COPESTYLUM CIRCUMDATUM (WALKER) (DIPTERA: SYRPHIDAE): REDESCRIPTION OF A NEOTROPICAL FLOWER FLY, WITH LECTOTYPE DESIGNATIONS, AND NEW SYNONYMS[1]

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ABSTRACT: *Copestylum circumdatum* (Walker) (Diptera: Syrphidae) is redescribed. Lectotypes are designated for two names and one new synonym is proposed (*Volucella mus* Williston 1888 = *circumdatum* Walker 1857).

KEY WORDS: Diptera, Syrphidae, *Copestylum,* Neotropics, lectotype, synonyms.

Copestylum circumdatum is a widespread species in the Neotropics, which breeds in bromeliads. This species has recently been reared by workers and does appear in biodiversity inventory samples. The proper name for this species has been confused, as there is unrecognized but extensive variation in adult characters, as well as confusion about prior named concepts. We redescribe the species, propose the appropriate name and synonyms for this species, and designate lectotypes as necessary. The critical male genitalia characters are figured. The biology of the species and description of the immature stages will be published by Graham Rotheray and Geoffroy Hancock.

The format, methodology, terminology, and other aspects of this paper follow our general standards, which are enumerated in detail in our prior publications (see Marinoni and Thompson, 2004). Author FCT maintains a system of informal nomenclature for "morpho-species." When we know that something represents a species, but do not know the name, we either assign a Year-Sequence number, such as 73-2, or a CR-sequence for the Costa Rican Biodiversity inventory project. These numbers are all represented by vouchers here at the Smithsonian Institution, and these numbers are provided to users, just like names. These numbers get published sometimes and are used, for example, in database, such as INBio's ATTA system. Hence, author FCT reports them in his papers when the identity was finally resolved. On the Literature Cited, the bracketed codes at the end of each citation represent precise dates of publication. The format of those codes is [year.month.day]. The question mark means unknown. This practice is becoming more common amongst dipterists.

Copestylum Macquart is undoubtedly the largest genus of flower flies in the World. While in terms of the number of species described to date, *Cheilosia* Meigen, a mainly old world (Palaearctic) taxon, contains some 410 species, the

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New World endemic group, *Copestylum,* contains 315 described species, as well as more than 100 known, but currently undescribed species.

The current concept of *Copestylum* is very broad and covers a diverse array of adult forms, essentially any New World species with a plumose arista and bristles (see Thompson (1999) for a key to the Neotropical genera; Vockeroth and Thompson (1987) for a key to Nearctic genera). Most of the species fall into a number of well defined groups based on adult characters. While *C. circudatum* does not fall into a group defined by autamorphies, the species does belong to a phenetic group defined by the following shared character states: Cell R1 broadly open apically; bristles all black; scutellum with a pre-apical depression, but without basolateral flattened, rugose areas; scutum without any pre-scutellar bristles; anepisternum bare anteriorly, and katepimeron bare. *Copestylum circumdatum* differs from all other species in this group by the following combination of characters; face with median black vitta, broadly yellow laterally; legs partially pale, usually with coxae yellow; scutum generally black (not entirely pale), scutellum pale along base and marginally; calypter with margin and fringe black. Closely related species are diagnosed below.

Copestylum circumdatum (Walker, 1857)

(Figures 1-5)

Temnocera circumdata Walker, 1857: 154. Type-locality. Brazil [as "Valley of Amazon"]. Lectotype ♀ BMNH here designated. Fluke 1957: 156 (species *incertae sedis*).

Volucella circumdata. Kertész 1910: 188 (combination).

Copestylum circumdatum. Thompson *et alia* 1976: 73 (combination).

Volucella mus Williston, 1888: 274. Type-locality: Brazil, Mato Grosso, Chapada. Lectotype ♂ AMNH here designated. Kertész 1910: 195 (citation); Sack 1921: 137 (Bolivia, biology, immatures, fig. 10 (puparium), fig. 11c (anterior spiracular process); Curran 1926: 52 (key ref.), 1930: 7 (key ref.), 1934: 380 (key ref.), 1939: 2 (key ref.); Fluke 1957: 76 (catalog citation).

Copestylum mus. Thompson *et alia* 1976: 79 (combination).

