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Article in *Proceedings of the Biological Society of Washington* · April 2015

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A new species of the genus *Elanella* (Copepoda: Harpacticoida: Canuellidae) from the eastern Mediterranean Sea

David T. Drumm*, Pamela L. Neubert, and Hadas Lubinevsky

(DTD) EcoAnalysts, Inc., Moscow, Idaho 83843, e-mail: ddrumm@ecoanalysts.com
(PLN) Stantec, Inc., Bourne, Massachusetts 02532, e-mail: Pamela.Neubert@stantec.com
(HL) National Institute of Oceanography, Israel Oceanographic and Limnological Research (IOLR), Haifa, 31080, Israel, e-mail: hadas@ocean.org.il

Abstract.—A new species, *Elanella haifensis*, is described from off the coast of Israel, collected in depths ranging from 9.8–22.4 m. It is easily distinguishable from congeners by the spinulate bulbous setae III and IV of the female caudal ramus, and the shape of the male antennule. A new diagnosis is presented for the genus *Elanella*. This is the first record of the genus in Mediterranean waters.

Keywords: *Elanella*, Israel, Mediterranean Sea, meiofauna

The Canuellidae is considered the most plesiomorphic family of the Harpacticoida, but there is doubt about its monophyly due to the extreme variability exhibited among genera (Por 1984). The only synapomorphy uniting the family is the reduced, non-sexually dimorphic P5, which is represented by only four setae (Por 1984). Por (1984) erected the genus *Elanella* to accommodate *E. elanitica* (Por 1967), described from the Red Sea and originally placed in the genus *Canuella* T. & A. Scott, 1893. Only one other species has been described, *E. paenelanitica* (Fiers, 1982), from off the coast of Papua New Guinea. The family is mainly Indo-Pacific in distribution.

During a monitoring survey of the meiofaunal community along the coast of Israel, a new species of *Elanella* was discovered. We provide an illustrated description of the new species and present a new diagnosis for the genus.

Materials and Methods

Samples were collected from shallow subtidal areas off the coast of Israel by using a van Veen Grab (20 L volume). Specimens were fixed in 10% formalin and transferred to 70% ethanol. They were examined and dissected in glycerol. Dissected appendages were mounted on slides in glycerol. All drawings were prepared using a drawing tube on a Wild M12 microscope.

The descriptive terminology is adopted from Huys et al. (1996). Abbreviations used in the text are: enp, endopod; exp, exopod; P1–P5, first to fifth thoracopod. Type material is deposited at the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM).

Systematics

Family Canuellidae Lang, 1944
Genus *Elanella* Por, 1984

Diagnosis (modified after Por 1984).—First pedigerous somite free. Antennal exopodite 7-segmented. Armature of the

* Corresponding author.

terminal leg segments: exopodites, 7.7.5.5; endopodites, 5-6.5.4.4. P1-P3 endopod longer than exopod. First endopod segment of P2 in the male with a produced and blunt apophysis. Petasma of reduced size, with two short and stout pinnate spines.

Elanella haifensis, new species

Figs. 1-6

Type locality.—Haifa, Israel (32°51.835'N, 35°03.187'E, eastern Mediterranean Sea).

Material examined.—Holotype: 1 ♀ (USNM 1270794) from type locality, 13.2 m, coll. H. Lubinevsky, 24 Apr 2013. Allotype: 1 ♂ (USNM 1270795), 31°56.7568'N, 34°41.3702'E, 20.10 m, coll. H. Lubinevsky, 16 Oct 2013. Paratypes: 20 ♀♀, 21 ♂♂ (USNM 1270796) from type locality, 13.2 m, coll. H. Lubinevsky, 24 Apr 2013; 4 ♀♀, 11 ♂♂ (USNM 1270797), 32°53.480'N, 35°03.921'E, 13.4 m, coll. H. Lubinevsky, 9 Sept 2013; 69 ♀♀, 93 ♂♂ (USNM 1270798), 31°56.5092'N, 34°41.1319'E, 22.10 m, coll. H. Lubinevsky, 16 Oct 2013; 17 ♀♀, 52 ♂♂ (USNM 1270799), same locality as allotype.

Additional material.—4 ♀♀, 3 ♂♂, 32°53.765'N, 35°03.880'E, 13.5 m, coll. H. Lubinevsky, 9 Sept 2013; 1 ♀, 3 ♂♂, 32°54.548'N, 35°04.070'E, 10.6 m, coll. H. Lubinevsky, 9 Sept 2013; 9 ♀♀, 11 ♂♂, 32°54.029'N, 35°03.903'E, 12.6 m, coll. H. Lubinevsky, 24 Apr 2013; 2 ♀♀, 3 ♂♂, 32°53.480'N, 35°03.921'E, 13.4 m, coll. H. Lubinevsky, 24 Apr 2013; 18 ♀♀, 7 ♂♂, 32°54.558'N, 35°04.098'E, 9.8 m, coll. H. Lubinevsky, 24 Apr 2013; 14 ♀♀, 14 ♂♂, 31°56.594'N, 34°41.1735'E, 22.34 m, coll. H. Lubinevsky, 16 Oct 2013; 18 ♀♀, 21 ♂♂, 31°56.7658'N, 34°41.3702'E; 43 ♀♀, 95 ♂♂, 31°56.5088'N, 34°41.3839'E, 17.09 m, coll. H. Lubinevsky, 16 Oct 2013; deposited at the Natural History Museum in Haifa, Israel. 46 ♀♀, 86 ♂♂, 31°56.4902'N, 34°41.6226'E, 19.54 m, coll.

