



УДК 595.792.13 (720)

MEXICAN SPECIES OF *CYLLOCERIA* SCHIØDTE (HYMENOPTERA: ICHNEUMONIDAE: CYLLOCERIINAE)

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ABSTRACT

Seven species of the genus *Cylloceria* are found to occur in Mexico. Of them, *C. morelia* Humala et Khalaim sp. nov. is described as new, and two species, *C. alvaradoi* Gauld and *C. rubrica* Dasch, are recorded from Mexico for the first time. New data on distribution of four other species in Mexico are provided. *Cylloceria alvaradoi* is also recorded for the first time from Panama. An identification key to seven Mexican species of *Cylloceria* is given.

Key words: Mexico, Central America, North America, Neotropical region, taxonomy, new species, identification key

RESUMEN

Siete especies del género *Cylloceria* se han encontrado en México. Se describe *C. morelia* Humala et Khalaim sp. nov.; *C. alvaradoi* Gauld y *C. rubrica* Dasch se reportan por primera vez para México. Se incluyen nuevos datos de distribución de otras cuatro especies. *Cylloceria alvaradoi* se reporta por primera vez para Panamá. Se elaboró una clave de identificación para las siete especies mexicanas de *Cylloceria*.

Palabras clave: México, Centroamérica, Norteamérica, región Neotropical, taxonomía, nueva especie, clave

МЕКСИКАНСКИЕ ВИДЫ РОДА *CYLLOCERIA* SCHIØDTE (HYMENOPTERA: ICHNEUMONIDAE: CYLLOCERIINAE)

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РЕЗЮМЕ

Установлено, что в Мексике обитают семь видов рода *Cylloceria*. Из них вид *C. morelia* Humala et Khalaim sp. nov. описан как новый для науки и два вида, *C. alvaradoi* Gauld и *C. rubrica* Dasch, впервые указаны для Мексики. Приводятся новые данные о распространении в Мексике четырех других видов. *Cylloceria alvaradoi* также впервые отмечен из Панама. Дан определительный ключ для семи мексиканских видов *Cylloceria*.

Ключевые слова: Мексика, Центральная Америка, Северная Америка, Неотропики, систематика, новый вид, определительный ключ

INTRODUCTION

Cylloceria Schiødte is a moderately large genus that occurs predominantly in the Holarctic and Neotropical regions and comprises about 29 species (Humala 2012, Yu et al. 2012, Choi and Lee 2016). The genus is a member of the small ichneumonid subfamily Cylloceriinae, proposed for two genera, *Allomacrus* Förster and *Cylloceria*, by Wahl (1990), and more recently Humala (1997) has described the third genus in this subfamily, *Rossemia* Humala. Afterwards, basing on the results of combined DNA and morphological data analyses, the genus *Hyperacmus* Holmgren was transferred to Cylloceriinae as well (Quicke et al. 2009). Very little is known about the biology of *Cylloceria*. All reliable host records are from species of Tipulidae (Diptera) (Humala 2002).

Currently, the genus *Cylloceria* is represented by eight species in America north of Mexico (Dasch 1992); six of these are restricted to the Nearctic region and two, *C. borealis* (Roman) and the widespread *C. melancholica* (Grav.), also occur in the Palaearctic region. Two Nearctic species, *C. arizonica* Dasch and *C. melancholica* (Grav.), are known also from Mexico (Dasch 1992), and two species, *C. mexicana* Kasparyan et Ruíz-Cancino and *C. tropicana* Humala, were recently described from this country (Kasparyan and Ruíz-Cancino 2003, Humala 2012).

In the Neotropical region, four species occur in Costa Rica and a single South American species is only known from the Peruvian mountains at about 2300 m (Gauld 1991). None of them has been recorded from Mexico until now.

The aim of this paper is to review the Mexican fauna of *Cylloceria*, describe one new species and provide an identification key to the species occurring in Mexico.

