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# The genus *Centris* Fabricius in Cuba, with a new record and the description of a new species (Hymenoptera: Apoidea: Anthophila)

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1041: 1–26 **INSECTA MUNDI** 2024

# The genus *Centris* Fabricius in Cuba, with a new record and the description of a new species (Hymenoptera: Apoidea: Anthophila)

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**Abstract.** Members of the genus *Centris* Fabricius (Hymenoptera: Apoidea: Anthophila) constitute a significant component of the Neotropical (including insular) bee fauna, exhibiting high species richness, a moderate to large body size, and extensive interactions with various important plant groups. Females of most species possess specialized morphology adapted for collecting oils from flowers. This study documents the presence of the genus in Cuba, recognizing six species: *C. aethiops* Cresson, *C. cornuta* Cresson, *C. fulviventris* Cresson, *C. poecila* Lepeletier, *C. taina* Genaro and Breto **new species**, and *C. tarsata* F. Smith. Detailed information is provided for each species, encompassing a diagnosis, natural history, floral associations, seasonal occurrence, and distribution. *Centris taina* **new species** is described from Cuba, based on both sexes, which were previously misidentified as *C. versicolor* (Fabr.) for females and *C. fasciatus* F. Smith for males due to sexual dimorphism. *Centris tarsata* is reported as a **new national record** for Cuba, possibly introduced by humans from South America and now established and widely distributed across the entire island. A key to differentiate the Cuban species of *Centris* is presented.

**Key words.** Bees, the Antilles, *Centris tarsata*, invasive species, natural history, floral associations, seasonal occurrence, distribution, key.

**Resumen.** Los miembros del género *Centris* Fabricius (Hymenoptera: Apoidea: Anthophila) constituyen un componente significativo de la fauna de abejas neotropicales, incluyendo las islas, exhibiendo una alta riqueza de especies, tamaño corporal moderado a grande, y amplias interacciones con varios grupos de plantas importantes. Las hembras de la mayoría de las especies poseen una morfología especializada, adaptada para recolectar aceite de las flores. Este estudio documenta la presencia del género en Cuba, reconociendo seis especies: *C. aethiops* Cresson, *C. cornuta* Cresson, *C. fulviventris* Cresson, *C. poecila* Lepeletier, *C. taina* Genaro y Breto **nueva especie**, y *C. tarsata* F. Smith. Se proporciona información detallada para cada especie, incluyendo diagnóstico taxonómico, historia natural, relaciones florales, ocurrencia estacional y distribución. *Centris taina* **nueva especie** es descrita para Cuba, basándose en ambos sexos, que previamente fueron erróneamente identificados como *C. versicolor* (Fabr.) para las hembras y *C. fasciatus* F. Smith para los machos, debido al dimorfismo sexual. *Centris tarsata* se cita como un **nuevo registro** para Cuba, posiblemente introducido por humanos desde Sudamérica, ahora establecida y ampliamente distribuido en toda la isla. Se presenta una clave para diferenciar las especies cubanas de *Centris*.

**Palabras clave.** Abejas, Las Antillas, *Centris tarsata*, especie invasora, historia natural, asociaciones florales, ocurrencia estacional, distribución, clave dicotómica.

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# Introduction

The genus *Centris* Fabricius comprises a diverse group of medium-sized to large bees that inhabit the Western Hemisphere (Michener 2007). These species collect oils from flowers during nesting-related activities, aided by modifications present in the fore and midlegs of females (Neff and Simpson 1981, 2017; Buchmann 1987).

Cresson (1865) described three new Cuban species and offered information about the other forms known from the island. Gundlach (1886) followed Cresson's (1865) classification and added his field observations to that author's taxonomic findings. Cresson (1869) described another new species from Cuba. Friese (1900) included the Cuban species in his monograph. Alayo (1973, 1976) classified the species and offered information on their distribution on the island. Vivallo (2014) included *C. aethiops* Cresson in his study on the Antillean species of the subgenus *Xanthemisia* Moure. Vivallo (2019, 2020a) included the Cuban species in his studies of the primary types deposited in collections. Duarte (2014) offers data from the *Centris* specimens' labels deposited in the collections of the National Museum of Natural History of Cuba.

No information is available on the ecology or behavior of the Cuban *Centris* species and distinguishing them using a key was not possible previously. In this study, we describe a new species found in Cuba, provide the first-ever description of the male of *C. cornuta*, report a new record of *C. tarsata* in the Antillean region, compile taxonomic information for each species, and include data on their distribution, ecology, and behavior. Additionally, we provide a dichotomous key to separate the Cuban species.

# Materials and Methods

Specimens for study were provided by entomological institutions, museums, private collections and university collections across Cuba, the Dominican Republic, Canada and the United States of America. Acronyms are indicated below, with full names of institutions, curators and/or collection managers provided in parentheses:

**ANSP** The Academy of Natural Sciences of Drexel University, formerly the Academy of Natural Sciences of Philadelphia (I. Betancourt)
**CNC** Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Canada (S. Cardinal and J. L. Fernández)
**DB** Personal collection of Dayron Breto, Pinar del Río, Cuba
**FSCA** Florida State Collection of Arthropods, Gainesville, FL, USA (P. Skelley)
**IES** Instituto de Ecología y Sistemática, La Habana, Cuba (N. García)
**JAG** Personal collection of Julio A. Genaro, Toronto, Canada
**MCNC** Muestra de Ciencias Naturales de Caibarién, Cuba, A. Kroupa, personal collection of A. Kroupa
**MHNTSN** Museo de Historia Natural Tranquilino Sandalio de Noda, Pinar del Río, Cuba
**MNHNCu** Museo Nacional de Historia Natural de Cuba, La Habana (S. Duarte).
**MNHNSD** Museo Nacional de Historia Natural Prof. Eugenio de Jesús Marcano, Dominican Republic (C. Suriel)
**NHMUK** Natural History Museum, London, England
**NMNH** National Museum of Natural History, Smithsonian Institution, Washington DC, USA (S. Droege, S. Brady, B. Harris)
**OUM** Hope Department of Entomology, Oxford University, England
**PCYU** Packer Collection at York University, Toronto, Canada (L. Packer)

Metasomal terga and sterna are referred to with T and S followed by a number. Puncture density is indicated by their diameters relative to the interspaces, for example i=d, or i<0.5d. Terminalia were excised from relaxed specimens, cleared in 5% KOH solution and observed in glycerin.

Cresson's primary type material photos were obtained from Gundlach's collection in Havana, Cuba. The type specimens of the following species described by F. Smith and deposited in the Natural History Museum, London, United Kingdom, were studied using high-resolution images obtained from the museum's webpage: *C. fasciatus*, *C. insularis*, *C. simillima* and *C. tarsata*.

One leg was removed from some Antillean *Centris* specimens to be "barcoded" and sent to the Canadian Centre for DNA Barcoding in Guelph, Ontario, Canada for DNA extraction and gene amplification and sequencing. We used Kimura's 2-parameter (K2P) distance model (Kimura 1980) (the recommended model; Hebert et al.

2003) to calculate genetic distances between specimens to reveal a barcode gap or break in the distribution among genetic distances of specimens belonging to the same species and those of different species.

The field observations were conducted by the second author (DB) in San Diego de Los Baños, Sierra de Guane and Guanahacabibes, Pinar del Río, from 2019 to 2023.

Because Cuba is an archipelago composed of many islands, whenever we mention Cuba, we are specifically referring only to the main island.

The keys published by Roig-Alsina (2000) and Vivallo and Zanella (2012), photographs presented by Vivallo and Zanella (2012), images of the lectotype deposited at NHMUK available through their Data Portal, as well as DNA sequence analyses helped in the identification of *C. tarsata*.

# Results

## Systematics

### Genus *Centris* Fabricius

### Subgenus *Centris* Fabricius

**Diagnosis.** Members of the subgenus usually have a metallic metasomal background color; many species have yellow metasomal markings. In males, the gonocoxites each have a long, slender apical projection bearing long branched setae along the inner margin and extending parallel to the gonostylus (Snelling 1984; Michener 2007). Some species possess metanders or beta-males, i.e., dimorphic males which are unusually large and robust, with very stout legs, and much more extensively maculate than normal males (Snelling 1984, Vivallo 2019).

Nest in soil: flat ground or earth banks (Vinson and Frankie 1977, 1988; Coville et al. 1983; Vinson et al. 1987; Martins et al. 2020).

Twelve species occurring in the Antilles: *C. decolorata* Lepeletier, *C. dirrhoda* Moure, *C. elegans* F. Smith, *C. errans* Fox, *C. fasciata* F. Smith, *C. haemorrhoidalis* (Fabr.), *C. insularis* F. Smith, *C. poecila* Lepeletier, *C. smithii* Cresson, *C. taina* n. sp, *C. testacea* Lepeletier, and *C. versicolor* Fabr.

### *Centris* (*Centris*) *poecila* Lepeletier

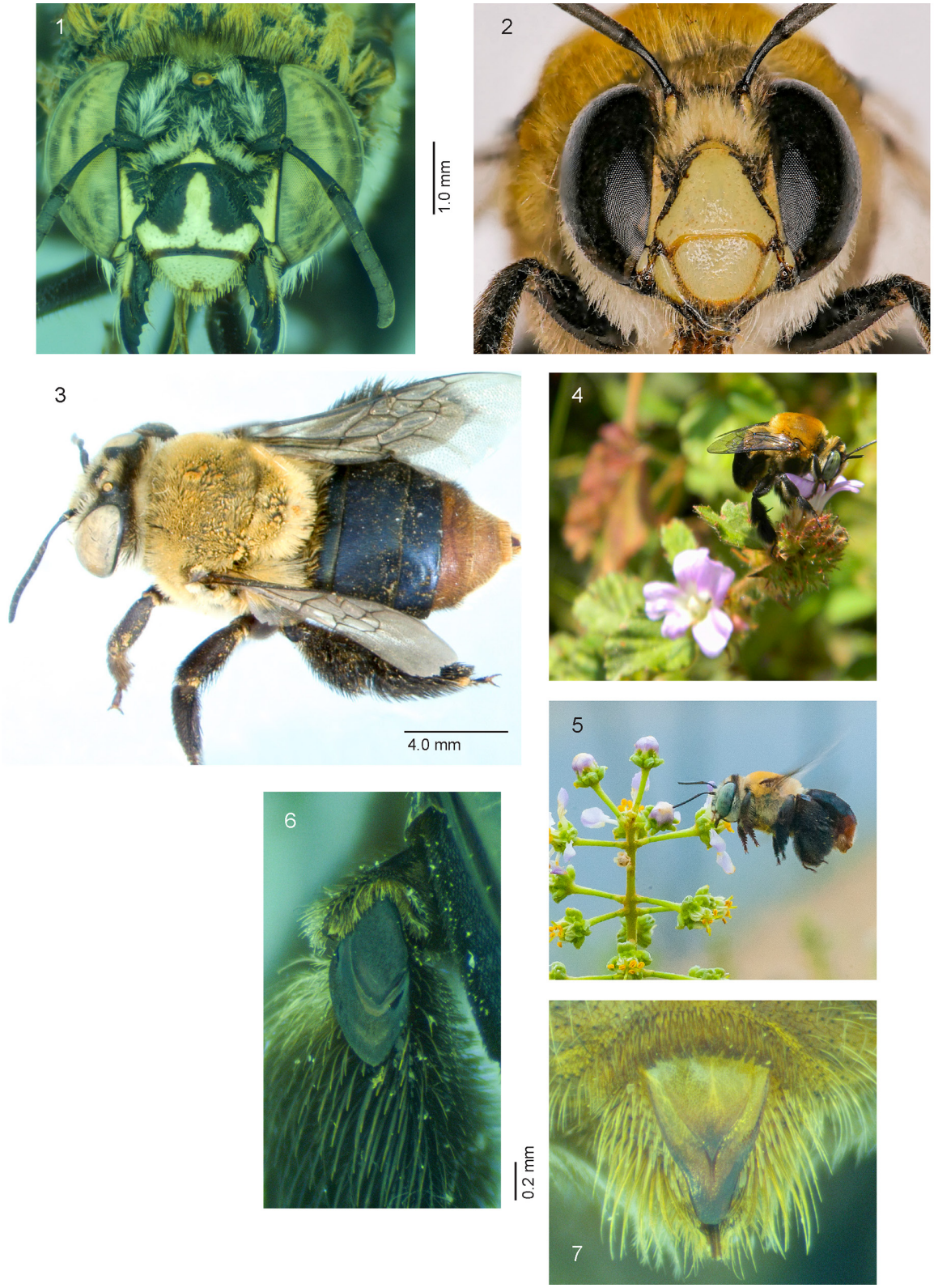
(Fig. 1–9)

