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Original Article

Description of two new epigean species of the genus *Hyalella* S.I. Smith, 1874 (Crustacea: Amphipoda: Hyalellidae) from Jalisco, Mexico

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ABSTRACT

Two new species of *Hyalella* S.I. Smith, 1874 are described from state of Jalisco, Mexico. *Hyalella marysolae* sp. nov. can be identified by the presence of small projections or carinae on pleonites 1–2, with the first antenna being composed of 12 articles and the second antenna being composed of 15 articles. The first maxilla bearing 2–3 distal pappose setae, and the propodus in male first gnathopod is hammer-shaped. Conversely, in *H. morronei* sp. nov., dorsal projections or carinae are absent on pleonites 1–2, with the first antenna being composed of 10 articles and the second antenna of 14 articles. The first maxilla always bears two distal pappose setae, and the propodus in male first gnathopod is hatchet-shaped. Both species are distinguishable from other *Hyalella* species found in Mexico by the second antenna. In these two species, the second antenna is approximately half as long as the total body length, and the peduncle comprises 14 –15 articles; whereas, in other Mexican species, it is shorter and composed of maximum 12 articles. Here, we add two species to the four previously described in Mexico as it is necessary to increase the knowledge of the alpha taxonomy of this group of crustaceans and compensate for the biodiversity of the genus being underestimated.

KEYWORDS

Freshwater, Neotropical region, new species, scud, species complex

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INTRODUCTION

Studies on freshwater amphipods in Mexico are scarce, with most of them focusing on subterranean environments (Marrón-Becerra et al., 2014). Nevertheless, *Hyalella* S.I. Smith, 1874 is a ubiquitous element of the epigean freshwater communities in Mexico, and other parts of the Americas. The genus *Hyalella* comprises a widespread group of freshwater endemic amphipods from the Americas, with distribution from Alaska, United States, all the way to Patagonia, Argentina (Bousfield, 1996; Gonzalez and Watling, 2002). More than 90 species have been formally described, most of which inhabit South America, especially Brazil with 37 species (Rangel et al., 2022). Because of their abundance in several water bodies, those amphipods are a key link in the nutrient and matter cycling, transferring energy from microorganisms, or primary producers, to higher trophic levels, such as birds, fish, reptiles, and macroinvertebrates (Brown and Fredickson, 1986; González and Watling, 2003; Gonzalez et al., 2006; Rogers et al., 2010; Wellborn and Cothran, 2004). Due to their ubiquity, crucial role in the trophic web, and close relation with sediment, most studies on these organisms focus on ecotoxicological experiments concerned with heavy metals and chemicals, including medicine or pesticides effects (Novoa-Luna et al., 2016; Poynton et al., 2018). Meanwhile, the alpha taxonomy of the group is still largely unknown, and its real biodiversity underestimated.

Presently, there are nine species of *Hyalella* formally described from Mexico: one from Durango (*Hyalella tepehuana* Marrón-Becerra, Hermoso-Salazar and Rivas, 2020), six from Veracruz (*Hyalella alvarezi* Marrón-Becerra and Hermoso-Salazar, 2022, *Hyalella azteca* (de Saussure, 1858), *Hyalella garyi* Marrón-Becerra and Hermoso-Salazar, 2022, *Hyalella villalobosi* Marrón-Becerra and Hermoso-Salazar, 2022, *Hyalella viviannae* Marrón-Becerra and Hermoso-Salazar, 2022, and *Hyalella sarukhani* Marrón-Becerra and Hermoso-Salazar, 2022), and two from the Yucatan Peninsula (*Hyalella cenotensis* Marrón-Becerra, Hermoso-Salazar and Solís Weiss, 2014, and *Hyalella maya* Marrón-Becerra, Hermoso-Salazar and Solís-Weiss, 2018). The aim of this study is to describe two new species from the state of Jalisco, Mexico, which constitute the first records of the genus *Hyalella* in this state.

MATERIAL AND METHODS

Study area

During a recent population study of crayfish of the genus *Cambarellus* Ortmann, 1905 in Jalisco, two previously undescribed species of *Hyalella* were collected from the El Tajo and Teuchitlán streams which empty into La Vega Dam, a RAMSAR site since 2010 (SEMADET, 2014) (Fig. 1).

The El Tajo stream is a narrow and shallow stream near the town of Teuchitlán, in the middle of corn and sugarcane fields with macrophytes in the surrounding littoral zone. In contrast, the Teuchitlán stream is located in the middle of the town and is somewhat wider (6 m) and deeper (1.3 m) with floating vegetation, such as *Lemna* sp. or *Pistia stratiotes* L., 1753.

Sampling

The material examined was collected using a 50 cm diameter net with 0.50 cm mesh size at 30 cm depth, near the roots of macrophytes. Then organisms were stored in 90% ethanol. The temperature (°C), dissolved oxygen = DO (mg/l), salinity (‰), and pH were measured with a YSI 556 multiparameter instrument with a precision of 0.01 units.

Identification

The total body length of the amphipods was measured following the dorsal outline of the body, from the base of the first antenna to the base of the telson, using an ocular micrometer, calibration slide, and segmented tool line in ImageJ software (following Gonzales and Watling, 2002; James and McClintock, 2017). The appendages were dissected and mounted on semi-permanent glycerol slides and permanent Entellan® slides to be described, drawn, and measured with an ocular micrometer. For the identification of morphological characteristics, the same pattern as the previous descriptions of *Hyalella* from Mexico was used. Descriptions were based on the holotypes, considering the variations within the paratypes. Namely, the following characteristics were analyzed; the relative length of appendages, number, shape, and

arrangement of the setae of the mouthparts, antennae, gnathopods, pereopods, uropods, and telson following Gonzales and Watling (2002), Marrón-Becerra et al. (2014), Soucek et al. (2015), Marrón-Becerra et al. (2018), and Marrón-Becerra et al. (2020). The whole specimens were examined under a Leica M125 stereomicroscope equipped with a camera lucida. Mouthparts and appendages were examined under a Leica DM100 compound microscope also equipped with a camera lucida. The terminology used for the setae follows Zimmer et al. (2009). Illustrations were digitized in Adobe Illustrator 24.0. The morphological variation observed among specimens of each species is reported. The type material is deposited in the Colección Nacional de Crustáceos (CNCR), at the Instituto de Biología, on the Universidad Nacional Autónoma de México (UNAM). The distribution map was made using QGIS 3.16 (QGIS, 2021) software.

SYSTEMATICS

Order Amphipoda Latreille, 1816

Suborder Senticaudata Lowry and Myers, 2013

Infraorder Talitrida Rafinesque, 1815

Parvorder Talitridira Rafinesque, 1815

Superfamily Talitroidea Rafinesque, 1815

Family Hyalellidae Bulyčeva, 1957

Genus *Hyalella* S. I. Smith, 1874

***Hyalella marysolae* sp. nov.**
(Figs. 2–6)
http://zoobank.org/urn:lsid:zoobank.org:act:68D260B8-6FD1-4440-9156-1CBB0BE15FF0

Etymology. This species is named in honor of Montserrat Marysol Ayón, the beloved daughter of the third author.

Type material. Holotype: male, body size 4.8 mm, cephalothorax size 0.49 mm (CNCR 35778), from El Tajo stream (Fig. 1A, B), in Teuchitlán, state of Jalisco, Mexico (20°40'40.49"N 103°52'13.4"W), 6 April 2018, 1,265 m.a.s.l., temperature 25.5 °C, pH 6.8, associated with roots of *Pistia stratiotes* Linnaeus, 1753, A. Marrón-Becerra, M. Ayón-Parente, and M. Hermoso-Salazar collectors. Paratypes (30 males, 30 females): males mean body size 3.9 ± 0.4 mm, mean cephalothorax length 0.39 ± 0.06 mm (n = 27), female mean body size 4.8 ± 0.6 mm, cephalothorax length 0.55 ± 0.12 mm (n = 30) (permanent slides CNCR 35779, male paratypes CNCR 357780, and female paratypes CNCR 35781), collected from the same locality as the holotype.

Diagnosis. Pleonites 1–2 with short dorsoposterior carina. Coxa 4 excavated posteriorly. Eyes pigmented, black. Antenna 1 shorter than antenna 2 without accessory flagellum. Antenna 2 less than half of body length, almost reaching seventh pereonite. Maxilla 1 palp short, reaching less than half of length between base of palp and tip of setae of outer plate, with 1 short stout distal seta and with setules; inner plate slender with 2–3 strong pappose apical setae. Maxilla 2 inner plate with 2 strong pappose setae on inner margin, simple setae and serrate setae on distal margin. Gnathopod 1 propodus hammer-shaped, palm with transverse slope, inner face with 2–5 serrate setae, comb scales on distoposterior and distoanterior border, carpus inner face lobe with 5 serrate setae. Gnathopod 2 basis posterior margin with 1 slender seta, merus without medial seta, palm with wide excavation. Uropod 1 male inner ramus without curved setae. Uropod 3, ramus slightly longer than peduncle, styliform and with 4 cuspidate setae of variable length. Telson as long as wide or wider, distal margin rounded or truncated with 2 long widely separated simple setae. Sternal gills on segments 3–7.

Description of males based on holotype (CNCR 35778) and paratypes. Body, pleonites 1–2 with short dorsoposterior carina (Fig. 2A). Epimeral plates 1–3 slightly acuminate. Coxae 1–3 (Fig. 2A) subequal in shape, subrectangular, longer than wide; coxa 1 shorter than coxae 2–3. Coxa 4 wider than coxae 1–3, with deep posterior excavation; coxae 1–4 slightly overlapping anterior coxa, distal margin rounded with small setae widely separated, acumination absent. Coxae 5–7 reduced, shorter than coxae 1–4, bilobate

(except coxa 7), lobe of basis overlapping posterior lobe of coxa, except coxa 7; coxa 5 with 2 subequal lobes, anterior lobe slightly shorter than posterior, overlapping coxae 4 and 6; coxa 6 with 2 unequal lobes, anterior lobe reduced; coxa 7 with 1 single lobe, anterior lobe absent.

Head typically gammaridean (Fig. 2A), with smooth surface, total length less than the combined length of the first 2 pereonites, reaching half of second pereonite, rostrum absent. Eyes pigmented, medium, rounded, and black, located between the insertions of antennae 1 and 2.

Antenna 1 (Fig. 2A, B) less than half body length, about 75% the length of antenna 2, but longer than peduncle of antenna 2, almost reaching half of fifth pereonite; peduncle longer than head, reaching one-third of first pereonite, article 1 and 2 subequal in length, article 1 wider than articles 2–3, article 2 longer and wider than article 3, article 3 shorter and thinner than articles 1–2 (proportions 1.6:1.3:1), article 1 with 1 medial short cuspidate seta, and 1 cluster with 3 cuspidate setae (one shorter) at distal end; flagellum with 12 articles reduced gradually towards distal portion, flagellum longer than peduncle; 1 pair of aesthetascs on articles 4–11; accessory flagellum absent.

