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Article

Taxonomic notes on the primary types of some species of *Centris* bees described by some entomologists from the Americas (Hymenoptera: Apidae)

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ABSTRACT. In this paper are presented notes on the primary types of some species of the oil-collecting bees of the genus *Centris* Fabricius, 1804 described by Alpheus Packard, Arturo Roig-Alsina, Charles Michener, Flamínio Ruiz, Haroldo Toro, James Crawford, Jesus Santiago Moure, Philip Timberlake, and Roy Snelling. Information on the type status, type locality and depository are provided.

KEYWORDS. Anthophila, biodiversity, oil-collecting bee, solitary bee, systematics.

RESUMO. Notas taxonômicas sobre os tipos primários de algumas espécies de abelhas do gênero *Centris* descritas por alguns entomologistas das Américas (Hymenoptera: Apidae). Neste artigo são apresentadas notas sobre os tipos primários de algumas espécies de abelhas coletoras de óleo do gênero *Centris* Fabricius, 1804 descritas por Alpheus Packard, Arturo Roig-Alsina, Charles Michener, Flamínio Ruiz, Haroldo Toro, James Crawford, Jesus Santiago Moure, Philip Timberlake e Roy Snelling. São fornecidas informações sobre o status dos tipos, localidade tipo e depositário.

PALAVRAS-CHAVE. Anthophila, biodiversidade, abelha coletora de óleo, abelha solitária, sistemática.

Centris Fabricius, 1804 is a genus of solitary bees widely distributed in America (Moure *et al*., 2007). Along with its wide distribution on the continent, it is also one of those with the highest specific richness (Vivallo, 2020j, 2022). This great diversity contributed to a profuse, extensive and sometimes complex taxonomic history, which is evidenced by the large number of species described, the number of which are considered valid, and the many synonyms that have been proposed in the last 200 years.

Recently, a series of extensive and complete articles on the taxonomy of *Centris* have been published (Vivallo, 2018, 2019a,b,c, 2020a,b,c,d,e,f,g,h,i,j, 2022), which have contributed to taxonomic stability mainly at specific level. Those papers have also allowed elucidating the real identity of some taxa, as well as recognizing and subsequently describing new species that until now remained unknown to science. The most recent example can be found in the taxonomic revision of the subgenus *C*. (*Melanocentris*) Friese, 1901 (Vivallo, 2022), where numerous new species were described, for example *C. velutina* Vivallo, 2022 from Venezuela, *C. vulnicura* Vivallo, 2022 from Brazil, and *C. caliginosa* Vivallo, 2022 from Peru.

Continuing with the taxonomic study of the species of *Centris*, in this article the primary types of the species described by the entomologists from the Americas: Alpheus Packard, Arturo Roig-Alsina, Charles Michener, Flamínio Ruiz, Haroldo Toro, James Crawford, Jesus Santiago Moure, Philip Timberlake, and Roy Snelling are studied. All these authors were specialists in other insect groups, making circumstantial inputs in *Centris*, except for Snelling and Moure who, among them, made the largest number of contributions in the genus.

MATERIAL AND METHODS

All labels are here considered whitish and rectangular, and the data contained on them is black, handwritten or printed. The specific features of the labels, like coloration or type of writing are given in squared brackets ([ ]). Some information on the handwritten labels is difficult to decipher, in these cases the symbol '[?]' was used. The backward slash (\) indicates different labels on the pin of the same specimen. All data contained on the labels was transcribed verbatim. The specimens cited are housed in the following collections:

CC BY

American Museum of Natural History, New York, United States (AMNH); California Academy of Sciences, San Francisco, United States (CAS); Colegio San Pedro Nolasco, Santiago, Chile (CSPN); Central Texas Melittological Institute, Austin, United States (CTMI); Coleção Entomológica Pe. Jesus Santiago Moure, Universidade Federal do Paraná, Curitiba, Brazil (DZUP); Coleção entomológica regional do Laboratório de Abelhas, Empresa Baiana de Desenvolvimento Agrícola, Salvador, Brazil (LABE/EBDA); Los Angeles County Museum, Los Angeles, United States (LACM); Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina (MACN); Museum of Comparative Zoology, Harvard University, Cambridge, United States (MCZ); Museo de La Plata, La Plata, Argentina (MLP); Muséum national d'Histoire naturelle, Paris, France (MNHP); Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (MNRJ); Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP); Natural History Museum, London, United Kingdom (NHMUK); National Museum of Natural History, Washington D.C., United States (NMNH); Oxford University Museum of Natural History, Oxford, United Kingdom (OUMNH); Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile (PUCV); Snow Entomological Museum, University of Kansas, Lawrence, United States (SEMK), and Museum für Naturkunde, Berlin, Germany (ZMB).

RESULTS

Recognition of the type specimens. The primary types of the species studied here were recognized following the information indicated in their respective original descriptions, about the place of deposit as well as the data on the labels of the specimens. Both pieces of information were contrasted in order to verify the existence of inconsistencies that could interfere with the recognition of the primary types.

In general, the types were indeed found in the institution indicated in each description. However, in some specific cases, apparently the specimens were not sent to the institution mentioned, despite what was indicated in the original description.

Alpheus Packard. Alpheus Spring Packard Jr. (1839–1905) was an American entomologist, naturalist and paleontologist. He worked as professor of Zoology at Brown University and during his years of activity he described over 500 new species, especially butterflies and moths (Cockerell, 1920). Packard began to work at the Museum of Comparative Zoology under the direction of the Swiss biologist and geologist Jean Louis Rodolphe Agassiz (1807–1873) but during his stay at that institution he had some differences with the staff and he leaved the Museum (Mead, 1918). In 1867, Packard was appointed as one of the curators of the Peabody Academy of Science at Salem, Massachusetts, United States. During his stay at this institution, he published several new species to science, including three of them in *Centris*. Packard passed away on 14 February 1905 in Providence, Rhode Island, United States, aged 65.

Packard's *Centris* bees. The three species of *Centris* described by Packard were based on specimens collected by the American naturalist James Orton (1830–1877) during the Smithsonian Expedition to South America in 1867. Most species described in that article were based on specimens collected on the route from Quito across the Andes, down the Napo River, and along the Maranon River. However, Packard (1869) mentioned that the Brazilian exemplars were collected in the upper Amazon, namely, the Maranon River and its tributary the Napo River. These both are Peruvian effluents of the Amazon River but their extensions do not reach the Brazilian territory. In the descriptions of the species of *Centris* proposed by him, he mentioned that they were collected on the "route along the Napo and Maranon Rivers". That information was effectively cited on the labels of those specimens, however, below it appears "Brazil", being this a conflicting data.

Packard mentioned that almost all species described in his article were based on single specimens which is somewhat reinforced in each description, because he mentioned specimen in singular. Thus, it was assumed that they were based on holotypes. In the case of *C. quadrimaculata* Packard, 1869 and *C. conica* (Packard, 1869) it seems to be true, but not in *C. braccata* Packard, 1869. Despite he mentioned that the description was based on a female, two specimens of that sex were found at MCZ.

Centris braccata Packard, 1869

Centris braccata Packard, 1869:57.

