

University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Insecta Mundi

Center for Systematic Entomology, Gainesville,
Florida

2016

The Trichoptera of Panama IV. New records for caddisflies (Insecta: Trichoptera) from the Republic of Panama

Brian J. Armitage

Instituto Conmemorativo Gorgas de Estudio de la Salud, tobikera89@gmail.com

Steven C. Harris

Clarion University, sharris@clarion.edu

Roger J. Blahnik

UNiversity of Minnesota, blahn003@umn.edu

Robin E. Thomson

University of Minnesota, thom1514@umn.edu

Follow this and additional works at: <http://digitalcommons.unl.edu/insectamundi>

 Part of the [Ecology and Evolutionary Biology Commons](#), and the [Entomology Commons](#)

Armitage, Brian J.; Harris, Steven C.; Blahnik, Roger J.; and Thomson, Robin E., "The Trichoptera of Panama IV. New records for caddisflies (Insecta: Trichoptera) from the Republic of Panama" (2016). *Insecta Mundi*. 1022.

<http://digitalcommons.unl.edu/insectamundi/1022>

This Article is brought to you for free and open access by the Center for Systematic Entomology, Gainesville, Florida at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Insecta Mundi by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

INSECTA MUNDI

A Journal of World Insect Systematics

0511

The Trichoptera of Panama IV.
New records for caddisflies (Insecta: Trichoptera)
from the Republic of Panama

Brian J. Armitage

Instituto Conmemorativo Gorgas de Estudio de la Salud
Ave. Justo Arosemena y Calle 35
Apartado Postal No 0816-02593
Panama, Republic of Panama

Steven C. Harris

Department of Biology and Geosciences
Clarion University
Clarion, PA 16214 USA

Roger J. Blahnik

Department of Entomology
University of Minnesota
St. Paul, MN 55108 USA

Robin E. Thomson

Department of Entomology
University of Minnesota
St. Paul, MN 55108 USA

Date of Issue: November 25, 2016

Brian J. Armitage, Steven C. Harris, Roger J. Blahnik, and Robin E. Thomson
The Trichoptera of Panama IV. New records for caddisflies (Insecta: Trichoptera)
from the Republic of Panama
Insecta Mundi 0511: 1–13

ZooBank Registered: urn:lsid:zoobank.org:pub:AB9CE066-DA80-4EF7-A7F9-63F21BD4D145

Published in 2016 by

Center for Systematic Entomology, Inc.
P. O. Box 141874
Gainesville, FL 32614-1874 USA
<http://centerforsystematicentomology.org/>

Insecta Mundi is a journal primarily devoted to insect systematics, but articles can be published on any non-marine arthropod. Topics considered for publication include systematics, taxonomy, nomenclature, checklists, faunal works, and natural history. **Insecta Mundi** will not consider works in the applied sciences (i.e. medical entomology, pest control research, etc.), and no longer publishes book reviews or editorials. **Insecta Mundi** publishes original research or discoveries in an inexpensive and timely manner, distributing them free via open access on the internet on the date of publication.

Insecta Mundi is referenced or abstracted by several sources including the Zoological Record, CAB Abstracts, etc. **Insecta Mundi** is published irregularly throughout the year, with completed manuscripts assigned an individual number. Manuscripts must be peer reviewed prior to submission, after which they are reviewed by the editorial board to ensure quality. One author of each submitted manuscript must be a current member of the Center for Systematic Entomology.

Chief Editor: Paul E. Skelley, e-mail: insectamundi@gmail.com
Assistant Editor: David Plotkin, e-mail: insectamundi@gmail.com
Head Layout Editor: Eugenio H. Nearn
Editorial Board: J. H. Frank, M. J. Paulsen, Michael C. Thomas
Review Editors: Listed on the **Insecta Mundi** webpage

Manuscript Preparation Guidelines and Submission Requirements available on the **Insecta Mundi** webpage at: <http://centerforsystematicentomology.org/insectamundi/>

Printed copies (ISSN 0749-6737) annually deposited in libraries:

CSIRO, Canberra, ACT, Australia
Museu de Zoologia, São Paulo, Brazil
Agriculture and Agrifood Canada, Ottawa, ON, Canada
The Natural History Museum, London, UK
Muzeum i Instytut Zoologii PAN, Warsaw, Poland
National Taiwan University, Taipei, Taiwan
California Academy of Sciences, San Francisco, CA, USA
Florida Department of Agriculture and Consumer Services, Gainesville, FL, USA
Field Museum of Natural History, Chicago, IL, USA
National Museum of Natural History, Smithsonian Institution, Washington, DC, USA
Zoological Institute of Russian Academy of Sciences, Saint-Petersburg, Russia

Electronic copies (Online ISSN 1942-1354, CDROM ISSN 1942-1362) in PDF format:

Printed CD or DVD mailed to all members at end of year. Archived digitally by Portico.
Florida Virtual Campus: <http://purl.fcla.edu/fcla/insectamundi>
University of Nebraska-Lincoln, Digital Commons: <http://digitalcommons.unl.edu/insectamundi/>
Goethe-Universität, Frankfurt am Main: <http://nbn-resolving.de/urn/resolver.pl?urn:nbn:de:hebis:30:3-135240>

Copyright held by the author(s). This is an open access article distributed under the terms of the Creative Commons, Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited. <http://creativecommons.org/licenses/by-nc/3.0/>

Layout Editor for this article: Brian J. Armitage

The Trichoptera of Panama IV. New records for caddisflies (Insecta: Trichoptera) from the Republic of Panama

Brian J. Armitage

Instituto Conmemorativo Gorgas de Estudio de la Salud
Ave. Justo Arosemena y Calle 35
Apartado Postal N° 0816-02593
Panama, Republic of Panama
tobikera89@gmail.com

Steven C. Harris

Department of Biology and Geosciences
Clarion University
Clarion, PA 16214 USA
sharris@clarion.edu

Roger J. Blahnik

Department of Entomology
University of Minnesota
St. Paul, MN 55108 USA
blahn003@umn.edu

Robin E. Thomson

Department of Entomology
University of Minnesota
St. Paul, MN 55108 USA
thom1514@umn.edu

Abstract. The Republic of Panama currently has 300 recorded species of Trichoptera distributed among 14 families. Herein we add 42 new country records for Panama, including one new family (Anomalopsychidae) and three new genera (Anomalopsychidae: *Contulma*; Hydroptilidae: *Byrsopteryx* and *Cerasmatrichia*). The newly recorded caddisfly taxa increase Panama's total known fauna to 342 species, distributed among 15 families and 50 genera. These results are part of an ongoing effort to characterize the caddisfly fauna of Panama, and to evaluate that country's major watersheds (cuencas).