Antenna 2 (Fig. 2A, C) almost 1.4 times longer than antenna 1, almost half of total body length, almost reaching seventh pereonite; peduncle almost reaching middle of third pereonite, articles gradually increasing in length and decreasing in width, article 5 longer than article 4 (about 1.5 times); flagellum with 15 articles, longer than peduncle (about 1.5 times); flagellum without aesthetascs.

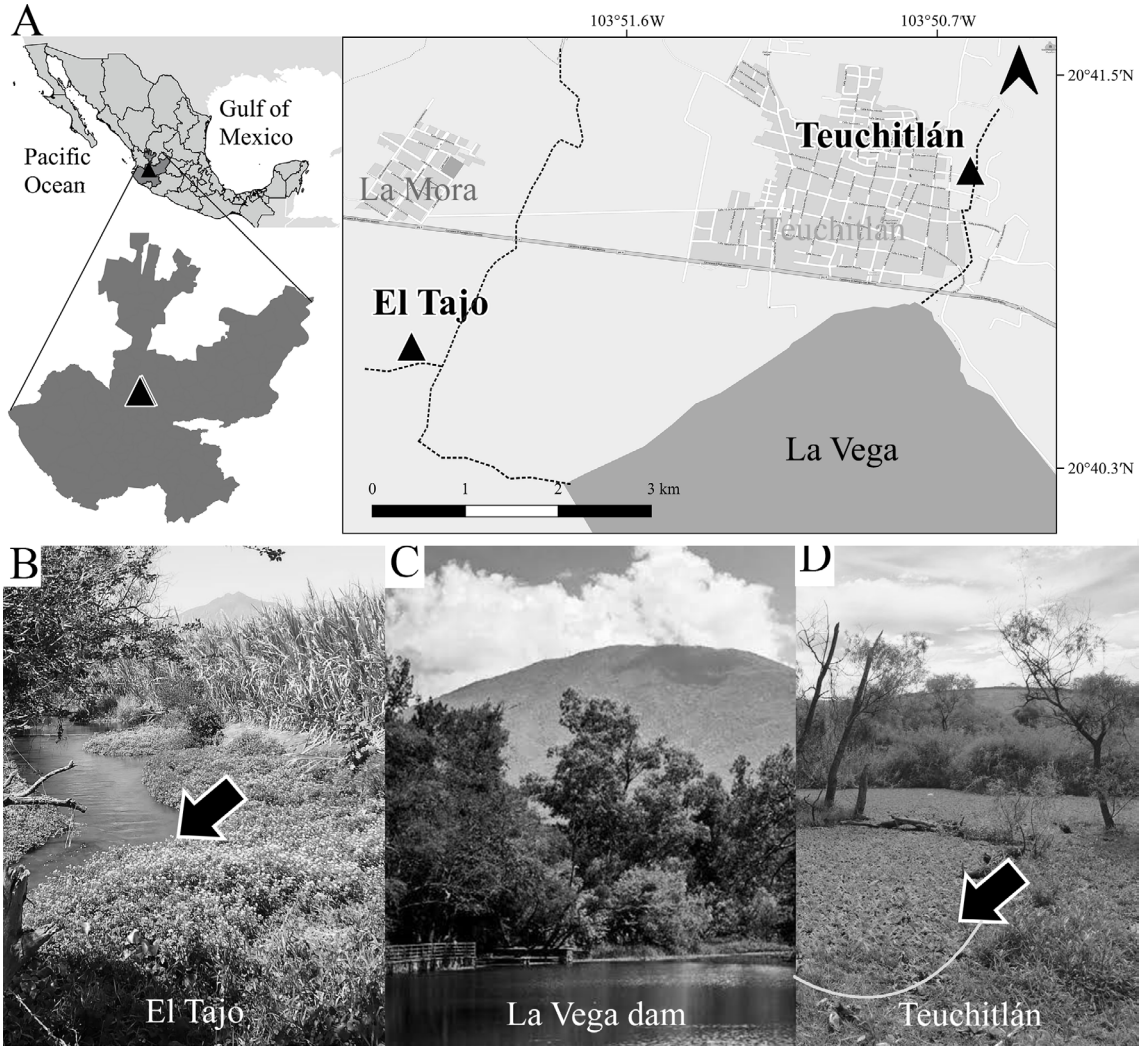

Figure 1. Type localities. (**A**) Location of streams El Tajo and Teuchitlán, La Vega system. Teuchitlán, state of Jalisco, Mexico; (**B**) El Tajo stream, arrow shows the sample site; (**C**) La Vega dam; (**D**) Teuchitlán stream, arrow shows the sample site.

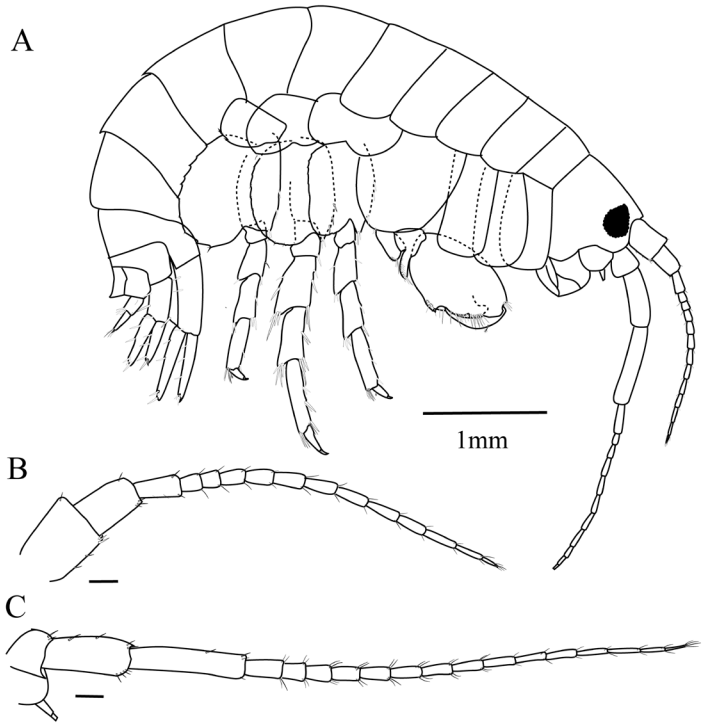

Figure 2. *Hyalella marysolae* sp. nov., male holotype 4.8 mm (CNCR 35778), El Tajo stream, Teuchitlán, state of Jalisco, Mexico. (**A**) lateral habitus; (**B**) antenna 1; (**C**) antenna 2. Scale bars: 100 μm.

Mouthparts: upper lip (Fig. 3A) distal margin rounded, with numerous setules, being longer and more distant towards lateral end. Lower lip (Fig. 3B) subquadrate, outer lobes without notches or excavations; mandibular projection of outer lobes rounded; without inner lobes.

Left and right mandibles (Fig. 3C, D) without palp, asymmetric. Incisor with 6 teeth. Left lacinia mobilis similar to incisor process, with 5 teeth; setal row on left mandible with 3 main pappose setae plus accessory setae. Right lacinia mobilis more reduced than left, with 2 pairs of asymmetric L-shaped teeth, fused at base, proximal pair longer than distal, inner margin denticulate; near lacinia mobilis base with setules on inner margin; setal row on right mandible with 2 main pappose setae plus accessory setae and with setulae near molar process. Molar process large, cylindrical, and triturative; accessory pappose setae present in both molars.

Maxilla 1 (Fig. 3E, F) palp short, vestigial, uniarticulated, longer than wide, distally pointed with 1 short stout distal seta, reaching less than half of palp length, palp length less than half distance between base of palp and base of seta on outer plate; inner plate slender, shorter than outer plate, with 2–3 pappose apical setae; outer plate with 9 apical stout serrate setae and with setules.

Maxilla 2 (Fig. 3G) plates subequal in length, width, and shape; inner plate shorter and slightly slender, with 2 pappose setae on mid-distal margin, and with 5 long serrulate setae on distal margin; outer and inner plates with large simple distal setae (type A2) and abundant setules on both distal surfaces and margins.

Maxilliped (Fig. 3H) inner plate lobe longer than outer plate lobe; distal margin slightly convex; inner plate distal margin with 3 cuspidate setae of equal size and with plumose setae, inner margin with several pappose setae; outer plate, inner and distal margins with numerous simple setae. Palp composed of 4 articles subequal in maximum length; first article with 3–4 simple setae at inner distal end and 2 setae at outer distal end; second article with numerous simple setae on inner margin and 2–3 at outer distal end; third article with several setae on distal margin, distal end on outer margin with 4–7 simple setae and comb scales, inner margin with at least 8 setae and 6 at distal end; fourth article unguiform, slightly longer than nail, with comb scales, inner margin with 4 setae near distal half, outer margin with 1 seta near nail base; nail overreaching two-thirds of fourth article in length, with serration on distal half.