Copestylum 73-2

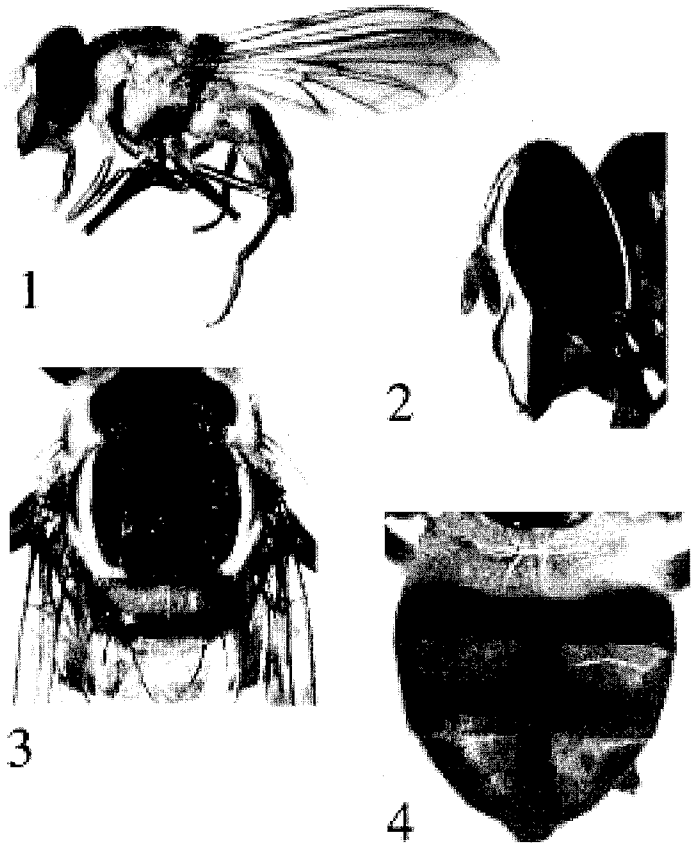
Copestylum CR-43

Head (Fig. 2). Face shiny, yellow with a dark brown medium vitta ventrad to antenna and narrowly brown laterally, white pilose; gena brown except yellow medially, [thus there is a broad brown vitta from eye margin to oral margin partially on face and gena], short white pilose posteriorly; lunule yellow except narrowly brown along posterior margin; frontal triangle yellow, white pilose; frons yellow except for a triangular brown macula dorsad to lunule on ventral 1/2 or less; vertical triangle black, black pilose; vertex dark brown, shiny, black pilose; occiput black except yellow on ventral 1/5, white pollinose, white pilose except black on dorsal 1/8; antenna yellow to orange, black pilose; basoflagellomere elongate, about three times as long as wide; arista orange on basal 2/3, dark apically, with black rays.

Thorax (Fig. 3). Postpronotum yellow, white pilose; scutum bluish black except broadly yellow laterally, except notopleuron brownish laterally, narrowly yellow anterior scutellum in females, some individual also with yellow lateral areas mesial to wing with brown vitta, white pilose with intermixed black pile; bristles black, 2 notopleurals, 3 supra-alars with anterior most weak, about 1/2 size of posterior supra-alar, 3 postalar callars, no pre-scutellars, 3 marginal scutellars, one anepisternal; scutellum with apicomedial depression, yellow, with a narrow transverse brown fascia, black pilose

except bare on the depression, with three pairs of long marginal bristles; pleuron generally brown to blackish, white pilose, yelllow on propleuron, posterior anepisternum, and anterior anepimeron; katepimeron bare; plumula yellow; halter white; calypter pale basally, becoming dark apically, with brown to blackish margin and fringe. Wing: hyaline except stigma dark brown and costal margin slightly brownish, microtrichose except bare base of cell C, basal 2/3 of cell R, anterobasal 3/4 of cell BM, all of cell CuP except apex, and on anal lobe anterior to vein A2; alula trichose; Cell r1 closed at wing margin or before, with or without very short petiole. Legs: dark brown to black, brown and black pilose except procoxa white pilose.

Abdomen (Fig. 4). Brown to bluish-black with yellow maculae, shiny; 1st tergum yellow, white pilose; 2nd tergum yellow laterally and on basal 1/3, dark elsewhere, yellowish-white pilose on basal 1/3, black pilose elsewhere; 3rd and 4th terga bluish-black except with large basal yellow maculae on basal 1/2 and broadly separated medially by about medial 1/4 and yellow laterally or sublaterally, black pilose except yellow pilose on maculae (males) or on basal 1/3 (females); sterna brownish to bluish-black except yellow laterally on 1st through 3rd sterna, white pilose except black pilose on 4th sternum (♂♂) or apical 2/3 (♀♀); ♂ genitalia (Fig. 5) black, black pilose; cercus semi-circular; postcercal area only slightly sclerotized; surstylus approximately triangular; aedeagus rectangular; 9th sternum with a single apicolateral bristle, with large lateral oval membranous area; superior lobe slightly arcuate; lingular area only slightly concave.



Figs 1-4. *Copestylum circumdatum* (Walker): (1) Adult, lateral view; (2) head, lateral view; (3) thorax, dorsal view; (4) abdomen, dorsal view.

