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Description of *Pseudoameiropsis suphankaraytugi* sp. nov. (Copepoda: Harpacticoida: Ameiridae) with the first report of the genus *Pseudoameiropsis* Pallares, 1982 outside of the South Atlantic Ocean

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Abstract: A new species of the monotypic genus *Pseudoameiropsis* was found in samples collected from the eastern Mediterranean coast of Turkey. The new species can be separated from *P. argentinus* by the armature formula in the endopod of the second to fourth swimming legs (0, 1, 021; 0, 1, 121; 0, 1, 121 in *P. argentinus*, but 1, 1, 221; 1, 1, 221; 1, 1, 221 in the new species), and armature complement in the third exopodal segment of the fourth swimming leg (with eight setae/spines in the new species, but seven elements in *P. argentinus*). The general shape and armature of the female fifth leg is similar in the two species but some minor differences in their ornamentation were observed. This is also the first record of the genus in the Mediterranean Sea and outside of the South Atlantic Ocean.

Key words: Meiofauna, Mediterranean Sea, intertidal zone, interstitial, new species

1. Introduction

The family Ameiridae Boeck, 1865, with more than 400 species accommodated in 50 genera, is one of the most speciose harpacticoid families, which can be found in a wide range of habitats from marine to freshwater (Boxshall and Halsey, 2004; Wells, 2007).

The genus *Pseudoameiropsis* was established by Pallares (1982) to accommodate *P. argentinus* found in washings of red algae and in plankton samples collected from Bahía Thetis, Tierra del Fuego, Argentina (South Atlantic Ocean). Pallares (1982) considered *Pseudoameiropsis* as closely related to *Ameiropsis* Sars, 1907 and *Ameiropsyllus* Huys, 2009 by the structure of the antennal exopod and mandibular palp (the latter biramous), and defined the genus by the combination of the following characters: i) first antennulary segment not elongated; ii) short caudal rami; iii) rami of P1–P4 three-segmented; iv) structure of A2 exopod (two-segmented; first segment slightly elongated, with one seta; distal segment short, with two setae); v) biramous mandibular palp, vi) presence of an inner seta on P1 exp-2; vii) P1 endp-1 strongly prehensile, with first segment extremely elongated, and second and third segments very small; and viii) first endopodal segment of P2–P4 reduced. The genera *Pseudoameiropsis*, *Ameiropsis*, *Ameiropsyllus*, and *Biameiropsis* Karanovic, 2006 share the biramous mandibular palp, but the first can be separated from the other genera by the structure and shape of P1 (Gee, 2009).

The distribution of the only species of *Pseudoameiropsis*, *P. argentinus*, was restricted to its type locality, Bahía Thetis, Tierra del Fuego, Argentina, until Bick and Arlt (2013) reported the species from the intertidal zone of King George Island, at the southeast of Bahía Thetis in the South Atlantic Ocean.

A new species of the genus *Pseudoameiropsis*, *P. suphankaraytugi* **sp. nov.**, was found in samples taken from the eastern Mediterranean coast of Turkey. This is the first record of the genus for the Mediterranean Sea as well as for outside of the South Atlantic Ocean.

2. Materials and methods

Samples of interstitial water were collected in the intertidal zone of Samandağ/Hatay (36°08.315′N, 35°54.598′E) and Viranşehir/Mersin (36°44.357′N, 34°32.478′E) using the Karaman–Chappuis method (Delamare Deboutteville, 1953). The samples were fixed with 4% formalin, and the copepods were separated from the detritus following Karaytuğ and Sak (2006). Drawings of whole specimens and their dissected parts were prepared using an Olympus BX-51 differential interference contrast microscope equipped with a camera lucida. Slides were sealed with Entellan (Merck) and the type material was deposited in the

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Zoology Museum of Adıyaman University (ZMADYU). The terminology used in the text follows Huys et al. (1996). Abbreviations used in the text and tables are: A1, antennule; A2, antenna; ae, aesthetasc; Mxp; maxilliped; P1–P6, swimming legs 1–6; exp, exopod; enp, endopod; exp(enp)-1 (-2, -3) denotes the proximal (middle, distal) segment of a ramus. All scale bars are in μm.

3. Results

3.1. Systematics

Order Harpacticoida Sars, 1903
Family Ameiridae Boeck, 1865
Subfamily Ameirinae Lang, 1944
Genus *Pseudoameiropsis* Pallares, 1982
Pseudoameiropsis suphankaraytugi **sp. nov.** (Figures 1–4)

3.2. Material examined

Holotype: Adult ♀ (ZMADYU 2007/267) dissected and mounted on eight slides, collected from the type locality, 24.11.2007, leg. Serdar Sak, Serdar Sönmez.