H. Lubinevsky, 16 Oct 2013; 45 ♀♀, 54 ♂♂, 31°56.5089'N, 34°41.2539'E; 10 ♀♀, 20 ♂♂, 31°56.1603'N, 34°41.5796'E, 12.44 m, coll. H. Lubinevsky, 16 Oct 2013; 10 ♀♀, 11 ♂♂, 31°56.4394'N, 34°41.1911'E, 20.53 m, coll. H. Lubinevsky, 16 Oct 2013; 7 ♀♀, 12 ♂♂, 31°57.1842'N, 34°41.5893'E, 19.81 m, coll. H. Lubinevsky, 16 Oct 2013; retained in the author's collection (DTD) at EcoAnalysts, Inc.

Description of female.—Total body length of holotype 1.45 mm (measured from tip of rostrum to posterior margin of caudal rami). Body tapering posteriorly. Largest width measured at posterior margin of cephalic shield, 275 µm. Entire surface dorsally and ventrally covered with minute denticles (Fig. 1A, B).

Prosome (Fig. 1A, B) comprising cephalosome and four free pedigerous somites, P1-bearing somite separated from the cephalosome but concealed by cephalic shield in dorsal aspect (Fig. 1B). Ornamentation consisting of few sensilla. Pleural areas of cephalic shield narrow and posterolateral angles rounded. Prosomites without distinct hyaline frills and with smooth posterior margins.

Rostrum (Figs. 1A, B, 2C) well developed, elongated and bell-shaped with round anterior apex; with pair of sensilla near anterior margin.

Urosome (Fig. 1A, B) five-segmented, comprised of P5-bearing somite, genital double-somite, and three free abdominal somites. P-5 bearing somite with few sensilla.

Genital double-somite with original segmentation indicated by lateral, dorsal, and ventral sutures. Genital field as in Fig. 2A.

Anal operculum (Fig. 1A) weakly developed.

Caudal rami (Figs. 1A, B, 2B) divergent, 2.9 times as long as wide; mid-dorsal carina along almost entire length and tapering distally; with seven setae. Seta I short and with one setule subdistally, located ventrally near outer margin; seta II pinnate,

