

ISTHMIOCARIS LONGITELSON GEN. ET SP. NOV., A STRONGLY DERIVED HARPACTICOID (COPEPODA) FROM THE MAGELLAN REGION, AND ITS SYSTEMATIC AFFINITIES TO CERTAIN “CANTHOCAMPTID” TAXA

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ABSTRACT

A new harpacticoid copepod from the Patagonian continental slope (Chile) is described. *Isthmiocaris longitelson* gen. et sp. nov. is characterised by several peculiar features like the presence of an additional collar-like pseudosomite between cephalothorax and first pedigerous somite, a remarkably long telson, small appendages, pronounced sexual dimorphism in the swimming legs P2 to P5, and long sensilla on the body. Several of these characters are unique within Harpacticoida. There are similarities with species of the canthocamptid “genera” *Itunella* Brady, 1898 and *Psammocamptus* Mielke, 1975. *Isthmiocaris longitelson* gen. et sp. nov. is therefore placed into the “Canthocamptidae” Sars. Its phylogenetic position is briefly discussed.

ZUSAMMENFASSUNG

Vom Patagonischen Kontinentalabhang (Chile) wird eine neue Harpacticoidenart beschrieben. *Isthmiocaris longitelson* gen. et sp. nov. zeichnet sich durch eine Reihe besonderer Merkmale aus, wie einem kragenartigen zusätzlichen Pseudosomit zwischen Cephalothorax und dem ersten schwimmbeintragenden Segment, einem bemerkenswert langen Telson, kleinen zierlichen Schwimmbeinen, einem ausgeprägten Sexualdimorphismus an den Schwimmbeinen P2 bis P5 und sehr langen Sensillen am Körper. Einige dieser Merkmale sind innerhalb der Harpacticoida einzigartig. Andererseits zeigt das neue Taxon Übereinstimmungen mit Arten der “Gattungen” *Itunella* Brady, 1898 und *Psammocamptus* Mielke, 1975. *Isthmiocaris longitelson* gen. et sp. nov. wird deshalb den “Canthocamptidae” Sars zugeordnet. Seine phylogenetische Stellung wird kurz besprochen.

The diversity of harpacticoids is full of surprises. Wherever the ocean floor is sampled, new species turn up that mostly belong to known “families” or “genera.” But quite often lately, new forms have been discovered that do not fit any of the higher taxa known. Such forms have given rise to new taxa, which demonstrate the amazing plasticity of the basic harpacticoid design. Among the new discoveries are the Rotundiclipeidae (Huys, 1988), the Cristacoxiidae (Huys, 1990), the Styracothoracidae (Huys, 1993), the Superomatiroidae (Huys, 1996), and the Novocriniidae (Huys and Iliffe, 1998).

Conversely, other enigmatic species do not necessarily represent new high level taxa but rather the terminal clades within known ones. They can display extreme morphological modification, which renders recognition of their affinities virtually impossible.

The present contribution deals with such an

amazing form. It was found in the Magellan Region of South America, which has already yielded other interesting discoveries (George, 1997, 1998, 2001, 2002; George and Schminke, 1998).

MATERIALS AND METHODS

Five specimens (2 males, 2 females, and 1 male CIV) were found in samples from the Patagonian continental slope. The sediment samples were taken with a multicorer (MUC) from station 40/110 during ANT XIII/4 with RV “Polarstern” in 1996 (Fahrback and Gerdes, 1997; George, 1999). Samples were treated as described in George (1999). The specimens were cleared up with glycerol. Drawings were made with the aid of a camera lucida on a Leitz-Dialux 20 EB compound microscope equipped with a phase contrast 100-times objective.

The morphological terminology has been adopted from Huys and Boxshall (1991). The terminus “telson” is used according to Schminke (1976). The terminology related to phylogenetic systematics is used according to Ax (1984). Abbreviations used in the text: cphth: cephalothorax; A1: antennula; aes: aesthetasc; A2: antenna; md: mandibula; mxl: maxillula; mx: maxilla; mxp: maxilliped; enp:

endopod; exp: exopod; exp1: first exopodal segment; GDS: genital double somite; CR: caudal ramus; P1–P6: swimming legs 1–6; benp: baseopod.

DESCRIPTION

“Canthocamptidae” Sars, 1906

Isthmiocaris gen. nov.

Isthmiocaris longitelson gen. et sp. nov.

Generic diagnosis as following description. Type species: *Isthmiocaris longitelson* gen. et sp. nov. *Locus typicus*: Patagonian continental slope, locality 55°26.4'S/66°14.0'W, 101 m depth (station 40/110 of ANT XIII/4 of RV “Polarstern”). The type material is kept in the collection of the AG Zoosystematik und Morphologie of the Carl von Ossietzky-Universität, D-26111 Oldenburg, Germany.

Holotype: dissected adult male, mounted on nine slides (UNIO 1999.19/1-9).

Allotype: dissected adult female, mounted on five slides (UNIO 1999.020/1-5).

Paratypes: 1 female, not dissected, mounted on one slide (UNIO 1999.021/1), 1 male CIV, not dissected, mounted on one slide (UNIO 1999.022/1), and 1 male, not dissected, mounted on one slide (UNIO 1999.023/1).

Etymology: The generic name *Isthmiocaris* is derived from the Greek *isthmion*, meaning collar, and *caris*, meaning crab, crustacean. The specific name *longitelson* refers to the long telson. Gender: masculine.

Male: Habitus (Figs. 1B, 2A) long, cylindrical, average length from rostral tip to end of CR approximately 680 μ m. Rostrum articulated, with 2 sensilla at its tip (Fig. 2B). Body somites of almost equal length, except telson of about same length of 2 preceding abdominal somites combined. With corrugated collar-like pseudosomite (isthmion) between cphth and first free (P2 bearing) prosomite which bears 2 small sensilla laterally (cf. Fig. 2A). Isthmion with several furrows. Body surface without spinules. Cephalothorax with long sensilla dorsally and laterally. Free thoracic somites with pair of long sensilla laterally, accompanied by 1 lateral pore, except for P2-bearing somite, which presents 2 lateral pores. First and second abdominal somites with 1 sensillum laterally, and with 2 lateral pores and 1 lateral pore, respectively. Penultimate abdominal somite without sensilla. Telson without anal operculum, with 2 sensilla dorsolaterally, and 1 pore laterally.

