

*This contribution is published  
to honor Dr. Amnon Freidberg,  
a scientist, a colleague and a friend,  
on the occasion of his 75<sup>th</sup> birthday.*

## **New species and distribution records of *Alujamyia* Norrbom and *Molynocoelia* Giglio-Tos (Diptera: Tephritidae)**

ALLEN L. NORRBOM<sup>1</sup>, GARY J. STECK<sup>2</sup>, ERICK J. RODRIGUEZ<sup>3</sup>, BRUCE D. SUTTON<sup>4</sup>,  
NORMA NOLAZCO<sup>5</sup>, CLIFFORD KEIL<sup>6</sup>, ANABEL PADILLA<sup>6</sup> &  
PEDRO ALEXANDER RODRIGUEZ CLAVIJO<sup>7</sup>

<sup>1</sup>*Systematic Entomology Laboratory, USDA, ARS, c/o National Museum of Natural History,  
P. O. Box 37012, Washington, DC 20013-7012, USA. E-mail: allen.norrbom@usda.gov*

<sup>2</sup>*Division of Plant Industry, Florida Department of Agriculture and Consumer Services,  
Gainesville, Florida, USA*

<sup>3</sup>*Department of Entomology and Nematology, University of Florida, Gainesville, Florida, USA*

<sup>4</sup>*Research Associate, Department of Entomology, Smithsonian Institution, Washington, DC, USA*

<sup>5</sup>*Servicio Nacional de Sanidad Agraria (SENASA), Lima, Peru*

<sup>6</sup>*Museum of Zoology-Invertebrates, School of Biological Sciences,  
Pontificia Universidad Católica del Ecuador, Quito, Ecuador*

<sup>7</sup>*Instituto Colombiano Agropecuario (ICA), Tibaitatá, Colombia*

### **ABSTRACT**

*Alujamyia octopuncta* Norrbom, n. sp. from Costa Rica and *Molynocoelia carmenae* Norrbom, n. sp. from Amazonian Ecuador (Orellana) and Peru (Cusco), are described and illustrated. New distribution records are reported for *Alujamyia bella* Norrbom (Costa Rica) and *Molynocoelia erwini* Norrbom (Peru: Madre de Dios), *M. lutea* Giglio-Tos (Colombia: Antioquia, Caldas, and Cundinamarca), and *M. plumosa* Norrbom (Peru: Loreto). A revised key to species of *Alujamyia* and an addendum to the key to species of *Molynocoelia* are provided.

**KEYWORDS:** Tephritidae, fruit flies, biodiversity, taxonomy, Neotropical Region, identification key.

### **RESUMEN**

Nuevas especies *Alujamyia octopuncta* Norrbom de Costa Rica y *Molynocoelia carmenae* Norrbom de la Amazonia de Ecuador (Orellana) y Perú (Cusco), son descritas e ilustradas. Nuevos registros de distribución son reportados para *Alujamyia bella* Norrbom (Costa Rica) y *Molynocoelia erwini* Norrbom (Perú: Madre de Dios), *M. lutea* Giglio-Tos (Colombia: Antioquia, Caldas y Cundinamarca) y *M. plumosa* Norrbom (Perú: Loreto). Se proporciona una clave revisada para las especies de *Alujamyia* y una adición a la clave para las especies de *Molynocoelia*.

**PALABRAS CLAVE:** Tephritidae, moscas de la fruta, biodiversidad, taxonomía, Región Neotropical, clave de identificación.

## INTRODUCTION

*Alujamyia* Norrbom and *Molynocoelia* Giglio-Tos are endemic Neotropical genera of fruit flies (Diptera: Tephritidae). They were revised by Norrbom (2006), in the proceedings of the First Tephritidologist Meeting, organized by Amnon Freidberg in Israel in 2000. The meeting was a superb combination of scientific presentations, field collecting, and visits to the varied biological and historical sites of Israel and the Palestinian Territories (West Bank), and it is fondly remembered by all of us who participated. This paper, in which additional new species of *Alujamyia* and *Molynocoelia* are described, is dedicated to Amnon in recognition of his role in that meeting as well as his numerous contributions to our knowledge of the Tephritoidea.

Only one species of *Molynocoelia* and none of *Alujamyia* were known prior to the revision by Norrbom (2006), who proposed the latter genus for four species new to science, and also described three new species in *Molynocoelia*, in addition to redescribing *M. lutea* Giglio-Tos. Norrbom (2011) described one additional species of *Molynocoelia*. Currently there are four known species of *Alujamyia* and five species of *Molynocoelia*. Norrbom (2006) considered *Alujamyia* and *Molynocoelia* to be closely related to *Pseudophorellia* Lima and recognized these taxa as the *Molynocoelia* group. Specimens of all three genera are rare in collections and most are associated with primary forests. Two additional species and more specimens of several previously described species have been examined in the former INBio collection from Costa Rica, the ICA collection in Colombia, or new samples obtained through our USDA Farm Bill projects (see Acknowledgements). The new species are described here and the new records for the other species are reported.

## MATERIALS AND METHODS

Morphological terminology follows White *et al.* (1999), except for the wing venation, which follows that of Cumming and Wood (2017). The names for the bands of the wing pattern are also shown in Norrbom (2006, figs 14, 18, 39, 71). The illustrations are digital photographs taken with a Visionary Digital system, enhanced using Photoshop CS2 to adjust the color and make minor corrections (e.g., remove debris, add missing setae). The habitus illustration of *M. carmenae* (Fig. 6) is a composite of images with each major body part (head, thorax, abdomen, legs and wings) positioned in dorsal view.