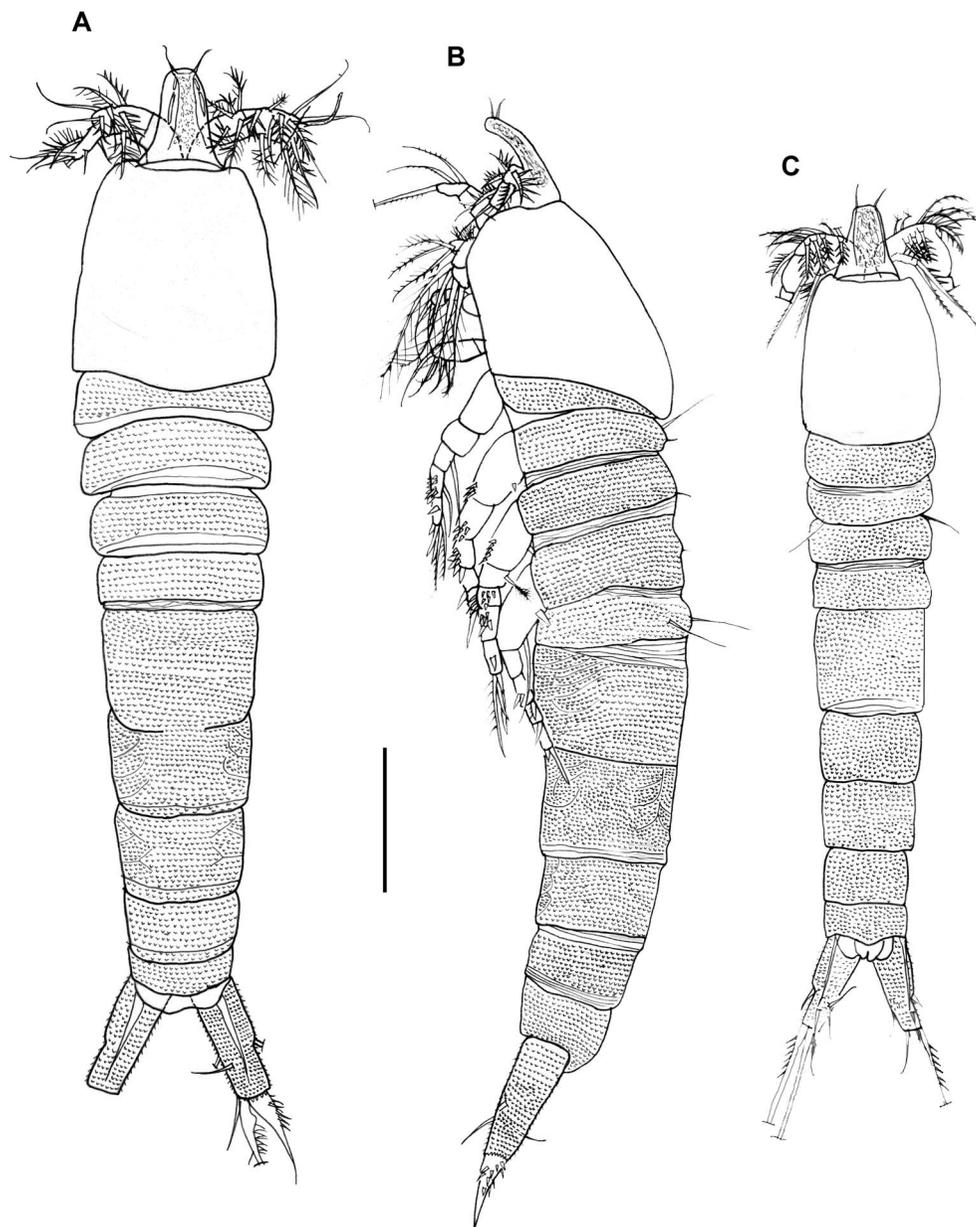


Fig. 1. *Elanella haifensis*. A, female holotype, habitus, dorsal; B, female holotype, habitus, lateral; C, male allotype, habitus, dorsal. Scale bar = 0.2 mm.

located dorsally near distal margin. Distal margin with three setae; seta III rather short, bulbous, and densely spinulate basally, narrowing abruptly mid-length, crenulate proximally; seta IV long, bulbous, basally spinulate and distally pinnate; seta

V short and bipinnate; seta VI setulate, located ventrally near inner margin; seta VII plumose, short, tri-articulate at base, located dorsally near inner margin.

Antennule (Fig. 2C, D) apparently three-segmented. First segment longest, with

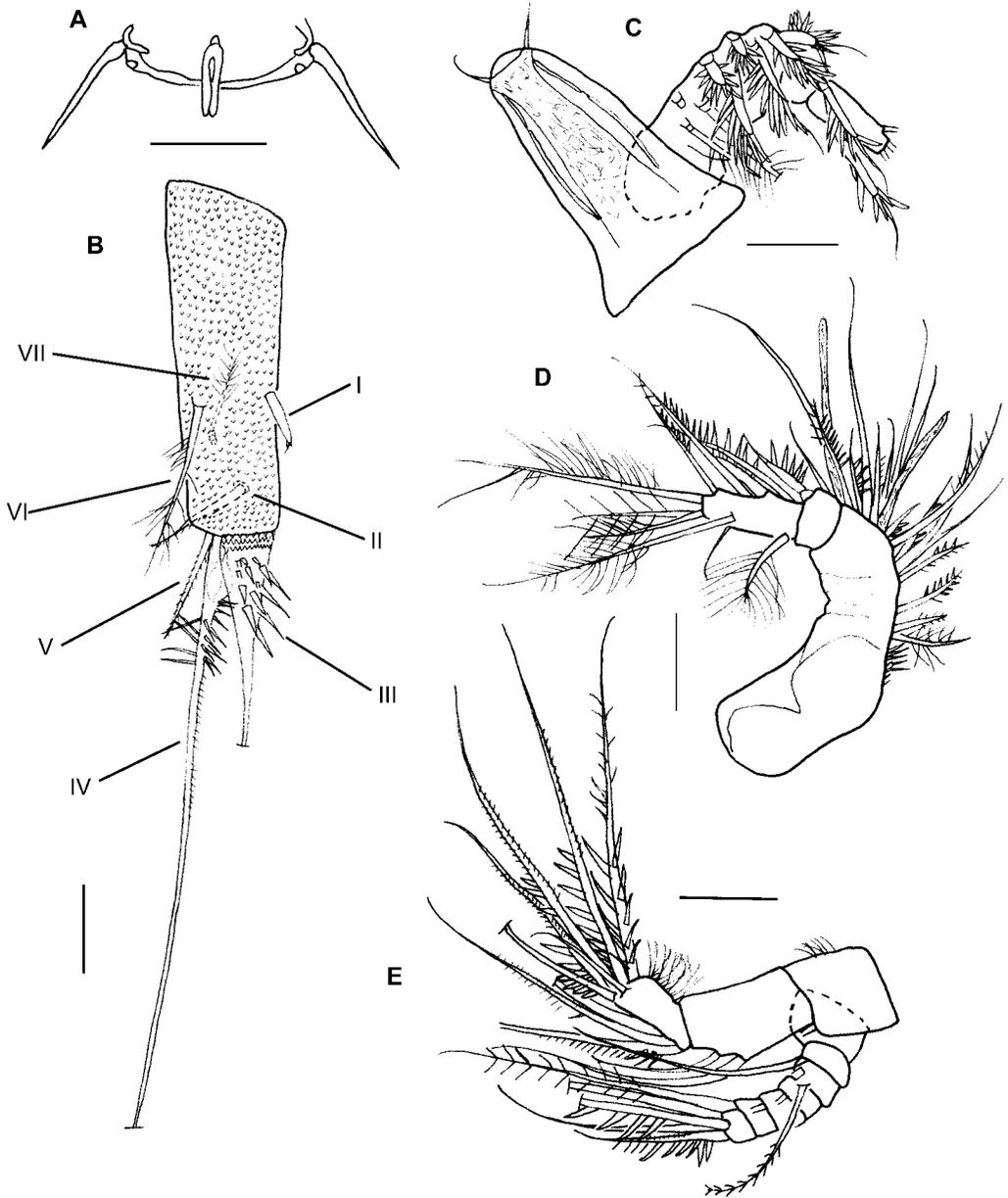


Fig. 2. *Elanella haifensis*, female. A, genital field; B, caudal ramus, ventral; C, rostrum and antennule, dorsal (showing only dorsal setae); D, antennule, ventral; E, Antenna. Scale bars = 0.05 mm.

several incomplete sutures but no functional articulations; with about nine dorsal pinnate setae bi-articulate at base, and several pinnate and naked setae and two aesthetascs on inner margin (exact number of setae difficult to determine). Middle

segment short, with two pinnate and one naked seta. Distal segment with one proximal plumose seta on outer margin, several pinnate setae on inner and distal margins (exact number difficult to determine), and one naked seta distally on outer margin.