CR (Fig. 1B, 2A, cf. Fig. 5D) about 3 times longer than broad, without spinules, subtermi-

nally with small inner projection; with 6 setae: I and II laterally on distal half, II slightly longer than I; III small, subapical on outer side; IV presumably reduced; V terminally, longest, as long as half of body length; VI as small as III, subapical on inner side; VII on distal half, dorsally.

A1 (Fig. 3C, D) sturdy, 7-segmented, subchirocer. First segment small, with 1 seta accompanied by 4 spinules. Second segment with 5 pinnate setae, 1 small bifurcated seta, and 1 bare seta. Third segment small, with 3 pinnate setae and 1 bare seta. Fourth segment swollen, with 4 small, bare setae and 1 long seta, as with a strong and large aes, accompanied by slender seta, both arising from strong projection. Following segments smaller. Fifth segment with no discernible armature. Sixth segment with small inner projection bearing 1 bare seta. Cuticular gaps may indicate presence of additional setae, but none have been detected. Seventh segment smallest, with 7 bare setae and 1 aes. Setal formula: I-1/II-7/III-4/IV-6 + aes/V-0/VI-1(?)/VII-7 + aes.

A2 (Fig. 4A) robust, with coxa and allobasis, 1-segmented enp and 1-segmented exp. Allobasis without spinules, with long pinnate seta proximally. Enp with several strong spinules. Laterally with 2 strong bipinnate spines. Subterminally with 2 bare spines. Terminally with 1 long unipinnate seta, 1 smaller bipinnate spine, and 1 bare spine of same length as bipinnate one. Exp with 1 bipinnate seta and 2 bare setae, one of which long, slender.

Mouthparts as in female (see below).

P1 (Fig. 4B) small, with 2-segmented exp and 1-segmented enp. Praecoxa well developed, as large as coxa. Basis without outer seta. Inner basal seta longer than enp. Exp1 with 1 outer spine. Exp2 with 1 outer seta and 2 terminal setae. Enp smaller than exp1, terminally with bipinnate seta and 3 spinules. Armature as in table below.

P2 (Fig. 4C) small, lacking enp. Praecoxa and coxa of nearly the same size, larger than basis, the latter without outer seta. Exp 2-segmented, exp1 with 1 outer seta, exp2 with 1 outer seta and 2 terminal setae. Armature as follows:

	Male		Female	
	Exp	Enp	Exp	Enp
P1	I-0; I,2,0	0,I,0	I-0; I,2,0	0,I,0
P2	I-0; I,2,0	–	I-0; 0,2,0	–
P3	I-0; I-1; I,2,0	0-0; 0-0; 0,2,0	I-0; I-1; I,2,0	–
P4	I-0; I-0; I,2,0	0-0; I,2,0	I-0; I,2,0	–

