

RECORD OF *Cletocamptus sinaloensis* (COPEPODA: HARPACTICOIDA: CANTHOCAMPTIDAE) FROM THE CARIBBEAN COAST OF COLOMBIA*

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Abstract

Objectives: to report the first record of *C. sinaloensis* for Colombia. **Scope:** to present a brief description of this material in order to support the identification of the newly found material. **Methodology:** Water samples were taken at Ciénaga Grande de Santa Marta Colombia using a 25 L bucket. Samples were filtered with a standard zooplankton net (45 µm mesh) and fixed and preserved in 70% ethanol. Harpacticoid copepods were separated with a brush. Dissected specimens and appendages were mounted in glycerine. The dissected appendages were photographed using a Kodak Easy Share C140 digital camera adapted to a compound microscope at a magnification of 1000X. **Main results:** *Cletocamptus sinaloensis* seems to be closely related to *C. levis* Gómez 2005, known from Brazil. The closeness of these species was assumed based on the general shape and number of setae of the mandibular palp (one-segmented with three setae), P2-P4 EXP3 and ENP2 with 5-5-4 and 3-3-2 elements respectively, length: width ratio of the caudal rami, and ornamentation of the anal operculum with two rows of strong spinules. Nevertheless, they can be separated by 1) the armature complement of the antennal exopod, 2) length of the exopodal lobe of the female P5, 3) relative length of the P3ENP, 4) number of setae on the female P6. **Conclusions:** The specimen from Colombia bears the diagnostic features of *C. sinaloensis* as originally described, but shows subtle differences in the length of P1ENP, shape of seminal receptacle and relative length of P6.

Key words: distribution, coastal copepods, Caribbean Sea, crustaceans, zooplankton.

* FR: 2-III-18. FA: 26-III-18.

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CÓMO CITAR:

FUENTES-REINÉS, J.M., GÓMEZ, S. & DORADO-RONCANCIO, E.F., 2018.- Record of *Cletocamptus sinaloensis* (Copepoda: Harpacticoida: Canthocamptidae) from the Caribbean Coast of Colombia. *Bol.Cient.Mus.Hist. Nat.U.de Caldas*, 22 (2): 172-182. DOI: 10.17151/bccm.2018.22.2.12

REGISTRO DE *Cletocamptus sinaloensis* (COPEPODA: HAPARTICOIDA: CANTHOCAMPTIDAE) DE LA COSTA CARIBE DE COLOMBIA

Resumen

Objetivos: Reportar el primer registro de *C. sinaloensis* para Colombia. **Alcance.** Presentar una breve descripción de este material para apoyar la identificación del nuevo material encontrado. **Metodología:** Se tomaron muestras de agua en Ciénaga Grande de Santa Marta Colombia utilizando un balde de 25 L. Las muestras se filtraron con una red estándar de zooplancton (malla con diámetro de poro de 45 μm) y se fijaron y conservaron en etanol al 70%. Los copépodos harpacticoides se separaron con un pincel. Las muestras disecadas y los apéndices se montaron en glicerina. Los apéndices disecados se fotografiaron usando una cámara digital Kodak Easy Share C140 adaptada a un microscopio compuesto con un aumento de 1000X. **Resultados principales:** *Cletocamptus sinaloensis* parece estar estrechamente relacionado con *C. levis* Gómez 2005, conocido en Brasil. La cercanía de estas especies se asumió en función de la forma general y el número de setas del palpo mandibular (un segmentado con tres setas), P2-P4 EXP3 y ENP2 con 5-5-4 y 3-3-2 elementos respectivamente, relación longitud: anchura de la rama caudal, y ornamentación del opérculo anal con dos filas de espínulas fuertes. Sin embargo, pueden separarse por 1) el complemento de armadura del exopodo antenal, 2) la longitud del lóbulo exopodal de la P5 de la hembra, 3) la longitud relativa del P3ENP, 4) el número de setas en la P6 de la hembra. **Conclusiones:** El espécimen de Colombia tiene las características diagnósticas de *C. sinaloensis* como se describió originalmente, pero muestra diferencias sutiles en la longitud de P1 ENP, en la forma del receptáculo seminal y en la longitud relativa de P6.

Palabras clave: vertical stratification, strata, times, dry forest.