Acronyms for the collections in which specimens are deposited are: FSCA – Florida State Collection of Arthropods, Gainesville, USA; ICAT – Instituto Colombiano Agropecuario, Mosquera, Tibaitatá, Colombia; MHNJP – Museo de Historia Natural Javier Prado, Universidad Nacional Mayor de San Marcos, Lima, Peru; MNCR – Museo Nacional de Costa Rica, San José, Costa Rica (includes former Instituto Nacional de Biodiversidad de Costa Rica (INBio) collection); QCAZ – Museum of Zoology-Invertebrates, Pontificia Universidad Católica del Ecuador, Quito, Ecuador; USNM – National Museum of Natural History, Smithsonian Institution, Washington, DC, USA.

## TAXONOMY

Genus *Alujamyia* Norrbom, 2006

*Alujamyia* Norrbom, 2006: 37.

**Type species:** *A. sexvittata* Norrbom, 2006, by original designation.

**Comments:** Norrbom (2006) recognized four species of *Alujamyia*, known from Mexico, Guatemala and the Greater Antilles. Two species, *A. bella* Norrbom and a new species, occur in previously unreported material from Costa Rica, thus extending the known range of the genus. The following key to species is modified from Norrbom (2006) to incorporate the new species.

Key to the species of *Alujamyia*

- 1 Wing (Norrbom 2006, figs 14–16) with subcostal band from pterostigma to base of cell  $m_4$ ; distal margin of discal band arising at or close to apex of pterostigma; subapical band slightly oblique, more or less parallel to crossvein  $dm-m$ , anteriorly more distal than posteriorly, connected anteriorly to complete anterior and posterior apical bands; setae dark brown to black (Greater Antilles) ..... 2
- Wing (Figs 7, 8; Norrbom 2006, figs 12, 13, 17, 18) without subcostal band; discal band more proximal, its distal margin arising closer to base of pterostigma; subapical band curving anterobasally or more or less aligned anteriorly and posteriorly, sometimes separated from anterior apical band; posterior apical band often absent or incomplete; setae orange to orange brown (Mexico, Guatemala, Costa Rica) ..... 3
- 2 Anterior apical and posterior apical bands not connected posteriorly, hyaline area between them reaching posterior wing margin (Norrbom 2006, fig. 14); scutellum with pair of dark brown lateral marks not extending beyond midlength, and pair of separate, weaker spots on disk near midlength (Norrbom 2006, fig. 29); scutum with 0–2 pairs of pale to moderate brown vittae (Cuba, Jamaica) ..... *farri* Norrbom
- Anterior apical and posterior apical bands connected posteriorly, hyaline spot or spots between them isolated from posterior wing margin (Norrbom 2006, figs 15, 16); scutellum with 2 large dark brown lateral marks, covering at least basal 0.75 of side and lateral third of disk (Norrbom 2006, figs 6, 10); scutum with 2 pairs of dark brown vittae (Hispaniola, Puerto Rico) ..... *isolata* Norrbom
- 3 Wing with subbasal, discal and subapical bands narrow, subbasal band yellow and often difficult to observe, discal band not covering crossvein  $bm-m$  (Fig. 7; Norrbom 2006, figs 12, 13); posterior apical band, if present, not connected to subapical band; scutellum sparsely setulose on margins; scutum with 0–1 pair of dark brown vittae (Norrbom 2006, fig. 5) (Mexico: Colima, Guerrero, Veracruz; Costa Rica) ..... *bella* Norrbom
- Wing with subbasal, discal and subapical bands broad, subbasal band mostly brown, discal band covering much or all of crossvein  $bm-m$  (Fig. 8; Norrbom 2006, figs 17, 18); scutellum without setulae; scutal marking variable ..... 4

- 4 Scutum (Norrbon 2006, figs 7, 8) with 3 pairs of dark brown vittae or spots; scutellum with brown basal markings laterally and dorsally; wing with anterior apical band reduced to apical spot, not connected to subapical band anteriorly (Norrbon 2006, figs 17, 18); posterior apical band broadly connected anteriorly to subapical band, short, posteriorly not extended to vein  $M_4$  (Guatemala, Mexico: Guerrero, Quintana Roo) ..... *sexvittata* Norrbom
- Scutum (Fig. 5) without brown markings; scutellum (Figs 3, 4) with brown basal mark only laterally; wing with anterior apical band complete, connected to subapical band anteriorly (Fig. 8); posterior apical band very narrowly connected to subapical band along vein  $R_{4+5}$ , extended from vein  $R_{4+5}$  to posterior wing margin or interrupted in cell  $r_{4+5}$  (Costa Rica)..... *octopuncta* Norrbom, n. sp.

*Alujamyia bella* Norrbom, 2006

(Fig. 7)

*Alujamyia bella* Norrbom, 2006: 43 (holotype ♂ (Instituto de Ecología, Xalapa, Mexico), Mexico: Veracruz: Teocelo, Llano Grande, 840 m).

**Material examined:** **Costa Rica:** Guanacaste: 1 ♀ Bagaces, Parque Nacional Palo Verde, Sector Catalina, Fila Catalina, LN 257400 400000, 250 m, Malaise trap, 11.x–9.xi.1999, I. Jiménez (USNM INBioCRI0003307980); 3 adults, same data but 8.ii–8.iii.2000 (MNCR INBioCRI0003308186, INBioCRI0003308187, INBioCRI0003308189); 3 adults, same data but 9.iii–6.iv.2000 (2 adults MNCR INBioCRI0003420354, INBioCRI0003420356; 1 ♀ USNM INBioCRI0003420357); 14 adults, Parque Nacional Palo Verde, Cerro Guayacán, LN 259350 389600 [10.352318°N 85.341398°W], 212 m, Malaise trap, 10.iii–6.iv.2000, I. Jiménez (13 adults MNCR INBioCRI0003308323, INBioCRI0003308324, INBioCRI0003308326, INBioCRI0003308327, INBioCRI0003308328, INBioCRI0003308329, INBioCRI0003308330, INBioCRI0003308331, INBioCRI0003308332, INBioCRI0003308333, INBioCRI0003308334, INBioCRI0003308335, INBioCRI0003308336; 1 ♂ USNM INBioCRI0003308325); 5 adults, Cerro Guayacán, 10.355903°N 85.351454°W, 195 m, Malaise trap, 5.v–5.vi.1999, I. Jiménez (MNCR INBioCRI0003307418, INBioCRI0003307421, INBioCRI0003307425, INBioCRI0003307428, INBioCRI0003307431).