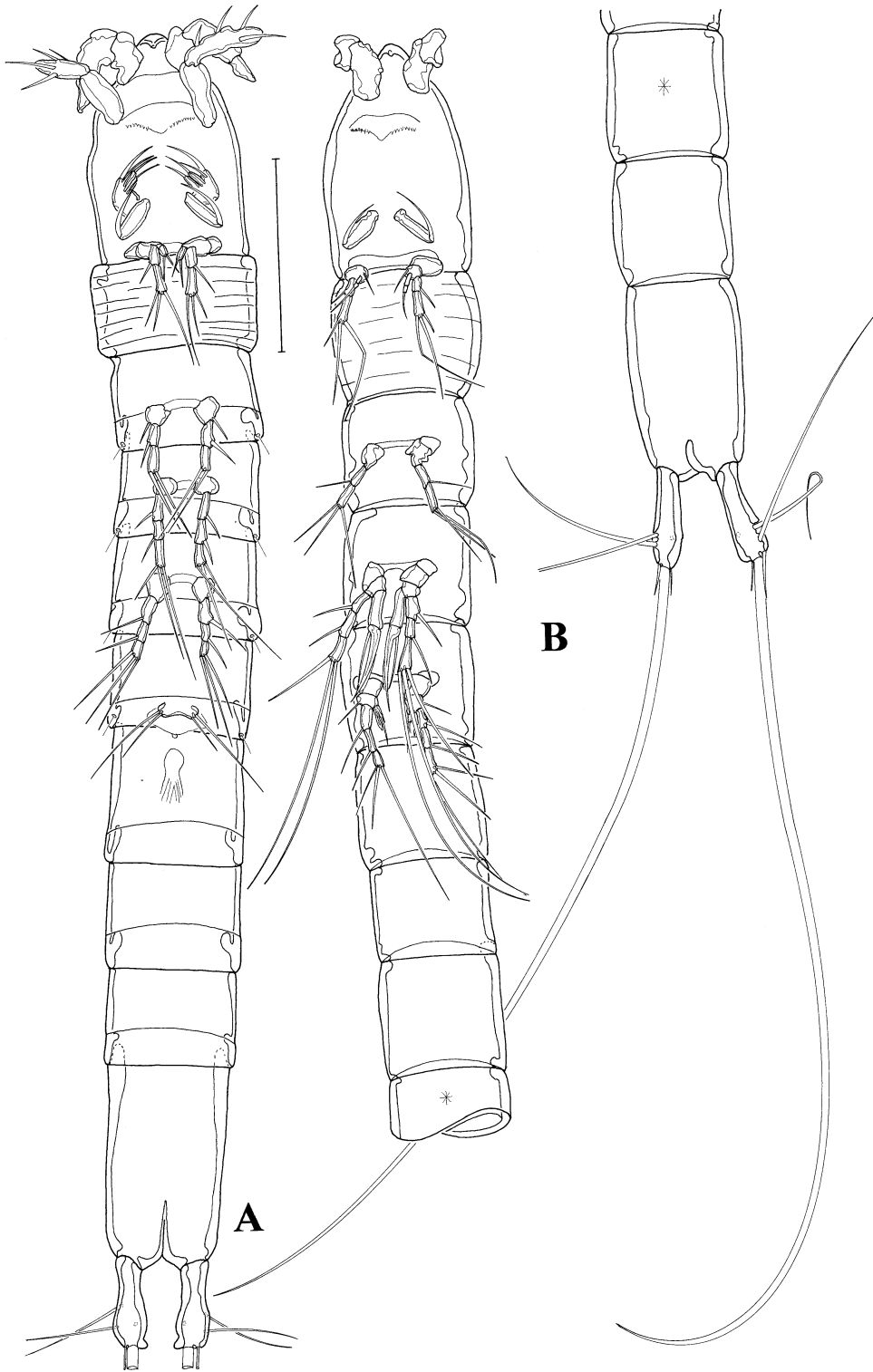


Fig. 1. *Isthmiocaris longitelson* gen. et sp. nov., habitus. A, female; B, male. Scale bar: 100 μ m.

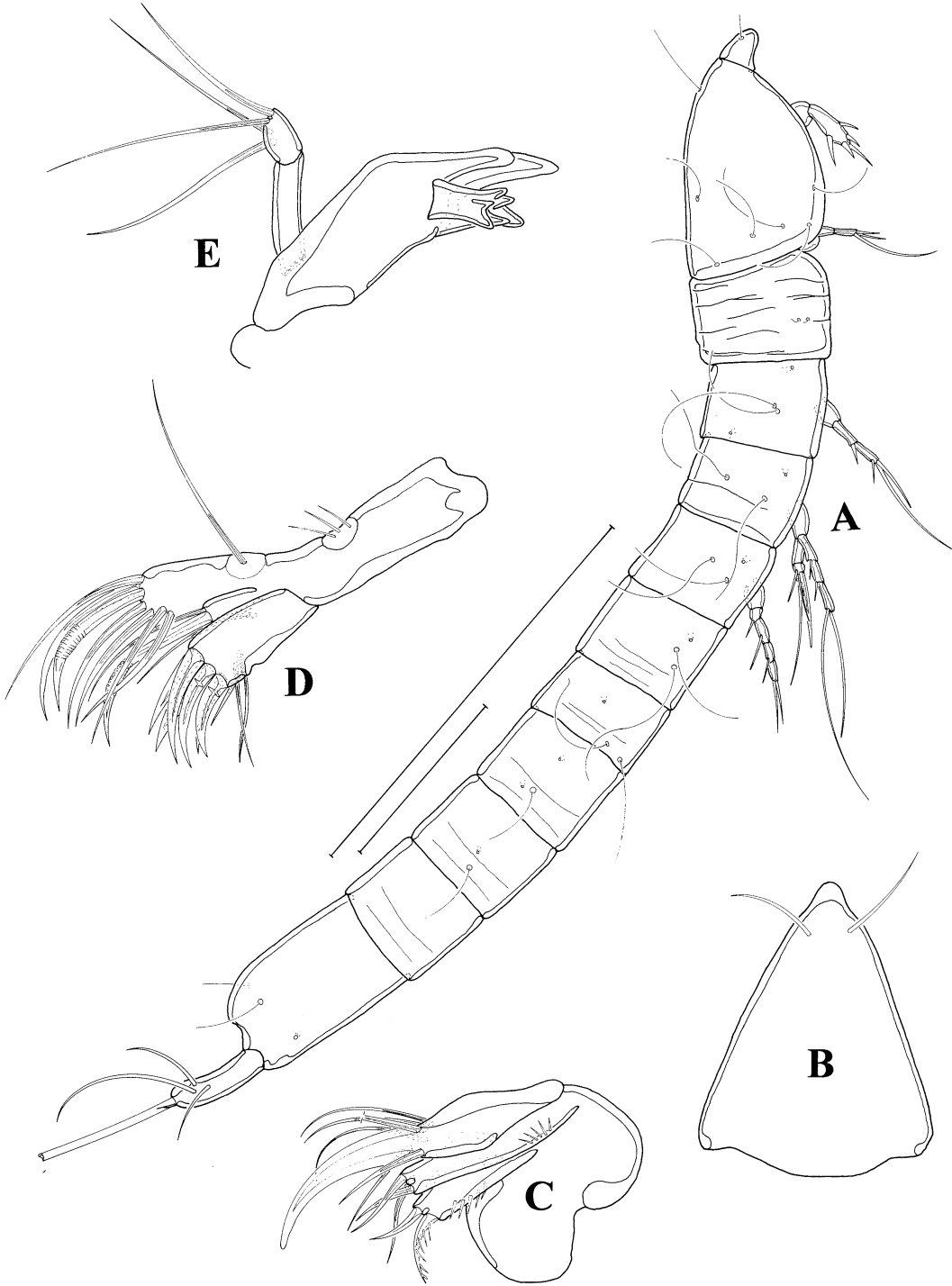


Fig. 2. *Isthmiocaris longitelson* gen. et sp. nov., A, male habitus laterally; B, male rostrum; C, female Mx; D, female Mxl; E, female Md. Scale bars: short (A), 100 μ m, long (B–E), 50 μ m.