Key Words. Anomalopsychidae, Philopotamidae, Glossosomatidae, Hydroptilidae, Hydrobiosidae, Leptoceridae, new country record, cuenca.

Introduction

Until the last 25 years, the insect order Trichoptera (caddisflies) was poorly known in Panama, both in terms of diversity and distribution. In general, repeated collections were made in a relatively few locations. Aguila (1992) published the first list of caddisflies (Insecta: Trichoptera) from Panama, listing 168 species in 39 genera and 13 families. Through 2014, 6 genera and 78 additional species were recorded by other researchers, bringing the total to 246 species distributed among 13 families and 45 genera. In 2015, Armitage et al. (2015b) and Harris and Armitage (2015) added 32 new country records, 10 new species to science, one new family and two new genera. Muñoz-Quesada and Holzenthal (2015) added a net total of 11 *Wormaldia* species, and Bueno-Soria and Barba-Alvarez (2015) added one species of *Plectropsyche*. Except for the latter species, the entire fauna of Panama was summarized in Armitage et al. (2015a). Thus, at the end of 2015, 300 species were known from Panama,

distributed among 14 families and 47 genera. Even so, neighboring Costa Rica boasts over 500 species, suggesting there is much yet to learn about Panama's caddisfly diversity.

There is also much to be learned about the distribution of caddisflies among Panama's administrative units (provinces and indigenous comarcas) and major watersheds (cuencas). Armitage and Cornejo (2015; in Spanish) clearly demonstrated the concentrated aspect of historical collections in this country. Currently, caddisflies are known from only 20 of 52 major watersheds (ten of these with 6 or fewer species known) and 8 of 14 administrative units (six of these with 37 or fewer species known).

Based on specimens collected primarily by the first author and personnel of the Colección Zoológica Dr. Eustorgio Méndez (CoZEM) of the Gorgas Institute, we herein add 42 new Panamanian country records. Thus, the new total of known caddisflies from the Republic of Panama is 342 species, a 14% increase. In addition, one family, Anomalopsychidae, and three genera (Anomalopsychidae: *Contulma*; Hydroptilidae: *Byrsopteryx* and *Cerasmatrixia*), are now recorded from Panama for the first time.

Materials and Methods

Single-night collections were made, in general, using UV light and alcohol traps (Calor and Mariano 2012). Multiple-night collections were made with this same method or employing Malaise traps, as indicated. Specimens listed in this publication will be deposited in the University of Panamá Museo de Invertebrados (MIUP), CoZEM, or the authors' reference collections. The order of families below follows the classification presented by Holzenthal et al. (2015).

Results

Figure 1 (A-C) displays the major watersheds (cuencas) in which the new country records are found, the number of new country records per watershed, and the new total number of species known from the involved watersheds. There was one new family (Anomalopsychidae) added to known caddisfly fauna of Panama, and three new genera (Anomalopsychidae: *Contulma*; Hydroptilidae: *Byrsopteryx* and *Cerasmatrixia*). The 42 newly recorded caddisfly taxa for the Republic of Panama increase Panama's total known fauna to 342 species (Fig. 2), distributed among 15 families and 50 genera. Their collection details follow.

Family Philopotamidae

Chimarrhodella costaricensis Blahnik and Holzenthal

Material examined—Chiriquí Province: **Cuenca 108**, Quebrada Honda, N Fortuna Dam, 8.74985°N and 82.23885°W, 1132 m asl, CoZEM, 22.vi.2015, 1 male; afluente Río La Cruz, Potrerillos Arriba, 8.70985°N and 82.47848°W, 925 m asl, 20.vi.2015, CoZEM, 1 male.

Distribution: Costa Rica, Panama

Wormaldia buenorum Munoz-Quesada and Holzenthal

Material examined—Chiriquí Province: **Cuenca 102**, Quebrada Norte, Mount Totumas Cloud Forest and Biological Reserve, 8.87361°N and 82.69051°W, 1920 m asl, 14.iv.2015, B. Armitage, 1 male; **Chiriquí Province: Cuenca 108**, trib. to Quebrada Jaramillo, Jaramillo Alto Rd. Bridge, 8.76671°N and 82.41519°W, 1300 m asl, 11.xi.2014, B. Armitage, 1 male;