Paratypes: One adult ♀ (ZMADYU 2007/268) dissected and mounted on four slides and one whole adult ♀ (ZMADYU 2007/269) preserved in alcohol, collected from the type locality (36°08.315′N, 35°54.598′E), 24.11.2007, leg. Serdar Sak, Serdar Sönmez. One adult ♀ (ZMADYU 2007/270) dissected and mounted on one slide, collected from Samandağ Beach/Hatay (36°05.783′N, 35°56.182′E), 24.11.2007, leg. Serdar Sak, Serdar Sönmez.

Type locality: Intertidal zone of Viranşehir Beach/Mersin, Turkey (36°08.315′N, 35°54.598′E), interstitial.

3.3. Description

Female: Body (Figures 1a and 1b) semicylindrical; total body length measured from tip of rostrum to posterior end of caudal rami, 393 μm (mean = 421,5 n = 2), widest at posterior part of cephalothorax in dorsal view; gradually tapering posteriorly. Rostrum (Figure 1c) fused to cephalothorax, triangular, with pointed tip, reaching about end of first antennulary segment, with two sensilla. Surface of somites with sensilla as figured except penultimate somite. All somites with plain hyaline frill. Genital double-somite (Figures 1a, 1b, 2a) completely fused dorsally and ventrally, with suture laterally; about as long as wide; with 2 rows of spinules dorsally (Figure 1a) and ventrally (Figure 2a), with 1 ventral pore medially. Genital field as figured (Figure 2a). Anal somite (Figures 2a, 2b) with 1 slightly convex unornamented operculum; dorsally and ventrally with transverse row of coarse spinules close to caudal rami, dorsally with additional short spinules near anal cleft.

Caudal rami (Figures 1a, 1b, 2a, 2b) short, about as long as wide in dorsal view, slightly depressed laterally, with 1 tube pore dorsally, and 2 relatively small tube pores ventrally; with 1 medial transverse row of spinules laterally; dorsally with 1 medial row of coarse inner spinules; ventrally with 1 transverse row of spinules close to distal inner corner; with 7 elements. Seta I very small and naked, located near outer distal corner of dorsal surface; seta II about 4 times as long as seta I, located distally on lateral surface; seta III slightly shorter than seta II, located at outer distal corner ventrally, naked; seta IV about half length of seta V, unipinnate, spinulose; seta V longest, about 0.8 times as long as total body length; seta VI located at inner distal corner, about as long as seta II, naked; dorsal seta VII located on distal third of ramus close to inner margin, triarticulated, spinulose.

A1 (Figure 3a) 8-segmented and slender; segment 2 longest. All elements naked except seta on first segment. Segment 4 with 1 aesthetasc fused basally to a very long naked seta. Segment 8 with 1 acrothek consisting of 1 short aesthetasc fused basally to 1 relatively short and 1 long, naked seta. Armature formula: 1-[1 plumose], 2-[7], 3-[4], 4-[1+ae], 5-[2], 6-[2], 7-[5], 8-[5+acrothek].

A2 (Figure 3b) with unarmed allobasis, about 2.5 times as long as wide, fusion of basis and first endopodal segment marked at inner margin. Exopod 2-segmented; first segment elongated, vase-shaped, with 1 strong spinulose inner distal seta; second segment short, about as long as wide, with 1 naked and 1 spinulose seta. Free endopodal segment elongated, about 2 times as long as wide, with short inner spinules proximally and at base of subdistal spine, with 1 transverse row of spinules close to outer distal corner, with 2 strong naked spines, 3 bare and 4 geniculate setae.

Labrum (Figure 3c) arch-shaped, with coarse spinules as figured.

Mandible (Figure 3d, 3e). Cutting edge of coxal gnathobase (Figure 3d) with several teeth as figured and with 1 short curved unipinnate seta. Basis (Figure 3e) about 2.4 times as long as wide, with 2 outer subapical spinules, distally with 1 strong spinulose spine and 1 plumose seta; with well-developed rami. Exopod unisegmented, with 3 naked distal setae and 2 naked lateral elements. Endopod unisegmented, with 1 lateral spinulose element, and 4 distal naked setae.

Maxillule (Figure 3f) well developed. Praecoxal arthrite with 2 rows of spinules, with 2 naked seta, 3 spinulose and 1 naked spine, and 2 surface setae. Coxal endite with 1 long naked spine-like element, and 1 long naked seta. Basis with 6 naked setae. Exopod unisegmented, small, squarish, with 1 naked and 1 spinulose setae. Endopod unisegmented, with 3 long naked setae.