**Distribution:** This species was described from Mexico (Colima, Veracruz; possibly Guerrero). The above records from Costa Rica significantly extend its known range.

**Comments:** The presence of the posterior apical band varies in the Costa Rican specimens. The gender was not recorded for the specimens from Costa Rica in the MNCR (former INBio) collection.

*Alujamyia octopuncta* Norrbom, n. sp.

(Figs 1–5, 8)

**LSID:** urn:lsid:zoobank.org:act:14315F28-874D-4B30-BB5A-954816F6E5D7.

**Etymology:** The name of this species is a noun in apposition, in reference to the four pairs of brown spots present on the scutellum and abdomen.

**Diagnosis:** This species differs from all other species of *Alujamyia* in having the scutellum dorsally and the notopleuron microtrichose, and the wing with the posterior apical band present only from vein  $R_{4+5}$  to the posterior wing margin. It



**Figs 1–5:** *Alujamyia octopuncta*: (1) female holotype, Costa Rica, Cerro Puma (INBioCRI0003826274), habitus, left lateral; (2) same, head, lateral; (3) female paratype, Costa Rica, Cerro Puma (INBioCRI0003780172), habitus, right lateral; (4) same, abdomen, dorsal; (5) same, thorax, dorsal.

differs from the other species except *A. sexvittata* Norrbom in having a complete subbasal band, and from the other species except for some specimens of *A. farri* Norrbom in lacking brown markings on the scutum. It differs from the Antillean species (*A. farri* and *A. isolata* Norrbom) in lacking a subcostal band and in having orange brown setae, and from the other Mesoamerican species (*A. bella* Norrbom and *A. sexvittata*) in having a complete anterior apical band connected anteriorly to the subapical band.

**Description:** Body length 5.0–6.0 mm. Mesonotum length 2.5–2.7 mm. Wing length 5.3–5.7 mm. Setae orange brown.

*Head* (Fig. 2). Antenna yellow except most of arista brown; first flagellomere moderately long, 2.25–2.40× as long as wide, reaching or almost reaching ventral facial margin.

*Thorax.* Mesonotum (Fig. 5) mostly orange. Scutum orange except for white areas (poorly differentiated), at least paired lateral postsutural white vittae present, without brown markings. Scutellum white except for paired circular dark brown spot on base laterally, extending dorsally only to basal scutellar seta. Pleuron (Figs 1, 3) orange except for white areas. Mediotergite entirely orange. Scutum nonmicrotrichose except postsutural margin lateral to supra-alar seta; notopleuron microtrichose except dorsal margin; scutellum nonsetulose, entirely microtrichose dorsally, microtrichose only on distal half laterally.

*Legs.* Entirely orange.

*Wing* (Fig. 8). With 5 bands: subbasal band extended to base of vein CuA+CuP, orange except posterior margin narrowly brown in cells c and br; discal band orange with brown margins, relatively broad, its proximal margin covering crossvein bm–m, its distal margin covering basal half of pterostigma, but band narrow and entirely brown in cell m<sub>4</sub>; subapical band orange with brown margins, entirely brown posterior to middle of cell dm, broad, covering crossveins r–m and dm–m, with proximal and distal margins convex, not parallel to crossvein dm–m, its proximal margin without sharp bends; anterior apical band complete, connected to subapical band, mostly brown but partially orange in cells r<sub>1</sub> and r<sub>2+3</sub>; posterior apical band narrow, extended from vein R<sub>4+5</sub> to posterior wing margin or interrupted in cell r<sub>4+5</sub>, very narrowly connected to subapical band along vein R<sub>4+5</sub>.

*Abdomen* (Fig. 4). Tergites 3, 4 and 5 each with pair of sublateral dark brown spots, 2–3× as broad as long on tergites 3 and 4, circular on tergite 5.

*Female terminalia.* Oviscape orange, 1.3–1.4 mm long. Aculeus gradually tapered to long, acute tip.

**Holotype:** ♀ (MNCR INBioCRI0003826274) **Costa Rica:** Puntarenas: P. N. Corcovado, Sector La Leona, Cerro Puma, LS 267700 518900, 100–300 m, Malaise trap #2, 19.vi–8.vii.2003, M. Moraga, A. Azofeifa & K. Caballero.

**Paratype:** **Costa Rica:** 1 ♀ same data as holotype except Malaise trap #7, 16.ix–6.x.2003, K. Caballero (USNM INBioCRI0003780172).

**Distribution:** This species is known only from Costa Rica.

**Biology:** The host plants and biology of this species are unknown.

**Comments:** Within *Alujamyia*, the new species appears to be more closely related to the other Mesoamerican species, *A. bella* and *A. sexvittata*. They share the following synapomorphies (character numbers following Norrbom (2006)): 40.2 (subbasal band present from crossvein h to apex of cell cua), 44 (discal band shifted basally, touching crossvein bm–m), 47 (discal and subapical bands mostly orange with brown margins), 49 (subapical band not parallel to crossvein dm–m, anteriorly curved or angled more proximally), and 53.4 (abdomen yellow, with paired sublateral brown spots on tergites 3–5, female tergite 6 yellow). The presence of the distal part of the posterior apical wing band (52.1), the plesiomorphic state, suggests that *A. octopuncta* may be the sister group to the other two species, in which this band is reduced. The isolated anterior apical band may be another synapomorphy for *A. bella* + *A. sexvittata*. It is complete and connected to the subapical band in *A. octopuncta*.

