

THE PATTERNED-WING SPECIES OF *CONICEROMYIA* (DIPTERA: PHORIDAE)

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ABSTRACT. Fifteen species of patterned-wing *Coniceromyia* are recognized, including the following ten new to science: *Coniceromyia apicalis*, *C. aurantia*, *C. bilineata*, *C. brevivena*, *C. globosa*, *C. impluvia*, *C. impudica*, *C. leucomacula*, *C. setitarsalis*, and *C. truncata*. A key to the identification of males of these species is given.

INTRODUCTION

The genus *Coniceromyia* Borgmeier (1923) is a group of 32 species confined to the New World. Most species are tropical, with only two reaching the southern U.S.A. (Borgmeier, 1968). Only a small fraction of the true diversity of this genus has been described.

One easily recognizable trait of males of some species of this genus is the presence of patterned wings. Patterned wings are herein defined as the presence of definite pigment in the wing membrane, but some of the patterning found in some species is caused by, or enhanced by, the presence of dense, reduced setae. There is no evidence that species sharing wing-patterning form a monophyletic group, but they are distinctive, attractive, conspicuous taxa whose recognition could inspire studies on the function of such markings.

In this paper we describe ten new species of patterned-wing *Coniceromyia* and present a key to all species known to display this attribute.

METHODS

Most specimens were collected into 70% ethanol and critical-point dried using hexamethyldisilazane (Brown, 1993) or a standard critical-point drier (Gordh and Hall, 1979).

Terms used are those of McAlpine (1981). Recently, Stuckenberg (1999) has proposed that the large third antennal segment of the Cyclorrhapha should be called the postpedicel, rather than flagellomere 1, as it may comprise a fusion of flagellomere 1 with other flagellomeres. The actual segments that might have been involved in such a fusion are still unidentified, however, and they still are homologous to the flagellomeres of more primitive Diptera. Therefore, we continue to use the term flagellomere 1 for the first visible flagellomere, regardless of its potential composition.

Tarsal ratios are length/width of the tarsal segment.

In addition to regular locality labels, all specimens have

Code-49 barcoded labels, and their information is recorded in a database. The barcode of each holotype is reported in brackets.

Material was deposited in the following museums (codens from Arnett et al., 1993).

- EAPC Agroecological Inventory Collection, Departamento de Proteccion Vegetal, Escuela Agrícola Panamericana, Apartado 93, Tegucigalpa, Honduras (R. Cave)
- EMUS Department of Biology, Utah State University, Logan, Utah 84322-5305, U.S.A. (W.J. Hanson)
- INBC Instituto Nacional de Biodiversidad, A.P. 22-3100, Santo Domingo, Heredia, Costa Rica (M. Zumbado)
- LACM Entomology Section, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California 90007, U.S.A. (B.V. Brown)
- MCZC Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, U.S.A. (on indefinite loan to B.V. Brown)
- MUCR Museo de Insectos, Universidad de Costa Rica, San Pedro, San José, Costa Rica (P. Hanson)
- MUSM Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Av. Arenales 1267, Apartado 14-0434, Lima-14, Peru (G. Lamas)
- MZLU Museum of Zoology, Lund University, Helgönav. 3, S-223, 62 Lund, Sweden (R. Danielsson)
- ROME Department of Entomology, Royal Ontario Museum, 100 Queens Park, Toronto, Ontario, Canada M5S 2C6 (D.C. Darling)
- USNM United States National Museum, Smithsonian Institution, Washington, DC 20560, U.S.A. (on indefinite loan to B.V. Brown)

SYSTEMATICS

Coniceromyia Borgmeier, 1923

Coniceromyia Borgmeier, 1923:338. Type species: *C. epicantha* Borgmeier, by original designation.

DIAGNOSIS. Frons with median furrow. One pair of reclinate supra-antennal setae present. Flagellomere 1 elongate, conical in most species. Anepisternum bare or setulose; anepisternal furrow absent. Foremetatarsus of male with elongate, fringed process at apex. Tibiae with large, unpaired setae;

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hind tibia without dorsal, longitudinal rows of enlarged setulae. Costa usually darkened; wing vein R_{2+3} absent or vestigial. Epandrium with fused surstyli shifted to left side. Hypandrium with bilobed right process. A full list of genus-level characters was given by Borgmeier (1963b).

PHYLOGENETIC RELATIONSHIPS. *Coniceromyia* was hypothesized to belong to a newly restricted subfamily Phorinae by Brown (1992a, b), with its closest relative being the Old World genus *Plethysmochaeta* Schmitz (1924). No phylogenetic relationships have been proposed for species within the genus, and no taxonomic subdivisions, such as subgenera, are currently used. The patterned-wing species described herein do not form a monophyletic group but apparently are representatives of a number of lineages that have independently evolved this trait.

TAXONOMIC NOTES. Sexual dimorphism in the genus is problematic, as females lack many of the characters that are taxonomically useful in males (including patterned wings). Therefore, most of the 32 described species are known from male specimens, although some have questionably associated females. Most species are known from fewer than five specimens, and twelve species have been recorded from the holotype alone.

Male genitalia, often of great value in determining phorid species (e.g., Brown, 1996, 1998; Disney, 1989), are relatively uniform in *Coniceromyia* and were not illustrated. A full discussion of their structure is given by Brown (1992a).

WAY OF LIFE. The natural history of all species is unknown, although one species was collected with army ants. Species of related genera (Brown, 1992b) are scavengers.

The elaborately decorated males of some species, especially *C. stephensoni* Peterson and *C. leucomacula* new species, possibly use their colored wings and brightly marked forefemora in courtship displays or to defend territories against other males. No such observations have been made on these species, however, as specimens of both species have only been collected by traps.

DISTRIBUTION. Most species are found in the Neotropical Region, although two species reach the southern U.S.A.