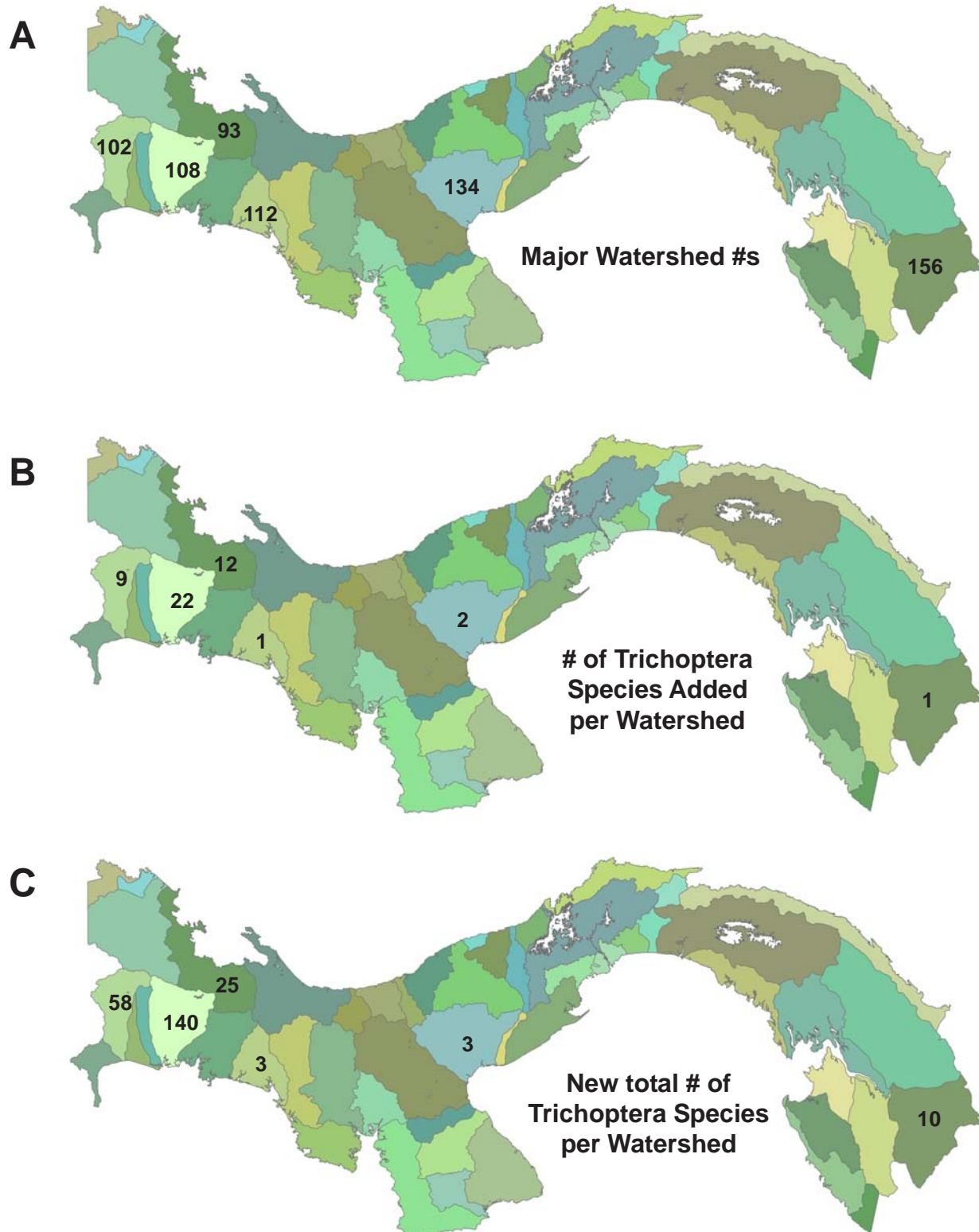


Figure 1. Major watersheds (cuencas) of the Republic of Panama. **A.** New country records were present in the watersheds indicated as follows (watershed #–major river–watershed area): **93**–Río Guariviara–2,121 km²; **102**–Río Chiriquí Viejo–1,376 km²; **108**–Río Chiriquí–1,905 km²; **112**–Río Felix–1,168 km²; **134**–Río Grande–2,493 km²; and, **156**–Río Tuira–3,017 km². **B.** Number of new country records added for each watershed indicated in A. **C.** New total number of species known from each watershed indicated in A.

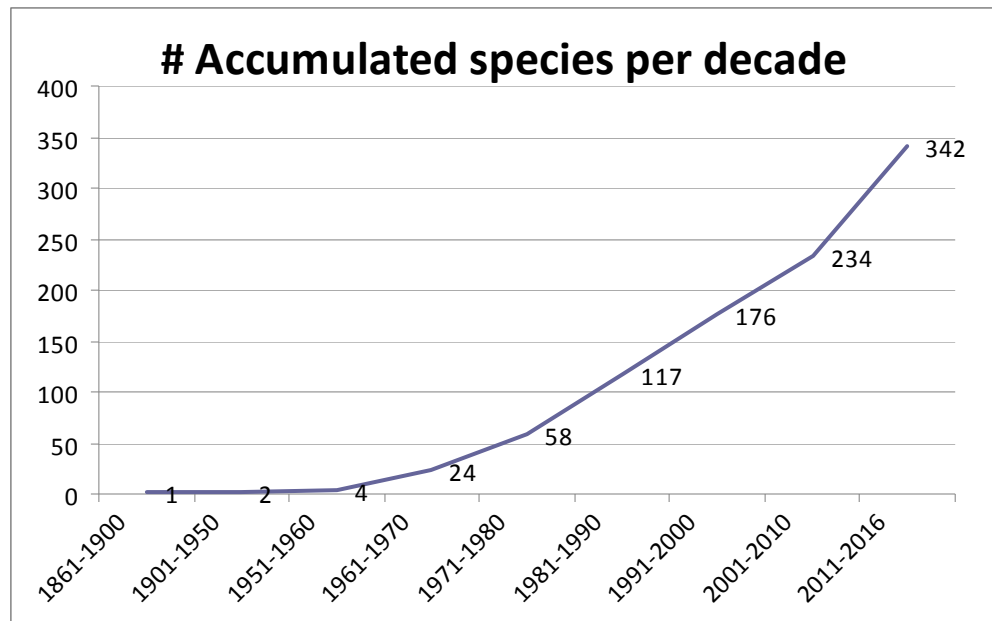


Figure 2. Species accumulation graph for species reported from Panama per decade.

ibid., Quebrada Aserrio, platanal; nr Boquete, 8.79472°N and 82.44968°W, 1157 m asl, 15.vi.2015, CoZEM, 1 male; ibid., Río Brazo Prieto, E Guayabal, 8.65689°N and 82.56153°W, 797 m asl, 19.vi.2015, CoZEM, 1 male; ibid., Primer Brazo del Río David, Ruta 103; Potrerillos Arriba, 8.64414°N and 82.49408°W, 696 m asl, 21.vi.2015, CoZEM, 1 male; **Coclé Province: Cuenca 134**, afluyente Las Yayas, Toma de agua Barringón, 8.66307°N and 80.58908°W, 709.4 m asl, 26.ii.2015, CoZEM, 1 male.

