

New species of *Leptocaris* and a new record of *Darcythompsonia inopinata* (Harpacticoida: Darcythompsoniidae) from Colombia

Nuevas especies de *Leptocaris* y un nuevo registro de *Darcythompsonia inopinata* (Harpacticoida: Darcythompsoniidae) de Colombia

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ABSTRACT

Water samples taken from Rodadero Bay (Colombia) yielded three species of harpacticoid copepods of the family Darcythompsoniidae. *Leptocaris colombiana* sp. nov. is attributed to the *brevicornis*-group, and is characterized by the five-segmented antennule, discrete (not fused) female genital somite and third urosomite, six setae on the caudal rami, two setae on the antennal exopod, lack of abexopodal seta on the allobasis of the antenna, mandibular palp reduced to one seta, one inner seta only on the first endopodal segment of leg one and second segment with two apical elements, and by three setae on leg five. *Leptocaris vicina* sp. nov., is attributed to the *mangalis*-group, and is similar to *L. stromatolicola* in the armature formula of leg one to leg four, female leg five with two inner small subequal setae and one outer long element, five-segmented female antennule, antenna with one abexopodal seta on allobasis, antennal exopod reduced to two setae, mandibular palp reduced to one seta, and maxilla with two endites. These two species can be separated by the shape of the anal operculum, by the relative length of the endopodal segments of legs two and three, and by the innermost distal spine of the endopodal segment of the antenna. The record of *Darcythompsonia inopinata* from northern Colombia represents a continuum along the Caribbean coast of the Pacific dominion, Brazilian subregion.

Key words. Caribbean, Copepoda, Crustacea, taxonomy.

RESUMEN

Se hallaron tres especies de copépodos harpacticoides de la familia Darcythompsoniidae en muestras de agua tomadas de la Bahía del Rodadero (Colombia). *Leptocaris colombiana* sp. nov. pertenece al grupo *brevicornis*, y se caracteriza por la anténula de cinco segmentos, somita genital y tercer urosomita de la hembra discretos (no fusionados), ramas caudales con seis setas, exópodo de la antena representado por dos setas, alobase de la antena sin seta abexopodal, palpo mandibular reducido a una seta, primer segmento del endópodo de la pata uno con una seta interna y segundo segmento con dos setas apicales, y pata cinco con tres setas. *Leptocaris vicina* sp. nov. pertenece al grupo *mangalis* y es similar a *L. stromatolicola* en la fórmula de setas y espinas de las patas uno a cuatro, pata cinco de la hembra con dos setas internas pequeñas de la misma longitud y un elemento externo largo, anténula de la hembra de cinco segmentos, alobase de la antena con una seta abexopodal, exópodo de la antena reducido a dos setas, palpo mandibular reducido a una seta, maxila con dos enditos. Estas dos especies pueden distinguirse por la forma del opérculo anal, por la longitud relativa de los segmentos del endópodo de las patas dos y tres, y por la espina interna del segmento

del endópodo de la antena. Finalmente, el registro de *Darcythompsonia inopinata* en el norte de Colombia representa un continuo a lo largo de la costa caribeña del dominio del Pacífico, subregión Brasileña.

Palabras clave. Caribe, Copepoda, Crustacea, taxonomía.

INTRODUCTION

The marine and brackish harpacticoid fauna from Colombia has received some attention recently, and 15 families, 28 genera, and 48 species of harpacticoid copepods are known (Fuentes-Reinés and Zoppi de Roa 2013a, b, Fuentes-Reinés and Gómez 2014, Fuentes-Reinés and Suárez-Morales 2014a, b, Fuentes-Reinés *et al.* 2015, Gómez and Fuentes-Reinés 2017, Suárez-Morales and Fuentes-Reinés 2015a, b), including the three representatives of the family Darcythompsoniidae reported herein. Although they are common inhabitants of mangrove ecosystems (Por 1983, Gee and Somerfield 1997, Boxshall and Halsey 2004, Huys *et al.* 2016), members of the family Darcythompsoniidae are also common in some other habitats (Zamudio-Valdéz and Reid 1990, Fiers 1986). Several harpacticoid copepods were gathered in water samples taken from mangrove ecosystems and oyster banks in Rodadero Bay, Magdalena, northern Colombia. Among others, we found specimens of *Tisbintra* (Tisbidae) and *Geehydrosoma* (Cletodidae), whose descriptions were published earlier (Gómez and Fuentes-Reinés 2017). Darcythompsoniids were scarce and only three specimens were retrieved. Two of them attributed to the genus *Leptocaris* and whose complete descriptions are given below, turned out to be new to science. Additionally, we report on the presence of *Darcythompsonia inopinata* Smirnov, 1934 in Rodadero Bay, Magdalena, northern Colombia.

MATERIALS AND METHODS

Eleven water samples were collected from mangrove ecosystems and at an oyster bank

in Rodadero Bay, Magdalena, northern Colombia (11°14' North, 74°12' West). These samples were collected monthly from August 2015 to June 2016. Samples of 432 l each were taken using a 25 l bucket, sieved with a 45 µm zooplankton net, and preserved in 70% ethanol. Water salinity, pH, and temperature were measured with a Multi 350i handheld meter. Copepods were sorted manually and processed for taxonomic identification. Observations and drawings of the material presented herein were made from whole and dissected material. Dissected parts were mounted in lactophenol under a Leica compound microscope equipped with phase contrast and a drawing tube at a magnification of 1000X. Partially dissected material — habitus, right antennule, labrum, and P5 of *Leptocaris colombiana* sp. nov.— was left intact and preserved in alcohol.

The material examined was deposited in the Copepoda collection of the Instituto de Ciencias del Mar y Limnología, Mazatlán Marine Station (ICML-EMUCOP) and in the Centro de Colecciones Biológicas de la Universidad del Magdalena-Colombia (CBUMAG). Morphological terminology follows 0 except for the maxilla. Morphological terminology for the latter follows Ferrari and Ivanenko (2008). The following abbreviations are used throughout the text and figures: ae, aesthetasc; P1-P4 ENP/EXP1-3, first (proximal) to third (distal) endopodal/exopodal segment of first to fourth leg; P5, fifth leg.

Note also that the genus name *Leptocaris* is feminine (Art. 30.1.2; ICZN 1999) and Apostolov's (2007) and Huys' (2009) views have been adopted here for the masculine

names given to some species of the genus. The biogeographical regionalization of the Neotropical region by [Morrone \(2014\)](#) was adopted.

RESULTS

Taxonomy

Order Harpacticoida Sars, 1903

Family Darcythompsoniidae Lang, 1936

Leptocaris Scott T., 1899

Leptocaris colombiana sp. nov.

(Figs. 1-3)

Type material. Adult female holotype partially dissected as follows: habitus, right antennule, labrum, and P5 left intact and preserved in alcohol (ICML-EMUCOP-010815-11); left antennule, antennae, mandibles, maxillulae, maxillae, P1-P4 dissected (ICML-EMUCOP-010815-12) and mounted onto four slides; Colombia, Magdalena, Rodadero Bay, 11°14' North, 74°12' West; August 2015; coll. J. M. Fuentes-Reinés.