NOTES ON IDENTIFICATION. The most recent key to species is that of Borgmeier (1963a); since then, several further species have been described (Borgmeier, 1969a, b; Borgmeier and Prado, 1975; Peterson, 1982; Peterson and Arntfield, 1971; Prado, 1976).

Coniceromyia apicalis new species

(Fig. 1)

SPECIES RECOGNITION. This species is most easily recognized by a thickened M_1 vein and the continuation of the wing darkening to the apical margin. A smooth and entire wing margin and the presence of setae on the anepisternum further dif-

ferentiate this species from *C. vesperilio* Schmitz (1927).

DESCRIPTION. Male. Body length 1.75 to 2.40 mm. Frons brown. Flagellomere 1 brown, elongate-conical. Arista apical and pubescent. Palpus brown, small, with short, dark setae. Dorsum of thorax brown. Pleural regions brown. Anepisternum with short, fine setae. Scutellum brown. Legs yellowish-brown. Foreleg with two strong setae anterodorsal to posterodorsal on tibia; tarsomeres about twice as long as wide (e.g., in one specimen, tarsal ratio is 2.00:1.75:1.75:1.67:2.00); tarsomere 1 with anterobasal seta, anterior excavation, and anteroapical process, without basal triangular process; posteroventral setae on tarsomere 1 without curved tips. Midcoxa with long, erect setae; tips of setae curved, without thick ventrolateral seta. Hind femur with sparse, tiny, blunt setae on basal half; setae extend dorsally to one-third height of posterior face of femur at basal extremity. Wing with M_1 thickened, about one-half thickness of R_{4+5} , thicker than M_2 and CuA_1 ; space between M_1 and M_2 narrowed basally, so that the veins are parallel in basal third and divergent in apical two-thirds. Wing with line of darkened pigment and slightly denser setae parallel to and posterior to leading edge. Apical third of wing darkened by pigment from anterior margin to CuA_1 (Fig. 1). Mean costal length 0.42 wing length; range 0.36 to 0.46. Halter white. Tergites brown. Tergite 1 medially constricted, the middle complete to partially split. Abdomen gray ventrally. Terminalia yellowish-brown.

GEOGRAPHICAL DISTRIBUTION. Known from two sites in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for apical, referring to the continuation of the wing pattern to the apical margin.

HOLOTYPE. ♂, COSTA RICA: Guanacaste, Estación Pitilla, 11°N, 85.43°W, vi.1989, P. Hanson, Malaise trap, 600 m (LACM) [LACM ENT 029706].

PARATYPES. COSTA RICA: Alajuela, Peñas Blancas Valley, 10.32°N, 84.76°W, 1♂, 7.xi.1987, E. Cruz, Malaise trap (LACM), 20 km S Upala, 10.73°N, 85.10°W, 1♂, 1-3.v.1990, F.D. Parker (EMUS); Guanacaste, Estación Pitilla, 11°N, 85.43°W, 3♂, iv.1989, 5♂, v.1989, 1♂, vi.1989, P. Hanson, Malaise trap, 600 m (LACM, MUCR), 2♂, v.1994, P. Rios, Malaise trap, 700 m (INBC).

Coniceromyia aurantia new species

(Fig. 2)

SPECIES RECOGNITION. This species is most easily recognized by a basal, oval, orange macula on the anterior face of the forefemur and a posteroventral row of setae on the foretibia.

DESCRIPTION. Male. Body length 2.20 to 2.30 mm. Frons reddish-brown. Flagellomere 1 brown, elongate-conical. Arista apical, pubescent. Palpus yellow with short, dark setae. Dorsum of thorax yellowish-brown. Pleural regions yellowish-brown.

Anepesternum with short setae. Scutellum yellowish, brown medially. Legs yellowish-brown. Forefemur with oval, orange macula on basal half of anterior face. Foretibia with dorsal row of short, brown setae anterior to two strong dorsal setae; with posteroventral row of short, thick setae. Foreleg with tarsomeres 2 to 5 one and one-half times as long as wide (e.g., in one specimen, tarsal ratio is 3.29:1.63:1.50:1.50:1.50); tarsomere 1 with anteroapical process and shallow excavation, without basal triangular process; posteroventral setae on tarsomere 1 without curved tips. Setae on midcoxa not long, without curved tips; with thick ventral setae. Hind femur with dense, tiny, blunt posteroventral setae on basal two-fifths; distribution of setae extends dorsally to one-third height of posterior face in basal half, tapers to ventral margin in apical half. Wing (Fig. 2) with darkened pigment along M_1 and M_2 , line of dense setae posterior to anteroapical margin. Apical three-fourths of wing darkened by dense setae. Mean costal length 0.34 wing length. Halter yellowish-white. Tergites dark brown. Tergite 1 medially constricted, middle entirely split. Abdomen yellowish-white ventrally. Terminalia light brown.

PHYLOGENETIC RELATIONSHIPS. We consider this species to be part of a monophyletic group, along with *C. leucomacula* new species and *C. stephensoni* Peterson (1982), based on the presence of posteroventral setae on the foretibia and a differentiated macula on the anterior face of the forefemur.

GEOGRAPHIC DISTRIBUTION. Amazonian Peru.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for orange, referring to the orange macula on the forefemur.

HOLOTYPE. ♂, PERU: Madre de Dios, Manu N.P., Cocha Cashu Station, 23–30.viii.1986, D.C. Darling, Malaise trap, 380 m (MUSM) [LACM ENT 137646].

PARATYPES. PERU: Madre de Dios, Manu N.P., Cocha Cashu Station, 1♂, 18–22.viii.1986, 1♂, 22–27.viii.1986, 1♂, 23–30.viii.1986, 1♂, 31.viii–1.ix.1986, D.C. Darling, Malaise trap, 380 m (LACM, ROME), Pakitza, 11.94°S, 71.28°W, 1♂, 13–18.ii.1992, D. Quintero, Malaise trap (LACM), 1♂, 10.vi–6.vii.1993, R. Cambra, yellow pans (LACM).