#### Genus *Molynocoelia* Giglio-Tos, 1893

*Molynocoelia* Giglio-Tos, 1893: 11; Norrbom 2006: 50 (revision, additional references).

**Type species:** *Molynocoelia lutea* Giglio-Tos, 1893, by monotypy.

**Comments:** Norrbom (2006) recognized four species of *Molynocoelia* (*M. lutea* Giglio-Tos from Mexico to Costa Rica; *M. grossa* Norrbom and *M. separata* Norrbom from Costa Rica; and *M. plumosa* from Brazil (Amapá)), and Norrbom (2011) described a fifth species, *M. erwini*, from Amazonian Ecuador. The new species described below is from Amazonian Ecuador and Peru, and new records extend the known ranges of both *M. erwini* and *M. plumosa* to Amazonian Peru, and that of *M. lutea* to Colombia. The addendum below to the key to species of Norrbom (2006) includes the new species as well as *M. erwini*.

**Diagnosis:** *Molynocoelia* differs from other New World genera of Tephritidae by the following combination of characters: Arista plumose, hairs at least half as long as width of first flagellomere; thorax mostly bare of microtrichia; 2 frontal, ocellar, postocellar, and acrostichal setae present; medial scapular seta absent; scutellum with 2 (apical and basal) marginal setae, flat, entirely yellow or with basal margin of disc and base of lateral margin brown, setulose on margins and sometimes laterally on disk but always with broad medial bare area; wing with single large brown area covering distal half, or banded, with short radial-medial band often connected to discal band to form Y-shaped mark; and vein Cu not setulose.

#### Addendum to key to the species of *Molynocoelia*

A Wing with 5–6 transverse bands (Figs 9–12; Norrbom 2006, figs 37–41); scutum with various brown markings, but without submedial brown vittae except in *M. carmenae* (Fig. 6; Norrbom 2006, figs 30–32, 35); posterior margin of scutum and base of scutellum yellow, at least medially; male fore- and midfemora without ventral row of spinelike setae..... B

- Wing with single large brown area covering distal half (Norrbom 2011, figs 1, 2); scutum with pair of submedial brown vittae (Norrbom 2011, fig. 1); posterior margin of scutum and base of scutellum with brown band; male fore- and midfemora with ventral row of spinelike setae (Ecuador, Peru).....  
..... *erwini* Norrbom
- B. Scutum with at most 1 pair of postsutural brown spots or vittae (Norrbom 2006, figs 30–32, 35); wing with subapical band (that covering crossvein dm–m) connected anteriorly to anterior apical band (Norrbom 2006, figs 37–41); crossvein r–m covered by narrow brown rm band well separated from discal band in cells  $r_1$  and  $r_{2+3}$  or if by discal band (*M. separata*), discal band interrupted in cell  $m_4$  .....continue with couplet 1 of Norrbom (2006)
- Scutum with 2 pairs of narrow postsutural brown vittae (Fig. 6); wing with subapical band not connected anteriorly to anterior apical band, but connected to posterior apical band (Figs 9–11); crossvein r–m covered by narrow brown rm band very narrowly separated from discal band in cells  $r_1$  and  $r_{2+3}$  or by very broad band (fused discal and rm bands); discal band uninterrupted (Ecuador, Peru) ..... *M. carmenae* Norrbom, n. sp.

***Molynocoelia carmenae*** Norrbom, n. sp.

(Figs 6, 9–11)

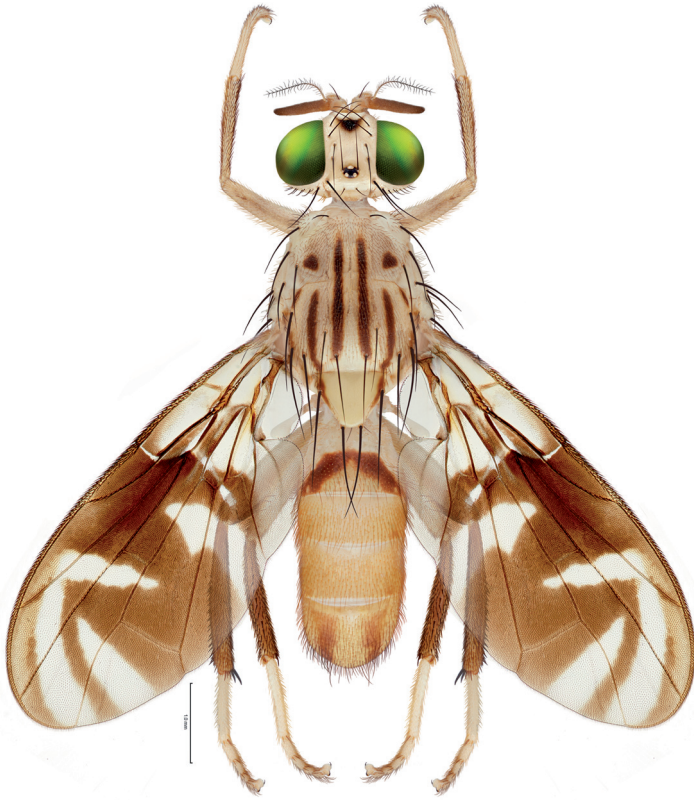
**LSID:** urn:lsid:zoobank.org:act:A9E72BD2-CADA-4D55-8E19-C8ADBC946DAA.