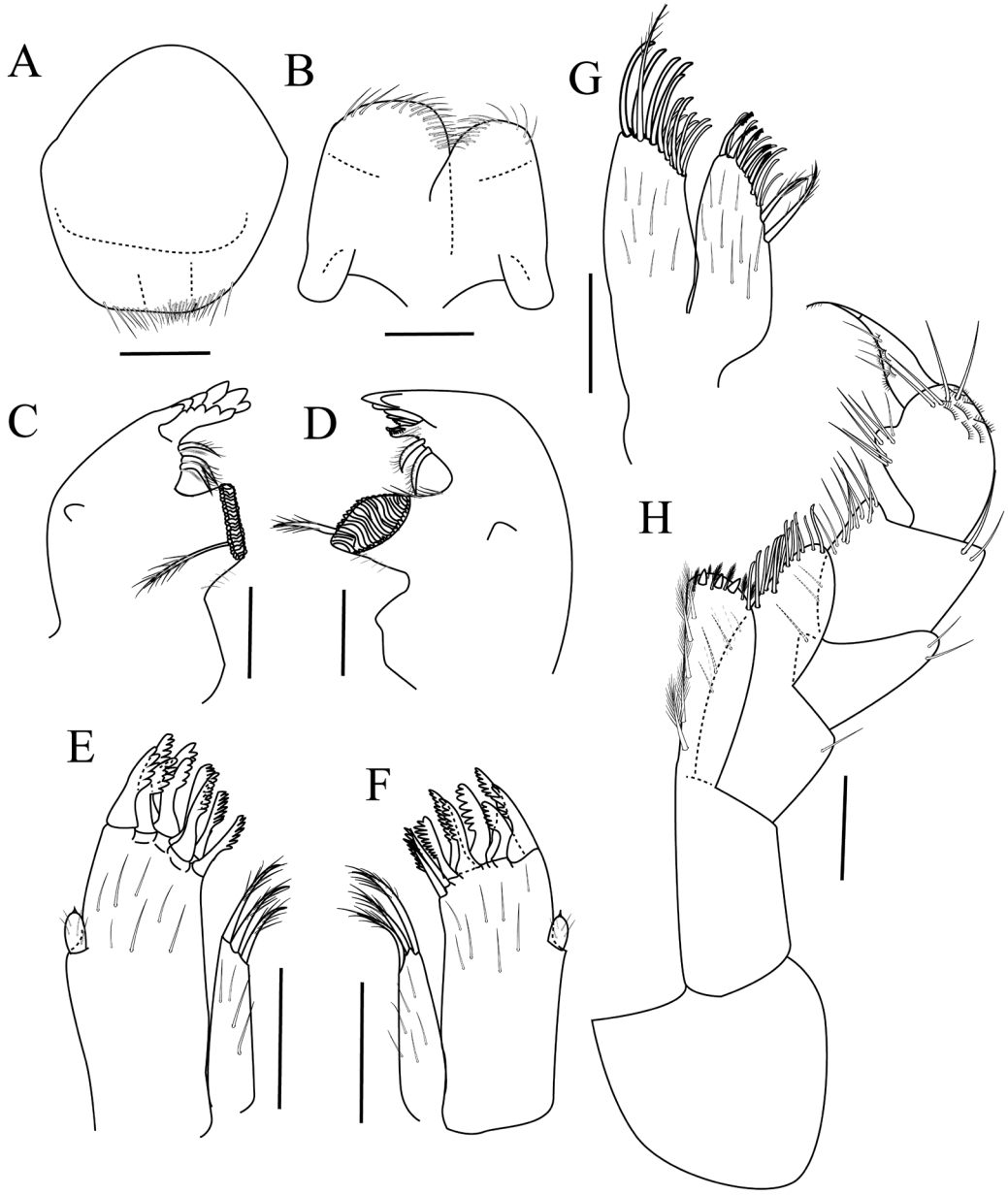

Figure 3. *Hyalella marysolae* sp. nov., male holotype 4.8 mm (CNCR 35778), El Tajo stream, Teuchitlán, state of Jalisco, Mexico. Mouth parts: (**A**) upper lip; (**B**) lower lip; (**C**) left mandible; (**D**) right mandible; (**E**) left maxilla 1; (**F**) right maxilla 1; (**G**) left maxilla 2; (**H**) right maxilliped. Scale bars: 100 μm.

Gnathopod 1 (Fig. 4A) subchelate, propodus hammer-shaped, shorter than gnathopod 2. Basis elongated, maximum length 3–3.5 times longer than maximum width; medial seta absent, posterior distal end with cluster of 2 setae. Ischium short, subquadrate, longer than wide, length almost same as maximum width of basis and maximum length of merus; distal posterior end with 1 cluster of 2 setae. Merus longer than wide, almost at midway of posterior margin with comb scales; almost at distal margin with 3–8 setae. Carpus longer than wide, slightly longer and wider than propodus, with strong, short, and wide posterior lobe forming 1 scoop-like structure open to inside; mesial surface of lobe with 2–5 serrate setae, outer surface on distal half of lobe, near margin, with comb scales and serrate setae (10), anterior distal end with 7–9 simple setae. Propodus maximum length almost 1.5 times longer than wide; inner surface near distal margin with 3–5 serrate setae in 1 row; distal anterior end with 2 clusters of approximately 5 setae; distal half of anterior and posterior surfaces with comb scales; posterior margin with 1 medial seta; palm transverse,

posterior distal end with 1 robust seta and cup for dactyl. Dactyl claw-like; nail present; anterior surface near proximal third with 1 plumose seta, with comb scales on anterior surface.

Gnathopod 2 (Fig. 4B) subchelate. Basis elongate, 4 times longer than wide; posterior margin with 1 slender seta. Ischium short, subquadrate, as long as merus. Merus short; distal end of posterior margin with 4 simple setae, medial setae absent; distal end with comb scales. Carpus shorter than propodus, length similar to merus maximum length, slightly exceeding 1.5 times the width of merus; anterodistal end with 1–3 simple setae; posterior lobe scoop-like, elongate, almost 1.5 times width of merus, with several submarginal pappose setae and comb scales. Propodus robust, ovate, 1.5 times longer than maximum width; palm oblique, shorter than posterior margin; slope slightly irregular, with several long simple setae, few short and medium setae; distal margin of palm with 1 truncated process near insertion of dactyl and with presence of 1 wide posterior excavation at base; palm posterior distal end with 2 robust setae, comb scales, and cup for dactyl. Cup for dactyl as long as space between the inner end of cup and truncated process. Dactyl claw–like, congruent with palm, occupying less than half of cup of dactyl without comb scales; outer margin proximal third with 1 plumose seta; inner margin slightly crenulated with separated setules.

Pereopods 3–7 (Fig. 5A, F) simple, gradually expanding posteriorly. Pereopod 5 shorter than 6 and 7.

Pereopod 3 (Fig. 5A), basis elongate; posterior margin with 1 simple seta; anterodistal and posterodistal ending with simple setae. Ischium subquadrate; posterodistal end with one pair of setae. Merus longer than ischium (almost 2.5 times maximum length); anterior margin with 1 robust seta; posterior margin with 5 slender simple setae (2 clusters of 2 setae plus 1 separated seta); anterodistal and posterodistal ends with 1 cluster of 4 slender setae, anterodistal end with 1 robust seta. Carpus shorter and more slender than merus; posterior margin with 4–5 stout setae plus accessory setae; posterodistal end with at least 2 slender setae; anterodistal end with at least 2–3 setae. Propodus shorter than anterior margin of merus, more slender than carpus; posterior margin with 5–6 stout setae plus accessory seta; anterodistal end with 3–5 simple setae. Dactyl claw-like, length more than half of propodus; nail present; first proximal third of anterior margin with 1 plumose seta; anterior and posterior margins with 1 simple seta near base of nail.

Pereopod 4 (Fig. 5B) similar in shape to pereopod 3 but slightly longer; coxa 4 wider than coxa 3 with posterior excavation; basis posterior margin with 1 simple seta; propodus posterior margin with 5 setae. Pereopods 5–7 (Fig.5C, E) similar in shape; basis posterior lobe rounded and denticulated.

Pereopod 7 (Fig. 5F) basis lobe widely expanded posteriorly, overreaching ischium distal margin; wider than lobes of pereopods 5 and 6; basis lobe, width almost 2.2 times as wide as basis (measured at cleft between basis and basis lobe); posterior margin with 10–11 serrations, each with 1 setule, without stout seta on distal margin; anterior margin with 3 stout setae and 1 at distal end. Dactyl length less than half of propodus.

Pleopods 1–3 similar in size and shape, not modified, biramous, elongated, ramus longer than peduncle, rami multi–annulated, with numerous plumose setae. Pleopod 1 (Fig. 5F) inner margin of peduncle distal end with 2 short retinacula (coupling hooks).

Uropod 1 (Fig. 6A) longer than uropod 2 (Fig. 6B); peduncle longer than rami, proximal half of dorsal margin with 2 dorsal cuspidate setae, distal cuspidate seta with accessory seta (type B6), inner and outer distal ends with 1 cuspidate seta; rami subequal, inner ramus slightly longer, with two dorsal and 3–4 distal cuspidate setae, outer ramus with three dorsal cuspidate setae type B6 and 4–5 distal setae; male without curved setae on inner ramus.

Uropod 2 (Fig. 6B) longer than peduncle of uropod 1; peduncle as long as rami or slightly shorter, with 2 dorsal cuspidate setae on distal half and 1 cuspidate seta at distal end; rami subequal, inner ramus slightly longer with 2 dorsal and 3 distal cuspidate setae, outer ramus with 3–5 dorsal cuspidate setae, proximal seta with accessory seta (type B6), and up to 4 distal setae.

Uropod 3 (Fig. 6C) slightly longer than peduncle of uropod 2; peduncle subrectangular, wider than ramus with 4 robust distal cuspidate setae of variable length (1 with accessory seta, type B6); inner ramus absent, outer ramus uni-articulate, slender, slightly longer than peduncle, about 2 times length of the larger seta of peduncle, basal width about 2 times apex width of ramus, with 3–7 slender apical simple setae and 1 connate seta.

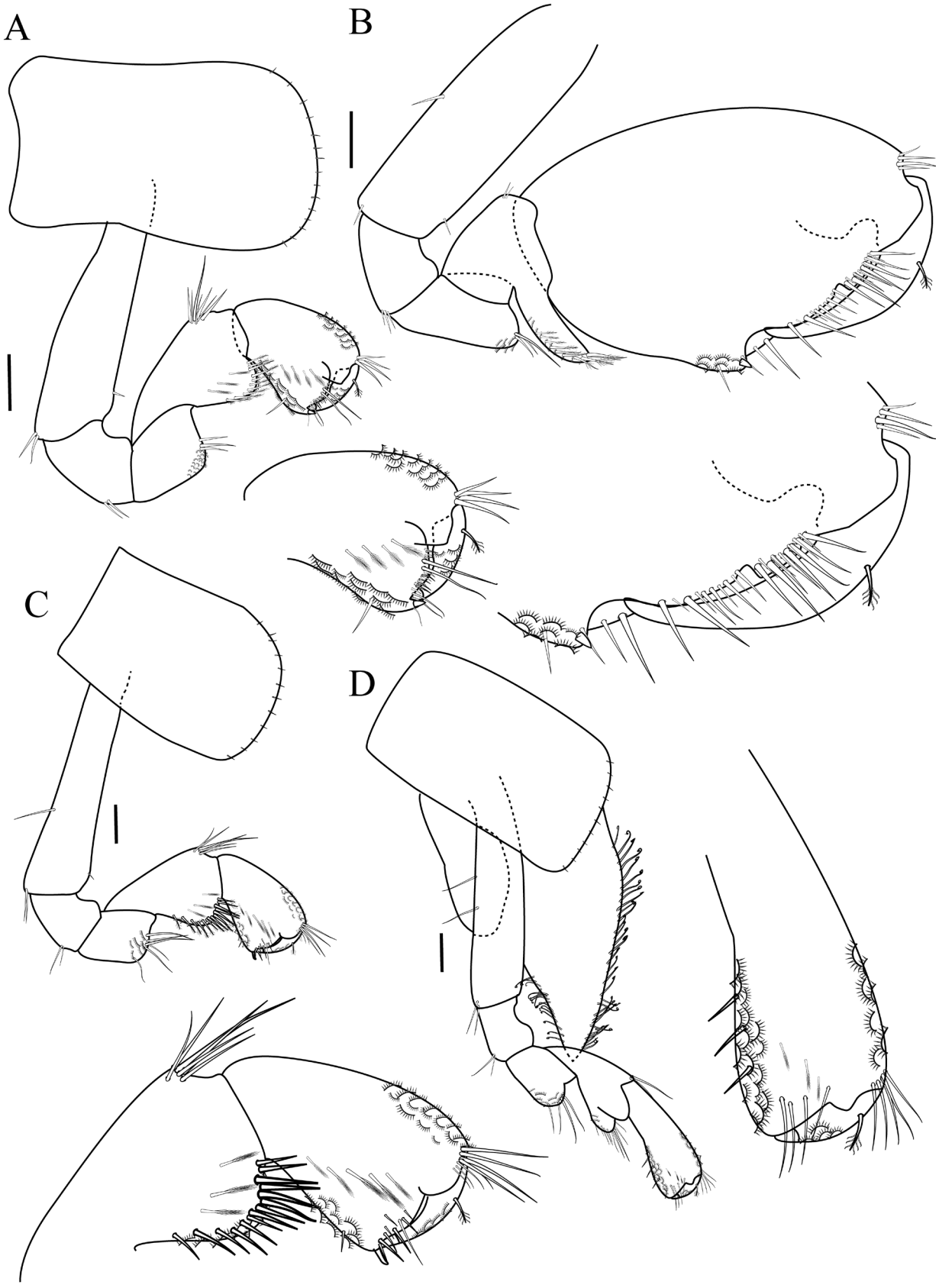

Figure 4. *Hyalella marysolae* sp. nov., male holotype 4.8 mm (CNCR 35778), El Tajo stream, Teuchitlán, state of Jalisco, Mexico. (**A**) Male gnathopod 1; (**B**) male gnathopod 2. Female paratype 4.8 mm (CNCR 35781). (**C**) Female gnathopod 1; (**D**) female gnathopod 2. Scale bars: 100 μm.