Distribution: Mexico, Panama

Wormaldia hedamafera Munoz-Quesada and Holzenthal

Material examined—Chiriquí Province: Cuenca 102, afluyente Río Colorado, Mount Totumas Cloud Forest and Biological Reserve, 8.88472°N and 82.68408°W, 1920 m asl, 14.iv.2015, B. Armitage, 1 male; ibid., 25.vi.2016, 1 male; ibid., 31.viii.2015, 1 male; ibid., Quebrada Norte, Mount Totumas Cloud Forest and Biological Reserve, 8.87361°N and 80.69051°W, 1920 m asl, 14.iv.2015, B. Armitage, 1 male; ibid., small waterfall, 8.88267°N and 82.68446°W, 1920 m asl, 25.vi.2016, 1 male; ibid., Quebrada Norte, Mount Totumas Cloud Forest and Biological Reserve, 8.87361°N and 80.69051°W, 1920 m asl, 26.vi.2015, B. Armitage, 1 male; ibid., 30-31.viii.2015, 1 male; ibid., Río Colorado, Mount Totumas Cloud Forest and Biological Reserve, 8.873556°N and 82.689993°W, 1920 m asl, 26.vi.2015, B. Armitage, 1 male; **Chiriquí Province: Cuenca 108**, trib. to Quebrada Jaramillo, Jaramillo Alto Rd. Bridge, 8.76671°N and 80.41519°W, 1300 m asl, 11.xi.2014, B. Armitage, 1 male; ibid., 10.ii.2015, 1 male; ibid., Jaramillo Alto Rd. Bridge (upper), 8.774267°N and 80.406993°W, 1470 m asl, 11.xi.2014, B. Armitage, 1 male; ibid., Jaramillo Centro Rd. Bridge (lower), 8.75454°N and 80.41848°W, 1075m asl, B. Armitage, 14.xii.2015, 1 male; ibid., Quebrada Aserrio, cafetal; nr Boquete, 8.80105°N and 80.45608°W, 1348 m asl, 17.vi.2015, CoZEM, 1 male; ibid., Quebrada Aserrio, platanal; nr Boquete, 8.79472°N and 80.44968°W, 1157 m asl, 15.vi.2015, CoZEM, 1 male; ibid., Primer Brazo del Río David, Ruta 103; Potrerillos Arriba, 8.64414°N and 80.49408°W, 696 m asl, 21.vi.2015, CoZEM, 1 male; ibid., Río Brazo Prieto, E Guayabal, 8.65689°N and 80.56153°W, 797 m asl, 19.vi.2015, CoZEM, 1 male; ibid., Quebrada Honda, N

Fortuna Dam, 8.74985°N and 80.23885°W, 1132 m asl, CoZEM, 22.vi.2015, 1 male; *ibid.*, afluyente Río La Cruz, Potrerillos Arriba, 8.70985°N and 80.47848°W, 925 m asl, 20.vi.2015, CoZEM, 1 male; *ibid.*, afluyente Río Majagua, nr Majagua, SW Rt.103, 8.66172°N and 80.53818°W, 837 m asl, 18.vi.2015, CoZEM, 1 male; *ibid.*, afluyente Río Palo Alto, Tree Trek Lodge, 8.80949°N and 82.39575°W, 1673 m asl, 2.vi.2016, T. Armitage, 1 male.

Distribution: Costa Rica, Nicaragua, Panama

Wormaldia imberti Munoz-Quesada and Holzenthal

Material examined—Chiriquí Province: Cuenca 108, afluyente Río La Cruz, Potrerillos Arriba, 8.70985°N and 82.47848°W, 925 m asl, 20.vi.2015, CoZEM, 1 male; *ibid.*, Río Chirigagua, SSE Guayabal, 8.64102°N and 82.55780°W, 737 m asl, 19.vi.2015, CoZEM, 1 male.

Distribution: Costa Rica, Panama

Wormaldia monsonorum Munoz-Quesada and Holzenthal

Material examined—Bocas del Toro Province: Cuenca 093, Quebrada Rambala, nr Rambala Jungle Lodge, 8.91627°N and 82.15469°W, 120 m asl, 31.iii.2015, E. Carlson, 1 male; **Coclé Province: Cuenca 134**, afluyente Las Yayas, Toma de agua Barringón, 8.66307°N and 80.58908°W, 709.4 m asl, 26.ii.2015, CoZEM, 1 male.

Distribution: Costa Rica, Panama

Wormaldia paprockevi Munoz-Quesada and Holzenthal

Material examined—Chiriquí Province: Cuenca 108, afluyente Río Majagua, nr Majagua; SW Rt.103, 8.66172°N and 82.53818°W, 837 m asl, 18.vi.2015, CoZEM, 1 male; *ibid.*, Río Chirigagua, SSE Guayabal, 8.64102°N and 82.55780°W, 737 m asl, 19.vi.2015, CoZEM, 1 male.

Distribution: Costa Rica, Panama

Wormaldia tocajoma Munoz-Quesada and Holzenthal

Material examined—Chiriquí Province: Cuenca 102, afluyente Río Colorado, Mount Totumas Cloud Forest and Biological Reserve, 8.88472°N and 82.68408°W, 1920 m asl, 14.iv.2015, B. Armitage, 1 male; *ibid.*, 7-13.xii.2015 (Malaise trap), J. Dietrich, 1 male.

Distribution: Costa Rica, Panama

Family Polycentropodidae

Cernotina taeniata Ross

Material examined—Darién Province: Cuenca 156, Río Tuira, 8.01750°N and 77.72417°W, 147 m asl, 19.xi.2015, CoZEM, 1 male.

Distribution: Mexico, Nicaragua, Panama

Polyplectropus denticulus Bueno-Soria

Material examined—Chiriquí Province: **Cuenca 108**, Río Chirigagua, SSE Guayabal, 8.64102°N and 82.55780°W, 737 m asl, 19.vi.2015, CoZEM, 1 male; *ibid.*, Primer Brazo del Río David, Ruta 103, Potrerillos Arriba, 8.4414°N and 82.43408°W, 696 m asl, 21.vi.2015, CoZEM, 4 males.

Distribution: Costa Rica, Mexico, Nicaragua, Panama

Family Glossosomatidae

Mortoniella carinula Blahnik and Holzenthal

Material examined—Chiriquí Province: **Cuenca 102**, Quebrada Norte, Mount Totumas Cloud Forest and Biological Reserve, 8.87361°N and 82.69051°W, 30-31.viii.2015 (Malaise trap), J. Dietrich, 5 males.