Diagnosis

Habitus elongate, cylindrical. Rostrum minute. Female antennule five-segmented. Antenna with allobasis, without abexopodal seta; exopod represented by two setae; endopod one-segmented, with seven elements, of which apical inner spine smallest. Mandible with well-developed coxa and gnathobase; palpus represented by single seta. Maxillule with well-developed arthrite bearing four distal multicuspidate spines and three pinnate setae, and one surface seta; coxal endite, basis, exopod and endopod fused, with seven setae in all. Syncoxa of maxilla with one (probably coxal) endite armed with one stout spinulose element fused to endite basally, and one slender seta; allobasis with one (probably basal) strong claw with one accompanying seta, drawn out into strong curved claw with one accompanying seta (probably

endopodal), endopod represented by two setae. Maxilliped absent. P1-P4 with three-segmented exopod and two-segmented endopod. Female P5 reduced, fused to somite ventrally, with three setae in all. Caudal rami with six setae.

Description of female

Habitus elongate, cylindrical, without a clear division between pro- and urosome. Total body length measured from anterior margin of rostrum to posterior margin of caudal rami, 620 μm . Cephalothorax (Fig. 1a) rounded anteriorly; with minute surface denticles posteriorly; with sensilla as shown; medial and posterior sensilla very long (indicated in Fig. 1a). Rostrum (Fig. 1a) minute, fused to cephalothorax, with two long sensilla. Surface of free prosomites (Fig. 1b) covered with small denticles; posterior margin of somites with coarser denticles and with some short sensilla; with two dorsal and two lateral long sensilla on posterior third of somites. First urosomite (P5-bearing somite; Fig. 1c) ornamented with denticles dorsally as previous prosomites; ventrally without denticles, with some sensilla along posterior margin only, with two small medial pores close to P5 (Fig. 1d). Genital somite and third urosomite discrete (Figs. 1c, d); genital somite with small denticles dorsally, posterior denticles not coarser than the rest (Fig. 1c); ventrally without denticles, with some sensilla along posterior margin only (Fig. 1d); genital field (Figs. 1d, f) located on anterior half of somite, with medial copulatory pore. Third urosomite with denticles and sensilla as in P5-bearing somite dorsally (Fig. 1c); ventrally with one row of slender spinules on proximal third, with one medial short row of slender spinules close to posterior margin, and one long row of slender spinules along posterior margin medially (Fig. 1d). Fourth urosomite as previous somite dorsally (Fig. 1c); ventrally without denticles, with long medial row of slender spinules along

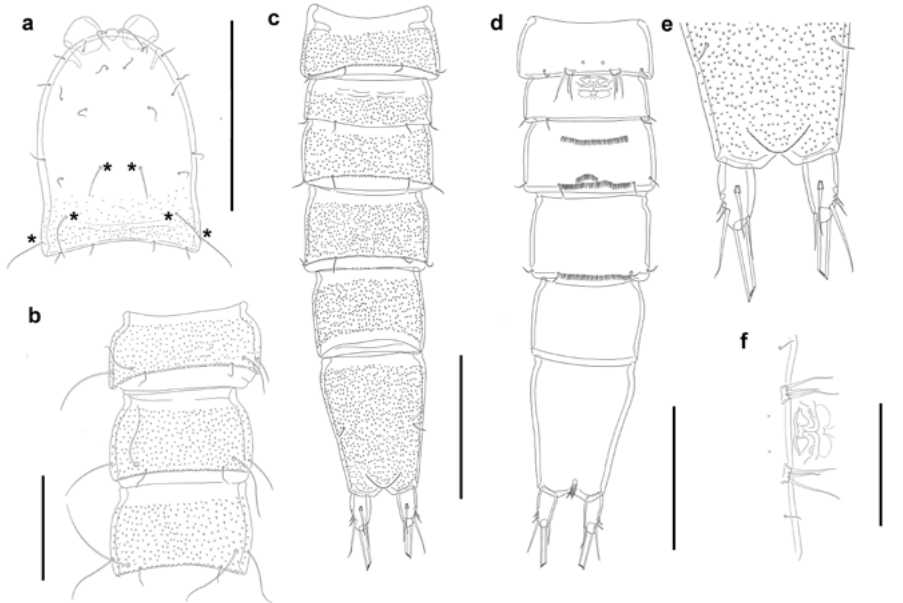


Figure 1. *Leptocaris colombiana* sp. nov. Female. **a.** cephalothorax, dorsal, posterior long sensilla indicated by asterisks, **b.** free prosomites, dorsal, **c.** urosome, dorsal, **d.** urosome, ventral, **e.** posterior half of anal somite and caudal rami, dorsal, **f.** genital field and P5. Scale a,c,d,e = 100 μ m, Scale b,f = 50 μ m.

posterior margin (Fig. 1d). Fifth urosomite with small denticles dorsally, those along posterior margin not visibly coarser than the rest (Fig. 1c); without ventral ornamentation (Fig. 1d). Anal somite (Figs. 1c-e) elongate, conical, tapering distally, about as long as two previous somites combined; with crescentic anal operculum not reaching posterior margin of somite (Fig. 1e); the two sensilla associated to the anal operculum separated by a gap visibly wider than the width of the anal operculum, and displaced medially (Figs. 1c, e). Caudal rami (Figs. 1c-e) ovate, about twice as long as wide; with six setae as follows (seta I lost): seta II and III vestigial, situated laterally on distal half of ramus; seta IV well-developed, displaced dorsally close to vestigial setae II and III; apical seta V longest; inner seta VI arising distally; dorsal seta VII arising medially, articulated basally.

Antennule (Fig. 2a) short, five-segmented. Armature formula as follows: 1(1)-2(7)-3

(5+[1+ae])-4(1)-5(8+[1+ae]); all setae smooth; three setae articulated on last segment.

Antenna (Fig. 2b) with unornamented coxa. Allobasis and free endopodal segment subequal in length; the former without armature nor ornamentation. Exopod represented by two setae. Endopodal segment with one proximal and one subdistal transverse row of strong spinules, with two stout lateral spines on inner margin, and three spines and two setae distally, one of them with comb-like tip.

Mandible (Fig. 2c) with well-developed gnathobase bearing several multicuspidate teeth and one lateral seta. Palp represented by one long seta.

Maxillule (Fig. 2d) with unornamented praecoxa. Arthrith well-developed, with four multicuspidate spines and three pinnate setae; with one surface seta; coxal endite,

basis, exopod and endopod fused, with two proximal, two subdistal and three distal setae.

Maxilla (Fig. 2e) with syncoxa ornamented with spinular patch as depicted, and with one syncoxal (probably coxal) endite with one stout spinulose element fused to endite basally, and one slender seta. Allobasis with one (probably basal) strong claw with one accompanying seta, drawn out into strong curved claw with one accompanying seta (probably endopodal); endopod represented by two setae.

Maxilliped absent.

P1 (Fig. 3a). Coxa seemingly without ornamentation. Basis with one subdistal spinular row medially, and one transverse spinular row close to exopod, with one inner spine-like element and one outer seta. Exopod three-segmented; all segments with outer spinules close to outer spine and distally; EXP1 and EXP2 without inner seta; EXP3 with one outer spine, two apical and one inner bare elements; all elements seemingly bare. Endopod two-segmented; reaching distal margin of EXP2; ENP1 with some subdistal spinules, with one inner seta oriented downwards and with comb-like tip; ENP2 with some subdistal spinules, with one apical outer bare spine and one apical inner bare short seta.

P2 (Fig. 3b). Coxa with some small spinules close to outer corner. Basis with one subdistal spinular row medially, and one transverse spinular row close to exopod; outer seta short, spine-like. Exopod three-segmented; all segments with outer spinules close to outer bare spine and distally; EXP1 and EXP2 without inner armature; EXP3 with two outer bare spines and two apical setae—outermost with outer spinules, innermost with outer spinules and inner setules—. Endopod two-segmented, barely reaching tip of EXP2, with spinular ornamentation as shown; ENP1 without armature; ENP2 with

one strong inner seta with comb-like tip, two apical setae with outer spinules medially and with setules distally and along inner margin, and one outer apical bare spine.