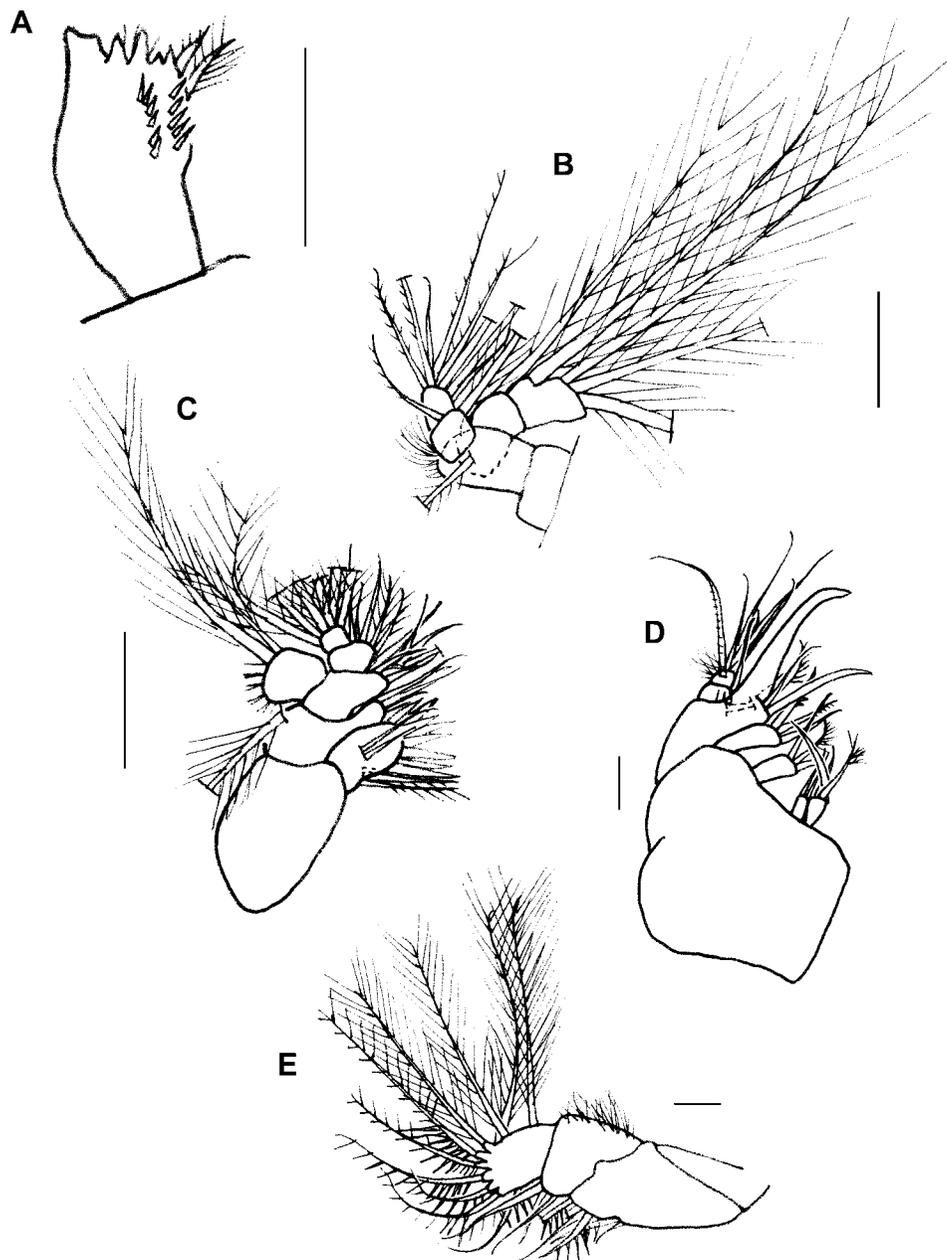


Fig. 3. *Elanella haifensis*, female. A, mandible gnathobase; B, mandibular basis, endopod, and exopod; C, maxillule; D, maxilla; E, maxilliped. Scale bars: A–C = 0.05 mm; D, E = 0.02 mm.

Antenna (Fig. 2E) with two-segmented endopod and seven-segmented exopod. Basis with short hairs on inner margin. Endopod with two naked setae on proximal segment; distal segment with four lateral and four apical pinnate setae,

and one naked subdistal seta. Exopod segments 1–6 with one pinnate seta; terminal segment with three pinnate setae.