INTRODUCTION

The systematic position of the genus *Cletocamptus* Schrankewitsch, 1875 (Harpacticoida: Canthocamptidae Brady, 1880) is still controversial. Species of *Cletocamptus* can be found in estuaries and coastal lagoons, as well as in freshwater habitats (GÓMEZ *et al.*, 2004, 2007; BOXSHALL & DEFAYE 2008), and hypersaline situations (GÓMEZ *et al.*, 2004; SUÁREZ-MORALES *et al.*, 2013), and the genus shows a wide distribution. Most species have been recorded at low altitude (0 – 600 m a.s.l.) e.g., *C. nudus* Gómez, 2005, *C. sinaloensis* Gómez, Fleeger, Rocha-Olivares & Foltz, 2004, *C. samariensis* Fuentes-Reinés, Zoppi de Roa & Torres, 2015 (GÓMEZ *et al.*, 2005; FUENTES-REINÉS *et al.*, 2015), but some of them are also known to

inhabit high altitude localities (e.g., *C. cecsurirensis* Gómez, Scheihing & Labarca, 2007 from Salar de Surire, Chilean high Andean Plateau at 2265 m a.s.l (GÓMEZ *et al.*, 2007), and *C. gomezi* Suárez-Morales, Barrera-Moreno & Ciros-Pérez, 2013 from Lake Alchichica at 4180 m a.s.l.) (SUÁREZ-MORALES *et al.*, 2013).

Following FUENTES-REINÉS *et al.* (2015) and GÓMEZ *et al.* (2017), there are 29 valid species of *Cletocamptus*. Of these, 19 have been recorded in America. Species of *Cletocamptus* from America have been found in Argentina, Brazil, Chile, Colombia, Mexico and the United States (FLEEGER, 1980; MIELKE, 2000; GÓMEZ, 2005; GÓMEZ & GEE, 2009; FUENTES-REINÉS & SUÁREZ-MORALES, 2014; GÓMEZ & MORALES-SERNA, 2014; FUENTES-REINÉS *et al.*, 2015; GÓMEZ *et al.*, 2017). The knowledge about the presence of this genus in Colombia is still very limited; up to now, only four species: *C. dominicanus* Kiefer 1934, *C. helobius* Fleeger, 1980, *C. nudus* Gómez 2005, and *C. samariensis* Fuentes-Reinés, Zoppi de Roa & Torres, 2015, have been reported from three Caribbean localities of Colombia (Pozos Colorados in Santa Marta, Magdalena, Laguna Navío Quebrado, La Guajira, and in a temporal pond in Pueblo Viejo, Magdalena) (FUENTES-REINÉS & SUÁREZ-MORALES, 2014; FUENTES-REINÉS *et al.*, 2015, GÓMEZ *et al.*, 2017). The copepod fauna from Colombia has received little attention despite the number of fresh, marine and brackish systems in both the Atlantic and Pacific coasts of the country and additional new species and records of harpacticoids are expected to be found in future studies.

Here we present the first record of *C. sinaloensis* in northern Colombia (Magdalena department), and Caribbean Sea which expands the regional distributional range of this copepod in northern South America. The aim of this paper is to report the first record of *C. sinaloensis* for Colombia and to present a brief description of this material in order to support the identification of the newly found material.

MATERIALS AND METHODS

Water samples were taken at Cienaga Grande de Santa Marta Colombia (10°52'11.25" N and 74°19'31.64" W) in April of 2015. Water salinity was measured with a WTW 3111 conductivity meter. Water samples were collected using a 25 L bucket. Samples were filtered with a standard zooplankton net (45 µm mesh size) and fixed and preserved in 70% ethanol. Harpacticoid copepods were separated from the sediment with a brush. Dissected specimens and appendages were mounted in glycerine. The dissected appendages were photographed using a Kodak Easy Share C140 digital camera adapted to a compound microscope at a magnification of 1000X. Identification of this species of *Cletocamptus* followed the keys and descriptions by GÓMEZ *et al.* (2004); GOMEZ (2005), WELLS (2007) and GÓMEZ & GEE (2009). The

specimens were measured in lateral position, from the anterior end of the rostral area to the posterior margin of the caudal rami. Morphological nomenclature follows HUYS & BOXSHALL (1991). The following abbreviations are used in the descriptions: P1-P6, first to sixth swimming legs; EXP, exopod; ENP, endopod. The specimens were deposited in the collection held at the Museo de Colecciones Biológicas from Universidad del Atlántico, (UARC), Barraquilla- Atlántico, Colombia.