P3-P4 (Figs. 3c, d). Coxa with some small spinules close to outer corner. Basis with one subdistal spinular row medially, and one transverse spinular row close to exopod; outer element setiform, longer than in P2. Exopod three-segmented; all segments with outer spinules close to outer bare spine and distally; EXP1 and EXP2 without inner armature; EXP3 with two outer bare spines, two apical setae with outer spinules and inner setules, and one inner plumose element. Endopod two-segmented, barely reaching tip of EXP2, with spinular ornamentation as shown; ENP1 without armature; ENP2 with one strong inner seta with comb-like tip, two apical setae with outer spinules medially and with setules distally and along inner margin, and one outer apical bare spine. Armature formula of P1-P4 as in table 1.

P5 (Figs. 1d, f) represented by small segment fused to somite ventrally; each leg with three bare setae, of which innermost and outermost subequal in length, medial shorter.

Table 1. Armature formula of P1-P4 of *Leptocaris colombiana* sp. nov.

	P1	P2	P3	P4
EXP	0-0-121	0-0-022	0-0-122	0-0-122
ENP	1-020	0-121	0-121	0-121

P1 = leg 1, P2 = leg 2, P3 = leg 3, P4 = leg 4, EXP = exopod, ENP = endopod.

Etymology

The specific epithet, *colombiana*, refers to the country where the species was found.

Leptocaris vicina sp. nov.

(Figs. 4-6)

Type material. Adult female holotype partially dissected as follows: urosome left in-

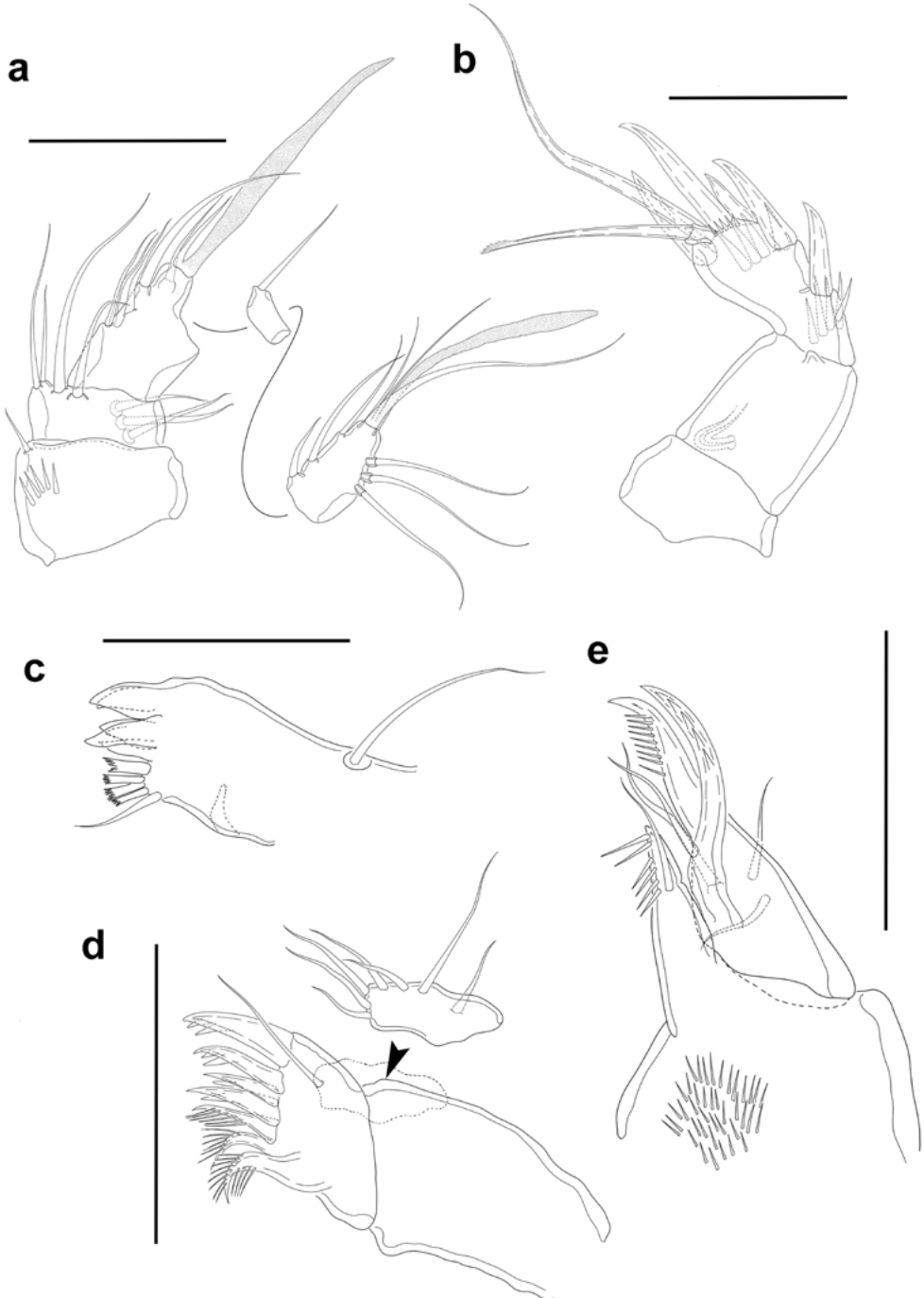


Figure 2. *Leptocaris colombiana* sp. nov. Female. **a.** antennule, **b.** antenna, **c.** mandible, **d.** maxillule, **e.** maxilla. Scale = 25 μ m.

