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REVIEW OF THE GENUS *METACOSMUS* COQUILLET
(DIPTERA: BOMBYLIIDAE: TOMOMYZINAE) WITH
DESCRIPTIONS OF NEW SPECIES, AND DISCUSSION OF AN
INTERESTING TERGAL FEATURE FOUND IN THE SUBFAMILY

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Cover photo: Mating pair of *Metacosmus mancipennis* Coquillett from Cape May, New Jersey. Photo © Seth Ausubel.

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Review of the genus *Metacosmus* Coquillett (Diptera: Bombyliidae: Tomomyzinae) with descriptions of new species, and discussion of an interesting tergal feature found in the subfamily

NEAL L. EVENHUIS

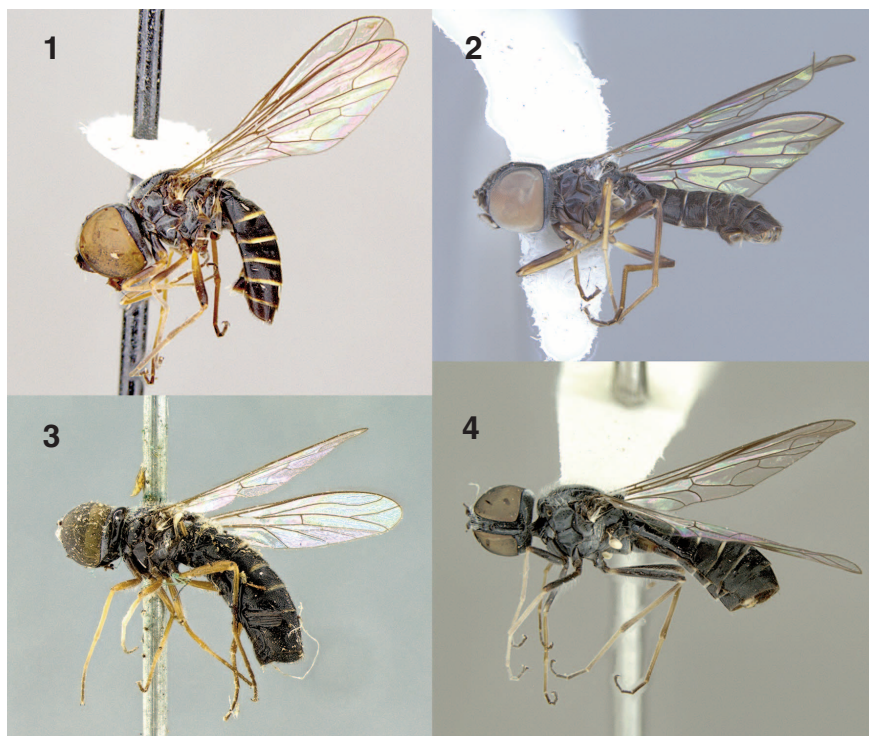
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Abstract. The genus *Metacosmus* Coquillett is reviewed, including descriptions and illustrations of eleven new species: *Metacosmus costaricensis* Evenhuis & Hanson, **sp. nov.**, *M. geronimo* Evenhuis, **sp. nov.**, *M. grandis* Evenhuis, **sp. nov.**, *M. halli* Evenhuis, **sp. nov.**, *M. hidalgo* Evenhuis, **sp. nov.**, *M. marstoni* Evenhuis, **sp. nov.**, *M. mexicanus* Evenhuis, **sp. nov.**, *M. painteri* Evenhuis, **sp. nov.**, *M. sabroskyi* Evenhuis, **sp. nov.**, *M. yanegai* Evenhuis, **sp. nov.**, and *M. zircon* Evenhuis, **sp. nov.** Keys to genera of New World Tomomyzinae and species of *Metacosmus* are given. An unusual tergal character consisting of foveate or rugose ovular areas found laterally on tergites III and IV in genera of Tomomyzinae is discussed and illustrated.

INTRODUCTION

The bombyliid subfamily Tomomyzinae is comprised of 55 species of rather small-sized bee flies with a pipunculid-like appearance found in six genera and two subgenera distributed in the New World, the Afrotropical and Australian Regions. The recent finding of a new species of *Metacosmus* Coquillett, marking the first record of the genus in Costa Rica, prompted me to review the genus *Metacosmus* as a whole. The results herein include descriptions of 11 new species: *Metacosmus costaricensis* Evenhuis & Hanson, **sp. nov.**, *M. geronimo* Evenhuis, **sp. nov.**, *M. grandis* Evenhuis, **sp. nov.**, *M. halli* Evenhuis, **sp. nov.**, *M. hidalgo* Evenhuis, **sp. nov.**, *M. marstoni* Evenhuis, **sp. nov.**, *M. mexicanus* Evenhuis, **sp. nov.**, *M. painteri* Evenhuis, **sp. nov.**, *M. sabroskyi* Evenhuis, **sp. nov.**, *M. yanegai* Evenhuis, **sp. nov.**, and *M. zircon* Evenhuis, **sp. nov.** A revised key to *Metacosmus* is given, including Chilean species described by Hall (1976) that were missed by subsequent workers when discussing genera and distributions of Tomomyzinae.

During examination of species, a unique and unusual granular to rugose patch occurring laterally on tergites III and IV was found. Examination of other genera of Tomomyzinae showed these patches to be present in all genera of the subfamily except *Pantostomus* Bezzi and *Tomomyza* Bezzi. Their function is unknown.

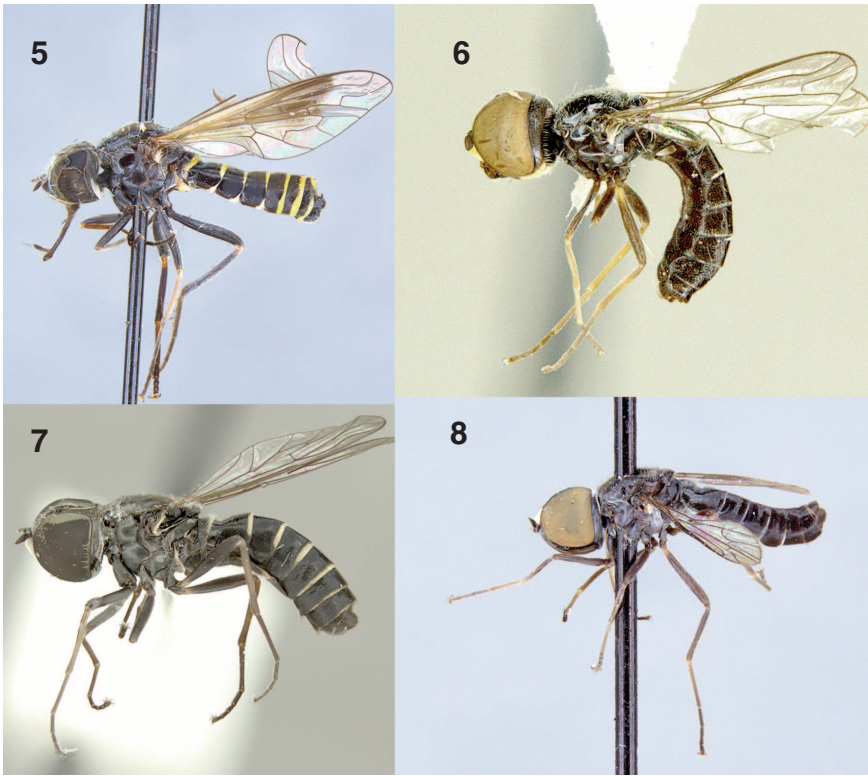


Figures 1–4. *Metacosmus* habitus, lateral. 1. *Metacosmus chilensis*; 2. *M. costaricensis* Evenhuis & Hanson, sp. nov.; 3. *M. exilis*; 4. *M. geronimo* Evenhuis, sp. nov.

MATERIAL AND METHODS

Specimens examined in this study derive from or are deposited in the following collections [abbreviations follow Evenhuis (2025)]: BMNH (the Natural History Museum, London); BPBM (Bernice Pauahi Bishop Museum, Honolulu); CAS (California Academy of Sciences, San Francisco); CDFA (California Department of Food and Agriculture, Sacramento); MEL (Museo Entomológico de León, León, Nicaragua); MEUC (Museo Entomologica de la Universidad de Chile, Santiago); MZUCR (Museo de Zoología, Universidad de Costa Rica, San Jose); UCR (University of California, Riverside); USNM (United States National Museum of Natural History, Washington, D.C.).

Morphological terminology follows Cumming & Wood (2017). Images were accomplished by obtaining a series of stacked images using a Leica M165C stereo dissecting scope via the Leica Microsystems LASX Multifocus software and using Zerene Stacker[®] stacked focusing software (v. 1.04) (Zerene Systems, LLC, Richmond, Washington, USA) to align and stack-focus each final image. Genitalic preparations were made by macerating parts in either hot lactic acid (30 second bursts in a microwave), washing in distilled water, and dissecting and examining in concave slides in a medium of Purell[®] Hand sanitizer mixed with



Figures 5–8. *Metacosmus* habitus, lateral. 5. *Metacosmus grandis* Evenhuis, sp. nov.; 6. *M. halli* Evenhuis, sp. nov.; 7. *M. hidalgo* Evenhuis, sp. nov.; 8. *M. mancipennis*.

a drop of 95% ethanol; male genitalia are preserved in microvials pinned below the specimen; female genitalia are mounted on slides.

TAXONOMY

While some workers (Hull 1973, Hall 1976, Theodor 1983), treated the genera including and related to *Metacosmus* within the Cylleniinae following Bezzi (1924), Evenhuis (1991) placed them in the subfamily Tomomyzinae; and Yeates (1994) confirmed that subfamilial status, which is followed herein. Evenhuis & Greathead (1999) gave the current composition of the Tomomyzinae consisting of six genera (two containing one subgenus each) found in the Nearctic (*Amphicosmus* Coquillett, *Metacosmus* Coquillett, and *Paracosmus* Osten Sacken), the Neotropics (*Metacosmus*), the Afrotropics (*Pantostomus* Bezzi, *Tomomyza* Wiedemann) and Australia (*Docidomyia* White). A key to the genera of Tomomyzinae in the New World is presented here based on re-examination of the constituent genera and subgenera.

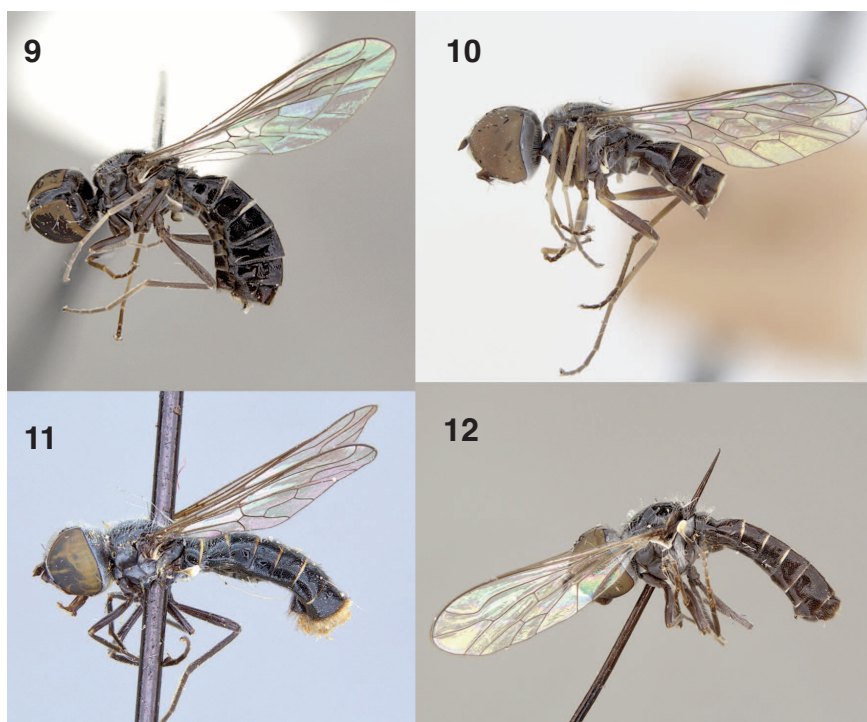
KEY TO GENERA OF NEW WORLD TOMOMYZINAE

1. Wing with two submarginal cells; apex of antennal flagellomere truncate, with minute point subapicodorsally (Fig. 16); ocellar tubercle situated at or just in front of level of hind margin of eyes, not well forward on frons (Fig. 18) ***Paracosmus* Osten Sacken ... 2**
- . Wing with two or three submarginal cells, if two submarginal cells, antennal flagellomere tapering to apex, without minute point subapicodorsally (Fig. 17); ocellar tubercle(s) situated well forward of hind margin of eyes (Fig. 18) **3**
2. Head and abdomen yellow with contrasting brown to orange markings; anterior ocellus rudimentary or lacking subgenus ***Atherosia* Hull**
- . Head and abdomen predominantly black or mixtures of black and reddish orange; anterior ocellus normal, not reduced or lacking subgenus ***Paracosmus* Osten Sacken**
3. Wing with two submarginal cells; median ocellus on a tubercle or bulge separate from lateral ocelli (Fig. 18); male genitalia with epandrium having well developed process projecting ventrocaudally, palps short, not exerted from oral margin ***Metacosmus* Coquillett**
- . Wing with three submarginal cells; median ocellus not on a separate tubercle or bulge from lateral ocelli; male genitalia with epandrium lacking well developed ventrocaudal process, palps clearly visible, well exerted from oral margin ***Amphicosmus* Coquillett**

Genus *Metacosmus* Coquillett

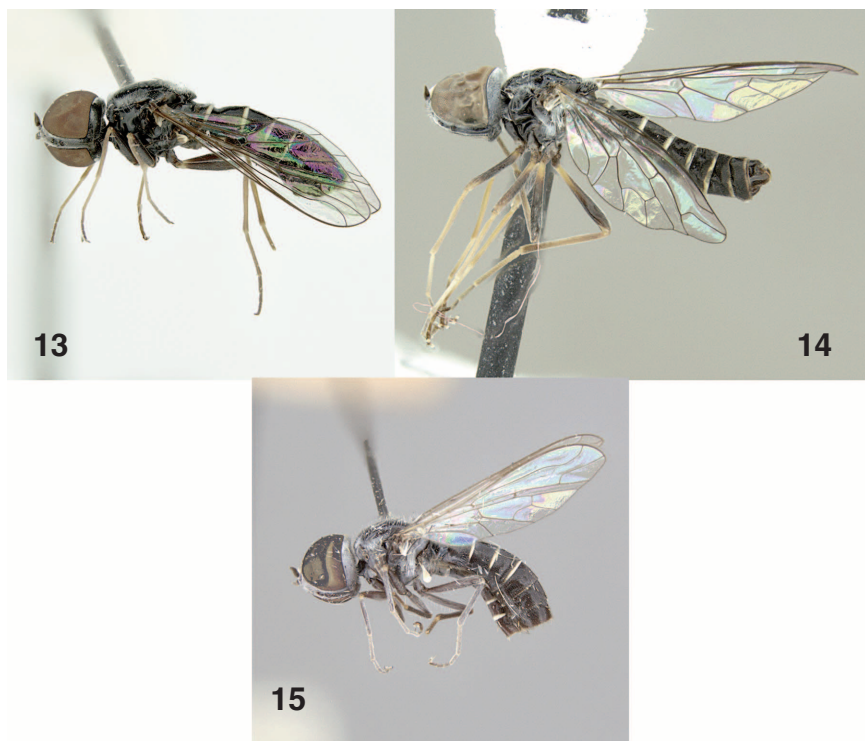
Metacosmus Coquillett, 1891: 220. Type species: *Metacosmus exilis* Coquillett, 1891, by monotypy. Bigot 1892: 335; Coquillett 1894: 92, 1910a: 41, 1910b: 568; Aldrich 1905: 243; Williston 1908: 217; Cockerell 1909: 54, 1914: 234; Kertész 1909: 111; Smith 1910: 747; Becker 1913: 497; Woodworth 1913: 152; McAtee 1918: 91; Cole 1922: 23, 1923: 311; Bezzi 1924: 6; Cole *et al.* 1924: 190; Johnson 1925: 111; Curran 1934: 200; Paramonov 1939: 31; Neave 1940: 125; Brimley 1942: 170; Friend 1942: 170; Melander 1950: 156; Wray 1950: 79, 1967: 29; Brues *et al.* 1954: 337; Hall 1957: 141, 1969: 5, 1976: 125, 1981: 591; Hardy & Kohn 1964: 302; Painter & Painter 1965: 427; Blades & Maier 1968: 68; Cole & Schlinger 1969: 242; Hull 1973: 295; U.S. Department of the Interior 1973: V-426; Tabet 1974: 20, 1979: 219; Painter *et al.* 1978: 23; Arnaud 1979: 217; Frommer 1981: 36; Theodor 1983: 148; Tabet & Hall 1984: 81, 1987: 75; Zaitzev 1985: 472; Yeates 1994: 158, 1996: 407; Evenhuis & Greathead 1999: 285; Evenhuis 1991: 51, 2018: 37; Poole 1996: 72; Arnett, 2000: 879; Skevington *et al.* 2001: 109; Ávalos Hernández 2007: 145; Kits *et al.* 2008: 4; Adams *et al.* 2010: 30; Buchmann *et al.* 2010: 23; Rafael & Skevington 2010: 793.

Included species: *Metacosmus chilensis* Hall, 1976, *M. costaricensis* Evenhuis & Hanson, **sp. nov.**, *M. exilis* Coquillett, 1891, *M. geronimo* Evenhuis, **sp. nov.**, *M. grandis* Evenhuis, **sp. nov.**, *M. halli* Evenhuis, **sp. nov.**, *M. hidalgo* Evenhuis, **sp. nov.**, *M. mancipennis* Coquillett, 1910, *M. marstoni* Evenhuis, **sp. nov.**, *M. mexicanus* Evenhuis, **sp. nov.**, *M. nitidus* Cole, 1922, *M. painteri* Evenhuis, **sp. nov.**, *M. sabroskyi* Evenhuis, **sp. nov.**, *M. schlingeri* Hall, 1976, *M. yanegai* Evenhuis, **sp. nov.**, and *M. zircon* Evenhuis, **sp. nov.**



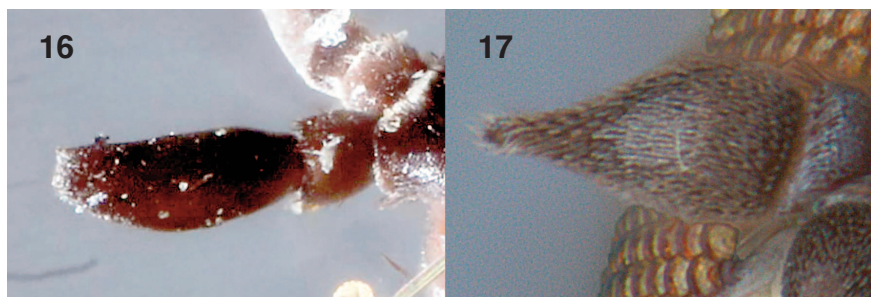
Figures 9–12. *Metacosmus* habitus, lateral. 9. *Metacosmus marstoni* Evenhuis, sp. nov.; 10. *M. mexicanus* Evenhuis, sp. nov.; 11. *M. nitidus*; 12. *M. painteri* Evenhuis, sp. nov.

Diagnosis. Small black flies (usually 4.0–6.0 mm) with a pipunculid-like appearance owing to the head dominated by large compound eyes and having a narrow abdomen. Slight sexual dimorphism is evident with the frons narrow in males and slightly wider in females. Body often shiny, but certain areas may be covered with pollinosity to varying degrees. Ocelli placed forward on the frons on two separate tubercles, anterior one hemispherical harboring the medial, and the posterior one larger, spherical to elongate ellipsoid containing the two very small lateral ocelli; hind margin of eyes entire, not indented; face produced, usually past the level of the antennal pedicel; antennal flagellomere often conical, some with thinner apical portion; proboscis often short, contained within the oral margin (but long in *M. grandis*, sp. nov.); palps short, single-segmented, visible only when proboscis is exerted. Mesonotum relatively flat, with fine erect hairs anteriorly and dorsally and wavy tomentum dorsally; scutellum hemispherical, with vestiture as on mesonotum; pleural sclerites shiny or pollinose, or combinations of both (often a species-specific character). Wing hyaline (except in *M. grandis*) and costa complete; with two submarginal cells (cells r_{2+3} and r_4); R_{2+3} sinuous and curved apically to wing margin; crossvein r-m placed near to or just beyond middle of cell dm (well beyond in *M. mexicanus*, sp. nov. and *M. grandis*, sp. nov.); anal cell narrowly open in wing margin by width subequal to width of cell r_5 (most species)

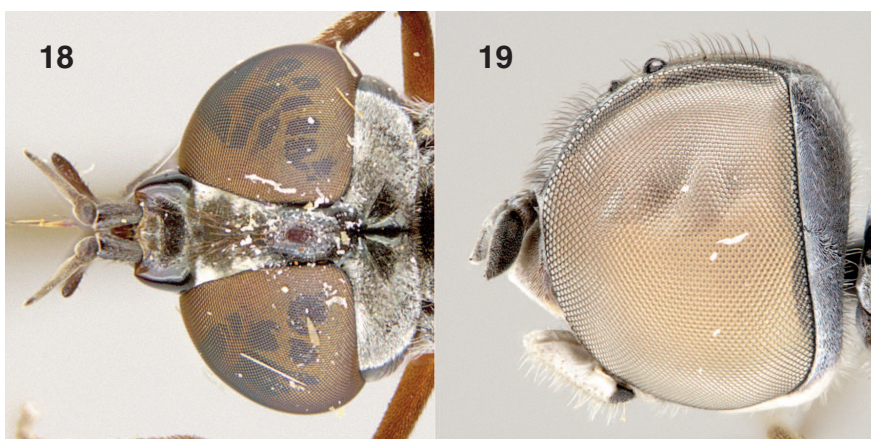


Figures 13–15. *Metacosmus* habitus, lateral. **13.** *Metacosmus sabroskyi* Evenhuis, sp. nov.; **14.** *M. yanegai* Evenhuis, sp. nov.; **15.** *M. zircon* Evenhuis, sp. nov.

or widely open, width much more than width of cell r5 (e.g., *M. manicpennis*); anal lobe small, narrow but normal in shape with wing margin rounded, or greatly reduced (extremely narrowed) with wing margin straight; alula absent. Legs gracile, femora without strong bristles, but some species with thin hairs ventrally; pulvilli as long as claws; all claws of equal size. Abdomen shiny, with minute rugose sculpturing or lacking sculpturing; tergites compressed laterally (less so in females), often with thin line of yellow along posterior margin; tergite II often with constriction dorsally (best seen in lateral view; Fig. 111); tergites III and IV with patches of foveate to micro-rugose sculpturing (Figs. 122–136). Male genitalia capsule-like in general appearance owing to epandrium and gonocoxae kept closed; epandrium with enlarged area ventrocaudally (in lateral view); phallic complex with long aedeagus contained within conical parameral sheath, and a relatively small aedeagal apodeme. Female genitalia uniform in appearance among species (and among many tomomyzine genera); genital fork V-shaped to U-shaped; spermathecal ducts long, thin; sperm pump short, often with disc-shaped basal and apical valves; apical sperm duct sometimes with numerous glandular trichomes adjacent to apical valve of sperm pump; spermathecal reservoirs sclerotized, elongate ovular, subequal in length to sperm pump; or (in *M. costaricensis* and *M. yanegai*) very long, vermiform, lightly sclerotized.