MATERIAL AND METHODS

This work is based on material from the following Mexican and USA collections:

EMEC – Essig Museum of Entomology, University of California, Berkeley, USA;

EMUS – Utah State University, Logan, Utah, USA (Townes collection);

TAMU – Texas A&M University, College Station, Texas, USA;

UAT – Universidad Autónoma de Tamaulipas, Cd. Victoria, Tamaulipas, México;

UAEM – Universidad Autónoma de Estado Morelos, Cuernavaca, Morelos, Mexico;

UMSNH – Universidad Michoacana de San Nicolás Hidalgo, Tarímbaro, Michoacán, México;

UNAM – Instituto de Biología, Universidad Nacional Autónoma de México, D.F., México.

Additionally, samples of the following Nearctic and Central American species of *Cylloceria* were examined by the first author in the Townes collection (currently EMUS):

C. borealis (Roman) from the Nearctic region;

C. calva Dasch, holotype female from Canada;

C. impolita Dasch, holotype female from USA;

C. striatula Dasch, holotype female from Canada;

C. ugaldi Gauld from Costa Rica.

Morphological terms predominantly follow those of Gauld (1991). Layer photographs were taken in TAMU with a DFC 295 digital camera attached to a Leica stereomicroscope, and partly focused images were combined using Helicon Focus software.

SYSTEMATICS

Family Ichneumonidae Latreille, 1802

Subfamily Cylloceriinae Wahl, 1990

Genus *Cylloceria* Schiødte, 1838

Type species: *Phytodietus caligatus* Gravenhorst, 1829.

Remarks. In addition to four species previously known from Mexico, we describe one new species, *C. morelia* Humala et Khalaim sp. nov., and record two species, the Central American *C. alvaradoi* Gauld and Nearctic *C. rubrica* Dasch. New data on distribution of four other species and a key for identification of seven species occurring in Mexico are provided. The key below is largely based on a simple colour differences that were found to work equally well for females and males of Mexican species of *Cylloceria*.

Key to species of *Cylloceria* occurring in Mexico

1. Metasomal tergites 2 and following red (Fig. 5) 2
 - Metasomal tergites brownish black to black, at most hind margins of second and following tergites reddish 4
2. Hind coxa red. Propodeum with longitudinal carinae mostly lacking 6. *C. rubrica* Dasch
 - Hind coxa black. Propodeum with longitudinal carinae well developed (Fig. 4) 3

3. Hind wing with nervellus intercepted in the middle or somewhat above middle. Maxillary palp reddish or brownish, sometimes infuscate. Malar space 0.9–1.0 times as long as basal mandibular width in female and about 0.8 times in male 4. *C. mexicana* Kasparyan et Ruíz-Cancino
- Hind wing with nervellus intercepted distinctly below the middle (Figs 3, 5). Maxillary palp white with apical palpomere fuscous. Malar space 0.8 times as long as basal mandibular width in female and 0.6–0.8 times in male 5. *C. morelia* sp. nov.
4. Coxae black 5
- Coxae red 6
5. Hind leg and tegula entirely black 7. *C. tropicana* Humala
- Hind leg bright yellow with only coxa black. Tegula yellow or sometimes slightly infuscate 1. *C. alvaradoi* Gauld
6. Mesoscutum with median longitudinal carina with several parallel striae on disk in front of scutellum. Ovipositor 1.55–1.75 times as long as hind tibia 2. *arizonica* Dasch
- Mesoscutum without median longitudinal carina, scabrous in front of scutellum. Ovipositor 1.7–2.9 times as long as hind tibia 3. *C. melancholica* (Grav.)

1. *Cylloceria alvaradoi* Gauld, 1991

References. Gauld 1991: 550 [Costa Rica]. Humala 2012: 167 [Honduras].

Material examined. MEXICO: 1 male (UNAM), State of Mexico, Texcoco, Montecillo, 22 September 2009, coll. Miranda P. 1 female (UAT), Veracruz, SW of Xalapa, park near Institute de Ecología, N 19°30.768', W 96°56.349', 1260 m, 17–18 February 2009, coll. A.I. Khalaim. 1 female (UNAM), Oaxaca, Municipio Santiago Comaltepec, La Esperanza, 1600 m, N 17.62261° W 96.36950° Malaise trap, 1–10 July 2008, coll. A. López García. **COSTA RICA:** 4 females (EMUS), Escazú, 20–26 May 1987, coll. H. & M. Townes. 1 female (EMUS), San Vito de C.B., Las Cruces, 1200 m, 17 August–12 September 1982, coll. B. Gill. 1 female (EMUS), Monteverde, 12–15 June 1974, coll. J. Donahue. 1 female (EMUS), same locality, January–February 1963, coll. C. Palmer. **PANAMA:** 1 female (EMUS), near Hato Del Volcan, 1700 m, 30 June 1981, coll. B. Gill. 1 female (TAMU), Bocas del Toro, 5 km W of Fortuna Hwy., N 8°47', W 82°12', 3360 ft. (= 1025 m), Malaise trap, 5–10 August 1999, coll. A. Gillogly & J. Woolley.