Coniceromyia bilineata new species

(Fig. 3)

SPECIES RECOGNITION. This species is most recognizable by the two striae on the wing at the anterior margin and along M_1 . The most similar species is *C. striativena* Borgmeier (Borgmeier, 1963a), which has darkening along M_2 .

DESCRIPTION. Male. Body length 2.15 to 2.35 mm. Frons dark brown. Flagellomere 1 dark brown with long pubescence, elongate-conical. Arista apical, pubescent. Palpus yellow. Dorsum of thorax

dark brown. Pleural regions same color as dorsum of thorax dorsally, lighter in color ventrally. Anepesternum without setae. Scutellum dark brown. Foreleg dark brown, yellowish-brown from apical region of femora to apex; midleg slightly lighter brown from tip of femur to apex; hind leg dark brown. Foreleg with three dorsal setae on tibia; tarsal ratio of tarsomeres 2 to 4 subequal (e.g., in one specimen, ratio is 1.80:0.89:1.00:1.14:2.00); tarsomere 1 with basal triangular process, anterior excavation, and anteroapical process; posteroventral setae on tarsomere 1 without curved tips. Foreleg with pulvilli slightly enlarged. Midcoxa with fine setae and thick ventrolateral seta. Hind femur with dense, tiny, blunt posteroventral setae on basal third, distribution of setae tapered apically toward ventral margin. Wing with darkened pigment along anteroapical margin and M_1 ; subcostal cell darkened by pigment at apex (Fig. 3). Mean costal length 0.48 wing length. Halter yellow. Tergites dark brown, almost black. Tergite 1 shortened or not shortened medially. Abdomen gray ventrally. Terminalia light brown.

GEOGRAPHICAL DISTRIBUTION. Known from one site in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for two-lined, referring to the two striae on the wing.

HOLOTYPE. ♂, COSTA RICA: Guanacaste, Volcan Cacao, Cerro Pedregal, 10.93°N, 85.48°W, ii–iv.1989, I. Gauld, D. Janzen, Malaise trap, 1000 m (LACM) [LACM ENT 053782].

PARATYPES. COSTA RICA: Guanacaste, Santa Rosa National Park, 10.95°N, 85.62°W, 1♂, 21.ii–14.iii.1987, I. Gauld, D. Janzen, Malaise trap (LACM), Volcan Cacao, Cerro Pedregal, 10.93°N, 85.48°W, 4♂, ii–iv.1989, I. Gauld, D. Janzen, Malaise trap, 1000 m (INBC, LACM), 1♂, ii–iv.1989, P. Hanson, Malaise trap, 1000 m (LACM).

Coniceromyia blomae Peterson and Arntfield, 1971

Coniceromyia blomae Peterson and Arntfield, 1971:395–398, fig. 1.

NEW MATERIAL EXAMINED. MEXICO: Chiapas, Yerba Buena, 16.35°N, 96.07°W, 1♂, 8.vi.1969, W. Mason, 1760 m (LACM).

Coniceromyia brevivena new species

(Fig. 4)

SPECIES RECOGNITION. This species differs from all other patterned-wing *Coniceromyia* by the presence of the apical half of R_{2+3} . This species is further differentiated from *C. maculipennis* Borgmeier (1969b) by the lack of darkening along the posterior wing margin.

DESCRIPTION. Male. Body length 3.1 mm. Frons dark brown. Flagellomere 1 dark brown, elongate-conical. Arista apical and pubescent. Palpus light brown with short, dark setae. Dorsum of

thorax dark brown. Pleural regions same color as dorsum of thorax. Anepisternum with short, fine setae. Scutellum dark brown. Legs brown, lighter apically. Foreleg with three dorsal setae on tibia; tarsomeres 2 to 4 twice as long as wide, tarsal ratio is 3.50:2.00:2.00:1.60; tarsomere 1 with three thick anterobasal setae ventral to anterior excavation, without basal triangular process; posteroventral setae on tarsomere 1 without curved tips. Midcoxa with fine setae and thick ventrolateral seta. Hind femur with tiny, blunt posteroventral setae on basal half; distribution of setae tapered apically toward ventral margin. Apical third of wing, except for apex, darkened by pigment; costal and subcostal cells darkened by pigment. Apical half of R_{2+3} present (Fig. 4). Costal length 0.43 wing length. Halter yellow. Tergites dark brown. Tergite 1 medially constricted. Abdomen dark gray ventrally. Terminalia dark brown.

GEOGRAPHICAL DISTRIBUTION. Known from a single site in Peru.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for short vein, referring to the presence of the apical half of R_{2+3} .

HOLOTYPE. ♂, PERU: Madre de Dios, Rio Tambopata Reserve, 12.83°S, 69.28°W, 8.xi.1983, T. Erwin, canopy fogging, 290 m (USNM) [LACM ENT 028082].

Coniceromyia globosa new species

(Fig. 5)

SPECIES RECOGNITION. This species is most easily recognized by the round macula on the wing between the anteroapical margin and M_1 . The most similar species are *C. setitarsalis* new species and *C. impluvia* new species, in which the darkening on the wing between the anteroapical margin and M_1 is not distinctly round.

DESCRIPTION. Male. Body length 1.8 to 1.9 mm. Frons brown. Flagellomere 1 brown, elongate-conical. Arista apical, pubescent. Palpus brown. Dorsum of thorax brown. Pleural regions same color as dorsum of thorax. Anepisternum without setae. Scutellum brown. Legs yellowish-brown. Foreleg with two anterodorsal setae on tibia; tarsal ratio of tarsomeres 2 to 4 subequal (e.g., in one specimen, ratio is 2.29:1.00:1.14:1.33:2.00); tarsomere 1 with anteroventral excavation and anteroapical process, without basal triangular process; posteroventral setae on tarsomere 1 without curved tips. Midcoxa with fine setae and thick ventrolateral seta. Hind femur with dense, tiny, blunt posteroventral setae in basal third; setae slightly tapered apically. Wing with pigment darkened along R_{4+5} , anteroapical margin, M_1 , M_2 ; darkened pigment forming round macula between M_1 and anteroapical margin (Fig. 5). Mean costal length 0.48 wing length; range 0.46 to 0.50. Halter yellowish-brown. Tergites dark brown. Tergite 1 shortened medially. Abdomen gray ventrally. Terminalia light brown.