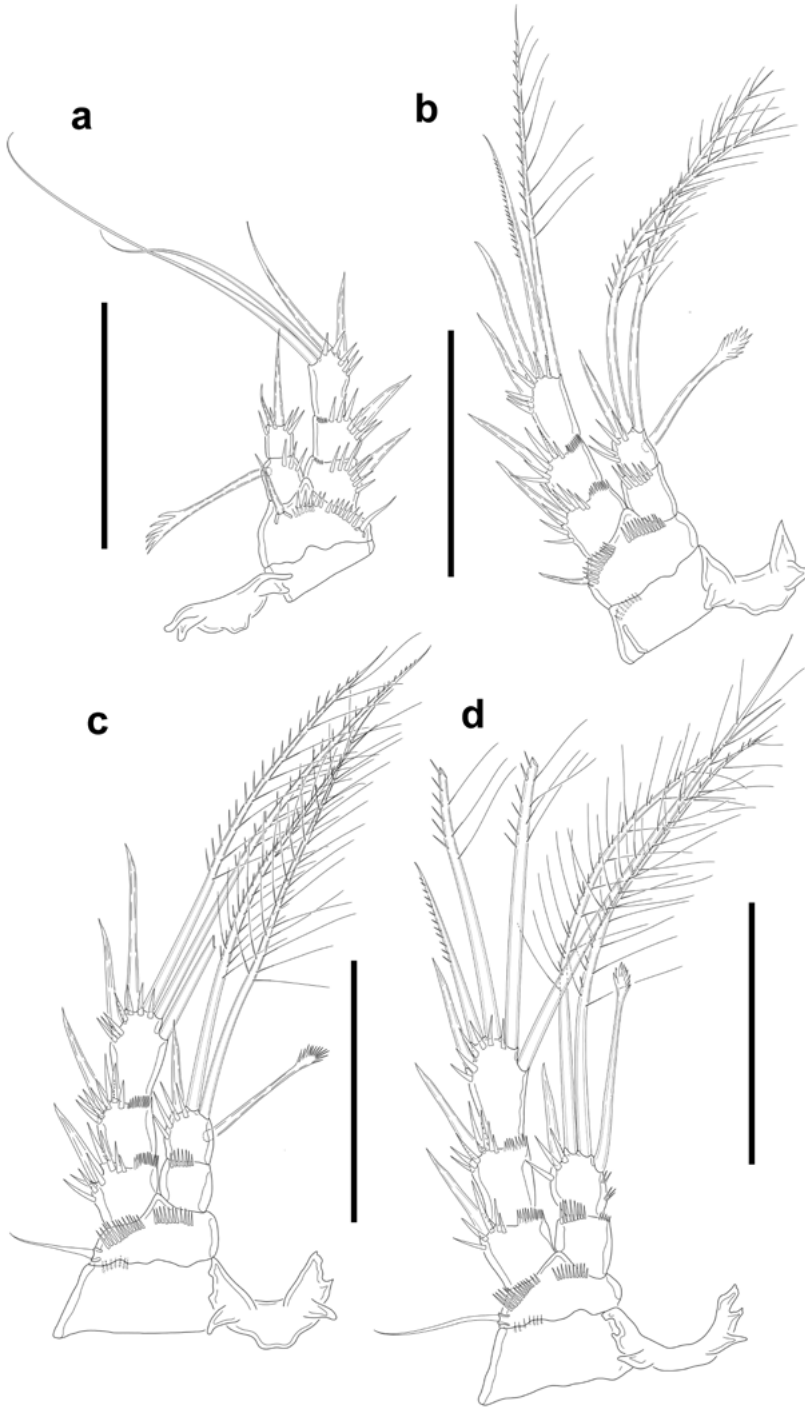


Figure 3. *Leptocaris colombiana* sp. nov. Female. **a.** P1, anterior, **b.** P2, anterior, **c.** P3, anterior, **d.** P4, anterior. Scale = 50 μ m.

tact and preserved in alcohol (ICML-EMU-COP-010815-14); antennules, antennae, mouth parts, and P1-P4 dissected and mounted onto five slides (ICML-EMU-COP-010815-13); Colombia, Magdalena, Rodadero Bay, 11°14' North, 74°12' West, August 2015; coll. J. M. Fuentes-Reinés.

Diagnosis

Habitus elongate, cylindrical. Rostrum minute. Female antennule five-segmented. Antenna with allobasis, with abexopodal seta; exopod represented by two setae; endopod one-segmented, with seven elements, of which apical inner spine very small. Mandible with well-developed coxa and gnathobase; palpus represented by single seta. Maxillule with well-developed arthrite bearing four distal spines and two pinnate elements, with one surface seta; coxal endite, basis, exopod and endopod fused, with four setae. Syncoxa of maxilla with one (probably coxal) endite with one stout spinulose element fused to endite basally, and two slender setae; allobasis with one (probably basal) strong claw with two accompanying setae, drawn out into strong curved pinnate claw with one accompanying seta (probably endopodal), endopod represented by two setae. Maxilliped absent. P1-P4 with three-segmented exopod; P1 with one-segmented endopod; P2-P4 with two-segmented endopod. Female P5 reduced, fused to somite ventrally, with three setae in all, of which outermost longest. Caudal rami with six setae.

Description of female

Habitus as in *L. stromatolicola* Zamudio-Valdéz & Reid, 1990, elongate, cylindrical, without a clear division between pro- and urosome. Total body length measured from anterior margin of rostrum to posterior margin of caudal rami, about 533 µm. Dorsal surface of pro- and urosomites smooth, without ornamentation. Rostrum minute, fused to cephalothorax, with two sensilla. Genital somite and third urosomite

fused, without trace of division, forming genital double-somite; genital field located on anterior half of somite, with medial copulatory pore. Posterior half of genital double-somite and following somite with medial row of minute spinules close to posterior margin. Fifth urosomite without ornamentation. Anal somite (Fig. 4) about 1.3 times as long as preceding somite, tapering posteriorly; with naked rounded anal operculum; the two sensilla associated to the anal operculum separated by a gap about as wide as the width of the anal operculum, and displaced medially. Caudal rami (Fig. 4) ovate, about twice as long as wide; with six setae as follows (seta I lost): seta II and III vestigial, situated laterally on distal half of ramus; seta IV well-developed, displaced dorsally close to vestigial setae II and III; apical seta V longest; inner seta VI arising distally; dorsal seta VII arising medially, articulated basally.

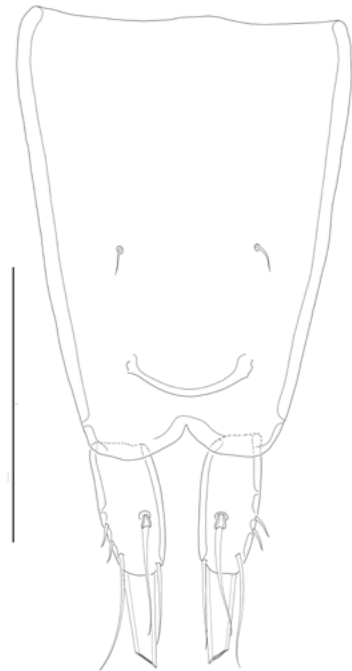


Figure 4. *Leptocaris vicina* sp. nov. Female. Anal somite and caudal rami, dorsal. Scale = 50 µm.

Antennule (Fig. 5a) short, five-segmented. Armature formula as follows: 1(1)-2(7)-3(4+[1+ae])-4(1)-5(8+[1+ae]); all setae smooth; three setae on last segment articulated.

Antenna (Fig. 5b) with allobasis, the latter with abexopodal seta with comb-like tip, and about as long as free endopodal segment. Exopod represented by two setae. Endopodal segment with one proximal and one subdistal transverse row of strong spinules, with two stout lateral spines on inner margin, distally with three spines (innermost small and can be mistaken for spinule, arrowed in Fig. 5b), and two setae, one of them with comb-like tip.

Mandible as in previous species.

Maxillule (Fig. 5c) similar to that of *L. stromatocolica*, with four distal spines and two pinnate setae on well-developed arthrite, and one surface seta. Coxal endite,

basis, exopod and endopod fused, with two lateral and two distal setae.

Maxilla (Fig. 5d) with one syncoxal (probably coxal) endite with one stout spinulose element fused to endite basally, and seemingly two slender setae. Allobasis with one (probably basal) strong claw with two accompanying setae, drawn out into strong curved pinnate claw with one accompanying seta (probably endopodal), endopod represented by two setae.

Maxilliped absent.