Distribution. Mexico (Mexico, Oaxaca, Veracruz), Honduras, Costa Rica, Panama. First records from Mexico and Panama.

2. *Cylloceria arizonica* Dasch, 1992

References. Dasch 1992: 283 [USA (Arizona, New Mexico), Mexico (Durango, Jalisco, Veracruz, Guanajuato, Mexico, Puebla)]. Humala 2012: 167 [Mexico (Morelos)].

Material examined. MEXICO: 1 male (UAT), Tamaulipas, 15 km SSW of Cd. Victoria, El Ma-droño, 20 October 1984, coll. E. Ruíz-Cancino. 1 female (UNAM), Veracruz/Puebla, “Km 124 Orizaba Puebla 21–I .47 Col. E. Zarreza” (handwritten illegible text). 1 male (UAT), Tlaxcala, 15 km SSE of Apizaco, north slope of La Malinche volcano, 2550–2600 m, 1 October 2016, coll. A.E. Humala. 1 female (UNAM), Hidalgo, Huasca de Ocampo, Rancho Santa Elena, Hueyapan River, N 20°06', W 98°31', 2330–2535 m, Malaise trap, 21 September–19 October 2010, coll. A. Contreras et al. 1 female (UAEM), Morelos, Temixco Campus UAEM, 9 January 1997, coll. G. Peña. 1 female (UNAM), Oaxaca, Municipio Santiago Comaltepec, La Esperanza, 1600 m, N 17.62261° W 96.36950° Malaise trap, 1–10 July 2008, coll. A. López García.

Distribution. USA (Arizona, New Mexico), Mexico (Durango, Guanajuato, Hidalgo, Jalisco, Mexico, Morelos, Oaxaca, Puebla, Tamaulipas, Tlaxcala, Veracruz).

3. *Cylloceria melancholica* (Gravenhorst, 1820)

References. Dasch 1992: 269 [Canada, USA (including Alaska, widespread), Mexico].

Remarks. Dasch (1992: 275) mentioned that this species is widespread in Mexico, but with no details on the distribution. According to the large examined ichneumonid material from Mexico, the species is rare in this country.

All morphological characters used for diagnosing *C. melancholica* vary considerably within this species. It is very probable that *C. melancholica* actually comprises a complex of morphologically similar species, and some West Palaearctic species were unjustifiably synonymized with *C. melancholica* (Humala, pers. obs.). Anyway, species limits of *C. melancholica* and its possible related species require special investigation and are beyond the scope of this study.

Material examined. USA: 1 female (EMUS), Georgia, Jackson Co., 10 mi. (= 16.0 km) SE of Jefferson, 13–21 April 1989, coll. Wenzel. **MEXICO:** 1

male (UAT), Tlaxcala, 15 km SSE of Apizaco, north slope of La Malinche volcano, 2550–3000 m, 2 October 2016, coll. A.E. Humala. 3 females (UNAM), Tlaxcala, Nanacamilpa, Ejido Los Búfalos, N 19°28', W 98°35', bosque Pino-Encino, 2830–2900 m, Malaise trap, 3 May – 30 June 2016, coll. Y. Marquez & A. Contreras.

Distribution. Palaearctic region (transcontinental), Canada, USA (widespread, including Alaska), Mexico (Tlaxcala).

4. *Cylloceria mexicana* Kasparyan et Ruíz-Cancino, 2003

References. Kasparyan and Ruíz-Cancino 2003: 347 [Mexico (Tamaulipas)].