Mandible (Fig. 3A, B): gnathobase (Fig. 3A) with five teeth, the four weaker teeth

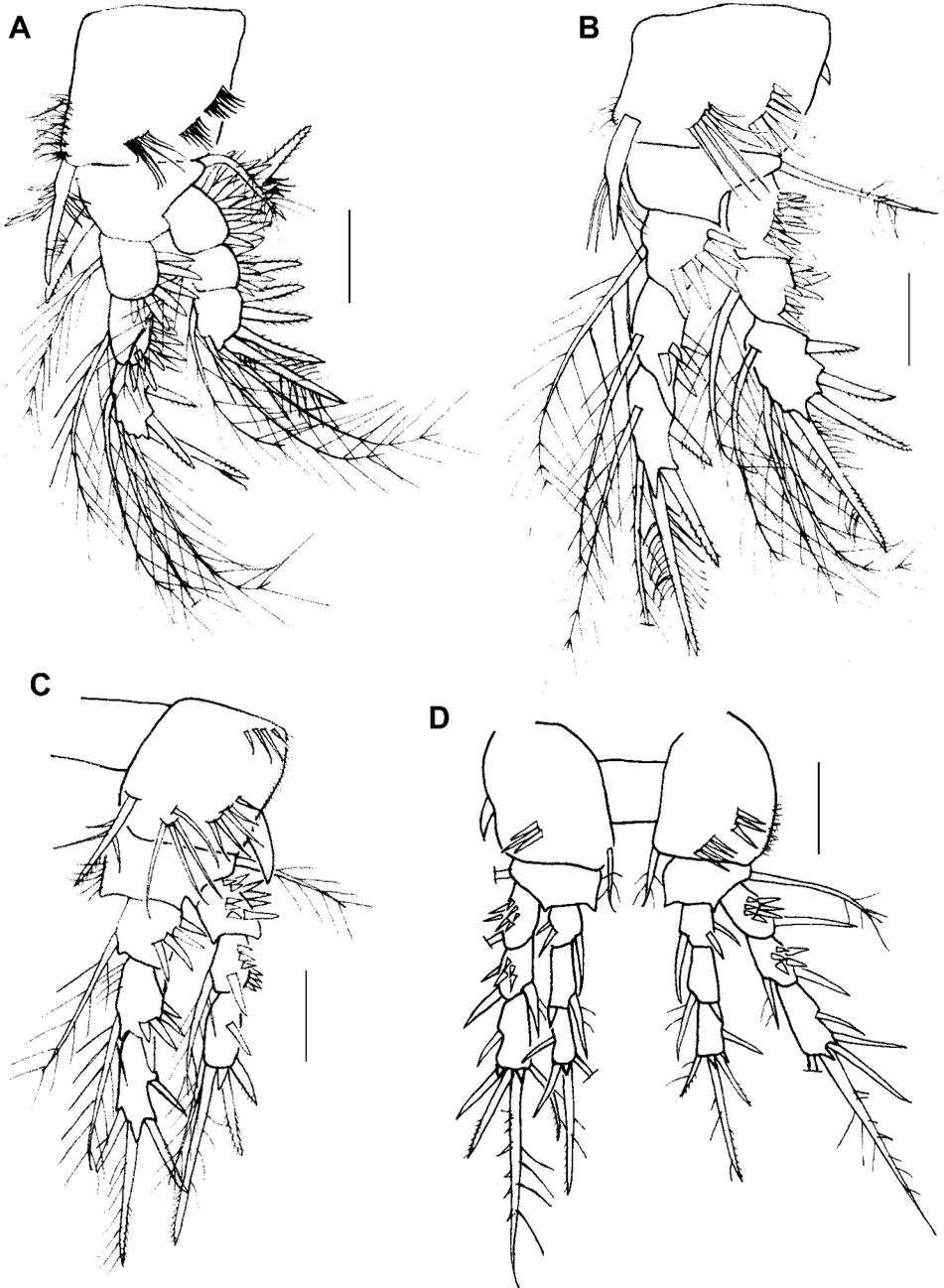


Fig. 4. *Elanella haifensis*, female. A, P1; B, P2; C, P3; D, P4. Scale bars = 0.05 mm.

with accessory spines; dorsal corner with two plumose setae; with two rows of spinules around dorsal margin. Basis with one plumose seta and long hairs on distal margin. Endopod two-segmented, enp-1 with one plumose and one pinnate seta;

enp-2 with six pinnate and two simple setae. Exopod three-segmented, with setal formula [1, 1, 4]; all setae plumose.

Maxillule (Fig. 3C): precoxal arthrite with eight spines, two pinnate setae, one simple posterior seta, and two simple