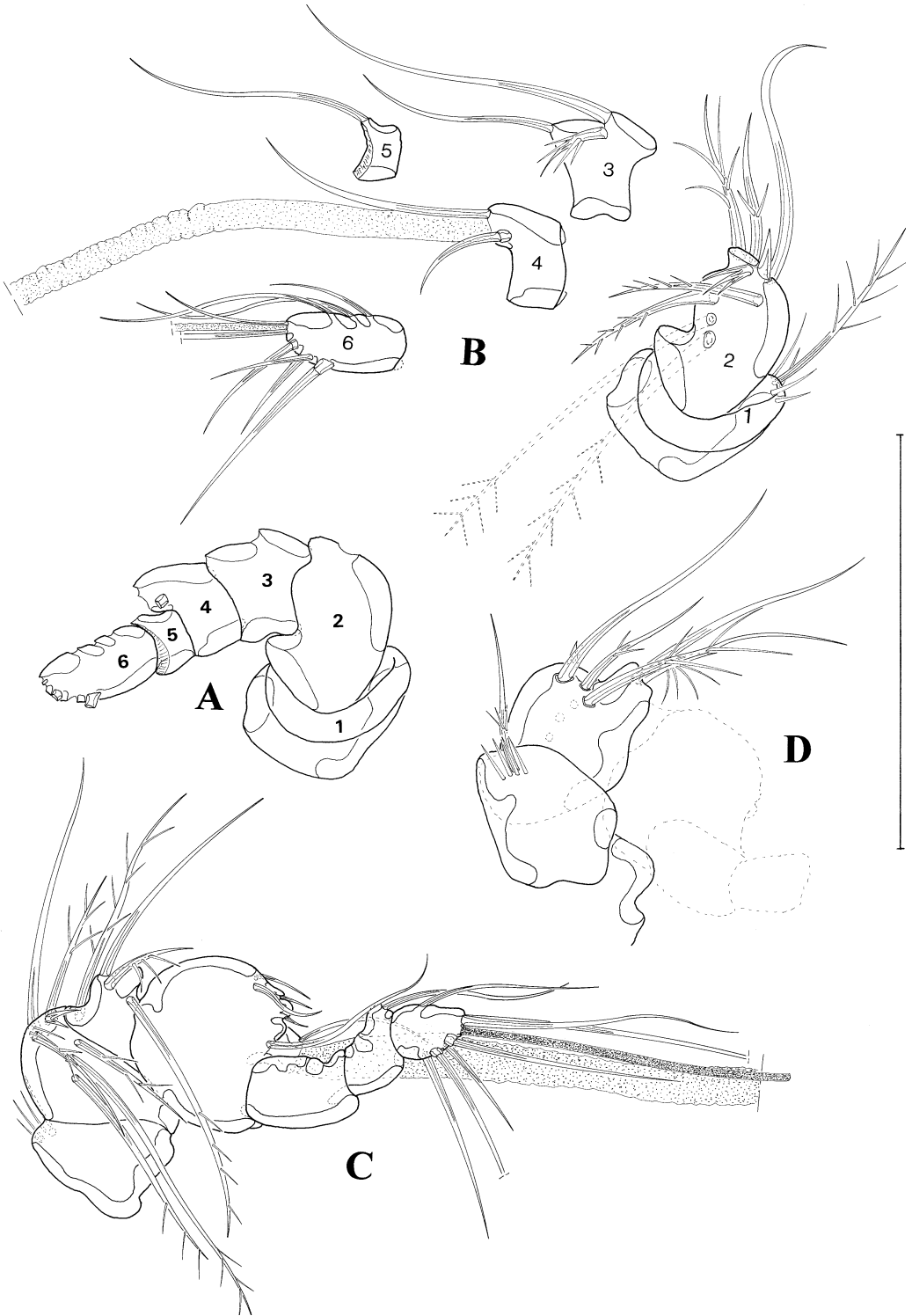


Fig. 3. *Isthmiocaris longitelson* gen. et sp. nov., A, shape of A1 female; B, A1 female, setation of segments; C, A1 male; D, A1 male, setation of segments 1 and 2. Scale bar: 50 μm.