Type data. This species was described from a couple of females collected in Peru. The lectotype was designated by Vivallo (2022) and it has the following data label: *C. braccata* Pack. Napo x Maranon River Orton [printed] Brazil. [printed]\ [red label] Type. [printed] 557 1 [handwritten]\ MCZ-ENT 00511492 QR code [printed]\ [red label] LECTOTYPE *Centris braccata* Packard, 1969 F. Vivallo des, 2016 [printed] (MCZ). Paralectotype with the following data label: *Centris braccata* Pack. Bis. Quito x Maranon Orton [handwritten] Brazil [printed]\ [red label] Type. [printed] 557 2 [handwritten]\ MCZ-ENT 00000557 QR code [printed] (MCZ).

Type locality. Peru: "Route along the Napo and Maranon Rivers".

Centris conica (Packard, 1869)

Anthophora conica Packard, 1869: 58 (Junior synonym of *C. varia* (Erichson, 1848)).

Type data. Packard (1869) described this species using a single female which has the following data label: [red label]

Type. [printed] 551 [handwritten]\ *Anthophora conica* Pack Napo & Maranon rivers Brazil Orton [handwritten]\ MCZ-ENT 00000551 QR code [printed] (MCZ).
Type locality. Peru: "Route along the Napo and Maranon Rivers".

Centris quadrimaculata Packard, 1869

Centris 4-maculata PACKARD, 1869: 57 (Senior synonym of *C. fusciventris* Mocsáry, 1899).

Type data. This species was proposed based on a single female specimen. The holotype has the following data label: [red label] Type. [printed] 558 [handwritten]\ *C. 4-maculata* Pack Napo & Maranon r. Orton [handwritten] Brazil [printed]\ MCZ-ENT 00000558 QR code [printed] (MCZ).
Type locality. The type locality is cited as "Route along the Napo and Maranon Rivers", but in the label of the holotype says "Brazil". As mentioned above, the Brazilian specimens described by Packard were collected on the "upper Amazon, namely the Maranon River, and its tributary the Napo".

Arturo Roig-Alsina. Arturo Hernán Roig-Alsina is an Argentinean entomologist, curator of the insect collection of the MACN. Most of his research is focused on solitary and cleptoparasitic bees, but he also had published several articles on wasps, as well as in other groups of arthropods.

Roig-Alsina's *Centris* bees. Despite his prolific research activity and the large number of published articles, so far Roig-Alsina has only published a single paper on *Centris* (ROIG-ALSINA, 2000). In the revision of the species of the genus that occur in Argentina, he included the description of six new species, mainly from the north of the country.

Centris catsal Roig-Alsina, 2000

Centris (*Centris*) *catsal* ROIG-ALSINA, 2000: 179.

Type data. This species was proposed based on specimens of both sexes. The holotype female was collected by Roig-Alsina himself and it bears the following data label: [black rimmed] ARGENTINA SALTA [printed]\ 6 km S Pichanal 6-XI-1993 A. Roig A. [handwritten]\ [red label with black rimmed margin] *Centris catsal* sp. n. ♀ [handwritten] HOLOTYPUS [printed] A. Roig Alsina 2000 [handwritten] (MACN).
Type locality. Argentina: Salta Province: "6 km S Pichanal".

Centris cordillerana Roig-Alsina, 2000

Centris (*Paracentris*) *cordillerana* ROIG-ALSINA, 2000: 185.

Type data. This species was described based on specimens of both sexes collected in northern Argentina. The holotype female has the following data label: JUJUY 4500m Mina Aguilar En. 1968 Sosa [handwritten]\ [red label with black rimmed margin] *Centris cordillerana* ♀ [handwritten] HOLOTYPUS [printed] sp. n. A. Roig Alsina 2000 [handwritten] (MACN).
Type locality. Argentina: Jujuy Province: Mina Aguilar.

Centris hyptidoides Roig-Alsina, 2000

Centris (*Wagenknechtia*?) *hyptidoides* ROIG-ALSINA, 2000: 190.

Type data. This species was proposed based on a single female collected in Formosa Province by the ornithologist Juan Bautista Daguerre (1890–1975). The holotype bears the following data label: Las Lomitas Terr. de Formosa XII-1950-J. B. Daguerre [handwritten]\ [red label with black rimmed margin] *Centris hyptidoides* ♀ [handwritten] HOLOTYPUS [printed] sp. n. A. Roig Alsina 2000 [handwritten] (MLP).
Type locality. Argentina: Formosa Province: Las Lomitas.

Centris jujuyana Roig-Alsina, 2000

Centris (*Hemisiella*) *jujuyana* ROIG-ALSINA, 2000: 181.

Type data. This species was described based on two males and two females collected in the extreme north of Argentina by the Argentinean entomologist specialist in Lepidoptera Ricardo Néstor Orfila (1911–1967). The holotype female has the following data label: ARG. Jujuy San Pedro, Termas del Palmar 1600 m IX-1953, R N Orfila [handwritten]\ [red label with black rimmed margin] *Centris jujuyana* ♀ [handwritten] HOLOTYPUS [printed] sp. n. A. Roig Alsina 2000 [handwritten] (MACN).
Type locality. Argentina: Jujuy Province: San Pedro (Termas del Palmar).

Centris mourei Roig-Alsina, 2000

Centris (*Paracentris*) *mourei* ROIG-ALSINA, 2000: 187.

Type data. This species was proposed based on a large series of specimens of both sexes collected in several localities of north central Argentina. The holotype female bears the following data label: LA RIOJA Illiar II-1928 Mateo Gómez\ [red label with black rimmed margin] *Centris mourei* sp. n. ♀ [handwritten] HOLOTYPUS [printed] A. Roig Alsina 2000 [handwritten] (MACN).
Type locality. Argentina: La Rioja Province: Illiar.

Centris vardyorum Roig-Alsina, 2000

Centris (*Wagenknechtia*) *vardyorum* ROIG-ALSINA, 2000: 190.

Type data. This species was described based on specimens of both sexes collected in south central Argentina. The holotype female was collected by the British entomologist and former curator of the wasp collection of the NHMUK Colin Ryder Vardy (1934–2016) and his wife Marta in Río Negro Province, in the Argentinean Patagonia. The specimen bears the following data label: ARG: Río Negro Paso Córdoba; river 8k sw General Roca. 6-7.xi.1997 C. & M. Vardy [printed]\ [red label with black rimmed margin] *Centris vardyorum* ♀ [handwritten] HOLOTYPUS [printed] sp. n. A. Roig Alsina 2000 [handwritten] (MACN).

Type locality. Argentina: Río Negro Province: "8km SW General Roca, Paso Córdoba".

Centris vogeli Roig-Alsina, 2000

Centris (*Paracentris*) *vogeli* Roig-Alsina, 2000: 189.

Type data. This species was described based on a single male collected by the same collector and in the same locality of *C. jujuyana*. The holotype has the following data label: ARG. Jujuy San Pedro, Termas del Palmar 1600 m IX-1953, R N Orfila [handwritten]\ [red label with black rimmed margin] *Centris vogeli* sp. n. ♂ [handwritten] HOLOTYPUS [printed] A. Roig Alsina 2000 [handwritten] (MACN).
Type locality. Argentina: Jujuy Province: San Pedro (Termas del Palmar).