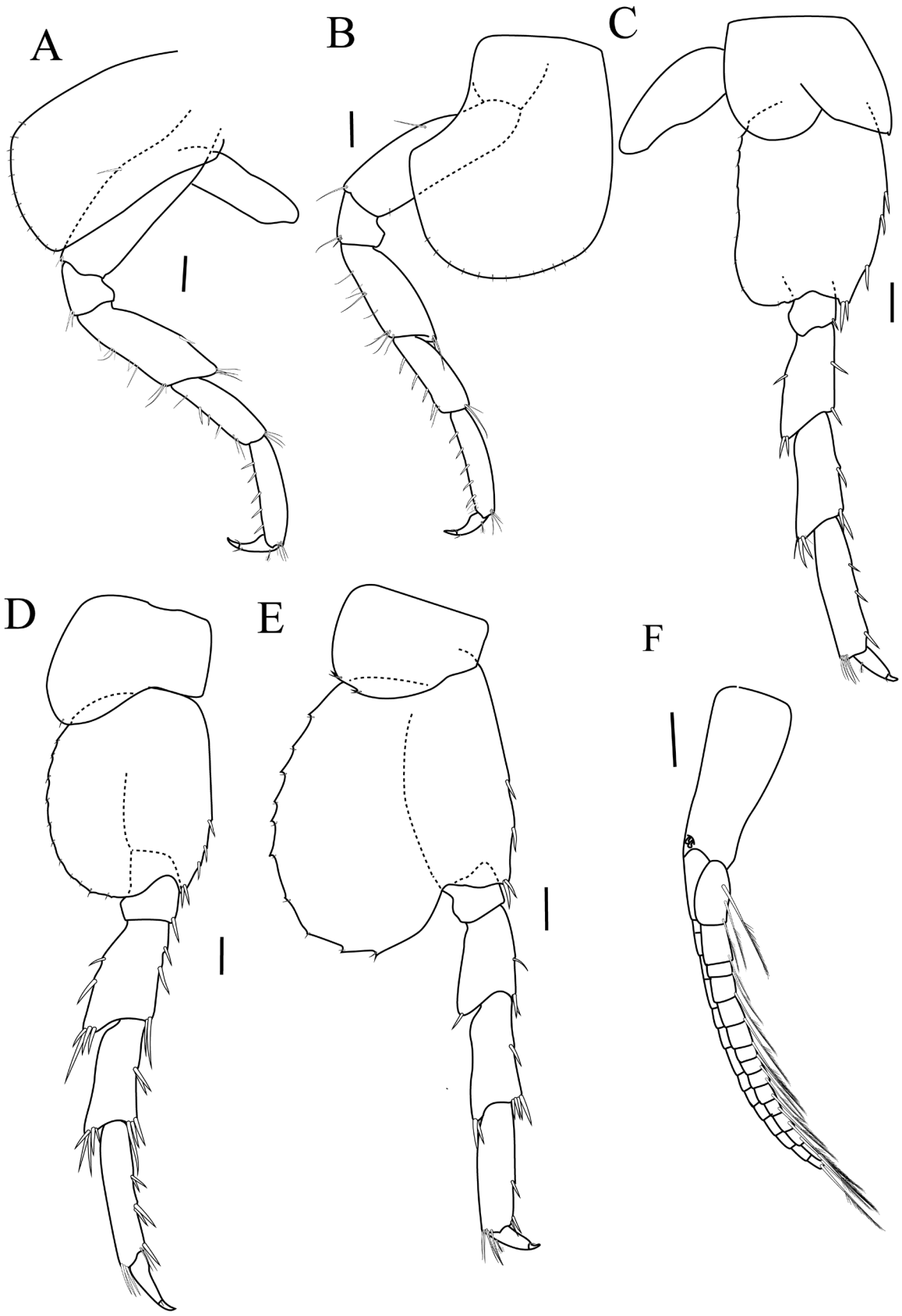

Figure 5. *Hyalella marysolae* sp. nov., male holotype 4.8 mm (CNCR 35778), El Tajo stream, Teuchitlán, state of Jalisco, Mexico. (**A**) Pereopod 3; (**B**) pereopod 4; (**C**) pereopod 5; (**D**) pereopod 6; (**E**) pereopod 7; (**F**) pleopod 1. Scale bars: 100 μm.

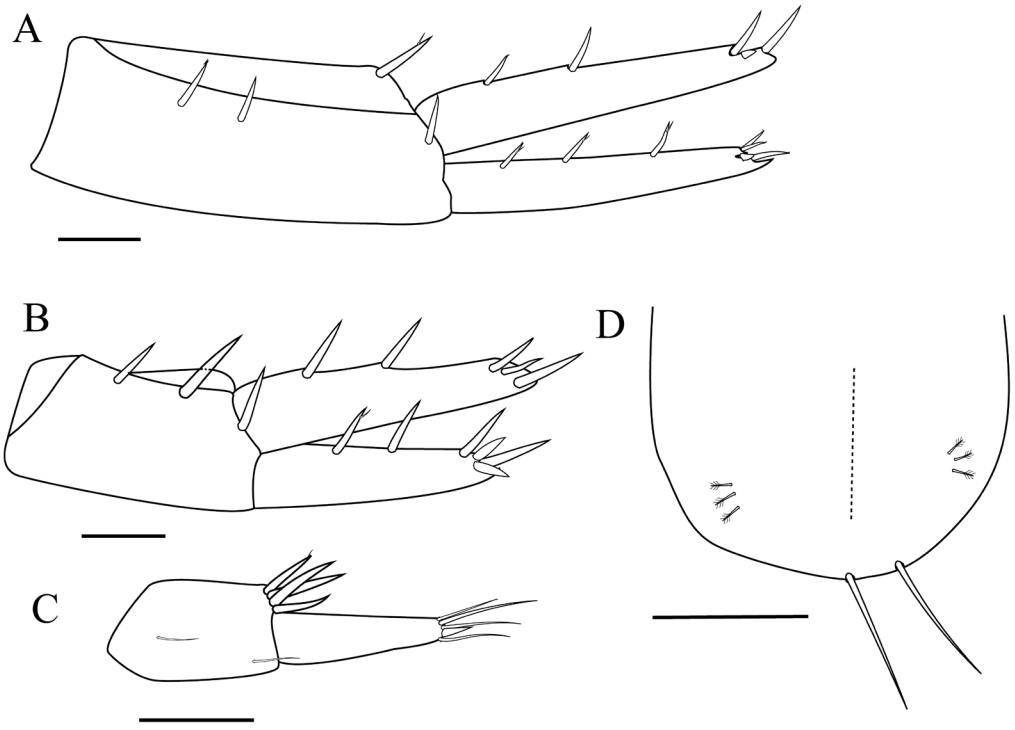

Figure 6. *Hyalella marysolae* sp. nov., male holotype 4.8 mm (CNCR 35778), El Tajo stream, Teuchitlán, state of Jalisco, Mexico. (**A**) Uropod 1; (**B**) uropod 2; (**C**) uropod 3; (**D**) telson. Scale bars: 100 μm.

Telson (Fig. 6D) entire, as long as wide or wider than long, distal margin rounded or truncated with 2 long simple setae widely separated; dorsal surface bearing 2 clusters of 3 plumose setae near middle distal portion, near lateral margin, symmetrically distributed.

Coxal gills sac-like, present on segments 2–6. Sternal gills tubular, present on segments 3–7.

Description of paratypes females. Females mean body size 4.8 ± 0.6 mm, cephalothorax length 0.55 ± 0.12 mm. Gnathopod 1 (Fig. 4C), carpus with 5 setae on inner face lobe; propodus with a row of 5 setae on inner face. Gnathopod 2 (Fig. 4D) smaller than male gnathopod 2, parachelate; palm reverse oblique. Basis posterior margin with 1 seta. Propodus 2.6 longer than maximum width; outer face with 2 setae in 1 row and 2 large setae near palm, with 3 medial setae on mid-posterior surface; anterior and posterior distal half with comb scales. Pereonite 2 with 1 anterior excavation or notch for amplexus. Pereopod 7 lobe with 11 serrations and setules, without stout setae on distal margin. Oostegites subtriangular, with curled setae on margins, almost reaching half of length of merus. Telson similar in shape to male.

Intraspecific variation. The number of articles in the flagellum of antennae 1–2 is variable, increasing proportionally with body size. The length of antenna 2 can posteriorly reach one-third of the sixth pereonite or almost reach the seventh. The length of the flagellum of antenna 2 varies from 1.3 to 1.5 times as long as the peduncle. The palp of maxilla 1 can be different between individuals or even between right and left side on the same individual, from one third to more than half of the length from the base of palp to the base of setae on the outer plate. Also, the number of setae on the inner plate of maxilla 1 can be 2–3. The number of setae in the first and third article of maxilliped is variable. The basis of the first gnathopod can be 3–3.5 times as long as wide. Some individuals bear an extra robust medial cuspidate seta on the peduncle of uropod 3, like in *Hyalella wakulla wakulla* (Drumm and Knight-Gray, 2019). Moreover, the distal margin of the telson varies from rounded to truncated.