Figures 16–17. Antennae, lateral view. 16. *Paracosmus morrisoni* Osten Sacken; 17. *Metacosmus mancipennis* Cole.

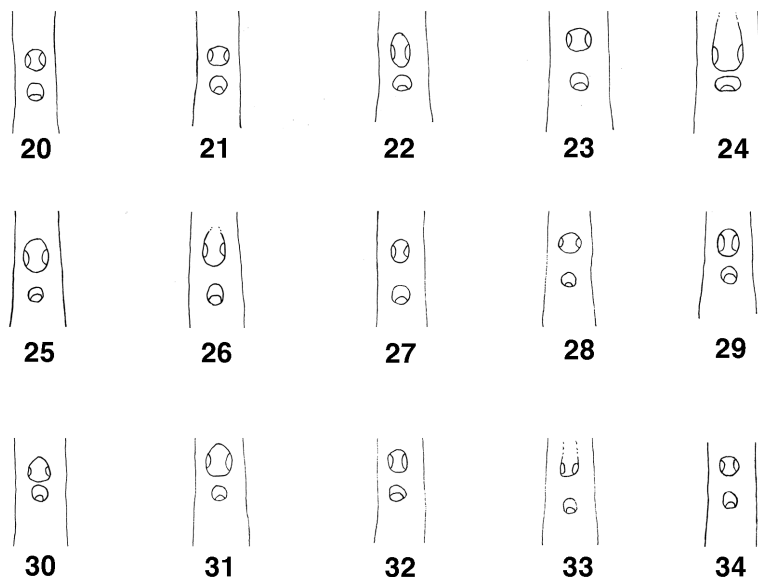


Figures 18–19. Ocular tubercles. 18. *Paracosmus* sp. (Mexico), female, dorsal view; 19. *Metacosmus costaricensis* Evenhuis & Hanson, sp. nov., female, lateral view.

Taxonomic background

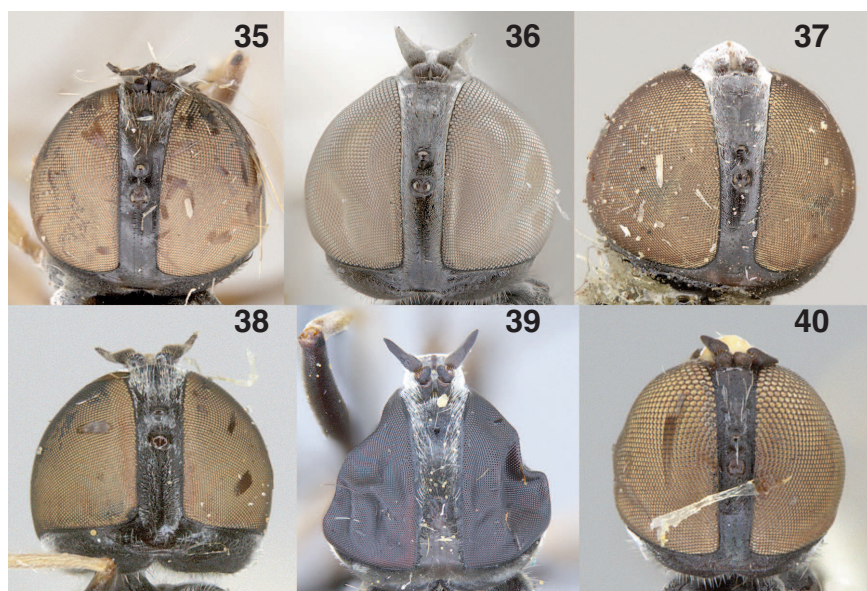
Since the proposal of *Metacosmus* by Coquillett (1891) for the southern Californian *Metacosmus exilis* Coquillett, little revisionary work has been conducted on the genus. Coquillett (1910a) added an eastern U.S. species, *M. mancipennis*; Cole (1922) added the species *M. nitidus*; Melander (1950) gave a key to species known at the time; and Hall (1976) described an additional two species from central western Chile: *M. chilensis* and *M. schlingeri*, which are the only known species south of the Equator.

Despite the two Chilean species described by Hall (1976), the genus was listed as only occurring in the Nearctic by Yeates (1996). Examination of one of the two species described by Hall (1976) (*M. chilensis*) shows it to be a true *Metacosmus*, so the genus is another example of a disjunct distribution in North America and Chile—*Triploecheus* Edwards, *Aphoebantus* Loew, and *Dolichomyia* Wiedemann are three further examples of this type of distribution in the Bombyliidae (cf. Hall 1976)—and it is the only representative of the subfamily Tomomyzinae in the Neotropical Region.



Figures 20–34. Schematic representation of location, shape, and size of *Metacosmus* anterior (lower of the pair) and posterior (upper) ocellar tubercles; **20.** *Metacosmus chilensis*; **21.** *M. costaricensis* Evenhuis & Hanson, sp. nov., holotype; **22.** *M. exilis*, paralectotype; **23.** *M. geronimo* Evenhuis, sp. nov., holotype; **24.** *M. grandis* Evenhuis, sp. nov., holotype; **25.** *M. halli* Evenhuis, sp. nov., holotype; **26.** *M. hidalgo* Evenhuis, sp. nov., holotype; **27.** *M. mancipennis*; **28.** *M. marstoni* Evenhuis, sp. nov., holotype; **29.** *M. mexicanus* Evenhuis, sp. nov., holotype; **30.** *M. nitidus*; **31.** *M. painteri* Evenhuis, sp. nov., holotype; **32.** *M. sabroskyi* Evenhuis, sp. nov., holotype; **33.** *M. yanegai* Evenhuis, sp. nov., holotype; **34.** *M. zircon* Evenhuis, sp. nov., holotype.

The recent discovery of a new species of *Metacosmus* from Costa Rica prompted me to review the genus and describe new species that have been available for study. The presence of *Metacosmus* in Costa Rica gives hope that other representatives of the genus may be found in other Neotropical countries, especially those with arid or semi-arid regions, however limited in overall acreage. I would hypothesize that, with rigorous collecting for the genus, other specimens may be ultimately found in the drier regions of Guatemala, El Salvador, Ecuador, Peru, Argentina, and Brazil. It could be that many collectors have not ventured into these drier areas (probably because they are thought to have a paucity of taxa) since the temptation would be to try and find as many new taxa as possible in the more moist tropics and Amazonian rainforests of South America, areas of which harbor the vast majority of undescribed species of insects in the Neotropics. My experience in collecting tomomyzines in the southwestern United States is that they tend to fly low to the ground, a habit that may be a reason why they are not collected much by Malaise traps. Unless the traps have mesh extending to the ground (cf. Fig. 149), these tomomyzine flies will merely fly beneath the mesh.

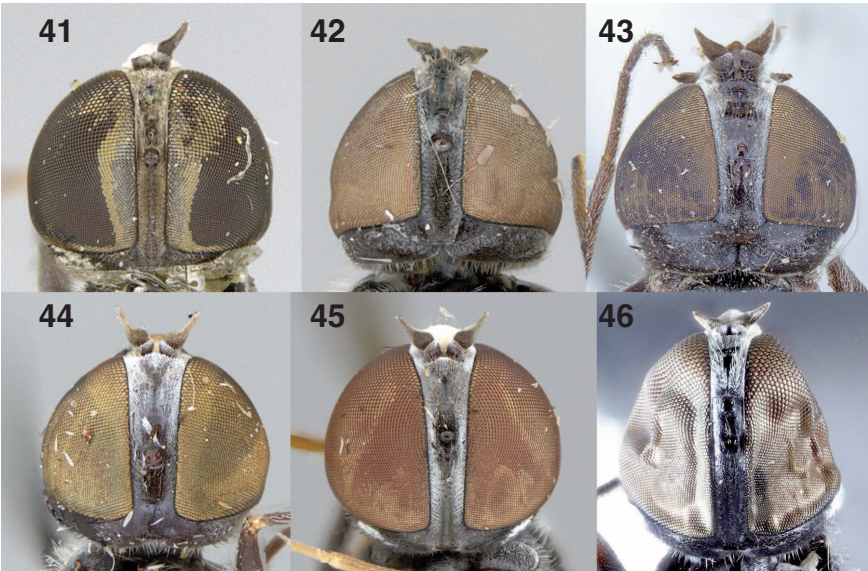


Figures 35–40. *Metacosmus* heads, dorsal. **35.** *Metacosmus chilensis*; **36.** *M. costaricensis* Evenhuis & Hanson, sp. nov.; **37.** *M. exilis*; **38.** *M. geronimo* Evenhuis, sp. nov.; **39.** *M. grandis* Evenhuis, sp. nov.; **40.** *M. halli* Evenhuis, sp. nov.

KEY TO SPECIES OF *METACOSMUS* COQUILLETT¹

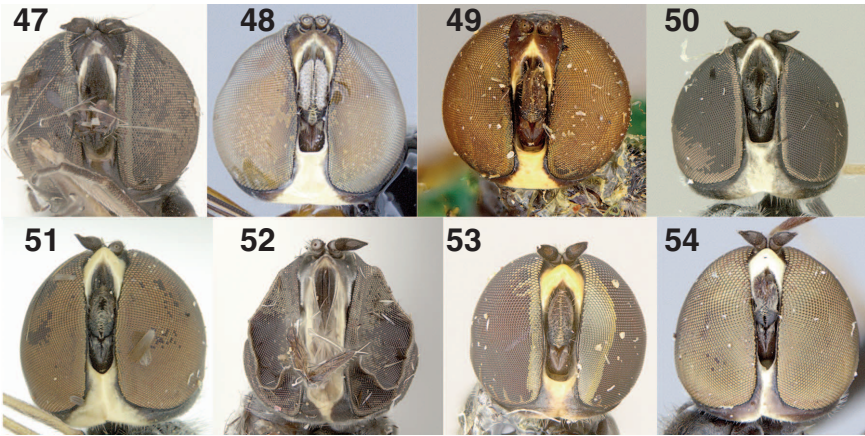
1. Wing vein R_{2+3} straight, parallel with R_4 before turning at an almost 90° angle toward wing margin (Fig. 90); face and mentum all shining black; anterior ocellar tubercle in close association with hind tubercle (Figs. 30, 43) *Metacosmus nitidus* Cole
- . Wing vein R_{2+3} curving toward R_4 before curving toward wing margin, not upcurved 90°; face and or mentum with some yellow to white color; anterior ocellar tubercle with median ocellus far removed from posterior tubercle containing lateral ocelli (e.g., Fig. 22) **2**
2. Wing with brown infuscation basoanteriorly (Figs. 83, 84); crossvein r-m at apical three-fourths of cell dm (Figs. 83, 84); proboscis extending well beyond oral margin (Fig. 5); large species (ca. 8 mm) ... (southern Mexico) *Metacosmus grandis* Evenhuis, sp. nov.
- . Wing hyaline, without such infuscation; crossvein r-m at or slightly beyond middle of cell dm (two-thirds beyond in *M. mexicanus* sp. nov.); proboscis short, not extending beyond oral margin; smaller species (ca. 3–5 mm) **3**
3. Female **4**
- . Male **15**

¹ *Metacosmus schlingeri* was not available for study and thus could not be included in the key. However, it is easily separated from the only other Chilean species (*M. chilensis* Hall) by the all black legs.



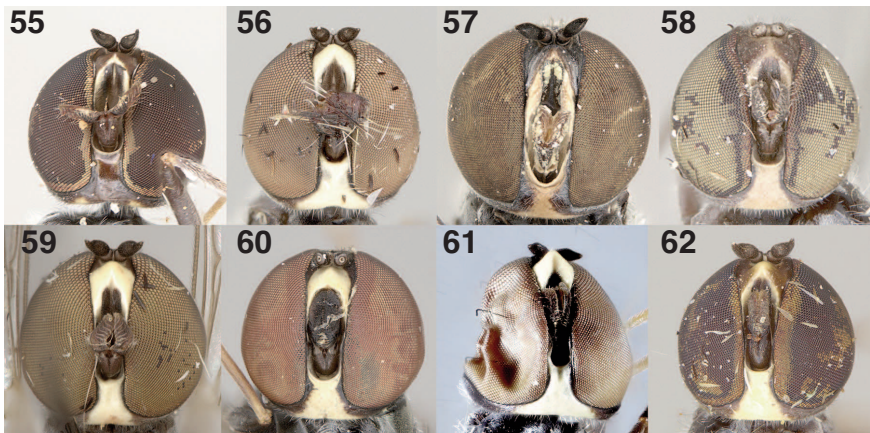
Figures 41–46. *Metacosmus* heads, dorsal. **41.** *Metacosmus hidalgo* Evenhuis, sp. nov.; **42.** *M. mexicanus* Evenhuis, sp. nov.; **43.** *M. nitidus*; **44.** *M. painteri* Evenhuis, sp. nov.; **45.** *M. sabroskyi* Evenhuis, sp. nov.; **46.** *M. yanegai* Evenhuis, sp. nov.

- 4. Face prominently yellow, little brown color evident (Fig. 60)
..... *Metacosmus sabroskyi* Evenhuis, **sp. nov.**
- . Face with only a thin line of yellow on rim of oral margin or medially (e.g., Fig. 59),
otherwise brown to black **5**
- 5. Mentum broadly yellow (Fig. 48); anal lobe normal, rounded, may be narrow, but not
extremely reduced (Fig. 80) **8**
- . Mentum predominantly brown, with yellow reduced to thin medial line or small
spots (Fig. 55); anal lobe extremely reduced (cf. Figs 78, 79) **6**
- 6. Mentum shiny brown with paired tiny yellow spots laterally (Fig. 55) ... (Guerrero)
..... *Metacosmus marstoni* Evenhuis, **sp. nov.**
- . Mentum brown with yellow line medially **7**
- 7. Legs testaceous, some brown on femur ... (central Chile)... *Metacosmus chilensis* Hall
- . Legs black ... (eastern and southern United States)
..... *Metacosmus mancipennis* Coquillett
- 8. Inner surface of labellum predominantly gray to whitish (some specimens of *M.*
yanegai, sp. nov. brownish) **9**
- . Inner surface of labellum brown to yellow **10**



Figures 47–54. *Metacosmus* heads, ventral. **47.** *Metacosmus chilensis*, female; **48.** *M. costaricensis* Evenhuis & Hanson, sp. nov., female; **49.** *M. exilis*, paralectotype female; **50.** *M. geronimo* Evenhuis, sp. nov., female; **51.** *M. geronimo* Evenhuis, sp. nov., male; **52.** *M. grandis* Evenhuis, sp. nov., male; **53.** *M. hidalgo* Evenhuis, sp. nov., male; **54.** *M. mancipennis*, male.

9. Wing cell m1 (second posterior) short than cell dm (Fig. 80); halter knob with brown dorsally; anepisternum subshining (Fig. 64); scutum with fairly dense coppery yellow tomentum anterolaterally ... (Costa Rica) *Metacosmus costaricensis* Evenhuis & Hanson, **sp. nov.**
- . Wing cell m1 longer than cell dm (Fig. 93); halter knob yellow, brown color of halter present only at apex of halter stem; anepisternum shining (Fig. 76); scutum with less dense and shorter white tomentum anterolaterally ... (Utah) *Metacosmus yanegai* Evenhuis, **sp. nov.**, in part
10. Legs with at least some yellow, orange, or testaceous color on femur or tibia ... **11**
- . Femora, tibiae, and apical tarsomeres black ... (New Mexico) *Metacosmus zircon* Evenhuis, **sp. nov.**
11. Yellowish color on posterior margin of tergites extending to lateral margin (e.g., Fig. 4) **12**
- . Yellowish color on posterior margin of tergites present only medially, lateral margins of tergites black (e.g., Fig. 3) **14**
12. Crossvein r-m at apical two-thirds of cell dm (Fig. 89); halter knob with large brownish spot or smear; Wing Interference Pattern (WIP) with golden blotch in radial field surrounded by blue (Fig. 105) ... (central Mexico) *Metacosmus mexicanus* Evenhuis, **sp. nov.**
- . Crossvein r-m slightly beyond middle of cell dm (Fig. 82); halter knob without brown; Wing Interference Pattern (WIP) with radial field unicolorous, not surrounded by blue (Fig. 98) (southwestern United States) **13**



Figures 55–62. *Metacosmus* heads, ventral. **55.** *Metacosmus marstoni* Evenhuis, sp. nov., female; **56.** *M. mexicanus* Evenhuis, sp. nov., male; **57.** *M. nitidus*, male; **58.** *M. painteri* Evenhuis, sp. nov., male; **59.** *M. painteri* Evenhuis, sp. nov., female; **60.** *M. sabroskyi* Evenhuis, female; **61.** *M. yanegai* Evenhuis, sp. nov., male; **62.** *M. zircon* Evenhuis, sp. nov., female.

13. Anal lobe narrow, margin straight, not rounded (Fig. 82); Wing Interference Pattern (WIP) green to blue-green on apical half (Fig. 98); flagellomere tapered to narrow apical neck; halter knob yellow ... (Arizona) *Metacosmus geronimo* Evenhuis, **sp. nov.**
 - . Anal lobe with rounded wing margin (Fig. 93); Wing Interference Pattern (WIP) brassy golden on apical half (Fig. 109); flagellomere conical, tapering to pointed apex; halter knob white ... (Utah) *Metacosmus yanegai* Evenhuis, **sp. nov.**, in part
14. Pleura gray pollinose (Fig. 74) ... (New Mexico) *Metacosmus painteri* Evenhuis, **sp. nov.**
 - . Pleura predominantly bare, shining brown (Fig. 65) ... (California) *Metacosmus exilis* Coquillett
15. Anal lobe extremely reduced, narrow, border not rounded (Fig. 78) **16**
 - . Anal lobe not as above, rounded on wing border (although narrow in *M. geronimo*) (cf. Figs 81, 82, 93) **18**
16. Abdominal tergite I with distinct yellow along posteromedial margin (Fig. 7); pleura subshining grayish black (Fig. 69) **17**
 - . Abdominal tergite I without distinct yellow color medially; pleura densely gray pollinose (Fig. 70) ... (eastern and southern United States) *Metacosmus mancipennis* Coquillett
17. Wing cell m1 longer than cell dm (Fig. 85); mentum yellow without brown ... (Sinaloa) *Metacosmus halli* Evenhuis, **sp. nov.**
 - . Wing cell m1 shorter than cell dm (Fig. 86); mentum brown with yellow medially (Fig. 53) ... (Hidalgo) *Metacosmus hidalgo* Evenhuis, **sp. nov.**

-
18. Pleura predominantly bare, shining brown 19
 —. Pleura gray to grayish brown pollinose 20
19. Katepisternum bare; anepisternum with tomentum on upper third, remainder bare; mesonotum laterally above notopleural tomentose area with erect hairs (Fig. 65) ... (California) *Metacosmus exilis* Coquillett
 —. Katepisternum with pollinosity on ventral one-third or more; anepisternum with tomentum, bare only at posterolateral corner; mesonotum laterally above notopleural tomentose area bare (Fig. 76) (Utah) ... *Metacosmus yanegai* Evenhuis, **sp. nov.**
20. Notopleural area densely shining silvery pollinose (Fig. 74) ... (New Mexico)
 *Metacosmus painteri* Evenhuis, **sp. nov.**
 —. Notopleural area dull grayish pollinose, not shining silvery (Fig. 66) 21
21. Hind femur predominantly black (Fig. 4), brownish only at extreme base; posterior margin of abdominal tergite I with yellow band... (Arizona)
 *Metacosmus geronimo* Evenhuis, **sp. nov.**
 —. Hind femur predominantly brown with testaceous color basally (Fig. 10); tergite I all black ... (central Mexico) *Metacosmus mexicanus* Evenhuis, **sp. nov.**

***Metacosmus chilensis* Hall**

(Figs. 1, 20, 35, 47, 63, 79, 95, 122)

Metacosmus chilensis Hall, 1976: 126. Painter *et al.* 1978: 23; Evenhuis & Greathead 1999: 285.

Types. Holotype ♂ and 3 ♀ paratypes from CHILE: Santiago: Quebrada de la Plata, near Maipú, 2 Feb 1966, M.E. Irwin. Holotype ♂ and 1 ♀ paratype in MEUC (not examined).

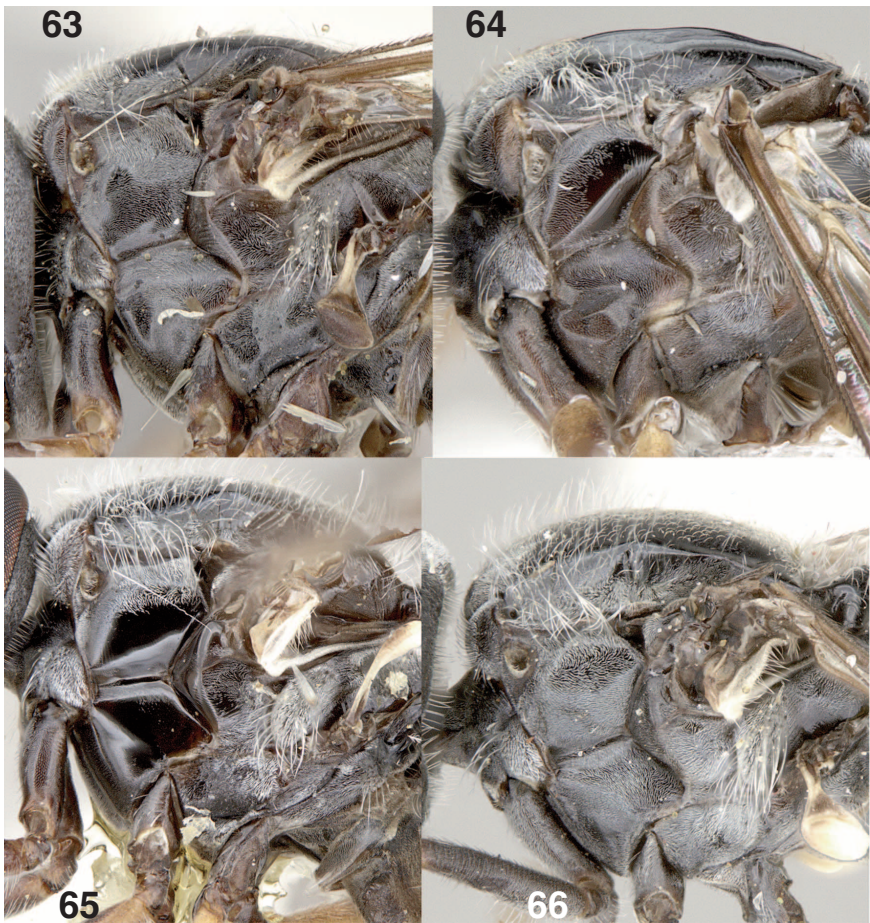
Material examined. Paratype ♀ from CHILE: Santiago: Quebrada de la Plata, near Maipú, 2 Feb 1966, M.E. Irwin (UCR).

Diagnosis. Most similar to *Metacosmus mancipennis* by both having the mentum brown with a yellow medial stripe, but *M. chilensis* can be separated from it by the testaceous legs in *M. chilensis* (legs all black in *M. mancipennis*).

