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Relocation of *Alona manueli* Sinev & Zawisza 2013 and a new closely related species from the Ecuadorian Andes to the new genus *Alpinalona* (Cladocera, Chydoridae, Aloninae)

MIGUEL ALONSO[1,2,3,4] & ARTEM Y. SINEV[3]

[1]*Ecology Section. Department of Evolutionary Biology, Ecology and Environmental Sciences, Faculty of Biology, University of Barcelona. Avda. Diagonal 643. 08028 Barcelona, Spain. E-mail: malonso@ub.edu*

[2]*Departamento de Recursos Hídricos y Ciencias Ambientales. Facultad de Ciencias Químicas. Universidad de Cuenca. Av. 12 de Abril s/n y Agustín Cueva. Cuenca. Ecuador.*

[3]*Department of Invertebrate Zoology, Biological Faculty, Lomonosov Moscow State University, Leninskie Gory, Moscow 119991, Russia. E-mail: artemsinev@yandex.ru*

[4]*Corresponding author*

Abstract

Alpinalona **gen. nov**. is described for two species found in high altitude localities of continental North America and South America: *Alona manueli* (Sinev & Zawisza, 2013) from the Neovolcanic Mexican Axis and *Alpinalona cajasi* **gen. et sp. nov** from El Cajas National Park (Ecuador). The new genus is separated from *Hexalona* and allies by the absence of limb VI and filter plate V; from *Anthalona*, *Coronatella* and the *elegans*-group by having seven setae on exopodite III, and by the presence of a well-developed seta 1 on the IDL of limb III; from *Alona* s. str. (*quadrangularis*-group) and *Ovalona*, by two main head pores, lateral head pores located close to main pores, and by a bilobed exopodite V; from *Ovalona* by the presence of seta (i) and inner setae 2–3 on limb I, and setae 4–5 of exopodite III being of same size; and from *Alona* s. lato by weakly developed marginal denticles of postabdomen, clusters of thin setulae on ventral surface of limb I, and by plumose setae 5–6 of exopodite IV. *Alpinalona cajasi* **sp. nov.** can be easily distinguished from *A. manueli* by the following characteristics: prominent posterodorsal angle of carapace; broader headshield; longer PP distance; and postanal marginal denticles organized into groups.

Key words: *Alpinalona* **gen. n.**, cladocera, Ecuadorian Andes

Introduction

One of main trends of Aloninae systematics of last decades is revision of the artificial genus *Alona* s. lato, which was composed of more than ten species-groups of generic-level and numerous species of unclear affinities (Van Damme *et al*. 2010). Recent revisions of the main groups of the genus have led to their assignment to separate genera (Dumont & Silva-Briano 2000; Sinev 2004; Van Damme & Dumont 2008a; Van Damme *et al.* 2011; Van Damme & Sinev 2011; Sinev 2015; Sinev & Dumont 2016), while Van Damme & Dumont (2008b) restricted true *Alona* to the *quadrangularis*-group, now consisting of five species (Sinev 2012).

"Marginal" species of *Alona* s. lato, having no clear affinities within the genus, were actively investigated as well. Several such species were transferred to existing genera (Sinev *et al*. 2005; Sinev & Kotov 2012), and a number of small genera were created for strongly divergent forms (Sinev & Shiel, 2008; Van Damme *et al.* 2009; Sinev & Kobayashi 2012; Van Damme & Maiphae 2013; Sousa *et al*. 2016ab). Still, some such forms are not yet revised. One such species is *Alona manueli* Sinev & Zawisca, 2013, described from crater lakes of Nevado de Toluca volcano, Central Mexico. Morphology of thoracic limbs of this species did not fit any existing genera, so authors choose to place the form in *Alona* s. lato.

Investigation of mountainous regions of Central and South America revealed a number of endemic species of Aloninae (Hudec 1998; Kotov *et al.* 2011, Sinev & Silva-Briano 2012), but their fauna is far from fully studied

(Kotov *et al*. 2011). Particularly the cladoceran fauna of Ecuador is practically unknown; only few studies display any information on some lakes (Colinvaux & Steinitz 1980; Torres & Rylander 2006; Briones 2012; Van Colen *et al.* 2016; López-Blanco & Sinev 2016), mainly dealing with zooplankton and only occasionally with benthic species.

Andean lakes, such as other high mountain water bodies in tropical-subtropical latitudes of Africa and South America frequently contain endemic cladoceran taxa from different families (Delachaux 1919; Hann 1986; Smirnov 1996; Sinev & Coronel 2006; Kotov & Taylor 2010; Kotov *et al*. 2010; Van Damme & Eggermont 2011), many still undescribed. In this sense, the Southern Equadorian Andes is one of the most likely territories to find new species such as the one found close to *Alona manueli*.

The aim of the present study is to describe the new species and to clarify the taxonomic status of *Alona manueli* group, allocating the two species in the new genus, *Alpinalona*.

Material and methods

Samples were collected in 2015 by means of dip nets (50 µm mesh size) from the littoral zone of lakes. Sampling was done in 202 water bodies (lakes, lagoons and ponds) located between 3,150 and 4,460 m above sea level (a.s.l.) in the Cajas National Park (Southern Ecuadorian Andes). This sampling program was performed in the framework of the project "Limnological Characterization of the lakes and lagoons of Cajas National Park, founded by the University of Cuenca and ETAPA. Immediately after sampling, zooplankton samples were put in plastic tubes and preserved in 4% formaldehyde. Animals were selected from the sample under a binocular stereoscopic microscope, placed on slides (in a drop of a glycerol-formaldehyde mixture), dissected and studied under an optical microscope. Measurements were conducted using an eyepiece-micrometer. Drawings were made by means of camera lucida.

