

A REVISION OF *PSOLOPTERA* BUTLER, INCLUDING A REDESCRIPTION OF ITS KNOWN SPECIES
(ARCTIIDAE: ARCTIINAE: EUCHROMIINI)

REBECCA B. SIMMONS

Dept. of Biology, University of North Dakota, P. O. Box 9019, Grand Forks, ND 58202, rebecca.simmons@und.nodak.edu

ABSTRACT. *Psoloptera* Butler, a genus of three species within Euchromiini, was previously described based on wing venation and overall appearance, resulting in a polyphyletic assemblage. Here, species of *Psoloptera* are redescribed and illustrated. One species, *P. aurifera* (Herrich-Schäffer), is transferred to *Calonotos* Hübner as a **new combination**. Comparisons of male and female genitalia of *Psoloptera* with other historically associated genera refute previous hypotheses on euchromiine relationships.

Additional key words: Neotropical fauna, taxonomy, mimicry

The tribe Euchromiini (Lepidoptera: Arctiidae: Arctiinae) consists of highly specialized mimics of Hymenoptera, Diptera, and Coleoptera. This specialized mimicry has confounded efforts to classify these animals; distantly related species may mimic the same model, resulting in a convergence in appearance. Historically, classifications were formed based on overall wing venation and similar coloration. This practice often results in polyphyletic genera. One such genus is *Psoloptera* Butler (Figs. 1–3).

Butler (1876) erected *Psoloptera*, and originally placed two species in the genus, *P. thoracia* (Walker) and *P. leucosticta* (Hübner). Later, Schaus (1894) described *P. basifulva*, citing that it was allied to *P. thoracia* (Walker), the type of *Psoloptera*. Hampson (1898) placed *P. aurifera* (Herrich-Schäffer) in *Psoloptera* because of similar overall appearance and wing venation.

Butler (1876) placed *Psoloptera* in the subfamily Euchromiinae (= Euchromiini of Jacobson & Weller 2002), and stated that it was closely allied to *Calonotos* Hübner and *Amycles* Herrich-Schäffer (= *Pompiliodes* Hampson 1898; = *Sphecosoma* Simmons & Weller in press), but distinct because of its plumose antennae and different hindwing venation. Hampson (1898), in his phylogeny of the Syntominiinae, placed *Psoloptera* as ancestral to *Metaloba* Hampson, and sister to *Calonotos*, *Chrysocale* Walker, *Micragyrta* Butler, *Mystrocneme* Herrich-Schäffer, *Orcynia* Walker, *Paramya* Druce (= *Methysia* Butler; Simmons & Weller in press), *Saurita* Herrich-Schäffer, and *Scena* Walker. Forbes (1939a) allied *Psoloptera* to *Saurita* based on wing venation, and noted that the genera differed in the branching of the radial veins. Though a consensus of these views indicates a close relationship with *Calonotos*, this assertion has never been examined using any characters other than external features.

This paper redescribes *Psoloptera* and revises its composition by transferring one species to *Calonotos*. The individual species are diagnosed and figured. The

genitalia of both sexes of all *Psoloptera* species are figured for the first time here as well. Relationships of *Psoloptera* and other euchromiines are discussed.



FIG. 1. Male *P. basifulva* Schaus, type specimen (USNM). **FIG. 2.** Adult *P. leucosticta* (Hübner), lectotype specimen (USNM). **FIG. 3.** Male *P. thoracia* (Walker), type specimen (BMNH).

MATERIALS AND METHODS

Standard genitalic and whole-body dissections were performed (Winter 2000). Bodies were softened in warm 10% KOH for 5–15 minutes and then cleaned (scales and viscera removed) in several rinses of 30–40%

ethanol. Structures were stained with chlorazole black E (Sigma, St. Louis, MO) dissolved in distilled water (saturated). Specimens were viewed in 30–40% ethanol. Wings were bleached and then neutralized with dilute acetic acid. They were then rinsed in distilled water, and stained overnight with Eosin Y (1% in distilled water; Fisher Scientific, Pittsburgh, PA). Permanent slide mounts of wings, abdominal pelts, appendages, genitalia and thoraces were made with Euparal (Bioquip, Rancho Dominguez, CA).

Male-female pairs of each species of *Psoloptera* (sensu Zerny 1912) were dissected to describe genitalia. These species included *P. thoracia* (Walker), *P. aurifera* (Herrich-Schäffer), *P. basifulva* Schaus, and *P. leucosticta* Hübner. Camera lucida drawings were made from these preparations. Forewing measurements were made from specimens representing each species of *Psoloptera*. Type specimens for *P. aurifera* (BMNH), *P. basifulva* (USNM), and *P. thoracia* (BMNH) were examined to verify species identifications.