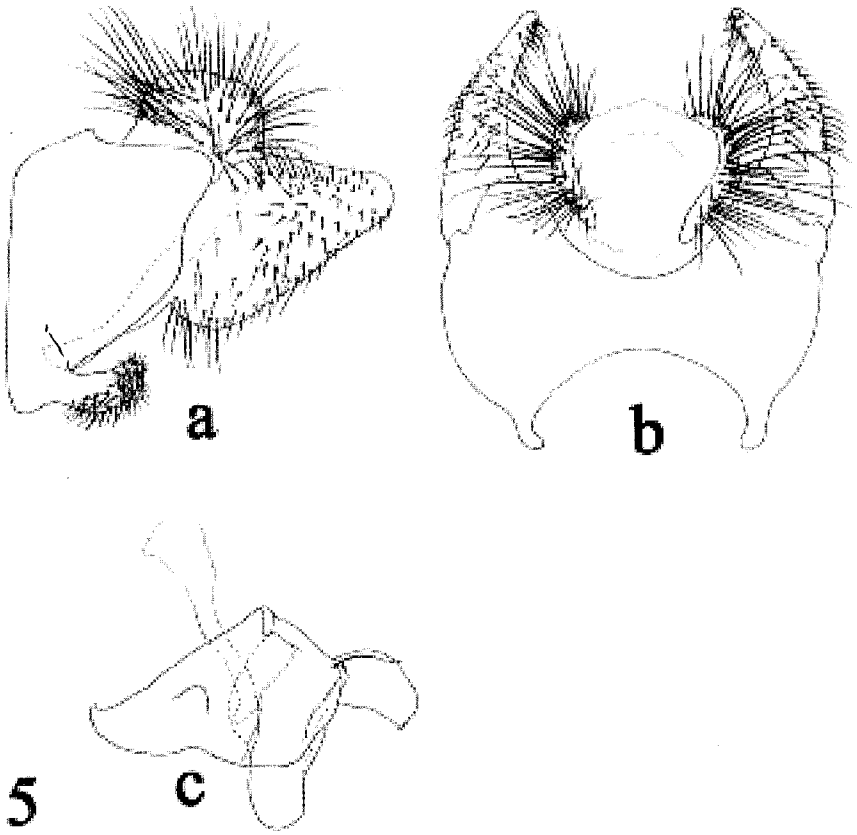


Fig 5. *Copestylum circumdatum* (Walker): (a) 9th tergum and associated structures, lateral view; (b) 9th tergum and associated structures, dorsal view; (c) 9th sternum and associated structures, lateral view.

Variation. As is usual with *Copestylum* species, color develops and darkens after the adult emerges. Freshly emerged adults (young specimens) appear paler and more brownish, whereas older ones are more yellow and bluish-black. Also, some individuals have more extensive pale areas.

Examination of specimens of *C. circumdatum* indicates that the extent of yellow coloration on the scutum is a factor of age and individuals. Freshly emerged specimens have the scutum extensively pale, so as to have a large triangular macula anterior to the scutellum and the lateral margins of the scutum broadly yellow. In older individuals, the scutum becomes darker so that the triangular macula is reduced to a transverse fascia and the lateral margins become more narrowly pale (dark areas expand).

Types. *Temnocera circumdata* Walker was described from an unspecified number of specimens from the "Valley of Amazon" in the Saunders' collection, which was ultimately donated to the Natural History Museum, London. A single specimen remains there and is labeled as follows: Holotype (red circular NMH type label); Cotype (green circular BMNH type label); "Amazon, 66.53;" "Temnocera circumdata Wlk" [E. Austen's hand]; and "Brazil, Amazon, H. W. Bates, 66.53." This specimen is here designated as lectotype to fix the concept of the name and assure the consistent future interpretation of this name.

Volucella mus Williston was described from eleven specimens collected by H. H. Smith in "Chapada, Brazil." A number of specimens agreeing with this data are now found in the American Museum of Natural History, having been donated by Williston's family, and another two syntypes are found in the Cornell University Collection. Of these specimens a male labeled "Chapada," "Type, No., A. M. N. H." [red], "S. W. Williston Collection," "Am. Mus. Nat. Hist., Dept. Invert. Zool., No. 19921," "Volucella, mus, Williston" [red-bordered determination label] "Lectotype, Volucella mus, Williston, Design. Thompson 2002" and in the American Museum of Natural History is here designated as lectotype to fix the concept of the name and assure the consistent future interpretation of this name.

Distribution. Costa Rica, Panama, Suriname, Trinidad, Colombia, Brazil (Bahia, Mato Grosso, Paraná, Santa Catarina), Peru, Paraguay, Bolivia, Argentina.