Maxilla (Figure 3g). Syncoxa with 2 short rows of spinules on anterior surface as figured. With 3 endites; proximal endite with 1 plumose and 1 naked seta; middle endite with 1 naked seta; distal endite with 3 naked setae. Allobasis transformed into 1 very strong spinulose claw.

Table. Comparison of some female characters of the species of the genera *Ameiropsis*, *Ameiropsyllus*, *Pseudoameiropsis*, and *Biameiropsis*.

Genera	Species	A2 Exp numb. of seg.	Mxp Syncoxa number of setae	Armature Formula										P1 length of Enp1/Exp	P1 length of Enp-1/Enp 2+3	P1	Reference
				P1		P2		P3		P4		P5					
				Exp	Enp	Exp	Enp	Exp	Enp	Exp	Enp	Exp	Baseoendopod				
Ameiropsis	*A. brevicornis* Sars, 1907	2	1	0.1.023	1.1.120	1.1.223	1.1.221	1.1.323	1.1.321	1.1.323	1.1.221	5	4	1	1.8	Not prehensile	Sars, 1907 Lang, 1948
	A. longicornis Sars, 1907	2	1	0.1.023	1.1.120	1.1.223	1.1.221	1.1.323	1.1.321	1.1.323	1.1.221	5	5	1.2	2.75	Not prehensile	Sars, 1907 Kunz, 1975
	A. mixta Sars, 1907	2	1	0.1.023	1.1.120	1.1.223	1.1.221	1.1.323	1.1.321	1.1.323	1.1.221	5	4	1.2	2.6	Not prehensile	Sars, 1907 Lang, 1948
	A. nobilis Sars, 1911	2	2	0.1.023	1.1.120	1.1.223	1.1.221	1.1.323	1.1.321	1.1.323	1.1.221	6	4	1	2	Not prehensile	Sars, 1911 Guille and Soyer, 1966
	A. angulifera Sars, 1911	2	1	0.1.023	1.1.120	0.1.223	1.1.221	0.1.323	1.1.321	0.1.323	1.1.221	6	5	1	1.6	Not prehensile	Sars, 1911
	A. minor (Sars, 1920)	2	1	0.1.022	1.1.120	1.1.223	1.1.221	1.1.323	1.1.221	1.1.223	1.1.221	5	4	1.4	2.5	Not prehensile	Lang, 1948 Sars, 1920
	A. reducta Apostolov, 1973	2	1	0.1.023	1.1.120	0.1.123	0.0.121	0.1.123	0.0.121	0.1.223	0.0.121	5	4	1.4	2.2	Not prehensile	Apostolov, 1973
	A. australis Kunz, 1975	2	1	0.0.023	1.1.120	1.1.123	1.1.121	1.1.123	1.1.221	1.1.223	1.1.221	5	5	1	1.6	Not prehensile	Kunz, 1975
	A. martinis Gee, 2009	2	1	0.0.023	1.1.120	1.1.123	1.1.121	1.1.123	1.1.221	1.1.323	1.1.221	5	5	1	1.5	Not prehensile	Gee, 2009
	A. robinsoni Gurney, 1927	2	?	0.0.023	1.1.020	1.1.223	1.1.221	1.1.323	1.1.221	1.1.323	1.1.221	4	4	1	1.1	Not prehensile	Lang, 1948

Table. (Continued).

Ameiropsyllus	*A. ariana* (Monard, 1928)	2	0	0.0.023	1.1.120	0.0.223	0.1.121	0.1.323	0.1.121	0.1.223	0.1.121	5	3	0.75	1	Not prehensile	Monard, 1928 Lang, 1948
	A. monardi (Bodin, 1979)	2	2	0.0.023	1.1.120	0.1.223	0.1.121	0.1.323	0.1.121	0.1.323	0.1.121	5	3	0.68	1	Not prehensile	Bodin, 1979
Biameiropsis	*B. barrowensis* Karanovic, 2006	1	1	0.1.023	1.1.120	1.1.223	1.1.221	0.1.323	1.1.321	1.1.223	1.1.221	5	4	1.2	1.8	Not prehensile	Karanovic, 2006
	B. abbreviata Sars, 1911	1	2	0.1.023	1.1.120	0.1.223	1.1.221	0.1.323	1.1.221	0.1.223	1.1.221	5	4	1.2	2.4	Not prehensile	Sars, 1911
Pseudoameiropsis	*P. argentinus* Pallares, 1982	2	1	0.1.023	1.1.120	0.1.123	0.1.021	0.1.223	0.1.121	0.1.223	0.1.121	5	5	1.5	5.2	Prehensile	Pallares, 1982
	P. suphankaraytugi **sp. nov.**	2	2	0.1.023	1.1.120	0.1.123	1.1.221	0.1.223	1.1.221	0.1.323	1.1.221	5	5	1.5	4.6	Prehensile	Holotype