**Etymology:** The name of this species is derived from its type locality.

**Diagnosis:** This species differs from all other species of *Molynocoelia* by the following combination of characters: Scutum with 2 pairs of postsutural brown vittae, but no brown band on the posterior margin; wing with subapical band (covering crossvein dm–m) connected to posterior apical band, but not connected anteriorly to anterior apical band; crossvein r–m covered by narrow brown band very narrowly separated from discal band in cells  $r_1$  and  $r_{2+3}$  or by very broad band (fused discal and rm bands).

**Description:** Body length 6.0–7.5 mm. Mesonotum length 2.8–2.9 mm. Wing length 6.0–6.4 mm. Setae dark brown to black.

*Head* (Fig. 6). Yellow except brown ocellar tubercle, large medial brown spot or semicircular mark anteriorly on frons, sometimes small brown mark midway between ocellar tubercle and eye margin (Ecuador paratypes) or on orbital plate (holotype), and weak brown spot on gena bordering eye. Facial carina entirely finely microtrichose. Parafacial mostly nonmicrotrichose, 0.53–0.60 width of first flagellomere. Postocular setae moderately large, distinct, occiput without setulae near postoculars. Antenna yellow except dorsal margin to dorsal half and apex of first flagellomere and most of arista brown; first flagellomere long, 4.8–5.1× as long as wide, exceeding ventral facial margin; arista long plumose, longest hairs 0.75–1.00× as long as basal width of first flagellomere.



**Fig. 6:** *Molynocoelia carmenae*, male paratype, Peru, Villa Carmen (USNMENT01354468).

*Thorax* (Fig. 6). Scutum with small dark brown spot anteromesal to presutural supra-alar seta; with 2 pairs of narrow brown vittae, submedial pair extended from at least slightly anterior to transverse suture to acrostichal setae, sublateral pair between levels of dorsocentral and intra-alar setae, extended from slightly posterior to transverse suture to posterior margin, except in holotype extending on lateral margin of scutellum to at least basal scutellar seta; except in holotype with short, narrow brown vitta or spot between transverse suture and postsutural supra-alar seta. Mediotergite with or without lateral brown vitta. Dorsocentral seta aligned about midway between postsutural supra-alar and intra-alar setae or slightly closer to former. Anepisternum with 2 well developed setae. Katepisternal and anepimeral setae well developed. Anatergite entirely microtrichose; katatergite microtrichose on posterior half; scutum nonmicrotrichose except narrow postsutural lateral margin (lateral to postsutural supra-alar seta); scutellum entirely nonmicrotrichose.

*Legs.* Mostly orange; tibiae pale to dark brown. Fore femur with ventral setae weak, orange.

*Wing* (Figs 9–11). With 5–6 bands: subbasal band extended to base of vein CuA+CuP, sometimes almost reaching its apex, entirely brown; discal band extended from pterostigma to posterior margin distally in cell  $m_{4+5}$ , entirely brown; radial-medial band very narrowly separated from discal band (Fig. 9) or fused with discal band (Figs 10, 11); subapical band broad, expanding posteriorly, broadly connected to discal band on posterior margin and in cell dm (hyaline area between them ending in cell  $r_{4+5}$  or cell dm), connected anteriorly to posterior apical band, but separated from anterior apical band, entirely brown; anterior apical band narrowly separated from or connected to rm band (or fused rm and discal bands), relatively narrow, partially to mostly orange; posterior apical band relatively narrow, entirely brown. Cell bc, base of cell c, and base of cell br subhyaline to pale brown; cell c with anterior and distal margins pale to moderate brown, with large posterior hyaline area. Cells bm and cua except posterior margins, and alula and anal lobe hyaline.

*Abdomen*. Yellow except syntergite 1+2 with brown markings (inverted V-shaped mark in Peruvian paratype (Fig. 6) and one Ecuadorian paratype, paired submedial posterior marks in holotype as if apex of V missing, or with 4 small paler brown marks in 1 Ecuadorian paratype, if connected would form margin of inverted V); also with pair of short paler brown submedial vittae on male tergite 5 and female tergites 5 and 6.

*Female terminalia*. Oviscape brown dorsally, orange or brown ventrally, 0.8 mm long.

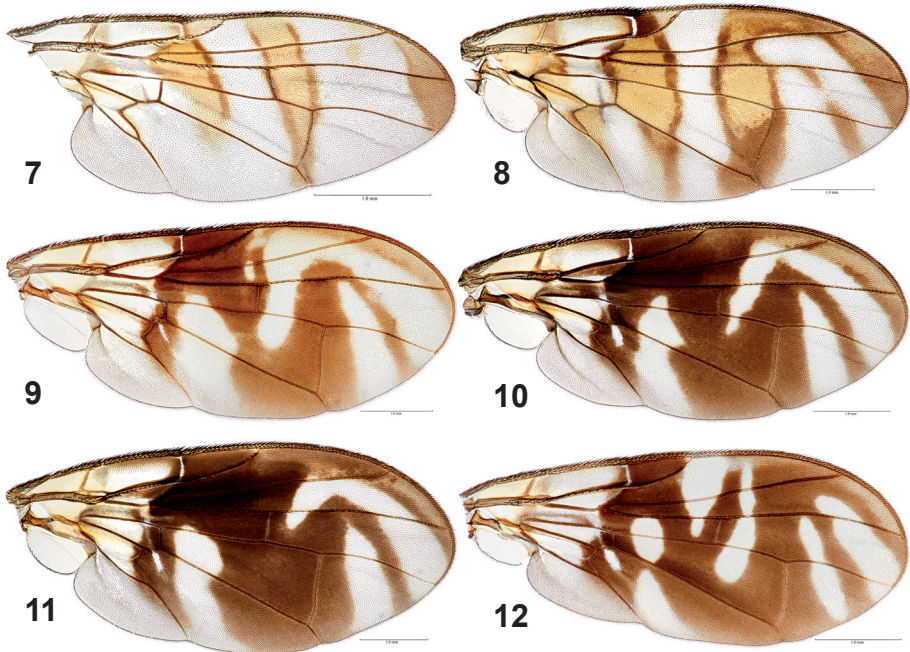
**Holotype:** ♂ (MHNJP USNMENT01354468) **Peru:** Cusco: Estación Biológica Villa Carmen, trail 5, 12.89342°S 71.41900°W, 577 m, trap VC-ML-30, 27.viii–16.ix.2013, M. Macedo.