Remarks. Hyalella marysolae sp. nov. exhibits two short dorsal projections or carinae on pleonites 1–2, barely visible, this characteristic is also in *H. azteca, H. cenotensis, H. maya, H. tepehuana,* and *H. wakulla* from North America, and it is not in the species from

South America but, unlike *H. marysolae* sp. nov., in the species from North America the projections or carinae are evident. The presence or absence of projections or carinae was long considered a crucial feature to distinguish the species of the genus. The most morphologically similar species to *H. marysolae* sp. nov. is *H. morronei* sp. nov., despite the absence of projections or carinae in this last species (described below). Both species share characters, such as: the number of articles in the antennae 2 (more than 13), the relative length of antennae 2 and the body, and the form of the eyes that distinguish them from the other species from Mexico (Tab. 1). Nevertheless, several differences can be observed between both species, for example: *H. marysolae* sp. nov., the palp of maxilla 1 presents setules; the length of the head relative to the second pereonite is smaller in *H. marysolae* sp. nov. than in *H. morronei* sp. nov.; *H. marysolae* sp. nov. has one pair of aesthetascs on the articles 4–11 of the flagellum of antenna 1, while *H. morronei* sp. nov. has one aesthetasc on articles 1, 5, 8, 9 and one pair on articles 6–7; in *H. marysolae* sp. nov., the propodus of the gnathopod 1 is hammer-shaped, while in *H. morronei* sp. nov. it is hatchet-shaped; the propodus maximum length relative to the width of gnathopod 1 is greater in *H. marysolae* sp. nov. than in *H. morronei* sp. nov. (1.5× vs. 1.25×, respectively); and the telson is wider than long in *H. marysolae* sp. nov. and longer than wider in *H. morronei* sp. nov. (Tab. 1).

Type locality. El Tajo stream, Teuchitlán (Fig. 1A, B), state of Jalisco, Mexico (20°40'40.49"N 103°52'13.40"W).

Habitat and conservation. This species was collected near the sediment and in the roots of macrophytes in the littoral zone. It is important to mention that the habitat of this species is threatened by anthropogenic activities. Water is regularly extracted from the El Tajo stream to maintain surrounding crops of corn and sugarcane. This process generates runoff of herbicides and chemicals (urea) into the stream (M.A.-P., pers. observation).

***Hyalella morronei* sp. nov.**

(Figs. 7–11)

http://zoobank.org/urn:lsid:zoobank.org:act:9D8B4C87-ED22-4D47-A310-AD9CAA24F7B6

Etymology. This species is named in honor of Dr. Juan José Morrone, for his outstanding contributions to biogeography and especially for his interest in amphipods of the genus *Hyalella*.

Material examined. Holotype, male, body size 5 mm, cephalothorax size 0.51 mm (CNCR 35782), from Teuchitlán stream (Fig. 1A, D), La Vega reservoir, in Teuchitlán, state of Jalisco, Mexico (20°41'11.15"N 103°50'36.43"W) 6 April 2018, 1,288 m.a.s.l., temperature 24.2 °C, pH 6.9, DO saturation 112%, associated with the buried roots of littoral macrophytes, A. Marrón -Becerra, M. Ayón -Parente, and M. Hermoso-Salazar, collectors. Paratypes (30 males, 30 females): males mean body size 4.6 ± 0.6 mm, mean cephalothorax length 0.46 ± 0.05 mm (n = 27), female mean body size 4.8 ± 0.5 mm, mean cephalothorax length 0.61 ± 0.13 mm (n = 30) (permanent slides CNCR 35783, male paratypes CNCR 357784, and female paratypes CNCR 35785), collected from the same locality as the holotype.

Diagnosis. Pleonites 1–2 without dorsoposterior carina. Coxa 4 excavated posteriorly. Eyes pigmented, black. Antenna 1 shorter than antenna 2, without accessory flagellum. Antenna 2 less than half of body length, almost reaching the seventh pereonite. Maxilla 1 palp short, reaching less than half of length between base of palp and tip of setae of outer plate, with 1 short stout distal seta and without setules; inner plate slender with 2 strong pappose apical setae. Maxilla 2 inner plate with 2 strong pappose setae on inner margin and serrate setae on distal margin. Gnathopod 1 propodus hatchet-shaped, palm with transverse slope, inner face with 4 serrate setae, comb scales on distoposterior and distoanterior border, carpus inner face lobe with 2 serrate setae. Gnathopod 2, basis hind margin with 1 slender seta, merus without medial seta, palm with wide excavation. Uropod 1 male inner ramus without curved setae. Uropod 3, ramus longer than peduncle, styliform and with 5 cuspidate setae. Telson as long as wide, or longer, distal margin rounded or truncated with 2 long simple setae widely separated. Sternal gills on segments 3–7.

Table 1. Comparison between the closest Mexican species of the genus *Hyalella*.

	***Hyalella marysolae* sp. nov.**	***Hyalella morronei* sp. nov.**	***Hyalella azteca* (de Saussure, 1858)**	***Hyalella maya* Marrón-Becerra, Hermoso-Salazar and Solís-Weiss, 2018**	***Hyalella cenotensis* Marrón-Becerra, Hermoso-Salazar and Solís-Weiss, 2014 (female)**	***Hyalella tepehuana* Marrón-Becerra, Hermoso-Salazar and Rivas, 2020**
Locality	Tajo (river)	Teuchitán (river)	Veracruz	Aktun-Ha (cenote)	Aktun-Ha (cenote)	Durango (river)
Total body length (mm)	4.8	5	7.8	3.85–4.1	5.3	5.4–5.7
Dorsal projections or carinae on pleon 1–2	Present (short)	Absent	Present	Present (short)	Present (short)	Present
Head length vs second pereonite	Reaching half	Reaching two thirds	Reaching half	Reaching half	Equal in length	Reaching half
Eye form	Subquadrate/rounded	Subquadrate	Rounded	Subtriangular	Absent	Subtriangular
Antenna 1 length vs. relative body length	Reaching the middle of fifth pereonite	Reaching the fifth pereonite	Reaching the middle of third pereonite	Reaching one-third of third pereonite	Reaching the middle of third pereonite	Overreaching the middle of third pereonite
Antenna 1 peduncle vs. body length	Reaching one third of first pereonite	Reaching half of first pereonite	Reaching half of first pereonite	Reaching beyond half of first pereonite	Reaching half of first pereonite	Overreaching the middle of first pereonite
Antenna 1 proportion, articlesof peduncle	1.6:1.3:1	1.5:1.2:1	1.6:1.25:1	1.4:1.3:1	1.7:1.3:1	1.5:1.4:1
Antenna 1 flagellum, numberof articles	12	10	7–9	9	7	9–11
Antenna 1 aesthetasc in flagellum on articles	4–11 (1 pair)	4–5 (1), 6–7 (1 pair), 8–9 (1)	3–6 (1 pair), 7–8 (1)	–	–	4–1 (1 pair), 8–11 (1)
Antenna 2 length	Almost half of total body length	Almost half of total body length	Less than one third total body length	Almost half of total body length	Almost one third of total body length	Slightly longer than one third total body length
Antenna 2 length vs. total body length	Almost reaching the seventh pereonite	Almost reaching the seventh pereonite	Reaching the fourth pereonite	Almost reaching middle of sixth pereonite	Reaching one-third of fourth pereonite	Reaching middle of fifth pereonite
Antenna 2 flagellum number of articles	15	14	8–10	10	8	11–12
Antenna 2, flagellum relative length vs. peduncle	1.5×	1.8×	1.1×	1.2×	1.35×	1.25×
Palp of maxilla 1	With setules	Without setules	With setules	With setules	With setules	With setules

Table 1. Cont.

	Hyalella marysolae sp. nov.	*Hyalella morronei* sp. nov.	*Hyalella azteca* (de Saussure, 1858)	*Hyalella maya* Marrón-Becerra, Hermoso-Salazar and Solís-Weiss, 2018	*Hyalella cenotensis* Marrón-Becerra, Hermoso-Salazar and Solís-Weiss, 2014 (female)	*Hyalella tepehuana* Marrón-Becerra, Hermoso-Salazar and Rivas, 2020
Maxilla 1 inner plate, number of setae	2–3	2	3	2–3	3	3–4
Maxilliped, palp, 4th article inner margin setae	4	5	4	3	2	3
Relative length of nail vs. palp 4th article	2/3	1/2	More than 2/3	1/2	Almost as long as	2/3
Gnathopod 1, propodus form	Hammer	Hatchet	Hammer	Hammer	Hammer	Hammer
Gnathopod 1, propodus maximum length vs. width	1.5×	1.25×	1.6×	1.8×	1.6×	1.5×
Gnathopod 1, male propodus, inner face, number of serrate setae in a row	3–5	4	4	4	–	3+1
Gnathopod 2 basis length vs. width	Almost 4×	More than 3×	Almost 3×	3.5×	–	More than 3×
Pereopod 7, lobe length vs. distal margin of ischium	Overreaching	Shorter	Overreaching	Overreaching	Shorter	Overreaching
Pereopod 7 relative width of lobe vs. width of basis (measure at cleft)	2–2.2×	2×	2.5×	3×	1.7×	2×
Pereopod 7 number of serrations and setae	10–11 with setules	9–11 with setules	18 with setules but 3 to 5 stout setae	9 with setules	11 with setules but 3 stout setae	14 with setules but 1–2 with stout setae
Telson	W ≥ L	W ≥ L, or L>W	W>L	W>L	W>L	L>W
Telson distal simple setae	Two widely separated	Two widely separated	Two apposed	Two widely separated	Absent	Two widely separated

Description of males based on holotype (CNCR 35782) and paratypes. Body, pleonites 1–2 without dorsoposterior carina (Fig. 7A). Epimeral plates 1–3 slightly acuminate. Coxae 1–3 (Fig. 7A) subequal in shape, subrectangular, longer than wide; coxa 1 shorter than coxae 2–3. Coxa 4 wider than coxae 1–3, with deep posterior excavation; coxae 1–4 slightly overlapping anterior coxa, distal margin rounded with small setae widely separated, acumination absent. Coxae 5–7 reduced, shorter than coxae 1–4, bilobate except coxa 7, lobe of basis overlapping posterior lobe of coxa (except coxa 7); coxa 5 with 2 subequal lobes, anterior lobe slightly shorter than posterior, overlapping coxae 4 and 6; coxa 6 with 2 unequal lobes, anterior lobe reduced; coxa 7 with 1 single lobe, anterior lobe absent.

Head typically gammaridean (Fig. 7A), with smooth surface, total length less than the combined length of first two pereonites, reaching two-thirds of second pereonite, rostrum absent. Eyes pigmented, medium, subquadrate, and black, located between the insertions of antennae 1 and 2.

Antenna 1 (Fig. 7A, B) less than half body length, about 65% the length of antenna 2 but longer than peduncle of antenna 2, almost reaching to fifth pereonite; peduncle longer than head, reaching half of first pereonite, article 1 and 2 subequal in length, article 1 wider than articles 2–3, article 2 longer and wider than article 3, article 3 shorter and thinner than articles 1–2 (proportions 1.5:1.25:1), article 1 with 1 medial cuspidate seta, and 1 cluster with 3 cuspidate setae at distal end; flagellum with 10 articles reduced gradually towards distal portion, flagellum longer than peduncle; aesthetascs present on articles 4–8, 4–5 (1 aesthetasc), 6–7 (1 pair), 8–9 (1 aesthetasc); accessory flagellum absent.