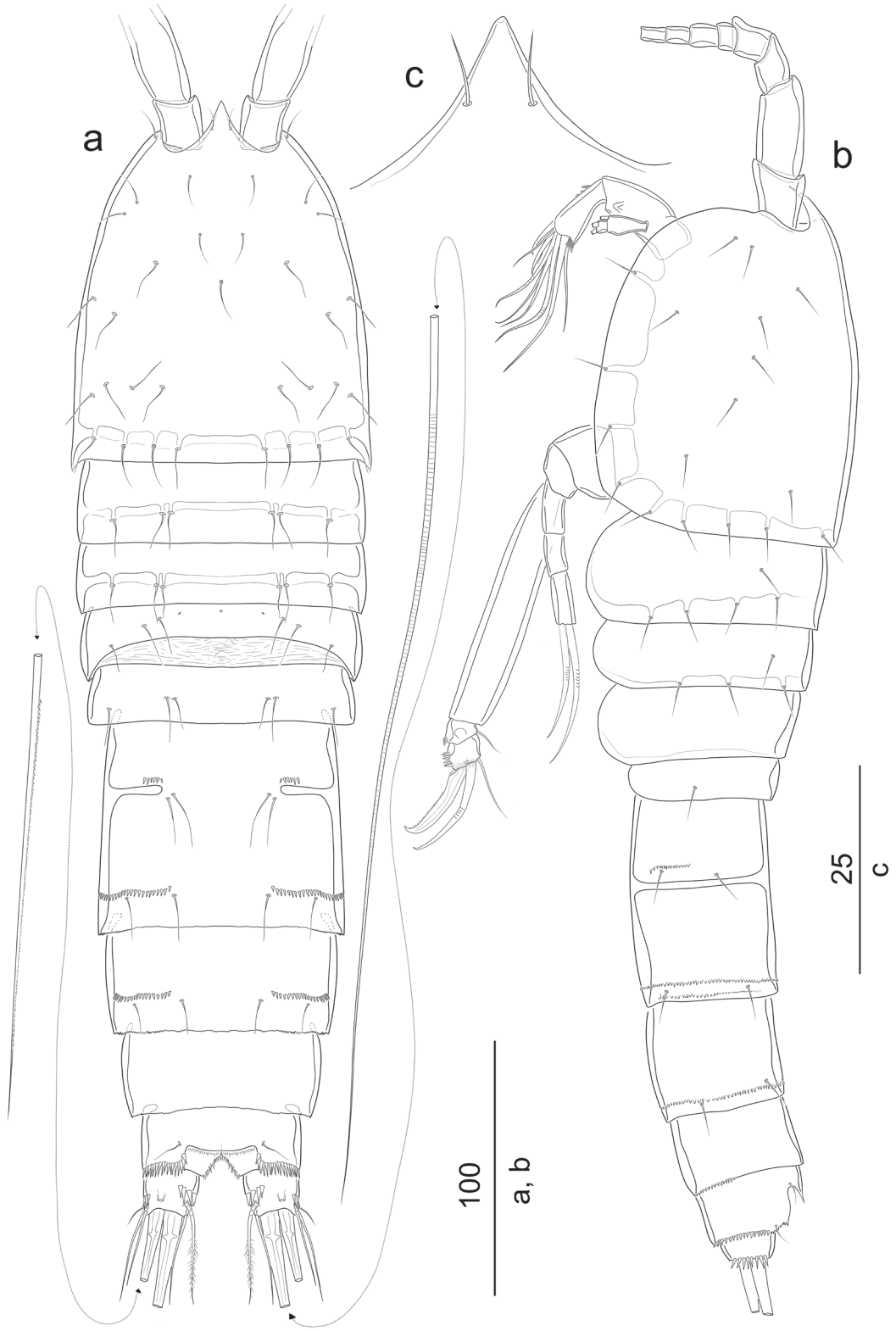

Figure 1. *P. suphankaraytugi* **sp. nov.**, holotype, ♀, habitus: a) dorsal, b) lateral, c) rostrum.