Genera previously associated with *Psoloptera* were examined to identify putative sister taxa. Male and female genitalia were examined for *Calonotos phlegmon* (Cramer), *Chrysocale principalis* (Walker), *Metaloba argante* (Druce), *Methysia notabilis* (Walker), *Orcynia calcarata* Walker, *Saurita cassandra* (L.), *Scena styx* (Walker), and *Sphecosoma aliena* (Walker).

Terminology for abdominal and genital morphology follows Klots (1970) and Forbes (1939b). Collections consulted include BMNH, the Natural History Museum, London (M. Scoble), and NMNH, National Museum of Natural History, Smithsonian Institution, Washington, D.C. (D. Harvey).

RESULTS AND DISCUSSION

Species composition. *Psoloptera basifulva*, *P. leucosticta*, and *P. thoracia* are medium-sized black moths with lateral white spots on the first abdominal segment, which may mimic a wasp waist (Weller *et al.* 2000). Upon examination of *Psoloptera* species *sensu* Hampson, I found that *P. basifulva*, *P. leucosticta*, and *P. thoracia* can be distinguished from *P. aurifera* by both genitalic and nongenitalic characters. *Psoloptera aurifera* is colored metallic green and is larger than the other species of *Psoloptera*. Further, *P. aurifera* males have an enlarged juxta bearing large spines, bilobed valves, and a trilobed uncus (Fig. 4). These characters are not shared with the other members of *Psoloptera* (see following species descriptions), but are diagnostic for *Calonotos* males. Based on these observations, I propose the following change:

P. aurifera (Herrich-Schäffer), 1854 = *Calonotos aurifera* (Herrich-Schäffer), **new combination**

Phylogenetic placement. In Euchromiini, male genitalia are useful for assigning species to genera, grouping genera, and for verification of tribal affiliation. *Psoloptera* shares genital features with some other euchromiines: projections on the tegumen, slightly bilobed valves, and enlarged juxta. *Calonotos phlegmon*, *Chrysocale principalis*, and *Metaloba argante* share an enlarged juxta with spines, as in Fig. 4. This character is also present in *Macrocneme* Hübner and certainly represents a synapomorphy for this group of genera (Deitz 1994). *Methysia notabilis* appears to have highly specialized genitalia with trilobed valves and a spirelike juxta (figured in Simmons & Weller in press). Males of *Saurita cassandra*, *Scena styx*, and *Sphecosoma aliena* do not have genitalia similar to *Psoloptera* males (not figured). The valves of *Orcynia* are bilobed, while those of *Psoloptera* are unilobed; however, *Orcynia calcarata* has projections on the tegumen similar to those of *Psoloptera* and its juxta is slightly butterfly-shaped.

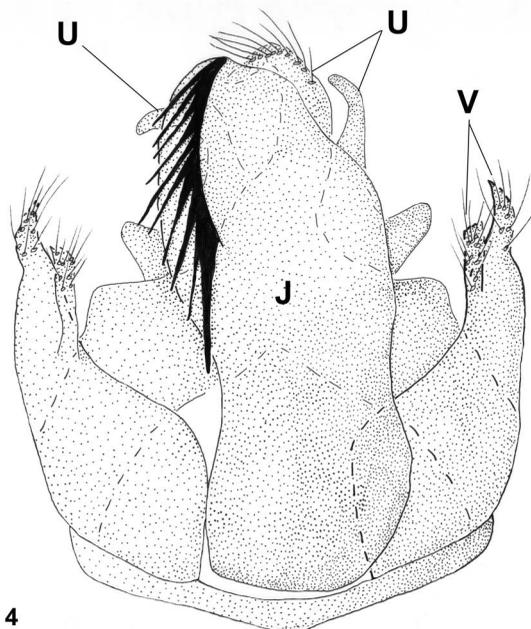


FIG. 4. *Calonotos aurifera* (Herrich-Schäffer), male genitalia. J = juxta, U = uncus, V = valve.