Abbreviations. In the illustrations and text: I–V = thoracic limbs I–V; as = accessory seta of limb I; cbs = copulatory brush seta; e1–3 = endites 1–3 of limb I; ep = epipodite; ex = exopodite; gfp = gnathobase filter plates of limbs II–V; il = inner lobe of limb V; IDL = inner distal lobe of limb I; IP = interpore distance (distance between anterior and posterior major head pores); ms = male seta of limb I; ODL = outer distal lobe of limb I; pep = preepipodite; PP = postpore distance (distance between posterior head pore and posterior border of head shield); s = sensillum.

In the list of collections: MECN—Museo Ecuatoriano de Ciencias Naturales. Quito. Ecuador.

Results

Order Anomopoda Sars, 1865

Family Chydoridae Dybowski & Grochowski, 1894 emend. Frey, 1967

Subfamily Aloninae Dybowski & Grochowski, 1894 emend. Frey, 1967

Alpinalona gen. nov.

Type species. *Alpinalona manueli* (Sinev & Zawisza, 2013) = *Alona manueli* Sinev & Zawisza, 2013

Etymology. From "alpina, –Latin –for alpine and –alona , referring to its habitat related to high mountains: Andes and the Neovolcanic Mexican Axis.

Description. Parthenogenetic female. In lateral view body oval moderately high, maximum height at middle of body. Body moderately compressed laterally. Dorsal margin uniformly curved; postero-ventral angle broadly rounded; posterior margin weakly curved; ventral margin almost straight; antero-ventral angle rounded. Valves with well-developed linear sculpture. Ventral margin of valves with 40–60 setae, about 10–12 anterior setae long, next 5–7 setae very short, followed by setae of moderate length. Postero-ventral angle bears about 20 short setulae of unequal length, organized into 2–3 groups.

Head trianglur-rounded in lateral view. In lateral view, rostrum short. Ocellus and eye of similar size. Head shield with maximum width behind the mandibular articulation. Rostrum short, broadly rounded. Posterior part of head shield with broadly rounded distal angle. Two main head pores of similar size with narrow connection between them. Lateral head pores minute. Labrum of moderate size; labral keel moderately wide; anterior margin of keel convex, posterior margin without any setulae.

Thorax two times longer than abdomen. Middle abdominal segment not saddle-shaped, no abdominal joint.

Postabdomen moderately short and broad, subrectangular, maximum height at the middle of postanal margin. Length 2.3–2.5 height. Ventral margin straight. Distal margin convex, distal angle broadly rounded. Dorsal margin convex in postanal part and concave in anal part. Preanal angle well-defined, postanal angle not defined. Preanal margin almost straight. Postabdomen provided with short postanal marginal denticles, and with 3 or 4 groups of marginal setulae on anal margin. 12–14 well-developed lateral fascicles of setulae; posteriormost setae of postanal fascicles very thick and long, about 1.5–2 width of postabdominal claw base. Postabdominal claw weakly curved, slender. Basal spine moderately short, thin, about 0.2 length of claw itself.

Antennule long and slender, length about 3 width. Antennular sensory seta slender, arising at 2/3 distance from the base. Nine aesthetascs of similar size.

Antenna with antennal formula setae 0-0-3/1-1-3, spines 1-0-1/0-0-1. Basal segment massive; branches of moderate length; basalmost segments of both branches 1.5 times longer than others. Seta arising from basal segment of endopodite thin, reaching tip of distal segment. Seta arising from middle segment of endopodite of similar size with apical setae. Apical setae of similar size and thickness. Spine on basal segment of exopodite slightly shorter than middle segment. Apical spines long.

Thoracic limbs: five pairs.

Limb I of moderate size. Epipodite oval, without projection. Accessory seta short. ODL seta with very short setulae in distal part. IDL with 3 setae, seta 1 sharp, short, setae 2 and 3 of moderate thickness, armed with thin setulae in distal part. Endite 3 with four setae subequal in length. On endite 2 there are three outer setae of different length and inner naked seta on anterior face. Endite 1 with two 2-segmented setae (g–h), a flat, geniculated seta (i) shifted to the limb base, and inner naked setae on anterior face. Four-five rows of long setulae on ventral face of limb.

Limb II triangle-rounded. Exopodite elongated, with short seta. Inner portion of limb with eight scraping spines increasing progressively in length distally, armed with denticles of similar size. No inner setae near base of scraper 1. Distal armature of gnathobase with four elements. Filter plate II with seven setae, two posteriormost members considerably shorter than others.

Limb III. Epipodite oval. Exopodite subquadrangular, with seven setae. Seta 3 longest, setae 6 about 1/3 length of seta 3, other setae short, more than two times shorter than seta 6. Setae 1–5 plumose, seta 6 armed bilaterally with hard setulae, seta 7 with short thin setulae at the middle. Distal endite with 3 setae, two distalmost setae scraping, slender, sharp, with denticles in distal part; basalmost seta (3) shorter, flattened, geniculated, bilaterally provided with setulae. Filter plate III with seven setae.