Description

Female (Fig. 1). Measurements. Body: 4.0 mm. Wing: 4.2 mm. *Head* (Fig. 35). Black, occiput slightly gray pollinose posteromedially; ocelli on two tubercles, separated by width of anterior tubercle (Fig. 20); occipital fringe with short white hairs. Eyes separated at vertex by width of posterior ocellar tubercle. Front slightly tumid, sparse coppery yellow pilose, minute black tomentum immediately above and lateral to antennae. Mentum (Fig. 47) brown, thin yellow medially. Face produced, subconical, rounded apically, with black hairs, oral margin narrowly whitish yellow. Antenna with small subcylindrical scape, with cluster of black hairs laterally; pedicel flared, bare; flagellomere length two times length of scape and pedicel combined; conical, tapering to apex, style minute, terminal. Proboscis short, dark brown, not projecting beyond oral margin.

Thorax (Fig. 63). Mesonotum subshining black, with scattered white hairs minute on anterior half. Scutellum subshining black, with scattered white hairs and tomentum, long hairs along posterior margin. Pleura black, bare except katatergite with patch of white hairs in front of posterior spiracle; all sclerites minute silvery pollinose. Post alar callus bare. Halter stem yellow, knob brown.

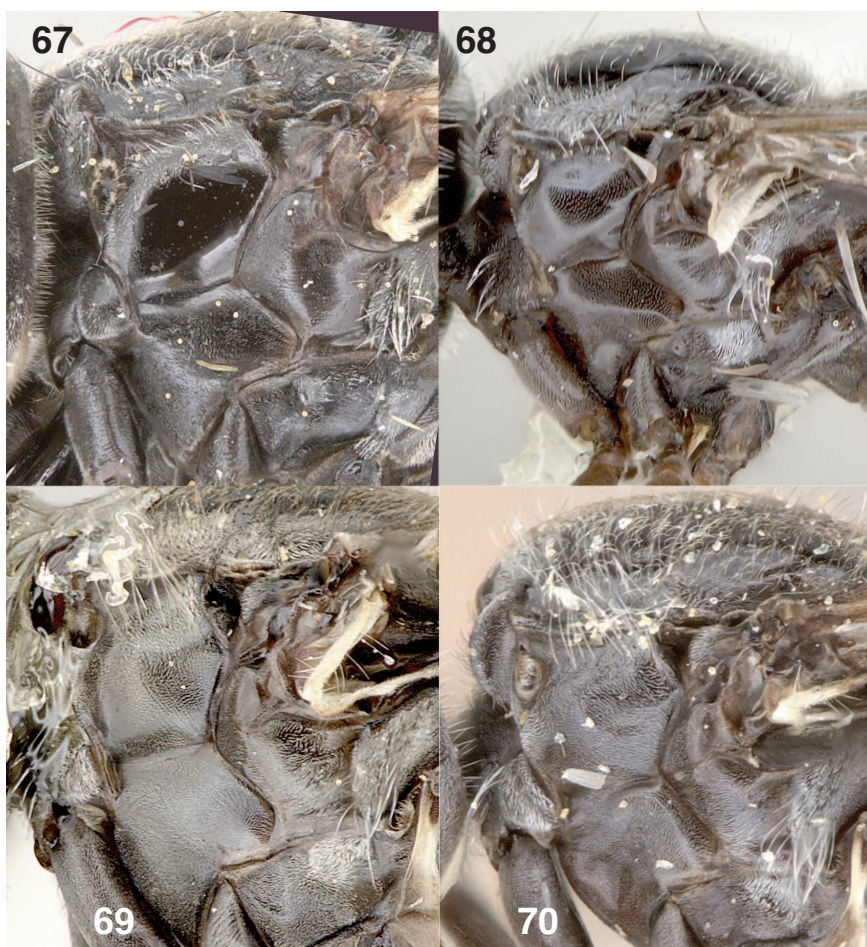


Figures 63–66. *Metacosmus* thoraxes, lateral. **63.** *Metacosmus chilensis*; **64.** *M. costaricensis* Evenhuis & Hanson, sp. nov.; **65.** *M. exilis*; **66.** *M. geronimo* Evenhuis, sp. nov.

Legs. Coxae black basally, brown on apical one-sixth; all legs orange-yellow, except femora with brown dorsally; femora with white hairs basally; tibiae without bristles.

Wing (Figs. 79, 95). Hyaline, veins dark brown; vein R_{2+3} slightly sinuous to wing margin, ending at level slightly beyond end of M_1 ; R_4 angled upward at wing margin; crossvein r-m slightly beyond middle of cell dm; anal cell widely open at wing margin, width more than width of cell r5; anal lobe extremely narrow; alula absent. Wing Interference Pattern (Fig. 95) with green in radial field, a mixture of green and magenta in cell m1; cells m2+3 and m4 predominantly orange, grading to thin line of magenta and thin band of blue-green along wing margin; cell m4 golden on apical; anal lobe with a rainbow of color bands.

Abdomen (Fig. 1). Black, tergites II–VI with thin yellow band of color posteriorly, with



Figures 67–70. *Metacosmus* thoraxes, lateral. **67.** *Metacosmus grandis* Evenhuis, sp. nov.; **68.** *M. halli* Evenhuis, sp. nov.; **69.** *M. hidalgo* Evenhuis, sp. nov.; **70.** *M. mancipennis*.

admixed thin white, yellow and black tomentum, white to yellow hairs scattered dorsally; abdominal patches laterally on tergite III and IV (Fig. 122) small, elliptical in shape. Venter patterned as tergites, with white to yellow hairs. Apex of abdomen (sand chamber) with dense dark brown hairs.

Genitalia. Not dissected.

Male. Not examined. Hall (1976: 125–126) described the male as similar to the female in almost all characters. The exceptions being the abdomen has a narrow yellow posterior margin of only tergites I–IV; and the external terminalia (gonocoxae and epandrium; genitalia not dissected) have black hair.

***Metacosmus costaricensis* Evenhuis & Hanson, sp. nov.**

(Figs. 2, 21, 36, 48, 64, 80, 96, 111, 123, 137, 143)

Material examined. *Holotype* ♀ (BPBMMENT 0000081275) and 4 *paratype* ♀♀ from **COSTA RICA**: Guanacaste Province: Cuajiniquil, Bahía Tomás, salinitas, 7 Feb–7 Mar 2022, Malaise trap, M.M. Chavarría & P. Hanson (BPBM). *Other paratypes*: **COSTA RICA**: 9♀♀, topotypic, 28 Jan–7 Feb 2022, Malaise trap, M.M. Chavarría & P. Hanson; 5♀♀, same data except Jan 2023. *Holotype* in BPBM; *paratypes* in BPBM and MZUCR.

Unconfirmed specimen. NICARAGUA: Granada: 1♂, Volcán Mombacho: Finca San Joaquín, 650 m, 11.825672, -85.988872, Malaise trap, 30 Apr 1998, col. Jean-Michel Maes (MEL). link: <https://www.inaturalist.org/observations/116779798>

Diagnosis. Most similar to *Metacosmus yanegai*, sp. nov. by both having a predominantly grayish-white inner labellar surface and vermiform spermathecae, but *M. costaricensis* can be separated from it by having brown dorsally on the halter knob (all yellow in *M. yanegai*) and cell m1 shorter than cell dm (this cell longer than cell dm in *M. yanegai*).

Description

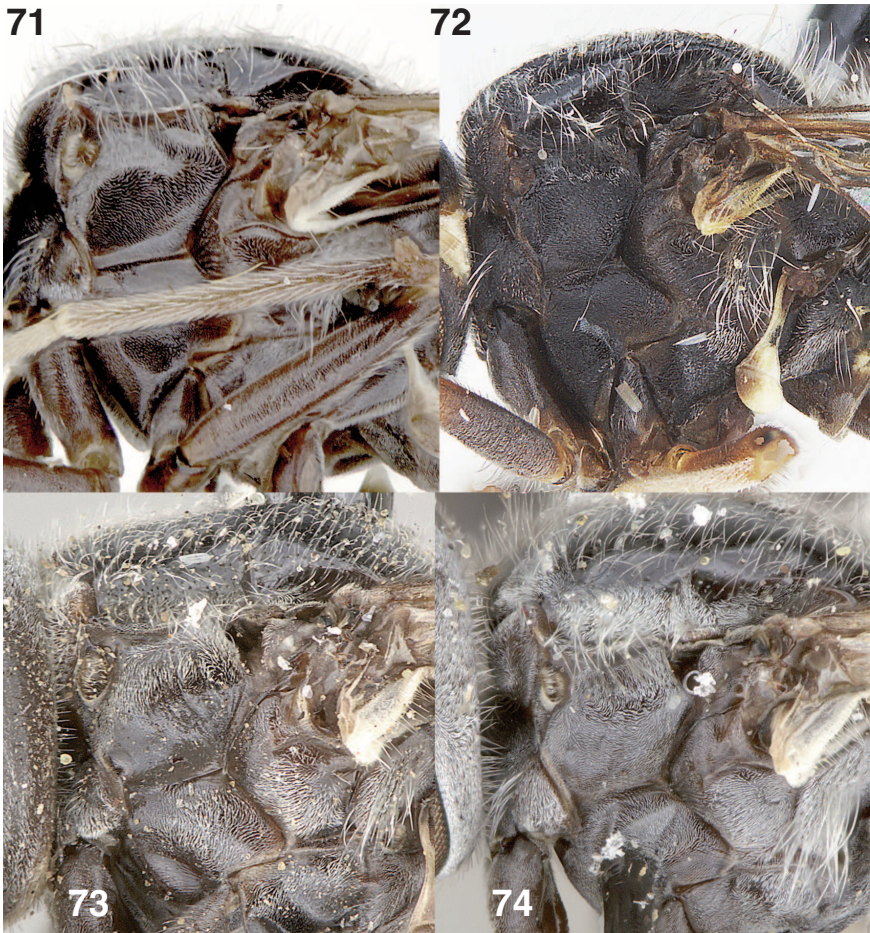
Female (Fig. 2). Measurements. Body: 4.2–5.2 mm. Wing: 4.0–5.0 mm. *Head* (Fig. 36). Black, occiput slightly gray pollinose posteromedially; ocelli on two tubercles, separated by width of anterior tubercle (Fig. 21); eyes separated at vertex by width of posterior ocellar tubercle; occipital fringe with short white hairs; frons slightly tumid, silvery tomentose immediately above antennae and along inner eye margin. Mentum (Fig. 48) creamy yellowish white. Face brown, produced, subconical, rounded apically. Antenna with small subcylindrical scape, with cluster of black hairs laterally; pedicel flared, bare; flagellomere length two times length of scape and pedicel combined; conical, tapering to apex, style minute, terminal. Proboscis short, dark brown, not projecting beyond oral margin; labellae with small patch of black at extreme base, grayish white elsewhere on inner surface (Fig. 48).

Thorax (Fig. 64). Mesonotum and scutellum shining black, with scattered minute white hairs and yellow tomentum, densest on anterior half and laterally, center of mesonotal disc bare. Scutellum subshining black, with scattered white hairs and tomentum, long hairs along posterior margin. Pleura with anepisternum black, other sclerites dark brown, all with minute white tomentum; propleuron and katatergite with white hairs; post alar callus with patch of white hairs. Halter stem white, knob white with dark brown dorsally.

Legs. Coxae black basally; fore femur brown with orange at apex; mid femur brown medially, with orange-yellow basally and apically; hind femur with yellow to orange-yellow on basal one-fourth, remainder dark brown; tibiae and basitarsi orange-yellow to brown, remainder of tarsi dark brown.

Wing (Fig. 80, 96). Hyaline, veins dark brown; vein R_{2+3} slightly sinuous to wing margin, ending at level well beyond end of M_1 ; R_4 angled upward at wing margin; crossvein r-m slightly beyond middle of cell dm; anal cell widely open at wing margin, width more than width of cell r5; anal lobe narrow; alula absent. Wing Interference Pattern (Fig. 96) with magenta in radial field, a mixture of green and magenta in cell m1; cells m2, m3, and m4 with green basally and dark purple apically.

Abdomen (Fig. 2). Black, with thin white band along posterior margin of tergites II–VI; tergites with white hairs dorsally and laterally; tergite II with constriction dorsally (best seen in lateral view; Fig. 111); abdominal patches laterally on tergite III and IV (Fig.



Figures 71–74. *Metacosmus* thoraxes, lateral. **71.** *Metacosmus marstoni* Evenhuis, sp. nov.; **72.** *M. mexicanus* Evenhuis, sp. nov.; **73.** *M. nitidus*; **74.** *M. painteri* Evenhuis, sp. nov.;

123) elliptical (on III) and circular (on IV) in shape, grayish silver sculpturing contrasting with black cuticle. Venter dark brown, black pilose. Apex of abdomen (sand chamber) with dense yellow to brown hairs.

Genitalia (Figs. 143) with genital fork (Fig. 143A) U-shaped, consisting of two semi-parallel sclerotized bars connected medially by membrane; basal ducts relatively short, clear, length ca. equal to sperm pump, connected together at base by short sclerotized common duct; sperm pump (Fig. 143B) short, with broad, disc-like apical and basal valves; apical duct long, clear, length ca. 5× length of sperm pump, with glandular tri-

chomes subbasally near sperm pump; spermathecae (Fig. 143C) long, vermiform, lightly sclerotized, tips not recurved as in *M. yanegai*, sp. nov., all three spermathecae convoluted together.

Male. Unknown.

Remarks. Paul Hanson collected and helped identify the new species and participated in the description and manuscript preparation of the new species and, as such, is given co-authorship. One male of what may be this species was collected in Nicaragua and the photo of the specimen is on iNaturalist (see link above).

See Figs. 149–152 for type habitat. The site is located in the Guanacaste Conservation Area in northwestern Costa Rica, not far from the Nicaraguan border. Surrounded by seasonally dry tropical forest, the type locality is a former saltworks (salt evaporation ponds) that is now the site of a mangrove restoration project. This site is notable for its high temperatures and extensive open areas of saline soil (for more details, see Lobo *et al.* 2023). Costa Rica is not necessarily known for having a diverse bombyliid fauna, so it is noteworthy that the trap in the locality depicted has resulted in apparently more Bombyliidae collected than any other trap in Costa Rica (species in at least 8 different genera have been sorted out from it).

Etymology. Named for the type locality of Costa Rica.

Distribution. Costa Rica, ?Nicaragua.

***Metacosmus exilis* Coquillett**

(Figs. 3, 22, 49, 56, 138, 146)

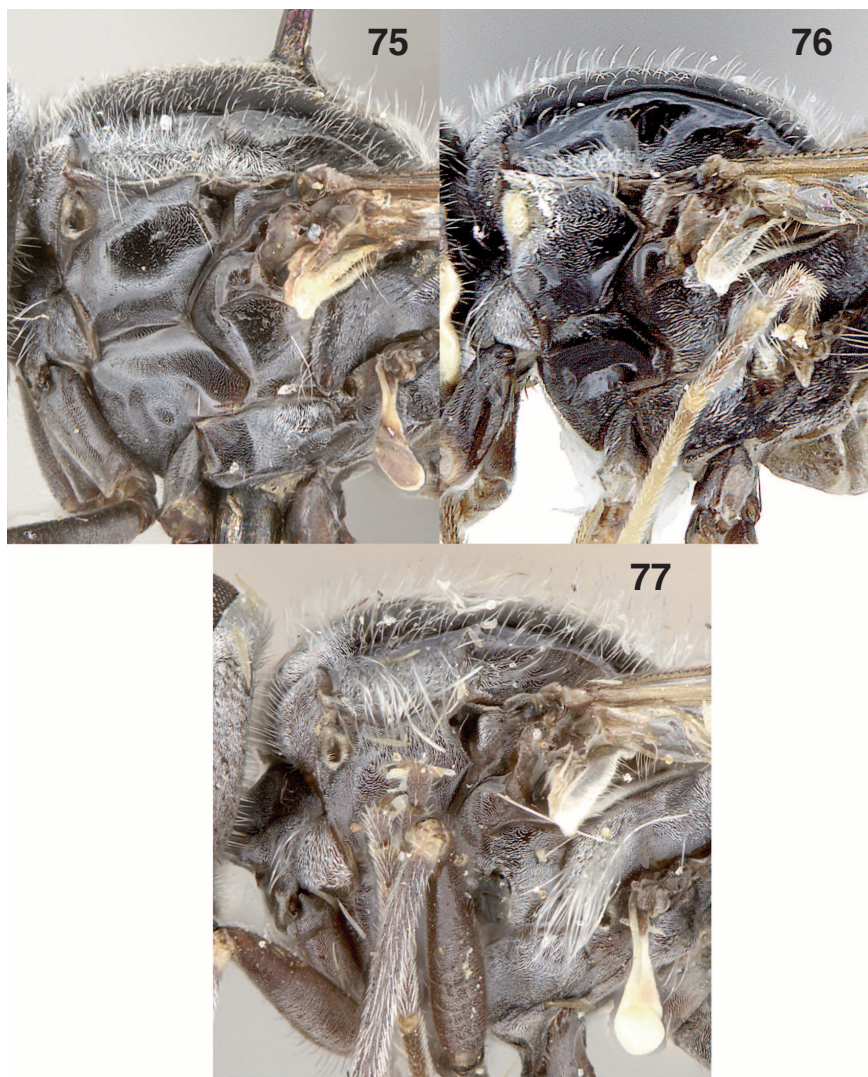
Metacosmus exilis Coquillett, 1891: 219. Coquillett 1910b: 568; Aldrich 1905: 243; Cockerell 1914: 236; Cole 1923: 311; Melander 1950: 156; Cole & Schlinger 1969: 242; Painter & Painter 1965: 427; Hull 1973: 295; Painter *et al.* 1978: 23; Frommer 1981: 36; Poole 1996: 72; Evenhuis & Greathead 1999: 285; Evenhuis 2018: 56.

Type. *Lectotype* ♀ (USNM 01172785) designated by Evenhuis & Greathead (1999: 666) and paralectotype ♀ from UNITED STATES: **California:** Orange County (USNM).

Other material examined: **MEXICO:** **Baja California:** 1♀, Escondido Bay, 14 Jun 1921 (CAS). **UNITED STATES:** **California:** 1♂, 1♀ [*in copula*], Glenwood, 31 Jul 1930, T.F. Winburn (USNM); 1♀, Riverside County, Eagle Mountain Road, NW of Desert Center, 24 Sep 1991, T. Kuklenski, S. Miller (BPBM).

The lectotype and paralectotype both have the heads broken off and glued back on. The glue on the lectotype obscures the yellow mentum but it is seen in the paralectotype. Coquillett (1891: 220) says of the habits of the type specimens: “These insects I captured about six years ago [= 1885], resting on the ground in the hot sunshine, but I have never succeeded in obtaining another specimen since that time, although I have repeatedly looked for them.”

Diagnosis. This species is most similar to *Metacosmus painteri* Evenhuis, sp. nov. by both having yellowish color on the abdominal tergites only medially, the remainder being black; but *M. exilis* can be separated from *M. painteri* by the pleura being predominantly bare, shining brown (pleura gray pollinose in *M. painteri*).



Figures 75–77. *Metacosmus* thoraxes, lateral. **71.** *Metacosmus sabroskyi* Evenhuis, sp. nov.; **76.** *M. yanegai* Evenhuis, sp. nov.; **77.** *M. zircon* Evenhuis, sp. nov.

Description

Male. Measurements. Body: 5.2–5.5 mm. Wing: 4.8–5.2 mm. *Head.* Dark brown to black; occiput dark brown, gray pollinose; occipital fringe short white pilose; ocelli on two tubercles, separated by width of anterior tubercle (Fig. 22); eyes separated at vertex by width of posterior ocellar tubercle. Frons slightly tumid with short, white hairs, shining

medially, gray pollinose above antennae and along inner eye margin. Face produced, yellow, subconical, silvery tomentose. Antenna black with scape subcylindrical, flared at mesoapical margin, twice as long as pedicel, with black hairs; pedicel subspherical, with medial ring of black hairs; flagellomere longer than scape and pedicel combined; base subconical, tapering to thinner apical one-fourth, style minute, terminal. Proboscis short, dark brown, not projecting beyond oral margin; labellae dark brown. Mentum yellow and brown. Palpi not evident.

Thorax (Fig. 65). Mesonotum and scutellum shining black, gray pollinose laterally and anteriorly, with scattered short white pile on mesonotal disc. Scutellum with white hairs and sparse white tomentum. Pleura black, gray pollinose. Post alar callus brown with a few white hairs. Halter stem yellow, knobs white.

Legs. Dark brown, except basitarsi yellowish brown; femora with scattered white hairs ventrally; fore tibia without bristles, with minute thin hairs.

Wing (cf. Fig. 81). Hyaline, veins dark brown; vein R_{2+3} slightly sinuous to wing margin, ending at level well beyond end of M_1 ; R_4 angled upward at wing margin; crossvein r-m slightly beyond middle of cell dm; anal cell widely open at wing margin, width more than width of cell r5; anal lobe as wide as anal cell; anal lobe extremely reduced. Wing Interference Pattern (cf. Fig. 97) with apical half predominantly green; cell m4 with some blue admixed apically.

Abdomen (cf. Fig. 3). Black, with thin yellowish white band medio-posteriorly on tergites II–V, all dark brown pilose dorsally; abdominal patches laterally on tergite III and IV (Fig. 124) elliptical in shape. Venter dark brown.

Genitalia (Fig. 138). Epandrium in lateral view subsquarish, as high as wide, cercus small, exerted; gonocoxa in lateral view subovular, in ventral view as high as wide, with small concavity medially at base; gonostylus (Fig. 138C) long, length ca. $4\times$ greatest width, with slightly hooked apex; parameral sheath in lateral view rather long, tapering to long, thin apex; aedeagal bulb rounded, rather small; aedeagal apodeme axe-shaped, with foliar-shaped lateral rami.

Female (Fig. 3). As in male except: mentum (Fig. 49) all yellow; face brown with medial yellow line connecting to yellow surrounding oral margin; abdominal tergite I with white band; apex (sand chamber) with dense yellow hairs. Genitalia (Fig. 146) with genital fork as in *M. nitidus* (cf. Fig. 144); sperm pump thin, with short cylindrical apical and basal valves; apical duct slightly longer than sperm pump; spermatheca ovular with pointed apex.

Remarks. *Metacosmus exilis* is a very commonly identified western North American species in collections, but examination here shows that it is highly variable in females with very few matching the color pattern of the type series: the pleural sclerites exhibit variation in the presence of or amount of pollinosity although all have the anepisternum and katepisternum predominantly shiny and bare; the femoral coloration is most often orange with black on the distal two-thirds, but some populations have the femora all orange (as in the lectotype and paralectotype). The gonostylus shape (Fig. 138C) can be used to confirm species identification. Because of this apparent variability, I have only verified identifications as *M. exilis* with the above listed specimens, although there are many more that I have examined that possibly appear to be this species, but do not key out confidently in the key given above. More study on long series from the same area will need to be done to better ascertain their specific status.