*Centris poecila* Lepeletier 1841: 154. Holotype female in OUM.
*Anthophora versicolora* Sagra 1857: 326.
*Anthophora versicolor apicalis* Guérin-Méneville 1844: 455. Holotype female whereabouts unknown.
*Centris poecila segregata* Crawford 1906: 159; Lutz and Cockerell 1920: 559. Female. Misidentification. Elevated to species level by Snelling (1974).

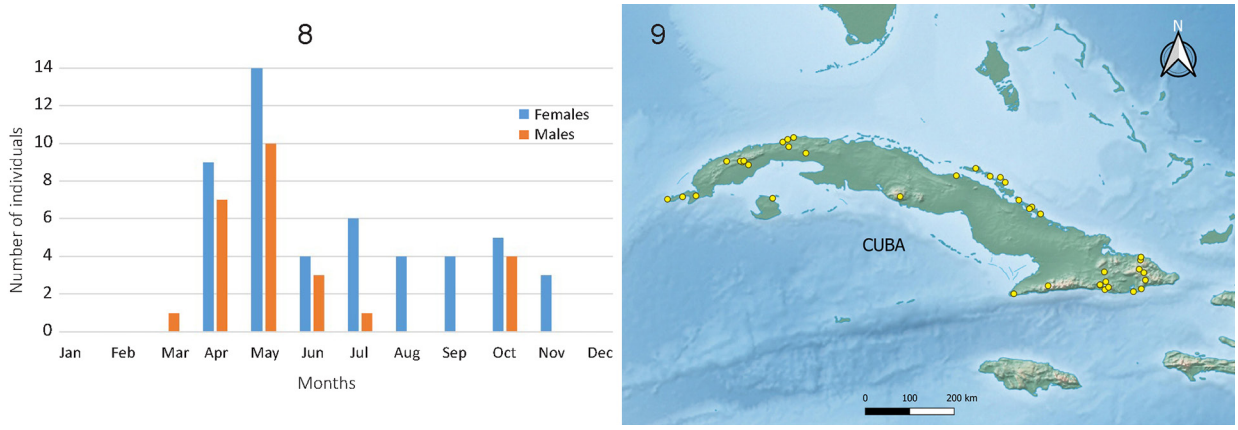
Vivallo (2019) included this species in his study of the primary types of *Centris* described by Lepeletier, offering information about its taxonomic history, conservation status in the collection and distribution.

**Natural history.** *C. poecila* was commonly observed in diverse habitats and types of vegetation, found in pine forests, semi-deciduous forest, secondary vegetation, ruderal vegetation, and complex of sandy coastal vegetation (Breto 2021a, 2021b). The species was more active during the warm hours of the day, its flight was fast and it emitted a perceptible buzz a few meters away. It is often seen visiting flowers, sometimes near nesting areas. Females visited flowers in a fast flight and collected pollen and oils by strong vibration of the thoracic muscles. They were often observed rearranging pollen and oils by rubbing their legs together while hovering in front of flowers.

Nests can be found on horizontal and uneven terrain, in coastal areas, roadsides and riverbanks. Nests observed were solitary, never occurring in aggregations. *Mesoplia cubensis* Genaro and Breto has been observed entering the nest of this species and is one of its possible cleptoparasites (Genaro and Breto 2022). Males generally sip nectar from flowers or stalk other males. At times, males rested on twigs, leaves, or flowers where they groomed and/or guarded their territory. Males appear to have emerged before females and aggregated near flower patches, where they fed and waited for them.




**Figures 1–7.** *Centris poecila*. Head in frontal view. **1)** Female. **2)** Male. **3)** Dorsal habitus of female. **4)** Male visiting flowers of *Melochia spicata*, Malvaceae, San Diego de los Baños, Pinar del Río (photo D. Breto). **5)** Female visiting flowers of *Mascagnia* sp., Malpighiaceae, Guantánamo (photo courtesy of W. Fidler). Female. **6)** Basitibial plate. **7)** Pygidial plate.




**Figures 8–9.** *Centris poecila*. **8)** Seasonal occurrence, according to sex. **9)** Distribution.

The species is multivoltine, more active during April to July, during the raining season, although collection efforts may be biasing the results (Fig. 8).

Two beetle specimens *Ceratocanthus gundlachi* (Harold) (Hybosoridae) as *Acanthocerus gundlachi*, Acanthoceridae, emerged from a brood cell (Genaro 1996).

**Floral relations. Previous records:** *Ouratea agrophylla* (Tiegh.) Urb. (Ochnaceae); *Tolumnia guibertiana* (A. Rich.) Braem (Orchidaceae); *Stigmaphyllon diversifolium* (Kunth) A. Juss. Malpighiaceae (Vale et al. 2011); *Bourreria havanensis* (Willd. ex Roem. and Schult.) Miers (Boraginaceae) (Alameda et al. 2023). **New records:** *Senna occidentalis* (L.) Link, *S. hirsuta* (L.) H.S. Irwin and Barnaby, *S. alata* (L.) Roxb., *Poeppigia procera* Presl., *Chamaecrista diphylla* (L.) Greene (Caesalpiniaceae); *Calopogonium caeruleum* (Benth.) C. Wright. (Fabaceae); *Malpighia emarginata* D.C, *Mascagnia lucida* (Kunth) W.R. Anderson and C. Davis, *Byrsonima pinetorum* Griseb., *B. wrightiana* Nied., *B. crassifolia* (L.) Kunth, *B. spicata* (Cav.) D.C., *Stigmaphyllom sagranum* A. Juss. (Malpighiaceae); *Melochia spicata* (L.) Fryxell, *M. savannarum* Britton (Byttneriaceae); *Miconia octona* (Bonpl.) Judd and Majure, *Conostegia xalapensis* (Bonpl.) D. Don ex D.C. (Melastomataceae); *Mimosa pudica* L. (Mimosaceae); *Eugenia farameoides* A. Rich., *E. rocana* Britton and P. Wils. (Myrtaceae); *Securidaca elliptica* Turcz. (Polygalaceae); *Antigonon leptopus* Hook. and Arn. (Polygonaceae); *Solanum* sp. (Solanaceae); *Stachytarpheta cayennensis* (Rich.) Vahl, *S. jamaicensis* (L.) Vahl. (Verbenaceae).

Between May 1 and 6, 2021, San Diego de Los Baños, several *C. poecila* males were observed foraging on inflorescences of *Securidaca elliptica*. The flowers of this plant were also visited by males of *C. taina* **new species**, *C. aethiops* and *C. tarsata*.

During two days, in 1 hr of sampling with an entomological net passed three times every 15 minutes at flowers, eight and 11 males of *C. poecila* were captured, respectively. The individuals were kept in nylon bags, identified and released at the end of the sampling period.

**Distribution.** Cuba, Isla de La Juventud and Sabana-Camagüey Archipelago (Coco, Sabinal, Guajaba, Romano, Cruz and Mégano Grande keys) (Fernández et al. 1990; Genaro 2004).

Genaro (2007) incorrectly listed the species for Hispaniola, the Bahamas and Panama, however it may actually live in the Bahamas as it occurs in other Cuban islands or keys, as Sabana-Camagüey Archipelago, which is very close to Bahamas, demonstrating dispersion. Other authors also published erroneous records on the distribution of this species (Friese 1900); Michener (1954) mentioned its presence from Panama and offered male terminalia drawings, but according to Moure et al. (2007) and Vivallo (2019) the species occurs only in Cuba. Snelling (1974) published male terminalia images, which are somewhat different from those of Michener (1954), and indicated how to differentiate the species from *C. segregata* Crawford.

Other entomologists also mentioned only Cuba in the range of distribution (Smith 1854; Dalla Torre 1896; Ashmead 1900; Friese 1902; Lutz and Cockerell 1920; Snelling 1974).

Although discontinuous, the range of its occurrence in Cuba is wide, potentially reflecting insufficient sampling (Fig. 8).

***Centris* (*Centris*) *taina* Genaro and Breto, new species.**
(Fig. 10–18, 20–28).

*Centris fasciata* Genaro 2007: 251. Male. Misidentified.
*Centris versicolor* Alayo 1976: 28. Female. Misidentified.
*Centris fasciata* Alayo 1976: 28. Male. Misidentified.
*Centris versicolor* Alayo 1973: 213. Female. Misidentified.
*Centris fasciata* Alayo 1973: 213. Male. Misidentified.
*Centris versicolor* Friese 1902: 199. Misidentified.
*Centris versicolor* Gundlach 1886: 176. Female. Misidentified.
*Centris versicolor* Cresson 1865: 193. Female. Misidentified.

**Diagnosis.** This species exhibits sexual color dimorphism (Fig. 10, 13). Females have white hairs on the gena (Fig. 11); yellow pilosity on the vertex, mesosoma and outer surfaces of metafemur and metatibia (the hairs of the vertex, mesoscutum and scutellum are black-tipped, Fig. 10, 11, 12); black hairs on the inner surface of the metabasitarsus; an inverted "Y" yellow mark on the clypeus (Fig. 12); and black terga with metallic blue reflections, except T5 and T6 are light brown and amber at the apical margin (Fig. 10). Males have white pilosity on the gena, yellowish pilosity on the vertex and dorsally on the mesosoma (with paler hairs ventrally) (the hairs of the vertex, mesoscutum and scutellum are black-tipped); dark brown terga with metallic green reflections, complete, yellow transverse bands on T2 and T3, with the former broader than the latter (Fig. 13); and a mostly yellow clypeus (Fig. 15).