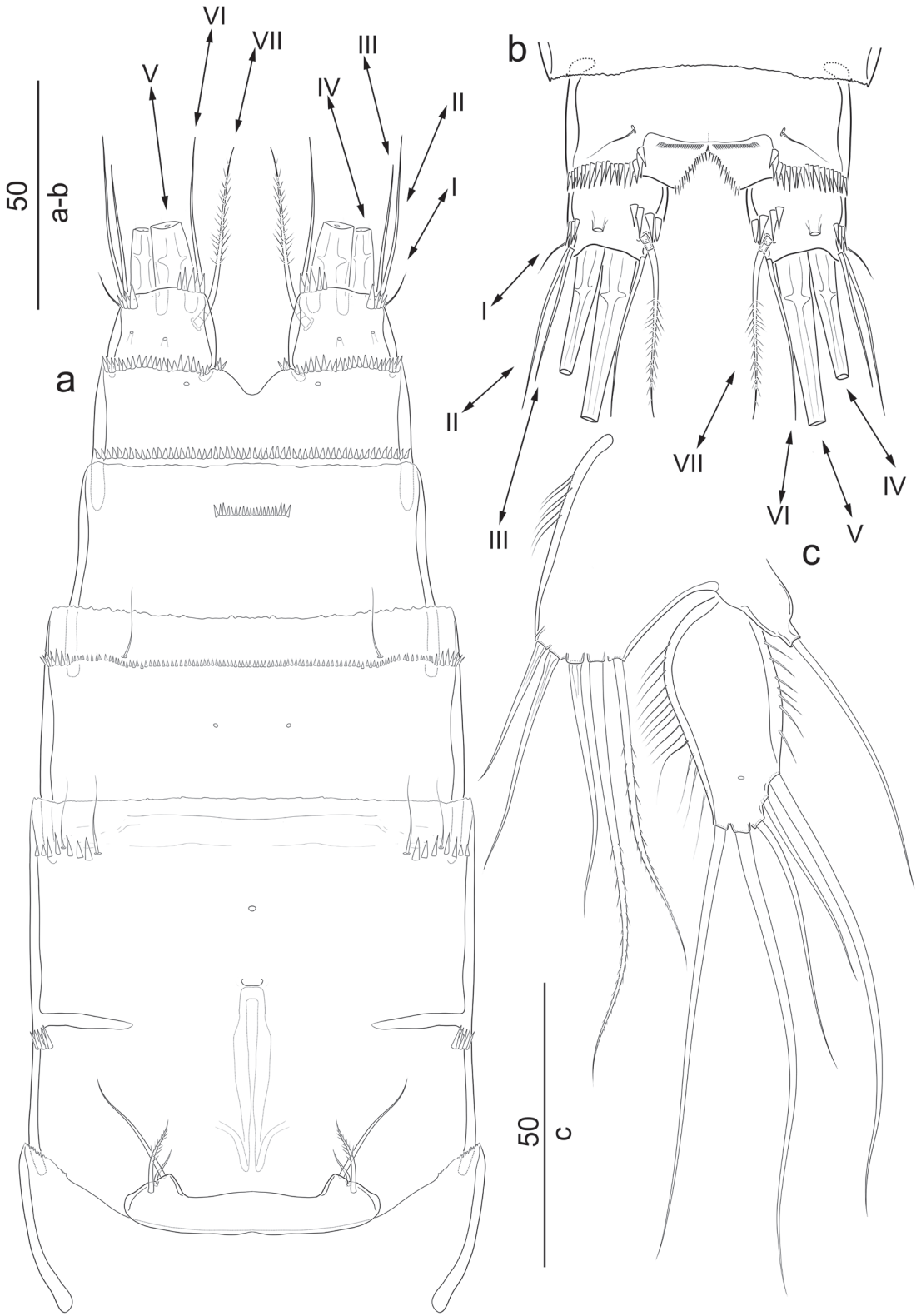

Figure 2. *P. suphankaraytugi* **sp. nov.**, holotype, ♀: a) urosome, ventral; b) anal somite and caudal rami, dorsal; c) P5.