As in other Lepidoptera, the female genitalia of Euchromiini tend to be more conserved than those of the males. *Psoloptera* females have genitalia with two signa placed opposite each other on the corpus bursae and an accessory bursa originating from the ductus bursae (Figs. 8, 11, 14). These traits are shared with other euchromiines examined here including *Calonotos phlegmon*, *Chrysocale principalis*, *Metaloba argante*, and *Saurita cassandra*. Based on these observations, Butler's (1876) placement of *Psoloptera* in Euchromiini

is justified. *Metaloba* seems to be related to *Calonotos*, *Chrysocale*, and *Macrocneme* because of the presence of a knob-shaped projection on the antevagellar plate, which is not found in *Psoloptera*. The sister taxon of *Psoloptera* is probably not *Saurita*, as proposed by Forbes (1939a) or *Calonotos* (Butler 1876, Hampson 1898). Female *Orcynia* possess a ridged bursae, like that of *P. basifulva* (Fig. 8), but the signa differ. Although the male and female genitalia are not identical to those of *Psoloptera*, *Orcynia* seems to be the most likely candidate for the sister taxon. This relationship remains open to further exploration with other data, such as molecular or larval characters.

Taxonomy. Here, I redescribe *Psoloptera* and provide illustrations of the habitus, wing venation, and male and female genitalia of its three species.

Psoloptera Butler, 1876

Psoloptera Butler, 1876: 369.

Type: *Euchromia thoracia* Walker 1854: 243, by original designation.

Diagnosis. This genus superficially resembles many other euchromiine and ctenuchine genera (Figs. 1–3). The male genitalia of *Psoloptera*, especially the ornamented, V- or butterfly-shaped juxta is distinctive within Ctenuchini and Euchromiini. The highly sclerotized, curved uncus is also unique to *Psoloptera*.

Adult habitus (Figs. 1–3). Wings entirely black, or with scarlet at the base. Male forewing length 12–17 mm (average = 14.5 mm, SD = 1.2 mm, $n = 20$); female forewing length 12–17 mm (average = 14.9 mm, SD = 1.5 mm, $n = 11$). Antennae black. Ground color of head and thorax black or red; abdomen black with paired lateral spots on first abdominal segment.

Head and thorax. Antennae biserrate and ciliate in males; filiform and ciliate in females; ocelli present with melanized outer ring. Proboscis longer than head. Epiphyses and tibial spurs short and smooth. Tarsal claws simple.

Wings. Forewing venation (Fig. 5A): Sc sinuous, extending 3/4 of the costa. R_1 and R_2 branched, arising from discal cell. R_{3-5} stalked with R_3 arising closer to cell than R_{3-4} . M_1 arising from the cell; M_2 arising from the cell medially between M_1 and M_3 . M_3 arising from the base of the cell. CuA_1 and CuA_2 widely separated; A_1 present. Hindwing venation (Fig. 5B): Sc + R_1 absent. Rs and M_1 connate. Discal cell cross vein asymmetrical, V-shaped. M_{2+3} fused. CuA_1 and CuA_2 stalked, branching close to wing margin. A_1 and A_2 present.

Abdomen. In both sexes, second sternite with short, stubby apodemes. Structural modifications for wasp waist absent (Weller *et al.* 2000). Male lacking androconia.

Genitalia. Males (Figs. 6, 7, 9, 10, 12, 13): **Tegumen** bearing curved projections (TP) (Figs. 6, 9, 12), one on either side of uncus; uncus strongly sclerotized, hooked, setose. **Valve** (V) setose, spindle-like or slightly bilobed. **Juxta** (J) enlarged, V- or butterfly-shaped. **Aedagus** with sclerotized vesicular region (SP) (Fig. 7), cornuti (C) or both (Fig. 10), depending on the species.

Females (Figs. 8, 11, 14): **Papillae anales** (PA) laterally flattened; membrane surrounding ovipore folded; posterior apophyses (PP) long and narrow; anterior apophyses (AP) long and narrow or reduced and thickened; dorsal pheromone glands reduced. **Seventh sternite** (VII) unmodified; antevagellar plate unmodified or bearing crescent-like, heavily sclerotized lip; ostium bursae symmetrical or asymmetrical.

Ductus bursae (DB) short, membranous. **Corpus bursae** (CB) with two patches of spinose signa (S) located opposite one another.

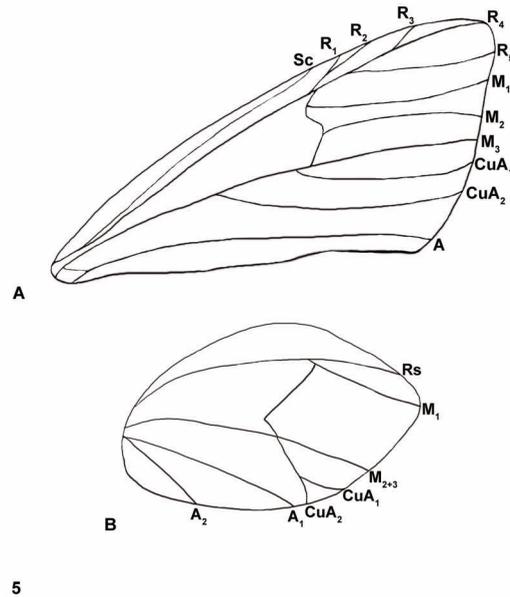


FIG. 5. Wing venation of *Psoloptera* Butler. A. Forewing. B. Hindwing. A = anal vein, CuA = cubital vein, M = medial vein, R = radial vein, Rs = radial sector, Sc = subcosta, 1–5 = vein number.