Limb IV. Epipodite with long finger-like projection. Exopodite subquadrangular, with six plumose setae. Seta 1-2-3 being longest; seta 5 about 2/3 length of seta 3, setae 4 and 6 about 1/2 length of seta 3, seta 4 shorter than seta 6. Inner portion of limb IV with four setae and sensillum. Scraping seta slender, sharp; flaming-torch setae of similar shape, decreasing in size basally. Three inner setae. Gnathobase with two-segmented seta, sensillum and a small hillock distally. Filter plate IV with five setae.

Limb V. Epipodite with long finger-like projection. Exopodite of moderate size, bilobed, with four plumose setae. Inner lobe moderately broad, widening distally. At inner face, two setae, distal seta 1.5 times longer than basal seta. Filter plate V absent.

Male. Body low oval.

Postabdomen similar in shape to that of female, but more narrow, length about 3 maximum heights. Gonopores located at some distance from the end of postabdomen. Ventral margin straight, with defined step at the location of gonopores. Distal margin convex, distal angle broadly rounded. Preanal angle well-defined, postanal angle not defined. Anal and postanal portions of similar length. Wide clusters of short setulae or spinulae in place of marginal denticles. Lateral fascicles of setulae same as in female. Postabdominal claw short, shorter than preanal portion of postabdomen, basal spine straight, about 0.17–0.25 of claw length.

Antennule with 12 terminal aesthetascs. Male seta thick, about 1/2–1/3 of antennule length.

Limb I with U-shaped copulatory hook, its distal portion 1.5 times longer than basal one. A row of setulae located under copulatory brush on ventral face of limb. IDL without seta 1; setae 2 and 3 of similar length, much thinner and shorter than in female; male seta large, hook-like, almost as long as seta 3.

Differential diagnosis. Outer morphology of the new genus is typical for *Alona* s. lato. Several features separate this new genus from other genera: (1) from *Hexalona* groups of *Alona* s. lato (*Flavalona*, *Prenda*, *guttata*, *affinis* and *intermedia* groups) by absence of limb VI and filter plate V; (2) from *Anthalona*, *Coronatella* and *elegans*-group by seven setae on exopodite III, and by presence of well-developed seta 1 on IDL of limb III; (3) from *Alona* s. str. (*quadrangularis*-group) and *Ovalona*, by two main head pores, lateral head pores located close to main pores, and by bilobed exopodite V; (4) from *Ovalona* by presence of seta i and inner setae 2–3 on limb I, and setae 4–5 of exopodite III being of same size; and (5) from *Alona* s. lato by weakly developed marginal denticles of postabdomen, clusters of thin setules on ventral surface of limb I, and by plumose setae 5–6 of exopodite IV.

***Alpinalona cajasi* sp. nov.**
(Figs. 1–3)

Etymology. Species name refers to El Cajas National Park (Azuay Province; southern Ecuadorian Andes) where it has been found.

Type locality. Shallow lagoon annexed to Yantahuaico lake in the Cajas National Park, Azuay Province, Ecuador. Position: 250’7.428”S; 7920’31.696”W. Altitude: 4085 masl.

Type material. Holotype: parthenogenetic female from the type location, MECN SI-Cal-0007 coll. Henrietta Hampel, March 2015.

Paratypes: 10 parthenogenetic females, 4 gamogenetic females and 2 males from the type location, MECN SI-Cal-0007 coll. Henrietta Hampel, March 2015.

Comparative material examined: All in collection of Laboratory of Hydrobiology of the Departamento de Recursos Hídricos y Ciencias Ambientales de la Universidad de Cuenca (Ecuador). All localities from El Cajas National Park: Charca Anostráceos, code LUL159 (247’2.92”S, 7914’51.94”W, 4131 masl) March, 2015; Anexo Estrella 1, code CAL139 (251’5.88”S, 7920’19.72”W, 4125 masl) March, 2015; Anexa Culebrillas, code SUL190 (249’42.52”S, 7916’46.25”W, 3971 masl) April, 2015.

Diagnosis. *Parthenogenetic female.* Body sub ovoid, of moderate height, maximum height at middle of body. Dorsal margin uniformly curved; postero-dorsal angle prominent; postero-ventral angle broadly rounded and provided with about 20 short setulae organized in groups, without denticles. Body moderately compressed laterally. Ventral margin with about 50–60 setae. Head shield with broadly rounded posterior angle; rostrum short, broadly rounded. Two major head pores with narrow connection between them, PP about 2 IP. Lateral head pores minute, located at about same IP distance from midline, at level between major head pores. Labrum of moderate size; labral keel moderately wide, with convex anterior margin and rounded or blunt apex; anterior margin of keel convex, posterior margin without any setulae. Postabdomen moderately short and broad, subrectangular, maximum height at the middle of postanal margin. Length about 2.3–2.4 height. Ventral margin straight. Dorso-distal margin broadly rounded. Dorsal margin convex in postanal part and concave in anal part; preanal, anal and postanal margins of similar length. Preanal angle well-defined, postanal angle not defined. Preanal margin almost straight. 7–8 short postanal marginal groups of 3–5 denticles, each group formed by one bigger distal denticle followed by others decreasing in size proximally; 3–5 groups of marginal thin denticles on anal margin. 12–14 well-developed lateral fascicles of setulae; posteriormost setae of postanal fascicles very thick and long, about 1.5–2 width of postabdominal claw base. Distal postanal fascicles narrow, consisting of 4–6 setulae only, other more proximal fascicles of moderate width. Postabdominal claw weakly curved, slender, as long as preanal margin of postabdomen. Basal spine moderately short, thin, about 0.2 length of claw itself. Antennule long and narrow; antennular sensory seta 1.7 times shorter than antennule. Antennal formula, setae 0–0–3/1–1–3, spines 1–0–1/0–0–1. Seta arising from basal segment of endopodite slightly shorter than endopodite. Spine on basal segment of exopodite shorter than middle segment. Apical spine of exopodite longer than apical segment; apical spine of endopodite equal or little shorter than apical segment. Thoracic limbs as for genus.