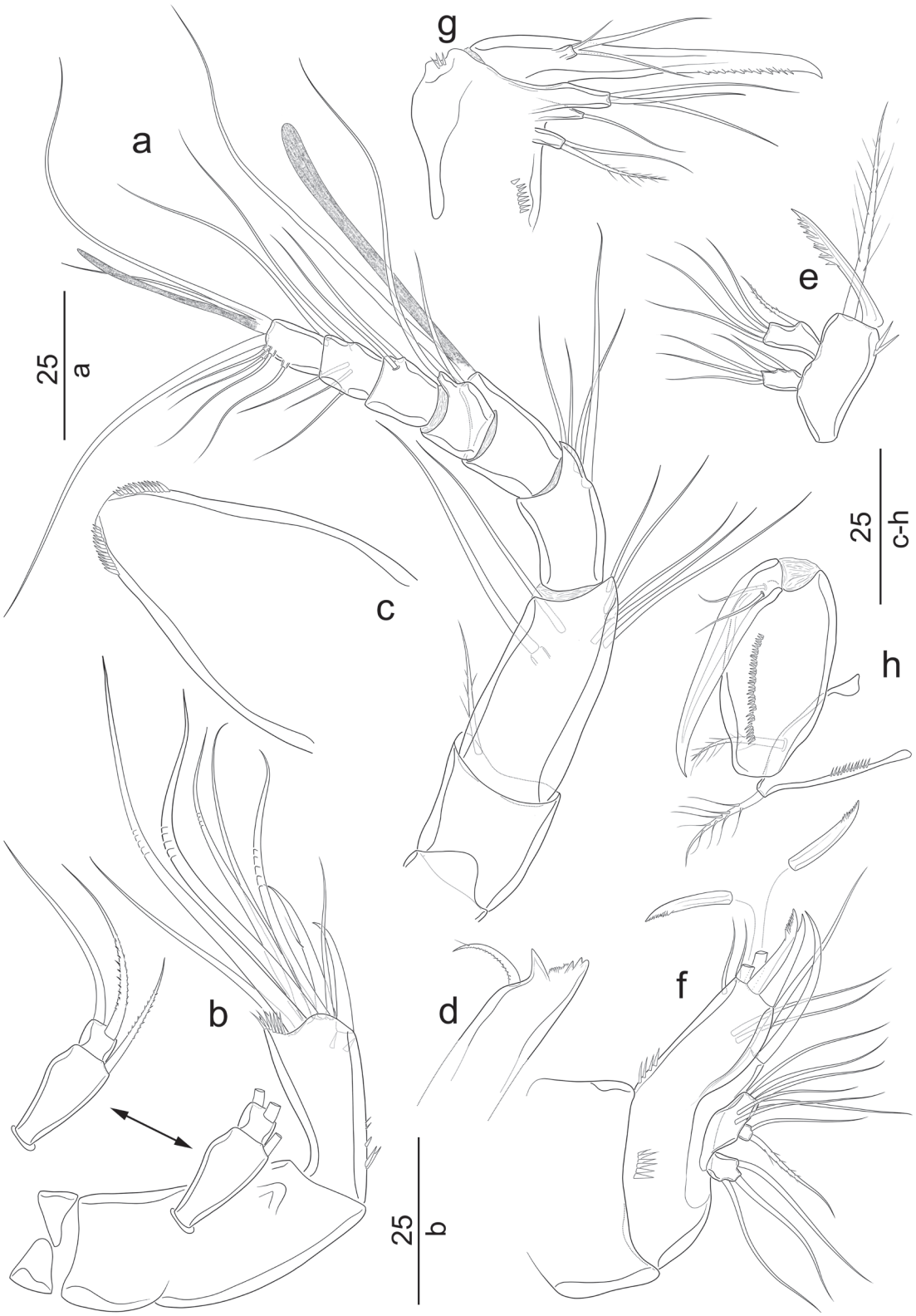

Figure 3. *P. suphankaraytugi* **sp. nov.**, holotype, ♀: a) A1, b) A2, c) labrum, d) mandibular gnathobase, e) mandibular palp, f) maxillule, g) maxilla, h) maxilliped.