Appendix bursa (AB) from ductus bursae, irregular in shape, lacking ornamentation. **Ductus seminalis** (DS) from appendix bursa.

Discussion. Species of *Psoloptera* are easily distinguished from each other by habitus and male and female genitalia. The larval host plants and stages are not known. Tymbal organs are present, indicating that ultrasound is utilized for either defense or intraspecific communication; they do not appear to be sexually dimorphic.

Psoloptera basifulva Schaus, 1894

(Figs. 1, 6, 7, 8)

Psoloptera basifulva Schaus, 1894. Proc. Zool. Soc. Lond. 1894: 225.

Psoloptera thoracia Druce, 1884. Biol. Centr.-Am., Het. 1: 46, preoccupied by *Psoloptera thoracia* Walker (1854).

Diagnosis. Though *P. basifulva* resembles *P. thoracia*, *P. basifulva* has orange-red patches at the base of the fore- and hindwings (Fig. 1). These patches are lacking in *P. thoracia* (Fig. 3). *Psoloptera basifulva* also has an orange-red thorax and head; the head and thorax are black in *P. leucosticta* (Fig. 2).

Description. Medium-sized, black moths that have red heads and thoraces (Fig. 1).

Male. Head Red; antenna black, biserrate; frons and labial palpus black.

Thorax. Patagium, meso-, metathorax orange-red; fore, mid, and

hindlegs black with white spots on coxae and femur; tarsi black.

Wings. Forewing. Length = 14–16 mm (average = 15 mm, SD = 1 mm, n = 3). Black with basal scarlet area. Hindwing. Black, costal area slightly hyaline, basal scarlet area present.

Abdomen. Black with white spots on the first abdominal segment.

Genitalia (Figs. 6 & 7). Tegumen heavily sclerotized, bearing spirelike projections (TP), one on each side of uncus; uncus curved, setose; saccus square-shaped; valve unilobed, spatulate, setose; juxta enlarged, butterfly-shaped; base of phallus rounded; vesica with sclerotized area.

Female. As in male, except antennae filiform and ciliate; forewing length = 12–17 mm (average = 14.4 mm, SD = 1.7, n = 7).

Genitalia (Fig. 8). Papillae anales, posterior apophyses unmodified; anterior apophyses greatly reduced, nublike; S7 unmodified; antevagellar plate U-shaped, highly sclerotized; asymmetrical; ductus bursae sclerotized tube; corpus bursae membranous, slightly ridged, bearing two patches of signa near accessory bursa; ductus seminalis from middle of accessory bursa.

Type material. *Psoloptera basifulva* Schaus. The holotype male (USNM) is labeled: Peru; 520; not [? text unreadable]; Collection Wm Schaus. Type locality: Peru (Fig. 1).

Psoloptera thoracia Druce. The holotype male (BMNH) is labeled: Panama: Chiriqui; Godman-Salvin Coll. Type locality: Panama.

Specimens examined. **BRAZIL:** Amazonas: Villa Franca (BMNH: 2♂, 2♀); **BRITISH HONDURAS:** Punta Gorda (BMNH: 7♂, 5♀); **No Data** (BMNH: 1♀); **COSTA RICA:** Guapiles (USNM: 1♀); **San Mateo** (BMNH: 1♀); **Tuis** (USNM: 1♂); **GUATEMALA:** Cayuga (USNM: 8♂, 6♀; BMNH: 2♂, 2♀); **HONDURAS:** Cambre

(BMNH: 3♂, 1♀); **MEXICO:** Tabasco (BMNH: 1♂, 2♀): Teapa (USNM: 1♀); **PANAMA:** Bugaba (BMNH: 2♂); **Chiriqui** (BMNH: 1♂); **NICARAGUA:** No Data: Mobile 752 on a ship (USNM: 1♀); **PERU:** No Data (USNM: 1♀); **VENEZUELA:** Palma Sola (BMNH: 1♂); **NO DATA:** (USNM: 2♂).