P1 (Fig. 6a, b). Coxa with posterior row of small spinules close to basis. Basis with one subdistal spinular row medially, and one transverse spinular row close to exopod, with one inner spine-like element and one minute outer seta (the latter arrowed in Fig. 6a, b). Exopod three-segmented; all segments ornamented with subdistal and distal outer spinules; EXP1 and EXP2 without inner

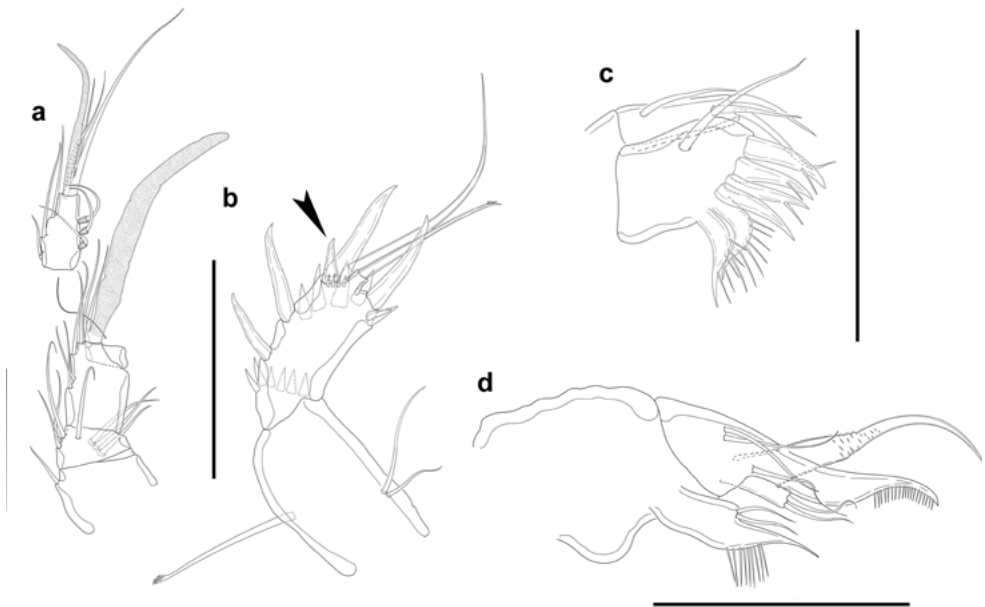


Figure 5. *Leptocaris vicina* sp. nov. Female. **a.** antennule, **b.** antenna, small inner apical spine indicated with an arrow, **c.** maxillule, **d.** maxilla. Scale = 25 μ m.

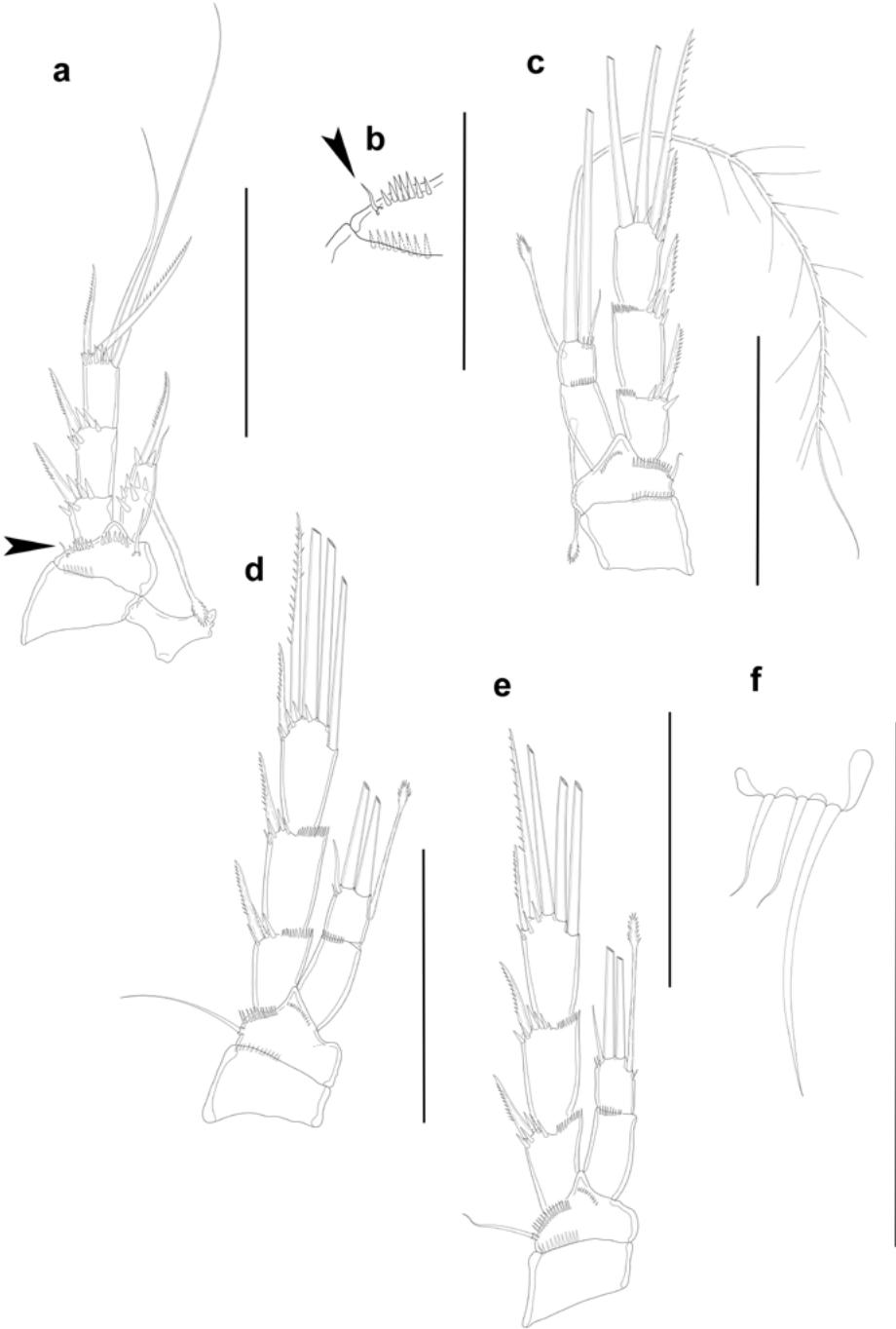


Figure 6. *Leptocaris vicina* sp. nov. Female. **a.** P1, anterior, outer basal seta indicated with an arrow, **b.** outer corner of basis of P1, outer basal seta indicated with an arrow, anterior, **c.** P2, anterior, **d.** P3, anterior, **e.** P4, anterior, **f.** P5. Scale a,c,d,e =50 μ m, b,f =25 μ m.

seta; EXP3 with two outer pinnate spines and two bare distal setae. Endopod one-segmented; reaching middle of EXP2, with stout spinules medially and subdistally, with one inner seta oriented downwards and with comb-like tip, distally with one inner small seta and one outer apical pinnate spine, the latter twice as long as the former.

P2 (Fig. 6c). Coxa with some posterior spinules close to outer corner. Basis with transverse row of small spinules close to exopod, and with minute spinules close to endopod, outer seta small. Exopod three-segmented; all exopodal segments with few distal and subdistal outer spinules; EXP1 and EXP2 without inner armature; EXP3 with two outer pinnate spines and two long apical setae with outer spinules and inner setules. Endopod two-segmented, reaching middle of EXP2; ENP1 about 1.8 times as long as ENP2, reaching beyond EXP1, with spinular ornamentation as shown and with one inner seta oriented downwards and with comb-like tip; ENP2 with some outer subapical spinules, distally with one outer small seta, two long setae with outer spinules and inner setules, and one inner seta with with comb-like tip.