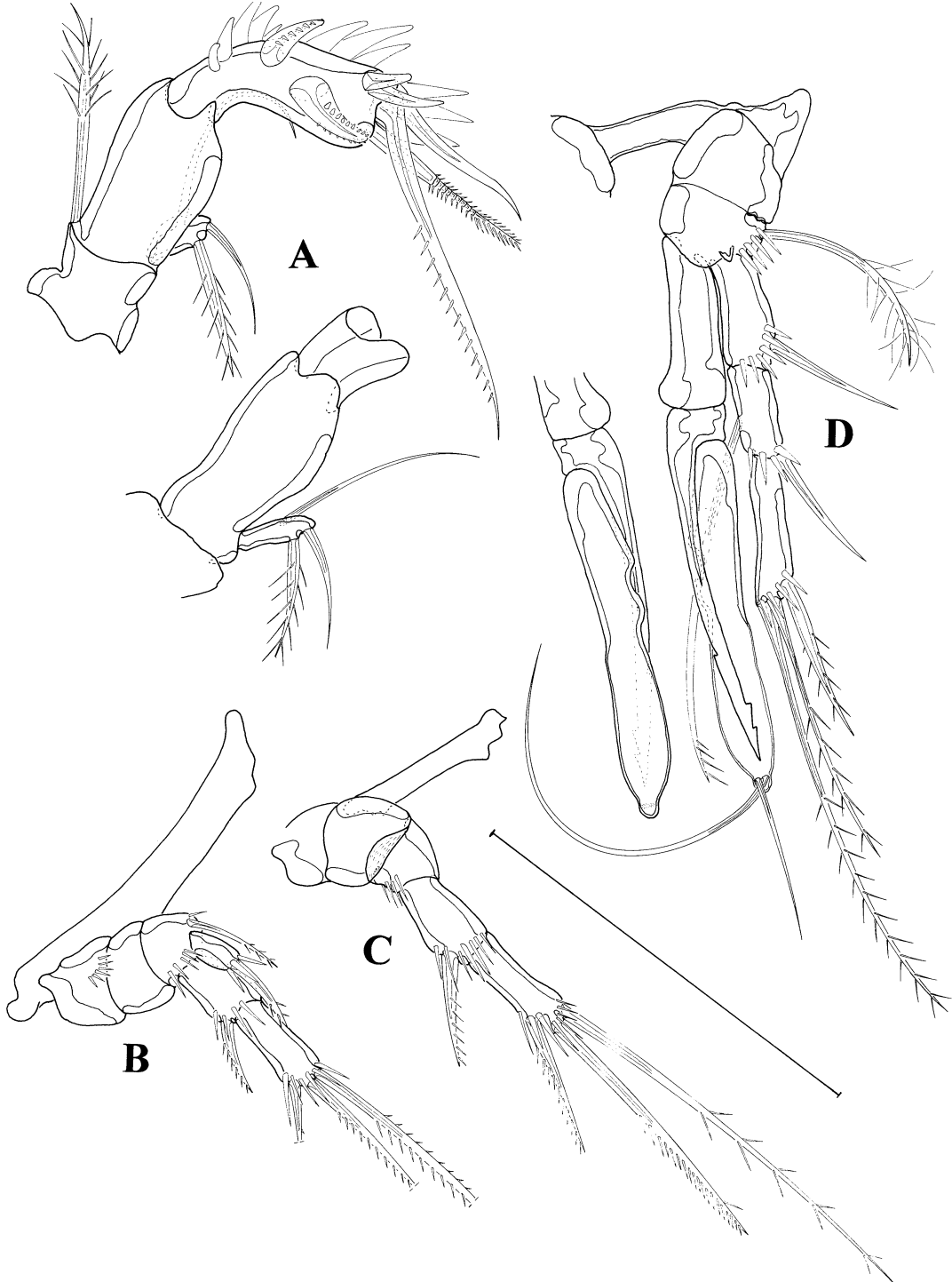


Fig. 4. *Isthmiocaris longitelson* gen. et sp. nov., male. A, A2; A', A2, showing exp; B, P1; C, P2; D, P3; D', enp P3, turned around. Scale bar: 50 μ m.

P3 (Fig. 4D) with small praecoxa and well-developed coxa. Basis with small knuckle above base of exp, with outer plumose seta. Exp 3-segmented, exp1 and exp2 each with 1 outer spine, exp2 with 1 long inner seta. Exp3 with 1 outer spine and 2 terminal setae. Enp 3-segmented, strongly sexually dimorphic. Enp1 longer than exp1, without armature. Enp2 also without setae but extended into strong apophysis reaching almost to end of enp3, with 2 outer small, and 1 inner barb on inner side. Enp3 longest, transformed into paddle-like hyaline segment, with 2 apical setae. Armature as in table above.

P4 (Fig. 5A, B) as small as P1 and P2. Basis with outer seta. Exp 3-segmented. Exp1 and exp2 each with 1 outer spine. Exp3 with 1 outer spine and 2 terminal setae. Enp 2-segmented. Enp1 small, without armature. Enp2 longer than enp1, with 2 distal setae and 1 modified outer spine, which is serrate along its outer distal margin. Armature as in table.

P5 (Fig. 5C) transformed into single small plate which bears 4 setae, 2 large tube pores, and, on its inner margin, pair of long cuticular apophyses.

P6 completely reduced.

Female:

Body (Fig. 1A) as in male, differing only in fusion of last thoracic somite with first abdominal one to form GDS. Average length from rostral tip to end of CR approximately 680 μ m.

A1 (Fig. 3A, B) 6-segmented, sturdy. First segment with 1 pinnate seta, accompanied by several long spinules. Second segment with 9 setae, 2 of which very short, sturdy. Third segment with 2 bare setae and small pinnate one. Fourth segment as small as third, with 2 bare setae and broad aes. Fifth segment smallest, with 1 bare seta. Sixth segment as long as third and fourth combined, with 9 setae, one of which inserting on small knob, and with small aes. Setal formula: I-1/II-9/III-3/IV-2 + aes/V-1/VI-9 + aes.

A2 as in male.

Md (Fig. 2E). Gnathobase with 2 strong and several smaller teeth. Mandibular palp 2-segmented, basis unarmed, enp with 4 long bare setae.

Mxl (Fig. 2D). Praecoxal arthrite longer than broad, with 6 apical spines, and 1 small and 2 long, slender subapical setae. On the opposite with a fourth bare seta. Coxal endite with 2 bare setae, one of which is strong and geniculated. Basis, enp and exp fused to single lobe bearing

5 apical bare setae, one of which is geniculated, and 2 subapical setae. Laterally with 1 bare seta and 3 long spinules.

Mx (Fig. 2C). Syncoxa without ornamentation, with 2 endites. Proximal endite with row of small spinules and 2 setae, one of which is bare, other one pinnate. Distal endite with 3 bare setae and few small spinules at base. Basis with strong claw and 2 accompanying setae; enp represented by 4 setae.

Mxp (Fig. 7A) prehensile. Syncoxa fused with basis, with 1 bare seta. Enp produced into claw longer than syncoxa-basis.

P1 (Fig. 6A) as in male. Armature formula as in table.

P2 (Fig. 6B) as in male, except for ornamentation of outer spine of exp1 and armature formula of exp2 (without outer spine). Armature formula as in table.

P3 (Fig. 6C) without enp. Basis with outer seta. Exp 3-segmented. Exp1 with 1 outer seta, exp2 with 1 outer and 1 inner seta. Inner seta long, brush-like at its tip. Exp3 with 1 outer seta and 2 terminal setae. Armature formula as in table.

P4 (Fig. 7B) without enp. Basis with outer seta. Exp 2-segmented. Exp1 with 1 outer seta, exp2 with 1 outer and 2 terminal setae. Armature formula as in table.

P5 (Fig. 7C) fused to single plate, very small, bearing 2 very long feathered setae.

GDS (Fig. 7C) Last thoracic and first abdominal somite fused to form genital double somite. Copulatory pore located ventrally in middle of somite. P6 very small, forming genital operculum, with 1 seta on both sides.