Distribution: Costa Rica, Panama

Family Hydroptilidae

Bredinia emarginata Harris, Holzenthal, and Flint

Material examined—Chiriquí Province: **Cuenca 108**, Quebrada Honda, nr Fortuna Dam, 8.74985°N and 82.23885°W, 1132 m asl, 22.vi.2015, CoZEM, 1 male.

Distribution: Costa Rica, Panama

Byrsopteryx cuchilla Harris and Holzenthal

Material examined—Bocas del Toro Province: **Cuenca 093**, afluyente Quebrada Rambala, Rambala Jungle Lodge, 3.7 km SSE Rambala, 8.91627°N and 82.15649°W, 9.viii.2014, E. Carlson, 1 male.

Distribution: Brazil, Panama

Cerasmatrixia wirthi (Flint)

Material examined—Bocas del Toro Province: **Cuenca 093**, Quebrada Rambala, Rambala Jungle Lodge, 3.74 km SSE Rambala, 8.91627°N and 82.15469°W, B. Armitage, 28.iii.2015 (Malaise trap), B. Armitage, 1 male; *ibid.*, 31.iii–11.iv.2015 (Malaise trap), E. Carlson, 1 male.

Distribution: Dominica, Panama, Venezuela

Costatrixia venezuelensis Flint

Material examined—Bocas del Toro Province: **Cuenca 093**, Quebrada Cañaza, at Pipeline Road nr El Guabo, 8.86685°N and 82.16688°W, 300 m asl, 18.v.1985, R. Flowers, 1 male.

Distribution: Panama, Venezuela

Flintiella heredia Harris, Flint, and Holzenthal

Material examined—**Bocas del Toro Province: Cuenca 093**, Quebrada Rambala, Rambala Jungle Lodge, 3.74 km SSE Rambala, 8.91627°N and 82.15469°W, 31.iii–11.iv.2015 (Malaise trap), E. Carlson, 1 male; *ibid.*, afluyente Quebrada Rambala, Rambala Jungle Lodge, 3.7 km SSE Rambala, 8.91627°N and 82.15649°W, 9.viii.2014, E. Carlson, 1 male; **Chiriquí Province: Cuenca 108**, afluyente Río Majagua, nr Majagua; SW Ruta 103, 8.66172°N and 82.53818°W, 837 m asl, 18.vi.2015, CoZEM, 13 males; *ibid.*, Río Chirigagua, SSE Guayabal, 8.64102°N and 82.55780°W, 737m asl, 19.vi.2015, CoZEM, 3 males.

Distribution: Costa Rica, Ecuador, Panama, Peru

Hydroptila maza Harris and Holzenthal

Material examined—**Bocas del Toro Province: Cuenca 093**, afluyente Quebrada Rambala, Rambala Jungle Lodge, 3.7 km SSE Rambala, 8.91627°N and 82.15649°W, 29.xi.2014, E. Carlson, 230 males; *ibid.*, 9.viii.2014, 71 males; *ibid.*, Quebrada Rambala, above main lodge, 28.iii.2015, B. Armitage, 16 males.

Distribution: Costa Rica, Panama

Hydroptila mexicana Mosely

Material examined—**Bocas del Toro Province: Cuenca 093**, afluyente Quebrada Rambala, Rambala Jungle Lodge, 3.7 km SSE Rambala, 8.91627°N and 82.15649°W, 9.viii.2014, E. Carlson, 13 males; *ibid.*, 29.xi.2014, 2 males; *ibid.*, above falls nr Rambala Jungle Lodge, 28.iii.2015, 44 males.

Distribution: Costa Rica, Mexico, Nicaragua, Panama

Hydroptila paradenza Harris and Holzenthal

Material examined—**Bocas del Toro Province: Cuenca 093**, Quebrada Cañaza, at Pipeline Road nr El Guabo, 8.86685°N and 82.16688°W, 300 m asl, 18.v.1985, R. Flowers, 8 males; *ibid.*, 19.v.1985, 2 males.

Distribution: Costa Rica, Nicaragua, Panama

Hydroptila singri Harris and Holzenthal

Material examined—**Chiriquí Province: Cuenca 108**, Quebrada Jaramillo, Collier Property upstream, 8.76320°N and 82.41383°W, 13.xi.2014, B. Armitage, 2 males; *ibid.*, Collier Property at cascade, 8.76320°N and 82.41383°W, 22.iv.2015, 10 males; *ibid.*, Jaramillo Centro Rd, 8.754536°N and 82.418475°W, 20.iii.2015, 6 males; *ibid.*, Alto Jaramillo Rd, 8.76625°N and 82.41341°W, 10.ii.2015, 4 males; *ibid.*, Alto Jaramillo Rd. bridge, 8.774627°N and 82.406993°W, 2.iii.2015, 6 males; *ibid.*, Primer Brazo del Río David, Ruta 103, Potrerillos Arriba, 8.4414°N and 82.43408°W, 696 m asl, CoZEM, 21.vi.2015, 21 males; *ibid.*, Río Brazo Prieto, E Guayabal, 8.6563°N and 82.56153°W, 797m asl, 19.vi.2015, CoZEM, 10 males; *ibid.*, afluyente Río Platanal, W Majagua 8.65452°N and 82.54255°W, 825m, 18-vi-2015, CoZEM, 8 males; *ibid.*, afluyente Río La Cruz, Potrerillos Arriba, 8.70985°N and 82.47848°W, 925 m asl, 20.vi.2015, CoZEM, 71 males; *ibid.*, afluyente Río Majagua, nr Majagua; SW

Ruta.103, 8.66172°N and 82.53818°W, 837 m asl, 18.vi.2015, CoZEM, 21 males; *ibid.*, Río Chirigagua, SSE Guayabal, 8.64102°N and 82.55780°W, 737m asl, 19.vi.2015, CoZEM, 21 males; Río La Cruz, NNW Potrerillos Abajo, 8.70268°N and 82.48445°W, 935 m asl, 20.vi.2015, CoZEM, 20 males.