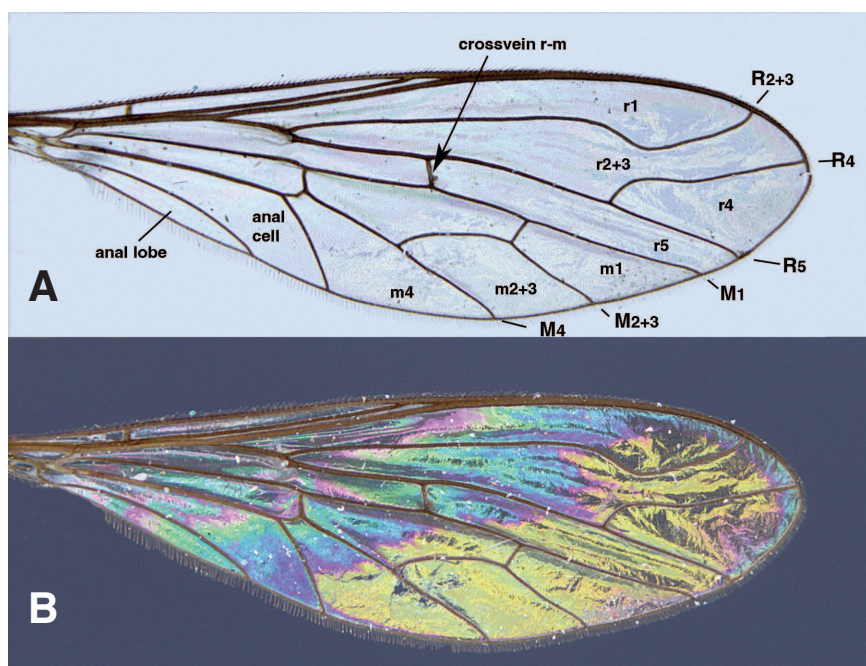


Figure 78. *Metacosmus mancipennis*. **A.** Wing; **B.** Wing Interference Pattern. Abbreviations: m = medial cells; r = radial cells; M = medial veins; R = radial veins.

***Metacosmus geronimo* Evenhuis, sp. nov.**

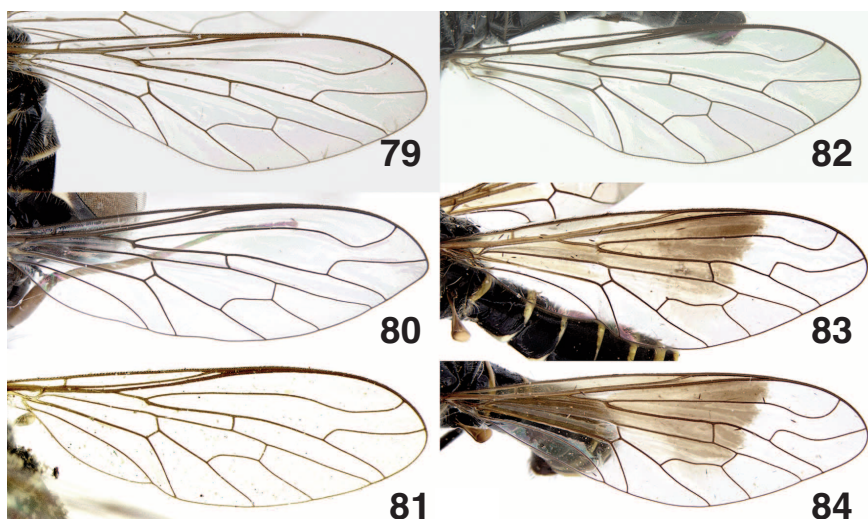
(Figs. 43, 23, 38, 50, 51, 66, 82, 98, 125)

Material examined. *Holotype* ♀ (USNMMENT 01353645) and *paratype* ♂ from **UNITED STATES: Arizona:** E. Turkey Creek, 9 Jun 1968, A. Menke & O. Flint. *Holotype* and *paratype* in USNM.

Diagnosis. Males are most similar to *Metacosmus mexicanus* Evenhuis, sp. nov. based on the shared character state of dull grayish pollinosity on the meron, laterotergite and mediotergite, but they can be separated from it by the hind femur being predominantly black (brown with testaceous color in *M. mexicanus*) and tergite I with a yellow posterior band (tergite I all black in *M. mexicanus*). Females are most similar to *M. mexicanus* based on each having the yellow band on the posterior margins of the abdominal tergites extending laterally, but they can be separated from it by crossvein r-m being slightly beyond the middle of cell dm (crossvein r-m at apical two-thirds of cell dm in *M. mexicanus*) and by the extremely narrow anal lobe (rounded in *M. mexicanus*).

Description

Female (Fig. 4). Measurements. Body: 5.6 mm. Wing: 6.0 mm. *Head* (Fig. 38). Shining black; occipital fringe with white hairs; ocelli on two tubercles, posterior slightly larger than anterior, separated from each other by width of anterior tubercle (Fig. 23); eyes sep-



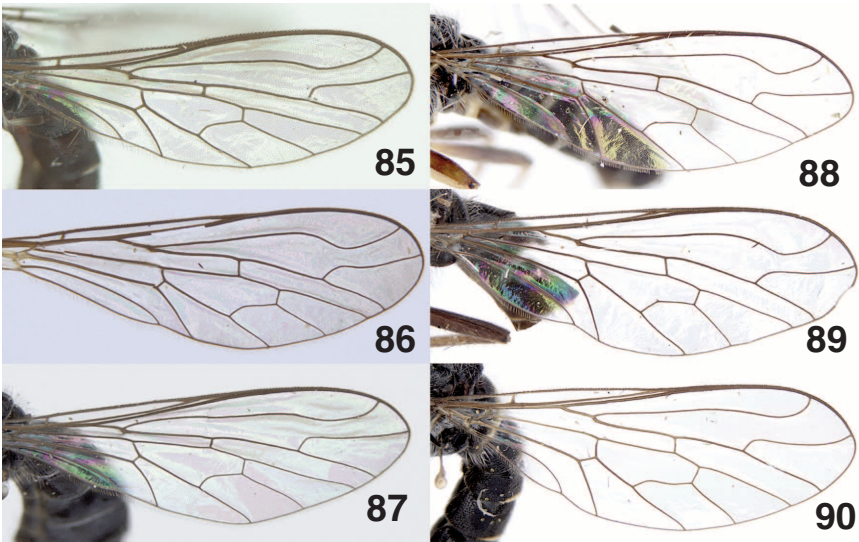
Figures 79–84. *Metacosmus* wings. **79.** *Metacosmus chilensis*, female; **80.** *M. costaricensis* Evenhuis & Hanson, sp. nov., female; **81.** *M. exilis*, lectotype female; **82.** *M. geronimo* Evenhuis, sp. nov.; **83.** *M. grandis* Evenhuis, sp. nov., male; **84.** *M. grandis* Evenhuis, sp. nov. female.

arated at vertex by $2\times$ width of posterior ocellar tubercle; frons slightly tumid, bare, except gray tomentose and short white pilose immediately above antennae. Face produced, subconical, rounded apically, dark yellow medially, silvery tomentose along oral margin. Antenna with small subcylindrical scape, with cluster of black hairs laterally; pedicel flared, bare; flagellomere length two times length of scape and pedicel combined; conical, tapering to apex, style minute, terminal. Mentum (Fig. 50) yellow. Proboscis short, black, not projecting beyond oral margin; labellae dark brown.

Thorax (Fig. 66). Mesonotum and scutellum shining black, with scattered white and yellow adpressed scales and short erect white hairs. Scutellum with white hairs. Pleura with anepisternum black, other sclerites dark brown, all with minute white tomentum; katatergite with patch of white hairs in front of posterior spiracle. Post alar callus bare. Halter stem and knob yellow.

Legs. Coxae black; femora black except extreme base of hind femur yellowish brown; mid femur with white hairs ventrally, sense white hairs dorsally, densest at tip; tibiae and basitarsi yellow; basitarsus three-fourths length of tibia; remainder of tarsi brown.

Wing (Figs. 82, 98). Subhyaline, veins dark brown; vein R_{2+3} slightly sinuous to wing margin, ending at level well beyond end of M_1 ; R_4 angled upward at wing margin; crossvein r-m slightly beyond middle of cell dm; anal cell widely open at wing margin, width more than width of cell r5; anal lobe as wide as anal cell; anal lobe extremely reduced, wing margin straight. Wing Interference Pattern (Fig. 98) with apical half predominantly dark green and blue; cells m1–m4 dark blue; anal lobe with magenta basally, green apically.



Figures 85–90. *Metacosmus* wings. 85. *Metacosmus halli* Evenhuis, sp. nov.; 86. *M. hidalgo* Evenhuis, sp. nov.; 87. *M. marstoni* Evenhuis, sp. nov.; 88. *M. mexicanus* Evenhuis, sp. nov., male; 89. *M. mexicanus* Evenhuis, sp. nov., female; 90. *M. nitidus*.

Abdomen (Fig. 4). Shining black, tergites II–V with yellowish white posterior band; white hairs dorsally on tergites III; tergites III–VI with scattered admixed minute black and yellow hairs; abdominal patches laterally on tergite III and IV (Fig. 125) circular in shape; sternites dark brown pollinose with yellow posterior band and scattered white hairs.

Genitalia. Not dissected. Cercus bright yellow; sand chamber with dense black hairs.

Male. As in female except as follows: head with yellow medially on mentum (Fig. 51); hind femur with broad black subbasally, brown subapically, no dense white hairs on hind femur, otherwise as in female.

Remarks. The difference in reduction of the anal lobe between the male and female is unusual (normally this is a species-recognition character state not prone to sexual dimorphism) but both were collected at the same place and time and they otherwise correspond to characters for the species, so I have kept them together as *Metacosmus geronimo*.

Etymology. Named for the Apache Indian medicine man Gerónimo, who lead military campaigns against Mexican and U.S. troops in Arizona and New Mexico; and whose name is traditionally exclaimed by U.S. paratroopers when jumping out of planes.

Metacosmus grandis Evenhuis, sp. nov.

(Figs. 5, 24, 39, 52, 67, 83, 84, 99, 126)

Material examined. *Holotype* ♂ (USNMMENT 013535640) from **MEXICO: Puebla:** Acatlán [de Osorio], 4,800 ft [1,463 m], 3 Sep 1959, R.H. Painter. *Paratype* ♀ from **MEXICO: Oaxaca:** 3 mi [4.8 km] N. Huajuapán, 5,300 ft [1,615 m], 8 Sep 1959, R.H. Painter (USNM). Holotype and paratype in USNM.

Diagnosis. Easily separated from the congeners by the patterned wing (all other species have the wing hyaline) and its relatively large size (8.5 mm) whereas other species are much smaller (usually less than 5.0 mm).

Description

Male (Fig. 5). Measurements. Body: 8.5 mm. Wing: 7.5 mm. *Head.* Black; occiput with silvery white tomentum laterally on lower one-half; occipital fringe with short yellowish hairs; ocelli on two tubercles, anterior tubercle spherical, posterior tubercle elongate, ellipsoid, narrowly separated from each other (Fig. 24); eyes separated at vertex by 3× width of posterior ocellar tubercle; frons slightly tumid, dense yellow hairs along inner eye margin, silvery white tomentum immediately above antennae. Face produced, subconical, rounded apically, dark brown to black with silvery tomentum laterally. Antenna with scape subcylindrical, twice as long as pedicel, with white hairs laterally; pedicel subspherical, with medial ring of admixed black and white hairs; flagellomere longer than scape and pedicel combined; linear-conical, tapering evenly to apex, style minute, terminal. Mentum (Fig. 52) brown with yellow line medially. Proboscis black, projecting beyond oral margin subequal to head height. Palpi black.

Thorax (Fig. 67). Mesonotum and scutellum subshining black, with anterior and lateral margins scattered white pilose; disc with scattered white tomentum. Scutellum with erect white hairs and adpressed white tomentum. Pleura subshining dark brown to black with gray tomentum except anepisternum shining black. Post alar callus shining, bare. Halter stem brown, knob yellow.

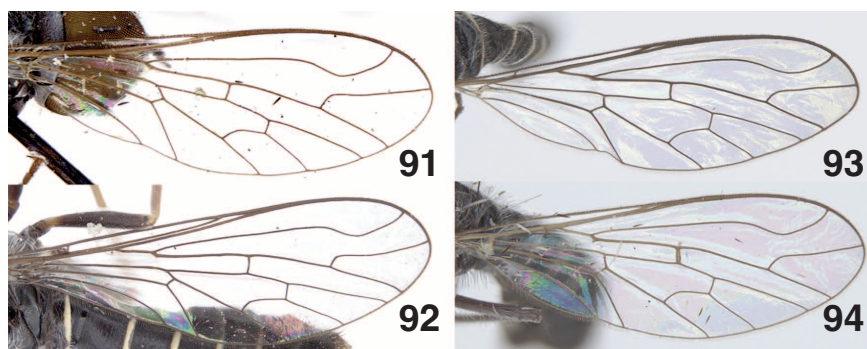
Legs. Black except fore and mid tibiae orange-yellow; femora without ventral hairs; tibia without bristles.

Wing (Fig. 83, 99). Infuscated brown to dark brown basally, hyaline apically and posteriorly, infuscation darkest in cell r1 and extending down to crossvein r-m, paler infuscation basal to that; veins dark brown to black; vein R_{2+3} sinuous to wing margin; R_4 originating at 90° angle from R_5 , then angled upward to wing margin; crossvein r-m at apical one-fifth of cell dm; anal cell open in wing margin for width subequal to cell r5; anal lobe normal; alula reduced. Wing Interference Pattern (Fig. 99) with blue at extreme tip; magenta in cell r5 and medial cells; dark brown basally.

Abdomen (Fig. 5). Shining black, tergites with bright yellow posterior band on tergites I–VII; tergite I with white hairs laterally, scattered shorter hairs on tergites I and II; tergites III–VI with adpressed brown scales and tomentum; abdominal patches laterally on tergite III and IV (Fig. 126) large, elliptical in shape. Venter dark brown, black pilose and tomentose except small patch of white hairs laterally on sternites II and III.

Genitalia. Not dissected.

Female. As in male except as follows: frons (Fig. 39) with silvery white hairs; mesonotum with erect hairs on disc; hind tibia clothed with dense white minute silvery hairs, shining at certain angles; wing infuscation (Fig. 84) slightly darker and slightly more extensive than in male. Genitalia not dissected.



Figures 91–94. *Metacosmus* wings. **91.** *Metacosmus painteri* Evenhuis, sp. nov.; **92.** *M. sabroskyi* Evenhuis, sp. nov.; **93.** *M. yanegai* Evenhuis, sp. nov.; **94.** *M. zircon* Evenhuis, sp. nov.

Remarks. Painter’s collecting notes (kept in the USNM along with the bee fly collection) for 8 September at Huajuapán say the specimen was collected on yellow daisies. The same spot was visited earlier on 3 September but was rainy so no collecting was done. These same notes also indicate that this specimen might represent a new genus (no notes were made on the Acatlán specimen). Although collected at two different localities in two states in Mexico, the sites are only ca. 20 miles [32 km] apart, lending support to the assumption more specimens of this species should be able to be collected between the two localities.

The genitalia were not dissected due to the paucity of material. If longer series are collected in the future, genitalic studies on them should give a better indication of its generic or subgeneric status. Until then, it is kept here in *Metacosmus*, although it is quite different in many characters to the more typical species.

Etymology. The specific name derives from the Latin, *grandis*, referring to its large size as compared with other *Metacosmus* species.

***Metacosmus halli* Evenhuis, sp. nov.**

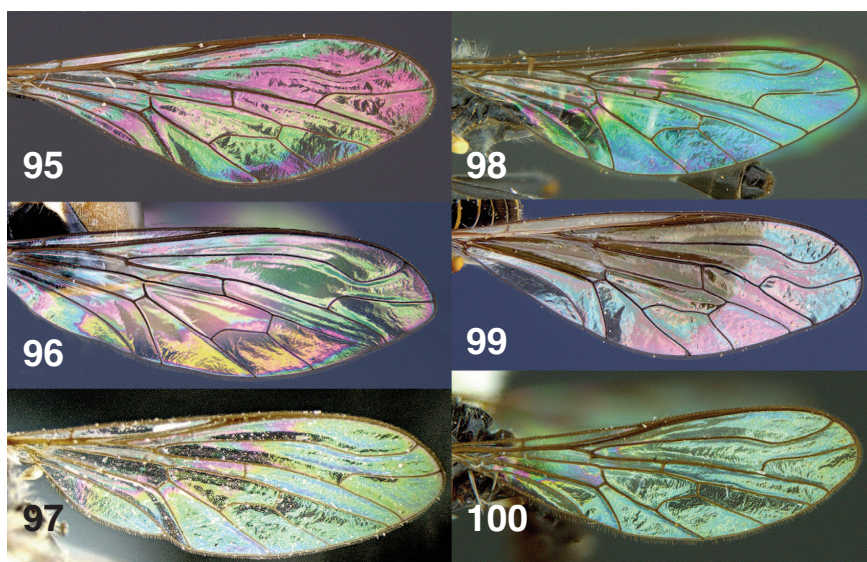
(Figs. 6, 25, 40, 68, 85, 100, 127)

Material examined. *Holotype* ♂ (UCRENT 157282) from **MEXICO: Sinaloa:** 54 mi [87 km] S. Culiacán, 23 Apr 1969, M.E. Irwin. *Holotype* in UCR.

Diagnosis. Similar to *Metacosmus hidalgo* Evenhuis, sp. nov. in both having tergite I with yellow along the posteromedial margin and the pleura grayish black, but can be separated from it by cell m1 longer than cell dm (shorter than cell m1 in *M. hidalgo*) and the mentum yellow without brown (brown medially in *M. hidalgo*). Also, *M. halli* is one of the smaller species of *Metacosmus*.

Description

Male (Fig. 6). Measurements. Body: 3.5 mm. Wing: 3.5 mm. *Head* (Fig. 40). Black, occiput dark brown medially; occipital fringe with short white hairs; ocelli on two tubercles, anterior much smaller than posterior, separated from each other by width of anterior tubercle (Fig. 25); eyes separated at vertex by width of posterior ocellar tubercle; frons



Figures 95–100. *Metacosmus* Wing Interference Patterns. **95.** *Metacosmus chilensis*, female; **96.** *M. costaricensis* Evenhuis & Hanson, sp. nov., female; **97.** *M. exilis*, female; **98.** *M. geronimo* Evenhuis, sp. nov.; **99.** *M. grandis* Evenhuis, sp. nov.; **100.** *M. halli* Evenhuis, sp. nov.

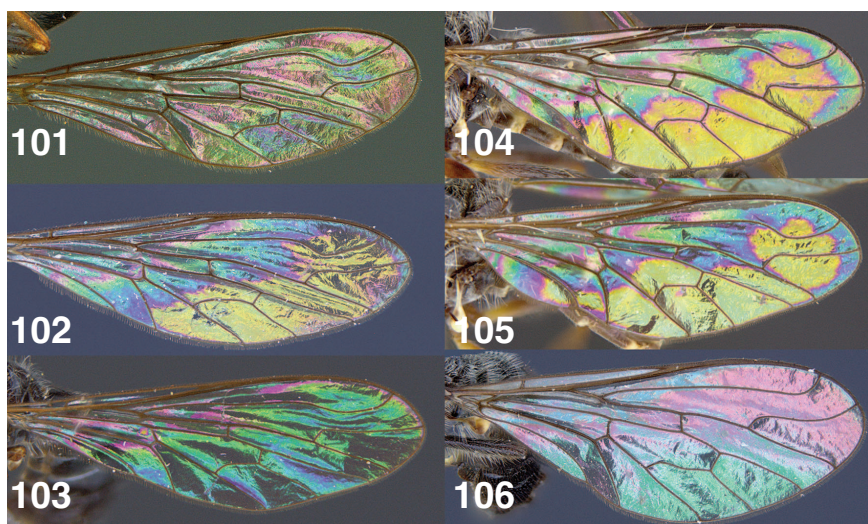
(greasy in holotype) slightly tumid, white hairs and tomentum immediately above antennae. Face produced, yellow, subconical, rounded apically, with silvery tomentum along oral margin. Mentum yellow. Antenna with small subcylindrical scape, with cluster of black hairs laterally; pedicel flared, bare; flagellomere length two times length of scape and pedicel combined; conical, tapering to apex, style minute, terminal. Proboscis short, dark brown, not projecting beyond oral margin.

Thorax (Fig. 68). Mesonotum and scutellum subshining black, with lateral margins with white hairs; disc covered with scattered white and yellow tomentum. Scutellum with sparse white hairs. Pleura shining black, gray tomentose except anepisternum and katepisternum bare. Katatergite with white hairs anterior to posterior spiracle. Post alar callus with white hairs. Halter broken off and missing.

Legs. Coxae black; femora brown except hind femur yellow at extreme base, without hairs ventrally; tibiae yellow; tarsi brown.

Wing (Figs. 85, 100). Hyaline, veins dark brown; vein R_{2+3} slightly sinuous to wing margin, ending at level slightly beyond end of M_1 ; R_4 angled upward at wing margin; crossvein r-m slightly beyond middle of cell dm; anal cell widely open at wing margin, width ca. $1.5\times$ width of cell r5; anal lobe narrow, wing border straight; alula absent. Wing Interference Pattern (Fig. 100) with wing all metallic green except cell bm green basally, blue apically.

Abdomen (Fig. 6). Black, dark brown laterally, with thin grayish white band posteriorly (thickest on tergites III–V); scattered short white hairs dorsally; abdominal patches



Figures 101–106. *Metacosmus* Wing Interference Patterns. **101.** *M. hidalgo* Evenhuis, sp. nov.; **102.** *M. mancipennis*; **103.** *M. marstoni* Evenhuis, sp. nov.; **104.** *M. mexicanus* Evenhuis, sp. nov., female; **105.** *M. mexicanus* Evenhuis, sp. nov., male; **106.** *M. nitidus*.

laterally on tergite III and IV (Fig. 127) small and almost imperceptible, irregular in shape. Venter brown, with scattered white hairs.

Genitalia. Not dissected.

Female. Unknown.

Etymology. Named for my mentor, bee fly collecting partner, and good friend, the late Jack Clayton Hall (1925–2013), who contributed significantly to our knowledge of Nearctic Bombyliidae.

***Metacosmus hidalgo* Evenhuis, sp. nov.**

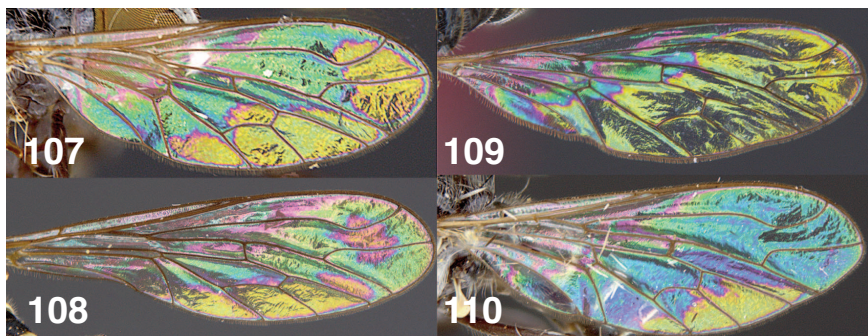
(Figs. 7, 26, 41, 53, 69, 86, 101, 128)

Material examined. Holotype ♂ (USNMMENT 01353635) from **MEXICO: Hidalgo**, 14 mi [22.5 km] NE Zimapán, 7,600 ft [2,316 m], 20 Apr 1966, R.H. & E.M. Painter (USNM).

Diagnosis. Similar to *Metacosmus mancipennis* based on the extremely reduced anal lobe and resulting narrow base of the wing, but can be separated from it by the presence of a distinct yellow band along the posterior margin on abdominal tergite I (this band absent a very faint and indistinct in *M. mancipennis*) and the Wing Interference Pattern (WIP) with large splashes of magenta throughout the wing (the WIP in *M. mancipennis* is blue to blue green medially and brassy golden apically).