*Male***.** Body low oval, height/length ratio about 0.53. Dorsal margin straight; posterodorsal angle prominent. Postabdomen similar in shape to that of female, but more narrow. Gonopores located at some distance from end of postabdomen. Ventral margin straight, with defined step at location of gonopores. Distal margin convex, distal angle broadly rounded. Preanal angle well-defined, postanal angle not defined. Distal part of postabdomen nearly as long than preanal, anal and postanal portions of similar length. Wide clusters of short thin spinulae in place of marginal denticles. Lateral fascicles of setulae same as in female. Postabdominal claw short, shorter than preanal portion of postabdomen; basal spine straight, about 0.17 claw length. Antennule without lateral aethetascs. Male seta arising at 1/4 antennule length from tip, about 0.5 antennule length. Limb I with U-shaped copulatory hook, its distal portion 1.5 times longer than basal one. A row of moderately long setulae located under copulatory brush on ventral face of limb. IDL without seta 1; setae 2 and 3 of similar length, much thinner and shorter than in female, male seta large, hook-like, almost as long as seta 3.

Description. Parthenogenetic female. *Habitus.* In lateral view body moderately high (Fig. 1A), maximum height at middle of body, height-to-length ratio 0.57–0.68 in adults; juvenile females with lower body than adult females. Body moderately compressed laterally. Dorsal margin uniformly curved; postero-dorsal angle characteristically protruding; postero-ventral angle broadly rounded; posterior margin weakly curved; ventral margin almost straight; antero-ventral angle rounded. Valves with well-developed linear sculpture. Ventral margin of valves (Fig. 1B) with 50–60 setae, about 15 anterior setae long, next 12–15 setae very short, followed by setae something shorter than the anterior ones, evenly decreasing in length posteriorly. Postero-ventral angle (Fig. 1C) bears about 20 short setulae of unequal length, organized into 2–3 groups. A row of about 200 setulae of unequal length, with very long setulae separated by shorter ones, along posterior margin on inner side of valve.

Head triangular-rounded in lateral view. In lateral view, rostrum short, pointing something forward. Ocellus and eye of similar size. Shape of head shield (Fig. 1E) as for genus, with maximum width behind the mandibular articulation; length about 1.4 width. Rostrum short, broadly rounded. Posterior part of head shield with broadly rounded distal angle. Two main head pores of similar size with narrow connection between them (Fig. 1F), PP about 2IP in adults. Lateral head pores minute, located at about same IP distance from midline, at level between main head pores.

Labrum (Fig. 2G) of moderate size; labral keel moderately wide, height-to-width ratio about 1.8, with rounded, blunt or slightly low-cut apex; anterior margin of keel convex, posterior margin without any setulae.

Thorax two times longer than abdomen. Middle abdominal segment not saddle-shaped, no abdominal joint.

Postabdomen (Fig. 2A, B) moderately short and broad, subrectangular, maximum height at the middle of postanal margin. Length about 2.3–2.4 height. Ventral margin straight. Dorso-distal margin broadly rounded. Dorsal margin convex in postanal part and concave in anal part; preanal, anal and postanal margins of similar length. Preanal angle well-defined, postanal angle not defined. Preanal margin almost straight. 7–8 short postanal marginal groups of 3–5 small denticles, each group formed by one bigger distal denticle followed by others decreasing in size proximally; 3–5 groups of marginal thin denticles on anal margin. 12–14 well-developed lateral fascicles of setulae; posteriormost setae of postanal fascicles very thick and long, about 1.5–2 width of postabdominal claw base. Distal postanal fascicles narrow, consisting of 4–6 setulae only, other more proximal fascicles of moderate width.

Postabdominal claw (Fig. 2A) weakly curved, slender, as long as preanal margin of postabdomen. Basal spine moderately short, thin, about 0.2 length of claw itself. Group of small spinulae located near the base of claw before basal spine.

Antennule (Fig. 1H) long and slender, length about 3 width, with four clusters of setulae on inner face. Antennular sensory seta slender, 1.7 times shorter than antennule, arising at 2/3 distance from the base. Nine aesthetascs of similar size, about half-length of antennule, projecting beyond anterior margin of the head shield.

Antenna (Fig. 1I) with antennal formula setae 0-0-3/1-1-3, spines 1-0-1/0-0-1. Basal segment massive, branches of moderate length, basalmost segments of both branches 1.5 times longer than others. Seta arising from basal segment of endopodite thin, surpassing tip of distal segment. Seta arising from middle segment of endopodite of similar size than apical setae. All apical setae of similar size and thickness. Spine on basal segment of exopodite slightly shorter than middle segment. Apical spine of exopodite longer than apical segment; apical spine of endopodite equal or little shorter than apical segment.

Thoracic limbs: five pairs.