P3-P4 (Figs. 6d, e). Coxa with some posterior spinules close to outer corner. Basis with transverse row of small spinules close to exopod, and with minute spinules close to endopod, outer seta well-developed, long. Exopod three-segmented; all exopodal segments with outer spinules as depicted; EXP1 and EXP2 without inner armature; EXP3 with two outer pinnate spines, two distal setae with outer spinules and inner setules, and one inner plumose element. Endopod two-segmented; ENP1 reaching tip of EXP1, about twice as long as ENP2, with some minute spinules apically, without armature; ENP2 reaching middle of EXP2, with one slender outer spine, two apical long setae and one inner element with comb-like tip. Armature formula of P1-P4 as in table 2.

P5 (Fig. 6f) represented by small segment fused to somite ventrally; each leg with three bare setae, two innermost setae subequal in length, outermost longest.

Table 2. Armature formula of P1-P4 of *Leptocaris vicina* sp. nov.

	P1	P2	P3	P4
EXP	0-0-121	0-0-121	0-0-122	0-0-122
ENP	120	1-121	0-121	0-121

P1 = leg 1, P2 = leg 2, P3 = leg 3, P4 = leg 4, EXP = exopod, ENP = endopod.

Etymology

The specific epithet, *vicina*, from Latin *vicinus*, *-a*, *-um*, neighbor, makes reference to the fact that these two species were found in the same sample.

DISCUSSION

The marine and brackish harpacticoid fauna from Colombia is poorly known and have received some attention recently (e.g., [Fuentes-Reinés and Zoppi de Roa 2013a, b](#), [Fuentes-Reinés and Gómez 2014](#), [Fuentes-Reinés and Suárez-Morales 2014a, b](#), [Fuentes-Reinés et al. 2015](#), [Gómez and Fuentes-Reinés 2017](#), [Suárez-Morales and Fuentes-Reinés 2015a, b](#)) The family Darcythompsoniidae, currently composed of the genera *Darcythompsonia*, *Kristensenia*, *Leptocaris*, and *Pabellonia*, can be found typically associated with decaying plant material in mangal ecosystems and coastal lagoons ([Por 1983](#), [Gee and Somerfield 1997](#), [Boxshall and Halsey 2004](#), [Huys et al. 2016](#)), but [Zamudio-Valdéz and Reid \(1990\)](#) and [Fiers \(1986\)](#) noted that some genera of this family, e.g. *Leptocaris* and *Darcythompsonia*, are common inhabitants of places completely different to mangrove systems.

The genus *Leptocaris* contains 29 species (*L. trisetosus* (Kunz, 1935) and *L. echinata* Fiers, 1986 with three and two subspecies, respectively), of which 12 species (*L.*

trisetosa and *L. echinata* with one subspecies each; *L. trisetosa trisetosa* (Kunz, 1935), *L. echinata echinata* Fiers, 1986, *L. armata* Lang, 1965, *L. brevicornis* (Douwe, 1904), *L. doughertyi* Lang, 1965, *L. kunzi* Fleeger & Clark, 1980, *L. pori* Lang, 1965, *L. stromatolicola*, *L. glaber* Fiers, 1986, *L. mangalis* Por, 1983, *L. minima* (Jakobi, 1954), and *L. vermiculata* (Oliveira, 1957)) have been described and/or reported from the New World. Of these, only seven species (*L. echinata* and *L. trisetosa*, with one subspecies each; *L. echinata echinata*, *L. trisetosa trisetosa*, *L. brevicornis*, *L. glaber*, *L. mangalis*, *L. minima*, and *L. vermiculata*) are known from the Neotropical Region. Interestingly, [Huys et al. \(2016\)](#) reported representatives of the *brevicornis*-group of the genus *Leptocaris* in early Miocene amber inclusions from northern Chiapas State, Southern Mexico.

[Lee and Chang \(2008\)](#), [Song et al. \(2012\)](#), and [Köroğlu et al. \(2014\)](#) presented a complete historical account of the family Darcythompsoniidae and its constituent genera, including the genus *Leptocaris*, as well as a brief revision of [Kunz's \(1978, 1983, 1994\)](#) species-groups, and [Apostolov's \(2007\)](#) reduction of species-groups from four as in [Kunz \(1994\)](#) to three. [Fiers \(1986\)](#); but see also [Kunz 1994: 51](#) questioned the adequacy of the subdivision of the genus given the wide combination of characteristics in, for example, *L. echinata echinata*, and the wide variability in the general structure and armature complements of the antennal exopod, mandibular palp, presence/absence of an abexopodal seta in the antenna, fused/discrete condition of the female genital somite and third urosomite, and general structure of the maxilla, to name a few, within each species-group. [Kunz's \(1978, 1983, 1994\)](#) and [Apostolov's \(2007\)](#) subdivision of the genus are followed here for identification purposes only. However, as for many other species within the genus,

the males of *L. colombiana* sp. nov. and *L. vicina* sp. nov. remain unknown, and the comparisons below are based solely on the females. The lack of males (see [Lee and Chang 2008](#)) and the wide variability observed in the number and shape of the setae on the female P5, among others, prevent any phylogenetical analysis ([Fleeger and Clark 1980](#), [Fiers 1986](#), [Apostolov 2007](#)).

Of particular interest here is the *brevicornis*-group, the most primitive species-group of the genus ([Kunz 1983](#), [Fiers 1986](#)), defined by the presence of five setae/spines on P3-P4 EXP3, and four elements on P2-P3 ENP2 ([Kunz 1983, 1994](#), [Apostolov 2007](#)), into which *L. colombiana* sp. nov., has been placed. Of interest is also the *mangalis*-group defined by the one-segmented endopod of P1 ([Kunz 1994](#)), into which *L. vicina* sp. nov. has been placed. The *brevicornis*-group is at present composed of *L. brevicornis*, *L. trisetosa trisetosa*, *L. gurneyi* (Nicholls, 1944), *L. sibirica* Borutsky, 1952, *L. vermiculata*, *L. echinata echinata*, *L. mucronata* Fiers, 1986, and *L. itoi* Kunz, 1994 ([Song et al. 2012](#)), but also of *L. trisetosa breviseta* Kunz, 1994, *L. trisetosa pacifica* Lee & Chang, 2008, *L. echinata nuda* Kunz, 1994, and *L. colombiana* sp. nov. Of these, only five species/subspecies are known from the New World and from the Neotropical Region, *L. colombiana* sp. nov., *L. trisetosa trisetosa*, *L. echinata echinata*, *L. brevicornis*, and *L. vermiculata*. The *mangalis*-group is composed by four species only, *L. mangalis*, *L. stromatolicola*, *L. noodti* Kunz, 1994, and *L. vicina* sp. nov. For a brief discussion on the *mangalis*-group see below.

As in the other species-groups of *Leptocaris*, an ample variety of combinations of characteristics is evident in the *brevicornis*-group, and any phylogenetic inference is at most speculative. This, as implicitly suggested by [Fiers \(1986\)](#), points to the inadequacy of the subdivision of the genus.