Description

Male (Fig. 7). Measurements. Body: 5.2 mm. Wing: 5.0 mm. *Head* (Fig. 41). Black; occipital fringe with short minute white hairs; ocelli on two tubercles, anterior tubercle spherical,



Figures 107–110. *Metacosmus* Wing Interference Patterns. 107. *Metacosmus painteri* Evenhuis, sp. nov.; 108. *M. sabroskyi* Evenhuis, sp. nov.; 109. *M. yanagai* Evenhuis, sp. nov.; 110. *M. zircon* Evenhuis, sp. nov.

posterior tubercle ellipsoid, separated from each other by width of anterior tubercle (Fig. 26); eyes separated at vertex by width of posterior ocellar tubercle; frons slightly tumid, black pilose, dense black tomentose immediately above antennae. Face yellow, produced, subconical, with thin silvery tomentose line along oral margin. Antenna with scape subcylindrical, flared at mesoapical margin, twice as long as pedicel, with black hairs; pedicel subspherical, with medial ring of black hairs; flagellomere longer than scape and pedicel combined, conical, tapering to apex, style minute, terminal. Mentum (Fig. 53) brown with yellow medially. Proboscis short, black, not projecting beyond oral margin.

Thorax (Fig. 69). Mesonotum and scutellum subshining black, disc covered with golden brown tomentum, hairs on disc sparse, golden brown, short, minute. Scutellum with yellowish hairs and tomentum, long hairs along lateral and posterior margins. Pleura black, minute gray tomentose. Post alar callus with golden brown tomentum. Halter stem yellow, brown apically, knob brown.

Legs. Coxae black, covered with gray tomentum making them look gray; ; femora brown except hind femur yellow at extreme base, without hairs ventrally; tibiae yellow; tarsi brown.

Wing (Figs. 86, 101). Hyaline, veins dark brown; vein R_{2+3} slightly sinuous to wing margin, ending at level slightly beyond end of M_1 ; R_4 angled upward at wing margin; crossvein r-m slightly beyond middle of cell dm; anal cell widely open at wing margin, width ca. equal to width of cell r5; anal lobe narrow, wing border fairly straight; alula extremely reduced. Wing Interference Pattern (Fig. 101) with magenta in a band along wing margin from cells r1 to r5, thinner in medial cells; all cells with mixture of green and magenta; cell r2+3 with blue subapically; cells m1 and m2 with blue basally; anal lobe dark green basally, magenta apically.

Abdomen (Fig. 7). Black, with yellow posterior band on tergites III–VII; tergite I yellow haired; tergite II bare; tergites III–VII with thin golden brown hairs dorsally; abdominal patches laterally on tergite III and IV (Fig. 128) small, narrow elliptical in shape. Venter black.

Genitalia. Not dissected.

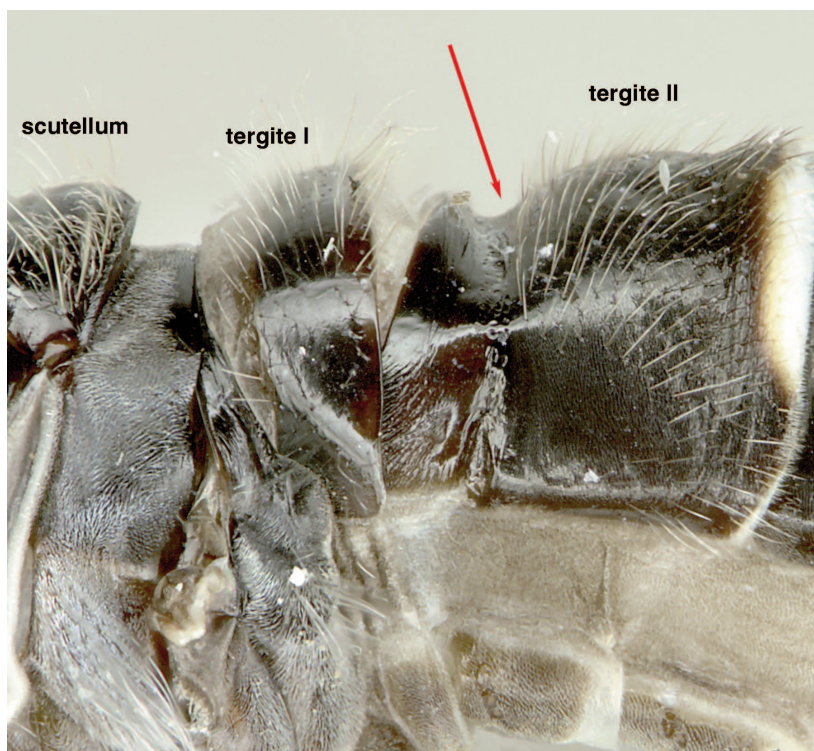


Figure 111. *Metacosmus costaricensis* Evenhuis & Hanson, sp. nov., showing dorsal constriction on tergite II (arrow).

Female. Unknown.

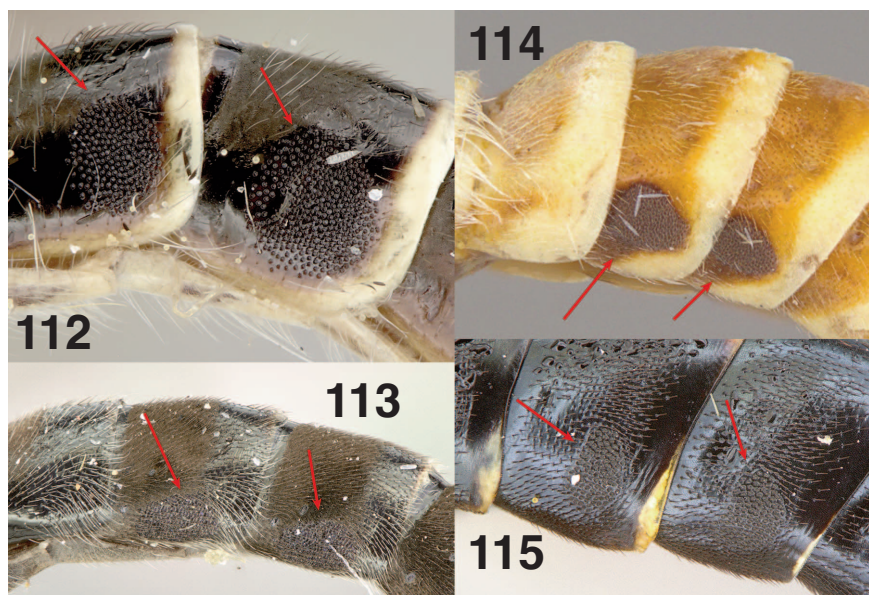
Remarks. Painter's collecting notes (kept in USNM along with his bee fly collection) for this spot say that this was a "dinner stop" and was the only specimen collected, so quite a serendipitous event.

Etymology. Named for the type locality of this species in Hidalgo state in Mexico.

***Metacosmus mancipennis* Coquillett**

(Figs. cover, 8, 17, 27, 54, 70, 78, 102, 129, 139, 144, 147)

Metacosmus mancipennis Coquillett, 1910a: 41. Smith 1910: 747. Curran 1934: 198; Melander 1950: 156; Painter & Painter 1965: 427; Hull 1973: 295; Poole 1996: 72; Evenhuis & Greathead 1999: 285; Kits *et al.* 2008: 4; Evenhuis 2018: 59.



Figures 112–115. Tomomyzinae tergal abdominal patches (arrows). **112.** *Amphicosmus painteri* Evenhuis; **113.** *Docidomyia genualia* Yeates; **114.** *Paracosmus* (*Actherosia*) *rubicundus* Melander; **115.** *Paracosmus* (*Paracosmus*) sp. (Mexico).

Material examined. *Holotype* ♂ (USNMMENT 01353025) from **UNITED STATES: Pennsylvania:** Glenside, 5 Jul 1909, C.T. Greene. *Other material examined:* **UNITED STATES: Georgia:** Cobb County: 1♂, 1♀ (*in copula*), Kennesaw Mountain, 1809 ft [550 m], net, 20 May 1953, J.M. Seago (USNM). **Maryland:** 1♀, Beltsville, 9 Jul 1916, C.T. Greene (USNM); 1♀, Bethesda, 8 Aug 1964, G. Steyskal (USNM). **Massachusetts:** 1♂, Blue Hills Res., 13 Jul 1919 (USNM); **Michigan:** 1♂, Grand Rapids, 9 Jul 1937 (USNM). **New Jersey:** 1♂, Glasboro, 28 Jun 1910 (USNM); 1♂, Pemberton, 11 Jul 1909, C.T. Greene (USNM); 1♀, Riverton, 20 Jul 1920, R.H. Painter (USNM); 1♀, Wenonah, 26 Jun 1910 (USNM). **Pennsylvania:** 1♂, 2♀, Lehigh Gap, 4 Jul 1906, C.T. Greene (USNM); 1♀, Germantown, 10 Jul 1909 (USNM). **Texas:** Travis County: 1♂, Austin, Windsor Hills, 17 Jun 2020, Justin Williams (Photographic records verified; no physical specimens seen) link: <https://www.inaturalist.org/observations/49922780>. **Virginia:** 1♀, Chain Bridge, 23 Jun 1915, C.T. Greene (USNM); 1♂, Page County, 7 mi [ca. 11.2 km] W. of Luray, 8 Jul 1978, G.F. Hevel (USNM).

Plausible but unverified records from the literature: **CANADA: Ontario:** Lambton County (Skevington *et al.* 2001: 106). **UNITED STATES: Maryland:** Beltsville, 4 Jul 1916, W.R. Walton (Cole *et al.* 1924: 190). **Massachusetts:** Framingham, 4 Jun 1922, C.A. Frost; Blue Hill, Milton, 13 Jul 1919, J. Bequaert (Johnson 1925: 111). **North Carolina:** Raleigh, 2 Jun 1942, C.S. Brimley (Wray 1950: 29).

Diagnosis. Most similar to *Metacosmus chilensis* by both having the mentum with a brown medial stripe, but *M. chilensis* can be separated from it by the all black legs in *M. mancipennis* (legs testaceous in *M. chilensis*).



Figures 116–121. *Metacosmus* hind leg knees (mesal surface). **116.** *Metacosmus nitidus*, lateral view, showing hind leg in association with tergal patches; **117.** *M. chilensis*; **118.** *M. exilis*; **119.** *M. grandis* Evenhuis, sp. nov.; **120.** *M. nitidus*; **121.** *M. yanegai* Evenhuis, sp. nov.

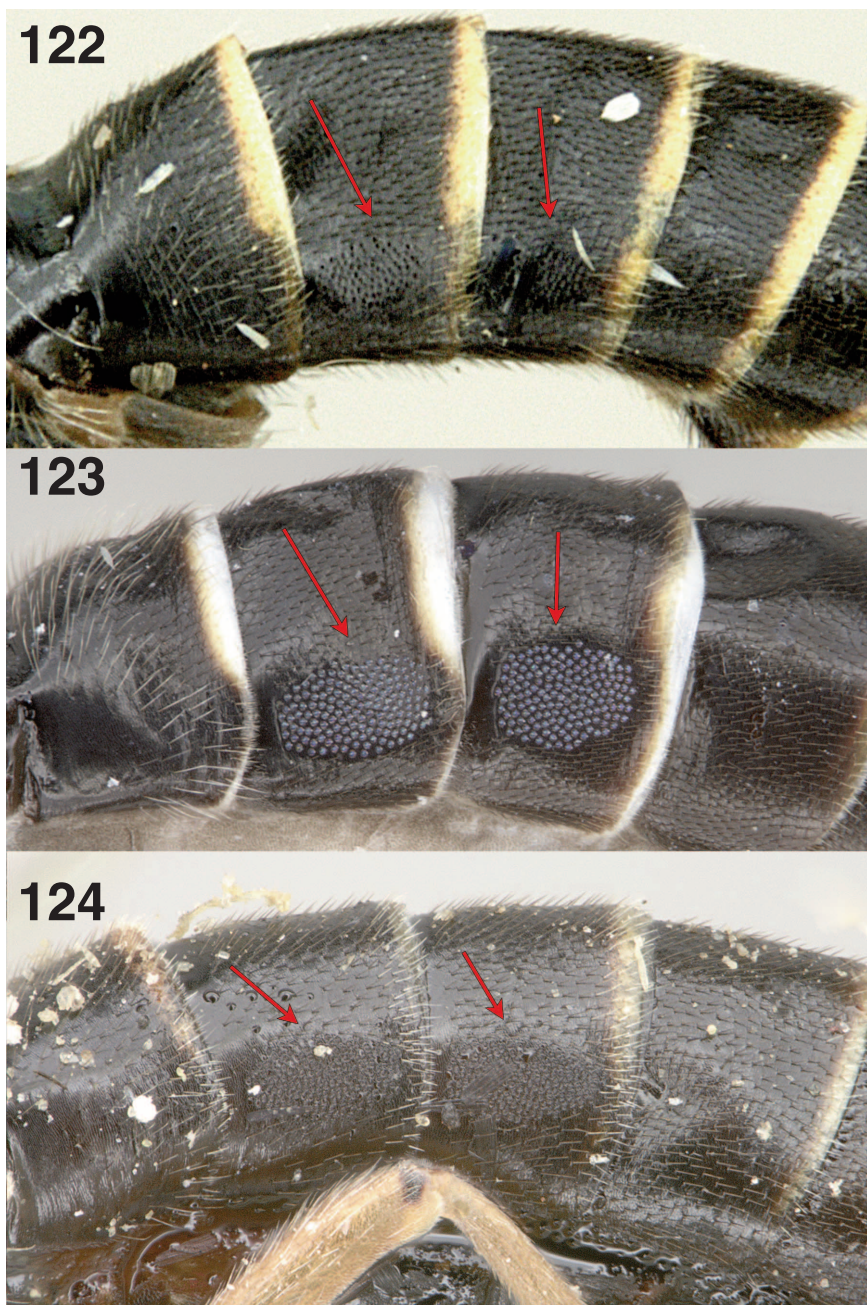
Description

Male (Fig. 8). Measurements. Body: 4.2–5.8 mm. Wing: 4.4–5.7 mm. Black, occiput slightly gray pollinose posteromedially; ocelli on two tubercles, each spherical in shape, posterior tubercle larger, separated from each other by 1.5× width of anterior tubercle (Fig. 27); occipital fringe with short white hairs. Eyes separated at vertex by width of posterior ocellar tubercle. Front slightly tumid, sparse coppery yellow pilose, minute black tomentum immediately above and lateral to antennae. Mentum (Fig. 54) black with thin yellowish white line medially. Face produced, subconical, rounded apically, with black hairs, oral margin narrowly whitish yellow. Antenna with small subcylindrical scape, with cluster of black hairs laterally; pedicel flared, bare; flagellomere (Fig. 17) length two times length of scape and pedicel combined, conical, tapering to apex, style minute, terminal. Proboscis short, dark brown, not projecting beyond oral margin.

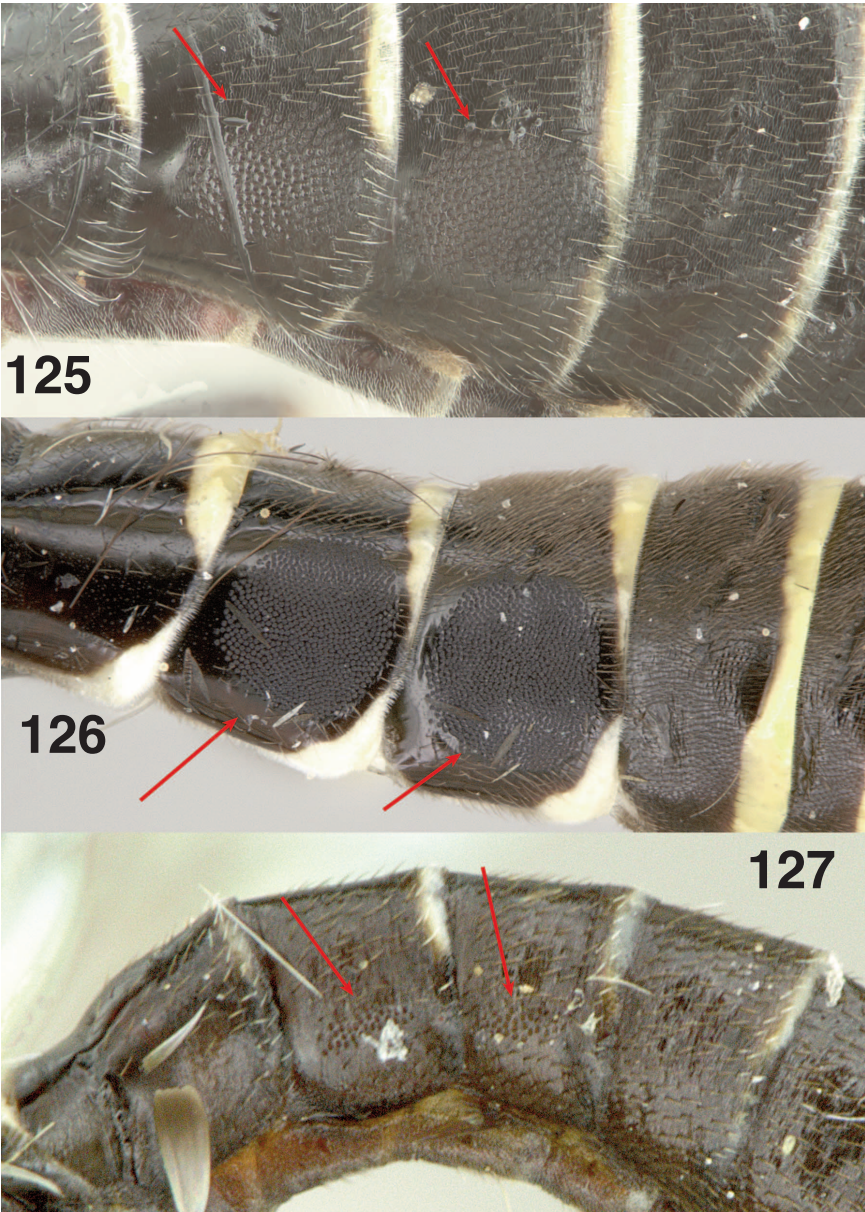
Thorax (Fig. 70). Mesonotum subshining black, gray pollinose anteriorly and laterally, with scattered minute white hairs on anterior half. Scutellum subshining black, with scattered white hairs and tomentum, long hairs along posterior margin. Pleura black, bare except katatergite with patch of white hairs in front of posterior spiracle; all sclerites minute silvery pollinose. Post alar callus bare. Halter stem yellow, knob brown.

Legs. Black, with sparse white hairs ventrally on femora.

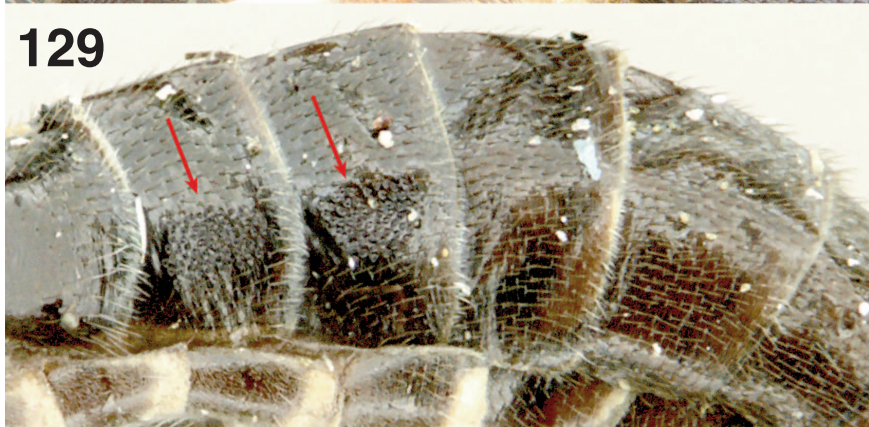
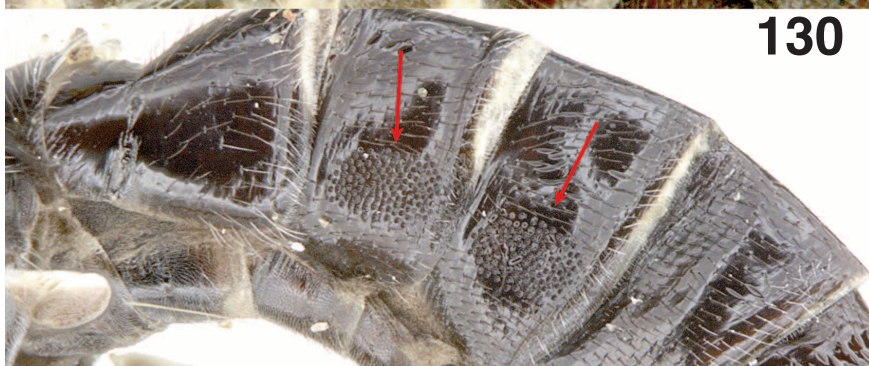
Wing (Fig. 78, 102). Hyaline, veins dark brown; vein R_{2+3} with distinct kink prior to final curve to wing margin, ending at level distinctly beyond end of M_1 ; R_4 angled upward at wing margin; crossvein r-m slightly beyond middle of cell dm; anal cell widely open at wing margin, width ca. 1.5× width of cell r5; anal lobe small, narrow, wing border



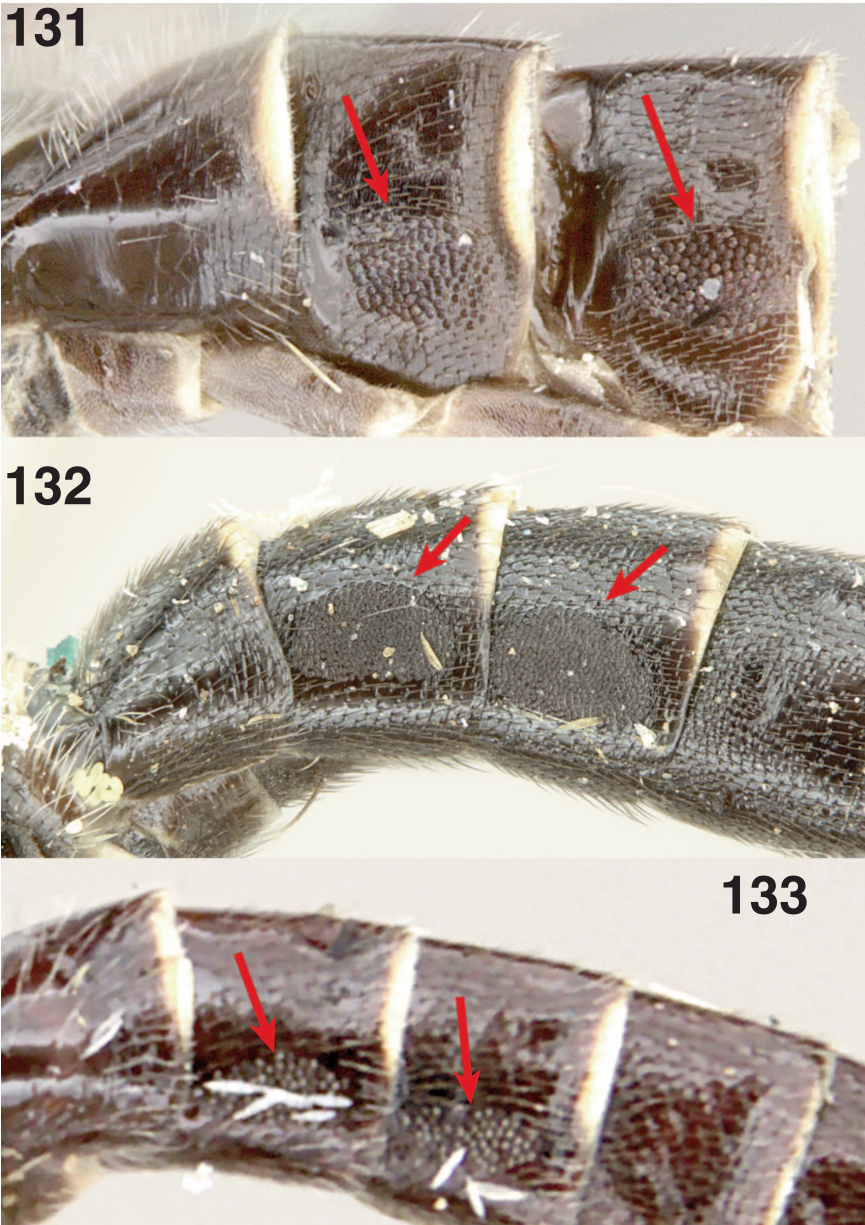
Figures 122–124. *Metacosmus* tergal abdominal patches (arrows). **122.** *Metacosmus chilensis*; **123.** *M. costaricensis* Evenhuis & Hanson, sp. nov.; **124.** *M. exilis*, lectotype.