Distribution: Costa Rica, Panama

Leucotrichia melleopicta Mosely

Material examined—**Bocas del Toro Province: Cuenca 093**, Quebrada Rambala, Rambala Jungle Lodge, 3.74 km SSE Rambala, 8.91627°N and 82.15469°W, 28.iii.2015 (Malaise trap), B. Armitage, 6 males; *ibid.*, E. Carlson, 31.iii–11.iv.2015, 68 males.

Distribution: Mexico, Panama, Venezuela

Metrichia avon (Bueno-Soria)

Material examined—**Bocas del Toro Province: Cuenca 093**, afluyente Quebrada Rambala, Rambala Jungle Lodge, 3.7 km SSE Rambala, 8.91627°N and 82.15649°W, 29.xi.2014, E. Carlson, 1 males.

Distribution: Costa Rica, Mexico, Panama

Metrichia picuda Bueno-Soria and Holzenthal

Material examined— **Bocas del Toro Province: Cuenca 093**, afluyente Quebrada Rambala, Rambala Jungle Lodge, 3.74 km SSE Rambala, 8.91543°N and 82.15527°W, 29.xi.2014, E. Carlson, 1 male; **Chiriquí Province: Cuenca 102**, Quebrada Norte, Mount Totumas Cloud Forest and Biological Reserve, 8.87361°N and 82.69051°W, 26.iv-10.v.2015 (Malaise trap), J. Dietrich, 8 males; *ibid.*, 18-23.v.2015, (Malaise trap), 8 males; *ibid.*, 30-31.viii.2015 (Malaise trap), 1 male; *ibid.*, afluyente Río Colorado, 8.884713°N and 82.68408°W, 7-13.xii.2015 (Malaise trap), 1 male; **Chiriquí Province: Cuenca 108**, Quebrada Jaramillo, Alto Jaramillo Rd. Bridge, 8.774627°N and 82.406993°W, 2.iii.2015, B. Armitage, 1 male.

Distribution: Costa Rica, Panama

Metrichia sacculifera (Flint)

Material examined—**Bocas del Toro Province: Cuenca 093**, Quebrada Rambala, Rambala Jungle Lodge, 3.74 km SSE Rambala, 8.91627°N and 82.15469°W, 31.iii–11.iv.2015 (Malaise trap), E. Carlson, 4 males.

Distribution: Colombia, Panama

Metrichia savegra Bueno-Soria and Holzenthal

Material examined—**Chiriquí Province: Cuenca 108**, afluyente Río Palo Alto, Tree Trek, 8.80949°N and 82.39575°W, 1673 m asl, 6/2/2016, T. Armitage, 1 male.

Distribution: Costa Rica, Panama

Metrichia separata Bueno-Soria and Holzenthal

Material examined—**Chiriquí Province: Cuenca 108**, afluyente Quebrada Grande, 8.78291°N, 84.44579°W, at waterfall, Valle Escondido, 25.vi.2013, B. Armitage, 1 male; *ibid.*, Quebrada Jaramillo, Alto Jaramillo Rd. bridge, 8.774627°N and 82.406993°W, 2.iii.2015, B. Armitage, 1 male.

Distribution: Costa Rica, Panama

Metrichia spica Bueno-Soria and Holzenthal

Material examined—**Chiriquí Province: Cuenca 108**, Quebrada Jaramillo, Alto Jaramillo Rd. bridge, 8.774627°N and 82.406993°W, 2.iii.2015, B. Armitage, 1 male.

Distribution: Costa Rica, Panama

Neotrichia esmalda (Mosely)

Material examined—**Chiriquí Province: Cuenca 112**, Las Lajas, Río San Felix, 29.v.1983, P. Spangler, R. Faitoute, W. Steiner, 1 male.

Distribution: Costa Rica, Mexico, Panama

Neotrichia hiaspa (Mosely)

Material examined—**Bocas del Toro Province: Cuenca 093**, Quebrada Cañaza, at Pipeline Road nr El Guabo, 8.86685°N and 82.16688°W, 300 m asl, 19.v.1985, R. Flowers, 1 male; **Chiriquí Province: Cuenca 108**, Río Caldera, Wilson Bridge, road to Lucero, S Boquete, 8.74228°N and 82.42160°W, 1,000 m asl, 18.xi.2013, B. and T. Armitage, 1 male; *ibid.*, Río Brazo Prieto, Guayabal, 8.65630°N and 82.56153°W, 797m asl, 19.vi.2015, CoZEM, 1 male.

Distribution: Mexico, Nicaragua, Panama

Neotrichia tuxtla Bueno-Soria

Material examined—**Chiriquí Province: Cuenca 108**, Quebrada Jaramillo, Collier property at cascade, 8.76320°N and 82.41383°W, 22.iv.2015, B. Armitage, 1 male.

Distribution: Mexico, Panama

Neotrichia unamas Botosaneanu

Material examined—**Bocas del Toro Province: Cuenca 093**, Quebrada Rambala, Rambala Jungle Lodge, 3.74 km SSE Rambala, 8.91627°N and 82.15469°W, 9.viii.2014, E. Carlson, 67 males; *ibid.*, 29.xi.2014, 58 males; *ibid.*, 31.iii–11.iv.2015 (Malaise trap), 5 males; *ibid.*, above main lodge, 28.iii.2016, 2 males; *ibid.*, afluyente Quebrada Rambala, 29.xi.2014, 1 male; *ibid.*, 22.i.2015, 1 male; *ibid.*, 28.iii.2016, 1 male; *ibid.*, above falls nr Rambala Jungle Lodge, 28.iii.2015, 32 males; **Chiriquí Province: Cuenca 108**, Río Caldera, Wilson Bridge, road to Lucero, S Boquete, 8.74228°N and 82.42160°W, 18.xi.2013, B. and T. Armitage, 15 males; *ibid.*, Quebrada Jaramillo, Jaramillo Centro