Charles Michener. Charles Duncan Michener (1918–2015) was an American entomologist and the most important melittologist of the world. Greatly influenced by his parents, Michener admired the nature (Engel, 2016a). During his adolescence he started studying some of the insects he collected in California with his family, making draws and keys that would later appear in his dissertation and seminal monograph on the comparative morphology of bees (Michener, 1944). Michener admired one of the most proliferous naturalists of his time, Theodore Dru Alison Cockerell (1866–1948) and in 1932, he wrote him asking for help with the identification of some bees (Engel, 2016a). Cockerell responded enthusiastically to the young teenager encourage him to obtain literature to increase his knowledge on that group of insects (Engel, 2016a). Michener kept building his collection and his knowledge on several species of bees and promptly he was able to publish his first article on nest of *Dianthidium singulare perluteum* Cockerell, 1904 [= *Dianthidium singulare* (Cresson, 1879)] which also included supplemental remarks on the morphology of the male of the subspecies (Michener, 1935). Cockerell invited Michener to spend the summer at his home in Colorado after the latter's junior year in high school. A year later he enrolled at the University of Colorado, Berkeley, graduating with his Bachelor of Science in 1939 and a Ph.D. two years later in December of 1941 (Engel, 2016b). His dissertation was a comprehensive treatment of bee morphology, as well as a revised classification and evolutionary scheme for the group worldwide, although with a particular focus on the identification of the North American fauna (Engel, 2016b). That work was published in 1944 and it revolutionized the study of wild bees, providing the first truly stable system from which to further explore their diversity and evolution (Engel, 2016b).

The comprehensive knowledge on bee systematics that Michener had during his years of activity was unmatched. During his life a further 91 species and six genera/ subgenera would come to bear his name (Engel, 2016a). His knowledge was divulged through many scientific articles and books, but also among his students. Some years after his retirement of the University of Kansas where he worked most of his life (Engel, 2016b), he published the first edition of his monumental work "The Bees of the World". The classificatory system proposed in that book was widely accepted by the melittological society and became the start point of taxonomic and phylogenetic analyses performed by students and researchers around the world. Michener passed away in Lawrence, Kansas, in 2015, aged 97.

Michener's *Centris* bee. As previously mentioned, Michener was a leading expert on bees. He made countless contributions on bionomy, morphology, taxonomy and systematics at different levels of the classification of that group of insects. However, he made a relatively few number of articles citing species of *Centris* and in only one of them he proposed a new species from Central America.

Centris obscurior Michener, 1954

Centris (*Centris*) *obscurior* Michener, 1954: 138.

Type data. This species was described from a large series of specimens of both sexes collected on *Cornutia grandiflora* Steud. (Lamiaceae) at Canal Zone, Panama. The holotype female and a paratype male were found at AMNH, and another couple of paratypes at NMNH. Holotype female with the following data label: [printed] Juan Mina, C.Z. V-14-1945 C. D. Michener [printed]\ [red label] HOLOTYPE [printed] *Centris obscurior* [handwritten] C.D. Michener [printed] (AMNH).

Paratype male with the following data label: [printed] Juan Mina, C.Z. V-22-1945 C. D. Michener [printed]\ [red label] ALLOTYPE [printed] *Centris obscurior* [handwritten] C.D. Michener [printed]\ AMNH_IZC 00324193 QR code [printed] (AMNH).

Paratype female with the following data label: [printed] Juan Mina, C.Z. V-14-1945 C. D. Michener [printed]\ [light yellow label] PARATYPE [printed] *Centris obscurior* [handwritten] C.D. Michener [printed]\ [light blue label] PARATYPE [handwritten] 61782 [handwritten] (NMNH).

Paratype male with the following data label: [printed] Juan Mina, C.Z. VI-22-1945 C. D. Michener [printed]\ [light yellow label] PARATYPE [printed] *Centris obscurior* [handwritten] C.D. Michener [printed]\ [light blue label] PARATYPE [handwritten] 61782 [handwritten] (NMNH).
Type locality. Panama: Panamá Province: Canal Zone: Juan Mina.

Flamínio Ruiz. Serapio Flamínio Ruiz Pereira was a Chilean priest and entomologist (1883–1942). He spent his youth in Bulnes (Ñuble Province, southern Chile), his natal city, entering in the Army in 1909, when he joined the Mercedary Order (Ureta, 1957). Ruiz was fascinated by nature and due this interest he was translated to Santiago (Metropolitan Region) where he was teacher of Biology and

Natural Sciences at Colegio San Pedro Nolasco (CSPN) for almost three decades (Ureta, 1957). In that institution he funded a museum where he deposited the specimens that he collected in nature. The main collection of the museum was of insects, turning the Chilean bees his favorite group.

Among the articles written by Ruiz, stand out the first and second parts of "Apidología Chilena", published in 1940 and 1942, respectively. In those articles he studied partially the families Colletidae, Megachilidae and Anthophoridae (= Apidae). The families Halictidae and Andrenidae were never studied by him as well as most of the melittofauna from northern Chile, apparently due he did not have the chance to know (Toro, 1986). Ruiz passed away in Santiago, on 8 November 1942, aged 59.

Ruiz's *Centris* bee. Ruiz proposed about fifteen new species and varieties of Chilean bees, among them, *C. nigerrima* var. *orellanai* Ruiz, 1940. This supposed variety of *C. nigerrima* (Spinola, 1851) was described based on females collected by the agricultural engineer Baldomero Orellana (1892– ?), former Director of the Escuela Práctica de Agricultura of Santiago in Los Pelambres, an open pit copper mine located at 3,600 m.a.s.l. in the mountains of the Coquimbo Region, northern Chile. The male identified by Ruiz as belonging to this variety was collected in Punta de Lobos, O'Higgins Region, southern Chile at sea level. That specimen was actually a male of *C. nigerrima* and this explains the supposed relationship between that species with the variety proposed by him.

Centris orellanai Ruiz, 1940

Centris nigerrima var. *orellanai* Ruiz, 1940: 335.

Type data. The holotype female of this supposed variety was originally housed at CSPN and according to José Salamanca, current curator of the museum most likely it was destroyed, as well as much of Ruiz's collection. Based on that information, Vivallo (2013) designated a neotype, providing a redescription based on it. In 2017, during a visit to the bee collection of the AMNH I found a female, mixed with other specimens that match exactly with the information provided by Ruiz in the description of *C. orellanai*. I am interpreting that female as the true type specimen of *C. nigerrima* var. *orellanai*, being here recognized as such. The specimen is in good condition and it has the following data label: [white label with blue rimmed margin] Coll ORELLANA [printed in blue] Pelambres. 16 [handwritten] .93. [printed in blue] I 5 [handwritten] CHILE [printed in blue]\ *Centris orellanai* Ruiz, 1941 [printed]\ [yellow label] PARATIPO [printed]\ [light blue label] HOLOTYPE *Centris nigerrima* var. *orellanai* Ruiz, 1940 F. Vivallo lab, 2017 [handwritten] (AMNH).

Ruiz mentioned three females and one male but it is not clear if the specimen he chose as holotype had the same information label of the other two females. If the three females shared the same information, then the specimen housed at AMNH could be interpreted as a syntype and not as the holotype of the species. Considering this, along with the unknown whereabouts of the other two females, seems correct, at least until one of the other two missing females is found, to recognize that female as holotype avoiding the designation of a lectotype. Independently of the option chosen, that female belongs to the type series of the species. It is not clear how and when that female was sent to the AMNH. A possibility could be when Haroldo Toro sent a large number of specimens to the AMNH, because the female bears a yellow label of paratype that Toro used to put in his specimens.

Type locality. Chile: Coquimbo Region: Los Pelambres.