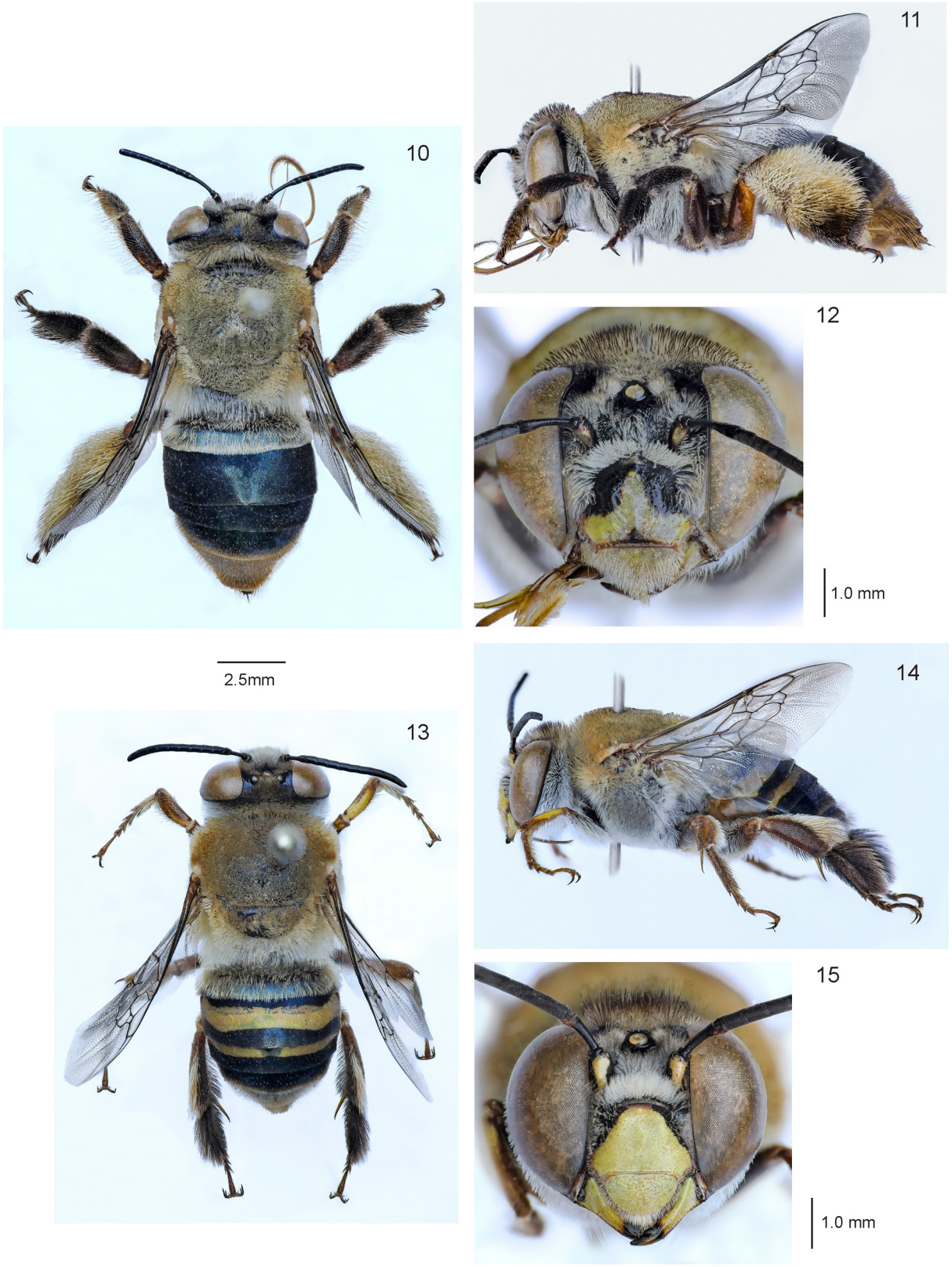
**Description of the female.** Body length 14.1–16.0 mm, forewing length 11.0–12.5 mm.

**Coloration of tegument.** *Head.* Black on tips of mandible, clypeus, upper part of paraocular area, frons, vertex, gena, scape, pedicel and first flagellomere. Yellow in mandibles (except tip), labrum, clypeus with transverse preapical band and con-joined median stripe which does not attain base, triangular spot at ventral area of scape (Fig. 12), spot in supraclypeal area, lower paraocular area. Dark brown rest of the antenna. *Mesosoma.* Pronotum, mesoscutum, scutellum, metanotum, propodeum, mesepisternum and episternum, in part black. Mesosoma and legs ventrally with variable mixture of dark brown and reddish-brown areas. Wings clear with dark brown venation. *Metasoma.* T1–T4 black with metallic blue reflections, T5 and T6 mostly amber with brown on posterior half; T1 brown in some specimens (Fig. 10). Sterna with variable amount of yellow on dark brown.

**Surface sculpture.** *Head*. Labrum irregularly punctate (i=0–2d) with central, triangular area on basal margin, with less punctures or impunctate; clypeus with separate punctures more concentrate on disc, carinate along midline; frons crowded with smooth areas around ocelli; gena irregularly punctate, with small punctures (i=0–3d). *Mesosoma*. Propodeum, mesoscutum, scutellum, metanotum, preepisternum and mesepisternum with irregular punctures (i=0–2.5d). *Metasoma*. T1–T4 minutely punctate; T5–T6 irregularly punctate punctures somewhat bigger and scattered. Sterna irregularly punctate, with fine punctures on the basal half and bigger on the apical half.

**Pubescence.** *Head*. White hairs on supraclypeal area, paraocular area and gena (Fig. 12). Yellow pubescence on apical margin of labrum, outer margin of mandible, frons, vertex with yellow hairs black-tipped (Fig. 10, 12). *Mesosoma*. Pronotum, mesoscutum, scutellum, metanotum and propodeum with yellow hairs black-tipped (Fig. 10, 11). Preepisternum, mesepisternum, metepisternum, mesopleuron with light yellow hairs. Pubescence of legs yellow, except mesotibia, mesotarsi and inner area of metabasitarsus, black (Fig. 10, 11). *Metasom*a. T1 with abundant plumose yellow pubescence, fascia with yellow simple hairs (Fig. 10); T4–T6 with yellow hairs; discal hairs longer, curved at sides of T5, also T5 with distinct, yellow apical fascia; T6 with long simple yellow hairs on apical margin and sides of pygidial plate (Fig. 17). S2–S5 with light yellow hairs on apical margin and central area of S2.

**Structure.** Mandible slender, tridentate, with the innermost teeth located far from the tip. Clypeus flat (Fig. 12, 14). Basitibial plate with well defined secondary plate, rounded, with sharp projecting margins (Fig. 16). Pro and mesobasitarsus are highly modified for oil-collecting. Probasitarsus with four giant spatulate setae on ventral surface and blade-like setae on dorsal area. Mesobasitarsus with blade-like setae on dorsal margin and comb



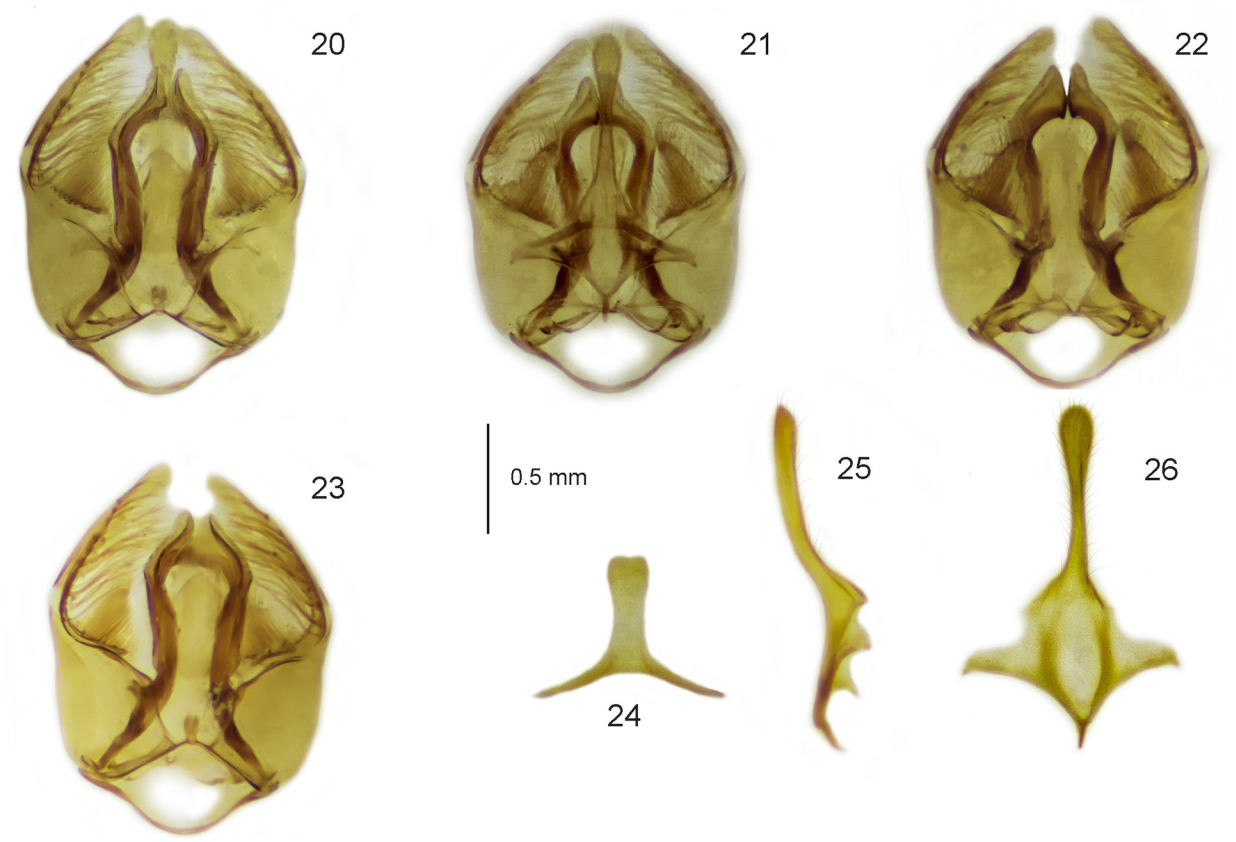

**Figures 10–15.** *Centris taina* new species. Female. **10)** Dorsal habitus. **11)** Lateral habitus. **12)** Head in frontal view. Male. **13)** Dorsal habitus. **14)** Lateral habitus. **15)** Head in frontal view.


**Figures 16–19.** *Centris* species. *C. taina* n. sp., female. **16)** Basitibial plate. **17)** Pygidial plate. **18)** *C. taina* n. sp., male, at flowers of *Bonellia* sp., Primulaceae, Guantánamo, Cuba (photo courtesy of W. Fidler). **19)** *Centris* sp. male, visiting flowers of *Lippia* sp., Verbenaceae, Altamira, Puerto Plata, Dominican Republic (photo courtesy of L. Johnson).

formed by long and robust setae on ventral margin. Pygidial plate with secondary plate; secondary pygidial plate with acute apex (Fig. 17).