Rd. bridge, 8.754536°N and 82.418475°W, 20.iii.2015, 6 males; *ibid.*, 14.xii.2015, 14 males; *ibid.*, Collier Property at cascade, 8.76320°N and 82.41383°W, 13.xi.2014, 6 males; *ibid.*, 22.iv.2015, 1 male; *ibid.*, Collier Property upstream, 13.xi.2014, 6 males; *ibid.*, Alto Jaramillo Rd, 8.76625°N and 82.41341°W, 11.xi.2014, 3 males; *ibid.*, 10.ii.2015, 6 males; *ibid.*, 2.iii.2015, 4 males; *ibid.*, Río Caldera Boquete, Wilson Bridge, road to Lucero, 8.74228°N and 82.42160°W, 1,000 m asl, 18.xi.2013, B. and T. Armitage, 14 males; *ibid.*, afluyente Río La Cruz, Potrerillos Arriba, 8.70985°N and 82.47848°W, 925 m asl, 20.vi.2015, CoZEM, 1 male; *ibid.*, afluyente Río Majagua, nr Majagua; SW Ruta. 103, 8.66172°N and 82.53818°W, 837 m asl, 18.vi.2015, CoZEM, 1 male; *ibid.*, Río Brazo Prieto, Guayabal, 8.65630°N and 82.56153°W, 797m asl, 19.vi.2015, CoZEM, 4 males; *ibid.*, Río Chirigagua, SSE Guayabal, 8.64102°N and 82.55780°W, 737m asl, 19.vi.2015, CoZEM, 4 males.

Distribution: Panama, Tobago

Neotrichia xicana (Mosely)

Material examined—Chiriquí Province: Cuenca 108, Quebrada Jaramillo, Jaramillo Centro Rd, 8.754536°N and 82.418475°W, 20.iii.2015, 1 male; *ibid.*, 14.xii.2015, 2 males; *ibid.*, Río Caldera Boquete, Wilson Bridge, road to Lucero, 8.74228°N and 82.42160°W, 1,000 m asl, 18.xi.2013, B. and T. Armitage, 14 males; *ibid.*, Quebrada Asserio, at cafetal nr Boquete, 8.80105°N and 82.45608°W, 1348 m asl, 17.vi.2015, CoZEM, 2 males; *ibid.*, afluyente Río Platanal, W Majagua 8.65452°N and 82.54255°W, 825m, 18-vi-2015, CoZEM, 6 males; *ibid.*, Río Chirigagua, SSE Guayabal, 8.64102°N and 82.55780°W, 737m asl, 19.vi.2015, CoZEM, 19 males; *ibid.*, afluyente Río La Cruz, Potrerillos Arriba, 8.70985°N and 82.47848°W, 925 m asl, 20.vi.2015, CoZEM, 1 male; *ibid.*, Primer Brazo del Río David, Ruta 103; Potrerillos Arriba, 8.64414°N and 82.49408°W, 696 m asl, 21.vi.2015, CoZEM, 1 male.

Distribution: Mexico, Nicaragua, Panama

Ochrotrichia arranca (Mosely)

Material examined—Chiriquí Province: Cuenca 108, Quebrada Jaramillo, Alto Jaramillo Rd. bridge, 8.774627°N and 82.406993°W, 2.iii.2015, B. Armitage, 1 male.

Distribution: Costa Rica, Mexico, Panama

Ochrotrichia avis Bueno-Soria and Holzenthal

Material examined—Chiriquí Province: Cuenca 102, Quebrada Norte, Mount Totumas Cloud Forest and Biological Reserve, 8.87361°N and 82.69051°W, 26.iv-10.v.2015 (Malaise trap), J. Dietrich, 1 male.

Distribution: Costa Rica, Panama

Ochrotrichia moselyi Flint

Material examined—Chiriquí Province: Cuenca 102, Río Colorado, Mount Totumas Cloud Forest and Biological Reserve, 8.87356°N and 82.68999°W, J. Dietrich, 15.iv.2015, 1 male; *ibid.*, Quebrada Norte, Mount Totumas Cloud Forest and Biological Reserve, 8.87361°N and 82.69051°W,

26.iv-10.v.2015 (Malaise trap), B. Armitage, 1 male; **Chiriquí Province: Cuenca 108**, afluyente Río La Cruz, Potrerillos Arriba, 8.70985°N and 82.47848°W, 925 m asl, 20.vi.2015, CoZEM, 1 male.

Distribution: Costa Rica, Guatemala, Mexico, Panama

Ochrotrichia ramona Bueno-Soria and Holzenthal

Material examined—**Chiriquí Province: Cuenca 102**, Quebrada Norte, Mount Totumas Cloud Forest and Biological Reserve, 8.87361°N and 82.69051°W, 18-23.v.2015 (Malaise trap), J. Dietrich, 1 male; *ibid.*, afluyente Río Colorado, 8.884713°N and 82.68408°W, 7-13.xii.2015 (Malaise trap), 1 male.

Distribution: Costa Rica, Panama

Oxyethira (Oxytrichia) culebra Holzenthal and Harris

Material examined—**Bocas del Toro Province: Cuenca 093**, afluyente Quebrada Rambala, Rambala Jungle Lodge, 3.74 km SSE Rambala, 8.91543°N and 82.15527°W, 13.iii.2015, E. Carlson, 1 male.

Distribution: Costa Rica, Panama

Oxyethira (Loxotrichia) janella Denning

Chiriquí Province: Cuenca 108, Río Caldera Boquete, Wilson Bridge, road to Lucero, 8.74228°N and 82.42160°W, 1,000 m asl, 18.xi.2013, B. and T. Armitage, 4 males.

Distribution: Dominican Republic, Haiti, Panama, USA

Oxyethira (Loxotrichia) parazteca Kelley

Chiriquí Province: Cuenca 108, Quebrada Jaramillo, Collier property at cascade, 8.76320°N and 82.41383°W, 13.xi.2014, B. Armitage, 21 males; *ibid.*, Collier property, upstream, 8.76320°N and 82.41383°W, 13.xi.2014, 7 males; *ibid.*, Alto Jaramillo Rd. bridge, 8.774627°N and 82.40699°W, 2.iii.2015, 2 males; *ibid.*, Río Caldera Boquete, Wilson Bridge, road to Lucero, 8.74228°N and 82.42160°W, 1,000 m asl, 18.xi.2013, B. and T. Armitage, 1 male; *ibid.*, Río Brazo Prieto, Guayabal, 8.65630°N and 82.56153°W, 797m asl, 19.vi.2015, CoZEM, 1 male; *ibid.*, Río Chirigagua, SSE Guayabal, 8.64102°N and 82.55780°W, 737m asl, 19.vi.2015, CoZEM, 1 male.