Figures 125–127. *Metacosmus* tergal abdominal patches (arrows). **125.** *Metacosmus geronimo* Evenhuis, sp. nov. **126.** *M. grandis* Evenhuis, sp. nov.; **127.** *Metacosmus halli* Evenhuis, sp. nov.

128**129****130**

Figures 128–130. *Metacosmus* tergal abdominal patches (arrows). **128.** *Metacosmus hidalgo* Evenhuis, sp. nov.; **129.** *M. mancipennis*; **130.** *Metacosmus marstoni* Evenhuis, sp. nov.



Figures 131–133. *Metacosmus* tergal abdominal patches (arrows). **131.** *M. mexicanus* Evenhuis, sp. nov.; **132.** *M. nitidus*; **133.** *M. painteri* Evenhuis, sp. nov.

straight; alula absent. Wing Interference Pattern (Fig. 102) with wing with brassy golden color apically, blue-green to blue basally; thin band of blue at extreme tip of wing.

Abdomen (Fig. 8). Black, tergites white to brown pilose dorsally, thin white band on posterior margin of tergites II–VII; abdominal patches laterally on tergite III and IV (Fig. 129) subrectangular (on III) or circular (on IV) in shape. Venter dark brown, with yellow on posterior margins of sternites II–VI; abdominal apex (sand chamber) with dense yellow hairs.

Genitalia (Fig. 139). Epandrium in lateral view subsquarish, as wide as high, cercus small, not exerted; gonocoxa in lateral view subconical, in ventral view broadly conical with deep medial cleft apically; gonostylus very long, almost as long as height of gonocoxa, slightly curved downward apically; parameral sheath long conical in dorsal view, tapering to aedeagal tip; aedeagal apodeme small, peanut-shaped, lateral rami short spatulate rounded.

Female. As in male except: fore and mid-femora orangish brown in some specimens; genitalia (Fig. 147) with genital fork as in *M. nitidus* (cf. Fig. 144); sperm pump thin, with very broad sclerotized disc-shaped apical valve; basal valve small, cylindrical; apical duct slightly longer than sperm pump; spermatheca ovular, tapering to blunt apex.

Remarks. The species is an east coast species ranging from Ontario, Canada south to Georgia and west to Texas in the United States. Records of specimens further west identified as *Metacosmus mancipennis* are most likely misidentification for other species.

***Metacosmus marstoni* Evenhuis, sp. nov.**

(Figs. 9, 28, 55, 71, 87, 103, 130)

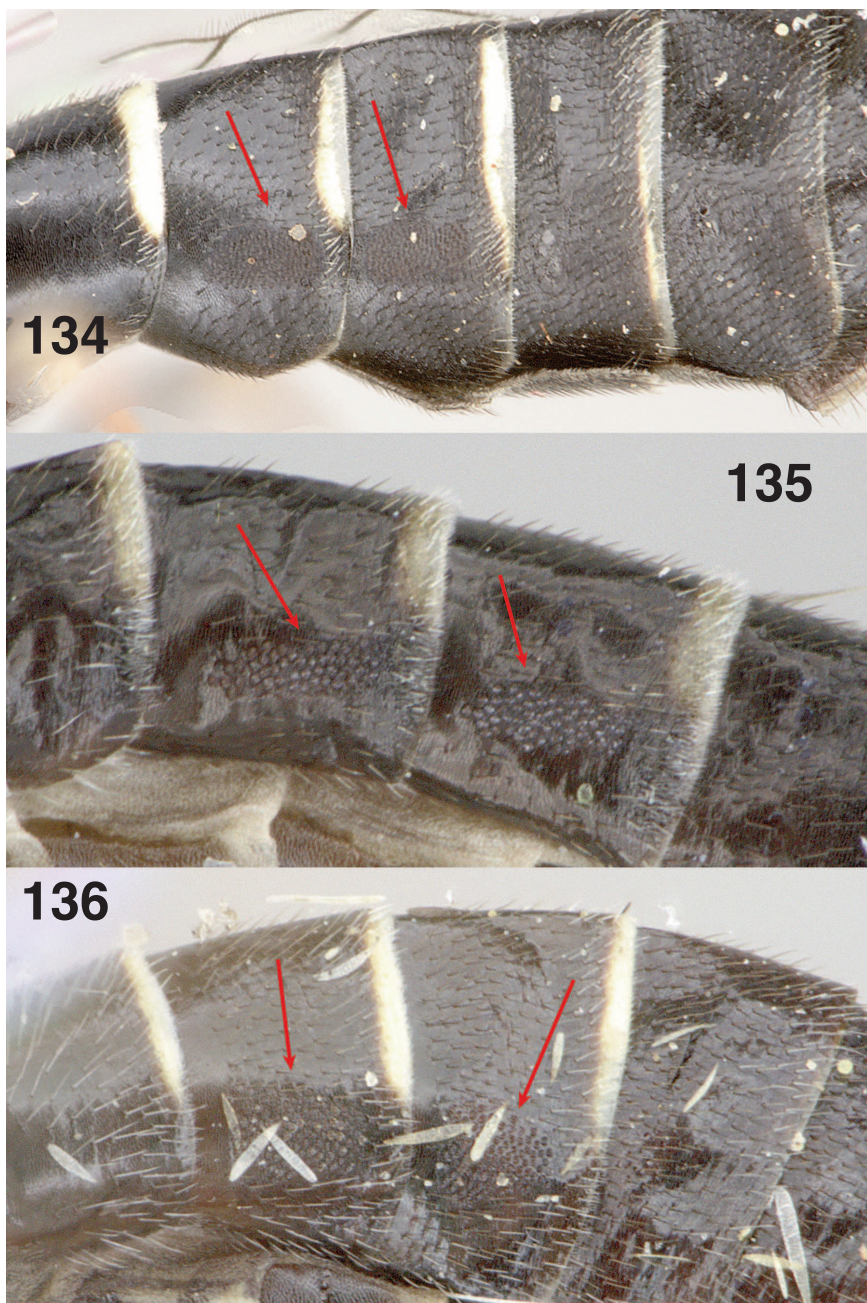
Material examined. Holotype ♀ (USNMENT 01353630) from MEXICO: Guerrero, Chilpancingo, 7 Aug 1962, N. Marston. Holotype in USNM.

Diagnosis. Separated from the congeners with a reduced anal lobe, by having a predominantly brown mentum with only paired spots laterally on the lower occiput (other species with a reduced anal lobe and brown mentum have a yellow medial stripe on the mentum).

Description

Female (Fig. 9). Measurements. Body: 4.8 mm. Wing: 4.6 mm. **Head.** Black, occiput slightly gray pollinose posteromedially; ocelli on two tubercles, separated by width of anterior tubercle (Fig. 28); occipital fringe with short white hairs. Eyes separated at vertex by width of posterior ocellar tubercle. Frons slightly tumid, silvery tomentose immediately above antennae and along inner eye margin. Mentum (Fig. 55) brown with small yellow spot laterally on lower occiput. Face brown with yellow line medially connected to yellow line surrounding oral margin, produced, subconical, rounded apically. Antenna black, with small subcylindrical scape, with cluster of black hairs laterally; pedicel flared, bare; flagellomere length two times length of scape and pedicel combined; conical, tapering apex, style minute, terminal. Proboscis short, dark brown, not projecting beyond oral margin; labellae dark brown and yellow.

Thorax (Fig. 71). Mesonotum and scutellum shining black, with scattered white hairs minute on anterior half, dense yellow tomentose except center of mesonotal disc bare. Scutellum subshining black, with scattered white hairs and tomentum, long hairs along posterior margin. Pleura with anepisternum black, other sclerites dark brown, all with minute



Figures 134–136. *Metacosmus* tergal abdominal patches (arrows). **134.** *Metacosmus sabroskyi* Evenhuis, sp. nov.; **135.** *M. yanegai* Evenhuis, sp. nov.; **136.** *M. zircon* Evenhuis, sp. nov.

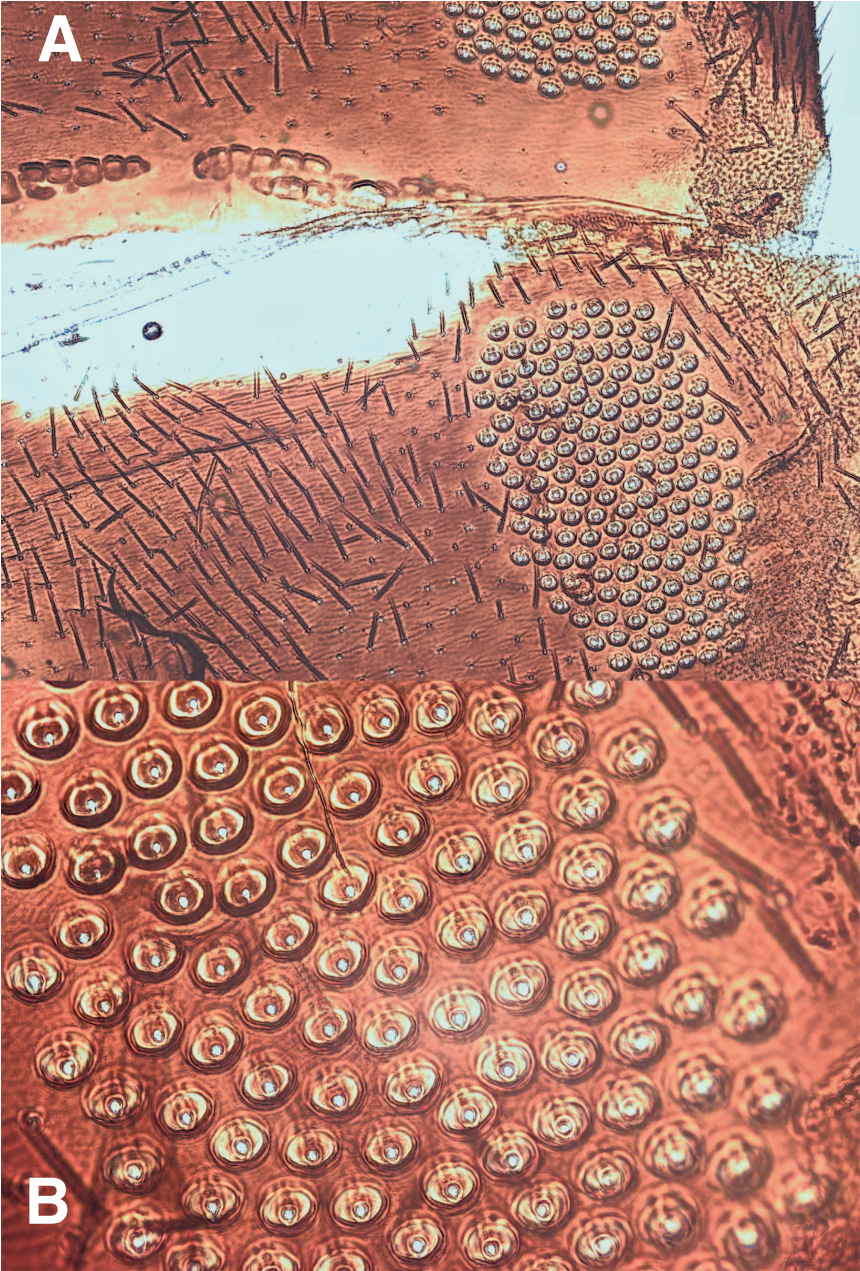


Figure 137. *Metacosmus costaricensis* Evenhuis & Hanson, sp. nov., tergal abdominal patches with transmitted light microscopy after dissection. **A.** Tergites II (bottom) and III (top); **B.** Detail of patch on tergite II.

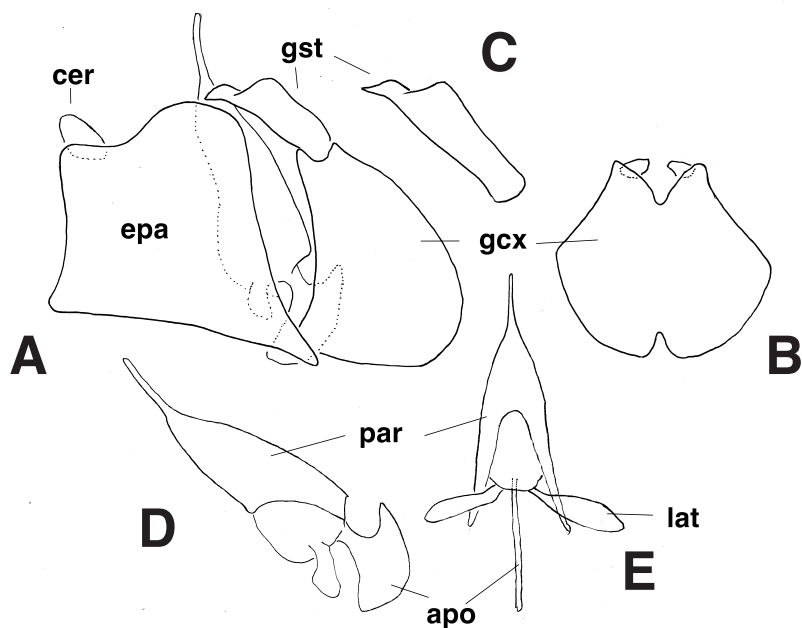


Figure 138. *Metacosmus exilis*, male genitalia. **A.** Lateral view; **B.** Gonocoxa, ventral view; **C.** Gonostylus; **D.** Phallic complex, lateral view; **E.** Phallic complex, dorsal view. Abbreviations: apo = aedeagal apodeme; cer = cercus; epa = epandrium; gcx = gonocoxa; gst = gonostylus; lat = lateral ramus.

white tomentum; katatergite with patch of white hairs in front of posterior spiracle; post alar callus bare. Halter stem and knob yellow, with dark brown on dorsal surface of each.

Legs. Black to brown, basitarsi yellow basally, femora with sparse white hairs ventrally.

Wing (Fig. 87, 103). Hyaline, veins dark brown; vein R_{2+3} slightly sinuous to wing margin, ending at level slightly beyond end of M_1 ; R_4 angled upward at wing margin; crossvein r-m slightly beyond middle of cell dm; anal cell widely open at wing margin, width ca. equal to width of cell r5; anal lobe narrow, wing border fairly straight; alula extremely reduced. Wing Interference Pattern (Fig. 103) with green apically and dark magenta and purple basally; cells m1, m2 and anal cell with blue apically.

Abdomen (Fig. 9). Black, with thin gray line on posterior margin of tergites III–VII, tergites black pilose dorsally; abdominal patches laterally on tergite III and IV (Fig. 130) rather small, circular in shape. Venter dark brown, black pilose and tomentose; apex of abdomen (sand chamber) with dense mixed black and white hairs.

Genitalia. Not dissected.

Male. Unknown.

Etymology. Named for the late bee fly specialist Norman Lee Marston (1937–2021), who collected the holotype, and for his contribution to our knowledge of Anthracinae in the New World.

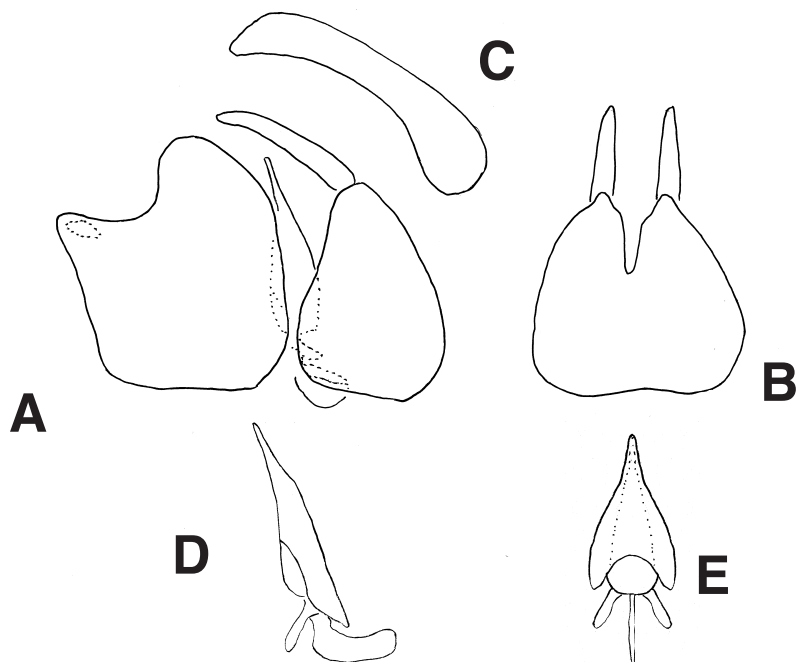


Figure 139. *Metacosmus mancipennis*, male genitalia. **A.** Lateral view; **B.** Gonocoxa, ventral view; **C.** Gonostylus; **D.** Phallic complex, lateral view; **E.** Phallic complex, dorsal view.

***Metacosmus mexicanus* Evenhuis, sp. nov.**

(Figs. 10, 29, 42, 56, 72, 88, 104, 105, 131, 140)

Material examined. *Holotype* ♂ (USNM 01353625) from **MEXICO: Morelos:** 12 mi [19.3 km] E. Cuernavaca, Lobo Canyon, 4,000 ft. [1,220 m], 13 Apr 1966, R.H. & E.M. Painter (USNM). *Paratype* ♀ from **MEXICO: Puebla:** 3 mi [4.8 km] NW Petlacingo, 4 Mar 1972, F. Parker, D. Miller (USNM). Holotype and paratype in USNM.

Non-type material examined. **MEXICO: Puebla:** 1 ♀, 3 mi [4.8 km] NW Petlacingo, 4 Mar 1972, F. Parker, D. Miller (USNM). Not part of the type series because it is greasy and characters cannot be seen to confirm its identity.

Diagnosis. Separated from the congeners with hyaline wings by having the crossvein r-m well beyond the middle of cell dm (this crossvein at or slightly beyond in the other species). In this respect, it is similar to *Metacosmus grandis* Evenhuis sp. nov., but can be easily separated by having hyaline wing (wings infuscated in *M. grandis*).

Description

Male (Fig. 10). Measurements. Body: 5.2 mm. Wing: 5.0 mm. *Head* (Fig. 42). Dark brown; occiput gray tomentose; occipital fringe with short white hairs; ; ocelli on two tubercles, separated by width of anterior tubercle (Fig. 29); eyes separated at vertex by

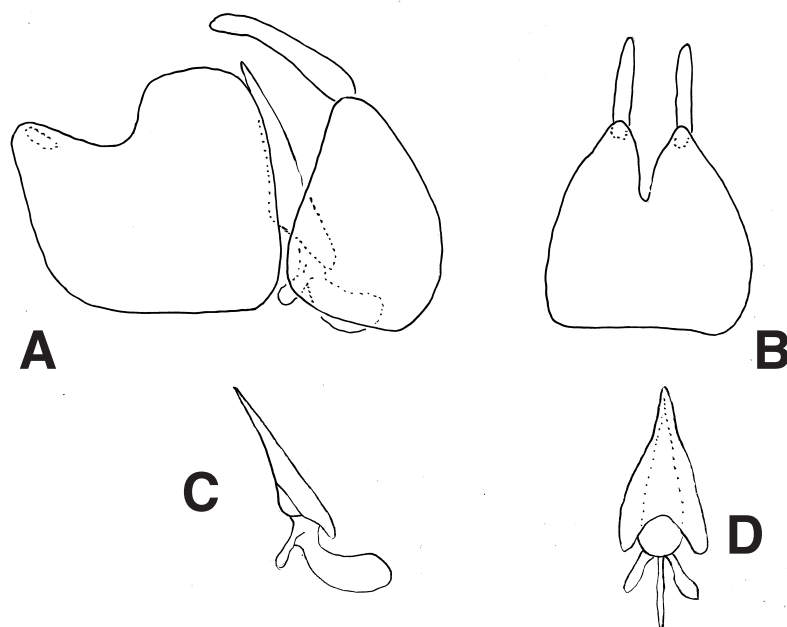


Figure 140. *Metacosmus mexicanus* Evenhuis, sp. nov., male genitalia. **A.** Lateral view; **B.** Gonocoxa, ventral view; **C.** Phallic complex, lateral view; **D.** Phallic complex, dorsal view..

2.5× width of posterior ocellar tubercle; frons slightly tumid, with white hairs, silvery tomentose immediately above antennae and along inner eye margins. Face produced, sub-conical, rounded apically, yellow, silvery tomentose. Mentum (Fig. 56) yellow. Antenna with small subcylindrical scape, with cluster of black hairs laterally; pedicel flared, bare; flagellomere length two times length of scape and pedicel combined; conical, tapering to apex, style minute, terminal. Proboscis short, black, not projecting beyond oral margin.

Thorax (Fig. 72). Mesonotum and scutellum subshining black, dense gray tomentose in interhumeral areas; disc covered with scattered gray tomentum and uniformly distributed short white hairs. Scutellum with white hairs and tomentum. Pleura dark brown gray pollinose. Post alar callus with scattered white hairs. Halter stem brown yellow medially, brown basally and apically, knob yellow.

Legs. Coxae black; femora yellow with brown band medially, scattered whiter hairs ventrally; tibiae and basitarsi yellowish brown, rest of tarsi brown.

Wing (Figs. 88, 105). Hyaline, veins dark brown; vein R_{2+3} sinuous to wing margin, ending at level beyond end of R_5 ; R_4 angled upward at wing margin; crossvein r-m well beyond middle of cell dm; anal cell open at wing margin, subequal to width of cell r5; anal lobe normal, rounded; alula absent. Wing Interference Pattern (Fig. 104) with golden yellow in radial and medial fields, bordered by thin line of magenta and blue, golden color

extending in apical portion of cell dm and anal cell; blue band along apical tip of wing in cells r1, r2+3, and r4; blue basal to golden color, green and blue more basally.

Abdomen (Fig. 10). Black, tergites III–VII with yellow posterior band, black pilose dorsally, dense white pilose laterally on tergites I–III; tergites IV–VII with thin adpressed brown tomentum and hairs dorsally; abdominal patches laterally on tergite III and IV (Fig. 131) almost circular in shape. Venter dark brown, black pilose and tomentose except small patch of white hairs laterally on sternites II and III.