**Description of the male.** Body length 12.0–13.2 mm, forewing length 8.2–10.1 mm.

**Coloration of tegument.** Black integument on head, mesosoma, tip of mandible, two narrow stripes at lower paraocular area (Fig. 15). Dark brown in antenna; dorsal area of scape. Yellow on labrum; clypeus; supraclypeal area; paraocular area; most of the mandible; scape ventrally (Fig. 15); longitudinal stripes along protibia and mesotibia, variable, in some specimens is only small spot; small spot at base of metatibia. Brown reddish on




**Figures 20–26.** *Centris taina* new species. Terminalia. **20)** Dorsal. **21)** Ventral. Genital capsule. **22)** Dorsal. **23)** Ventral. Sterna. **24)** S7 dorsal view. **25)** S8 lateral view. **26)** S8 dorsal view.

scutellum, variable; coxa; legs, more reddish in some specimens; T1 and sterna. Wings as in the female. *Metasoma.* Terga dark brown with metallic green reflections, T1 and T4 each with one small yellow spot laterally, variable; T2 with broad, complete yellow band, T3 with narrower, complete yellow band (interrupted medially in some specimens), and T5 with apical yellow band; T6 entirely yellow (Fig. 13).

**Surface sculpture.** *Head*. Labrum with irregular punctures (i=0–1d); clypeus with irregular sparse punctures (i=0.5–5d), smooth on central lineal area; lower paraocular area with irregular punctures (i=0.5–3d); upper paraocular area, frons and vertex with crowded punctures, smooth around ocellus; irregular on gena (i=0.5–3d). *Mesosoma*. Mesoscutum dense and irregularly punctate (i=0–1d), denser on disc; scutellum with irregular punctures (i=0–4d); metanotum finely punctate-reticulate; basal area of propodeum smooth, finely and irregularly punctate (i=0.5–4d); preepisternum, mesepisternum and metepisternum with irregular punctures (i=0–4d). *Metasoma*. Terga finely and densely punctate, bigger on posterior margin of T5–T7; minute and sparse punctures on sterna.

**Pubescence.** *Head*. Light yellow hairs on labrum, base of mandible (appressed) and on ventral margin (long, simple), clypeus, supraclypeal area, lower paraocular area; mixed yellow/black-tipped and black hairs on upper paraocular area and vertex; white on gena (Fig. 15). *Mesosoma.* With yellow hairs, black-tipped on mesoscutum and scutellum; light yellow on preepisternum, mesepisternum, propodeum (Fig. 13, 14); white hairs on coxae, mixed white and yellow on femur; long, light yellow hairs on dorsal margin of metatibia and long black on ventral side, with black short on outer and inner whole area (Fig. 13, 14); metabasitarsus with black hairs, longer and mixed with some yellow on dorsal margin. *Metasoma*. T1 with yellow, long, plumose pilosity (Fig. 13); black, shorter and simple hairs on disc of T2–T4; yellow and plumose hairs on posterior margin of T4; T5 with longer, curved yellow, plumose hairs. S2–S4 with a band of long white hairs along posterior margin, broader at midline.

**Structure.** Mandible tridentate, inner tooth smaller. Disc of the clypeus flat with midline weakly raised in some specimens. Pro and mesobasitarsus unmodified. T7 without pygidial plate.

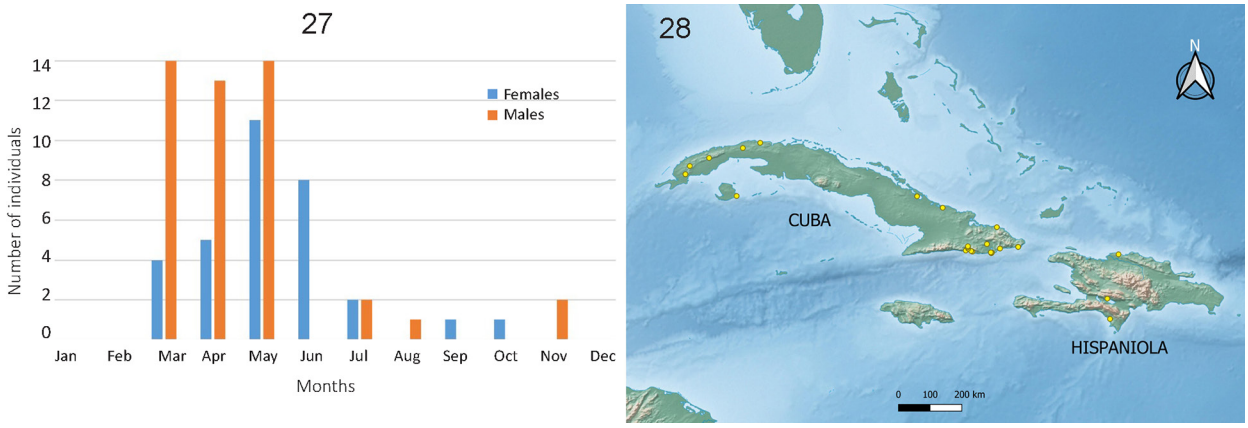
**Terminalia** (Fig. 20–26). *S7* (Fig. 24). Apical process slightly widened toward apex, with apical margin weakly concave; sides of distal processes divergent, gradually narrowed toward apex. *S8* (Fig. 25 and 26). Apical process with hairs simple, elongate, gradually widened towards the apex; lateral apodemes narrowed toward apex, ending in a lobe; distal apodeme central, elongated, narrowed. *Genitalia* (Fig. 20–23). Ventral process of gonocoxite digitiform, elongated, with numerous simple hairs; gonostylus with long, plumose setae on inner margin; penis short with pointed apex.

**Type material. Holotype:** Female, CUBA, Guantánamo Bay, 19.8993N 75.1193W, 5. May.2010, colls. S. Droege and S. Brady 7011, USGS-DRO 154288 (NMNH). **Paratypes**: CUBA: Baitiquirí, Guantánamo, v.2000, coll. J.A. Genaro, barcoding 73-CU-0073, 74-CU-0074 (female, male, JAG); Guantánamo Bay, 19.922N 75.1343W, 4. May.2010, colls. S. Droege and S. Brady, 7003 USGS-DRO 180378 (female, NMNH); Guantánamo Bay, 19.9167N 75.1031W, 17-21. Jun.2010, coll. J. Montalvo, 7723, USGS-DRO 171177 (female, NMNH); Guantánamo Bay, 19.8993N 75.1193W, 5. May.2010, colls. S. Droege and S. Brady, 7011, USGS-DRO 154277 (female, NMNH); Havana, Cuba, [coll.] Baker (no more data) (male, NMNH); Guantánamo Bay,19.9064N 75. 1286W, 9. May.2010, coll. S. Brady 7040, USGS-DRO170014, *Centris fasciata* S. Droege, det. [20]10 (male, NMNH); Guantánamo Bay, 19.8993N 75.1193W, 5. May.2010, colls. S. Droege and S. Brady 7011, USGS-DRO 154294, *Centris fasciata* S. Droege, det. [20]10 (male, NMNH); Mts [mountains] near Guantánamo, 6291 (no more data), *Centris nigrofasciata* Fr. (with a hand-written label by C. F. Baker) (male, NMNH); San Diego de Los Baños, Pinar del Río, 11.v.2014, coll. D. Breto (female, DB); San Diego de Los Baños, Pinar del Río, 16.iv.2015, coll. D. Breto (male, DB); San Diego de Los Baños, Pinar del Río, 10.v.2020, coll. D. Breto (female, MNHNCu); Sierra de Guane, Pinar del Río, 27.v.2022, coll. D. Breto, (male ANTBE099-23, MNHNCu); San Diego de Los Baños, Pinar del Río, 2.v.2023, coll. D. Breto (beta-male, MNHNCu).

**Comparison with other species**. The two species, *C. fasciata* and *C. versicolor*, with which *C. taina* has historically been misidentified, are not polymorphic species, meaning males and females have a similar color pattern. Both sexes of *C. fasciata* have yellow metasomal bands, which are absent in the female of *C. taina* **new species**, in addition to the complete transverse yellow bands in a greater number of terga (T2–T5 or T6 in some specimens) in *C. fasciata*. The female of *C. versicolor* is very similar superficially but differs in having entirely yellow hairs on the mesoscutum and scutellum and black hairs on the frons and vertex; in *C. taina* **new species**, these hairs are black-tipped. DNA barcoding of two specimens of *C. versicolor* from St. Vincent revealed considerable sequence divergence (8.3–8.6%) from specimens of *C. taina* **new species**. (Fig. 64).

There are some males collected in the Dominican Republic that have yellow-banded metasomas, and we did not find any morphological differences with *Centris taina* **new species** from Cuba. Even their terminalia are identical; however, the sequence of one barcode individual was assigned a separate barcode index number (BIN) (BOLD: AAW6170). Its nearest neighbor BIN (BOLD: AFI2035), with a pairwise distance of 5.1%, is the one to which the Cuban specimens were assigned (Fig. 64). In this case, we prefer to wait until fresh specimens of the female of the Dominican haplotype are collected for DNA barcoding to confirm whether they belong to the same species. Below are the label data for these specimens: HISPANIOLA, Dominican Republic, RD-212 ~m N bridge on road Cabo Rojo-Acetillar, Pedernales, prov., 16m, 17°58.530'N 71° 39.034'W, 7.iv.204, D. Pérez, B. Hierro, R. Bastardo (d/n) (male, NMNH); Dominican Republic, RD-225, 100 m N Playa Buen Hombre, Montecristi prov., near sea level, 19°51.797'N 71°24.181'W, 17.iv.2004, D. Pérez, B. Hierro (d), 72-DR-0072 barcoding (male, NMNH); Dominican Republic, La Descubierta, Lago Enriquillo, Sierra de Neyba, xi.2006, coll. J. A. Genaro, 59-DR-0059 barcoding (male, JAG). There is also an observation on iNaturalist (www.inaturalist.org/observations/32073815) by Lisa Johnson of a male (identified as *C. fasciata*) photographed in Altamira, Puerto Plata, Dominican Republic, on September 3, 2019 (Fig. 19).

**Etymology.** The specific epithet honors the native inhabitants of the Antillean islands: the now extinct Taíno indigenous people. Here it is used as an adjective, with the ending -a agreeing in gender with *Centris*, which is feminine.




**Figures 27–28.** *Centris taina* new species**. 27)** Seasonal occurrence, according to sex. **28)** Distribution.

**Natural history.** In Sierra de Guane, on May 27, 2022, females were observed nesting in aggregations, on the ground and in vertical banks, while males hovered over the nests and occasionally achieved copulation at the nest entrance.

This species is apparently multivoltine, more active during March to June, although uneven collection efforts may be biasing the results (Fig. 27).

**Floral relations.** *Stigmaphyllon* spp., *Malpighia emarginata*, *Byrsonima crassifolia*, *B. spicata* (Malpighiaceae); *Securidaca elliptica* (Polygalaceae); *Solanum* sp. (Solanaceae); *Bonellia* sp. (Theophrastaceae).