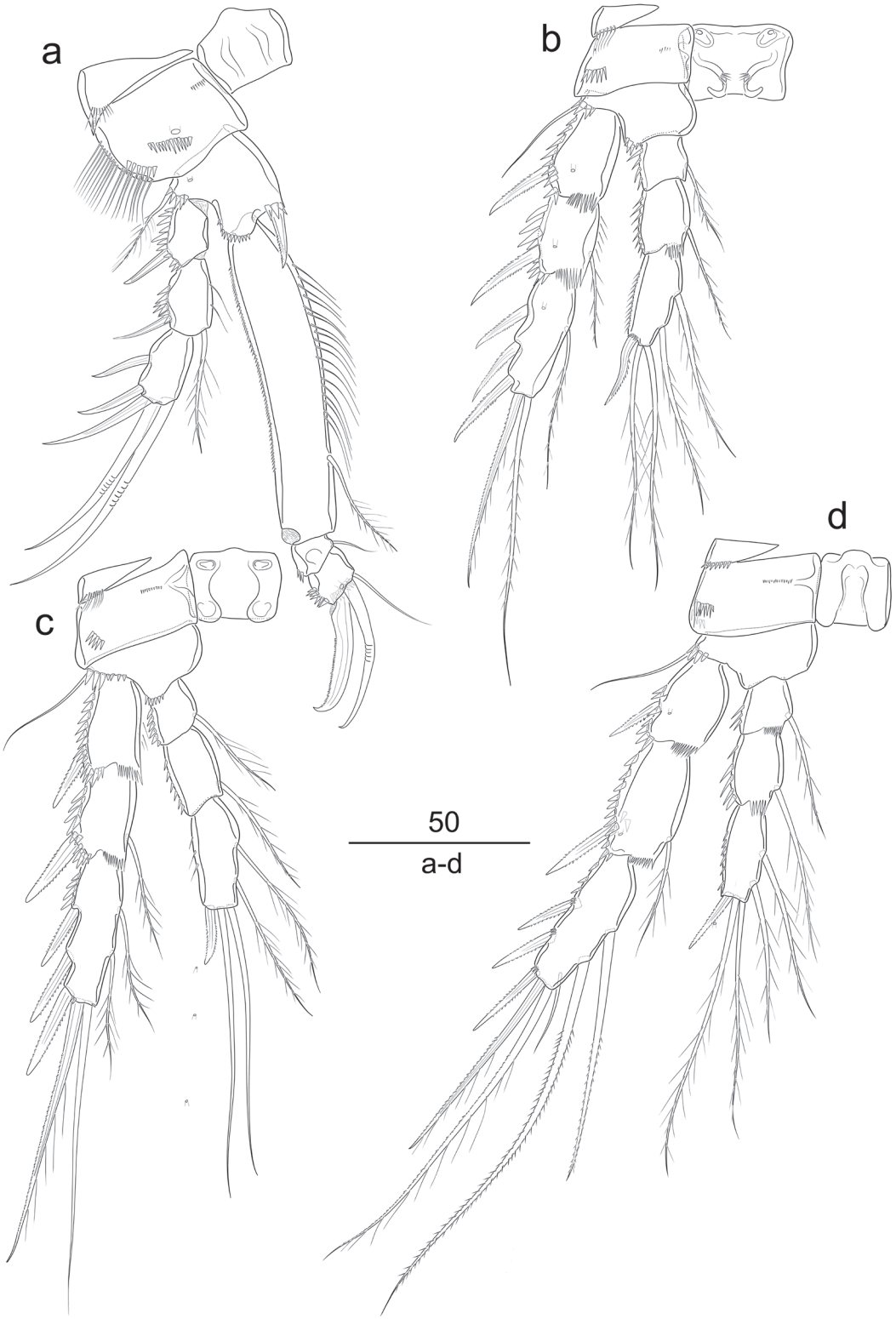

Figure 4. *P. suphankaraytugi* **sp. nov.**, holotype, ♀, swimming legs, anterior: a) P1, b) P2, c) P3, d) P4.

Endopod very short, incorporated to allobasis, with 1 minute naked seta, and 2 relatively long naked elements fused basally.

Maxilliped (Figure 3h). Syncoxa with inner row of spinules, with 2 plumose setae. Basis about 2 times as long as wide, with row of inner spinules at anterior surface, unarmed. Endopod transformed into 1 strong curved claw, with 2 accessory naked setae near its base.

P1–P4 (Figures 4a–4d). Praecoxa triangular, with 1 row of spinules near outer corner. Intercoxal sclerites as figured.

P1 (Figure 4a). Coxa squarish, with long outer setules, 3 rows of spinules as figured, and 1 pore on anterior surface. Basis with 1 pore on anterior surface, with strong spinules at base of outer and inner elements and with smaller spinules between rami, with 1 plumose outer seta and 1 unipinnate inner spine. Endopod 3-segmented, prehensile; first segment elongated, about 5.3 times as long as wide, with small outer spinules and with long setules along 2/3 of inner margin proximally, with 1 inner plumose seta; second segment very short, with 1 naked inner seta; third segment slightly longer than previous segment, squarish, with coarse outer spinules, distally with 1 strong outer claw, 1 geniculate medial seta, and 1 inner element. Exopod three-segmented, reaching about half of enp-1; first segment with coarse outer spinules, with 1 strong outer spine, without inner armature; second segment with coarse outer spinules, with a few inner setules, and 1 plumose inner seta; third segment without ornamentation, with 3 outer spines and 2 geniculate distal setae.

P2–P4 (Figures 4b–4d). Coxa rectangular, with row of coarse spinules near outer distal corner, and with very short medial spinules. Basis with spinules as figured, outer seta naked. Endopod 3-segmented; first and second segment with coarse inner spinules, with 1 short plumose inner seta; third segment slightly elongated, with inner spinules, distally with 1 spinulose outer spine and 2 plumose (P2 and P4) or naked (P3) setae, and 2 plumose inner setae. Exopod 3-segmented; all segments with a small pore at anterior surface; first segment with coarse outer spinules, with 1 bipinnate spinulose outer spine, inner margin naked (P2, P4) or with a few fine setules (P3); second segment with coarse outer spinules, with 1 bipinnate spinulose outer spine, and with 1 short inner plumose seta; third segment elongated, about 2.7 (P2) or 3.3 (P3, P4) times as long as wide, with 3 bipinnate spinulose outer spines; and 1 long plumose seta (P2), 2 relatively short plumose elements (P3), or 2 relatively long spinulose and 1 minute naked setae (P4) at inner margin, and with 1 long unipinnate spinulose spiniform element and 1 long plumose (P2 and P4) or naked (P3) seta apically.