RESULTS

Order HARPACTICOIDA G.O. Sars, 1903

Family CANTHOCAMPTIDAE Brady, 1880-

Genus *Cletocamptus* Schmankevitsch, 1875

Cletocamptus sinaloensis Gómez, Fleege, Rocha-Olivares & Foltz, 2004

(Figs. 1-3)

Material examined: 2 adult females (UARC329M).

Description of female

The studied specimens (2 adult females) agree with the descriptions and illustrations by GÓMEZ *et al.* (2004) and GÓMEZ (2005). Body length of the Colombian females ranged between 630 μm to 700 μm ($n = 2$). Body shape (Fig. 1A) as for the genus. Ventral and dorsal surface of urosomites ornamented with transverse rows of spinules as illustrated (Figures 1B-C). Seminal receptacle as in figure 1D. Dorsal surface of anal somite (Figure 1E) ornamented with proximal transverse rows of minute spinules (arrowed in figure 1E) and transverse rows of stronger spinules. Anal operculum with two rows of strong spinules (Figure 1F). Caudal rami about 1.3 times as long as wide (Figure 2A), with seven elements.

Antennule (Figure 2B) with six segments.

Antenna (Figure 2C) with small coxa. Allobasis armed with two abexopodal setae. Free endopodal segment with inner strong spinules proximally and subdistally, with two lateral inner spines and five distal elements. Exopod one-segmented, with one lateral small and one apical long seta, and two spinules in each side (arrowed in Figure 2D).

Mandibular palp (Figure 2E). represented by 1 small segment bearing 2 naked setae, accompanied by 1 slender seta nearby (arrowed in figure 2E).

Arthrite of praecoxa of the maxillule (Figure 2F), armed with seven distal spines and one lateral strong seta, the latter ornamented with long spinules (arrowed in Figure 2F).