**Paratypes:** **Ecuador:** Orellana: 1♀ Estación Científica Yasuní, trail 4 Peru, on narrow ridge, 0.67654°S 76.39203°W, 257 m, trap ECY-ML-43 on *Matisia malacocalyx* tree, 21–27.ix.2017, A. Padilla (QCAZ USNMENT01354469); 1♀ same, trail 2 Chorongó, 400 m from main road, 0.67679°S 76.4076°W, 241 m, trap ECY-ML-23, 11–17.x.2018, A. Padilla (USNM USNMENT01354593). **Peru:** Cusco: 1♂ Estación Biológica Villa Carmen, trail 5, 12.89056°S 71.42075°W, 570 m, trap VC-ML-41, 22–24.iii.2014, E.J. Rodriguez (USNM USNMENT01354466).

**Distribution:** This species is known only from Amazonian Ecuador and Peru. The elevation of collection localities ranges from 241–577 m.

**Biology:** The host plants and biology of this species are unknown.

**Comments:** This species is perhaps most closely related to *M. plumosa* Norrbom and *M. erwini* Norrbom. These species have the arista long plumose, although not as long in *M. carmenae* as in the other two species (apomorphic), scutum with post-sutural lateral margin narrowly microtrichose (plesiomorphic), dorsocentral seta aligned with or slightly anterior or posterior to intra-alar seta (plesiomorphic), the discal and subapical bands broadly connected posteriorly, at least in *M. plumosa* (polarity uncertain; *M. erwini* has a highly derived wing pattern), and a V-shaped mark at least sometimes present on syntergite 1+2 (apomorphic). Both *M. carmenae* and *M. erwini* have an anteromedial brown spot on the frons (apomorphic), which would support their closer relationship to the other species of *Molynocoelia*, unless the absence of the spot in *M. plumosa* is due to reversal.



**Figs 7–12:** Wings: (7) *Alujamyia bella*, Costa Rica, Cerro Puma (INBioCRI0003780172); (8) *Alujamyia octopuncta*, female paratype, Costa Rica, Cerro Puma (INBioCRI0003780172); (9–11) *Molynocoelia carmenae*: (9) male holotype, Peru, Villa Carmen (USNMENT01354468), (10) male paratype, Peru, Villa Carmen (USNMENT01354466), (11) female paratype, Ecuador, Yasuní (USNMENT01354469); (12) *Molynocoelia plumosa*, Peru, ExplorNapo (USNMENT01354489).

### *Molynocoelia erwini* Norrbom, 2011

*Molynocoelia erwini* Norrbom, 2011: 493 (holotype ♂ (Escuela Politécnica Nacional, Quito, Ecuador), Ecuador: Orellana: Reserva Etnica Waorani, Onkone Gare Camp, Transect 4, 0°39'25.7"S 76°27'10.8"W, 216.3 m).

**Material examined:** **Ecuador:** Orellana: 1♀ Estación Científica Yasuní, edge of 50 Ha parcel, West trail, near tree mark T8-225m, 0.68155°S 76.40434°W, 261 m, trap ECY-ML-06, 11–17.viii.2017, A. Padilla (QCAZ USNMENT01354476); 1♀ same, trail 4 Peru, 0.67755°S 76.39322°W, trap ECY-ML-42, 11–17.i.2018, A. Padilla (USNM USNMENT01354595); 1♂ Reserva Etnica Waorani, Tiputini Biodiversity Station, 0.63194°S 76.14417°W, 220–250 m, insecticidal fogging, 1.x.1999, T.L. Erwin *et al.*, Lot 2169 (USNM MEPN3963). **Peru:** Madre de Dios: 1♂ Centro de Investigación y Capacitación Río Los Amigos (CICRA), Trail #2, at edge of steep drop, 12.56309°S 70.10545°W, 276 m, trap LA-ML-08, 29.xi–5.xii.2013, J. Caballero (USNM USNMENT01354479); 1♀ same, Trail #22, 12.56227°S 70.1006°W, 290 m, trap LA-ML-14, 3–9.xi.2014 (USNM USNMENT01354478); 1♂ same, Trail #19, near *Annona* tree, 12.56738°S 70.09752°W, 278 m, trap LA-ML-17, 8–14.xii.2013 (USNM USNMENT01354477); 1♀ same, Trail #25, near tree 25–425, 12.56362°S 70.09110°W, 272 m, trap LA-ML-22, 27.xi–2.xii.2013 (USNM USNMENT00895871); 1♀ same, Trail #36, near tree 36–25, 12.55427°S 70.11172°W, 292 m, trap LA-ML-37, 13–19.xii.2013 (MHNJP); 1♂ same, Trail #15, near tree 15–303, 12.56932°S 70.09700°W, 246 m, trap LA-ML-39, 9–15.xii.2013 (MHNJP).

**Distribution:** This species was described from and previously known only from Ecuador (Orellana). The examined specimens from Peru (Madre de Dios) are the

first recorded for that country. The elevation of collection localities ranges from 216–292 m.