Genitalia (Fig. 140). Epandrium in lateral view subsquarish, as wide as high, cercus small, not exerted; gonocoxa in lateral view subconical, in ventral view broadly conical with deep medial cleft apically; gonostylus very long, almost as long as height of gonocoxa, slightly curved downward apically; parameral sheath long conical in dorsal view, tapering to aedeagal tip; aedeagal apodeme small, elliptical-shaped, lateral rami short, foliate.

Female. As in male except: head all gray pollinose; mentum yellow, with thin brown line laterally; face yellow; halter knob as in male but spot of brown dorsally on knob; Wing Interference Pattern (Fig. 104) very much like the male except the blue band along apical tip of wing in cells r1, r2+3, and r4 and the color immediately basal to the golden color is green; abdominal apex (sand chamber) with yellow hairs.

Remarks. Painter's collecting notes (kept along with the USNM bee fly collection) for the holotype locality say that specimens of various bee flies were collected along stream or mud.

Although the anal lobe is reduced in females and rounded in males (which is found in other species), and the female was collected in a different state than the male (about 80 miles [128 km] away), I am confident in placing the two in the same species based on the WIP being extremely similar.

Etymology. Named for the country (Mexico) in which this species is found.

Metacosmus nitidus Cole

(Figs. 11, 30, 43, 57, 73, 90, 106, 132, 141, 144, 145)

Metacosmus nitidus Cole, 1922: 23. Melander 1950: 156; Painter & Painter 1965: 427; Cole & Schlinger 1969: 242; Hull 1973: 295; Tabet 1974: 20, 1979: 220; Arnaud 1979: 217; Frommer 1981: 36; Tabet & Hall 1984: 81, 1987: 76. Poole 1996: 72; Evenhuis & Greathead 1999: 285; Evenhuis 2018: 59.

Type [not seen]: *Holotype* ♀ from **UNITED STATES: California: Fresno County:** Huntington Lake, 7,000 ft. [2,133 m], 15 Jul 1919, E.P. Van Duzee (CAS).

Material examined. **UNITED STATES: Arizona: Yuma County:** 1♀, Ligurta [ca. 230 ft [ca. 70 m]], 13 Apr 1963, G.I. Stage (USNM). **California: El Dorado County:** 1♀, Fallen Leaf Lake, Aug 1931, O.H. Swezey (CAS), 1♀, 2 mi [ca. 3.2 km] S. Meyers, 24 Jul 1955, E.I. Schlinger, UCRENT 459264 (UCR); **Fresno County:** 2♀♀ (paratypes), Huntington Lake, 7,000 ft. [2,133 m], 15 Jul 1919, E.P. Van Duzee (CAS); **Imperial County:** 1♀, 3 mi [4.8 km] NW Glamis, 15–16 Sep 1972, M. Wasbauer, A. Hardy (CDFA), 1♀, Pinto Flats, 5 May 1958, on *Eriogonum inflatum*, F.X. Williams (CAS); **Los Angeles County:** 1♀, Eagle's Roost, Angeles Crest Hwy, 27 Jun 1985, 2030 m, K.W. Cooper, UCRENT 501951 (UCR); **Madera County:** 1♂, first mine prospect above Willow Meadow, S.W. foot Madera Peak, 7,500 ft. [2,286 m], 13 Aug 1971, H.B. Leech (CAS); 1♀, Chiquito Creek, 0.25 mi [0.40 km] above upper Chiquito Campground, 6,820 ft. [ca. 2,081 m], 11 Aug 1971, H.B. Leech (CAS); **Modoc County:** 1♀, 15 mi [ca. 24.1 km] N. Canby, 17 Jul 1989, J.C. & E.M. Hall, UCRENT

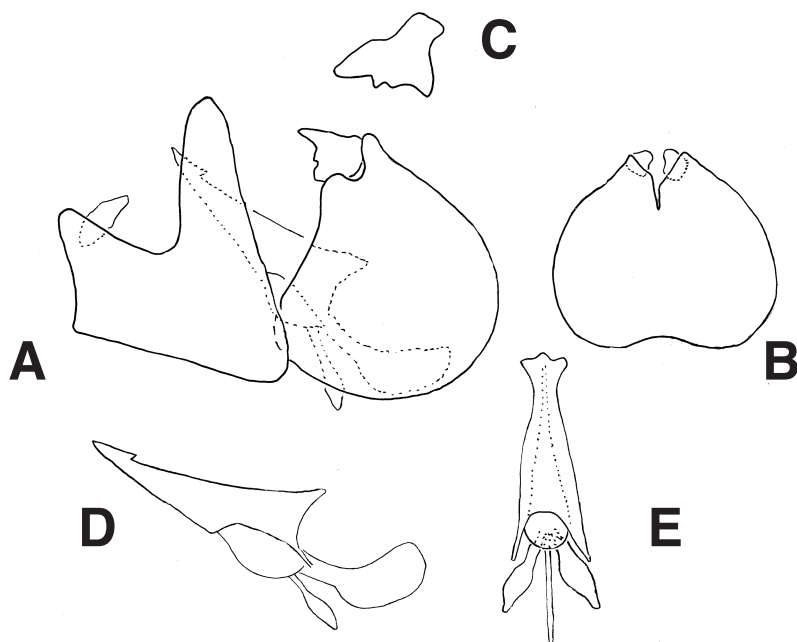


Figure 141. *Metacosmus nitidus*, male genitalia. **A.** Lateral view; **B.** Gonocoxa, ventral view; **C.** Gonostylus; **D.** Phallic complex, lateral view; **E.** Phallic complex, dorsal view.

522488 (UCR); *Nevada County*: 1♀, Sagehen Creek [ca. 6,500 ft [1,986 m], 25 Jul 1956, R.M. Bohart (USNM), Sagehen Research Camp, near Hobart Mills, 2 Jul 1954, E.I. Schlinger, UCRENT 445417 (UCR); *Placer County*: 1♂, Dollar Point, 2 mi [3.2 km] NE Tahoe City, 21–24 Jul 1980, Malaise trap, 8am–5pm, P.E. Adams (CDFA), 1♀, Brockway Summit, 25 Jul 1957, R.M. Bohart, UCRENT 547404 (UCR); *Riverside County*: 1♂, Upper Santa Ana River [ca. 6,500 ft [1,986 m]], 15 Jul 1948, A.L. Melander (USNM); 1♂, 8 mi. [ca. 13 km] N. Jct. Deep Creek and Horsethief Creek, 2,690 ft [925 m], 16–20 Aug 1973, A.B. Tabet, Malaise trap, UCRENT 294575 (UCR); 1♂, P.L. Boyd Desert Research Center, Deep Canyon, 4 mi [6.4 km] S. Palm Desert, 24 May 1969, M.E. Irwin, S. Frommer, Malaise trap, UCRENT 192534 (UCR), 1♀, 5 mi [8 km], S. Hemet, 3 May 1968, F.G. Andrews, UCRENT 522125 (UCR), 1♀, 5 mi [8 km], S. Hemet, 26–29 May 1978 [no further data], UCRENT 523335 (UCR); *San Bernardino County*: 1♀, Holcomb Valley, 3N02, 1 July 1982, K.W. Cooper, UCRENT 250464 (UCR), 1♂, Dollar Lake Trail, 10 Jul 1956, H.R. Moffitt, UCRENT 538499 (UCR); 1♂, Cadiz Valley, 540 m, 26 Apr 1994 [no collector], UCRENT 442862 (UCR); 1♀, Mojave River, near Victorville, 28 May 1932, on *Eriogonum gracillimum*, P.H. Timberlake, UCRENT 256821 (UCR); *San Diego County*: 1♀, Borrego Valley, 26 May 1954, F.X. Williams (CAS), 1♂, Borrego Valley, dunes, 18 Apr 1957, E.I. Schlinger, UCRENT 480470 (UCR), 1♀, Anza-Borrego Desert State Park, Coyote Canyon, 15 Apr 1981, J.C. Hall, UCRENT 45599 (UCR); *Shasta County*: 1♀, Hat Creek, U.S.F.S. Insect Lab, T34N R4E Sec 16, 8 Jul 1989, Malaise, M.A. Valenti (CDFA); *Stanislaus County*: 1♂, 1♀, Del Puerto Canyon, Frank Raines Park, 385 m, 6 May 1970, P.H. Arnaud (CAS); *Tuolumne County*: 1♀, Buck Meadows, Mather site, #51580 [37,822, -120,098], A.R. Moldenke, [no further data] (CAS); *Ventura County*: 2♂♂, Lockwood Valley, 12 Jun 1962, J.C. Hall, UCRENT 556740, 556741 (UCR). **Nevada**: 1♂, Santa Rosa Mountains, Santa Rosa Peak, 7,500 ft. [2,286 m], 8 Jun 1946, on *Cryptantha micrantha*, P.H. Timberlake (USNM).

Unverified but probable records in the literature. UNITED STATES: Idaho: Boise Co: 4 mi S. Robie Creek, 12 Jul 1976, A.B. Tabet; Latah Co: Robinson Lake, 4–5 Sep 1976, 27 Sep 1976, A.B. Tabet; Shoshone Co: 7 mi E. Avery 16 Jul 1969, C.J.H. (Tabet 1980: 220).

An undetermined specimen (not seen) recorded from the southern Okanagan region of British Columbia (Blades & Maier 1996) may be *M. nitidus* as it is the only known species that occurs anywhere nearby (Idaho).

Diagnosis. This species is easily separated from the congeners by the 90° curve toward the wing margin in vein R_{2+3} (all other species have much less of a curve toward the wing margin); and the nearly contiguous ocellar tubercle with the anterior tubercle nearly touching the posterior tubercle (separation between anterior and posterior tubercle much more distinct in the congeners except *M. grandis* Evenhuis, sp. nov.) [NB: Hall (1976) described *Metacosmus schlingerii* as having the “[m]edian ocellus in close proximity to the lateral ocelli” but, without seeing actual specimens, it is difficult to know how close the two tubercles actually are].

Description

Male (Fig. 11). Measurements. Body: 5.2–5.8 mm. Wing: 5.0–5.8 mm. *Head* (Fig. 43). Black; occiput gray tomentose along eye margin; ocelli on two tubercles, separated, but in very close proximity to each other (Figs. 30, 43); eyes separated by 2× width of posterior tubercle; occipital fringe with short white hairs. Frons slightly tumid, sparse white hairs laterally, silvery tomentose along inner eye margin. Face produced, subconical, rounded apically, with sparse black hairs, yellow along oral margin sometimes extending onto gena. Mentum (Fig. 57) black with yellow to yellow-orange medially, yellow color extending laterally onto lower occiput. Antenna with scape subcylindrical, flared at mesoapical margin, twice as long as pedicel, with black hairs; pedicel subspherical, with black hairs; flagellomere longer than scape and pedicel combined; conical, tapering apex, style minute, terminal. Proboscis short, black, not projecting beyond oral margin; labellae black.

Thorax (Fig. 73). Mesonotum and scutellum subshining black, with wavy white hairs; disc bare except some silvery tomentum laterally along notopleural stripe. Scutellum with white hairs and tomentum. Pleura black, subshining; katatergite with white hairs. Post alar callus with white hairs. Halter stem brown, knob white.

Legs. Black; tibia without bristles, with minute thin hairs.

Wing (Figs. 90, 106). Hyaline, veins dark brown; vein R_{2+3} fairly straight, then curved upward almost 90° to wing margin, ending at level before end of R_5 ; R_4 angled upward at wing margin; crossvein r-m at apical three fourths of cell dm; anal cell widely open at wing margin, wider than width of cell r5; anal lobe small, reduced, but with rounded border; alula absent. Wing Interference Pattern (Fig. 106) with magenta in radial field; cell r5 mixed magenta and blue-green; medical cells deep green; anal lobe magenta basally, blue-green apically; basal portion of wing mixed blue and magenta.

Abdomen (Fig. 11). Black, tergites I–V with white band along posterior margin, not extending laterally, tergite I with white hairs, black hairs on remainder of tergites; abdominal patches laterally on tergite III and IV (Fig. 132) elliptical in shape, almost fine granular in sculpture. Venter dark brown, black pilose.

Genitalia (Fig. 141). Epandrium subrectangular in lateral view with large posteroventral lobe; cercus narrow, partially exerted; gonocoxa broadly conical in lateral

view, subglobular in ventral view, with medial cleft; gonostylus short, subtriangular; parameral sheath long conical, with apex flared laterally in dorsal view; aedeagal apodeme linear-ellipsoid, lateral rami long, thin, foliate.

Female. As in male except: genitalia (Figs. 144, 145) with genital fork (Fig. 144) broad, sclerotized, each lateral arm curved, appearing fused together medially; basal duct thin, subequal in length to sperm pump, all three connected to semi-membranous plate serving as genital pore; sperm pump (Fig. 145) thin, with very broad sclerotized disc-shaped apical valve; basal valve small, cylindrical; apical duct twice length of sperm pump; spermatheca (Fig. 145) ellipsoid-ovular, with rounded apex. Abdominal apex (sand chamber) with dense orangish yellow hairs.

Remarks. *Metacosmus nitidus* appears to prefer high-elevations, found most often above ca. 2000 meters in cool forested mountainous areas of California and Nevada during June and July. Populations further south in California and Arizona are found in drier unforested locations at much lower elevations and earlier in the year. However, no appreciable differences in individuals from low or high elevations could be found in this study.

***Metacosmus painteri* Evenhuis, sp. nov.**
(Figs. 12, 31, 44, 58, 74, 91, 107, 133, 142)

Material examined. *Holotype* ♂ (USNM 01353620) and 3 *paratype* ♀♀ from **UNITED STATES: New Mexico:** Estancia, 12 Aug 1931, R.H. Painter; 1 ♂, same data except 12 Jun 1940 (USNM). *Holotype* and *paratypes* in USNM.

Diagnosis. This species is most similar to *Metacosmus exilis* by both having yellowish color on the abdominal tergites only medially, the remainder being black; but *M. painteri* can be separated from *M. exilis* by the pleura being gray pollinose (predominantly bare, shining brown in *M. exilis*).

Description

Male (Fig. 12). Measurements. Body: 5.2–5.8 mm. Wing: 5.0–5.8 mm. *Head* (Fig. 44). Dark brown to black; occiput dark brown, gray pollinose; occipital fringe short white pilose; ocelli on two tubercles, separated from each other by width of anterior tubercle (Fig. 31); eyes separated at vertex by width of posterior ocellar tubercle. Frons slightly tumid with short, white hairs, shining medially, gray pollinose above antennae and along inner eye margin. Face produced, yellow, subconical, silvery tomentose. Antenna black with scape subcylindrical, flared at mesoapical margin, twice as long as pedicel, with black hairs; pedicel subspherical, with medial ring of black hairs; flagellomere longer than scape and pedicel combined; conical, tapering to apex, style minute, terminal. Proboscis short, dark brown, not projecting beyond oral margin; labellae dark brown. Mentum (Fig. 58) yellow. Palpi not evident.

Thorax (Fig. 74). Mesonotum and scutellum shining black, gray pollinose laterally and anteriorly, with scattered short white pile on mesonotal disc. Scutellum with white hairs and sparse white tomentum. Pleura black, gray pollinose. Post alar callus brown with a few white hairs. Halter stem yellow, knobs white.

Legs. Dark brown, except basitarsi yellowish brown; femora with scattered white hairs; fore tibia without bristles, with minute thin hairs.

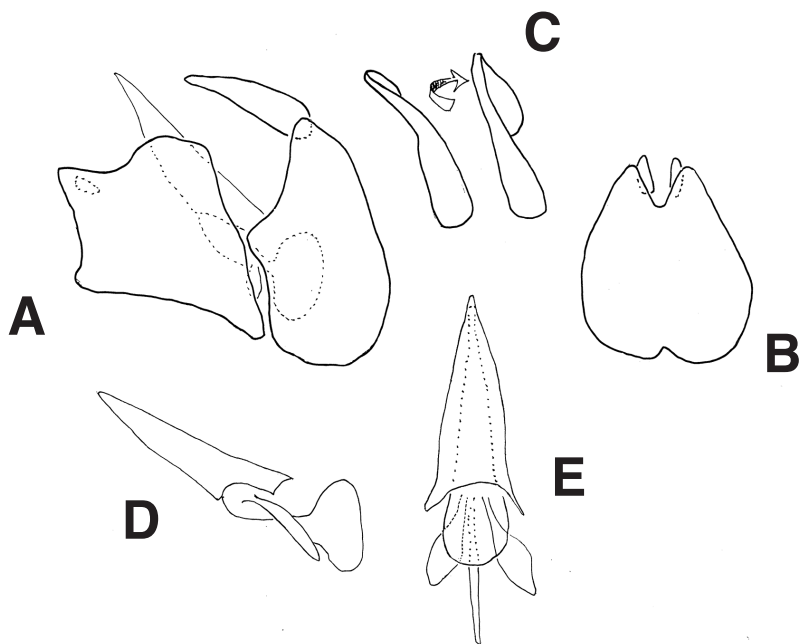


Figure 142. *Metacosmus painteri* Evenhuis, sp. nov., male genitalia. **A.** Lateral view; **B.** Gonocoxa, ventral view; **C.** Gonostylus; **D.** Phallic complex, lateral view; **E.** Phallic complex, dorsal.

Wing (Figs. 91, 107). Hyaline, veins dark brown; vein R_{2+3} sinuous and upcurved to wing margin, ending at level beyond end of M_1 ; R_4 angled upward at wing margin; crossvein r-m at middle of cell dm; anal cell open at wing margin, subequal to width of cell r5; anal lobe normal, rounded; alula absent. Wing Interference Pattern (Fig. 107) with golden yellow in radial and medial fields, bordered by thin line of green and blue, golden color of medial field coalesced with that in medial field; golden color extending in apical portion of cell dm; anal cell with spot of dark blue subapically in field of green; thin green band along apical tip of wing from cell r2+3, to cell m4; green color basally.

Abdomen (Fig. 12). Black, tergites VI–VIII dark brown, thin white band posteromedially on tergites III–VIII; white hairs on tergites I–III; abdominal patches laterally on tergite III and IV (Fig. 133) small, elliptical in shape. Venter with sternites I–II gray polli-nose, shiny elsewhere; sternites I–IV with white posterior band.

Genitalia (Fig. 142). Epandrium subtrapezoidal in lateral view; cercus very small, not exerted; gonocoxa in lateral view ellipsoid-ovular, height two times width, in ventral view subglobular with V-shaped cleft apically, small cleft basomedially; gonostylus long, narrow, tapering to pointed apex, with flat, flange-like process laterally; parameral sheath long, conical, undifferentiated; aedeagal apodeme small, subcircular, lateral rami long, foliate.

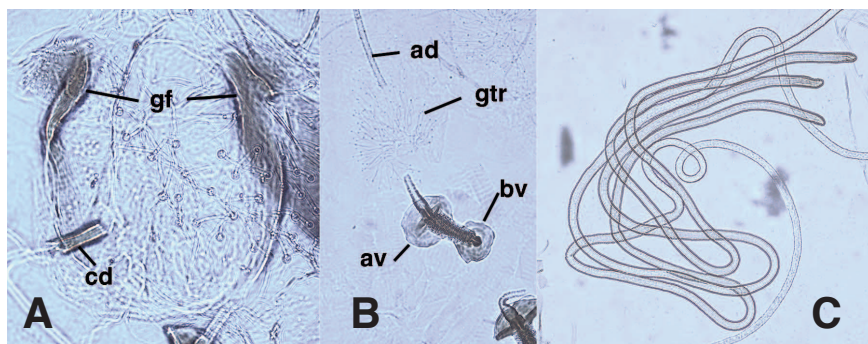


Figure 143. *Metacosmus costaricensis* Evenhuis & Hanson, sp. nov., female genitalia. **A.** Genital fork and common duct; **B.** Sperm pump showing glandular trichomes; **C.** Spermatheca. Abbreviations: ad = apical duct; av = apical valve; bv = basal valve; cd = common duct; gf = genital fork; gtr = glandular trichomes.

Female. As in male except: frons slightly wider; face (cf. Fig. 59) brown with medial line of yellow; legs all black; sand chamber with yellowish white hairs. Genitalia not dissected.

Etymology. Named for Reginald Henry Painter (1901–1968), who collected the type series and contributed significantly to our knowledge of Nearctic and Central American Bombyliidae.

***Metacosmus sabroskyi* Evenhuis, sp. nov.**

(Figs. 123, 32, 45, 60, 75, 92, 108, 134)

Material examined. Holotype ♀ (USNM 01353615) and 2♀♀ paratypes from **UNITED STATES: Arizona:** Southwest Research Station, 5 mi [8 km] SW Portal, 5,400 ft [1,646 km], 23 May–15 Jun 1967, C.W. Sabrosky (USNM). Holotype and paratypes in USNM.

Diagnosis. Easily separated from the female congeners by the all yellow face (face normally brown with thin line of yellow laterally along the oral margin in the other females of the genus).

Description

Female (Fig. 13). Measurements. Body: 5.7–6.2 mm. Wing: 5.0–5.6 mm. **Head** (Fig. 45). Dark brown to black; occiput dark brown, gray pollinose; occipital fringe short white pilose; ocelli on two tubercles, separated by width of anterior tubercle (Fig. 32). Eyes separated at vertex by width of posterior ocellar tubercle. Frons slightly tumid with short, white hairs, shining medially, gray pollinose above antennae and along inner eye margin. Face produced, yellow, subconical, silvery tomentose. Antenna black with scape subcylindrical, gray pollinose, flared at mesoapical margin, twice as long as pedicel, with black hairs; pedicel subspherical, with medial ring of black hairs; flagellomere longer than scape and pedicel combined; conical, tapering to apex, style minute, terminal. Proboscis short, dark brown, not projecting beyond oral margin; labellae dark brown. Mentum (Fig. 60) yellow. Palpi not evident.

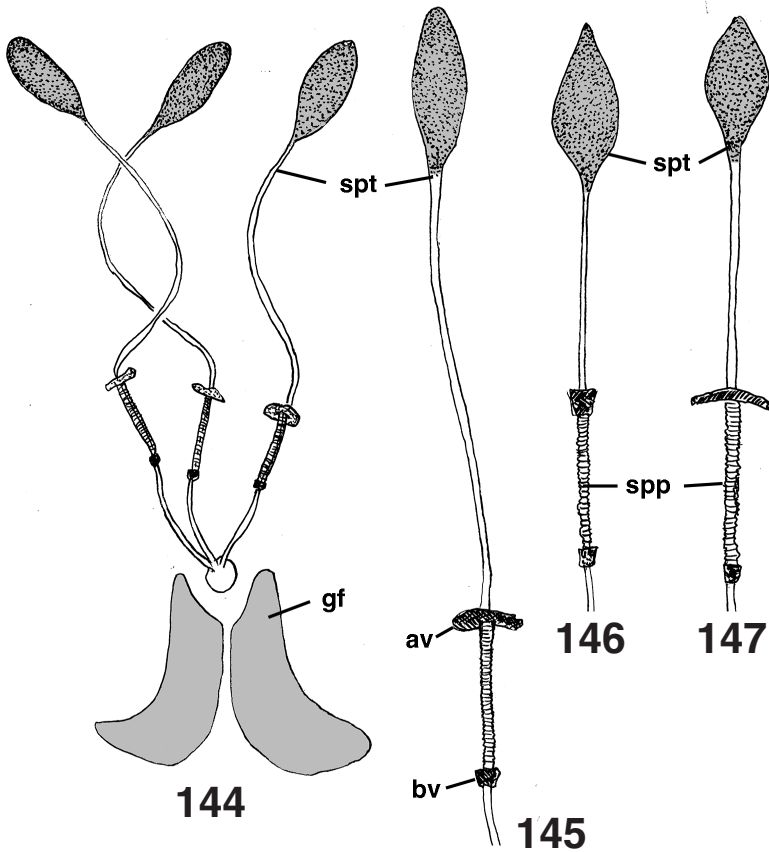


Figure 144–147. *Metacosmus* female genitalia. 144. *Metacosmus nitidus*, genitalia in situ; 145. *M. nitidus*, detail of sperm pump and spermatheca; 146. *M. exilis*, detail of sperm pump and spermatheca; 147. *M. mancipennis*, detail of sperm pump and spermatheca. Abbreviations: av = apical valve; bv = basal valve; gen = genital fork; spp = sperm pump; spt = spermatheca.