DISCUSSION

The most conspicuous feature of *Isthmiocaris longitelson* gen. et sp. nov. is the here-called "isthmion," the collar between the cephalothorax and the first free thoracic somite. The isthmion is quite distinct from the neighbouring parts of the body as is evidenced by the cuticula. Structure (transversal furrows), position, and apparent elasticity (see Figs. 1A, B) suggest that the mobility of the cephalothorax is greatly enhanced by this isthmion. This appears to be an appropriate adaptation for interstitial life. It is assumed that *Isthmiocaris longitelson* gen. et sp. nov. belongs, indeed, to the interstitial fauna because also the rest of the body points into this direction.

Despite the clear border between the isthmion and the cephalothorax and the first thoracic

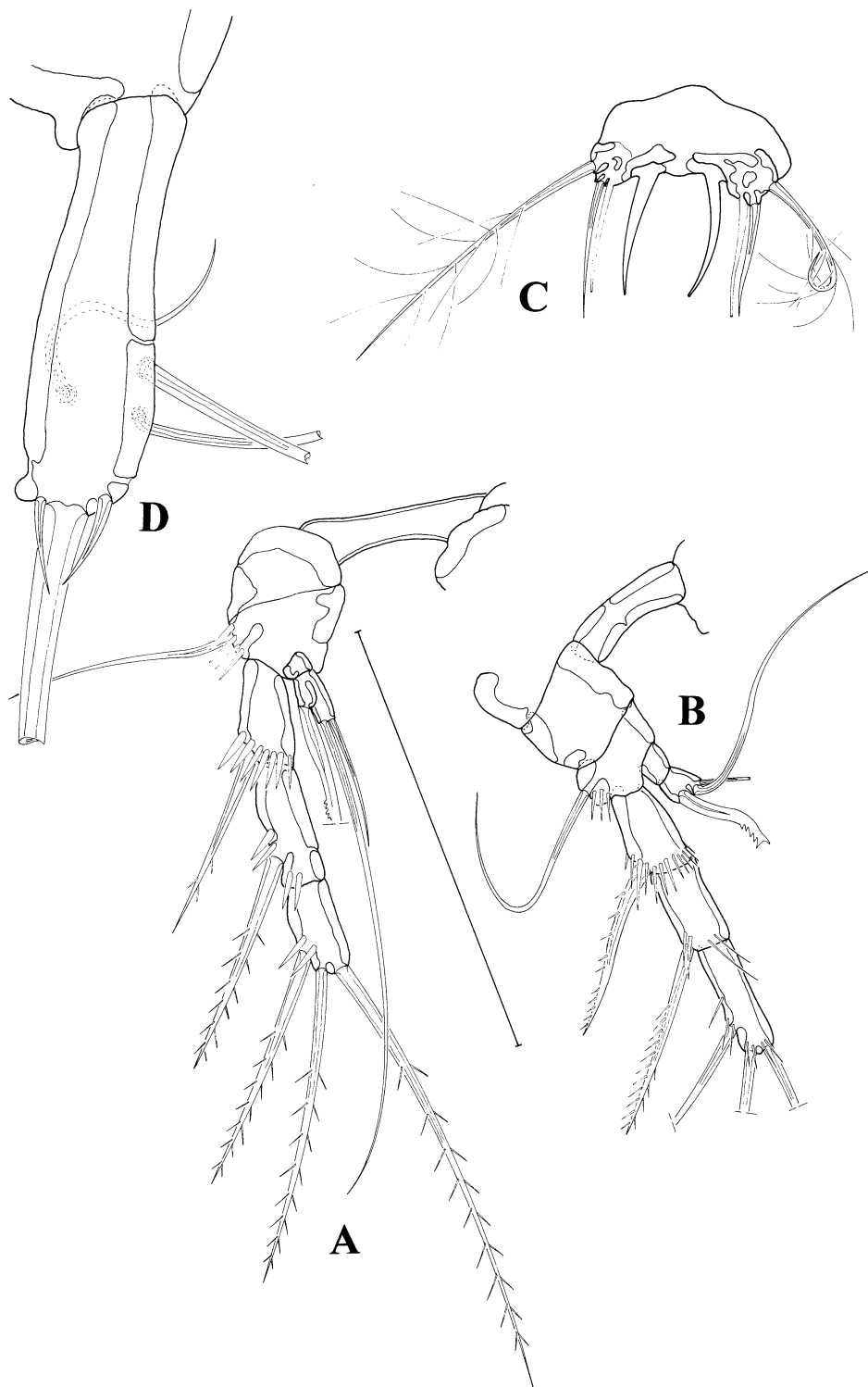


Fig. 5. *Isthmiocaris longitelson* gen. et sp. nov., male. A, P4; B, P4 of paratype; C, P5; D, CR. Scale bar: 50 μ m.