Morphological remarks. In the type series, both sexes have the hind leg with the coxae and trochanters black; females have the hind femur and tibia red, tarsus either red or fuscous; males have only the femur red, tibia and tarsus more or less infuscate (tibia usually paler basally and strongly infuscate apically, tarsus entirely fuscous). In the new material, the females completely correspond with the type specimens, but males have the hind leg entirely fuscous with the hind femur dark brown to brownish black. Thus, coloration of the hind leg is found to be rather variable, e.g. hind femur varies from entirely red to brownish black. Similarly, coloration of the hind leg varies in *C. morelia* sp. nov. (see *Variation* section for this species).

Material examined. MEXICO: holotype female (examined; UAT), Tamaulipas, Miquihuana, 22 km of La Peña, 2800 m, pine forest, 16 September 2000, coll. D.R. Kasparyan. 1 female (UAT), Tamaulipas, 6 km NE of Miquihuana, N 23°36.125', W 99°42.450', 2200–2600 m, 24 September 2016, coll. A.I. Khalaim. 1 male (EMEC), Puebla, NE slope of volcano Popocatepetl, near Buena Vista, 3070 m, 25 August 1987, coll. J. Brown & J. Powell. 1 male (EMEC), Morelos, 6 km NE of Tres Cumbres, 2900 m, 9 September 1982, coll. J.A. Powell.

Distribution. Mexico (Morelos, Puebla, Tamaulipas).

5. *Cylloceria morelia* Humala et Khalaim sp. nov. (Figs 1–6)

Holotype. Female – MEXICO, Michoacán, Morelia, Cerro Punhuato, Area de Nopalera, N 19°42',

W 101°08', 2096 m, 3 November 2010, coll. Ana L. Escalante Jiménez (UAT).

Paratypes. MEXICO: 2 males (EMUS, UAT) same data as holotype, but 6 August 2010; 1 male (UMSNH), Michoacán, Morelia, Cerro Punhuato, Tejocotero, N 19°42', W 101°08', 2133 m, 20 August 2010, coll. Ana L. Escalante Jiménez (apex of metasoma absent). 1 male (UNAM), Oaxaca, Santiago Comaltepec, N 17.565°, W 96.496°, 3107 m, subalpine dwarf pine forest, yellow pan trap, 18–20 June 2007, coll. H. Clebsch.

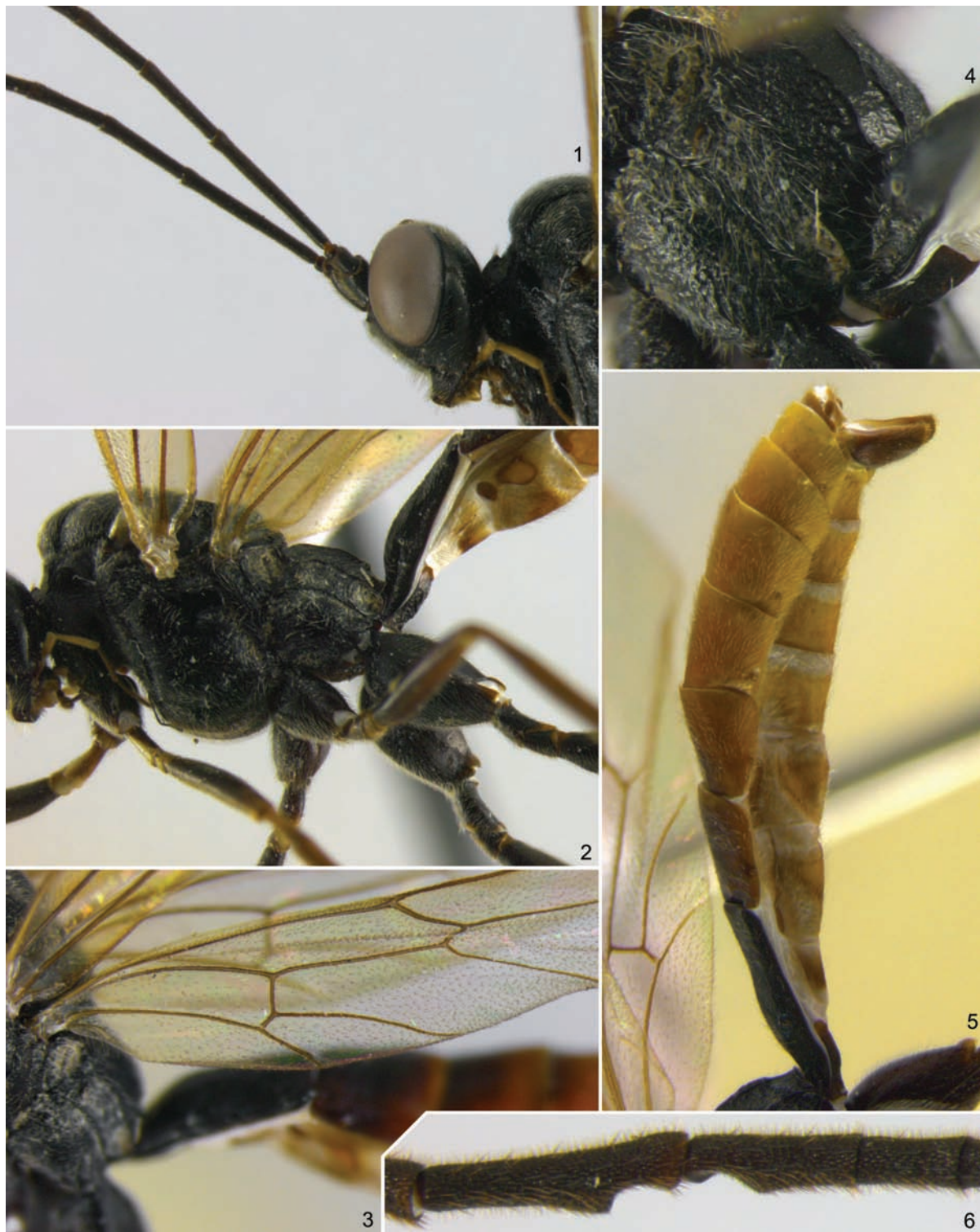
Etymology. Named after the type locality, Morelia.