Armature formula of the swimming legs as follows:

	P1	P2	P3	P4
Exp	0.1.023	0.1.123	0.1.223	0.1.323
Enp	1.1.120	1.1.221	1.1.221	1.1.221

P5 (Figure 2c). Baseoendopod with proximal inner long setules, outer basal seta naked; endopodal lobe slightly elongated, with 3 naked and 2 spinulose setae. Exopod not fused to baseoendopod, elongated, about 2 times as long as wide at midline of anterior surface, with long inner setules, and long outer spinules, with 1 subdistal anterior pore, with 3 outer setae (proximal one visibly longer), 1 apical and 1 inner seta subequal in length; all setae naked.

P6 (Figure 2a). Both legs fused, forming a short and wide symmetric plate. Each pair with 1 short and plumose seta, 1 relatively long and naked element, and 1 minute seta.

Male: Unknown.

3.4. Variability

The anal operculum of one female is furnished with spinules distally.

3.5. Etymology

The species was named after Prof Dr Süphan Karaytuğ for his great contribution to copepod taxonomy.

4. Discussion

The new species described here seems to be closely related to *Ameiropsis*, *Ameiropsyllus*, *Pseudoameiropsis*, and *Biameiropsis* by the biramous mandibular palp and the structure of the female A1 (first segment not elongated) (Gee, 2009) . The genus *Pseudoameiropsis* is unique within the genera above in the strongly prehensile endopod of P1 (enp-1 being much longer than the exopod), and enp-2 and -3, which are both very small segments.

Pseudoameiropsis argentinus was described by Pallares (1982) based on 3 females only, and her analysis of the relationships between *Pseudoameiropsis* and some other genera (*Ameiropsis*, *Psyllocamptus*, *Leptomesochra*, and *Ameiropsyllus*) was made solely based on female characters. Unfortunately, despite repetitive samplings in the surveyed localities and extensive samplings along the Black Sea, the Mediterranean Sea, and the Aegean Sea coasts of Turkey, neither the male nor additional females could be found in the present study. The inclusion of the new species into the genus *Pseudoameiropsis* and its exclusion from the other genera of Ameiridae with a biramous mandibular palp was based on the strongly prehensile P1 endopod (see Table).

The new species can be separated from *P. argentinus* by i) the armature formula of P2–P4 enp-1 (with one inner seta in the new species, but unarmed in the Argentinean species), ii) the armature complement of P4 exp-3 (with 8 setae/spines in the new species, but 7 elements only in *P. argentinus*, and iii) the armature complement of P2–P4 enp-3 (555 in the new species, but 344 in *P. argentinus*). Although the general shape and the armature of P5 are very similar in both species, some minor differences were observed, especially in the ornamentation of the armature elements: the three innermost elements of P5

beseoendopod are naked in the new species, but spinulose in *P. argentinus*. Also, all setae of the P5 exopod are naked in the new species, but three of the exopodal setae (the innermost two setae and the outermost seta) are plumose in *P. argentinus*.

Although the new species described herein and *P. argentinus* share the prehensile P1 endopod, the armature complement of P2–P4 enp-1 of these species (with an inner seta in *P. suphankaraytugi*, but unarmed in the Argentinean species), and the armature complement of the maxillipedal syncoxa (with 2 setae in the new species, but with 1 seta only in the Argentinean species) could render their congeneric status doubtful. However, similar variability in the armature complement of P2–P4 enp-1 and of the syncoxa of the maxilliped is present in the other genera of the subfamily (see Table). The interspecific differences in the armature complement of the syncoxa of the maxilliped and of the swimming legs could be indicative of different lineages within each genus. However, the proposal of such lineages would be premature and would require a complete revision and rediagnosis of all the genera within Ameiridae, and the description of the males of *P. argentinus* and *P. suphankaraytugi*.

Pseudoameiropsis suphankaraytugi is the second representative of the genus, and this is also the only record of the genus outside of the South Atlantic Ocean. *Pseudoameiropsis argentinus* was originally found in washings of coralline algae collected at the eulittoral and sublittoral, and in washings of red algae (Delesseriaceae) and plankton samples taken at the north of Bahía Thetis (Tierra del Fuego, Argentina). The discovery of a new member of the genus *Pseudoameiropsis* in the Mediterranean Sea is evidence of the amphi-Atlantic distribution of the genus and indicates that the ancestral stock of the genus had already existed before the breakup of Gondwanaland during the Mesozoic, about 180 mya.

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