Limb I (Fig. 3A) of moderate size. Epipodite oval, without projection. Accessory seta short, 4 times shorter than ODL seta. ODL seta with very short setulae in distal part. IDL with 3 setae, seta 1 sharp, about 1/6 length of ODL seta, setae 2 and 3 of moderate thickness, armed with thin setulae in distal part, seta 3 almost as long as ODL seta, seta 2 about 2/3 length of ODL seta. Endite 3 with four setae subequal in length. Endite 2 with three outer setae of different length, longest of them (e) longer than ODL seta and inner naked seta on anterior face. Endite 1 with two 2-segmented setae (g–h); a flat, geniculated seta (i) shifted to limb base, and inner naked setae on anterior face. Maxillar process long and narrow, with single setulated seta. Four–five rows of long setulae on ventral face of limb. Two ejector hooks, one of them slightly longer than other.

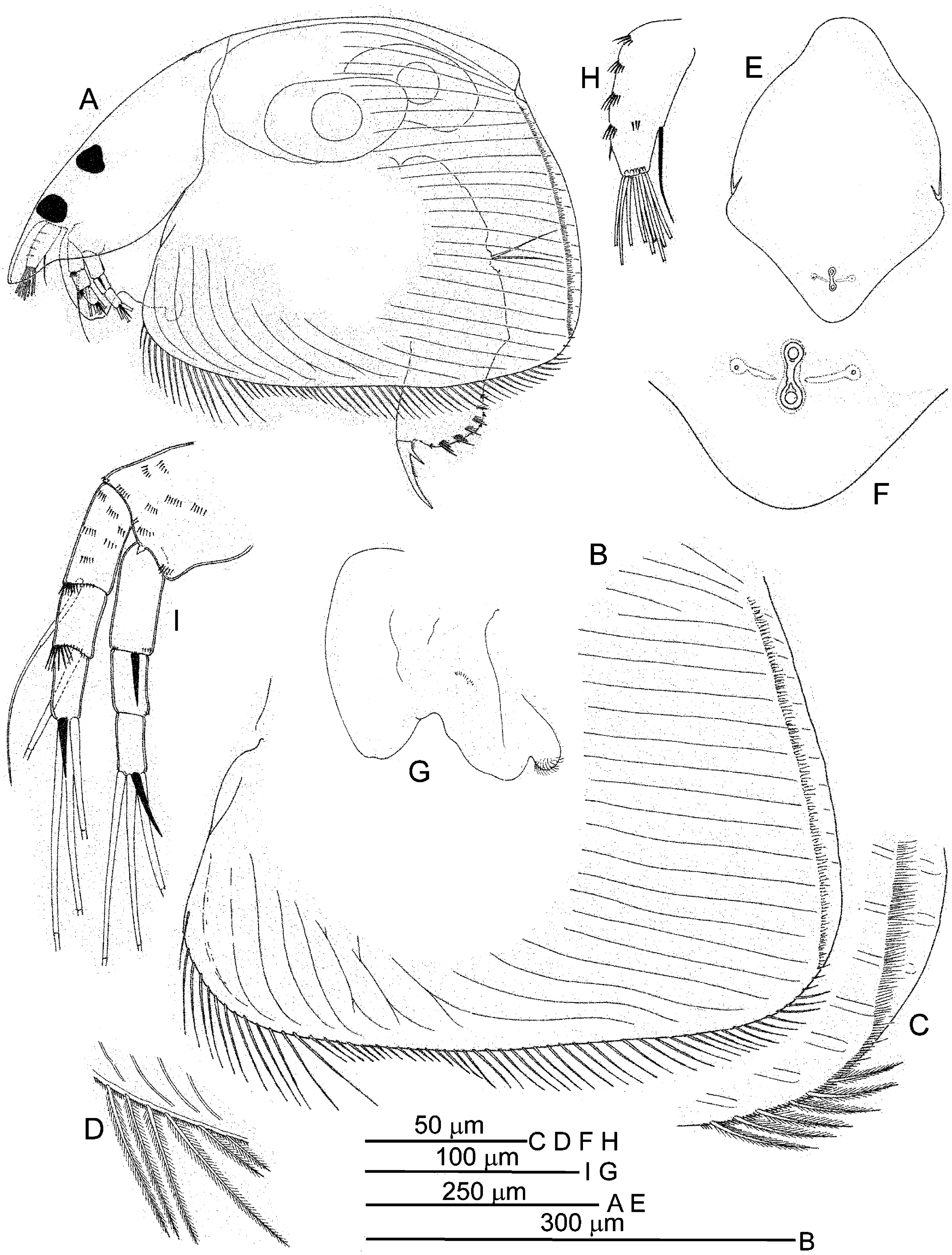

FIGURE 1. *Alpinalona cajasi* **sp. nov**. from the Cajas National Park, Azuay Province, Ecuador. A-I, adult parthenogenetic female. A, habitus. B, left valve. C, posteroventral angle of valve. D, marginal setae of anterior part of valve. E, head shield. F, head pores and posterior margin of head shield. G, labrum. H, antennule. I, left antenna.