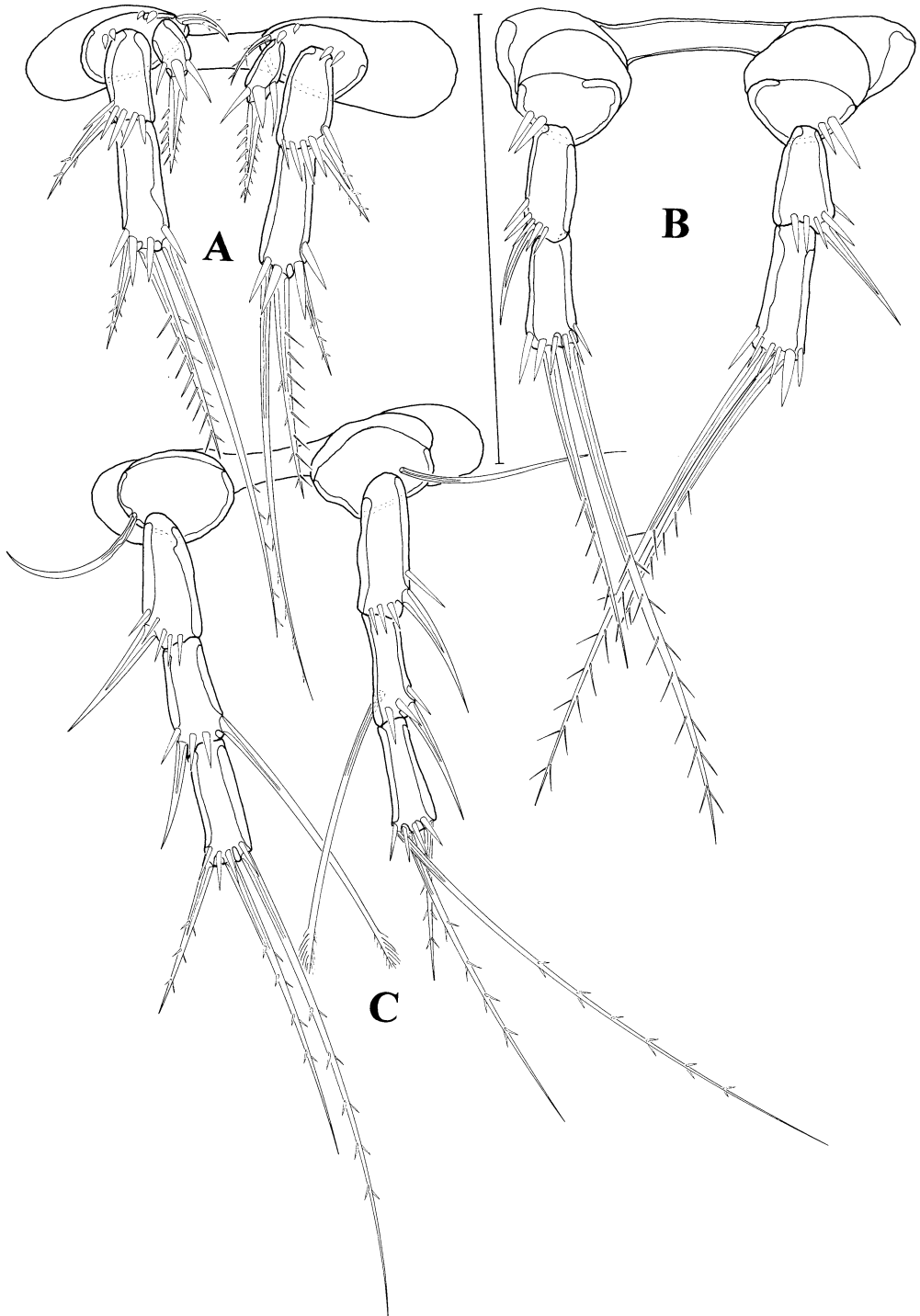


Fig. 6. *Isthmiocaris longitelson* gen. et sp. nov., female. A, P1; B, P2; C, P3. Scale bar: 50 μ m.