GEOGRAPHICAL DISTRIBUTION. Costa Rica and Panama.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for spherical, referring to the round macula on the wing.

HOLOTYPE. ♂, COSTA RICA: San José, Braulio Carrillo NP, 10.17°N, 84.12°W, 10.iv.1985, H. Goulet, L. Masner, 500 m (LACM) [LACM ENT 003289].

PARATYPES. COSTA RICA: San José, Braulio Carrillo NP, 8.2 km NE Tunel, 10.12°N, 83.97°W, 1♂, 15.v.1988, P. Hanson, 1500 m (LACM). PANAMA: Panama Prov., Cerro Jefe, 1♂, 31.vii.1978, N.E. Woodley, 975 m (MCZC).

Coniceromyia impluvia new species

(Fig. 6)

SPECIES RECOGNITION. This species is most similar to *C. setitarsalis* new species but differs by a shorter flagellomere, presence of darkening along CuA_1 , and absence of curved tips on ventral setae of tarsomere 1 on the foreleg. The clear window in the darkening of the wing, between the apical margin and M_1 , is twice as long as wide, further differentiating this species from *C. setitarsalis*.

DESCRIPTION. Male. Body length 1.7 to 2.0 mm. Frons dark brown. Flagellomere 1 brown, elongate-conical, length of tapered portion less than length of untapered portion. Arista apical, pubescent. Palpus yellow. Dorsum of thorax brown. Pleural regions same color as dorsum of thorax. Anepisternum without setae. Scutellum brown. Legs brown to yellowish-brown. Foreleg with two dorsal setae on tibia; tarsal ratio of tarsomeres 2 to 4 subequal (e.g., in one specimen, ratio is 2.29:0.88:1.00:1.00:1.16); tarsomere 1 with anterior excavation and anteroapical process; posteroventral setae on tarsomere 1 without curved tips. Tarsomere 1 without triangular process. Midcoxa with fine setae and thick ventrolateral seta. Hind femur with dense, tiny, blunt posteroventral setae in basal third; distribution of setae slightly tapered apically. Line of pigment and dense setae parallel to and posterior to leading edge of wing. Wing darkened by pigment near tip of R_{4+5} along anteroapical margin, M_1 , M_2 , and, faintly, along CuA_1 ; darkened pigment present between M_1 and anteroapical margin in apical half, but not extending to apical margin (Fig. 6). Mean costal length 0.45 wing length; range 0.42 to 0.47. Halter white. Tergites dark brown. Abdomen gray ventrally. Terminalia light brown.

GEOGRAPHICAL DISTRIBUTION. Lowland Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for window, referring to the presence of a clear window in the wing darkening.

HOLOTYPE. ♂, COSTA RICA: Puntarenas, 24 km W Piedras Blancas, 8.77°N, 83.4°W, xii.1990, P. Hanson, Malaise trap, 200 m (LACM) [LACM ENT 040466].

PARATYPES. COSTA RICA: Limon, 16 km W

Guapiles, 10.15°N, 83.92°W, 1♂, iii-v.1990, P. Hanson, Malaise trap, 400 m (LACM); Puntarenas, Road to Rincon, 24 km W Piedras Blancas, 8.77°N, 83.4°W, 1♂, iii-iv.1989, P. Hanson, I. Gauld, Malaise trap, 200 m (LACM), 1♂, xi.1990, P. Hanson, Malaise trap, 200 m (INBC), 3 km S Rincon, 8.68°N, 83.48°W, 1♂, ix-xi.1989, 1♂, xii.1989, P. Hanson, Malaise trap, 10 m (LACM). PANAMA: Darien, Cana Pirre Trail, 7.72°N, 77.7°W, 1♂, 7.vi.1996, A. Gillogly, FIT, 1250 m (LACM).

Coniceromyia impudica new species

(Fig. 7)

SPECIES RECOGNITION. This species is most easily recognized by its dark coloration, distinctive wing pattern, and the presence of curved tips on the ventral setae on tarsomere 1 of the foreleg.

DESCRIPTION. Male. Body length 2.35 to 2.85 mm. Frons blackish-brown. Flagellomere 1 dark brown with long pubescence, elongate-conical. Arista apical, pubescent. Palpus yellow. Dorsum of thorax and pleural regions dark brown. Anepisternum without setae. Scutellum dark brown. Legs with femora dark brown, yellow-orange apically; tibiae dark brown, yellow-orange basally and apically; tarsi yellowish-brown. Foreleg with three to four dorsal to anterodorsal setae on tibia; tarsal ratio of tarsomeres 2 to 5 subequal (e.g., in one specimen, ratio is 2.00:1.25:1.25:1.33:1.33); tarsomere 1 with basal triangular process, anterior excavation, and anteroapical process; tarsomere 1 with curved tips on some posteroventral setae. Foreleg with pulvilli slightly enlarged. Midcoxa with fine setae and thick ventrolateral seta. Hind femur with dense, tiny, blunt posteroventral setae on basal third, setae tapered apically toward ventral margin. Wing with darkened pigment along, and in membrane posterior to, M_1 , with enlarged areas at tip of R_{4+5} and mid- M_1 . Macula darkened by pigment on middle of M_2 present to absent, R_{4+5} slightly darkened by pigment and narrow line of darkened pigment parallel to and posterior to the leading edge of the wing (Fig. 7). Mean costal length 0.50 wing length; range 0.47 to 0.53. Halter yellow. Tergites dark brown, almost black. Tergite 1 shortened or lightened medially. Abdomen dark, almost black, ventrally. Terminalia dark brown.