The *brevicornis*-group, as defined by Kunz (1983, 1994) and Apostolov (2007), is characterized by the presence of five elements on the third exopodal segment of P3 and P4, and four elements on the second endopodal segment of P2 and P3. However, more relevant differences are evident regarding, for example, the fused/discrete condition of the female genital field and third urosomite, number of setae on the caudal rami (less than six setae in *L. brevicornis*, *L. trisetosa trisetosa*, *L. trisetosa breviseta*, *L. gurneyi* and *L. sibirica*; six setae in *L. vermiculata*, *L. echinata echinata*, *L. echinata nuda*, *L. mucronata*, *L. itoi* and *L. colombiana* sp. nov.; seven setae in *L. trisetosa pacifica*), number of segments of the female antennule (four segments in *L. mucronata*; five segments in *L. brevicornis*, *L. trisetosa trisetosa*, *L. trisetosa breviseta*, *L. trisetosa pacifica*, *L. gurneyi*, *L. vermiculata*, *L. echinata echinata*, *L. echinata nuda*, and *L. colombiana* sp. nov.; five or six segments in *L. sibirica*; seven segments in *L. itoi*), number of setae of the antennal exopod (without setae in *L. gurneyi*, *L. echinata echinata* and *L. echinata nuda*; with one seta in *L. sibirica*; with two setae in *L. brevicornis*, *L. trisetosa trisetosa*, *L. trisetosa breviseta*, *L. trisetosa pacifica*, *L. vermiculata*, *L. mucronata*, and *L. colombiana* sp. nov.), presence of the abexopodal seta of the antenna in *L. trisetosa pacifica*, *L. sibirica*, *L. echinata echinata*, *L. echinata nuda*, and *L. mucronata*, and lack of such seta in *L. trisetosa trisetosa*, *L. gurneyi*, and *L. colombiana* sp. nov. (the presence/absence of such seta needs to be verified for *L. brevicornis*, *L. trisetosa breviseta*, *L. vermiculata*, and *L. itoi*), number of setae representing the mandibular palp (without seta in *L. brevicornis*, *L. gurneyi*, and *L. sibirica*; with one seta in *L. vermiculata*, *L. echinata echinata*, and *L. colombiana* sp. nov.; with two setae in *L. trisetosa trisetosa*, *L. trisetosa pacifica*, *L. trisetosa breviseta*, *L. mucronata*, and *L. itoi*), and armature formula of the endopod

of P1 (1,111 in *L. brevicornis*, *L. trisetosa trisetosa*, *L. breviseta*, *L. trisetosa pacifica*, and *L. gurneyi*, *L. echinata echinata*, *L. mucronata* and *L. itoi*; 0,020 in *L. sibirica*; 0,111 in *L. vermiculata*; 1,020 in *L. echinata nuda* and *L. colombiana* sp. nov.), P2 (0,121 in *L. brevicornis*, *L. gurneyi*, *L. sibirica*, *L. vermiculata*, *L. echinata echinata*, *L. echinata nuda*, *L. itoi*, and *L. colombiana* sp. nov.; 1,121 in *L. trisetosa trisetosa*, *L. trisetosa breviseta*, *L. trisetosa pacifica*, and *L. mucronata*), P4 (0,121 in *L. brevicornis*, *L. trisetosa trisetosa*, *L. trisetosa breviseta*, *L. trisetosa pacifica*, *L. gurneyi*, *L. sibirica*, *L. mucronata*, *L. itoi*, and *L. colombiana* sp. nov.; 1,121 in *L. vermiculata*, *L. echinata echinata*, and *L. echinata nuda*), and P5 (without P5 in *L. gurneyi*; with two setae in *L. brevicornis*, *L. trisetosa trisetosa*, *L. breviseta*, and *L. sibirica*; three setae in *L. trisetosa pacifica*, *L. echinata echinata*, *L. echinata nuda*, *L. mucronata*, and *L. colombiana* sp. nov.; with four setae in *L. vermiculata* and *L. itoi*). These differences between species are not unique to the *brevicornis*-group, but are also observable in the other species-groups of the genus. These differences and the types of sexual dimorphism observed by Lee and Chang (2008) e.g., presence of normal setae or spiniform projections on P2ENP and P3ENP, might prove more reliable and could shed some light on the phylogenetic relationships of the species of *Leptocaris*.

***Leptocaris colombiana* sp. nov.**

The fused condition of the genital somite and the third urosomite to form the double genital-somite is present in *L. brevicornis*, in the three subspecies of *L. trisetosa*, and in *L. vermiculata* and *L. mucronata*, but these somites are clearly discrete in *L. sibirica*, in both subspecies of *L. echinata*, and in *L. colombiana* sp. nov. The caudal rami possess less than six setae in *L. brevicornis*, *L. trisetosa trisetosa* and *L. trisetosa breviseta*, *L. gurneyi*, and *L. sibirica*; six setae have

been observed for *L. vermiculata*, both subspecies of *L. echinata*, *L. mucronata*, *L. itoi*, and *L. colombiana* sp. nov.; *L. trisetosa pacifica* is unique by having a full complement of seven setae. The number of segments of the female antennule varies from four (only observed in *L. mucronata*) to seven (this condition was observed only for *L. itoi*), being the five-segmented the most common condition (though the five- or six-segmented condition of *L. sibirica* remains inconclusive; Borutzky 1952). The condition of the antennal exopod also varies among the species of the *brevicornis*-group. Two setae representing the antennal exopod have been observed in *L. brevicornis*, in the three subspecies of *L. trisetosa*, in *L. vermiculata*, *L. mucronata*, and *L. colombiana* sp. nov.; one seta has been observed for *L. sibirica*, while *L. gurneyi*, and both subspecies of *L. echinata* lack the antennal exopod. The antenna of *L. itoi* was omitted in Kunz (1994). The abexopodal seta on the allobasis of the antenna is present in *L. vermiculata*, *L. trisetosa pacifica*, *L. sibirica*, both subspecies of *L. echinata*, and in *L. mucronata*. This seta is absent in *L. colombiana* sp. nov., *L. gurneyi*, and in *L. trisetosa trisetosa* and *L. trisetosa breviseta*, and its presence/absence needs to be verified for *L. brevicornis* and *L. itoi*. Gurney (1920) redescribed *L. brevicornis* from several situations in the Norfolk Broads without abexopodal seta on the allobasis of the antenna, but noted also that one specimen bore a “blunt-pointed seta” on the allobasis of both antennae; Lee and Chang (2008) described their *L. brevicornis* from South Korea without abexopodal seta on the allobasis of the antenna; the antenna of *L. itoi* was not described in Kunz (1994). *L. brevicornis*, *L. sibirica*, and *L. gurneyi* lack the mandibular palp, but it is represented by one seta in both subspecies of *L. echinata* and in *L. colombiana* sp. nov., and by two setae in the three subspecies of *L. trisetosa*, in *L. mucronata* and *L. itoi*. Even though the

brevicornis-group was defined based on the number of setae of the P3-P4 EXP3, and P2-P3 ENP2, the armature formula of the female P1-P2 ENP, P4 ENP, and P5 is somewhat variable, being the most common formulae 1,111/0,121/0,121/3 for P1 ENP, P2 ENP, P4 ENP, and P5, respectively. *L. echinata nuda* and *L. colombiana* sp. nov. possess one inner seta on P1 ENP1, but only two setae on ENP2; *L. sibirica* also possesses two setae only on P1 ENP2 but lacks the inner seta on ENP1; *L. vermiculata* possesses three setae on P1 ENP2 but lacks the inner element on ENP1. All the species/subspecies of the *brevicornis*-group possess four setae on the P2 ENP2, but only the three subspecies of *L. trisetosa*, and *L. mucronata* possess one additional inner seta on ENP1. Similarly, all species/subspecies of this group bear four setae on the P4 ENP2, most species lack the inner seta on ENP1, and only *L. vermiculata*, and both subspecies of *L. echinata* bear an additional inner seta on ENP1. The number of elements on the female P5 is also variable within the *brevicornis*-group. The most drastic reduction was observed for *L. gurneyi* (without P5), while it is armed with two setae in *L. brevicornis*, *L. trisetosa trisetosa* and *L. trisetosa breviseta*, and *L. sibirica*. The female P5 of *L. trisetosa pacifica* bears three setae, casting some doubts about its relationship with the other two subspecies of *L. trisetosa*; three setae have been observed for both subspecies of *L. echinata*, for *L. mucronata* and *L. colombiana* sp. nov. Only *L. vermiculata* and *L. itoi* bear four setae on the female P5.