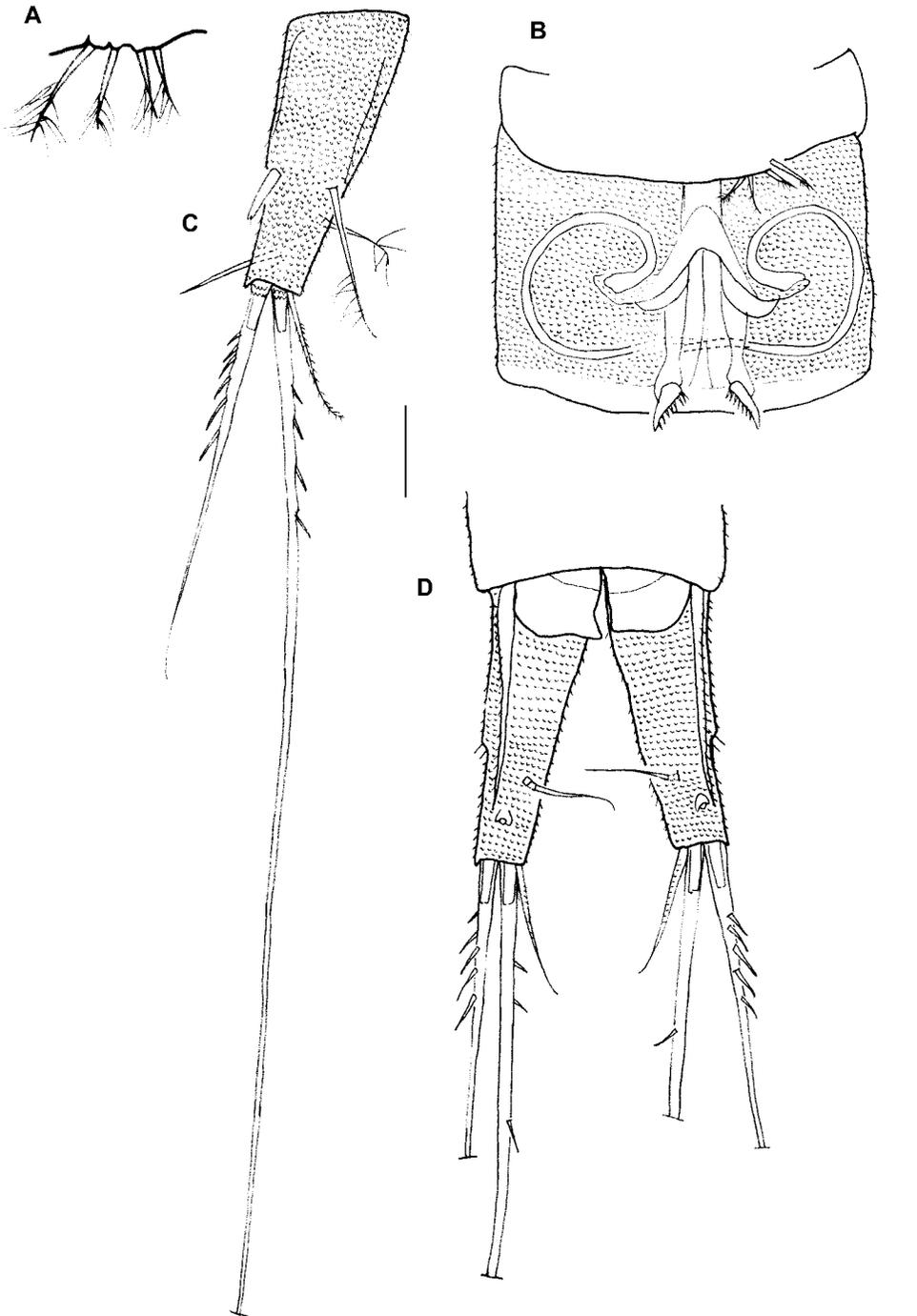


Fig. 5. *Elanella haifensis*. A, female P5. Male. B, genital field; C, caudal ramus, ventral; D, caudal rami, dorsal. Scale bars = 0.05 mm.