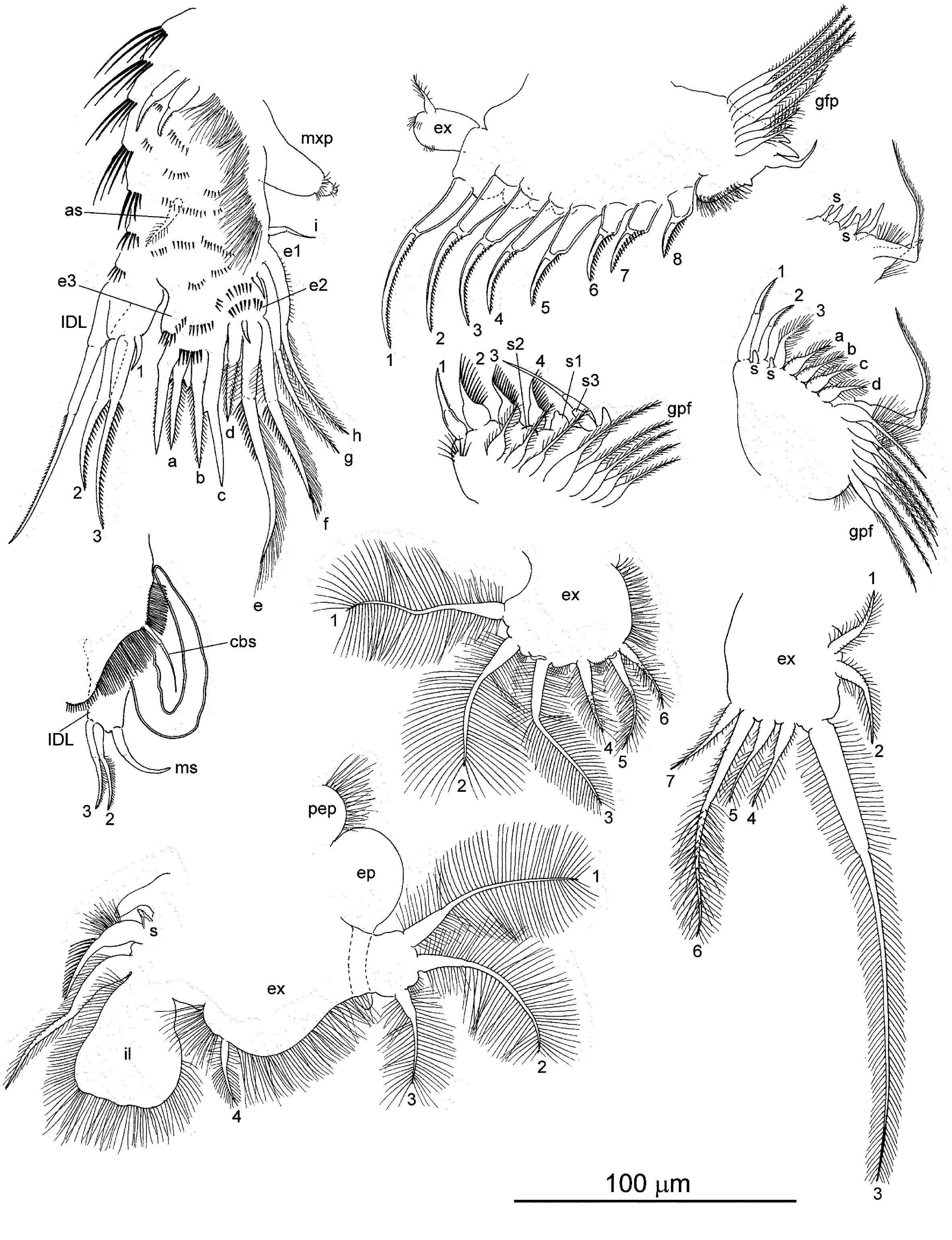

FIGURE 2. *Alpinalona cajasi* **sp. nov**. from the Cajas National Park, Azuay Province, Ecuador. A–H, adult parthenogenetic female. A, limb I. B, limb II. C, exopodite of limb III. D-E, inner portion of limb III. F, inner portion of limb IV. G, exopodite of limb IV. H, limb V. I, ventral margin, IDL and copulatory hook of limb I of adult male.