Psoloptera leucosticta (Hübner, 1827)

(Figs. 2, 9, 10, 11)

Glaucoptis leucosticta Hübner, 1827. Samml. Exot. Schmett. 1: t. 162.

Psoloptera leucosticta (Hübner) Hampson 1898. Cat. Lep. Phal. 1: 285.

Diagnosis. *Psoloptera leucosticta*, unlike its congeners, does not have any red markings on its head or thorax (Fig. 2).

Description. Medium-sized, black to purplish-black moths (Fig. 2).

Male. *Head.* Black; antenna black, biserrate and ciliate; palpus black; vertex and frons with white spots.

Thorax. Patagium black with lateral white spot; mesothorax black; metathorax black; fore, mid, and hind legs black with white spots on the coxa.

Wings. Forewing. Length = 13–16 mm (average = 14.4 mm, SD = 1.1 mm, n = 8). Black, with two white spots at base. Hindwing.

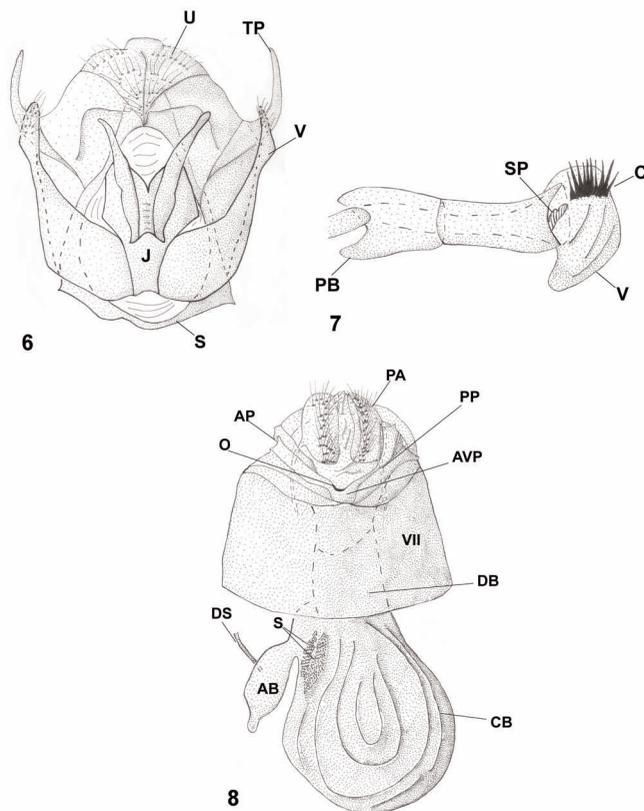


FIG. 6. *Psoloptera basifulva* Schaus, male genitalia, ventral view. J = juxta, S = saccus, TP = tegumenal process, U = uncus, V = valve. **FIG. 7.** *Psoloptera basifulva* Schaus, aedagus, lateral view. PB = phallic base, SP = sclerotized plate, V = vesica. **FIG. 8.** *Psoloptera basifulva* Schaus, female genitalia, ventral view. VII = seventh sternite, AB = accessory bursa, AP = anterior apophysis, AVP = antevagellar plate, CB = corpus bursae, DB = ductus bursae, DS = ductus seminalis, O = ostium, PA = papillae anales, PP = posterior apophysis, S = signa.

Ground color black; lighter shade of black in costal area.

Abdomen. Black. Dorsal lateral white spots on first abdominal segment. Medial white, faint patch on venter of first three abdominal segments.

Genitalia (Figs. 9 & 10). Tegumen heavily sclerotized, bearing spirelike projections, one on each side of uncus; uncus curved, setose; saccus rounded; valve terminating in blunt projection, setose; juxta elongate and narrow, V-shaped; phallus blunt at base; vesica bearing single patch of large cornuti apically.

Female. As in male, except antennae filiform and ciliate; forewing length = 15–16 mm (average = 15.5 mm, SD = 0.7 mm, $n = 2$).

Genitalia (Fig. 11). Papillae anales, posterior and anterior apophyses unmodified; S8 unmodified; antevagellar plate asymmetrical, without ornamentation; ductus bursae membranous; corpus bursae membranous, bearing two patches of signa; accessory bursa membranous, from ductus bursae; ductus seminalis from accessory bursa.

Type material. The type of *Glaucopsis leucosticta* Hübner is apparently lost. Type locality: Venezuela. The lectotype male (USNM, here designated) is labeled: 60 m. up Maroni River, *Psoloptera leucosticta* Hbn. from BM, Collection Wm Schaus. The lectotype is designated to ensure nomenclatural stability in this genus.