**Comments:** The additional specimens vary slightly from the holotype. The brown markings on the vertex sometimes comprise two spots that are separated from the ocellar tubercle, rather than forming a U-shaped mark. The postsutural lateral brown vitta on the scutum is sometimes interrupted or incomplete, ending at the postsutural supra-alar seta. On the female forefemur the ventral row of setae are not stout or spinelike, and the female midfemur lacks the posteroventral row of small, stout, spinelike setae. These characters are sexually dimorphic.

### *Molynocoelia lutea* Giglio-Tos, 1893

*Molynocoelia lutea* Giglio-Tos, 1893: 11 (holotype ♂ (Istituto e Museo di Zoologia, Turin), Mexico: Veracruz: Tuxpango [18°49'N 97°01'W]); Norrbom 2006: 57.

**Material examined:** **Colombia:** Antioquia: 1♀ Santa Bárbara, Finca El Guayabo, 5.8732°N 75.2290°W, 1500 m, trampa McPhail 82, 18.iv.2015, ICA (USNM USNMENT00875364). Caldas: 2♂ Belalcazar, Hacienda Beltran, 4.5949°N 75.4904°W, 1448 m, trampa McPhail 76, 11.i.2012, ICA (ICAT ICAMF00000369, USNM USNMENT00875365); 1♂ 1♀ Victoria, 5.3130°N 74.9588°W, 1136 m, trampa McPhail 08, 11.i.2012, ICA (FSCA); Cundinamarca: 1♀ Tena, Vereda El Rosario 4.6682°N 74.4030°W, 1586 m, McPhail trap 2, 15.viii.2014, ICA (ICAT ICAMF00000370). **Guatemala:** Suchitepéquez: 1♀ Patulul, Finca Vesuvio, 1450 m, 11.ii.2007, Monzón & Camposeco (USNM USNMENT01354548); 1♂ Santa Barbara, Finca Panama, Periauera, 14.53233°N 91.19761°W, 1127 m, i.2008, J.P. Pérez, F. Camposeco & J. Monzón (USNM USNMENT01354549).

**Distribution:** This species was previously known from Mexico (Chiapas, Veracruz), Guatemala, and Costa Rica (Norrbom 2006). The examined specimens from Colombia (Antioquia, Caldas and Cundinamarca) are the first recorded for that country. The Colombian localities are in the Cordillera Central and Cordillera Oriental, between 1136 and 1586 m altitude.

### *Molynocoelia plumosa* Norrbom, 2006

(Fig. 12)

*Molynocoelia plumosa* Norrbom, 2006: 60 (holotype ♀ (Museu de Zoologia, Universidade de Sao Paulo), Brazil: Amapá: Serra do Navio).

**Material examined:** **Peru:** Loreto: 2♂ ExplorNapo, Trail Curassow, 15 m after junction with Trail RenuPeru, 3.25626°S 72.90618°W, 116 m, trap EN-ML-05, 27.viii–2.ix.2015, U. Cabral (USNM USNMENT01354488, USNMENT01354489); 1♂ ExplorNapo, Trail Curassow, 900 m beyond junction with Trail RenuPeru, 3.25428°S 72.90316°W, 137 m, trap EN-ML-10, 29.iv–5.v.2015, U. Cabral (SENASA); 1♀ same, 9–15.vi.2015 (MHNJP); 1♀ same, 25–31.x.2015, (MNJP); 1♂ same, 1–5.xi.2015 (MHNJP); 1♀ ExplorNapo, Trail Curassow, 50 m before junction with Trail Tambos, 3.25246°S 72.90385°W, 135 m, trap EN-ML-12, 17–23.iv.2015, U. Cabral (MHNJP); 1♂ ExplorNapo, trail ACTS to Canopy walkway, 50 m before platform 1, 3.25166°S 72.90707°W, 127 m, trap EN-ML-14, 24–30.vi.2015, U. Cabral (MHNJP); 1♂ same, 10–16.vii.2015 (USNM USNMENT01354480); 1♀ ExplorNapo, Trail RenuPeru, 200 m beyond Botanical garden, 3.25735°S 72.9138°W, 123 m, trap EN-ML-18, 29.iv–5.v.2015, U. Cabral (MHNJP); 1♂ ExplorNapo, Trail Tambos, 50 m before junction with Trail Medicine, 3.25075°S 72.90182°W, 156 m, trap EN-ML-24, 7–13.iv.2015, U. Cabral (USNM USNMENT01354487); 1♂ ExplorNapo, Trail Tambos, 150 m before end, 3.24803°S 72.89838°W, 128 m, trap EN-ML-27, 29.iv–5.v.2015, U. Cabral (FSCA); 1♂ same, 3–9.ix.2015 (SENASA); 1♀ ExplorNapo, Trail Curassow, 500 m before junction with Trail RenuPeru, 3.25546°S 72.90851°W, 156 m, trap EN-ML-38, 3–9.ix.2015, U. Cabral (FSCA); 1♀ ExplorNapo, trail parallel to trail to canopy

walkway, 550 m from ACTS, 3.25116°S 72.90372°W, 139 m, trap EN-ML-41, 17–23.iv.2015, U. Cabral (USNM USNMENT01354476); 1♂ same, 23–27.iv.2015 (MHNJP); 1♀ ExplorNapo, Trail RenuPeru, second junction with trail to Trail Curassow, 3.25723°S 72.90943°W, 131 m, trap EN-ML-44, 9–1.ix.2015, U. Cabral (USNM USNMENT01354486); 2♀ ExplorNapo, Trail RenuPeru, 300 m before junction with trail to Trail Curassow, 3.25724°S 72.91009°W, 138 m, trap EN-ML-48, 29.iv–5.v.2015, U. Cabral (USNM USNMENT01354482, USNMENT01354483); 1♀ ExplorNapo, Trail Curassow, 600 m beyond junction with Trail RenuPeru, 3.25503°S 72.90392°W, 145 m, trap EN-ML-51, 17–23.iv.2015, U. Cabral (FSCA); 1♀ ExplorNapo, Trail Curassow, at Junction with trail to San Juan, 3.25399°S 72.90278°W, 159 m, trap EN-ML-52, 12–18.viii.2015, U. Cabral (USNM USNMENT01354485); 1♀ ExplorNapo, Trail Medicine, 50 m from junction with Trail Tambos, 3.24996°S 72.90218°W, 141 m, trap EN-ML-53, 29.iv–5.v.2015, U. Cabral (USNM USNMENT01354481).