**Distribution.** Cuba (Fig. 28). Perhaps the species also occurs in Hispaniola, but it is necessary to study the females associated with the known males mentioned above.

**Comment**. Alayo (1973, 1976) suspected that the specimens identified as *C. versicolor* were females of those recognized as *C. fasciata*. *Centris fasciata* only occurs in Jamaica (Moure 1969), although Moure and Melo (2023) erroneously mention it as also being present in Cuba. Moure (1960) studied the type material of *C. versicolor*, suggesting that its distribution should be restricted to the Lesser Antilles. The study highlighted taxonomic inaccuracies made by previous authors and emphasized that *C. versicolor* closely resembles other species, leading to frequent misidentifications.

## Subgenus *Xanthemisia* Moure

**Diagnosis.** This subgenus has a few species. The maxillary palpus is four-segmented; the mandibles of the female each have five teeth, one of them on the inner surface at the base of the apical tooth (rutellum); the primary pygidial plate is abruptly narrowed a short distance beyond the secondary one; and in males the gonostylus is much broadened in a vertical plane (Snelling 1974, 1984; Michener 2007; Vivallo 2014).

These bees build nests in pre-existing cavities such as wooden galleries made by other insects or abandoned nests of other bee and wasp species (Martins et al. 2020; F. Vivallo, pers. comm., 2022). Not much else is known about their nesting habits (Vivallo et al. 2013).

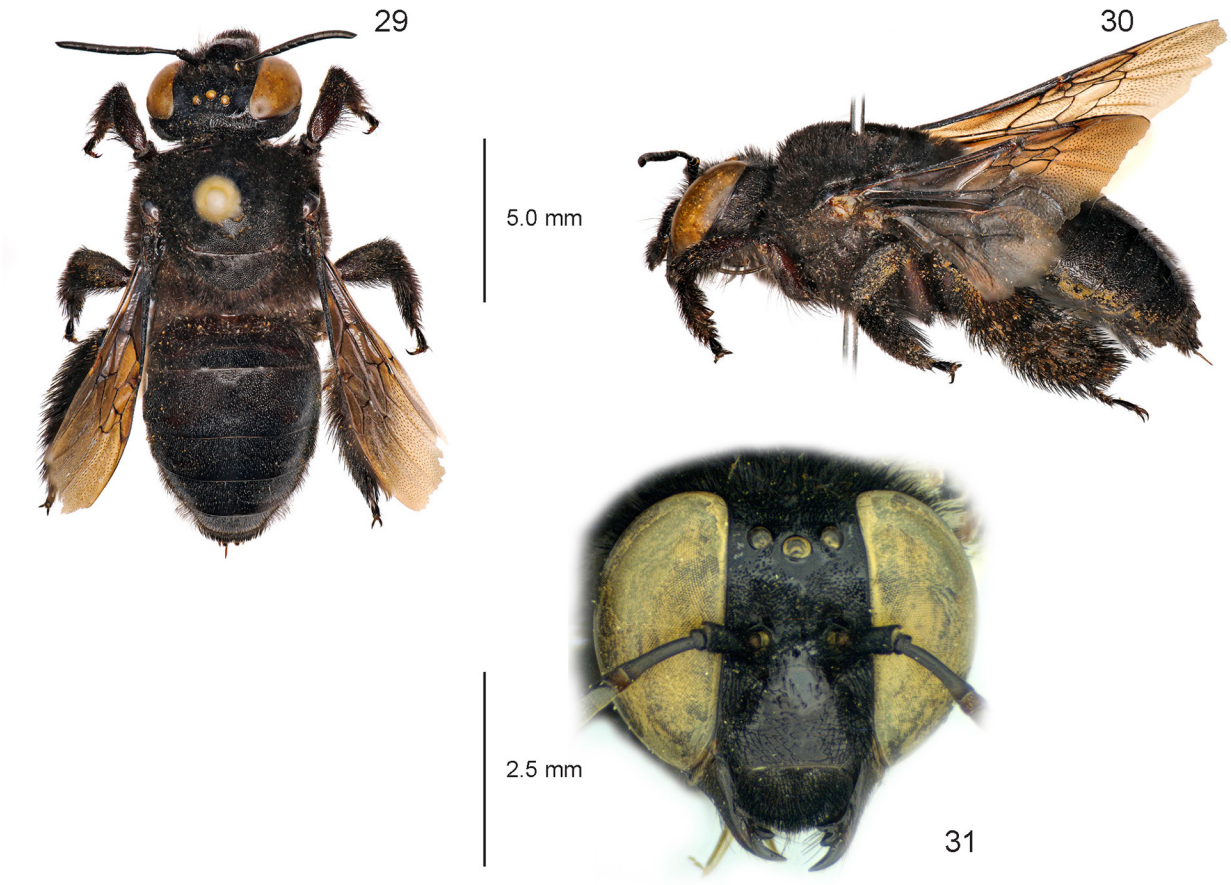
Three species occur in the Antilles: *C. aethiops*, *C. caymanensis* Vivallo and *C. domingensis* Dalla Torre.

### *Centris* (*Xanthemisia*) *aethiops* Cresson

(Fig. 29–36)

*Centris aethiops* Cresson 1865: 193. Holotype female in ANSP.
*Centris armillatus* Cresson 1869: 298. Holotype male in IES, Gundlach collection, no. 214.

Due to this species' sexual dimorphism, the female and male were described as separate species (Cresson 1865, 1869). Snelling (1966) published the synonymy of *C. armillatus* with *C. aethiops* and assigned the species to the subgenus *Xanthemisia*.




**Figures 29–31.** *Centris aethiops* female. **29)** Dorsal habitus. **30)** Lateral habitus. **31)** Head in frontal view.

Vivallo (2014) revised the genus for the Antilles, described a new species from the Cayman Islands, clarified the taxonomy and the distribution of the Cuban form and presented a key to separate the species. Genaro (2007) erroneously synonymized *C. domiguensis* Dalla Torre with *C. aethiops*. Vivallo (2014) resurrected the species.

**Natural history.** *Centris aethiops* was primarily observed in pine forests, mogote (limestone hill) vegetation, and coastal areas. Unlike the previously mentioned species, it is less common in disturbed habitats.

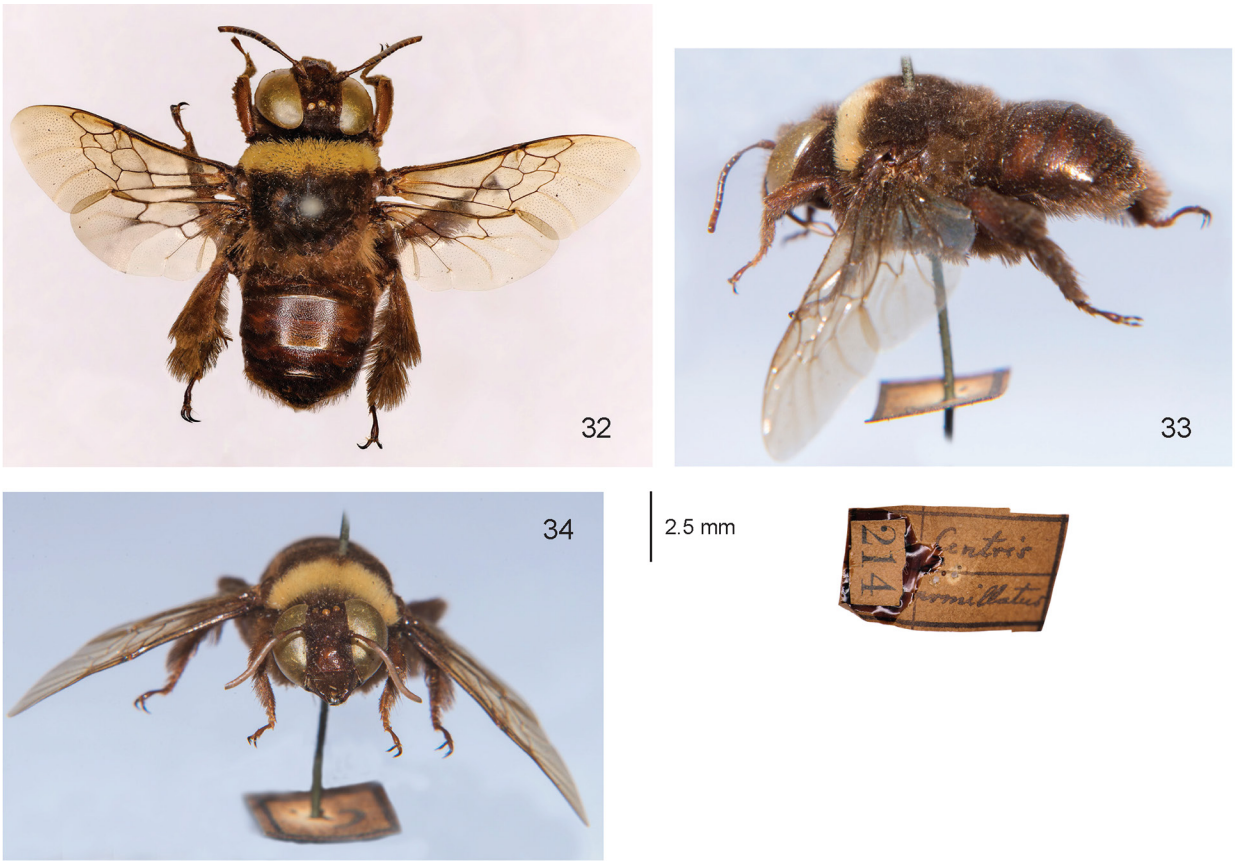
This species is apparently multivoltine, more active during April to July, although collection efforts may be biasing the results (Fig. 35).

**Floral relations.** *Byrsonima crassifolia*, *B. spicata*, *Stigmaphyllon* sp. (Malpighiaceae); *Miconia octona, Miconia* sp. (Melastomataceae); *Eugenia farameoides* (Myrtaceae); *Securidaca elliptica* (Polygalaceae); *Solanum havanense*, *Solanum* sp. (Solanaceae).

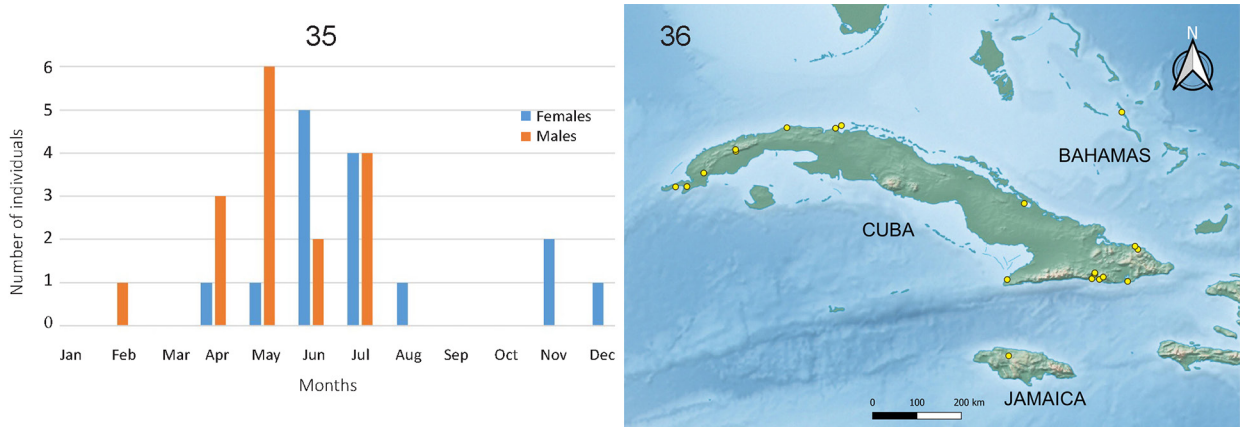
**Distribution** (Fig. 36). The Bahamas, Cuba and Jamaica (Genaro 2007; Vivallo 2014; Moure et al. 2007; Moure and Mello 2023). Genaro (2007) mistakenly mentioned the species as present in Hispaniola, considering it a synonym of *C. domingensis*.