Haroldo Toro. Haroldo Enrique Toro Gutiérrez was a Chilean entomologist (1934–2002). From his youth, he was interested in teaching, maybe influenced by his mother, a teacher of a school in Chillán, southern Chile (Chiappa, 2003). Toro was a brilliant student of biology and chemical and due his talent and capacities he was incorporated as Professor at the Pontificia Universidad Católica de Valparaíso, Chile (PUCV). In that institution Toro created the Laboratory of Zoology and teach classes of Zoology and Entomology. In this later area, he made his most important contributions, mainly focused on taxonomy, systematics and bionomy of Chilean bees. He described 144 species, in Andrenidae, Colletidae, Halictidae, Megachilidae and Apidae. Toro is still recognized internationally as the most important Chilean melittologist and I am sure that all his students were proud to have had the opportunity to meet him during their professional training and to have attended one of his classes. Haroldo Toro passed away in Valparaíso, aged 67.

Elizabeth Chiappa. Originally linked to pedagogy in Biology, Elizabeth Chiappa Tapia (1941– 2022), was an academic of the Facultad de Ciencias Naturales y Exactas of the Universidad de Playa Ancha (UPLA), Valparaíso, Chile. From there, she developed an extensive research career related to the reproductive behavior of bees and wasps from Chile. She was formed by Haroldo Toro who introduced her to the world of insects. In a short time, she moved away from taxonomy and concentrated her studies on ethology, the area where she focused most of her research. Elizabeth Chiappa passed away during the development of this article in Viña del Mar, Chile, aged 81.

Toro & Chiappa's *Centris* bees. During the decades of 1960 and 1980 Toro and his colleagues at the Department of Zoology of the PUCV made several collecting trips to northern Chile, mainly to the Atacama Desert. In those trips were collected biological samples of diverse groups of organisms which were used in the disciplines of Zoology for graduate and undergraduate students. During those trips to La Tirana and Pica in the Tarapacá Region there were collected the specimens used by Toro and Chiappa to describe a new species and subspecies of *Centris*. The holotypes of both taxa are currently housed at AMNH.

Centris tamarugalis Toro & Chiappa, 1989

Centris mixta tamarugalis TORO & CHIAPPA, 1989: 243.

Type data. The specimen designated holotype is a male collected in La Tirana, northern Chile, by the Chilean ichthyologist Eduardo De la Hoz Urrejola (1941–1997), who was member of the Department of Zoology of the PUCV and former student of Haroldo Toro. The holotype was originally housed at PUCV, but is currently in the AMNH. It bears the following data label: TARAPACA TIRANA 15-IX-84 [printed]\ DE LA HOZ COL. CHILE [printed]\ [red label] HOLOTIPO [printed]\ Centris mixta tamarugalis n. subsp. [printed]\ AMNH_IZC 00324673 QR code [printed] (AMNH). Paratype female with the following data label: TARAPACA TIRANA 15-IX-84 [printed]\ DE LA HOZ COL. CHILE [printed]\ [red label] ALLOTIPO [printed]\ *Centris mixta tamarugalis* Toro & Chiappa [printed]\ AMNH_IZC 00324674 QR code [printed] (AMNH). Paratype male with the following data label: I Región La Tirana 29-IX-83 [printed]\ M. ROJAS COL. CHILE [printed]\ [yellow label] PARATYPE [printed]\ Centris mixta tamarugalis [printed] (PUCV).
Type locality. Chile: Tarapacá Region: La Tirana.

In 1970, DE LA HOZ published an article on the intraspecific variation of the male genitalia in three species of *Centris* using some specimens identified as *C. mixta* Friese, 1904 collected during the expeditions of the PUCV to northern Chile. *Centris mixta tamarugalis* was described 29 years after De la Hoz's paper and at that time the subspecies was not considered different from *C. mixta*. This means that the research conducted by him was actually based on specimens of *C. tamarugalis* and not of the former species (VIVALLO *et al*., 2003).

Centris moldenkei Toro & Chiappa, 1989

Centris moldenkei TORO & CHIAPPA, 1989: 246.

Type data. This species was described based on a large series of specimens of both sexes collected in northern Chile, visiting flowers of *Prosopis tamarugo* F. Phil. (Fabaceae). The holotype male was collected by Toro and it is currently housed at AMNH. The specimen bears the following data label: I Region La Tirana 20-X-1988 H. Toro [handwritten]\ [red label] HOLOTIPO [printed]\ *Centris moldenkei* n. sp. [printed]\ AMNH_IZC 00324675 QR code [printed]. Paratype female with the following data label: I Región La Tirana 20-X-1988 H. Toro [handwritten]\ [red label] ALLOLOTIPO [printed]\ *Centris moldenkei* n. sp. [printed] TM [handwritten]\ *Centris moldenkei* Toro y Chiappa [printed]\ AMNH_IZC 00324676 QR code [printed] (AMNH).
Type locality. Chile: Tarapacá Region: La Tirana.

James Crawford. James Chamberlain Crawford (1880–1950) was an American entomologist. For many years Crawford was an active member of the Entomological Society of Washington, acting as recording secretary and member of its editorial committee (GAHAN *et al*., 1951). In 1904, he joined the Bureau of Entomology as special field agent, studying the cotton insects in Texas, United States. While in that city, Crawford published a number of papers focused on taxonomy of Hymenoptera. Some years later he was brought to Washington and appointed as curator of the Division of Insects in the United States National Museum staying in that institution until 1917. During that time, he specialized in the taxonomy of hymenopteran insects publishing numerous papers in different journals and magazines. He passed away in Bethesda, Maryland, United States, aged 70.

Crawford's *Centris* bees. In *Centris* Crawford described one species and one variety from Central America, based on specimens collected in Costa Rica. The contribution made by this author was failed, because both taxa are currently considered junior synonyms. He also failed in mentioning which specimens were the holotypes or citing any additional data to recognize them. In the type series of both taxa found at NMNH there is a single specimen of each series labeled as "Type", while the others bear a label of "cotype". This procedure is found in the species of *Centris* bees described by Cockerell (see VIVALLO, 2020c) and whose primary types are also deposited in NMNH. Considering this, I am interpreting that Crawford made both descriptions based on single specimens, therefore, holotypes.

Centris friesei Crawford, 1906

Centris friesei CRAWFORD, 1906: 158 (Junior synonym of *C. vittata* Lepeletier, 1841; junior primary homonym of *C.* (*Melanocentris*) *furcata* var. *friesei* Schrottky, 1902 (= *C. obsoleta* Lepeletier, 1841) and *C. friesei* Ducke, 1902 (= *C. frieseana* Moure, 2003b)).

Centris costaricensis CRAWFORD, 1907: 21 (*nom. nov.* for *Centris friesei* Crawford, 1906).

Type data. This species was proposed based on three females collected at Guácimo, Limón Province, Costa Rica between June 19th and 21st. Two of these specimens were found at NMNH. The holotype bears the following data label: Guacimo Costa Rica [handwritten]\ June 21-03 [handwritten] J C Crawford Collector [printed]\ [red label] Type No [printed] 10073 [handwritten] U.S.N.M. [printed]\ [white label with red rimmed margin] *Centris Friesei* Crawford Type ♀ [handwritten]\ [yellow label] NMNH ENT 00534194 barcode [printed] (NMNH).