Comparison. *Cylloceria morelia* sp. nov. resembles the Nearctic *C. aquilonia* Dasch known from Alaska and Canada, differing from the latter by the black hind femur, whitish tegula, palps, fore and mid trochanters, greater number of flagellomeres (22–24 in *C. aquilonia*), slenderer first flagellomere (6.55–7.2 times as long as broad in *C. aquilonia*), and lack of longitudinal striae on the second tergite. It is also similar to *C. mexicana* as both have a predominantly reddish brown metasoma and black hind coxa, but differs from this species by its shorter malar space, hind wing with nervellus intercepted distinctly below the middle and coloration of the maxillary palp.

Description of the holotype (female). Body length 10.5 mm, fore wing length 8.4 mm.

Head 1.15 times as wide as high. Face 1.75 times as wide as high and 0.45 times as wide as head, scabrous, lateral margins subparallel. Frons more smooth, sparsely punctate. Clypeus convex along upper margin, remainder flattened, separated from face by distinct groove, 2.7 times as wide as high, with apical margin truncate. Malar space 0.8 times as long as basal mandibular width, with subocular strip. Mandible stout, upper tooth twice as wide as lower tooth; basal half of mandible with rough punctures, bearing white setae. Ocelli of moderate size, in obtuse triangle; ocular-ocellar distance equal to maximum diameter of lateral ocellus; postocellar distance slightly exceeding it; central ocellus connected with occipital carina by fine median groove. Occipital carina complete. Gena weakly convex, inflexed posteriorly, finely punctate. Antenna long and slender, with 28 flagellomeres; first flagellomere about 12.0 times as long as centrally broad (Fig. 3).

Mesosoma 1.55 times as long as high. Notauli deep, converging and meeting posteriorly on disk of mesoscutum. Epomia present. Scutellum weakly



Figs 1–6. *Cylloceria morelia* sp. nov., female holotype (1–4) and male paratype (5, 6). 1 – head with bases of antennae, lateral view; 2 – mesosoma and tergite 1, lateral view; 3 – base of hind wing; 4 – propodeum, dorso-postero-lateral view; 5 – metasoma, lateral view; 6 – flagellomeres 3–5, lateral view.