GEOGRAPHICAL DISTRIBUTION. Honduras.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for bold, referring to the dark and distinctive wing pattern.

HOLOTYPE. ♂, HONDURAS: Francisco Morazan, San Antonio de Oriente, Cerra Uyuca, 14.03°N, 87.07°W, 12-18.ii.1990, R. Cave, Malaise trap in cloud forest (LACM) [LACM ENT 061908].

PARATYPES. HONDURAS: Cortés, Parque Nacional Cusuco, 15.48°N, 88.22°W, 2♂, 2.iii.1995, R. Cordero, Malaise trap (LACM), 1600 m, 6♂, 30.ix.1995, 3♂, 15.x.1995, R. Cave, Malaise trap in oak/pine cloud forest, 1600 m (EAPC, MZLU);

Francisco Morazan, Parque Nacional La Tigra, 14.25°N, 87.08°W, 1♂, 29.iii.1995, 1♂, 13.vi.1995, R. Cave, Malaise trap in oak/pine cloud forest (MZLU); San Antonio de Oriente, Cerra Uyuca, 14.03°N, 87.07°W, 2♂, 12-18.ii.1990, 1♂, 7-13.v.1990, R. Cave, Malaise trap in cloud forest (LACM).

Coniceromyia leucomacula new species

(Figs. 8, 9)

SPECIES RECOGNITION. This species is most easily recognized by a large white patch on the forefemur and an oval macula between M_2 and CuA_1 . A second darkening on the wing, between M_1 and M_2 , may be present or absent.

DESCRIPTION. Male. Body length 2.3 to 2.9 mm. Frons brown. Flagellomere 1 with various degrees of orange and brown, elongate-conical. Arista apical, pubescent. Palpus yellow-orange. Dorsum of thorax brown with yellowish margins. Pleural regions yellowish-brown to brown. Anepisternum with short, fine setae. Scutellum brown, darker than pleural regions. Legs mostly yellow. Foreleg with anterior of femur black apically with white patch about three-quarters length of femur, posterior side brown. Midfemur brown basally and yellowish-brown apically. Hind femur with apical anteroventral black spot. Foretibia with dorsal row of orange setae anterior to one to four black dorsal setae, with row of posterior spine-like setae, row extending ventrally along apical margin; tarsal segments clearly longer than wide (e.g., in one specimen, tarsal ratio is 5.20:3.60:4.00:3.00:2.67); tarsomere 1 with thick basal seta, ventral to anterior excavation, and anteroapical process, without basal triangular process; posteroventral setae on tarsomere 1 without curved tips. Midcoxa with fine setae and thick ventrolateral seta. Hind femur with tiny, blunt posteroventral setae on basal half; setae extend slightly higher at basal extremity. Wing with costal cell slightly darkened by pigment, anteroapical margin with faint darkening of pigment and dense, fine setae. Apical half with large, oval, darkening of pigment between M_2 and CuA_1 , and smaller and lighter spot between M_1 and M_2 (Fig. 8). Mean costal length 0.44 wing length; range 0.41 to 0.47. Halter white. Tergites brown. Tergite 1 medially constricted; middle entirely to partially split. Tergites 3 through 6 with lighter anterior margin. Abdomen gray ventrally. Terminalia yellowish. Hypandrium brown.

VARIATION. Specimens from Estación Cacao differ from the holotype and other specimens by overall lighter coloration, including the lack of darkening between M_1 and M_2 and smaller macula between M_2 and CuA_1 (Fig. 9).

PHYLOGENETIC RELATIONSHIPS. See *C. aurantia*, above.

GEOGRAPHICAL DISTRIBUTION. Known from three midelevation sites in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The

name is a combination of the Greek word for white, *leukos*, and Latin word *macula*, referring to the white patch of the forefemur.

HOLOTYPE. ♂, COSTA RICA: Puntarenas, Monteverde Biological Station, 10.33°N, 84.79°W, 9–18.iii.1995, B. V. Brown, Malaise trap, 1700 m (LACM) [LACM ENT 051936].

PARATYPES. COSTA RICA: Cartago, La Cangreja, 9.8°N, 83.47°W, 7♂, vii.1991, 1♂, viii–ix.1991, 2♂, xi.1991, 4♂, xii.1991, 10♂, vi–vii.1992, 9♂, ix–xii.1992, P. Hanson, Malaise trap, 1950 m (INBC, LACM, MCZC, MUCR, USNM); Guanacaste, Cerro Pedregal, 10.93°N, 85.48°W, 3♂, ii–iv.1989, I. Gauld, D. Janzen, Malaise trap, 1000 m (LACM), Estación Cacao, 10.93°N, 85.47°W, 2♂, ii.1989, I. Gauld, D. Janzen, Malaise trap, 900 m (LACM); Puntarenas, Monteverde Biological Station, 10.33°N, 84.79°W, 1♂, 9–18.iii.1995, B. V. Brown, Malaise trap, 1700 m (LACM).

Coniceromyia setitarsalis new species

(Fig. 10)

SPECIES RECOGNITION. This species is most similar to *C. impluvia* but differs by a longer flagellomere, absence of darkening along Cu_{A1}, and presence of curved tips on the ventral setae of tarsomere 1 on the foreleg. The clear window in the darkening of the wing, between the apical margin and M₁, is about as long as wide, further differentiating this species from *C. impluvia*.