Paratype with the following data label: Guacimo Costa Rica [handwritten]\ June 21-03 [handwritten] J C Crawford Collector [printed]\ [red label] Cotype No [printed] 10073 [handwritten] U.S.N.M. [printed]\ [white label with red rimmed margin] *Centris Friesei* Crawford Cotype ♀ [handwritten] (NMNH). The current condition and depository of the missing paratype is currently unknown.
Type locality. Costa Rica: Limón Province: Guácimo.

Centris poecila var. *segregata* Crawford, 1906

Centris poecila var. *segregatus* CRAWFORD, 1906:159 (Junior synonym of *C. varia* (Erichson, 1848)).

Type data. This variety was described based on four females collected in San José, on May 15th and 25th, and on June 1st. The holotype has the following data label: San José Costa Rica [handwritten]\ June 1-03 [handwritten]\ On Arguitilla [?] [handwritten]\ J. C. Crawford collector [printed]\ [red label] Type No [printed] 10079 [handwritten] U.S.N.M. [printed]\ [white label with black rimmed margin] *Centris poecila* var *segregatus* Crawford ♀ Type [handwritten]\ [yellow label] NMNH ENT 00534215 barcode [printed] (NMNH).

Paratype with the following data label: San José Costa Rica [handwritten]\May 25-03 [handwritten]\ J. C. Crawford collector [printed]\ [red label] Cotype No [printed] 10079 [handwritten] U.S.N.M. [printed]\ [white label with black rimmed margin] *Centris poecila* var *segregatus* Crafd ♀ Cotype [handwritten] (NMNH).

A third specimen that apparently belongs to the type series was also found at NMNH. This female bears a red label with the word "cotype". However, it was collected on 13th and not on 15th as explicitly cited by Crawford. Considering this fact, there are two possibilities: it could be recognized as a non-member of the type series or, as a true member but with its collecting date erroneously cited in the article. The specimen has the following data label: Costa Rica Cent. Am. [printed]\ San José V-13-03 [handwritten]\ 7 vund dead [?] [handwritten]\ J C Crawford collector [printed]\ [red label] Cotype No [printed] 10079 [handwritten] U.S.N.M. [printed]\ [white label with black rimmed margin] *Centris poecila* var *segregatus* Crafd ♀ Cotype [handwritten]\ [white label with black margin] *Centris* [printed] *inermis* Friese ♀ dark phase [handwritten] det Snelling [printed] '82 [handwritten] (NMNH).

The current condition and depository of the missing paratype is currently unknown.

Type locality. Costa Rica: San José Province: San José.

Jesus Santiago Moure. Jesus Santiago Moure (1912–2010) was a Brazilian religious trained in philosophy, natural sciences, physics, and mathematics (URBAN & MELO, 2010). Always an admirer of nature, he was interested in insects during his youth, beginning his studies in beetles and later in bees, being the latter group where he spent much of his professional career (SILVA, 1992). Moure was one of the most important melittologists of the 20th century, publishing more than 220 articles mainly focused on bees from the Neotropical region. He described 484 species and 218 genera, most of which are currently considered valid (URBAN & MELO, 2010). Moure passed away in Batatais, Brazil, aged 97.

Moure's *Centris* bees. Moure contributed actively on the taxonomy of *Centris* bees. He described 25 species, 21 of them currently considered valid, and he is the main author of the subgeneric arrangement of the genus (see MOURE, 1945, 1950). Moure resolved several taxonomic problems about the identity of some species, mainly those described by European entomologists, like Giovanni Gribodo (MOURE, 1960a), Johan Christian Fabricius (MOURE, 1960b) and Maximilian Perty (MOURE, 1960c). He had a special attraction to *Centris* bees, mainly by the beauty of its species, and several times he expressed it saying that it was one of his favorite groups of bees, along with stingless and orchid bees.

Moure's colleagues. Carlos Alberto Campos Seabra (1916–2001) was a Brazilian doctor, entomology enthusiast and friend of Moure for several years. Seabra had a private collection of more than two million insects, mainly Coleoptera and Hymenoptera, his favorite group. He transferred his collection to the MNRJ with the assistance of his colleague and friend the Uruguayan coleopterist specialist in longhorn beetles Miguel Ángel Monné (1938–). In *Centris* Moure and Seabra described together six species.

Favízia Freitas de Oliveira is a Brazilian melittologist specialist in stingless bees, and Blandina Felipe Viana is a Brazilian ecologist specialist in pollination. With them, Moure described a new species of *Centris*.

Marina Siqueira de Castro is a Brazilian biologist, specialist in ecology applied to environmental management. With her, Moure described a single new species of *Centris*.

Centris adunca Moure, 2003

Centris (*Heterocentris*) *adunca* MOURE, 2003a: 266.

Type data. This species was described based on two females collected in Venezuela and Brazil. The holotype was collected by the German entomologist Dieter Wittmann in the Venezuelan Amazon, while the paratype was collected by the Brazilian ecologist Elder Ferreira Morato in Reserva Catuaba, Acre State, Brazil. Both specimens are housed at DZUP.

Type locality. Venezuela: "nascente do Rio Orinoco, Culebra".

Centris bitaeniata Moure, 2002

Centris (*Melacentris*) *bitaeniata* MOURE, 2002a: 162.

Type data. MOURE (2002a) described this species based on a single male collected by the American botanist, orchidologist, and taxonomist Calaway Homer Dodson (1928–2020) at Iquitos, in the northeast Peruvian Amazon. The holotype is housed at DZUP.

Type locality. Peru: Loreto Department: Iquitos.

Centris confusa Moure, 1960

Centris (*Melanocentris*) *confusa* MOURE, 1960b: 128.

Type data. This species was described based on specimens of both sexes collected in southeastern Brazil. The holotype female and paratypes of both sexes were sent to the MZUSP, but not type specimens are currently housed there. According to the original description, the rest of the paratypes were

distributed in DZUP, MNHP, MNRJ, NHMUK, NMNH and OUMNH, however, they were not found in the last five collections.
Type locality. Brazil: São Paulo State: Jundiaí.

Centris danunciae Moure, 2002

Centris (*Ptilocentris*) *danunciae* Moure, 2002b: 159.

Type data. Moure (2002b) proposed this species using two females and one male collected by the Polish botanist Felix Woytkowski (1892–1966) at Huanta, southern Peru. At the age of 37 Woytkowski arrived in Peru where he travelled throughout most of the country. During his more than 35 years of activity, he studied insects and plants sending samples and information on specimens to botanists and entomologists (Gurney, 1976). The holotype was caught on 2 April 1941 and it is deposited, as well as the paratypes, in the DZUP.
Type locality. Peru: Ayacucho Department: Huanta "2400m".

Centris decipiens Moure & Seabra, 1960

Centris (*Ptilotopus*) *decipiens* Moure & Seabra, 1960: 115.

Type data. This species was proposed based on specimens of both sexes collected in Rio de Janeiro and Espírito Santo States, southeastern Brazil. The holotype female and one paratype male were housed at MNRJ and both are currently destroyed. The holotype had the following data label: [light yellow label with black rim] COLEÇÃO CAMPOS SEABRA [printed]\ [red label] HOLOTIPO [printed]\ [light yellow label with black rim] S. Bento Duque de Caxias Est. do Rio BRASIL [printed] II.955 [handwritten] P. A. Teles [printed]\ [light yellow label with black rim] *Centris decipiens* M. S. [handwritten] Det. J. S. Moure 19 [printed] 59 [handwritten]\ [red label with black rim] HOLOTYPE [printed] *C*. (*Ptilotopus*) *decipiens* [handwritten] J. S. Moure [printed] Seabra [handwritten] (MNRJ, destroyed).