Antenna 2 (Fig. 7A, C) almost 1.4 times longer than antenna 1, almost half of total body length, almost reaching seventh pereonite; peduncle reaching third pereonite, articles gradually increasing in length and decreasing in width, article 5 longer than article 4 (about 1.3 times); flagellum with 14 articles, longer than peduncle (about 1.8 times); flagellum without aesthetascs.

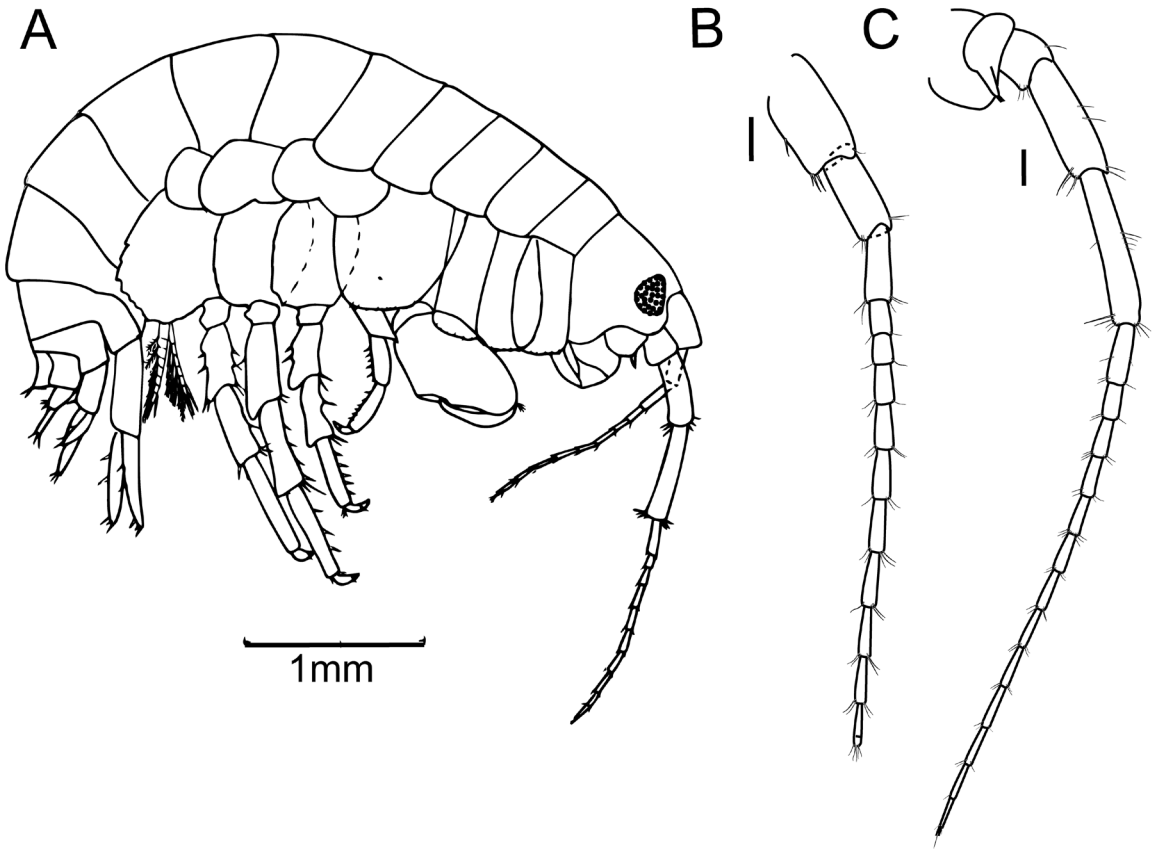

Figure 7. *Hyalella morronei* sp. nov., male holotype 5 mm (CNCR 35782), Teuchitlán stream, Teuchitlán, state of Jalisco, Mexico. (**A**) Lateral habitus; (**B**) antenna 1; (**C**) antenna 2. Scale bars: 100 μm.

Mouthparts: upper lip (Fig. 8A) distal margin rounded with numerous setules, being longer and more distant towards lateral end. Lower lip (Fig. 8B) subquadrate, outer lobes without notches or excavations; mandibular projection of outer lobes widely rounded; without inner lobes.

Left and right mandibles (Fig. 8E, F) without palp, asymmetric. Incisor with 6 teeth. Left lacinia mobilis similar to incisor process, with 5 teeth; setal row on left mandible with 3 main pappose setae plus accessory setae. Right lacinia mobilis more reduced than left, with 2 pairs of asymmetric L-shaped teeth, fused at base, proximal pair subequal to distal, inner margin denticulate; near lacinia mobilis base with setules on inner margin; setal row on right mandible with 2 main pappose setae plus accessory setae and with setulae near molar process. Molar process large, cylindrical, and triturative, accessory pappose setae in both molars.

Maxilla 1 (Fig. 8C) palp short, vestigial, uni-articulated, longer than wide, distally pointed with 1 short stout distal seta, reaching less than half of palp length, setules absent; palp length less than half distance between base of palp and base of seta on outer plate; inner plate slender, shorter than outer plate, with 2 pappose apical setae; outer plate with 9 apical stout serrate setae and with setules.

Maxilla 2 (Fig. 8D) plates subequal in length, width, and shape; inner plate shorter and slender, with 2 pappose setae on mid-distal margin, and with simple setae and 5 long serrulate setae on distal margin; outer and inner plates with large simple distal setae (type A2) and few setules on both distal surfaces and margins.

Maxilliped (Fig. 8F) inner plate lobe longer than outer plate lobe; distal margin slightly convex; inner plate distal margin with 3 cuspidate setae of equal size and with plumose setae, inner margin with several pappose setae; outer plate, inner and distal margins with numerous simple setae. Palp composed of 4 articles subequal in maximum length; first article with 2–4 simple setae at inner distal end and 2 setae at outer distal end; second article with numerous simple setae on inner margin and 2–3 at outer distal end; third article with several setae on distal margin, distal end on outer margin with 7 simple setae and comb scales, inner margin with at least 8 setae and 6 at distal end; fourth article unguiform, longer than nail, with comb scales, inner margin with 5 setae near distal half, outer margin with 1–2 setae near nail base; nail almost half length of fourth article, with serration on distal half.

Gnathopod 1 (Fig. 9A) subchelate, propodus hatchet-shaped, shorter than gnathopod 2. Basis elongated, maximum length almost 3.3 times longer than maximum width; medial seta absent, posterior distal end with cluster of 2 setae. Ischium short, subquadrate, longer than wide, length longer than maximum width of basis, and as long as maximum length of merus; distal posterior end with 1 cluster of 2 setae. Merus longer than wide, at one-third of the posterior margin with comb scales; almost at distal margin with 3–6 setae. Carpus longer than wide, longer and slightly wider than propodus, with strong, short, and wide posterior lobe forming one scoop-like structure open to inside; mesial surface of lobe with 2 serrate setae, outer surface with comb scales and serrate setae (10–12), anteriodistal end with 5 simple setae. Propodus maximum length 1.25 times longer than wide; inner surface near distal margin with 4 serrate setae in 1 row; distal anterior end with 2 clusters of approximately 5 setae; distal half of anterior and posterior surfaces with comb scales; palm transverse, posterior distal end with 1 robust seta and cup for dactyl; posterior surface, near distal third with 1 long, simple seta. Dactyl claw-like; nail present; anterior surface near proximal third with 1 plumose seta, with comb scales on anterior surface.

Gnathopod 2 (Fig. 9B) subchelate. Basis elongate, more than 3 times longer than wide; posterior margin with 1 slender seta. Ischium short, subquadrate, as long as merus. Merus short; distal end of posterior margin with 4 simple setae, medial setae absent; distal quarter of posterior inner and outer surfaces with comb scales. Carpus shorter than propodus, length similar to merus maximum length, slightly exceeding 1.5 times width of merus; anterodistal end with 2 simple setae; posterior lobe scoop-like, elongate, almost 1.5 times width of merus, with several submarginal pappose setae and comb scales. Propodus robust, subrectangular, 1.5 times longer than maximum width; palm oblique, as long as posterior margin; slope slightly irregular, with several long simple setae, few short and medium setae; distal margin of palm with 1 truncated process near insertion of dactyl and with 1 wide posterior

excavation at base; palm posterior distal end with 2 robust setae, comb scales, and cup for dactyl. Cup for dactyl as long as the space between it and the truncated process. Dactyl claw-like, congruent with palm, occupying less than half of cup of dactyl, without comb scales; proximal third of outer margin with 1 plumose seta; inner margin slightly crenulated with separated setules.