DESCRIPTION. Male. Body length 1.9 to 2.6 mm. Frons dark brown. Flagellomere 1 dark brown with long pubescence, elongate-conical, with tapered portion longer than untapered portion. Arista apical, plumose. Palpus brown. Dorsum of thorax dark brown. Pleural regions same color as dorsum of thorax. Anepisternum without setae. Scutellum dark brown. Legs brown to yellowish-brown, lighter apical of femora. Foretibia and tarsus with long, fine, erect, ventral setae. Foreleg with two dorsal setae on tibia; tarsal ratio of tarsomeres 2 to 4 subequal (e.g., in one specimen, ratio is 2.67:1.11:0.89:1.00:2.00); tarsomere 1 with anterior excavation and anteroapical process. Excavation bordered with setae, ventrobasal margin of excavation with dense, fine setae. Tarsomere 1 without basal triangular process; some posteroventral setae on tarsomere 1 long, thin, curve-tipped, and erect. Midcoxa with fine setae and thick ventrolateral seta. Hind femur with dense, tiny, blunt setae on basal third; distribution of setae tapered apically toward ventral margin. Wing darkened with pigment at apex of costa, base of M₁, with macula anterior to M₁ at midpoint of M₁, pigment lighter at apex; pigment darkened along anteroapical margin and apex of M₂, M₂ faintly darkened by pigment (Fig. 10). Mean costal length 0.52 wing length; range 0.49 to 0.54. Halter yellow. Tergites dark brown. Tergite 1 shortened medially. Abdomen gray ventrally. Terminalia light brown.

GEOGRAPHICAL DISTRIBUTION. Known from four midelevation sites in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is a combination of the Latin word *seta* and Greek word *tarsus*, referring to the setose tarsomere 1 of the foreleg.

HOLOTYPE. ♂, COSTA RICA: Cartago, La Cangreja, 9.8°N, 83.97°W, vi–vii.1992, P. Hanson, Malaise trap, 1950 m (LACM) [LACM ENT 062665].

PARATYPES. COSTA RICA: Cartago, La Cangreja, 9.8°N, 83.97°W, 1♂, vii.1991, 1♂, viii–ix.1991, 2♂, xi.1991, 1♂, vi–vii.1992, 1♂, ix–xii.1992, P. Hanson, Malaise trap, 1950 m (LACM); Puntarenas, Monteverde, 10.10°N, 83.43°W, 1♂, 1–5.vi.1988, B. V. Brown, Malaise trap in stunted forest, 1700 m (LACM), 1♂, 1–10.iii.1992, D. M. Wood, Malaise trap, 1500 m (LACM); San José, Braulio Carrillo National Park, 8.2 km NE Tunel, 10.12°N, 83.97°W, 1♂, 15.v.1988, P. Hanson, Malaise trap, 1500 m (LACM), Zurquí de Moravia, 10.05°N, 84.02°W, 1♂, vii.1990, 5♂, ix–x.1990, 2♂, x–xii.1990, 1♂, iii.1991, 2♂, v.1991, 1♂, vi.1991, 3♂, vii.1991, 1♂, ix.1991, 1♂, v.1992, 2♂, iii–iv.1993, 2♂, iv–v.1993, 7♂, 1–15.vi.1993, 3♂, ix–x.1993, 1♂, v.1995, 1♂, vi.1995, 1♂, i.1996, P. Hanson, Malaise trap, 1600 m (INBC, LACM, MUCR).

Coniceromyia stephensoni Peterson, 1982

Coniceromyia stephensoni Peterson, 1982:136–138, figs. 1–2.

PHYLOGENETIC RELATIONSHIPS: See *C. aurantia*, above.

NEW MATERIAL EXAMINED. COSTA RICA: Puntarenas, Las Alturas, 8.95°N, 82.83°W, 1♂, 10–13.vi.1998, B. Brown, V. Berezovskiy, Malaise trap #1, 1600 m (LACM).

Coniceromyia striativena Borgmeier, 1963a
(Fig. 11)

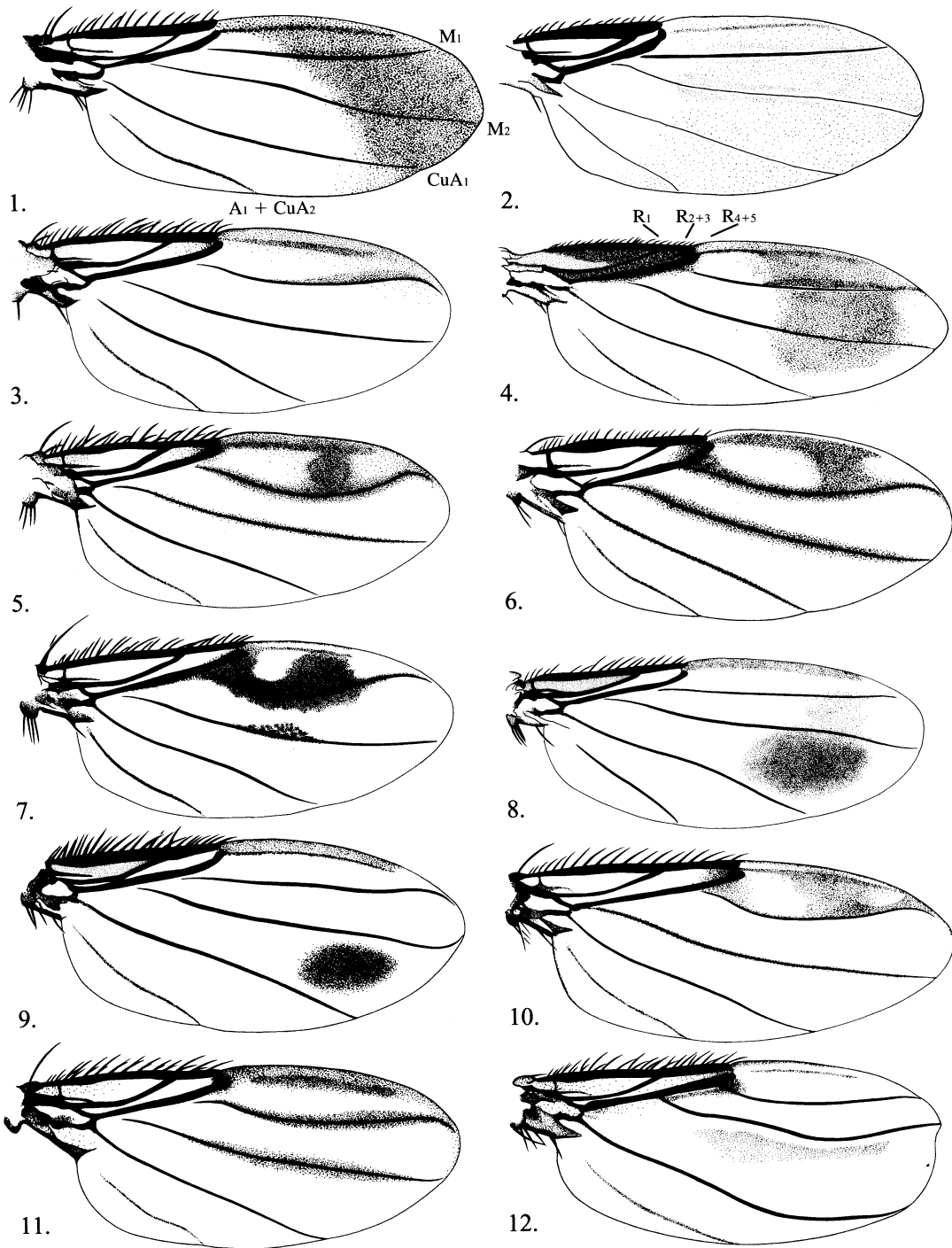
Coniceromyia striativena Borgmeier, 1963a:457–458, fig. 3.

