is that P5 exopod with six setae, seven in the original description. Unfortunately, the standards of Car's (1884) illustrations do not allow making further meaningful comparisons. On the other hand, Huys and Mu [9] refereed Monard's [14] report of *Microthalestris forficula* (Claus, 1863) from Banyuls-sur-Mer and Bodin's [15] report of *Parastenhelia spinosa* (Fischer, 1860) f. *penicillata* from Marseille conspecific with *P. pectinimana*. The materials examined in this study differ from above mentioned reports in the character of P4 exp-3 with eight setae instead of seven setae, but P4 exp-3 distal inner seta is very thin which can easily be overlooked. *P. penicillata* Willey, 1935 which described from Bermuda is the only species within the genus that has P4 exopod-3 with 8 setae, Willey [17] stated that distal two segments of ♀ P2-P3 endopod are frequently poorly separated in *P. penicillate* sensu Willey, 1935 [17], but P2-P3 endopod segments of the specimens examined are clearly separated. Taking into account the above-mentioned characters and considering that Willey's [17] population is located in very distant location, it can be speculated that Willey's [17] population may represent different morphological species. The redescription of both sexes of *P. pectinimana* from a wide range of localities along the Turkish coast can provide a basis for the future taxonomic studies on the species. On the other hand, considering the wide habitat range of species in Turkish water may be the indication of cryptic speciation among *P. pectinimana* populations. Therefore, a

molecular study within and between the populations of *P. pectinimana* based on freshly collected specimens may provide interesting results about the species delimitations.

Table 1: Differences between species of the genus *Penicillicaris*.

	<i>P. maldivensis</i>	<i>P. penicillata</i>	<i>P. sewelli</i>	<i>P. pectinimana</i>
Reference	Sewell [16]	Willey [17]; Huys and Mu [9]	Sewell [16]; Vervoort [18]	Car [10]; Monard[14]; Bodin[15]; present study
Location	Maldive archipelago, Addu Atoll	Bermuda, Trunk Island, Harrington Sound;	Maldive archipelago, Addu Atoll; Ifaluk Atoll in the Pacific	Italy, Trieste (Adriatic); Banyuls-sur-Mer; Marseille; Türkiye
♀A1 segment number	9	8	8	8
P1 exp-3	three penicillate spine + one long non-geniculate seta	two penicillate spine + one geniculate seta + one short seta	two penicillate spine + one geniculate seta + one short seta	two penicillate spine + one geniculate seta + one short seta
P2 exp/enp	unknown	unknown	1.1.123/1.1.121	1.1.123/1.1.121
P3 exp/enp	unknown	?.?.323/ 1.321	1.1.223/1.1.121	1.1.323/1.1.221
P4 exp/enp	0.1.223/1.1.121	?1.323/ ??.221	-/?.?.221	0.1.2(3)23/1.1.221
P5 benp: exp	5:6	5:6	5:6	5:6-7
♀ caudal rami setae IV-V	not swollen	swollen	swollen	swollen
♂ P3 enp	0.1.02+Apophysis	0.1.02+Apophysis	0.1.02+Apophysis	0.1.02+Apophysis
♂ P4 enp	?	1.1.021	?	1.1.021
♂ P5 benp: exp	2:7	2:7	2:7	2:7

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