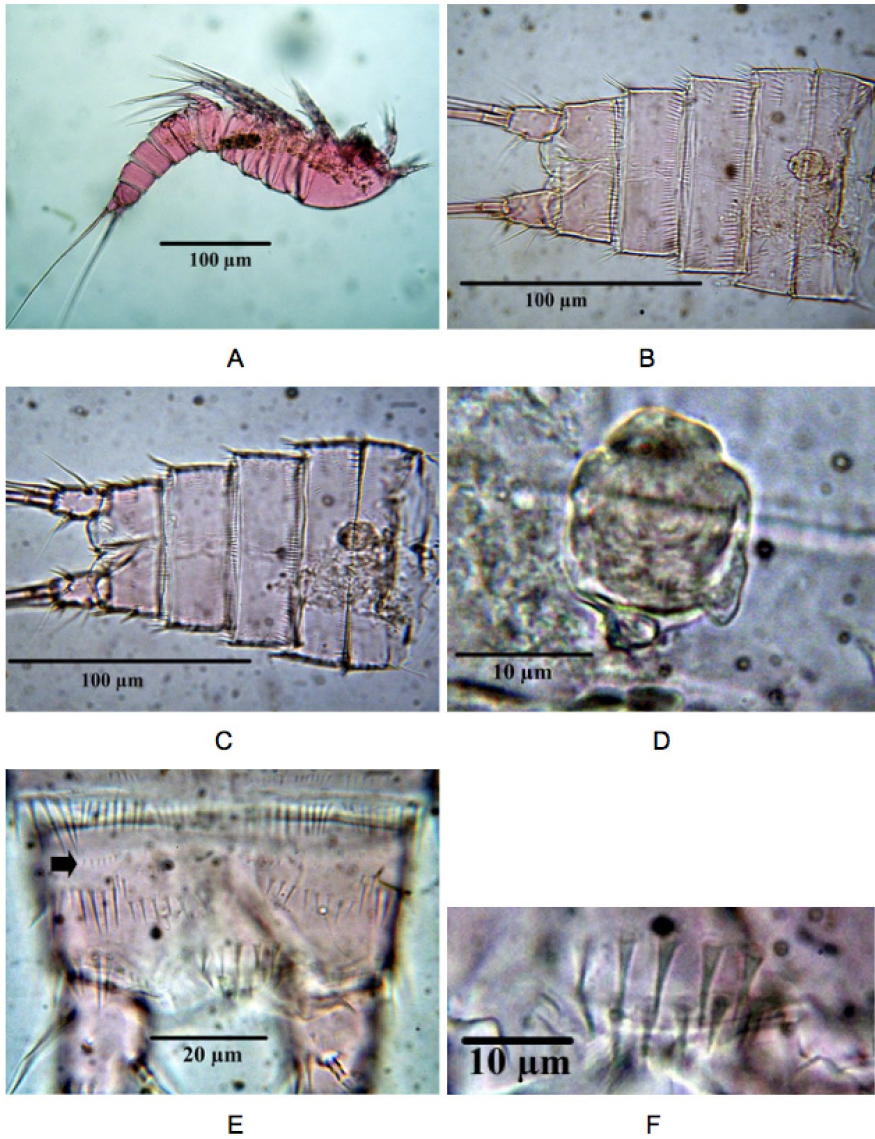


Figure 1. *Cletocamptus sinaloensis*. Female from Ciénaga Grande de Santa Marta Colombia. A: Habitus. B. Urosoma, ventral view. C. Idem, dorsal view. D. Seminal receptacle. E. Anal somite, dorsal view. F. Anal operculum