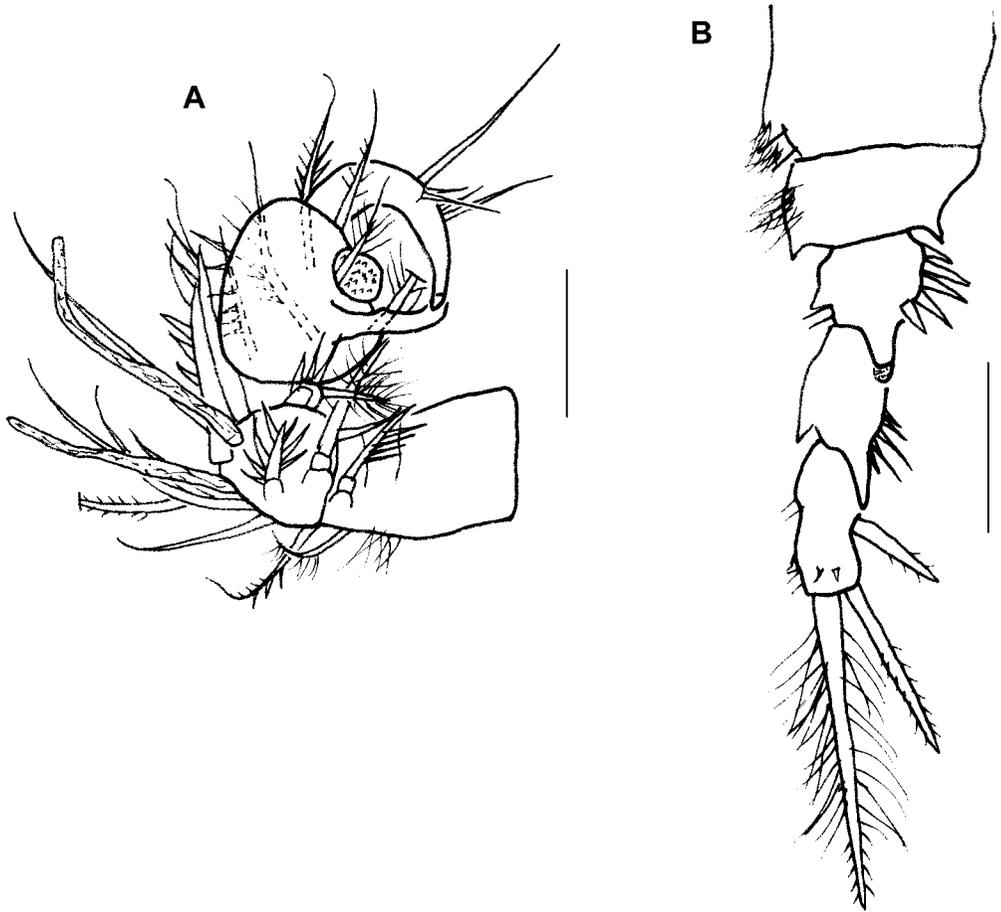


Fig. 6. *Elanella haifensis*, male. A, antennule; B, P2 endopod. Scale bars = 0.05 mm.

anterior setae. Coxa endite with five simple setae and one epipodal plumose seta. Basis with seven simple setae, four long and three short. Endopod two-segmented; enp-1 with two plumose and three simple setae; enp-2 with six plumose setae. Exopod one-segmented, with seven plumose setae, the two shortest setae at each end.

Maxilla (Fig. 3D): precoxa and coxa fused, with two endites each; precoxal endites with three and two setae; coxal endites with three setae. Basis hook-like, extended, with five setae. Endopod two-segmented, with about nine setae.

Maxilliped (Fig. 3E): coxa with four pinnate and two naked setae. Basis with one pinnate and two simple setae; outer

margin with hairs. Endopod with ten setae, four outer plumose and the remaining inner setae pinnate.

Swimming legs 1–4 (Fig. 4A–D) biramous, P1–P4 with three-segmented endopod and three-segmented exopod. Endopods longer than exopods, except P4 where the endopod is shorter than the exopod. Coxa with thick pinnate seta on inner distal corner and hook-like outer spine of P2–P4.

P1 (Fig. 4A): coxa with several rows of spinules on anterior surface and hairs on outer margin. Basis with outer seta bearing long setules; thick inner pinnate seta. Enp-1 with seven outer spinules and one long inner plumose seta; enp-2 with 12–13 outer spinules and one long inner plumose seta;

enp-3 with six setal elements; three outer pinnate setae, one terminal and two inner plumose setae. Exp-1 with 18–20 outer naked spinules and one long pinnate outer spine; exp-2 shortest, with seven spinules and one long pinnate outer spine, and one long inner plumose seta; exp-3 with seven setal elements, comprising four outer pinnate and one terminal and two inner plumose setae.

P2 (Fig. 4B): coxa similar to P1. Basis similar to P1 but without thick inner seta. Enp-1 with five outer spinules and one long inner plumose seta; enp-2 with five outer spinules and one long inner plumose seta; enp-3 with five setal elements, comprising two outer pinnate setae, one terminal seta with long and short setules, and two inner plumose setae. Exp-1 with about 16 outer spinules; exp-2 shortest, with about 12 outer spinules and one long inner plumose seta; exp-3 with seven setal elements, comprising three outer pinnate setae, one terminal seta with long and short setules, and three inner plumose setae.

P3 (Fig. 4C): coxa and basis similar to P2. Enp-1 with four outer spinules and one long inner plumose seta; enp-2 with four outer spinules and one long inner plumose seta; enp-3 with four setal elements, comprising two outer naked (pinnate?) setae, one terminal seta with long and short setules, and one inner seta with few setules. Exp-1 with ten outer spinules; exp-2 subequal to exp-1, with seven or eight outer spinules and one long inner plumose seta; exp-3 with five setal elements, comprising three outer pinnate setae, one terminal seta with long and short setules, and one inner plumose seta.

P4 (Fig. 4D): coxa and basis similar to other pereopods. Enp-1 with two outer spinules and one inner spine; enp-2 with one inner seta bearing a few setules; enp-3 with four setal elements, comprising two outer pinnate setae and two terminal setae with long and short setules. Exp-1 with seven short spinules and one long outer spine; exp-2 subequal to exp-1 with five

short spinules and one long outer spine; one inner seta with a few setules; exp-3 with five setal elements, comprising three outer naked (pinnate?) setae, and two terminal setae with long and short setules.

P5 (Fig. 5A) represented by four setulate setae.

Spine and seta formulae for P2–P4 as follows:

	Exopod	Endopod
P2	0.1.313	1.1.212
P3	0.1.113	1.1.022
P4	0.1.113	1.1.022

Description of male.—Sexual dimorphism in body size, antennule, P2, and caudal ramus was observed. Male smaller and more slender than female. Body length of allotype (Fig. 1C) 1.16 mm (measured from tip of rostrum to posterior margin of caudal rami). Greatest width measured at posterior margin of cephalic shield: 200 μ m.

Genital field (Fig. 5B) with two short and stout pinnate spines.

Caudal rami (Fig. 5C–D): setae III and IV without bulbous base and with fewer spinules than female.