## Subgenus *Heterocentris* Cockerell

**Diagnosis.** The maxillary palps are three-segmented; some scopal hairs, especially near the base of the metatibia, are simple; there is a groove on the inner ventral edge of the front coxa; the female secondary basitibial plate does not have a distinct overhanging margin; the males have a carina along the posterior margin of the metabasitarsus, which usually terminates in a prominent tooth-like process (Snelling 1974, 1984; Michener 2007).




**Figures 32–34.** *Centris armillatus* male holotype. **32**) Dorsal habitus. **33)** Lateral habitus. **34)** Frontal habitus.




**Figures 35–36.** *Centris aethiops*. **35)** Seasonal occurrence, according to sex. **36)** Distribution.

Thiele (2003) did not recognize the synonymization of the subgenera *Heterocentris* and *Hemisiella* as proposed by other authors (Michener 1951; Snelling 1984). Vivallo and Vélez (2016) recognized *Hemisiella* as a valid subgenus because its species form a distinct monophyletic group which is closely related to subgenera *Heterocentris* and *Trachina* Klug, with which it shares several synapomorphies in male morphology. Martins and Melo (2016) also recognized both subgenera in the New World molecular phylogeny and biogeographical analyses.

The bees in this subgenus adopt a variety of preexisting cavities as nest sites (Frankie et al. 1993; Vinson et al. 1996, 2011; Viera de Jesus and Garófalo 2000).

Two species occur in the Antilles: *C. cornuta* and *C. analis* (Fabr.).

### *Centris* (*Heterocentris*) *cornuta* Cresson

(Fig. 37–48)

*Centris*? *cornuta* Cresson 1865: 194. Holotype female in IES, Gundlach collection, no. 248.
*Centris difformis* Friese 1900: 300. Misidentification.
*Centris difformis* Lutz and Cockerell 1920: 552. Misidentification.
*Centris difformis* Alayo 1973: 214; Alayo 1976: 29. Misidentification.
*Centris* sp A. Alayo 1973: 214; Alayo 1976: 29. Males. Synonymy of R. S. Snelling.

Cresson (1865) described the species from a single female and recognized that while it had elements of the genus *Centris*, the structure of the head was significantly different. As a result, he proposed a new genus called *Gundlachia* to eventually accommodate it, although he tentatively described it under *Centris*. Gundlach (1886) redescribed the species in Spanish and claimed to have collected it in Rangel (Pinar del Río), so we assume that this is the type locality of the species, since there are no locality data on the label or in the original description, based on a single specimen.

Gundlach (1886) discovered that the name proposed by Cresson (1865) to create a new genus was already in use for a freshwater snail and thus unavailable. It was considered a synonymous name of *Centris difformis* F. Smith (Cockerell 1906), a species that inhabits Central and South America, but Snelling (1984) clarified the taxonomic status and recognized them as different species.

Moure (2003) described two new species of this group from South America and wrote about the taxonomic history of *C. cornuta*, recording it for the first time for Hispaniola, based on a female studied and deposited in the NHMUK. Genaro (2007) provided information on the distribution of the species. Vélez and Vivallo (2012) keyed the females of *Centris* (*Heterocentris*) with horns on the clypeus and presented images of *C. cornuta* without mentioning the locality. Probably the photos are based on the same Haitian specimen studied by Moure (2003). Vivallo (2020b) included the species in his comments on the species described by Cresson.

**Distribution.** Cuba and Hispaniola (Moure 2003; Portuondo and Fernández 2004, as *C. difformis*; Genaro 2007; Moure et al. 2007; Moure and Melo 2023); in Cuba, collected mainly from the eastern provinces and known also from another place located at the other end of the Island, Sierra de Rangel, Pinar del Río; in Hispaniola, known so far only from Grande Anse, a region very close to the east of Cuba. Rare species, known in Cuba from a few specimens deposited in the IES, MNHNCu and JAG collections (Fig. 47, 48).

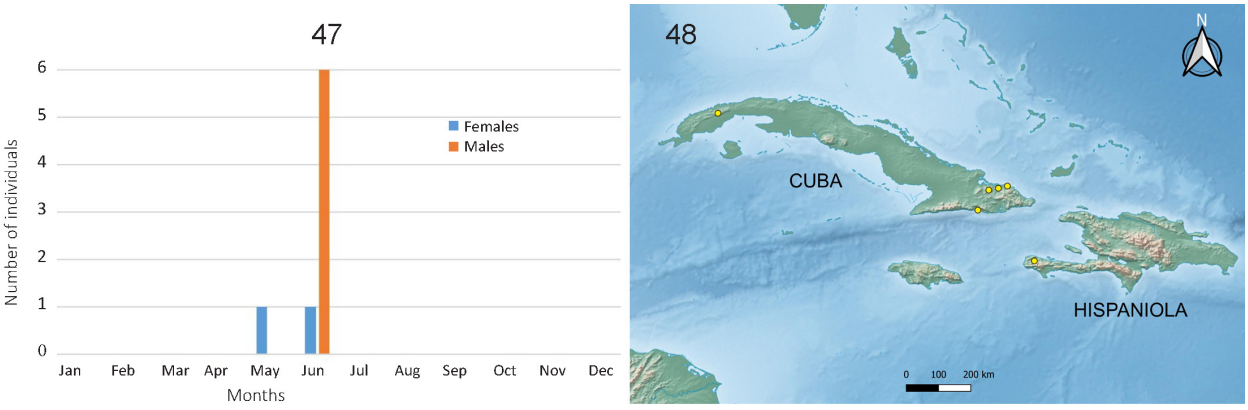
**Brief description of the unknown male.** Body length 12.4 mm, forewing length 10.5 mm. *Integument coloration.* Black, with light metallic blue reflections on head and metasomal terga. Yellow on clypeus, labrum and a triangular spot on ventral surface of antennal scape (Fig. 41). Reddish brown on mesosoma, legs, T5 and T6. Tegula translucent honey colored; wing membrane dusky subhyaline with brown venation. *Pubescence* (Fig. 42). Whitish pubescence on base of mandible, gena, supraclypeal area, pre episternum, mesepisternum, metepisternum, mesopleuron, inner margin of fore and mesotibia, anterior margin of T1. Yellow pubescence on mesoscutum, scutellum and propodeum, T3–T6 with simple hairs on posterior margin. Black pubescence on vertex, frons in part, tarsi, outer margin of metatibia, metafemur and short simple hairs on disc of terga; inner surface of metabasitarsus with black robust setae. *Surface sculpture.* Disc of labrum and clypeus smooth, shiny between scattered fine punctures; irregular punctures (i=0–3d) in area supraclypeal, frons and vertex; smooth around ocelli. Mesoscutum and scutellum with irregular punctures (i=0–2d). Terga with irregular punctures (i=1–3.5d), coarser on T3–T6; marginal zones of T1 and T2 polished. *Structure.* Middle tooth of mandible larger than inner tooth and nearer inner tooth than apical one. Labrum longer than clypeus (Fig. 41). Inner, posterodistal angle of metatibia distinctly produced and spiniform; hind basitarsus with spine on inner margin (Fig. 43).

### Subgenus *Hemisiella* Moure

**Diagnosis.** Species of the subgenus are morphologically homogenous and can be recognized by the pattern of facial coloration in both sexes, with males having a broad yellow transverse spot on the clypeus and females


**Figures 37–43.** *Centris cornuta*. Female. **37)** Head in frontal view. **38)** Head semi-lateral view. **39)** Basitibial plate. **40)** Pygidial plate. Male. **41)** Head in frontal view. **42)** Dorsal habitus. **43)** Basitarsus with sender process along inner posterior margin (encircle).


**Figures 44–46.** *Centris cornuta* female holotype. **44)** Dorsal habitus. **45)** Lateral habitus. **46)** Frontal habitus.




**Figures 47–48.** *Centris cornuta*. **47)** Seasonal occurrence, according to sex. **48)** Distribution.

having a dark brown to black clypeus with two very large, oblique yellow patches; the swollen hind leg of the male, of which the metabasitarsus usually has a spine on the inner margin and the trochanter a spine-shaped projection; and an elliptical primary basitibial plate, with the secondary plate covered with dense, short pubescence, in the female (Snelling 1974, 1984; Michener 2007; Vivallo and Velez 2016).

Species in this subgenus utilize preexisting cavities in a variety of substrates for nesting (Michener and Lange 1958; Jayasingh and Freeman 1980; Snelling 1984; Buschini and Wolff 2006), although some species may also nest in the ground (Vivallo and Vélez 2016).

Six species occur in the Antilles: *C. barbadensis* Cockerell, *C. crassipes* F. Smith, *C. fulviventris* Cresson, *C. lanipes* Fabr. and *C. rhodadelpha* Cockerell, *Centris tarsata* F. Smith, **new record**.

### *Centris* (*Hemisiella*) *fulviventris* Cresson

(Fig. 49–52)

*Centris fulviventris* Cresson 1865: 193. Holotype female in IES, Gundlach collection, no. 168.
*Centris simillima* F. Smith 1874: 370. Lectotype female in NHMUK. Synonymy of Vivallo (2020a).

This is the rarest species of *Centris* in Cuba, known only from the type specimen (Fig. 49–51) and some females from Hispaniola. Males are unknown.

Smith (1874) described this species under the name *C. simillima* from the female and described it as resembling *C. lanipes*. Moure et al. (2007) included *C. simillima*, *C. fulviventris* and *C. picea* Lepeletier as junior primary synonym of *C. lanipes*. Vivallo (2020a) reanalysed the taxonomic status and removed *C. fulviventris* and *C. simillima* from synonymy with *C. lanipes*, leaving *C. fulviventris* as the valid name and *C. simillima* a junior synonym thereof. Vivallo (2020b) included *C. fulviventris* among the species studied and described by Cresson.

**Distribution.** Cuba and Hispaniola.

### *Centris* (*Hemisiella*) *tarsata* F. Smith

(Fig. 53–63)

*Centris tarsata* F. Smith 1874: 371. Lectotype male in NHMUK (Catalog number NHMUK010812611).