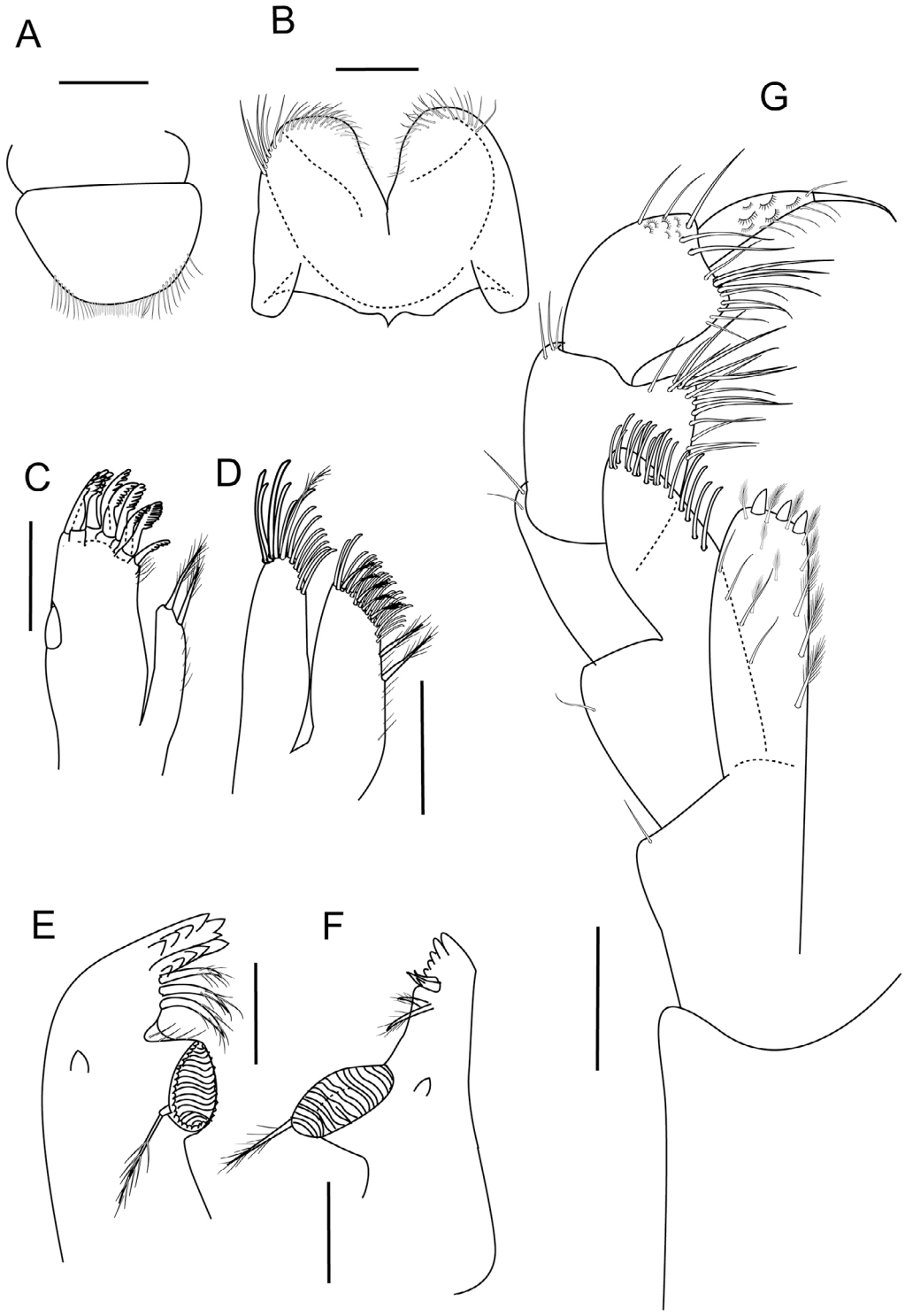

Figure 8. *Hyalella morronei* sp. nov., male holotype 5 mm (CNCR 35782), Teuchitlán stream, Teuchitlán, state of Jalisco, Mexico. Mouth parts: (**A**) upper lip; (**B**) lower lip; (**C**) left maxilla 1; (**D**) left maxilla 2; (**E**) left mandible; (**F**) right mandible; (**G**) left maxilliped. Scale bars: 100 μm.

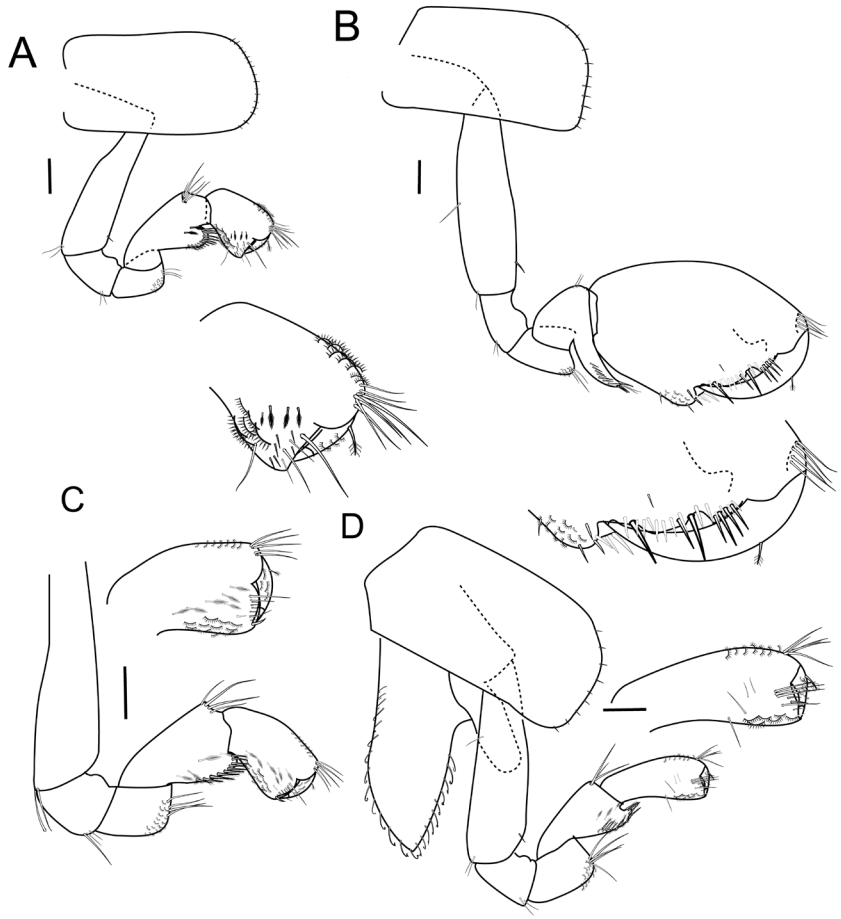

Figure 9. *Hyalella morronei* sp. nov., male holotype 5 mm (CNCR 35782), Teuchitlán stream, Teuchitlán, state of Jalisco, Mexico. (**A**) Male gnathopod 1; (**B**) male gnathopod 2. Female paratype 4.8 mm (CNCR 35785). (**C**) Female gnathopod 1; (**D**) female gnathopod 2. Scale bars: 100 µm.

Pereopods 3–7 (Fig. 10A, E) simple, gradually expanding posteriorly. Pereopod 5 shorter than 4 and 6.

Pereopod 3 (Fig. 10A) basis elongate; posterior margin with 1 simple seta; anterodistal and posterodistal ends with simple setae. Ischium subquadrate; posterodistal end with 1 pair of setae. Merus longer than ischium (almost 2.5 times the maximum length); anterior margin without robust seta; posterior margin with 4 clusters of slender simple setae (3 clusters of 2 setae plus 1 single separated seta); anterodistal and posterodistal ends with 1 cluster of 3–4 slender setae, anterodistal end with 1 robust seta. Carpus shorter and more slender than merus; posterior margin with 4 stout setae plus accessory setae; posterodistal end with at least 4 slender setae; anterodistal end with at least 2 setae. Propodus shorter than anterior margin of merus, more slender than carpus; posterior margin with 7 stout setae plus accessory seta; anterodistal end with 6 simple setae. Dactyl claw-like, length less than half of propodus; nail present; first proximal third of anterior margin with 1 plumose seta; anterior and posterior margins with 1 simple seta near base of nail.

Pereopod 4 (Fig. 10B) similar in shape to pereopod 3 but slightly longer; coxa 4 wider than coxa 3 with posterior excavation; basis posterior margin with 1 simple seta; propodus posterior margin with 7 setae. Pereopods 5–7 (Fig. 10C, E) similar in shape; basis posterior lobe rounded and denticulate.

Pereopod 7 (Fig. 10E) basis lobe widely expanded posteriorly, shorter than ischium distal margin; wider than lobes of pereopods 5 and 6; basis lobe, width almost 2 times as wide as basis (measured at cleft between basis and basis lobe); posterior margin with 9–11 serrations, each with one setule, without stout seta on distal margin; anterior margin with 4 stout setae and 3 at distal end. Dactyl length less than half of propodus.

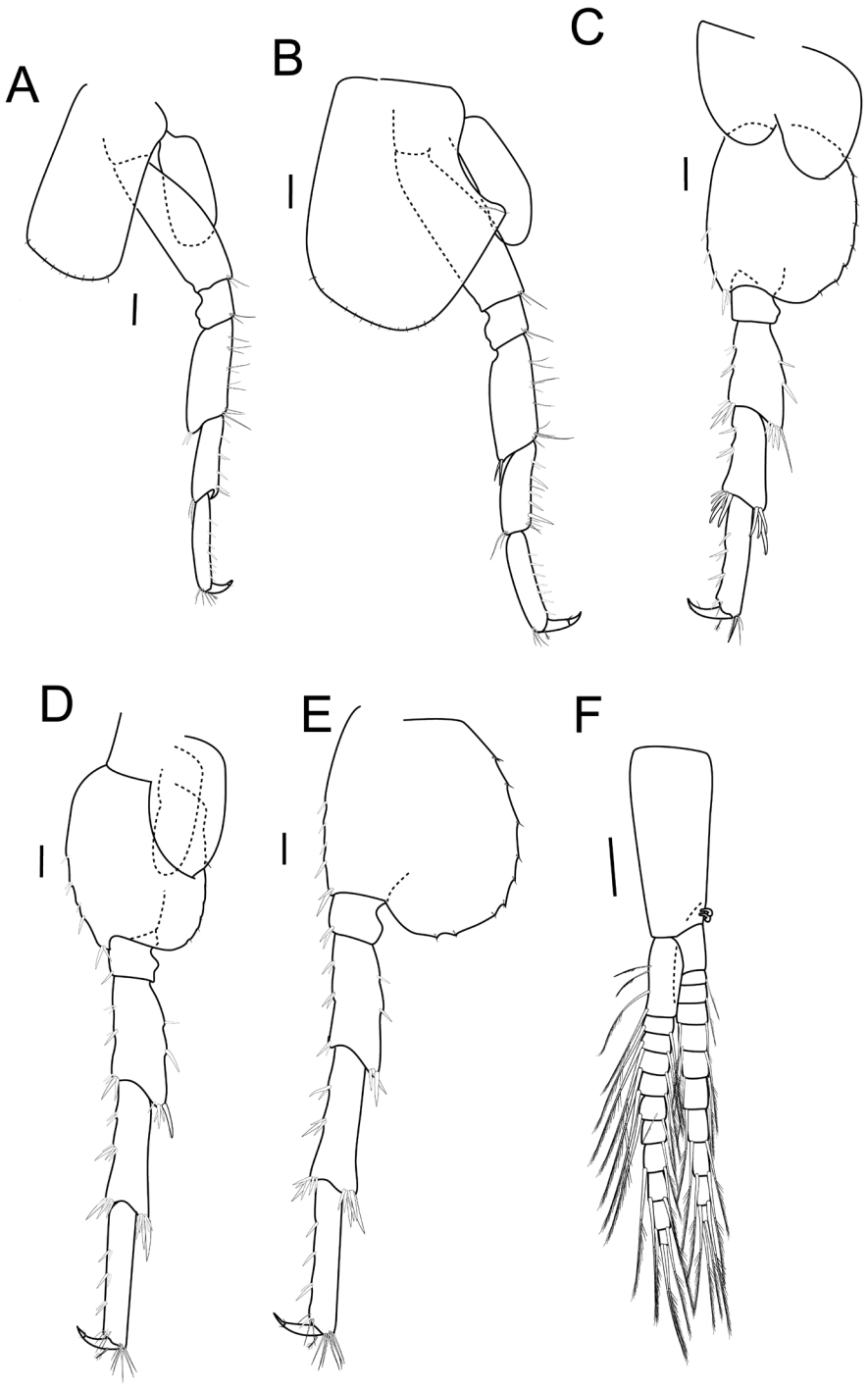

Figure 10. *Hyalella morronei* sp. nov., male holotype 5 mm (CNCR 35782), Teuchitlán stream, Teuchitlán, state of Jalisco, Mexico. (**A**) Pereopod 3; (**B**) pereopod 4; (**C**) pereopod 5; (**D**) pereopod 6; (**E**) pereopod 7. Scale bars: 100 μm.