Antennule (Fig. 6A) of the chirocer type, appearing to have 5 segments; first segment with some incomplete sutures, two pinnate setae, and hairs on inner margin; second segment with about seven pinnate setae (exact number difficult to determine with certainty), five simple setae, and two aesthetascs; third segment short with one plumose seta on outer margin; penultimate segment swollen, with six pinnate setae, large distal tooth and denticulate distal structure; ultimate segment claw-like, closing against penultimate tooth and bearing five simple setae mid-way.

P2 (Fig. 6B): outer margin of enp-1 produced into blunt cylindrical process.

Etymology.—The specific name refers to the type locality: Haifa, Israel.

Distribution.—Eastern Mediterranean off the coast of Israel (Fig. 7).

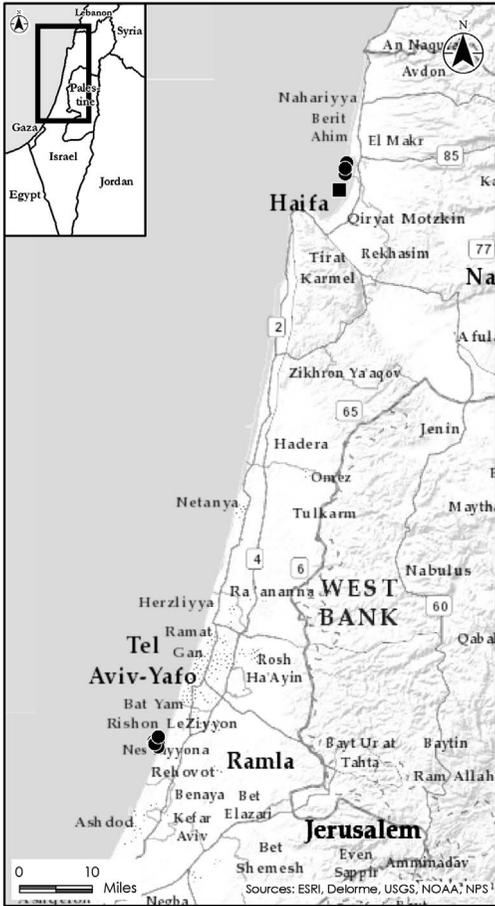


Fig. 7. Map showing collection sites and type locality (square) of *Elanella haifensis*.

Discussion

The new species is placed in the genus *Elanella* due to the male genital field (petasma) with the characteristic two short and stout pinnate spines, armature of the terminal leg segments, seven-segmented antennal exopodite, and sexual dimorphism of the P2 first endopod segment. Por (1984) diagnosed the genus as having five setal elements on the third segment of the P1 endopod. However, the new species and *E. paenelanitica* (of which Por was apparently unaware) have six setal elements. The new diagnosis accounts for this discrepancy. Our new species also keys out to *Elanella* using Huys et al. (1996).

Elanella haifensis can easily be distinguished from its congeners by its bulbous caudal ramal setae III and IV in the female. This type of sexual dimorphism is also present in other canuellid genera [i.e., *Scottolana* (Mu and Huys, 2004)], as well as several species in the genus *Amphiascoides* (Family Miraciidae; Lee et al. 2007). The penultimate segment of the male antennule has a large distal tooth, which is apparently absent or smaller in the other two congeners. Fiers (1982) illustrated the male genital field of *E. paenelanitica* with two long, slender setae adjacent to the two stout spines. These setae were not observed in the new species. *Elanella haifensis* is also smaller than the other congeners (♀, 1.45 mm compared to 1.70 mm).

The antennule is three-segmented. The other two congeners were described as having a five-segmented antennule, but the authors may have misinterpreted the incomplete sutures as functional articulations. It must also be noted that Mu and Huys (2004) described the canuellid, *Scottolana geei* Mu and Huys, 2004, as having three antennular segments.

This is the first record of the genus occurring in Mediterranean waters. Some canuellid species, i.e., *Canuellina insignis* Gurney, 1927 and *Scottolana longipes* I.C. Thompson and A. Scott, 1903, are found in both the Mediterranean and Red seas and are considered Indo-Pacific immigrants (Por & Marcus 1973). Por (1967, 1969) noted the faunal differences between the two northern Red Sea gulfs (Gulf of Suez and the Gulf of Aqaba, also known as the Gulf of Eilat); some of the Gulf of Suez inhabitants (i.e., *S. longipes*) have migrated to the Mediterranean Sea, while those found in the Gulf of Aqaba (i.e., *E. elanitica*) have not.

Elanella haifensis is often collected together with the canuellids *Scottolana longipes*, *Canuellina insignis*, and *Canuella* sp.; the miraciids *Diosaccus truncatus* Gurney, 1927 and an unidentified species; a laophontid, *Asellopsis* sp.; the ectinosomatid *Halectinosoma* cf. *elongatum* (G.O.

Sars, 1904); and a longipediid, *Longipedia* sp. *Elanella haifensis* is the largest harpacticoid copepod in the region where it was discovered, and is common.

Acknowledgments

The senior author would like to thank Jeffrey R. Cordell (Univ. of Washington) and Matthew Hill (EcoAnalysts, Inc.) for providing useful publications to assist with the description of this new species. We are grateful to Brendan “Chip” Barrett (EcoAnalysts, Inc.) for reviewing an early draft of the manuscript. The authors thank the captain and crew of the R/V Etziona of the Israel Oceanographic and Limnological Research (IOLR) and the research assistants of the marine ecology laboratory of IOLR and Geno Carpentier for producing the map.

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Associate Editor: Christopher Boyko.