Specimens examined. BRAZIL: Cayenne (USNM: 1♀); BRITISH GUIANA: Rio Potaro, Tumatumari (USNM: 4♂); MEXICO: No Data (USNM: 2♂, 1♀). VENEZEULA: Maroni River (USNM: 1♂, 1♀). NO DATA (USNM: 2♂, 6♀).

***Psoloptera thoracica* (Walker, 1854)**

(Figs. 3, 12, 13, 14)

Euchromia thoracica Walker, 1854. List Lep. Ins. Br. Mus. 1: 243.

Psoloptera thoracica Butler, 1876. J. Linn. Soc. Lond. Zool 12: 369.

Diagnosis. Bright scarlet coloration is restricted to the head and thorax in *P. thoracica* (Fig. 3); in *P. basifulva*, the base of the fore and hind wings are orange-red, as well as the thorax and portions of the head (Fig. 1). *Psoloptera leucosticta* lacks red coloration altogether (Fig. 2).

Description. Medium-sized, black moths with red heads and thoraces (Fig. 3).

Male. Head. Vertex black with pair of white spots; galae scarlet; antenna black, biserrate and ciliate; palpus black.

Thorax. Patagium scarlet; mesothorax scarlet with scattered, long black scales; metathorax scarlet; fore, mid and hind legs black with white spots on coxae.

Wings. Forewing. Length = 12–17 mm (average = 14.6 mm, SD = 1.3 mm, $n = 9$). Black. Hindwing. Costal region gray, grading to black at CuA_1 and CuA_2 .

Abdomen. Pair of white lateral spots present on first abdominal segment; remainder of abdomen black dorsally; medial white spot

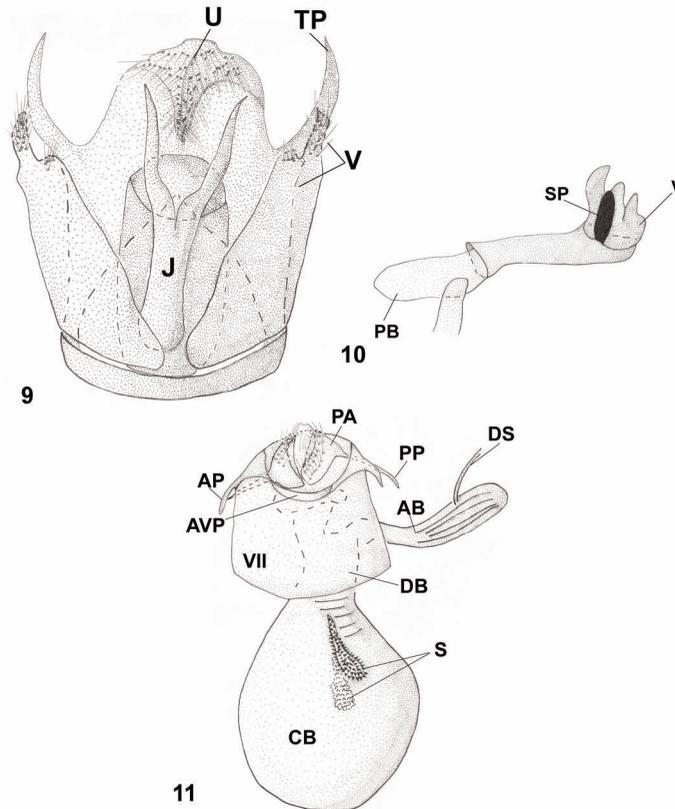


FIG. 9. *Psoloptera leucosticta* (Hübner), male genitalia, ventral view. J = juxta, TP = tegumenal process, U = uncus, V = valve. **FIG. 10.** *Psoloptera leucosticta* (Hübner), aedagus, lateral view. C = cornuti, PB = phallic base, V = vesica. **FIG. 11.** *Psoloptera leucosticta* (Hübner), female genitalia, ventral view. VII = seventh sternite, AB = accessory bursa, AP = anterior apophysis, AVP = antevagellar plate, CB = corpus bursae, DB = ductus bursae, DS = ductus seminalis, PA = papillae anales, PP = posterior apophysis, S = signa.