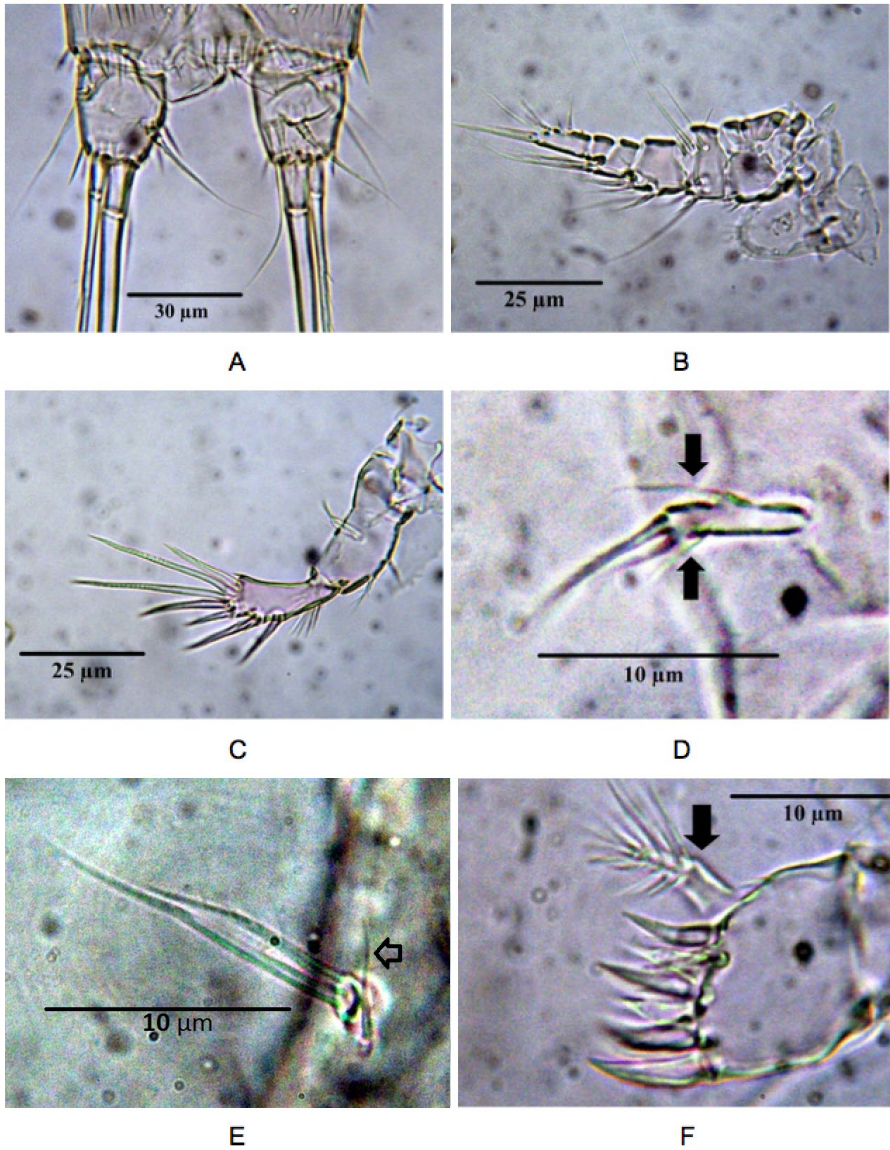


Figure 2. *Cletocamptus sinoensis*. Female from Ciénaga Grande de Santa Marta Colombia. A. Caudal rami, dorsal view. B. Antennule. C. Antenna. D. Antenal exopod. E. Mandibular palp. F. Maxillule.

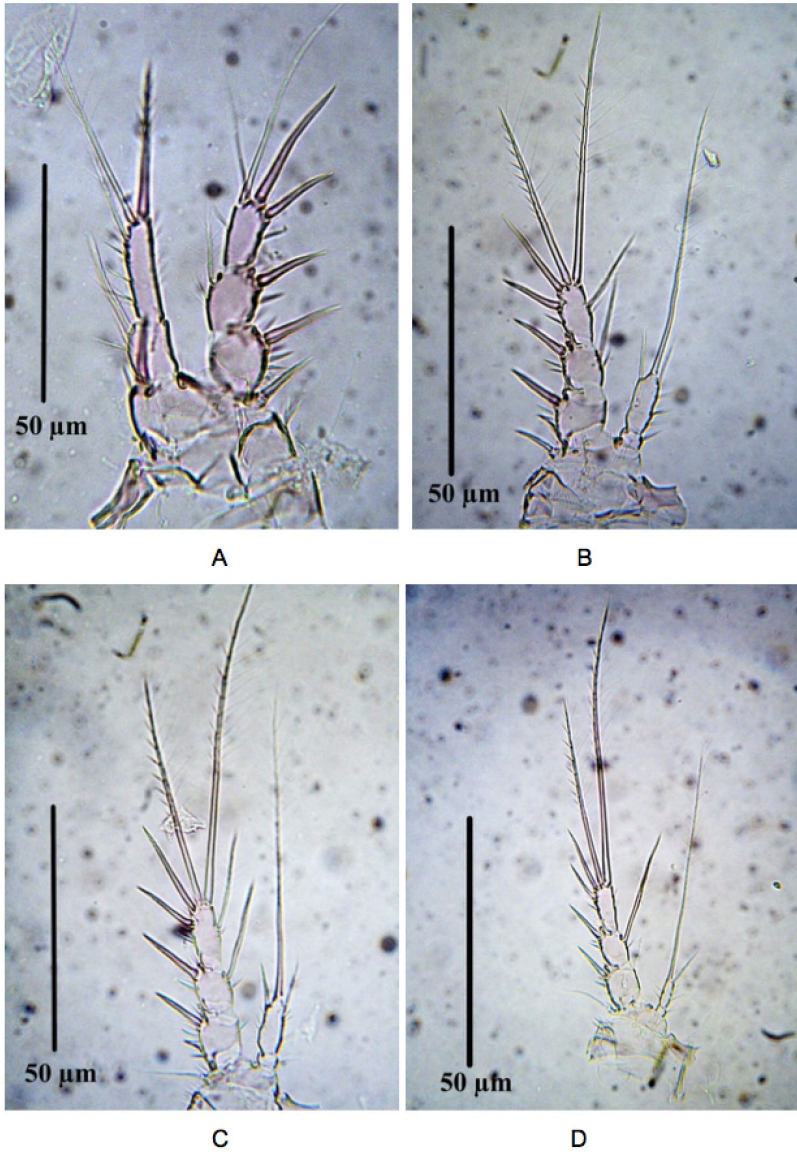


Figure 3. *Cletocamptus sinaloensis*. Female from Ciénaga Grande de Santa Marta Colombia. A. P1. B. P2. C. P3. D. P4

P1-P4 EXP three-segmented, distal segments with 4,5,5,4 setae/ spines, respectively. ENP two-segmented; P1-P4 ENP2 with 3, 3, 3, 2, setae, respectively (Figures 3A-D). Inner seta of P1ENP1, P2EXP2-3; P3EXP2-3, and P4EXP2 with a brush tip.