**Distribution:** This species was described from and previously known only from Brazil (Amapá). The examined specimens from Peru (Loreto) are the first recorded for that country and suggest that this species is widespread across the Amazon. The elevation of the Peruvian collection localities ranges from 116–159 m.

**Comments:** There is more variation in the Peruvian specimens than recorded in the original description of the three type specimens from Brazil. The postsutural scutal vittae are sometimes smaller, narrower, or absent. The subcostal and discal bands at least have extensions or are sometimes connected along vein  $M_4$  (Fig. 12). The connection of the  $rm$  and subapical bands along the costal margin is occasionally broader, extending as far as vein  $R_{2+3}$ , rarely with a hyaline spot within the connection. Female tergite 6 often has a pair of irregular, pale to moderate brown, submedial vittae, sometimes extending onto the posterior part of tergite 5.

#### ACKNOWLEDGEMENTS

We thank Elizabeth Morgulis and an anonymous reviewer for their reviews of this manuscript. Alyssa Seeman photographed and enhanced the wing photos; Taina Litwak montaged and enhanced the habitus image. Most of the examined specimens from Ecuador and Peru were collected via the USDA Farm Bill projects “Enhancement of Fruit Fly Larvae Identification and Taxonomy” (project numbers 3.0342 (2012) and 13-8131-0291-CA (2013)) and “Development of More Rapid and Reliable Diagnostic Tools for All Life Stages of *Anastrepha* and Other Pest Fruit Flies” (project number 3.0520 (2017)). Most of the authors contributed to the planning of the sampling in Ecuador and Peru and the collection and sorting of the samples; P.A. Rodriguez was responsible for the sorting and preliminary identification of the Colombian specimens; the senior author is responsible for the taxonomic decisions and descriptions. We are grateful to Megan MacDowell, Valerie Peterson and Eileen Rosin of the Amazon Conservation Association, Laura Samaniego, Patrick Campbell, Adrian Tejedor, Yngrid Espinoza, Fernando Araoz, Norma Fernandez, Marleni Macedo Choque, Jorge Caballero, Tim Perez and Oswaldo Coycosi of the Asociación para la Conservación de la Cuenca Amazónica (ACCA), and Pam Bucur, Ulises Cabral, and Marisol Rivera of Amazon Explorama Lodges, whose collaboration was essential to the success our sampling at their field stations and properties in Peru. We thank David Lasso, Carlos Padilla, our Huorani assistants and the staff of the Estacion Científica Yasuni for logistic support in Ecuador. Sampling in Peru was conducted with permission of Dirección General Forestal y de Fauna Silvestre (Resolución Directoral N° 209-2013-MINAGRI-DGFFS-DGEFFS; Resolución de Dirección No. 022-2015-SERFOR-DGGSPFFS). We also thank Gerardo Lamas, Juan Grados and Luis Figueroa (MHNJP) and Erika Paliza García and Frank Azorsa Salazar (Centro de Ecología y Biodiversidad) for collaboration and assistance with permits. Sampling in Ecuador was conducted with permission of the Ministerio del Ambiente (Autorización de Investigación Científica Nos. 003-17-IC-FAU-DNB/MA and 011-2018-IC\_FAU-DNB/MA issued to The Museum of Zoology-Invertebrates, Pontificia Universidad Católica del Ecuador). Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement. USDA is an equal opportunity provider and employer.

## REFERENCES

- CUMMING, J.M. & WOOD, D.M. 2017. Adult morphology and terminology. In: Kirk-Spriggs, A.H. & Sinclair, B.J. (Eds.), *Manual of Afrotropical Diptera*. Vol. 1. Introductory chapters and keys to Diptera families. *Suricata* **4**: 89–133.
- GIGLIO-TOS, E. 1893. Diagnosi di nuovi generi e di nuove specie di Ditteri. IX. *Bolletino dei Musei di Zoologia ed Anatomia Comparata dell' Università di Torino* **8** (158): 1–14.  
<https://www.biodiversitylibrary.org/item/42761#page/209>
- NORRBOM, A.L. 2006. A revision of the Neotropical genera *Molynocoelia* Giglio-Tos, *Pseudophorellia* Lima, and *Alujamyia*, n. gen. (Diptera: Tephritidae). *Israel Journal of Entomology* **35–36**: 35–134.  
<https://pubag.nal.usda.gov/download/43883/PDF>
- 2011. A new species of *Molynocoelia* Giglio-Tos (Diptera: Tephritidae) from Ecuador. *Proceedings of the Entomological Society of Washington* **113**: 492–496.  
<https://doi.org/10.4289/0013-8797.113.4.492>
- WHITE, I.M., HEADRICK, D.H., NORRBOM, A.L. & CARROLL, L.E. 1999. Glossary. In: Aluja, M. & Norrbom, A.L. (Eds.), *Fruit flies (Tephritidae): Phylogeny and evolution of behavior*. CRC Press, Boca Raton, pp. 881–924.