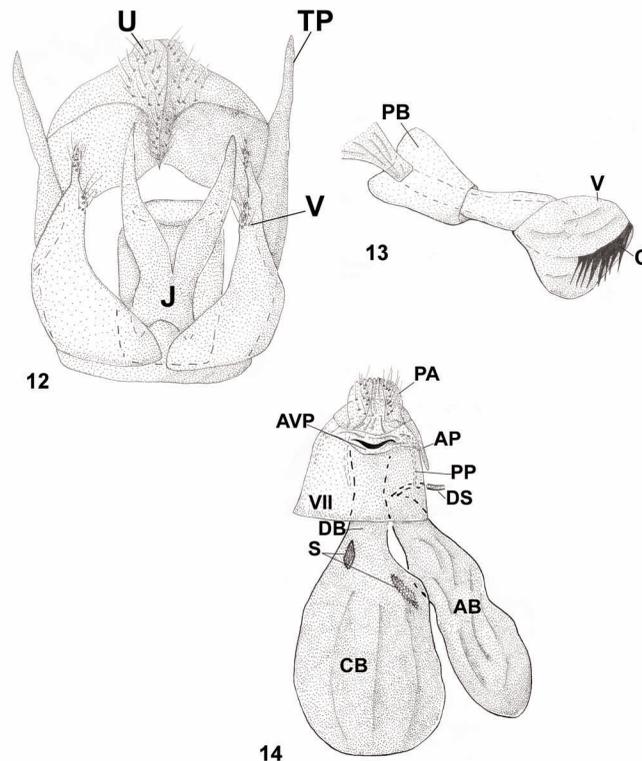


FIG. 12. *Psoloptera thoracia* (Walker), male genitalia, ventral view. J = juxta, TP = tegumenal process, U = uncus, V = valve. **FIG. 13.** *Psoloptera thoracia* (Walker), aedagus, lateral view. C = cornuti, PB = phallic base, SP = sclerotized plate, V = vesica. **FIG. 14.** *Psoloptera thoracia* (Walker), female genitalia, ventral view. VII = seventh sternite, AB = accessory bursa, AP = anterior apophysis, AVP = antevagellar plate, CB = corpus bursae, DB = ductus bursae, DS = ductus seminalis, PA = papillae anales, PP = posterior apophysis, S = signa.

present on venter of first three abdominal segments; remainder black ventrally.

Genitalia (Figs. 12 & 13). Tegumen rounded with elongate spindlelike projection on either side of uncus; uncus strongly hooked, setose; saccus rounded; valve apically narrowed, ending in rounded projections, setose; juxta with butterfly-shaped structure, strongly sclerotized; vesica with sclerotized plate and medial patch of medium-sized cornuti.

Female. As in male, except antennae filiform and ciliate; forewing length = 16 mm (average = 16 mm, SD = 0, $n = 2$).

Genitalia (Fig. 14). Papillae anales, posterior and anterior apophyses unmodified; sternite 7 unmodified; antevagellar plate with heavily sclerotized lip, symmetrical; ductus bursae membranous; corpus bursae membranous, bearing two patches of signa; accessory bursa large, irregular in shape, from ductus bursae; ductus seminalis from base of accessory bursa.

Type material. The holotype male of *Euchromia thoracia* Walker (BMNH) is labeled: Ega, Bates, 51–43. Type locality: Amazonas [Brazil].

Specimens examined. **BRAZIL:** Amazonas: Fonte Boa (BMNH: 5♂, 3♀), Pegas (BMNH: 1♂), Rio Ucayla (BMNH: 2♂), S. de Villa Franca (BMNH: 12♂), S. Paulo (BMNH: 1♀); **Cundinamarca:** Cananche (BMNH: 1♂); **Ega:** (BMNH: 4♂); **Humayta** (BMNH: 5♂, 2♀); **Lower Amazon and R. Madeira** (BMNH: 1♂); **Rio Maderia:** Allianca below S. Antonio (BMNH: 1♂); **San Juan:** Solimoens (BMNH: 1♂); **S. Paulo de Olivenca** (BMNH: 4♂, 5♀; USNM: 4♂); **Sao Paulo de Amazonas** (USNM: 2♂, 1♀); **Teffe** (BMNH: 6♂; USNM: 1♀). **COLOMBIA:** **Caqueta:** Rio Ortegua nr. Rio Peneya (USNM: 1♂, 1♀); **Chiriguana District:** Lake Sapatoza Region (BMNH: 1♂); **Llanos of Rio Meta:** S. Martin (BMNH: 1♂);