Thorax (Fig. 75). Mesonotum and scutellum shining black, gray pollinose laterally and anteriorly, with scattered short white pile on mesonotal disc. Scutellum with white hairs and sparse white tomentum. Pleura black, gray pollinose. Post alar callus brown, bare. Halter stem yellowish brown, knobs yellow with brown dorsally.

Legs. Coxae black, femora black, yellow basally; remainder of leg orangish with tarsomeres 3–5 brown; hind femur without hairs ventrally, silver tomentum dorsally visible only at certain angles.

Wing (Figs. 92, 108). Hyaline, veins dark brown; vein R_{2+3} sinuous to wing margin, ending at level slightly beyond end of R_5 ; R_4 angled upward at wing margin; crossvein $r-m$ well beyond middle of cell dm ; anal cell open at wing margin, slightly more than width

of cell r5; anal lobe narrow, margin straight; alula absent. Wing Interference Pattern (Fig. 108) with irregularly margined blotch of color in radial field, surrounded by green; cell r5 green with narrow elliptical spot subapically; medial cells predominantly brassy golden; cell dm green to blue-green with dark blue apically; base of wing with bright magenta color in most cells.

Abdomen (Fig. 13). Black, tergites I, III–V with white band along posterior margin extending laterally; short white hairs laterally on tergite I; minute white decumbent hairs dorsally on tergites; abdominal patches laterally on tergite III and IV (Fig. 134) small, elliptical in shape. Venter brown basally to black apically; white band of color posteriorly on sternites I, II–V. Apex of abdomen (sand chamber) with yellowish white hairs.

Genitalia. Not dissected.

Male. Unknown.

Etymology. Named for dipterist Curtis Williams Sabrosky (1910–1997), who collected the type series.

Metacosmus schlingeri Hall

Metacosmus schlingeri Hall, 1976: 126. Painter *et al.* 1978: 23; Evenhuis & Greathead 1999: 285.

Material examined [No physical specimens seen]. *Holotype* ♂ from: **CHILE: Ñuble Province:** Las Trancas Road nr. Ternes de Chillán, 15 Feb 1967, E.I. Schlinger (MEUC). Verified photograph of mating pair on iNaturalist at the following location: **CHILE: Valparaíso:** El Quisco, 19 Jan 2021, E.G. Tapia [link: <https://www.inaturalist.org/observations/70760895>].

Diagnosis. According to Hall (1976), *Metacosmus schlingeri* can be separated from the only other known Chilean *Metacosmus*, *M. chilensis*, by the black tibiae (testaceous in *M. chilensis*), the black fringe of the metapleuron [= laterotergite] (this fringe white in *M. chilensis*) and the black fringe of the squama (this fringe white in *M. chilensis*).

Description [from Hall (1976: 126–127)]:

Male. Measurements [not given].

“Black. Eyes separated by twice width of ocellar tubercle. Front parallel-sided with black hair both above and below ocellar tubercle. Median ocellus in close proximity to lateral ocelli. Antennae velvet black, first segment small, hardly visible; second segment short, wider than long, black hair above; third segment short, base bulbous, constricted near middle to slender apical portion which is nearly as long as bulbous base, arista either microscopic or wanting. Face conically projecting, receding below, upper part of face not pollinose; oral margin narrowly white. Underside of head white pollinose with white hair. Proboscis shorter than length of buccal cavity, labellae large, fleshy. Palpi short, one-segmented, black with black hair. Occiput white pollinose below, with short black hair; cervical fringe black.

Mesonotum dull, sense black pilose, lighter on humeral calli and collar; bristles wanting. Pleura white pollinose bare except white hair on propleuron, black hair on upper part of mesopleuron and in mesopleural tuft. Coxae and legs black, former somewhat white pollinose, white pilose, hind femur with white hair at base, black elsewhere; extreme base of hind femur with small ferruginous spot; knees on all legs somewhat ferruginous; fore and mid tibiae brownish, hind tibia black. Claws black; pulvilli as long as claws. Stem and knob of halter black. Squama black, small narrow, with fringe of black hair. Scutellum dull, pile white, slightly retrorse.

Basicosta not developed. Black setulae at wing base. Wing hyaline, apex faintly tinged with brown; r-m crossvein beyond middle of disc cell; second posterior cell slightly wider than third posterior cell at wing margin; anal cell broadly open; apex of discal cell blunt; axillary cell narrowly developed; alula wanting.

Posterior margin of abdominal tergites two to four narrowly white, dorsum black pilose, hair at sides of first two segments mixed black and white. Venter black, incisures gay, white pilose. Genital segments black pilose."

Female. Unknown.

***Metacosmus yanegai* Evenhuis, sp. nov.**

(Figs. 14, 33, 61, 76, 93, 109, 135, 148)

Material examined. *Holotype* ♂ (UCRENT 51148) from **UNITED STATES: Utah:** Washington County: Lytle Ranch Preserve, 832 m, 37°09'29.2" N, 114°01'1.6" W, 31 Aug–7 Sep 2017, Malaise trap in riparian area, G.R. Ballmer & M.E. Irwin. Paratypes: 2♂♂, same data except 17–24 Aug 2017, UCRENT 511502, 511503, 1♀, same data except 24–31 Aug, UCRENT 511521 (UCR). Holotype and paratypes in UCR.

Diagnosis. Most similar to *Metacosmus costaricensis* Evenhuis & Hanson, sp. nov. by both having a predominantly grayish white inner labellum, but *M. yanegai* can be separated from it by having the halter knob all yellow (brown dorsally in *M. costaricensis*) and cell m1 longer than cell dm (this cell shorter than cell dm in *M. costaricensis*).

Description

Male (Fig. 14). Measurements. Body: 3.8–4.2 mm. Wing: 3.0–4.0 mm. *Head* (Fig. 46). Dark brown to black; occiput dark brown, gray pollinose; occipital fringe short white pilose; ocelli on two tubercles, separated by width of anterior tubercle (Fig. 33); eyes separated at vertex by width of posterior ocellar tubercle. Frons slightly tumid with short, white hairs, shining medially, gray pollinose above antennae and along inner eye margin. Face produced, yellow, subconical, silvery tomentose. Antenna black with scape subcylindrical, flared at mesoapical margin, twice as long as pedicel, with black hairs; pedicel subspherical, with medial ring of black hairs; flagellomere longer than scape and pedicel combined; conical, tapering to apex, style minute, terminal. Proboscis short, dark brown, not projecting beyond oral margin; inner surface of labellae grayish white (specimens with brownish color externally have grayish on inner surface of labellae). Mentum (Fig. 61) yellow.

Thorax (Fig. 76). Mesonotum and scutellum shining black, gray pollinose laterally and anteriorly, with scattered short white pile on mesonotal disc. Scutellum with white hairs and sparse white tomentum. Pleura black, gray pollinose, bare on lower anepisternum, anterior anepimeron, most of katepisternum. Post alar callus dark brown, bare. Halter stem yellowish brown, knob white.

Legs. Coxae black, femora black, yellow basally; remainder of leg orangish with tarsomeres 3–5 brown; hind femur without hairs ventrally, silver tomentum dorsally visible only at certain angles.

Wing (Figs. 93, 109). Hyaline, veins dark brown; vein R_{2+3} sinuous to wing margin, ending at level slightly beyond end of R_5 ; R_4 angled upward at wing margin; crossvein r-m well beyond middle of cell dm; anal cell open at wing margin, slightly more than width of cell r_5 ; anal lobe narrow, margin straight; alula absent. Wing Interference Pattern (Fig. 109) with irregularly margined blotch of color in radial field, surrounded by green; cell r_5

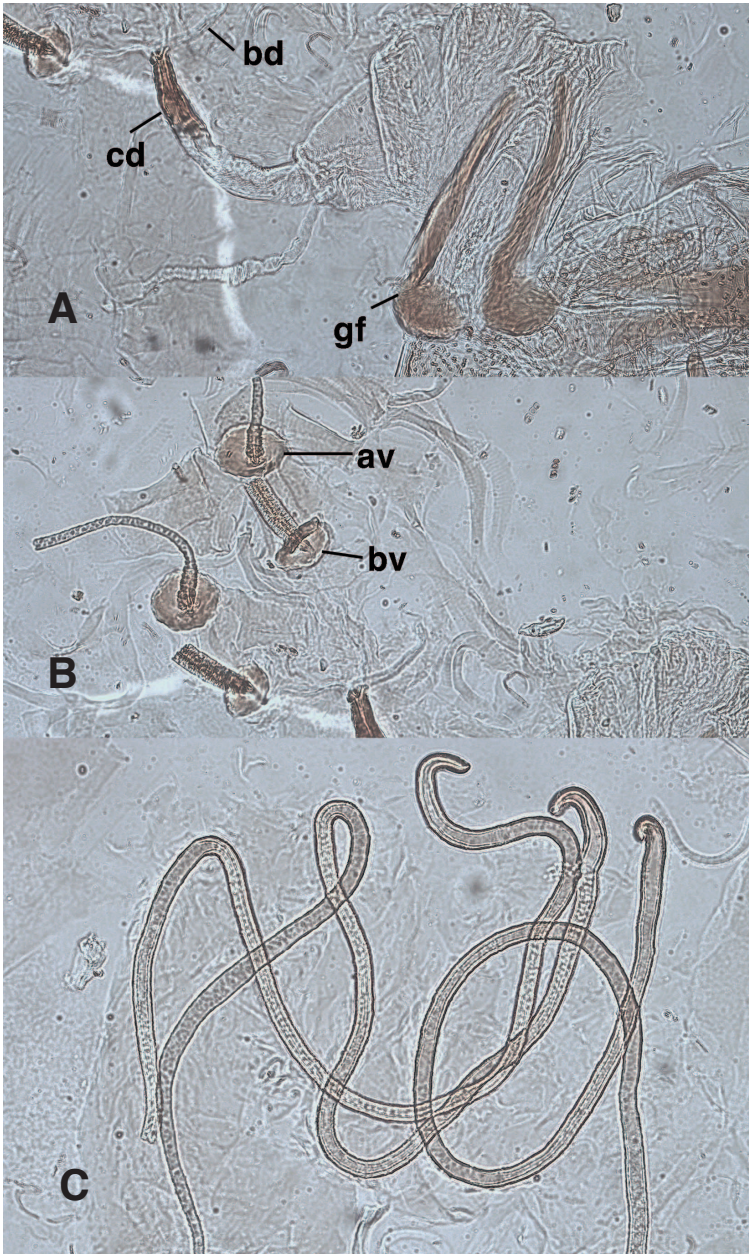
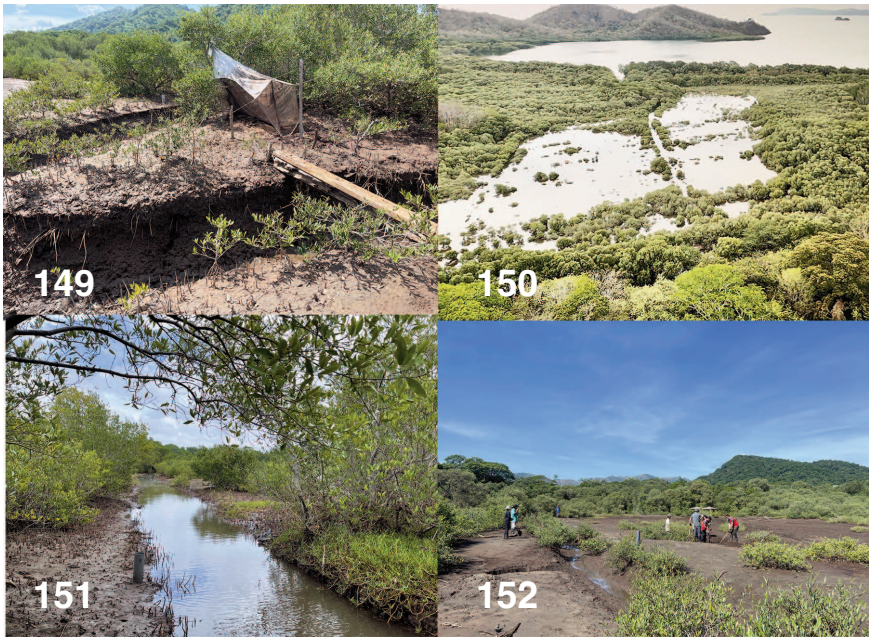


Figure 148. *Metacosmus yanegai* Evenhuis, sp. nov., female genitalia. **A.** Genital fork and basal duct; **B.** Sperm pump; **C.** Spermatheca. Abbreviations: av = apical valve; basal duct; bv = basal valve; cd = common duct; gf = genital fork.



Figures 149–152. Images of habitat where *Metacosmus costaricensis* Evenhuis & Hanson, sp. nov. was found. Photos: L.F. Chavarria Díaz.

green with narrow elliptical spot subapically; medial cells predominantly brassy golden; cell dm green to blue-green with dark blue apically; base of wing with bright magenta color in most cells.

Abdomen (Fig. 14). Dark brown to black with black hairs dorsally, white hairs laterally on tergites I and II; tergites I–VII with white band along posterodorsal margin, not extending laterally; abdominal patches laterally on tergite III and IV (Fig. 135) very small, narrow, irregular in shape. Venter brown with white band posteriorly on sternites II–III.

Genitalia. Not dissected.

Female. As in male except: katapisternum more shining brownish; face slightly wider; femora dark brownish. San chamber with white hairs. Genitalia (Fig. 148) with genital fork (Fig. 148A) U-shaped, with lateral portions sclerotized, connected by membrane medially; basal ducts short, connected to sclerotized common duct (Fig. 148B); sperm pump (Fig. 148B) relatively short with basal and apical valves disc-shaped; apical duct long, thin leading to lightly sclerotized convoluted and curved vermiform spermatheca (Fig. 148c), recurved at extreme apex.

Etymology. Named for Douglas Yanega (UCR) in thanks for the loan of *Metacosmus* specimens from UCR; for his discussions with me on characters that can be used to separate taxa in this genus; and for his monumental effort in establishing a complete list of animal genus-group names with gender for each.

Metacosmus zircon Evenhuis, sp. nov.

(Figs. 15, 34, 62, 77, 94, 110, 136)

Material examined. *Holotype* ♀ (USNMMENT 01353610) from **UNITED STATES: New Mexico:** Estancia, 12 Aug 1931, R.H. Painter (USNM). *Holotype* in USNM.

Diagnosis. Separated from those females with brown to yellow labellae by the having the femora, tibiae, and tarsomeres II–V black (these leg segments with at least some yellow, orange or testaceous color). It can also be separated from the congeners by the unique Wing Interference Pattern with the wing almost all blue with the apical half of cells r5, and medial cells contrastingly golden in color with a very thin line of blue along the wing margin (other species with golden in the medial cells have a blotch of golden in the radial field as well).

Description

Female (Fig. 15). Measurements. Body: 4.7 mm. Wing: 4.0 mm. *Head.* Black to dark brown; occiput brown shining silvery pollinose; occipital fringe with short white hairs; ocelli on two tubercles, separated by width of anterior tubercle (Fig. 34); eyes separated at vertex by width of posterior ocellar tubercle. Frons slightly tumid, black pilose, dense black tomentose immediately above antennae. Face produced, subconical, rounded apically, brown with medial yellow stripe, silver tomentose laterally. Antenna with scape subcylindrical, flared at mesoapical margin, twice as long as pedicel, with black hairs; pedicel subspherical, with medial ring of black hairs; flagellomere longer than scape and pedicel combined; conical, tapering to apex, style minute, terminal. Proboscis short, black, not projecting beyond oral margin. Mentum (Fig. 62) yellow.

Thorax. Mesonotum and scutellum subshining black, with anterior and lateral margins dense gray pollinose; disc covered with thin white hairs and tomentum. Scutellum with white hairs and tomentum. Pleura (Fig. 77) dark brown to black, gray pollinose; anepisternum and katapisternum not as densely pollinose and subshining brown; tuft of white hairs in notopleural area; katatergite with white hairs. Post alar callus dark brown with white hairs. Halter stem and knob yellowish white.

Legs. Black except basitarsi yellowish; femora with sparse white hairs ventrally.

Wing (Fig. 94, 110). Hyaline, veins dark brown; vein R_{2+3} sinuous to wing margin, ending at level of R_5 ; R_4 angled upward at wing margin; crossvein r-m well beyond middle of cell dm; anal cell open at wing margin, subequal to width of cell r5; anal lobe normal, margin rounded; alula absent. Wing Interference Pattern (Fig. 110) predominantly blue in medial field to mixed blue and green in radial field; contrasting golden color in cells r5 (apically), m1 (almost all), m2+3 (apical half), and m4 (posteroapical corner), wing margin in those cells with thin blue line.

Abdomen (Fig. 15). Black, with white hairs dorsally on tergites I and II; tergites III–V with white band along posterior margin; abdominal patches laterally on tergite III and IV (Fig. 136) small, circular (on III) to elliptical (on IV) in shape. Venter brown, with white band posteriorly on sternites II–VI. Sand chamber with white hairs surrounding black inner ring of hairs.

Genitalia. Not dissected.

Male. Unknown.

Remarks. Although collected with other females at the same place and date as *Metacosmus painteri*, sp. nov., this species exhibits distinct differences of the salient characters to define the species that I confidently feel it is a separate species.

Etymology. The species name derives from the Persian زرگون (*zargun*) (German translation *zirkon*) = golden; referring to the characteristic bright golden color in cells m1 and m2+3 in the WIP.

NOTES ON LATERAL TERGAL PATCHES IN TOMOMYZINAE

When examining specimens for sorting and description, unusual tergal patches were noticed on the lateral portions of tergites III and IV. Finding them in all the species of *Metacosmus* prompted me to examine other genera in Tomomyzinae; and all (except *Tomomyza* and *Pantostomus*) possess them to one degree or another (see Table 1). Searching the literature for mention of them in these genera and hoping for a detailed discussion was disappointing. Only a few workers had noticed them in their descriptions of species in genera in the Tomomyzinae. Johnson & Johnson (1959), in their description of *Amphicosmus arizonensis*, noted their presence and stated only: "The tiny pits on the third and fourth terga of the female have not previously come to our attention." These "pits" are found also in the male, but probably because their brown color contrasted with the reddish ground color in the female (the male has these tergites black) they were more easily seen and thus noted; and missed by not looking closely at the same areas in the male. Melander (1950) when describing the otherwise all yellowish *Paracosmus rubicundus*, called attention to them only in the following context: "... the sides of segments three and four each with an oval black spot". Hull (1973) did not mention these patches explicitly but might be referring to them in his diagnosis of his new subgenus *Atherosia* when he stated: "The dense patches of microspicules present on the sides of the tergites in *Amphicosmus* Coquillett are much more poorly developed"; however, checking his description of *Amphicosmus*, he made no mention of any "microspicules". Discussion of these lateral tergal features are unfortunately absent in the exhaustive morphological survey for characters used in a cladistic analysis of the family in Yeates (1994) and in descriptions of taxa in the revision of *Docidomyia* in Yeates (1996).

The sculpturing and texture of these patches appear to differ with some taxa exhibiting microscopic pits (e.g., *Amphicosmus*; Fig. 112); and some exhibit tiny protuberances in a more rugose appearance (e.g., *Docidomyia*, *Paracosmus* (*Atherosia*) *rubicundus*; Figs. 113, 114); while dissection shows that these tomomyzine species actually have minute papules with a microscopic opening (cf. Fig. 137).

It was initially thought that these patches may be cuticular modifications related to sound-production, similar to those found in some opetiids and phorids (cf. Brown & Amorim 2023). Their placement on the lateral portions of tergites III and IV is the exact place where the "knee" of the hind leg (junction of the femur and tibia) is held when at rest (cf. Fig. 116). Might they then be evidence of a stridulatory organ? To test this hypothesis, Brian Brown and I examined the inner surface of the "knees" of the hind legs of various species (cf. Figs. 117–121), but did not see any clearly discernable feature or protuberance that might be used to produce sound by scraping against these patches. There are some micro-striations present at the base of the tibia in some species, but these are also found in species of bombyliids that do not possess lateral tergal patches.

Dissection of the terga of *Metacosmus costaricensis* Evenhuis & Hanson, sp. nov. and examination under a light microscope (Fig. 137) showed that the patches were not cuticular

Table 1. Presence and shapes of tergal patches in genera of Tomomyzinae.

Genus (subgenus)	#spp seen	present?	shape	Figure(s)
<i>Amphicosmus</i>				
(<i>Amphicosmus</i>)	6	x	circular to ovular	
(<i>Glycophorba</i>)	1	x	circular	112
<i>Docidomyia</i>	1	x	elliptical	113
<i>Metacosmus</i>	15	x	elliptical, ovular, circular	122–136
<i>Pantostomus</i>	3	—	—	—
<i>Paracosmus</i>				
(<i>Paracosmus</i>)	4	x	hemispherical	115
(<i>Actherosia</i>)	1	x	circular	114
<i>Tomomyza</i>	5	—	—	—

modifications, but pore-like and extending through the cuticle and into the body. Searching the literature for similar tergal patches in other Diptera was more promising. Similar patches of pore-like structures are found also on tergites III and IV in some psychodids of the genus *Lutzomyia* França and are associated with pheromone secretions (Lane & Ward 1984; Tonelli *et al.* 2021) used as a sexual attractants during mating. However, these patches in the psychodids are found only in males. In the tomomyzine genera that have these patches, they are found in both males and females. Tergal sexual patches involved in exocrine excretion have been described for Tachinidae (Cerretti *et al.* 2014), but the location of these are more dorsal and not as much lateral. A possible function for these patches found in Tomomyzinae may be the same as what has been found in males and females of some tephritids (Raspi *et al.* 1997) where patches with pores (also located dorsally on the tergites as in tachinids) excrete a fluid that is brushed over the wings via the hind legs during cleaning, which takes place many times during the day.

Unfortunately, no observations of specimens of Tomomyzinae have been made that witness any cleaning behavior. Also unfortunate is that I was unable to conduct TEM or SEM studies, either or both of which would have helped to better diagnose the tergal ultra-structure and any internal glandular mechanism that may be present and associated with these patches. Without conclusive evidence, their function remains a mystery and it is hoped that further study prompted by their discussion here will better ascertain their use.

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helped me re-examine and reassess the characters that best define species vs. those that are variable. Hat tip to Seth Ausubel for allowing reproduction of his photo on iNaturalist of the mating *Metacosmus mancipennis*.

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