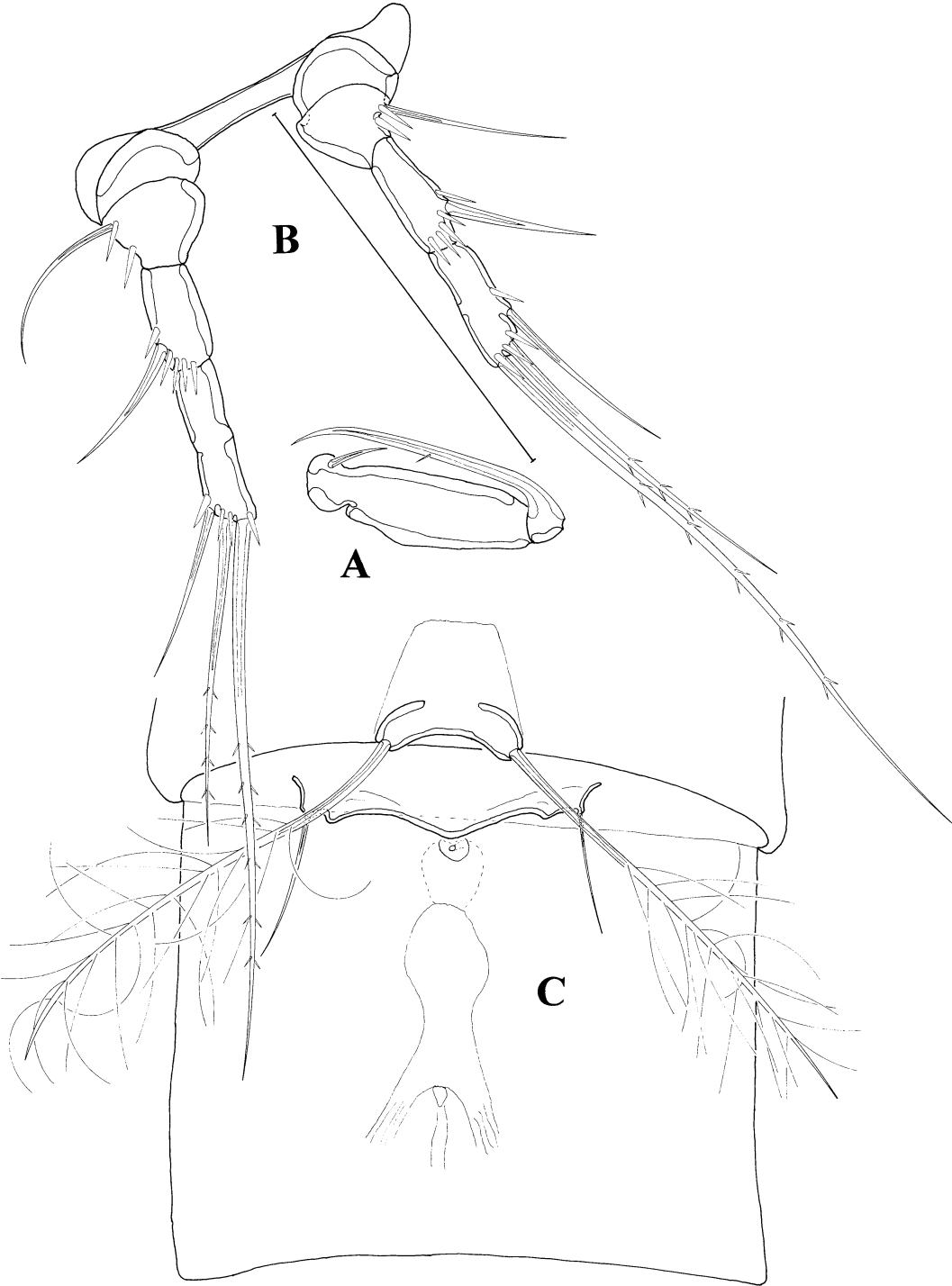


Fig. 7. *Isthmiocaris longitelson* gen. et sp. nov., female. A, Mxp; B, P4; C, genital field, showing small P5, P6, and gonopores. Scale bar: 50 μ m.

somite, the isthmion does not appear to be an extra body somite. There are no appendages, and the whole appearance is quite different to that of the thoracic somites. It is also not a free first pedigerous somite because the appendages of this somite are located on the cephalothorax. It is rather a "pseudosomite" such as occurs sporadically in other interstitial copepods (see Huys and Boxshall, 1991). As with the pseudosomite of other Harpacticoida [*Paramesochra mielkei* Huys, 1987 and *Scottopsyllus* (*Intermedopsyllus*) *intermedius* (T. and A. Scott, 1995)] and of Cyclopoida [*Metacyclopina* aff. *harpacticoides* (Klie, 1949)], also the isthmion of *I. longitelson* gen. et sp. nov. may allow for a better mobility (see Huys 1987). The difference between these pseudosomites and the collar of *I. longitelson* gen. et sp. nov. is their position. Whereas the isthmion is located directly behind the cephalothorax, the pseudosomites lie between the fifth pedigerous and the genital somite.

The isthmion is regarded as an autapomorphy (1) of *I. longitelson* gen. et sp. nov. Other strongly derived characters are:

- (2) The significantly long telson;
- (3) The sexual dimorphic reduction of the outer spine in exp3 of female P2;
- (4) The presence of a long, sabre-like apophysis on enp2 of male P3, exceeding the length of the exp and having 2 small hooks instead of 1 on the outer edge (see below);
- (5) The transformation of the enp3 of male P3 into a long, paddle-like segment;
- (6) The possession of a strongly reduced female P5, forming a very small single plate bearing 2 very long bipinnate setae;
- (7) The reduction of the male P5 to a small single plate with 2 long bipinnate and 2 smaller bare setae, as well as with 2 long tube pores and a pair of long cuticular apophyses;
- (8) The loss of the male P6.

There is no doubt that these characters warrant the recognition of a new higher taxon, *Isthmiocaris* gen. nov. It is easy to recognize the distinguishing characters, yet it is far more difficult to find characters shared with other species that might give a clue as to which suprageneric taxon the new species belongs. Comparative analysis revealed that peraeopods 3 and 4 of *Isthmiocaris longitelson* gen. et sp. nov. are similar to those of certain representatives of "Canthocamptidae," viz. the taxa

Itunella Brady, 1896, and *Psammocamptus* Mielke, 1975. These two taxa contain species that share the following characters with *I. longitelson* gen. et sp. nov.:

- (9) *Itunella muelleri* (Gagern, 1923), *Psammocamptus eckmani* (Huys and Thistle, 1989), *P. minutus* (Wells, 1965) (cf. Bodin, 1972; Huys and Thistle, 1989), and *I. longitelson* gen. et sp. nov. share the shape of the apophysis and the possession of small hooks on the inner and outer edge of male P3 enp2.
- (10) The above species and *Itunella intermedia* Apostolov and Marinov, 1988, *Psammocamptus axi* Mielke, 1975, and *P. galapagoensis* Mielke, 1997 share the shape and ornamentation of the male P4 enp, which is 2-segmented and bears at least 2 apical setae on enp2. Terminally, it also presents a strongly derived seta, which is pectinated at one side, giving the impression of a fret saw ("stichsägeartig," Gagern, 1923: p. 66). This seta is present in all named species (cf. Gagern, 1923; Chappuis and Serban, 1953; Bodin, 1972; Apostolov, 1973; Apostolov and Marinov, 1988; Huys and Thistle, 1989), except *Psammocamptus galapagoensis*, which instead possesses a small bipinnate seta (cf. Mielke, 1997) and *P. axi*, the seta of which shows a slightly different transformation into a bipectinate spoon-like spine (Mielke, 1975).
- (11) The possession of extremely long sensilla on the dorsal and lateral bodyparts (at least with *Psammocamptus eckmani*) (cf. Huys and Thistle, 1989).

The list shows that none of the characters 9 to 11 applies to all species mentioned. However, most of them agree in the specific structure of the saw-like seta of the male P4 enp (character 10). This possibly could be a synapomorphic character uniting the species that now belong to separate groups. It is interesting to note that *P. axi* and *P. galapagoensis* stand outside the group characterised by the saw-like seta. Mielke (1997) united *Psammocamptus* and *Bathycamptus* Huys and Thistle, 1989, but we do not share his opinion that sexually dimorphic characters are of minor importance in the phylogenetic assessment of these species. On the contrary, we are of the opinion that the remarkable similarity in the male enp P4 in *I. muelleri*, *I. intermedia*, *P. eckmani*, *P. minutus*, and *I. longitelson* gen.

et sp. nov. is of significant phylogenetic importance. The assumption that it represents a synapomorphy of the species mentioned seems more plausible to us than that it should have evolved several times independently. We are convinced that there are close affinities between *Itunella*, *Bathycamptus* (which should be re-established), and *Isthmiocaris* gen. nov. but, of course, only a comprehensive study could clear the details and tell which other taxa might have to be considered as well.

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