Magdalena Valley (BMNH: 1♀); **Ort.:** Medina (USNM: 1♀); **R. Cantinere:** Muzo (BMNH: 3♀); **Rio Negro** (BMNH: 1♂); **Villaricua** (USNM: 1♀). **COSTA RICA:** **Guanacaste:** Santa Rosa National Park (BMNH: 1♂, 1♀); **Turrialba** (USNM: 2♂, 1♀). **ECUADOR:** **Napo Prov.:** Yasuni Research Station, Rios Tivacuno & Tiputini, 76° 36' W, 0° 38' S, 250 m (USNM: 2♀); **Sarayacu** (BMNH: 1♂, 1♀). **GUATEMALA:** **No Data** (BMNH: 1♀); **PANAMA:** **Alhajuelo** (USNM: 1♀); **Barro Colorado Island** (USNM: 5♀); **Canal Zone** (USNM: 1♂); **Corozal** (USNM: 2♂); **Canno Saddle** (USNM: 2♀); **La Chorrera** (BMNH: 2♀); **Matachin** (BMNH: 1♀); **PortoBello** (USNM: 1♂, 2♀); **No Data** (BMNH: 1♂; USNM: 1♂). **PERU:** **Amazones:** Cavallo-Cocho (BMNH: 2♀); **Pebas:** Loreto (BMNH: 1♀); **Rio Udayali:** Contamama (BMNH: 1♀); **Tarapoto** (BMNH: 1♂); **No Data** (BMNH: 1♂). **VENEZUELA:** **Aroa** (USNM: 6♂, 5♀); **La Cruces Colon.** (BMNH: 2♀); **Las Quigas:** San Eseban Valley (8♂; 3♀); **Las Quigas nr. San Esteban** (BMNH: 3♂, 2♀); **Palma Sol** (BMNH: 1♂); **San Esteban** (BMNH: 11♂, 3♀); **Valencia** (BMNH: 1♂); **Valera** (USNM: 1♂); **No Data** (BMNH: 2♂, 1♀). **NO DATA:** (BMNH: 1♂; USNM: 1♂, 1♀).

ACKNOWLEDGEMENTS

Revisionary work is impossible without cooperation from collections and associated curators. I would like to thank Dr. Donald Harvey (USNM), Mr. Martin Honey (BMNH) and Dr. Malcolm Scoble (BMNH) for access and loans of specimens, as well as hospitality during museum visits. I would like to thank Drs. William Miller and Susan Weller and Ms. Michelle DaCosta for helpful discussion and suggestions during the formation of this manuscript. Ms. DaCosta also provided editorial aid. Funding

for associated travel was provided by ND-EPSCor and University of North Dakota, Dept. of Biology.

LITERATURE CITED

- BUTLER, A. G. 1876. Notes on the Lepidoptera of the family Zygaenidae, with descriptions of new genera and species. *J. Linn. Soc. Lond. Zool.* 12: 342–407.
- DIETZ, R. E. 1994. Systematics and biology of the genus *Macrocneme* Hübner (Lepidoptera: Ctenuchidae). University of California Press, Berkeley.
- FORBES, W. T. M. 1939a. The Lepidoptera of Barro Colorado Island, Panama. *Bulletin of the Museum of Comparative Zoology at Harvard College.* 85: vii + 97–322, 8 plates.
- FORBES, W. T. M. 1939b. The muscles of the lepidopterous male genitalia. *Ann. Entomol. Soc. Amer.* 32: 1–10.
- HAMPSON, G. F. 1898. Syntomidae. Catalogue Lepid. Phalaenae in the British Museum. Vol. I. Trustees of the British Museum, London.
- JACOBSON, N. J. & S. J. WELLER. 2002. A cladistic study of the tiger moth family Arctiidae (Noctuoidea) based on larval and adult morphology. Thomas Say Monograph Series, Entomol. Soc. America.
- KLOTS, A. B. 1970. Lepidoptera, pp. 115–130. *In* Tuxen, S. L. (ed.), *Taxonomist's glossary of genitalia in insects*, 2nd ed. Munksgaard, Copenhagen.
- SCHAUS, W. 1894. On new species of Heterocera from Tropical America. *Proc. Zool. Soc. Lond.*: 225–243.
- SIMMONS, R. B. & S. J. WELLER. 2006. Review of the *Sphecosoma* genus group using adult morphology (Lepidoptera: Arctiidae). Thomas Say Monograph Series. Entom. Soc. America, 108 pp., 108 figs.
- WALKER, F. 1854. Lepidoptera Heterocera, Part 1. List of the specimens of lepidopterous insects in the collection of the British Museum. 278 pp.
- WELLER, S. J., R. B. SIMMONS, R. BOADA, & W. E. CONNER. 2000. Abdominal modifications occurring in wasp mimics of the Ctenuchine-Euchromiine clade (Lepidoptera: Arctiidae). *Ann. Entomol. Soc. Am.* 93: 920–928.
- WINTER, W. D. 2000. Basic techniques for observing and studying moths and butterflies, Lepidopterists' Society.

Received for publication 25 October 2005; revised and accepted 7 July 2006