***Leptocaris vicina* sp. nov.**

Kunz (1994) noted that Por’s (1983) figures 48-51 and 57-61 showing the legs of *L. mangalis* do not correspond to Por’s (1983: 148-149) table of the armature formula of P1-P4, and suggested to consider Por’s (1983) table as wrong, and Por’s (1983) figures as correct regarding the armature of swimming legs. Based on the rare condition of the one-segmented endopod of P1, Kunz

(1994) suggested to establish the *mangalis*-group for *L. stromatolicola*, *L. noodti* and *L. mangalis*, which is probably the only species group of the genus *Leptocaris* that reflects some phylogenetic relationships. Por (1983: 152) commented that Kunz (1983) would consider *L. mangalis* as a member of the *ignavus*-group, which was not the case. The *mangalis*-group was not considered by Apostolov (2007). Kunz (1994: 48, Tab. 1) presented a brief table with the main differences between *L. stromatolicola*, *L. noodti*, and *L. mangalis*. Note that Kunz (1994) described and illustrated a seven-segmented female antennule for *L. noodti*, but showed a four-segmented female antennule in his table 1 (Kunz 1994: 48). The one-segmented condition of the P1 ENP is very rare among the species of *Leptocaris*. To the best of our knowledge, this has been observed for four species only, *L. stromatolicola* from stromatolites in two evaporitic lakes and a marsh in the Cuatro Ciénegas basin, in central Coahuila, northern México (Zamudio-Valdéz and Reid 1990), *L. noodti* Kunz, 1994 from Hawaii (Kunz 1994), *L. mangalis* from mangrove forests of Southern Sinai (Por 1983), and *L. vicina* sp. nov. from Colombia; the latter was unequivocally attributed to Kunz's (1994) *mangalis*-group.

The mouthparts of the different species of *Leptocaris* have not received enough attention, probably due to their difficult dissection, and small sizes making difficult to observe their general structure and armature complements. Due to the simple structure of the mandible, and to the size of the antenna, these two appendages, along with the antennule, are by far the easiest appendages to observe and illustrate. Unfortunately, this is not the case for the maxillule and maxilla. The figures and text describing the maxilla and maxillule of *L. noodti* (see Kunz 1994: 47, Fig. 9E, F) and *L. mangalis* (see Por 1983: 148, Figs. 46-47)

lack the necessary details. Nevertheless, *L. noodti* and *L. mangalis* seem to share the maxillule with coxa and basis separated. The structure of the maxilla of *L. noodti* and *L. mangalis* is misleading. The syncoxal endite of the maxilla of *L. noodti* appears as part of the allobasis, and the separation between the syncoxa and the allobasis is not evident in *L. mangalis*. These two species also share the lack of inner armature on the female P2 ENP1, and the presence of two setae only on the female P5, and can be easily separated by the number of segments of the female antennule (seven in *L. noodti*, but four in *L. mangalis*), by the presence, in *L. noodti*, of an abexopodal seta on the allobasis of the antenna (this seta is missing in *L. mangalis*), by the female armature formula of P1 EXP3 (with three setae in *L. mangalis*, but four elements in *L. noodti*), and P3-P4 EXP3 (with four setae/spines in *L. mangalis*, but five elements in *L. noodti*). Of interest, are the strong similarities between the general structure and armature complement of the mandible, maxillule and maxilla, and of P1-P5 of *L. stromatolicola* and *L. vicina* sp. nov. These two species share the combination of the following characters: armature formula of the female P1-P4 EXP/ENP (P1, 0-0-121/120; P2, 0-0-121/1-121; P3, 0-0-122/0-121; P4, 0-0-122/0-121), armature formula and relative length of the setae of the female P5 (with three setae; innermost elements subequal in length, half as long as outer seta), the five-segmented female antennule, and the general shape and armature of the antenna (allobasis with one abexopodal seta, exopod represented by two setae, endopodal segment with five spines and two setae), and mandible (palp represented by one seta). Furthermore, some striking similarities were observed between the general shape of the maxillule (arthritis with one surface seta, and with four spines and two pinnate setae distally), and the maxilla of *L. stromatolicola* and *L. vicina* sp. nov. Regarding the maxilla, besides the two setae representing the endopod, both

species share the presence of two endites; the proximal endite of *L. stromatolicola* possesses one strong spinulose element only, while that of *L. vicina* sp. nov. possesses one strong spinulose element and two slender setae that are difficult to see and probably have been overlooked in *L. stromatolicola*; the second endite is armed with two slender setae and a curved strong element in both species. These two species can be separated by the shape of the anal operculum (crescentic in *L. stromatolicola*, but rounded in *L. vicina* sp. nov.), by the relative length of the segments of P2 ENP and P3 ENP (ENP1 visibly longer than ENP2 in *L. vicina* sp. nov., but nearly subequal in *L. stromatolicola*), and by the innermost distal spine of the endopodal segment of the antenna (reduced in *L. vicina* sp. nov., but well-developed in *L. stromatolicola*).

***Darcythompsonia* Scott T., 1906**

***Darcythompsonia inopinata* Smirnov, 1934**

Syn: for a complete list of synonyms see [Fiers \(1986\)](#)

Material examined. One dissected adult female (CBUMAG:MEI:0004); Colombia, Magdalena, Rodadero Bay, 11°14' N, 74°12' W, August, 2015; coll. J. M. Fuentes-Reinés.

REMARKS

Currently, there are four valid species within *Darcythompsonia* (*D. inopinata*, *D. neglecta* Redeke, 1953, *D. fairliensis*, and *D. scotti* Gurney, 1920). *D. inopinata* is the most widespread ([Fiers 1986](#), [Gómez 2000](#)) and has been reported previously from Fiji Islands, Western Samoa, Papua New Guinea, Grand Comores Archipelago, and Solomon Islands ([Fiers 1986](#) and references cited therein). This species is known also from the Neotropical Region and has been reported from Inagua (Bahamas), Aruba (Netherlands Antilles) ([Fiers 1986](#)) in the

Antillean subregion, in Morocoy Peninsula (Venezuela) ([Fiers 1986](#)) and in the Cananúa Lagoon estuarine system (Brazil), Brazilian subregion ([Por et al. 1984](#), [Reid 1998](#)). This is a benthic species occurring in shallow marine and brackish coastal waters ([Reid 1998](#)), but also has been reported from a variety of situations like wells, caves, shallow pools, cenotes, crabholes, and in coarse sand and shell debris ([Fiers 1986](#)). The present record of *D. inopinata* from northern Colombia represents a continuum along the Caribbean coast of the Pacific dominion (Brazilian subregion). The specimen from Colombia fits the diagnostic features of *D. inopinata* as described by [Smirnov \(1934\)](#) and resembles *D. fairliensis* in the armature formula of P1–P4, number of segments of antennule, and number of segments and setae on the antennal exopod. Nevertheless, they can be separated by the number of setae in the female P5 (three setae in *D. inopinata*, but four elements in *D. fairliensis*), and by the shape of the caudal rami (with angular extension in the proximal half in *D. fairliensis*, but without angular extension in *D. inopinata*).

AUTHORS PARTICIPATION

JFR collected the samples; SG identified the specimens; JFR and SG wrote the text. SG made the drawings

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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