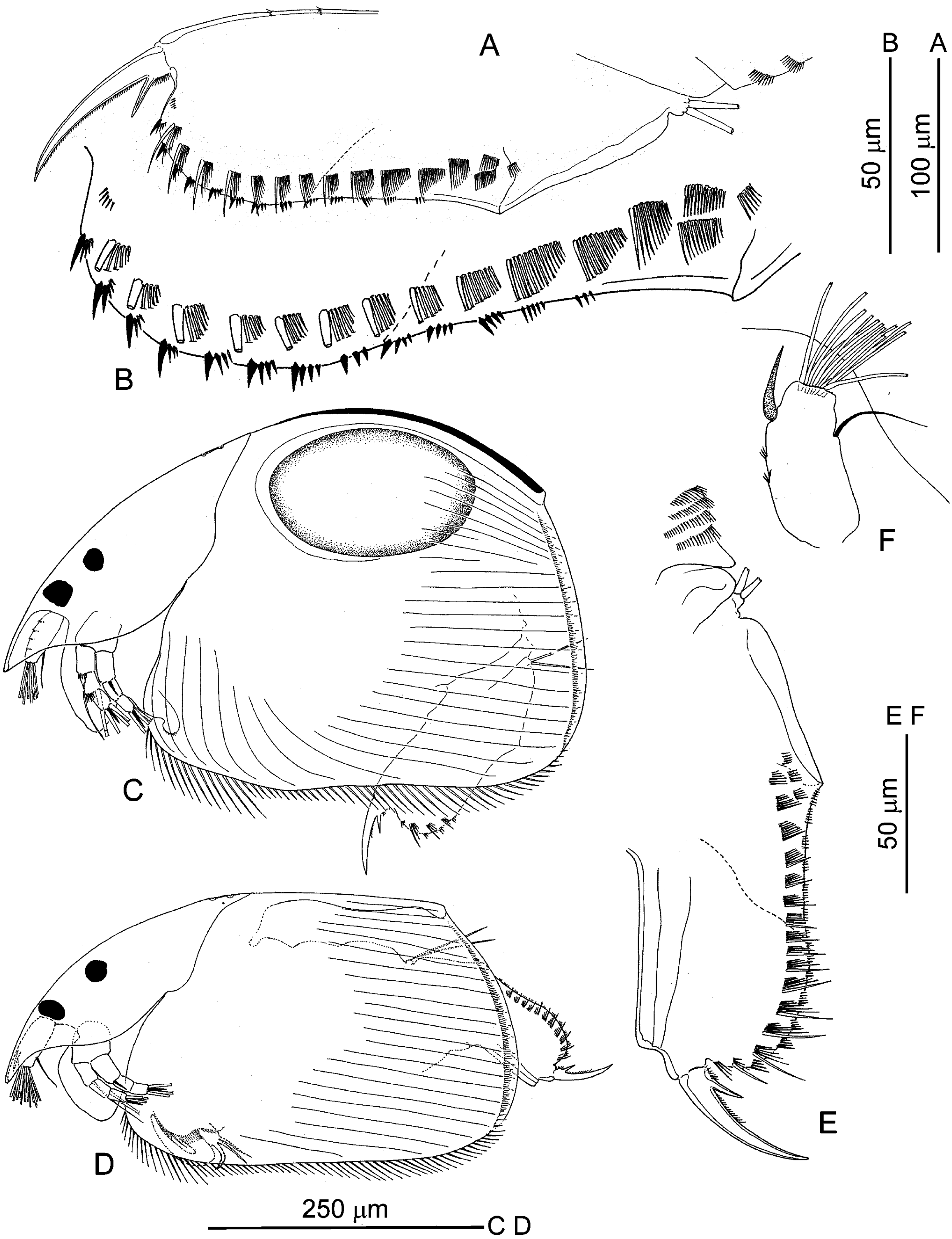

FIGURE 3. *Alpinalona cajasi* **sp. nov**. from the Cajas National Park, Azuay Province, Ecuador. A–B, adult parthenogenetic female postabdomen. C, ephippial female. D, adult male. E, adult male postabdomen. E, adult male antennule.

Limb II triangle-rounded (Fig. 3B). Exopodite elongated, of irregular shape, with short seta.

Inner portion of limb with eight scraping spines increasing progressively in length distally, armed with denticles of similar size. Distal armature of gnathobase with four elements. Filter plate II with seven setae, two posteriormost members considerably shorter than others.

Limb III. (Figs. 3C–E) Epipodite oval. Exopodite subquadrangular, with seven setae. Seta 3 longest; setae 6 about 0.45 length of seta 3; other setae short, more than two times shorter than seta 6. Setae 1–5 plumose, seta 6 armed bilaterally with hard setulae, seta 7 with short thin setulae at the middle. Distal endite with 3 setae and two small sensillae; two distalmost setae (1–2) scraping, slender, sharp, with denticles in distal part; basalmost seta (3) shorter, flattened, geniculated, bilaterally provided with setulae. Basal endite with 4 setae (a–d). Gnathobase with sensillum, small spine and a geniculated seta. Filter plate III with seven setae.

Limb IV (Figs 3F–G). Pre-epipodite setulated; epipodite with finger-like projection 1.5 times longer than epipodite itself. Exopodite subquadrangular, with six plumose setae. Setae 1–3 being longest; setae 2 slightly shorter than setae 1- 3; seta 5 about 2/3 length of seta 3; setae 4 and 6 about 1/2 length of seta 3; seta 4 shorter than seta 6. Inner portion with four setae and small bottle-shaped sensillum. Scraping seta slender, sharp, flaming-torch setae of similar shape, decreasing in size basally; small sensillum located between bases of setae 3 and 4. Three inner setae of similar length than filter plate setae. Gnathobase with long seta bent over endite, sensillum and small hillock distally. Filter plate IV with five setae.

Limb V (Fig. 3H). Preepipodite setulated, epipodite oval, with finger-like projection. Exopodite of moderate size, separated into two lobes, with four plumose setae evenly decreasing in length basally; seta 4 short, three times shorter than seta 1. Inner lobe moderately broad, widening distally. At inner face, two setae, distal seta 1.5 times longer than basal seta; large hillock and a small sensilla-like structure are located near its base. Filter plate V absent.

Ephippial female and ephippium. Ephippial female (Fig. 2C) of same size as parthenogenetic female. Dorsal margin more chitinized. Ephippium light brown.

Male. Body (Fig. 2D) lower than in female, height/length ratio about 0.53. Both eye and ocellus of size as in female.

Head similar to that of female. PP nearly IP distance.

Postabdomen (Fig. 2E) similar in shape to that of female, but more narrow, Length about 2.7 height. Gonopores located at some distance from the end of postabdomen. Ventral margin straight, with defined step at the location of gonopores. Distal angle broadly rounded. Preanal angle well-defined, postanal angle not defined. Distal part of postabdomen 1.6 times longer than preanal, anal portion slightly shorter than preanal portion. Clusters of short setulae in place of marginal denticles. Lateral fascicles of setulae same as in female.

Postabdominal claw short, shorter than preanal portion of postabdomen; basal spine straight, about 0.17 of claw length.

Antennule (Fig. 2F) short and moderately broad, length about two widths. 12 aesthetascs, of similar length, all of them terminal projecting beyond anterior margin of the head shield. Male seta about 1/3 of antennule length, arising at 1/4 length from tip.