Pleopods 1–3 similar in size and shape, not modified, biramous, elongated, ramus longer than peduncle, rami multi–annulated, with numerous plumose setae. Pleopod 1 (Fig. 10F), inner margin of peduncle distal end with two short retinacula (coupling hooks).

Uropod 1 (Fig. 11A) longer than uropod 2 (Fig. 11B); peduncle longer than rami, proximal half of dorsal margin with 3 dorsal cuspidate setae with accessory seta, inner and outer distal ends with 1 cuspidate seta; rami subequal, inner ramus slightly longer, with 2 dorsal cuspidate setae with accessory seta and 5 distal cuspidate setae, outer ramus with 3 dorsal cuspidate setae with accessory seta and 4 distal cuspidate setae; male without curved setae on inner ramus.

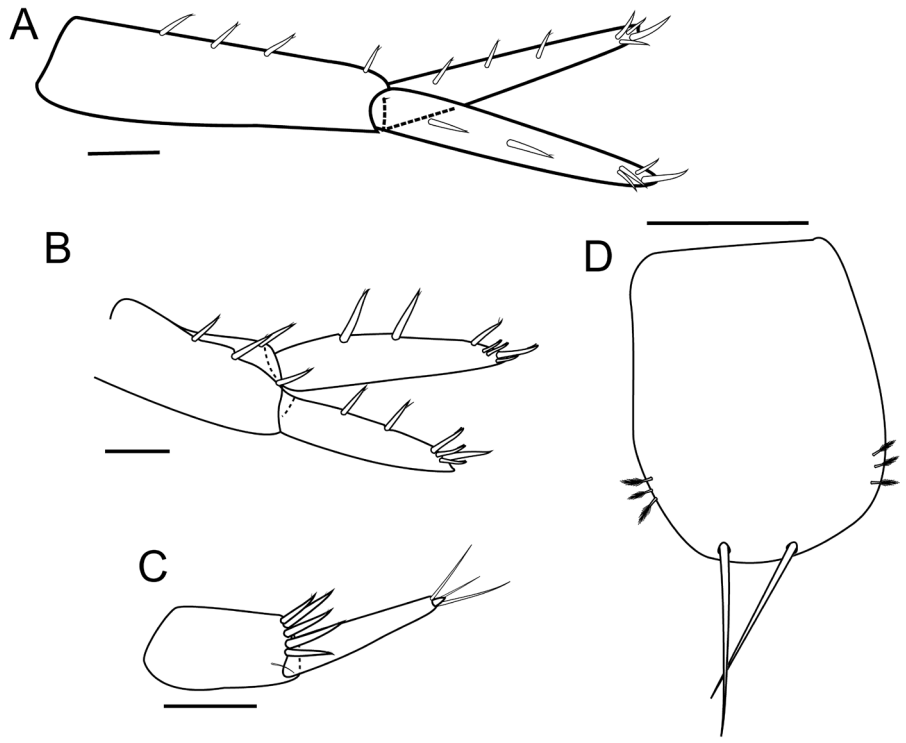

Figure 11. *Hyalella morronei* sp. nov., male holotype 5 mm (CNCR 35782), Teuchitlán stream, Teuchitlán, state of Jalisco, Mexico. (**A**) Uropod 1; (**B**) uropod 2; (**C**) uropod 3; (**D**) telson. Scale bars: 100 μm.

Uropod 2 (Fig. 11B) longer than peduncle of uropod 1; peduncle as long as rami or slightly shorter, with 2 dorsal cuspidate setae (with accessory seta) on distal half and 1 cuspidate seta at distal end; rami subequal, inner ramus slightly longer with 2 dorsal cuspidate setae with accessory seta and 5 cuspidate distal setae with accessory seta, outer ramus with 2 dorsal cuspidate setae with accessory seta and up to 4 distal cuspidate setae, the 3rd cuspidate seta is shorter with accessory seta.

Uropod 3 (Fig. 11C) longer than peduncle of uropod 2; peduncle subrectangular, wider than ramus with 5 robust distal cuspidate setae (with accessory seta) of variable length; inner ramus absent, outer ramus uniarticulate, slender, longer than peduncle, about 4 times the length of larger seta of peduncle, basal width about 2 times apex width of ramus, with 3 slender apical simple setae and 1 connate seta.

Telson (Fig. 11D) entire, as long as wide, distal margin rounded with 2 long simple setae widely separated; dorsal surface bearing 2 clusters of 3 plumose setae near middle distal portion, near margin, symmetrically distributed.

Coxal gills sac-like, present on segments 2–6. Sternal gills tubular, present on segments 3–7.

Description of paratypes females. Females mean body size 4.8 ± 0.5 mm, mean cephalothorax length 0.61 ± 0.13 mm (n = 30). Gnathopod 1 (Fig. 9C), carpus with 4 setae on inner face lobe; propodus with row of 5 setae on inner face. Gnathopod 2 (Fig. 9D) smaller than male gnathopod 2, parachelate; palm slightly reverse oblique; basis posterior margin with 2 setae. Propodus shorter than twice maximum width (1.6 times); outer face with 2 setae in 1 row and 3 large setae near palm, with 1 medial seta on mid-posterior surface; anterior and posterior distal half with comb scales. Pereonite 2 with 1 anterior excavation or notch for amplexus. Pereopod 7 lobe with 12 serrations and setules, without stout setae on distal margin. Oostegites subtriangular, with curled setae on margins, almost reaching half the length of merus. Telson similar in shape to male.

Intraspecific variation. The peduncle of antenna 1 in some individuals of this species is as long as or even longer than the head (reaching half of the first pereonite). In maxilla 1, the palp nearly reaches or overreaches half of the distance between the base of the palp and the base of serrate seta on the outer plate. The telson can be as long as wide or longer.

Remarks. One notable morphological feature of *H. morronei* sp. nov. is the hatchet-shaped propodus of gnathopod 1, which is 1.25× as long as wide (less than twice the maximum width), which distinguishes this species from the other species from Mexico (Tab. 1). This morphology of gnathopods has been observed in hyalellids species from South America, including e.g. hyalellids from Chile (Gonzalez, 2003); therefore, *H. morronei* sp. nov. constitutes the first North American species to exhibit this morphology.

Hyalella morronei sp. nov. can be easily distinguished by the length of the flagellum of the antenna 2, it is almost twice the length of the peduncle, in other species from Mexico it is 1.1×–1.5× (Tab. 1). The most morphologically similar species to *H. marysolae* sp. nov. is *H. morronei* sp. nov. and the differences are described above. *H. morronei* sp. nov. and *H. marysolae* sp. nov. have more articles in the flagellum of antenna 2 (14 and 15 articles, respectively) and the antenna reaches the seventh pereonite; in contrast, in other species from Mexico, the flagellum is shorter and has 8–12 articles (Tab. 1). Additionally, the form of the eyes in *H. morronei* sp. nov. and *H. marysolae* sp. nov. are subquadrate, whereas in *H. azteca* are rounded, in *H. maya* and *H. tepehuana* are subtriangular, and in *H. cenotensis* are absent (Tab. 1).

H. cheyennis Bueno, Oliveira and Wellborn, 2019 from Oklahoma, USA, as *H. morronei* sp. nov., lacks projections or carinae on pleonites 1–2; in addition, both species have serrated setae on maxilla 2, and in the male gnathopod 2, the palm of propodus is as long as the posterior margin. However, these two species are separated from each other by the shape of the propodus of gnathopod 1: in *H. morronei* sp. nov. it is hatchet-shaped and in *H. cheyennis* is hammer-shaped. Moreover, *H. morronei* sp. nov. has one slender seta on the posterior margin of the basis of pereopods 3–4, while *H. cheyennis* has two setae; *H. morronei* sp. nov. lacks distal robust setae on the lobe of pereopod 7, and *H. cheyennis* has three robust setae; *H. morronei* sp. nov. has less robust setae on peduncles of uropods 1–2 (three and two robust setae, respectively), and *H. cheyennis* has six on uropod 1 and five cuspidate setae on uropod 2; and the ramus of uropod 3 is longer than the peduncle in *H. morronei* sp. nov., which is shorter in *H. cheyennis*.

Type locality. Teuchitlán stream (Fig. 1A, D), La Vega reservoir, Teuchitlán, state of Jalisco, Mexico (20°41'11.15"N 103°50'36.43"W).

Habitat and conservation. This species was collected from the water column, associated with the roots of *Lemna* sp., although the predominant vegetation was water lettuce *Pistia stratiotes* L., 1753. As in the case of *H. marysolae* sp. nov., the habitat of this species is also threatened by anthropogenic activities. The Teuchitlán stream is impacted by caustic soda waste, molasses, cane bagasse, domestic plastics, and sewage discharge generated by the Teuchitlán people, in addition to nitrogen fertilizers from sugarcane crops (RAMSAR, 2018). Documenting the diversity of species of highly impacted freshwater environments such as the Teuchitlán stream, is a crucial task as increased anthropogenic activity may threaten the biodiversity of these habitats.

In summary, the new species in the state of Jalisco described in this paper, *H. marysolae* sp. nov. and *H. morronei* sp. nov., can be distinguished from all other *Hyalella* species present in Mexico by several morphological characters, including the length of the antenna 2 being approximately half as long as the body length, composed of 14–15 articles, and the relative length of the ramus in the uropod 3, which is longer than the peduncle. The length of the antenna 2 distinguishes these species from those found in North America, except for *Hyalella longicornis* Bousfield, 1996, which has less than 16 articles in the flagellum of antennae 2, and more than 5 setae on the posterior margin of the basis of both gnathopods. In contrast, *H. marysolae* sp. nov. and *H. morronei* sp. nov. have only one simple seta.

The findings concerning these two species contribute to highlighting the hidden diversity of the genus by showing that the biodiversity in the group is underestimated and increases to six the total number of species from Mexico. It is important to emphasize the need for further studies within this group of freshwater amphipods due to their importance in environmental and toxicological research, and secondly to record the unknown species before their habitat is lost. It is important to underline that we could preserve the unknown biodiversity of the group by enhancing

the policies to protect freshwater bodies and raising awareness of water issues in the local communities.

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ADDITIONAL INFORMATION AND DECLARATIONS

Author Contributions

Conceptualization and Design: AMB, AMHS, MAP. Performed research: AMB, AMHS, MAP. Acquisition of data AMB, AMHS. Analysis and interpretation of data AMB, AMHS. Preparation of figures/tables/maps: AMB. Writing original draft AMB, AMHS. Writting critical review and editing: AMHS, MAP.

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