EMENDED DESCRIPTION. We examined the holotype of this species and found an error in the original description: the halter is whitish-yellow, not black as stated by Borgmeier.

NEW MATERIAL EXAMINED. COSTA RICA: Alajuela, 5 km W San Ramon, 10.05°N, 84.05°W, 2♂, i.1997, 3♂, iv.1997, O. Castro, Malaise trap, 1200 m (LACM); Cartago, Turrialba, 9.93°N, 83.67°W, 1♂, 15–19.vii.1966, P. Spangler, Malaise trap, 600 m (USNM). MEXICO: Chiapas, San Cristobal, 16.75°N, 92.67°W, 1♂, 20.vii.1969, W. Mason, Malaise trap, 2000 m (LACM).

Coniceromyia truncata new species
(Fig. 12)

SPECIES RECOGNITION. This species is most easily distinguished from the other patterned-wing



Figures 1–12 Wings. 1. *Coniceromyia apicalis* new species. 2. *Coniceromyia aurantia* new species. 3. *Coniceromyia bilineata* new species. 4. *Coniceromyia brevivena* new species. 5. *Coniceromyia globosa* new species. 6. *Coniceromyia impluvia* new species. 7. *Coniceromyia impudica* new species. 8. *Coniceromyia leucomacula* new species [La Cangreja]. 9. *Coniceromyia leucomacula* new species [Estación Cacao]. 10. *Coniceromyia setitarsalis* new species. 11. *Coniceromyia striativena* Borgmeier. 12. *Coniceromyia truncata* new species

Coniceromyia by the sinuous, widely spaced M_2 and CuA_1 , and the truncate apical margin of the wing.

DESCRIPTION. Male. Body length 2.40 to 2.75 mm. Frons dark brown. Flagellomere 1 oval, brown. Arista subapical, pubescent. Palpus yellow with long, dark setae. Dorsum of thorax dark brown. Pleural regions brown. Anepisternum without setae. Scutellum dark brown. Legs yellowish-brown to dark brown. Forefemur with more than one row of long, thin setae on anteroventral margin and one row of long, thin setae on posteroventral margin. Foreleg with two strong dorsal or near-dorsal setae on tibia; tarsomere 1 with triangular process, ventral excavation, and apical process. Basal margin of triangular process with dense, short, fine setae. Posteroventral setae on tarsomere 1 without curved tips. Tarsal segments twice as long as wide (e.g., in one specimen, tarsal ratio is 2.00:1.87:1.83:1.80:1.88). Midcoxa with fine setae and thick ventrolateral seta. Hind femur with tiny, blunt posteroventral setae on basal half; distribution of setae slightly tapered apically. Wing with apical margin truncate. M_2 and CuA_1 slightly sinuous, with the space between these two veins markedly large. Dense setae and darkened pigment anteriorly and posteriorly parallel to R_{4+5} , between M_1 and M_2 , extending slightly apical of M_1 . Costal and subcostal cells slightly darkened by pigment. Dense patch of fine setae between M_2 and CuA_1 , producing a faint darkening (Fig. 12). Mean costal length 0.50 wing length; range 0.48 to 0.52. Halter yellow. Tergites dark brown; tergite 1 lightened medially. Abdomen gray ventrally. Terminalia light brown.

GEOGRAPHICAL DISTRIBUTION. Known from four midelevation sites in Costa Rica.

DERIVATION OF SPECIFIC EPITHET. The name is Latin for truncate, referring to the apical margin of the wing.

HOLOTYPE. ♂, COSTA RICA: San José, 6 km N San Gerardo, 9.55°N, 83.8°W, xi.1992, P. Hanson, Malaise trap, 2800 m (LACM) [LACM ENT 050221].

PARATYPES. COSTA RICA: Cartago, 4 km NE Canon, 9.71°N, 83.94°W, 1♂, vi.1995, P. Hanson, Malaise trap, 2350 m (LACM), Genesis II, 9.71°N, 83.91°W, 1♂, ii.1995, 1♂, viii.1995, 1♂, vii.1996, P. Hanson, Malaise trap, 2350 m (LACM), Villa Mills, 9.57°N, 83.73°W, 1♂, xi-xii.1989, 1♂, iii-iv.1990, P. Hanson, Malaise trap, 3000 m (LACM); Puntarenas, Las Alturas, 8.95°N, 82.83°W, 1♂, iii-v.1995, P. Hanson, Malaise trap, 2100 m (LACM); San José, 2 km W Empalme, 9.72°N, 83.97°W, 1♂, vi.1995, 1♂, vii.1995, P. Hanson, Malaise trap, 2300 m (LACM), 20 km S Empalme, 9.63°N, 83.85°W, 2♂, viii.1988, 1♂, iii-iv.1990, P. Hanson, Malaise trap, 2800 m (LACM), Sendero el Carbon, Estación Cuerici, 5 km E Villa Mills, 9.57°N, 83.73°W, 1♂, 16.iii.1996, A. Picado, 2600 m (INBC), 6 km N San Gerardo, 9.55°N, 83.8°W, 3♂, vi.1992, 1♂, ix.1992, 1♂, xi.1992, P. Hanson, Malaise trap, 2800 m (LACM, MUCR).