**Diagnosis.** Both sexes have greenish yellow pilosity on the head and mesosoma (Fig. 53–55, 57-59). In males, there is no spine-like projection on the posterior margin of the metabasitarsus, unlike in other males of the subgenus; pilosity on the posterior surface of the hind tibia is whitish; and the metabasitarsus has dark brown pubescence. In females, the surface of the clypeal disc is areolate, and without a longitudinal carina, and pale hairs on the hind tibiae are white to pale yellowish (Vivallo and Vélez 2016; Vivallo and Zanela 2012; Roig-Alsina 2000; Vivallo 2020b). Vivallo (2020b) studied the type material of *C. tarsata* and offered information about its taxonomy. A sample from Cuba shares a BIN with a sample from Argentina, supporting their status as conspecific (Fig. 64).

**Natural history.** The species had not been previously observed either in collections or in natural areas by other entomologists, nor had it been reported by the senior author (JAG) who was actively collecting in Cuba until 2004. This possibly indicates a recent introduction to the island. Although Cuba has been relatively closed to foreign investment and trade, especially with Latin America, in 2014 a significant expansion of the El Mariel Port was inaugurated. Construction, though, began years earlier with the involvement of South American countries, primarily Brazil. This involved the mobilization and displacement of heavy machinery and equipment, which could have transported nests of *Centris tarsata*, as it is a species that nests in cavities. The El Mariel Port is located in the western part of the island where the species' activity has been more frequently observed, which is consistent with the hypothesis that the movement of construction equipment and materials during the project served as an entry point for the species into the island.

Alexander Kroupa (pers. comm., 2023 to DB) has collected the species in the central part of Cuba. Moreover, trap nests that were set up by A. Kroupa were rapidly colonized by nesting females. The species was active in Pinar del Río, visiting bare ground mostly of trails to collect sandy soil for nest construction (Fig. 61). This information is evidence that the species is adapting and reproducing in Cuban ecosystems.

*Centris tarsata* was more commonly observed in open areas of coastal habitats and secondary vegetation near rural human settlements.

**Floral relations. Previous records**: *Bourreria havanensis* (Boraginaceae) (Alameda et al. 2023, as *C. fulviventris*). **New records**: *Malpighia emarginata* Moçiño & Sessé ex DC., *Stigmaphyllom* sp., *Mascagnia* sp. (Malpighiaceae); *Securidaca elliptica* Turcz (Polygalaceae); *Tridax procumbens* (Asteraceae); *Lantana* sp., *Stachytarpheta jamaicensis*


**Figures 49–51.** *Centris fulviventris* female holotype. **49)** Lateral habitus. **50)** Dorsal habitus. **51)** Head in frontal view.

(L.) Vahl., *S. cayennensis* (Rich.) Vahl (Verbenaceae); *Sida acuta* Burm.f., *Melochia spicata* (Malvaceae); *Senna uniflora* (Mill.) H. S. Irwin and Barneby, *S. alata* (L.) Roxb. (Leguminosae) (Fig. 60).

Dórea et al. (2009) analyzed pollen residues found in nests, in Bahia State, Brazil (deciduous dryland vegetation), where the most frequently visited plant families were Leguminosae (49.3%) and Solanaceae (43.2%). Aguiar et al. (2010) found, in a tropical semiarid area of Brazil, Leguminosae and Malpighiaceae as the plant families most represented.

**Distribution.** South America (Argentina, Paraguay, Uruguay, Brazil, Colombia and Guyana; Central America (Guatemala and Panama) (Moure et al. 2007; Moure and Melo 2023). Felipe Vivallo (pers. comm., 2023) found


**Figure 52.** *Centris fulviventris* distribution. Hispaniola is represented as a whole in yellow because there are no known exact locality records.

one male and one female from Mexico in the collection of National Museum of Rio de Janeiro, which were lost in the fire that occurred in 2018, preventing further study.

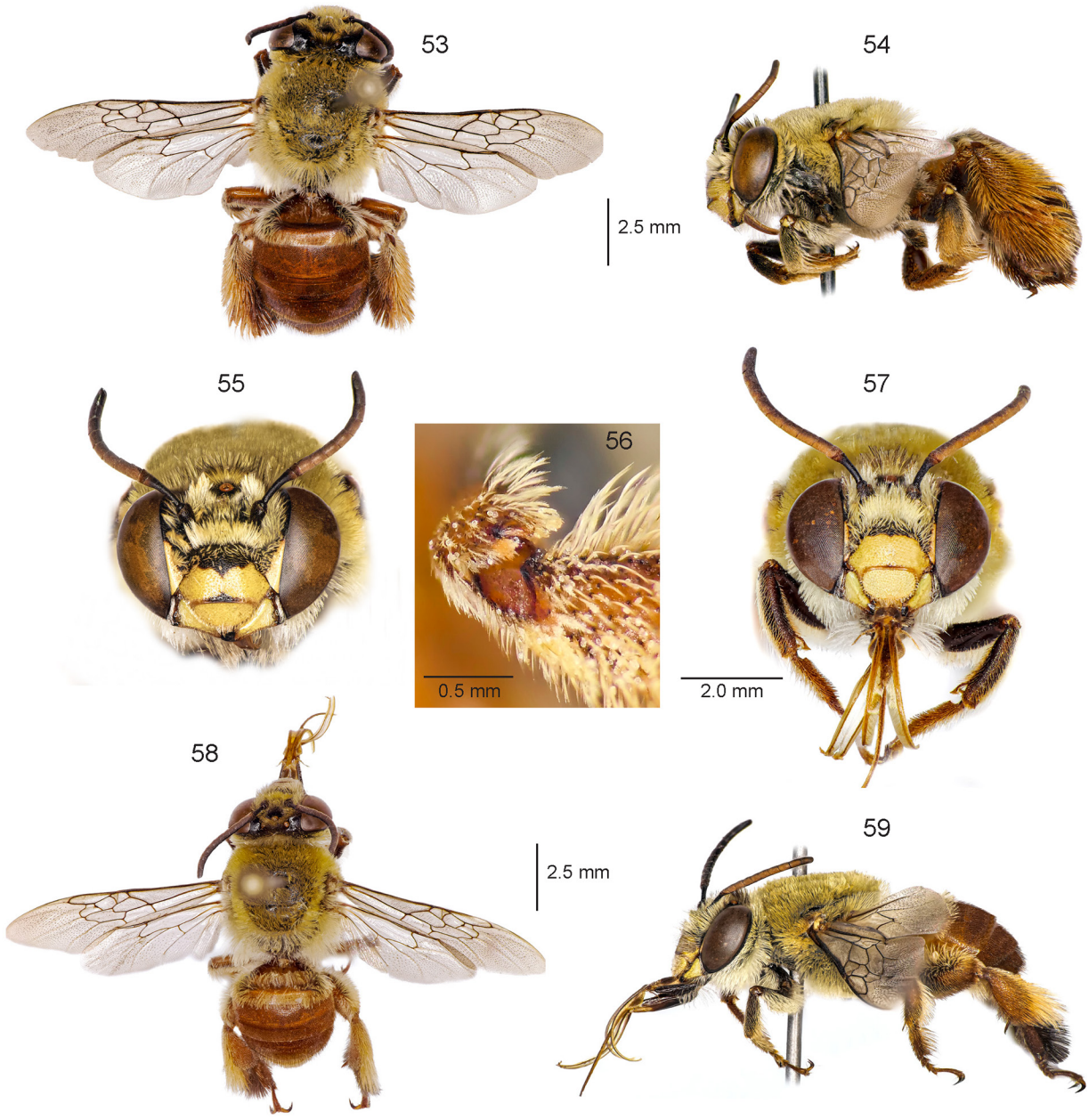
**First record.** CUBA. San Diego de Los Baños, Pinar del Río, 22.67803213 -83.36691732, 3.v.2013, coll. D. Breto, (male, JAG) WI JAG 1206, barcoded; 28.ix.2013, coll. D. Breto (male, JAG); 10.viii.2014, coll. D. Breto (1 female, 2 males, DB); 4.viii.2015, v.2017, 14.vii.2018, coll. D. Breto (3 males, DB); 6.vii.2019, coll. D. Breto (female, DB); 12.vii.2019, coll. D. Breto (1 female, 2 males, DB); 30.iv.2021, coll. D. Breto (male, DB); xii.2022, coll. D. Breto (2 females, 1 male, DB); 16.ix.2022, 9.xii.2022, coll. D. Breto (2 males, DB); 5.i.2023, 16.ix.2023, coll. D. Breto (2 females, DB, JAG). Guanahacabibes, Faro Roncali, Pinar del Río, 21.86786424, -84.9509587, x.2022, coll. D. Breto (female, DB). Santa Cruz del Norte, Lomas de Galindo, Mayabeque, 23.06689, -81.73359, iii.2019, colls. D. Alameda and D. Font (female, IES), GA195.22; vi.2019, coll. D. Alameda (male, IES), 198.10.

Villa Clara, Caibarién, Finca Vista Hermosa, 79.467 W/22.495 N, 02 and 20-28.xii.2016 (Malaise trap), 19.i.2017, 7.i-19.ii.2017 (Malaise trap), 29.ix.2019, 28 and 29.viii.2023 (trap nest), 16.ix.2023 coll. A. Kroupa, 1ECF37, 890/424 female, 1ED0E7, 890/849 male, 1ED10A, 890/884 male, 1ED68C, 890/1996 male, 1ED3BB, 890/1405 female, 1ED3C5, 890/1415 male, 1ED31C, 890/1283 male, 1EF122, 890/2238 male, 1F3FA4, 890/2242 male, 1F3FA5, 890/2243 female (MCNC); Parque Nacional Caguanes, Sancti Spíritus, 16.viii.2019, 79.117 W/22.392 N, coll. A. Kroupa, 1ED2E2, 911/27 female, 1ED2FD, 911/54 female, 1ED310, 911/73 female (MCNC); Villa Clara, Caibarién East, 28.vi.2021, 79.519 W/22.52 N, coll. Y. Solana Léon 1ED92A, 918/27 female (MCNC); Villa Clara, 1 km N Dolores, 31.xii.2022, 79.424 W/22.444 N, coll. A. Kroupa, 1EE74B, 924/91 male (MCNC); Villa Clara, Caibarién, Finca La Amalia, 7.vii.2021, 25.viii-14.ix.2021 (Malaise trap), 14.ix.-02.x.2021 (Malaise trap) 15.ix.-10.x.2022 (Malaise trap), 16.ix.2023 (trap nest) 79.473 W/22.491 N, coll. A. Kroupa, 1ED8F7, 919/393 female, 1EDE06, 919/974 female, 1EDBDF, 919/762 male, 1EE180, 919/1326 female, 1F3FA2, 919/1739 male, 1F3FA3, 919/1740 female (MCNC). All material collected by A. Kroupa appeared identified as *C. lanipes* in his collection)

**Non-preserved material.** CUBA, Caimanera, Guantánamo Naval Base, 16.vii.2019, coll. W. Fidler, male (identified as *Centris lanipes* and *C. fulviventris*); iNaturalist record #30971037.

## About the presence of other *Centris* species in Cuba

Moure and Mello (2023) mentioned *C. fasciata*, *C. haemorroidalis*, *C. lanipes, C. smithii* and *C. vesicolor* as occurring in Cuba, but we found no Cuban records of these species in existing collections or during any field trip.