Limb I (Figs. 3I) more massive than in female, copulatory hook U-shaped, its distal portion 1.5 times longer than basal one. A row of moderately long setulae located under copulatory brush on ventral face of limb. IDL without seta 1, setae 2 and 3 of similar length, much thinner and shorter than in female; male seta large, hook-like, almost as long as seta 3.

Size. In adult females length 0.48–0.58 mm, height 0.28–0.36 mm; length of adult males was 0.41–0.43 mm, height 0.22–0.23 mm.

Differential diagnosis. *Alpinalona cajasi* **sp. nov.** and *A. manueli*, the only two species in the genus, are quite similar. However, several features separate them easily, these are: (1) posterodorsal angle of carapace in *A. cajasi* **sp. nov.** shows a characteristic prominence formed by the dorsal union of the valves which extends backwards a little. This is a rare characteristic among Aloninae. In *A manueli* the porterodorsal angle of the carapace is broadly rounded; (2) female headshield is broader in *A. cajasi* **sp. nov**.; length/width about 1.4 in the new species and 1.6 in *A. manueli*; (3) in females, PP distance in *A. cajasi* **sp. nov**. is about 2 IP whereas in *A. manueli* the PP distance is 0.8–1.2 IP; (4) in *A. cajasi* **sp. nov** marginal denticles of female postabdomen, mainly in postanal portion, organized in groups of 3–5 elements decreasing in size proximally whereas in *A. manueli* such denticles are single composite, nearly triangular, with 2–5 spinulae on posterior margin.

Distribution and ecology. *Alpinalona cajasi* **n. sp.** was, up to now, known only from the El Cajas National Park, in the Southern part of Ecuadorian Andes. It occurs both in the littoral of big lakes such as Patoquinuas and Sunincocha, and in small lagoons and temporary ponds, always associated with submerged macrophytes (*Myriophyllum quitense, Potamogeton paramoanus*). Lakes are oligotrophic, although with significant amounts of DOC coming from adjacent lands dominated by paramo grassland (pajonal). Water mineralization is very low (9.84–91.50 S/cm).

Discussion

According to the recent works on the taxonomy of Aloninae, the main generic criteria for *Alona* s. lato is uniform morphology of thoracic limbs (Sinev 2015; Sinev & Dumont 2016). The genus *Alpinalona* **gen. nov**. differs from all other existing genera of *Alona* s. lato by the unique set of limb characters. *Alpinalona* **gen. nov.** lacks limb IV and filter plate V, which are present in all groups of *Hexalona*-branch sensu Van Damme & Dumont (2008a) (*Flavalona*, *Prenda*, *guttata*, *affinis* and *intermedia* groups). On the other hand, the genus retains well-developed IDL seta 1 on limb I and seven setae on exopodite III, unlike the genera of the *Coronatella*-branch (*Anthalona*, *Coronatella*, *Magnospina*, *Leberis* and *elegans*-group).

Thoracic limb morphology similar to that of *Alpinalona* **gen. nov.** is present only in two genera of the group namely *Alona* s. str. and *Ovalona*. But *Alpinalona* **gen. nov.** differs from both these genera by bilobed exopodite V; from *Ovalona* by presence of seta i and inner setae 2–3 on limb I, and setae 4–5 of exopodite III being of same size; from *Alona* s. lato by weakly developed marginal denticles of the postabdomen, clusters of thin setulae on the ventral surface of limb I, and by plumose setae 5–6 of exopodite IV. Additional differences are present in outer morphology, *Alpinalona* **gen. nov.** differs from both these genera by two main head pores and by the shape of postabdomen; from *Ovalona* by lateral head pores located more close to the main ones; and from *Alona* s. str. by the shape of the posterior part of the head shield and by weakly developed marginal denticles of the postabdomen.

Both the *Hexalona* and *Coronatella*-branches of *Alona* s. str., as defined by Van Damme & Dumont (2008) are not monophyletic (Sinev 2015; Sinev & Dumont 2016). According to Sinev (2015), one of monophyletic clades within the *Coronatella*-branch of *Alona* s. str. includes *Ovalona*, *elegans*-group, *Leberis*, *Celsinotum* and *Magnospina*. The relationship between *Coronatella*, *Anthalona*, and *Karualona* is so far not resolved.

Our analyses reveal one more monophyletic clade of *Alona* s. lato, which includes the *intermedia*-group, *Alpinalona* **gen. nov**., *Karualona, Rheoalona* Sinev, Tiang-nga & Sanomuang, 2017 and *Anthalona*. The main synapomorphies of the clade are two main head pores, and shortened broad postabdomen armed with extremely well-developed lateral setulae and weakly developed marginal denticles. The most primitive group of the clade is the *intermedia*-group, which retain limb morphology of *Hexalona*-type (well-developed IDL seta 1, seven setae on exopodite III, present). In other genera of the group, we observe gradual changes in limb structure. *Alpinalona* **gen. nov**. lack filter plate V and limb VI, but retain IDL seta 1 and seven setae on exopodite III. *Karualona*, *Rheoalona* and *Anthalona* form terminal clade of the group, characterized by six setae on exopodite III in addition to the absence of filter plate V and limb VI, relationship of these genera was discussed in details by Sinev *et al*. (2016). Only *Karualona* retain IDL seta 1, absent in *Rheoalona* and *Anthalona*, which have limb morphology typical for the *Coronatella*-group.

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