Material examined (12 ♂♂, 31 ♀♀). **ARGENTINA.** Corrientes: Ytuzaingo, Sep 1982, M. Fritz (USNM ENT 00114123 ♀ USNM). **BOLIVIA.** Beni: Cavinas, Jan 1922, Mulford Bio Exp 1921-1922, W. M. Mann (USNM ENT 00000002 ♀ USNM). **BRAZIL.** Amazonas/Pará: "Amazon," H. W. Bates (Lectotype circumdata Walker, ♀ BMNH). Bahia: Bonfim, 26 Jan 1930, Davis and Shannon (USNM ENT 00000001 ♂ UNSM). Mato Grosso: Maracaju, May 1937, Servico de Febre Amarela, "M.E.S. Bras." (USNM ENT 00000010 ♂ USNM); Chapada dos Guimarães, H. H. Smith (lectotype and paralectotypes of mus Williston, ♂ ♀ AMNH and CU). Paraná: Fênix, Reserva Est ITCF, 10 Sep 1986, Lev. Ent. PROFAUPAR, Malaise Trap (♀, DZUP); Foz do Iguaçú, 11 Dec 1966, AExc. Dep Zool. @ (♂, DZUP); ... 18 Feb 1969 (♀, DZUP). Santa Catarina: Nova Teutônia, Feb, Mar, Apr, Sep, Nov [various years 1964-75), Fritz Plaumann (USNM ENT 00000011-13, 00030703, 00114108-21 3 ♂♂ 14 ♀♀ USNM). COLOMBIA. Dept. Meta, Restrepo, 500 m, 1936, J. Bequaert (USNM ENT 00114127 ♂ CNC). **COSTA RICA.** San Mateo, Hiquito, [no dates], Pablo Schild (USNM ENT 00114106-7 2 ♀♀ USNM); Puntarenas: Est. Quebrada Bonita, Cruce de Quebradas Res. Biol. Carara, LN 195500 470400, 5 Nov-13 Dec 1990, E. Quesada (INBIOCRI000302126 ♀ INBIO). **PANAMA.** Gatun Lake, Cano Saddle, Jun 1923, M. F. Close (USNM ENT 00000000 ♀ USNM). **PARAGUAY.** Villarrica, F. Schade, Jun 1937 (USNM ENT 00000003 ♀ USNM), May 1938 (USNM ENT 00000008 ♂ USNM), Nov 1937 (USNM ENT 00000004-6, ♂ 2 ♀♀ USNM), Dec 1937 (USNM ENT 00000007 ♀ USNM). **PERU.** Loreto: Iquitos, Mar-Apr 1931, R. Shannon (USNM ENT 00000009 ♂ USNM); Rio Momon, ca 25 km NW Iquitos, 13 Feb 1984, W. Mathis (USNM ENT 00114126 ♀ USNM). Madre de Dios: Manu, Rio Manu, Pakitza, 250 m, 12 7S 70 58W, 9-23 Sep 1988, A. Freidberg (USNM ENT 00114124 ♂ USNM), W. Mathis (USNM ENT 00114125 ♀ USNM). **SURINAME.** Paramaribo, 5 54N 55 7W, K. Mayo (USNM ENT 00114128 ♀ USNM). **TRINIDAD.** Apr 1997, G. Rotheray (♂ USNM).

DISCUSSION

Curran (1926, 1930, 1934, 1939), the last worker to publish comprehensive keys of the group now called *Copestylum,* did not recognize the name *C. cir-*

cumdata Walker, as he only worked from specimens previously identified in the collection of his museum. He simply ignored the descriptions of other species by earlier authors. While Williston did attempt to decipher the species described by earlier authors, he apparently was unable to recognize that Walker's description of *C. circumdata* was the same as the species he described as *mus*. In terms of current taxonomy, there is a species called *mus* by Curran, whose senior synonym is *C. circumdata* Walker.

In the last published key to *Copestylum* species (Curran, 1939), *C. circumdatum* runs to couplet #35, *mus,* if the coxae are considered yellow (couplet #28), otherwise it runs to couplet #45, *contumax. Copestylum contumax* (Curran, 1939) is known from a unique male specimen which has "unusually large" male genitalia. *Copestylum circumdatum* has small, normal-sized male genitalia, also the male frontal triangle is not produced and the facial tubercle is white pilose, not black (contumax). This species differs from *musana* (Curran, 1930) in having the anepimeron extensively yellow and entirely yellow pilose, not black and black pilose *(musana).*

Footnote. This species is similar to the species named *obscurior* by Curran and so cataloged by Fluke (1957: 78). However, due to an ignorance of Latin, this epithet became incorrectly changed to *obscurius* in the Neotropical Diptera catalog (Thompson, *et alia* 1976: 80).

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This study resulted from an investigation of the flower fly fauna of southeastern Brazil. The junior author initiated the faunal survey of this area, doing the preliminary sorting and identification to morphospecies. The senior author is responsible for the taxonomy, recognizing that there is a single widespread species masquerading under various names. Together, we prepared this manuscript.

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