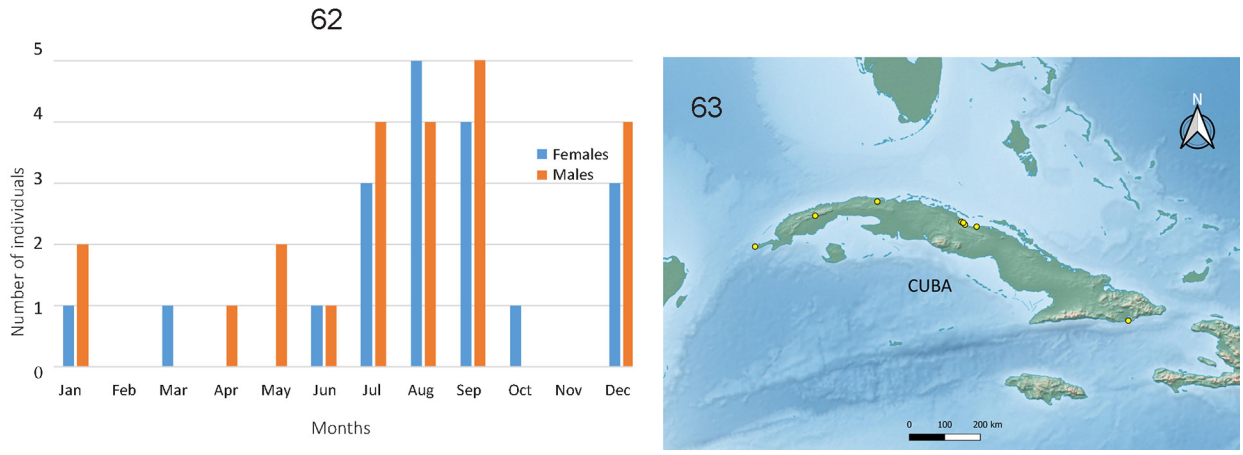



**Figures 53–59.** *Centris tarsata*. Female. **53)** Dorsal habitus. **54)** Lateral habitus. **55)** Head in frontal view. **56)** Basitibial plate. Male. **57)** Head in frontal view. **58)** Dorsal habitus. **59)** Lateral habitus.

*Centris lanipes* is one of the most frequently misidentified *Centris* species, and currently it is being studied to determine its accurate distribution and to better define the taxonomic boundaries of the Antillean forms (F. Vivallo, pers. comm., 2023).

*Centris decolorata* should be present along coastal sand dunes, but until now there is no record of its presence in Cuba. It occurs on Jamaica and Hispaniola and all Caribbean Isl. to Northern South America as well as along the Caribbean coast of Central America, north to Texas, USA.


**Figures 60–61.** *Centris tarsata* females. **60)** visiting flowers of *Senna alata*, Fabaceae, San Diego de los Baños, Pinar del Río. **61)** collecting sandy soil for nest construction. Photos by D. Breto.




**Figures 62–63.** *Centris tarsata*. **62**) Seasonal occurrence, according to sex. **63)** Distribution.

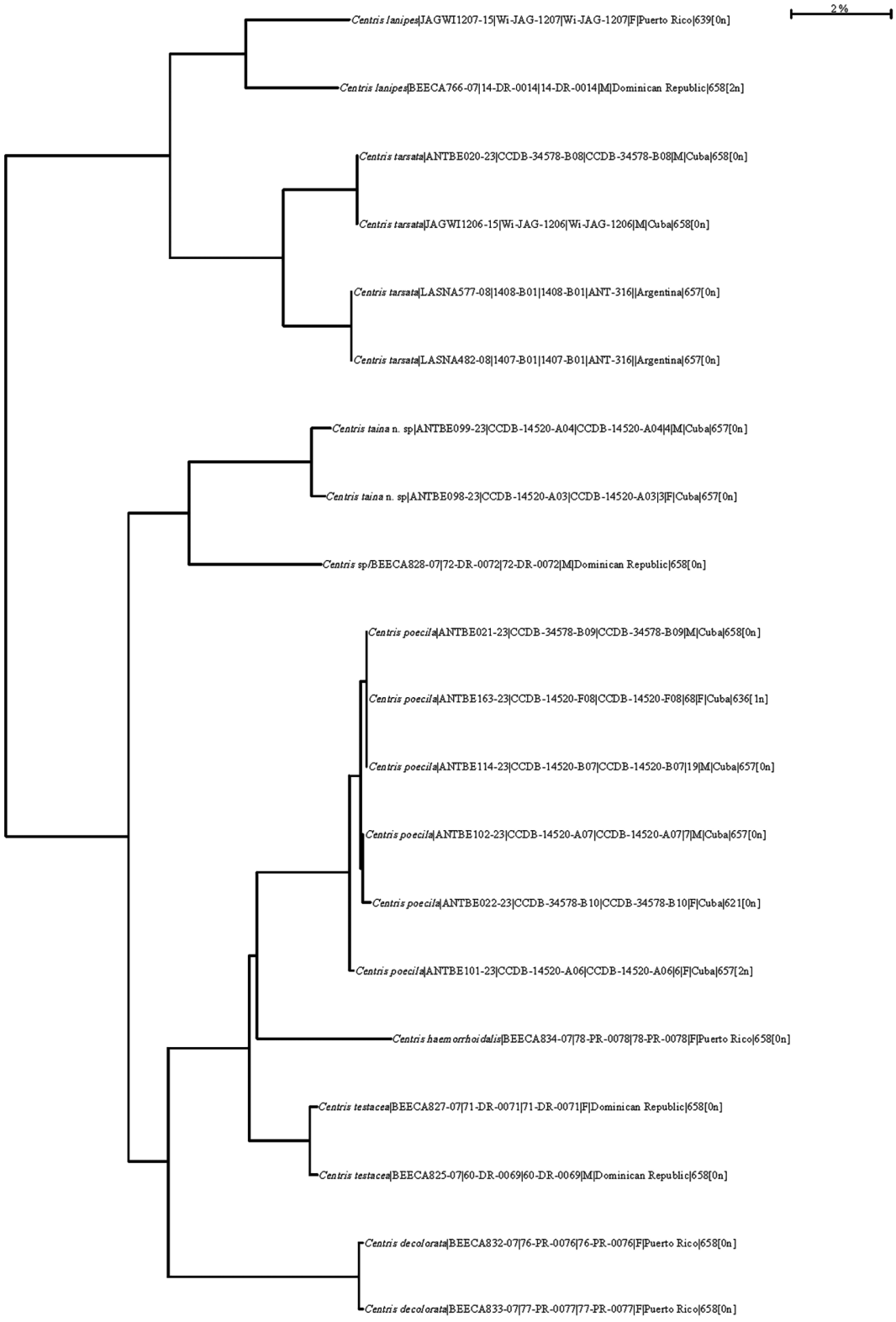



**Figure 64.** Neighbour-joining tree of the COI barcode sequences of some Antillean *Centris* species. Each sample is labeled with the following information: species name, BOLD sample ID, Sequence/process ID, Sex (M=male, F=female), country and sequence length, with the number of ambiguous bases indicated in square brackets. Scale bar represents pairwise distance.

**Key to *Centris* of Cuba. Males of *C. fulviventris* are unknown.**

1. Female (antenna 12-segmented, metasoma with 6 exposed terga, T6 with pygidial plate) . . . . . **2**
— Male (antenna 13-segmented, metasoma with 7 exposed terga, T7 without pygidial plate) . . . . . **7**

2(1). Head quadrate in dorsal view (Fig. 38, 44); mandible elongate reaching opposing mandibular bases (Fig. 37); clypeus short, emarginated laterally, with prominent incurved, subacute tooth medially (Fig. 37, 38) . . . . . ***C. cornuta* Cresson**
— Head not quadrate in dorsal view (Fig. 3, 10, 29, 50, 53); mandible shorter, not reaching opposing mandibular base (Fig. 12, 31, 51, 55); clypeus long, not emarginated laterally, without prominent, incurved, subacute tooth medially (Fig. 1, 12, 31, 51, 55) . . . . . **3**

3(2). Head, mesosoma and metasoma clothed with black pubescence (Fig. 29, 30) . . . . . ***C. aethiops* Cresson**
— Head, mesosoma and metasoma largely or entirely with pale pubescence (Fig. 3, 10, 11, 49, 50, 53, 54) . . . . . **4**

4(3). T1–T3 amber or light brown, without metallic reflections (Fig. 50, 53); secondary metabasitibial plate vestigial, without distinct overhanging margin (Fig. 56) . . . . . **5**
— T1–T3 black or dark brown, with metallic reflections (Fig. 3, 10); secondary metabasitibial plate with distinct overhanging margin (Fig. 6, 16) . . . . . **6**

5(4). Legs partially dark brown (Fig. 54); vertex with some dark hairs mixed with yellow ones (Fig. 55) . . . . . ***C. tarsata* F. Smith**
— Legs amber (Fig. 49); vertex without dark hairs (Fig. 51) . . . . . ***C. fulviventris* Cresson**

6(4). Mesoscutal hairs not distinctly dark-tipped (Fig. 3); metatibia with pubescence on anterior surface black; hind leg hairs entire black (Fig. 3, 5); metabasitibial secondary plate with apex acute (Fig. 6) . . . . . ***C. poecila* Lepeletier**
— Mesoscutal hairs distinctly dark-tipped; metatibia with pubescence on anterior surface yellow; hind leg hairs partial black (Fig. 11, 12); metabasitibial secondary plate broadly rounded (Fig. 16) . . . . . ***C. taina* Genaro and Breto, n. sp.**

7(1). Labrum longer than clypeus (Fig. 41); metabasitarsus with spine on inner posterior margin (Fig. 43); posterior surface with robust setae . . . . . ***C. cornuta* Cresson**
— Labrum shorter than clypeus (Fig. 2, 15, 57); metabasitarsus without spine on inner posterior margin; posterior surface without robust setae . . . . . **8**

8(7). Mesoscutum with transverse band of erect, pale-yellow hairs along anterior margin, rest of the body with integument and pubescence black (Fig. 32, 33, 34) . . . . . ***C. aethiops* Cresson**
— Mesoscutum without transverse band of erect, pale-yellow hairs along anterior margin, rest of the body with integument and pubescence variable (yellow, amber, and/or black) (Fig. 4, 13, 14, 58, 59) . . . . **9**

9(8). T2–T3 amber (Fig. 58); hind leg with black hairs only on metabasitarsus, otherwise with yellow hairs (Fig. 59) . . . . . ***C. tarsata* F. Smith**
— T2–T3 not amber (Fig. 4, 13); hind leg with black hairs, not restricted to metabasitarsus (Fig. 4, 14) . . . . **10**

10(9). T2–T3 with complete yellow preapical transverse bands (T2 band medially interrupted in some specimens) (Fig. 13, 18) . . . . . ***C. taina* Genaro and Breto, n. sp.**
— T2–T3 dark metallic blue, without yellow preapical transverse bands (Fig. 4) . . . . ***C. poecila* Lepeletier**

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