convex, with lateral carinae only at its base. Epicnemial carina complete, reaching front margin of mesopleuron. Mesoscutum rugulose, in profile abruptly rounded. Mesopleuron smooth, with scattered punctures bearing short white setae. Sternaulus obsolete. Metapleuron coarsely rugulose. Propodeum scabrous, with dorsal longitudinal carinae subparallel and posterior transverse carina more or less developed centrally; propodeal spiracle ovoid. Fore wing with nervulus (*cu-a*) clearly antefurcal. Intercubitus (*2rs-m*) about 0.8 times as long as abscissa of cubitus between intercubitus and second recurrent vein (abscissa of *M* between *2rs-m* and *2m-cu*). Hind wing with nervellus (*cu1&cu-a*) broken clearly below middle, *Cu1* present (Fig. 3). Legs with hind femur 5.2 times as long as broad and hind basitarsus 0.45 times as long as hind tibia.

First tergite of metasoma 1.75 times as long as apically wide, coriaceous, with indistinct dorsomedian carinae in basal half; spiracle at basal 0.3 of tergite. Glymma present. First sternite separated from tergite, with sclerotized part reaching 0.25 length of tergite and apical margin roundly incised. Second tergite 0.8 times as long as apically wide, matt on basal 0.9 and polished apically. Remaining tergites subpolished. Ovipositor moderately long, 1.8 times as long as hind tibia, with subapical dorsal notch.

Body predominantly black; second and following metasomal tergites (tergite 2 basally blackish) reddish-brown. Palps white, apical maxillary palpomere fuscous. Tegula white. Fore and mid legs dark brown with coxae black and trochanters mostly whitish. Hind leg predominantly black with spurs brown and trochantellus ventrally with white strip. Wings hyaline, veins and pterostigma dark brown.

Male. Similar to female. Malar space 0.6 times as long as basal mandibular width. Coloration as in female except tergite 2 which sometimes is more or less entirely reddish or orange-brown (Fig. 5), fore and mid legs mostly whitish with brown strips on inner surfaces of femora and tibiae, and dark brown parameres.

Variation. Specimens from Michoacán have fore and mid legs (except black coxae) white with profuse brown or fuscous markings, and the hind leg more or less entirely black. A male from Oaxaca has fore and mid coxae and both trochanters white ventrally and black dorsally, fore tibia whitish and all femora reddish brown.

Distribution. Mexico (Michoacán, Oaxaca).

6. *Cylloceria rubrica* Dasch, 1992

References. Dasch 1992: 285 [USA (Arizona)].

Material examined. USA: holotype female (examined, EMUS), Arizona, Portal, 18 September 1987, coll. H. & M. Townes. MEXICO: 1 female (UAT), Tlaxcala, 15 km SSE of Apizaco, north slope of La Malinche volcano, 2550–3000 m, 1–2 October 2016, coll. A.I. Khalaim.

Distribution. USA (Arizona), Mexico (Tlaxcala). First record from Mexico.

7. *Cylloceria tropicana* Humala, 2012

References. Humala 2012: 164 [Mexico (Chiapas)].

Material examined. MEXICO: Holotype female (examined, TAMU), Chiapas, Municipio San Cristobal, Reserva Huitepec, N 16°46'06'', W 92°41'04'', 8000 ft. (= 2440 m), Malaise trap 97/072, 2–14 August 1997, coll. Woolley, González & Galdamez. 1 female (UNAM), Tlaxcala, Nanacamilpa, Ejido Los Búfalos, N 19°28', W 98°35', bosque Pino-Encino, 2830–2900 m, Malaise trap, 30 June – 1 August 2016, coll. Y. Marquez & A. Contreras.

Distribution. Mexico (Chiapas, Tlaxcala).

ACKNOWLEDGEMENTS

We are thankful to John D. Oswald and Karen Wright (TAMU), Alejandro Zaldívar-Riverón (UNAM) and David Wahl (EMUS) for loans of valuable material. The work of the first author was supported by the Russian Foundation for Basic Research (grant no. 16-04-00197) and performed in the framework of the state research project No. 01201351189 (Russian Federation); the work of the second author was carried out under state order implemented by Forest Research Institute KarRC RAS (project # 0220-2014-0005). Also thanks to the PRODEP project "Taxonomical and biological studies of pests and natural enemies in Mexico" for supporting trips to central Mexico and TAMU.

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Submitted December 12, 2016; Accepted February 9, 2017.