Paratype male had the following data label: [light yellow label with black rim] COLEÇÃO CAMPOS SEABRA [printed]\ [red label] ALOTIPO [printed]\ [light yellow label with black rim] S. Bento Duque de Caxias Est. do Rio BRASIL [printed] 16-I-955 [handwritten] P. A. Teles [printed]\ [light yellow label with black rim] *Centris decipiens* M. S. [handwritten] Det. J. S. Moure 19 [printed] 59 [handwritten]\ [red label with black rim] ALLOTYPE [printed] *C*. (*Ptilotopus*) *decipiens* [handwritten] J. S. Moure [printed] Seabra [handwritten] (MNRJ, destroyed).
Type locality. Brazil: Rio de Janeiro State: São Bento.

Centris dichrootricha (Moure, 1945)

Hemisiella dichrootricha Moure, 1945: 408.

Type data. This species was proposed based on two females collected at Rio Jamari, northern Brazil by the Polish amateur naturalist Alexandre M. Parko (?–1945). Parko was a professional collector and he lived and worked actively in northern Brazil, making a considerable collection of reptiles, amphibians, mammals and insects (Iack-Ximenes *et al*., 2005). He died tragically on August 1st, 1945 in a disaster with a Brazilian ship in the Amazonian Solimões River. The holotype and the paratype are housed at DZUP.
Type locality. Brazil: Rondônia State: Porto Velho: Rio Jamari.

Centris dirrhoda Moure, 1960

Centris (*Centris*) *dirrhoda* Moure, 1960b: 121.

Type data. This species was described based on several specimens of both sexes collected in Jamaica, Greater Antilles. According to the original description, the holotype female is housed at NHMUK, however, it was not found in that collection.
Type locality. Jamaica: Surrey County: Kingston.

Centris dixanthozona Moure & Seabra, 1962

Centris (*Ptilotopus*) *dixanthozona* Moure & Seabra, 1962: 1.

Type data. This species was described based on two males collected by dr. R. Damasceno at Rio Pirirím, northern Brazil. The holotype was housed at MNRJ and is currently destroyed. It had the following data label: [light yellow label with black rim] COLEÇÃO CAMPOS SEABRA [printed]\ [red label] HOLOTIPO [printed]\ [light yellow label with black rim] Rio Piririm Macapá Terr. Amapá Setembro 1961 R. Damasceno Brasil [handwritten]\ [light yellow label] *C*. (*Ptilotopus*) *dixanthozona* ♂ nobis [handwritten]\ [red label with black rim] HOLOTYPE [printed] *C*. (*Ptilotopus*) *dixanthozona* [handwritten] J. S. Moure [printed] Seabra [handwritten] (MNRJ, destroyed). The paratype is housed at DZUP.
Type locality. Brazil: Amapá State: Macapá.

Centris erythrosara Moure & Seabra, 1960

Centris (*Ptilotopus*) *erythrosara* Moure & Seabra, 1960: 117.

Type data. This species was described based on seven specimens of both sexes collected in Colombia and Panama. According to the original description, the holotype and three paratypes are housed at NHMUK, one paratype female in AMNH and two in DZUP. However, a paratype female was housed at MNRJ which is currently destroyed. It had the following data label: [light yellow label with black rim] COLEÇÃO CAMPOS SEABRA [printed]\ [light yellow label] Colombia: L. Sapatoza Region, Chiriguana Dist. C. Allen [printed]\ [light yellow label with black rim] *Centris erythrosara* M. [handwritten] Det. J. S. Moure 19 [printed] 57 [handwritten]\ [red label with black rim] PARATYPE [printed] *C*. (*Ptilotopus*) *erythrosara* [handwritten] J. S. Moure [printed] Seabra [handwritten] (MNRJ, destroyed). Paratype female with the following data label: [light yellow label] T. Hallinan Porto Bello Trail Continental Divide Panama [printed] July 4-15. [handwritten]\ *C*. (*Ptilotopus*) *erythrosara* M. Seabra [handwritten] J. S. Moure 19 [printed]

63 [handwritten]\ AMNH_ENT AMNH_BEE 00274783 QR code [printed] (AMNH).
Type locality. Colombia: César Department: Chiriguaná: Lago Sapatoza.

Centris erythrotricha Seabra & Moure, 1961

Centris (*Ptilotopus*) *erythrotricha* Seabra & Moure, 1961: 26.

Type data. This species was described based on three females collected in Loreto Department, northeastern Peru. The holotype was collected by the Peruvian botanist José Miguel Schunke (1929–2018) in Pucallpa and it was housed at MNRJ (destroyed). The paratype from Rio Tapiche was collected by H. Basser and is housed at AMNH. The holotype had the following data label: [light yellow label with black rim] COLEÇÃO CAMPOS SEABRA [printed]\ [red label] HOLOTIPO [printed]\ [light yellow label with black rim] PUCALLPA Loreto PERU [printed] 19 Maio 1959 [handwritten] J. M. Schunke [printed]\ [light yellow label] Pucallpa 19-5-59 [handwritten] (MNRJ, destroyed). Paratype with the following data label Lower Rio Tapiche, Peru [printed] III.1928 [handwritten] F [printed] 6154 [handwritten]\ H. Bassler Collection Acc. 33591 [printed]\ [white label with black rim] HOLOTYPE [printed] *C*. (*Ptilotopus*) *erythrotricha* [handwritten] J. S. Moure [printed] 1957 [handwritten]\ AMNH_ENT AMNH_BEE 00274784 QR code [printed] (AMNH).

As mentioned above, the description of this species was based only on females. Nevertheless, a male specimen labeled "alotipo" was housed at MNRJ. The specimen is currently destroyed and it had the following data label: [light yellow label with black rim] COLEÇÃO CAMPOS SEABRA [printed]\ [red label] ALOTIPO [printed]\ [light yellow label with black rim] PUCALLPA Loreto PERU [printed] 15 Novembro 1960 [handwritten] J. M. Schunke [printed]\ [light yellow label] Pucallpa 15-11-60 [handwritten] (MNRJ, destroyed)
Type locality. Peru: Loreto Department: Pucallpa.

Centris erythrotricha Moure, 2003

Centris (*Ptilotopus*) *erythrotricha* Moure, 2003b: 423 (Junior primary homonym of *C. erythrotricha* Seabra & Moure, 1961).

Type data. Moure (2003b) described this species based on the same specimens he used to describe *C. erythrotricha* approximately four decades earlier. The holotype female is housed at DZUP.
Type locality. Peru: Loreto Department: Pucallpa.

Centris flavicans Moure, 2003

Centris (*Heterocentris*) *flavicans* Moure, 2003a: 266.

Type data. This species was described based on a single male specimen collected by the English entomologist and ecologist Anthony Raw in Goiás State, Midwest Brazil. The specimen was collected on flowers of *Physocalyma scaberrimum* Pohl (Lythraceae) and is housed at DZUP.
Type locality. Brazil: Goiás State: "Goiás Velho".

Centris flavifrons canescens Moure, 1969

Centris (*Centris*) *flavifrons canescens* Moure, 1969: 122.