P5 (Figure 4A). Exopod and baseopod fused. Endopodal lobe 1.6 times as long as exopod, armed with six elements. Exopodal lobe armed with five elements, plus outer basal element.

P6 vestigial, represented by median plate in anterior half of second urosomite (first genital somite) with a long seta (Figure 4B).

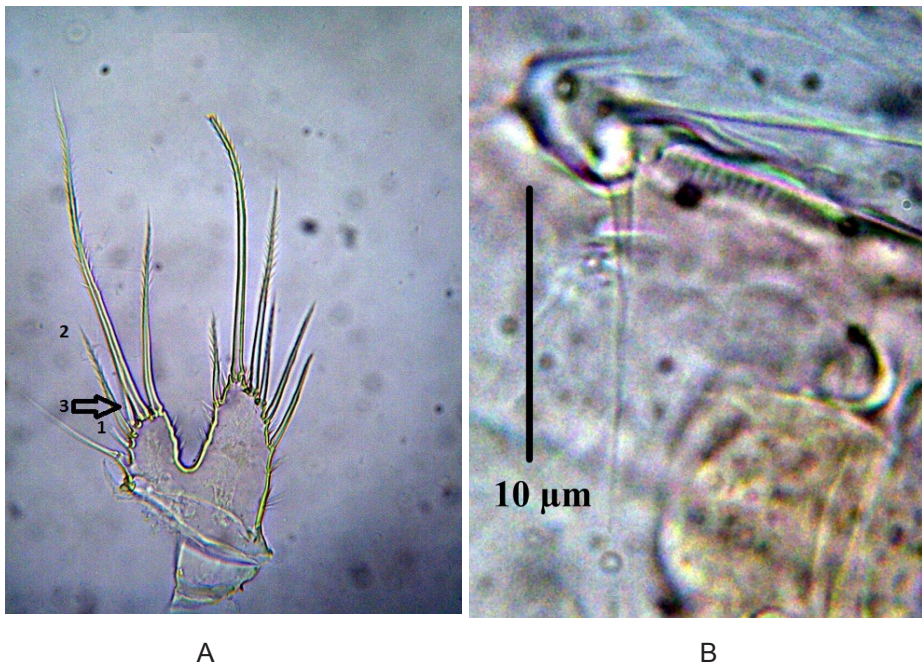


Figure 4. *Cletocamptus sinaloensis*. Female from Ciénaga Grande de Santa Marta Colombia. A. P5 (The arrow points at the seta 3). B. P6

Distribution and ecology

Cletocamptus was originally described from Mexico (GÓMEZ *et al.*, 2004), but is also known from Brazil (GÓMEZ, 2005). In Colombia this species was found in Ciénaga Grande de Santa Marta, Magdalena, on the Caribbean coast of Colombia, and represents a range extension of the species to the Guajira province *sensu* MORRONE (2014) in the Caribbean coast of Colombia. Ciénaga Grande de Santa Marta is a shallow swamp (depth 0.5-1.5m), with following water chemistry at the date: 31.2° C, pH = 8.9, salinity = 15PSU, dissolved oxygen = 7.86mg/L.

DISCUSSION

The specimens of *Cletocamptus sinaloensis* examined (two adult females) agree with the descriptions and illustrations by GÓMEZ *et al.* (2004) and GÓMEZ (2005). This species can be easily recognized by a unique combination of characters including: 1) antennal exopod one-segmented with two setae, 2) mandibular palp with three elements, 3) arthrite of maxillule with a strong and spinulose lateral seta, 4) female P2-P4 EXP3 and ENP2 with 5-5-4 and 3-3-2 elements respectively, 5) anal operculum with two rows of strong spinules, 6) caudal rami of about 1.3-1.5 times as long as wide, and 7) caudal setae IV and V separated, not fused. These distinctive characteristics also were observed in the specimens from Colombia.