Distribution: Ecuador, Panama

Oxyethira rareza Holzenthal and Harris

Chiriquí Province: Cuenca 108, Río Chirigagua, SSE Guayabal, 8.64102°N and 82.55780°W, 737m asl, 19.vi.2015, CoZEM, 1 male.

Distribution: Costa Rica, Panama

Family Hydrobiosidae*Atopsyche pachacamac* Schmid

Material examined—Chiriquí Province: **Cuenca 102**, Quebrada Norte, Mount Totumas Cloud Forest and Biological Reserve, 8.87361°N and 82.69051°W, 14.iv.2015, B. Armitage, 1 male.

Distribution: Costa Rica, Panama

Family Calomoceratidae*Phylloicus nigripennis* (Banks)

Material examined—Chiriquí Province: **Cuenca 108**, afluyente Río Majagua, nr Majagua; SW Ruta.103, 8.66172°N and 82.53818°W, 837 m asl, 18.vi.2015, CoZEM, 1 male.

Distribution: Costa Rica, Mexico, Nicaragua, Panama

Family Leptoceridae*Triaenodes nicaraguensis* Holzenthal and Andersen

Material examined—Chiriquí Province: **Cuenca 108**, Río Caldera, at Wilson Bridge on road to Lucero, 8.74228°N and 82.42160°W, 18.ix.2013, B. and T. Armitage, 1 male; *ibid.*, Quebrada Jaramillo, Collier Property at cascade, 8.76320°N and 82.41383°W, 22.iv.2015, 1 male; *ibid.*, Quebrada Asserio, at cafetal nr Boquete, 8.80105°N and 82.45608°W, 1348 m asl, 17.vi.2015, CoZEM, 1 male.

Distribution: Nicaragua, Panama

Family Anomalopsychidae*Contulma* n. sp.

Material examined—Chiriquí Province: **Cuenca 108**, Quebrada Honda, nr Fortuna Dam, 8.74985°N and 82.23885°W, 1132 m asl, 22.vi.2015, CoZEM, 1 male.

Distribution: Panama

Note: This new species, as yet undescribed, was not included in the 42 new country records recorded in this paper. Only the family and genus are recorded as new to Panama.

Discussion

Following the addition of 54 taxa in 2015 to Panama's list of caddisflies, it was not expected that so many more would be added so soon. Additionally, we have more than 24 new species to science that will be added to this list in separate, forthcoming publications. The diversity of caddisflies in Panama, at this point in time, appears unlimited. Costa Rica and Mexico, each with 500+ species known, are, of course, potential reasons to expect that Panama's numbers will increase. However, as evidenced in this paper, we are also starting to see more taxa

that were previously known only from South America and the Caribbean Islands. Indeed, the Caribbean side of Panama is poorly collected, as is Darién Province, adjacent to Colombia. We suggest more thorough collecting in those regions, as well as other areas, will significantly add to the caddisfly fauna of Panama in the near future.

Acknowledgments

We are grateful to Aydeé Cornejo and the field staff of CoZEM (Carlos Nieto, Milexi Molinar, and Anyi Tuñón) at the Gorgas Institute for collecting some of the material presented herein, to the Ministry of Economy and Finance, through which is funded the DICONASPA and Rural Productivity Project / Consolidation of the Mesoamerican Biological Corridor of the Panamanian Atlantic, and to the Ministry of Environment. We express our appreciation to Dr. Oliver S. Flint, Jr. of the Smithsonian Institution and Dr. R. W. Flowers of Florida A&M University, for making material available to us; and, to Jeffrey Dietrich of Mount Totumas Cloud Forest and Biological Reserve and Eric Carlson of Rambala Jungle Lodge for collecting and for facilitating our research. We thank an anonymous reviewer and MSc. Aydeé Cornejo for reviewing this manuscript.

Literature Cited

- Aguila, Y. 1992.** Systematic catalogue of the caddisflies of Panamá (Trichoptera). p. 532-548. *In*: D. Quintero and A. Aiello (eds.). *Insects of Panamá and Mesoamerica: Selected Studies*. Oxford University Press; Oxford, England. 714 p.
- Armitage, B. J., and A. Cornejo. 2015.** Orden Trichoptera (Insecta) en Panamá: Listas de especies y su distribución por cuencas y unidades administrativas. *Puente Biológica* 7: 175-199.
- Armitage, B. J., S. C. Harris, T. I. Arefina-Armitage, and A. Cornejo. 2015a.** The Trichoptera of Panama. III. Updated species list for caddisflies (Insecta: Trichoptera) in the Republic of Panama. *Insecta Mundi* 0442: 1-16.
- Armitage, B. J., S. C. Harris, and R. W. Holzenthal. 2015b.** The Trichoptera of Panama. I. New records for caddisflies (Insecta: Trichoptera) from the Republic of Panama. *Insecta Mundi* 0435: 1-10.
- Bueno-Soria, J., and R. Barba-Alvarez. 2015.** New species of *Plectropsyche* Ross 1947 (Trichoptera: Hydropsychidae: Hydropsychinae). *Zootaxa* 4040(4): 421-432.
- Calor, A. R., and R. Mariano. 2012.** UV light pan traps for collecting aquatic insects. *EntomoBrasilis* 5: 164-166.
- Harris, S. C., and B. J. Armitage. 2015.** The Trichoptera of Panama. II. Ten new species of microcaddisflies (Trichoptera: Hydroptilidae). *Insecta Mundi* 0437: 1-17.
- Holzenthal, R. W., R. E. Thompson, and B. Ríos-Touma. 2015.** Order Trichoptera. p. 965-1002. *In*: J. Thorp and D.C. Rogers (eds.). *Ecology and General Biology: Thorp and Covich's Freshwater Invertebrates*. Volume I. Fourth Edition. Academic Press; New York, NY. 1148 p.
- Muñoz-Quesada, F., and R. W. Holzenthal. 2015.** Revision of the Neotropical species of the caddisfly genus *Wormaldia* McLachlan (Trichoptera: Philopotamidae). *Zootaxa* 3998: 1-138.

Received October 19, 2016; Accepted October 24, 2016.

Review Editor Andrew K. Rasmussen.