Type data. This subspecies was described based on females collected by the American entomologist Herbert Ferlando Schwarz (1883–1960) in Cali, southwest Colombia. Schwarz was a researcher of the AMNH that studied actively some groups of solitary bees like Anthidiini (Megachilidae) and stingless bees, mainly of the genera *Partamona* Schwarz, 1939 and *Plebeia* Schwarz, 1938 (Apidae: Meliponina). The holotype female has the following data label: Cali District Cauca Valley Alt. 3260 ft. Colombia, [printed] VI.II [handwritten], 1935 [printed]\ Herbert F. Schwarz Coll [printed]\ [red label with black rim] HOLOTYPUS [printed] *Centris flavifrons canescens* ♀ [handwritten] Pe J S Moure 19 [printed] 68 [handwritten]\ AMNH_IZC 00324281 QR code [printed] (AMNH). Paratype female with the following data label: Cali District Cauca Valley Alt. 3260 ft. Colombia, [printed] VI.II [handwritten], 1935 [printed]\ Herbert F. Schwarz Coll [printed]\ [red label with black rim] PARATYPUS [printed] *Centris flavifrons canescens* ♀ [handwritten] Pe J S Moure 19 [printed] 68 [handwritten] (AMNH).
Type locality. Colombia: Valle del Cauca Department: Cali.

Centris hoplopoda Moure, 1943

Centris hoplopoda Moure, 1943: 160 (Junior synonym of *C. trigonoides* Lepeletier, 1841).

Type data. Moure (1943) described this species based on a couple of male specimens collected in Brazil. The holotype was collected at Batatais, São Paulo State, and the paratype at São José do Tocantins, Tocantins State. Both specimens are deposited at DZUP.
Type locality. Brazil: São Paulo State: Batatais.

Centris melampoda Moure, 2003

Centris (*Ptilotopus*) *melampoda* Moure, 2003b: 422.

Type data. Moure (2003b) proposed this species based on a single female collected by the Brazilian professional insect collector Claudionor Elias in Manaus, northern Brazil. This is a rare species only known by its type specimen housed at DZUP.
Type locality. Brazil: Amazonas State: Manaus.

Centris melanosara Moure, 2003

Centris (*Melacentris*) *melanosara* Moure, 2003b: 422 (Junior synonym of *C. discolor* Smith, 1874).

Type data. This species was described based on a single female specimen of *C. discolor* with orange metasoma. The presence

of specimens with that coloration in populations of species where this structure is blackish has been observed in other members of the genus, for example in *C. dentata* Smith, 1854. The holotype of *C. melanosara* was collected by the German Entomologist Petr Wolfgang Wygodzinsky (1916–1987) in Viçosa, southwest Brazil and is housed at DZUP.
Type locality. Brazil: Minas Gerais State: Viçosa.

Centris neffi Moure, 2000

Centris (*Paracentris*) *neffi* Moure, 2000: 148.

Type data. This species was proposed based on seven specimens of both sexes collected by the American entomologist John L. Neff (1947–) at Capillitas, northwestern Argentina. The holotype female is housed at DZUP.
Type locality. Argentina: Catamarca Province: La Mina.

Centris plumbea Moure, 2002

Centris (*Aphemisia*) *plumbea* Moure, 2002b: 260.

Type data. This species was described based on a couple of specimens of each sex collected by the German-Peruvian malacologist and entomologist Wolfgang Karl Weyrauch (1907−1970) in Tingo María, central Peru. During his period of activity, Weyrauch worked as entomologist at the Estación Experimental Agrícola de La Molina in Lima, Peru. He was also professor of Zoology and Genetics at the Museo Nacional de Historia of the Universidad Mayor de San Marcos in Lima, and professor of Agricultural Zoology at the Pontificia Universidad Católica de Lima. The holotype female is housed at DZUP.
Type locality. Peru: Huánuco Department: Tingo María.

Centris pulchra Moure, Oliveira & Viana, 2003

Centris (*Centris*) *pulchra* Moure, Oliveira & Viana, 2003: 570.

Type data. This species was described based on specimens of both sexes collected by the Brazilian ecologist Blandina Felipe Viana at Abaeté, northeastern Brazil. The holotype female was caught on flowers of *Waltheria cinerescens* A. St. Hil. (Malvaceae) and is housed at DZUP.
Type locality. Brazil: Bahia State: Abaeté.

Centris restrepoi Moure, 2002

Centris (*Schisthemisia*) *restrepoi* Moure, 2002c: 492.

Type data. Moure (2002c) described this species based on a single female specimen collected in Colombia. The holotype bears the following data label: Colombia, Soratoma, Meta, I-1952/ n°0284 Villa Vicencio- Colombia. This species is only known by its type specimen currently housed at DZUP.
Type locality. Colombia: Meta Department: Villavicencio "Soratoma". Unfortunately, this is an unknown locality located in Colombia. Moure *et al*. (2007) cited it as "Soratama" in Risaralda department, which is an error.

Centris spilopoda Moure, 1969

Centris (*Centris*) *spilopoda* Moure, 1969: 113.

Type data. Moure (1969) described this species based on females collected in Guyana. The holotype was collected in April 15th 1968 by J. Darlington and is housed at DZUP.
Type locality. Guyana: Upper Takutu-Upper Essequibo: Lethem.

Centris tetrazona Moure & Seabra, 1962

Centris (*Ptilotopus*) *tetrazona* Moure & Seabra, 1962: 8.

Type data. Moure & Seabra (1962) proposed this species based on five specimens of both sexes collected by the Brazilian coleopterist Moacyr Alvarenga (1915–2010) in Goiás and Mato Grosso States, Midwest Brazil. Alvarenga was an Air Force officer, a job that permitted him to travel around Brazil collecting in numerous places never collected before or since. He collected a large number of Brazilian insects that are now deposited in museum collections worldwide, mainly in DZUP. The holotype male of *C. tetrazona* was housed at MNRJ and is currently destroyed. The specimen had the following data label: [light yellow with black rim] COLEÇÃO CAMPOS SEABRA [printed]\ [light yellow label with black rim] S. ISABEL do MORRO I. BANANAL Goiás Brasil VI-1961 M. Alvarenga leg. [printed]\ [red label with red rim] HOLOTIPO [printed]\ [light yellow label] Variantes de côr da pilosidade da *C*. (*Ptilotopus*) *scopipes* Friese [handwritten in blue ink] (MNRJ, destroyed).
Type locality. Brazil: Tocantins State: Santa Isabel do Morro.

Centris torquata Moure & Seabra, 1962

Centris (*Ptilotopus*) *torquata* Moure & Seabra, 1962: 5.

Type data. This species was proposed based on a female collected by the American dipterologist specialist in malaria Thomas Henry Gardiner Aitken (1913–2007) at Trinidad and Tobago, and a male collected in Ciudad Bolívar, northeastern Venezuela. The holotype female, as well as the paratype male, are housed at DZUP.
Type locality. Trinidad and Tobago: Trinidad Island: "Rio Grande Forest".

Centris urens Moure, 2000

Centris (*Paracentris*) *urens* Moure, 2000: 155.

Type data. Moure (2000) described this species based on a single female collected by the American plant collector G. P. Frymire at Cañar, Ecuador. The specimen was sent to Moure by the American botanist specialist in orchids Calaway Homer Dodson (1928–2020) and is currently housed at DZUP.
Type locality. Moure cited "Ecuador, no km 110 Durantambo, Canar". However, Durantambo is not a locality, but a way between the cities of Durán and Tambo in south central Ecuador (Vivallo, 2022j).