KEY TO PATTERNED-WING CONICEROMYIA MALES

- 1 Anepisternum with setae 2
- Anepisternum without setae 7
- 2 Anterior of forefemur black with distinct white markings 3
- Anterior of forefemur not black with distinct white markings 4
- 3 Anterior of forefemur with large white patch extending three-quarters length of femur. Wing with oval darkening between M_2 and CuA_1 . Wing with or without lighter darkening between M_1 and M_2 (Figs. 8, 9) *C. leucomacula* new species [Costa Rica]
- Anterior of forefemur mostly black with narrow white markings. Wing with large double-lobed darkening, one lobe between anterior margin and M_2 , other lobe between M_2 and CuA_1 *C. stephensoni* Peterson [Costa Rica, Panama]
- 4 Apical half of R_{2+3} present. Costal and subcostal cell entirely darkened. Apical third of wing, except for apex, darkened. Darkening not extending to CuA_1 (Fig. 4) *C. brevivena* new species [Peru]
- Apical half of R_{2+3} not present. Both costal and subcostal cells not entirely darkened. Apex of wing darkened to CuA_1 , or not darkened. 5
- 5 Forefemur with anterior, oval, orange macula on basal half. Tarsomere 1 of foreleg without basal seta. Foretibia with posteroventral row of setae in apical half *C. aurantia* new species [Peru]
- Forefemur without orange macula. Tarsomere 1 of foreleg with basal seta. Foretibia without posteroventral row of setae in apical half 6
- 6 Darkening of wing not extending to apical margin. M_1 not thickened. Space between M_1 and M_2 not narrowed basally. Apical two-fifths of wing, except for apex, darkened *C. blomae* Peterson and Arntfield [Mexico]
- Darkening of wing extending to apical margin. M_1 thickened. Space between M_1 and M_2 narrowed basally so that veins are parallel in basal third and divergent in apical two-thirds. Apical third of wing darkened (Fig. 1) *C. apicalis* new species [Costa Rica]
- 7 Flagellomere 1 oval. M_2 and CuA_1 widely spaced and sinuous. Apical margin of wing truncate (Fig. 12) *C. truncata* new species [Costa Rica]
- Flagellomere 1 elongate-conical. M_2 and CuA_1 not widely spaced and sinuous. Apical margin of wing not truncate 8

- 8 Wing with darkening in membrane posterior to M_1 9
- Wing without darkening in membrane posterior to M_1 ; darkening, if present, restricted to wing veins 11
- 9 Foretibia without excavation with three to four dorsal to anterodorsal setae. Wing patterning along M_2 -enlarged midvein so that the darkening extends into membrane posterior to M_2 . Patterning does not extend posteriorly to CuA_1 *C. impudica* new species [Honduras]
- Foretibia excavate with one long seta. Wing patterning extends posteriorly to CuA_1 .. 10
- 10 Wing margin emarginate at M_2 and CuA_1 . Costal and subcostal cells not darkened. Darkening present in apical half of wing. Darkening not present on posterior margin *C. vespertilio* Schmitz [Brazil]
- Wing margin not emarginate; smooth and entire. Costal and subcostal cells darkened. Posterior half and apical two-fifths of wing darkened *C. maculipennis* Borgmeier [Brazil]
- 11 Wing pattern restricted to two lines of darkening: anterior margin and M_1 (Fig. 3); wing without distinct darkening between these two lines. Ventral setae on tarsomere 1 of foreleg without curved tips *C. bilineata* new species [Costa Rica]
- Wing pattern not restricted to two lines of darkening along anterior margin and M_1 . Ventral setae on tarsomere 1 with or without curved tips 12
- 12 Anterior margin of wing darkened, but membrane between anterior margin and M_1 not darkened. Wing darkened in three striae: anteroapical margin, M_1 , and M_2 (Fig. 11) *C. striativena* Borgmeier [Costa Rica, Mexico]
- Wing with membrane between anterior margin and M_1 darkened; darkening on M_2 present or absent 13
- 13 Foreleg with basal triangular process on tarsomere 1. Wing with darkened pigment along M_1 , with enlarged areas at tip of R_{4+5} and mid- M_1 . Darkening mid- M_2 present or absent. Without darkening along CuA_1 (Fig. 7) *C. impudica* new species [Honduras]
- Foreleg without basal triangular process on tarsomere 1. Wing with darkened pigment between anteroapical margin and M_1 ; along anteroapical margin, M_1 , and M_2 . Darkening along M_2 sometimes faint. Darkening along CuA_1 present or absent 14
- 14 Wing with a distinct round macula between anterior margin and M_1 ; darkening present along M_2 , although sometimes faint (Fig. 5) *C. globosa* new species

- [Costa Rica, Panama]
- Darkening between anterior margin and M_1 not distinctly round; darkening on M_2 present, although sometimes faint (Figs. 6, 10) .. 15
- 15 Tapered portion of flagellomere 1 longer than untapered portion. Tarsomere 1 of foreleg with long, thin, curve-tipped, erect, posterior setae. CuA_1 without darkening (Fig. 10) *C. setitarsalis* new species [Costa Rica]
- Tapered portion of flagellomere 1 shorter than untapered portion. Setae on posterior of tarsomere 1 of foreleg short, not curve-tipped or erect. CuA_1 faintly darkened (Fig. 6) *C. impluvia* new species [Costa Rica]

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