Cletocamptus sinaloensis seems to be closely related to *C. levis* Gómez 2005, known from Brazil. The closeness of these species was assumed based on the general shape and number of setae of the mandibular palp (one-segmented with three setae), P2-P4 EXP3 and ENP2 with 5-5-4 and 3-3-2 elements respectively, length:width ratio of the caudal rami, and ornamentation of the anal operculum (with two rows of strong spinules). Nevertheless, they can be separated by 1) the armature complement of the antennal exopod (with three setae in *C. levis* (GÓMEZ, 2005, fig 18B), but with two setae in *C. sinaloensis* (GÓMEZ *et al.*, 2004, fig 26B; GÓMEZ 2005, fig, 8B, present data, fig 2D)), 2) length of the exopodal lobe of the female P5 (reaching insertion site of outermost baseoendopodal seta in *C. levis* (GÓMEZ 2005, fig 17B), but shorter in *C. sinaloensis* (GÓMEZ *et al.*, 2004, fig 25B; GÓMEZ 2005, fig 7B, present paper, fig 4A)), 3) relative length of the P3ENP (barely reaching the tip of P3 EXP1 in *C. levis* (GÓMEZ *et al.*, 2004, fig 20A), but reaching the middle of P3 EXP2 in *C. sinalonesis* (GÓMEZ *et al.*, 2004, fig 28A; GÓMEZ 2005, fig 10A; present paper, fig 3C)), 4) number of setae on the female P6 (with two setae in *C. levis*, being the outer element longest (GÓMEZ 2005, fig 17A), but with one seta only in *C. sinaloensis* (GÓMEZ *et al.*, 2004, fig 25A, GÓMEZ 2005, fig 7A, present paper, fig 4B)).

The specimens from Colombia are identical in most aspects to those recorded from Mexico and Brazil. Nevertheless, some subtle differences were observed:, 1) the shape

of seminal receptacle (circular in the Mexican and Colombian populations (GÓMEZ *et al.*, 2004, fig 25A, present paper, fig 1D), but oval in the Brazilian material (GÓMEZ 2005, fig 7A)), 2) relative length of the seta of P6 (longer in the specimens from Colombia (present paper, fig 4B) than the Mexican and Brazilian population (GÓMEZ *et al.*, 2004, fig 25A; GÓMEZ, 2005, fig 7A)). Overall, we do not regard such differences as evidence enough to consider our specimens as representatives of a new species.

Key for the identification of the nominal species of *Cletocamptus* recorded in Colombia

1A. P1 ENP1 without inner seta, P4 ENP represented by a single seta, female P5 EXP and ENP with 5 and 3 setae respectively, male P5 EXP and ENP with 3 and 3 setae respectively..... *C. helobius** Fleeger, 1980

*This record from Colombia should be revised; it might represent a new species (Gómez *et al.*, 2017).

1B. P1 ENP with inner seta, P4 ENP one- or two-segmented2A

2A. P4 ENP two-segmented, P3 ENP2 with 3 setae, antennal exopod elongate, one-segmented with 2 setae..... 3A

2B. P4 ENP one segmented, P3 ENP2 with 5 setae, antennal exopod minute, one-segmented, with 1 seta, caudal rami about 2 times as long as wide, male and female P5 EXP and ENP separated by a small notch, male P5EXP with 4 setae *C. dominicanus* Kiefer, 1934

3A. P3-P4 EXP3 with 5-4 elements respectively, anal operculum with 2 rows of strong spinules, caudal rami about 1.3-1.5 time as long as wide, female P6 with 1 seta, male and female P5 EXP and ENP separated by a deep notch, male P5 EXP with 4 setae.....*C. sinaloensis* Gómez, Fleeger, Rocha-Olivares & Foltz, 2004

3B. P3-P4 EXP3 with 6-5 elements respectively, distal row of spinules on anal operculum absent or present, caudal rami about 1.5 times as long as wide, female P6 with 2 setae, male and female P5 EXP and ENP separated by deep notch, female P5 EXP with 4 or 5 setae, male P5 EXP with 3 or 4 setae4A

4A. Distal row of spinules on anal operculum present, female P5 EXP with 4 setae, male P5 EXP with 3 setae.....*C. samariensis* Fuentes-Reinés, Zoppi de Roa & Torres, 2015

4B. Anal operculum bare, female P5 EXP with 5 setae, male P5 EXP with 4 setae..... *C. nudus* Gómez, 2005

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