Centris willineri Moure, 2000

Centris (*Paracentris*) *willineri* MOURE, 2000: 152.

Type data. MOURE (2000) described this species using a single male collected by the Argentinean Jesuit priest and prestigious entomologist Gregorio Julio Williner (1909– ?) at La Paz, Bolivia. The holotype is housed at DZUP.
Type locality. Bolivia: La Paz Department: La Paz.

Centris xanthomelaena Moure & Castro, 2001

Centris (*Paracentris*) *xanthomelaena* MOURE & CASTRO, 2001: 330.

Type data. This species was described based on three females collected by the Brazilian ecologist Marina Siqueira de Castro in northeastern Brazil. The specimens were collected on flowers of *Chamaecrista amiciela* (H.S. Irwin & Barneby) H.S. Irwin & Barneby (Fabaceae). The holotype and one paratype are housed at LABE/EBDA. Another paratype is at DZUP.
Type locality. Brazil: Bahia State: Milagres.

Before the formal description, specimens of this species were cited by VOGEL & MACHADO (1991) under the same name. Those specimens were identified by Moure as a new species who informally named them as "*C. xanthomelaena*".

Philip Timberlake. Philip Hunter Timberlake (1883–1981) was one of the most prolific American entomologists of the 20th century. He was employed by the United States Department of Agriculture Bureau of Entomology for conducting research in biological control of pest insects (HURD *et al*., 1982). Between 1914 and 1924 he was associate entomologist at the Hawaiian Sugar Planters Experiment Station in Honolulu, where his research dealt primarily with biological control using parasites and predators (HURD *et al*., 1982). After he leaved Hawaii, he moved to California where he was appointed associate entomologist in the Department of Biological Control at the Citrus Experiment Station of the University of California, Riverside. He stayed there until his retirement in 1950 (HURD *et al*., 1982). Timberlake had an extensive knowledge of the taxonomy of parasitic Hymenoptera as well as of native bees. During his stay in Riverside, he made numerous collecting trips especially in southern areas of the state, including the deserts. Encouraged by the renowned naturalist Theodore Dru Alison Cockerell, Timberlake continued his collecting activities and increasing his collection of bees. Cockerell deposited a very sizeable collection of North American bee types in the California Academy of Sciences which were used by Timberlake in his taxonomic studies (HURD *et al*., 1982).

During his period of activity, Timberlake described and named about 800 species of bees, including other species in other insect groups. His insect collection contained about 500,000 specimens of which about 150,000 were Hymenoptera (HURD *et al*., 1982). His large bee collection served as the foundation for the collection now housed in the University of California's Entomology Research Museum, containing some 4 million total specimens. Timberlake passed away in Riverside, California, in 1981, aged 97 (HURD *et al*., 1982).

Timberlake's *Centris* bees. Despite his large knowledge on North American bees, Timberlake published a single paper including species of *Centris* (TIMBERLAKE, 1940). In that article, he cited the species that occur in California, providing some notes on their distribution and floral hosts. In the same article, he described two new species which are currently considered valid. The primary types of both are currently housed at CAS.

Centris californica Timberlake, 1940

Centris californica TIMBERLAKE, 1940: 139.

Type data. Timberlake proposed this new species based on two females. The specimen designated holotype was collected by the termitologist Paul A. Harvey at Kerman, Fresno County visiting mustard (*Brassica* sp., Brassicaceae). The paratype was collected by Timberlake himself at Barstow, San Bernardino County on flowers of *Cleomella obtusifolia* Torr. & Frém. (Cleomaceae). The holotype has the following data label: Kerman, Cal. 9-24-33 [handwritten]\ on mustard [handwritten]\ P.A. Harvey coll. [handwritten]\ *Centris californica* Timb. Type [handwritten]\ [red label] Holotype [printed] *C. californica* [handwritten]\ California Academy of Sciences Type No. [printed] 14806 [handwritten] (CAS).
Type locality. United States: California State: Kerman.

Centris rhodomelas Timberlake, 1940

Centris rhodomelas TIMBERLAKE, 1940: 139.

Type data. This species was described based on two females and sixteen males collected in different places of California. The holotype is currently housed at CAS and three male paratypes at AMNH. The holotype female was collected by the American entomologist Richard Mitchell Bohart (1913–2007) at Mariposa in June 18th 1938 and has the following data label: [white label with black lateral margins] Mariposa Calif. VI-18-38 [handwritten]\ R. M. Bohart Collector [printed]\ *Centris rhodomelas* Timb. Types [handwritten]\ [red label] Holotype [printed] *C. rhodomelas* [handwritten]\ California Academy of Sciences Type No. [printed] 14807 [handwritten] (CAS).

Paratype male with the following data label: Sespe Canyon Cal [printed] VI.9.26 [handwritten]\ [yellow label] Paratype [printed] *C. rhodomelas* [handwritten] (AMNH).

Paratype male with the following data label: Sespe Canyon Cal [printed] VI.9.26 [handwritten]\ [yellow label] Paratype [printed] *C. rhodomelas* [handwritten]\ *Centris rhodomelas* Timb. Timb. det. [handwritten] (AMNH).

Paratype male with the following data label: [white label with black lateral margins] Mariposa Calif. VI.18.38 [handwritten]\ [yellow label] Paratype [printed] *C. rhodomelas* [handwritten]\ *Centris rhodomelas* Timb. Timb. ♂ [handwritten] (AMNH).
Type locality. United States: California State: Mariposa.

Roy Snelling. Roy Robert Snelling (1934–2008) was an American entomologist who studied ants, wasps and bees. Born of Cherokee Indian heritage in 1934 in Turlock, California, he was basically a self-taught entomologist. Snelling was curator and collections manager in the Los Angeles County Museum of Natural History. In that institution he developed most of his research work, remaining there between 1963 and 1993, when he retired. Snelling was very prolific studying ants and he was much respected among the myrmecological society. He also published articles on wasps and bees, mainly from desert areas of the United States and Mexico (TRAGER, 2008). Snelling became interested in insects, mainly on bees and wasps when he was a kid living in the San Joaquin Valley, California. This early interest became his first article on wasps published in 1953, when he was barely out of high school (TRAGER, 2008). Although from the beginning he was interested in the nesting biology and other aspects of behavior of aculeate Hymenoptera, his main contributions were on systematics; like most systematists he was an active and enthusiastic collector (TRAGER, 2008).

His work on bees, mostly on taxonomy, led to 45 publications that appeared from 1954 to 1997, focused on different taxa. For the genus *Hylaeus* Fabricius, 1793 (Colletidae), he published numerous papers, with emphasis on the North American and African species. For the genus *Centris* and its allies, his publications included revisions of North and Central America. He was also interested in the cleptoparasitic subfamily Nomadinae (Apidae) but in this group his contributions were relatively modest (TRAGER, 2008). While on an ant expedition in Kenya, Snelling passed away, aged 73.

Snelling's *Centris* bees. Among his articles on bees, Snelling published five on *Centris* species between 1956 and 1988. In those articles he made taxonomic revisions of the species of the genus that occur in North and Central America, describing several new species, proposing new synonymies and citing new distribution records and floral hosts. In that series of publications, Snelling's knowledge on *Centris* bees is perceived to be growing, being the article published in 1984 his most extensive and complete. That publication became Snelling's most famous contribution in the genus, being widely used for the identification of North American species. Despite its relevance, unfortunately that paper contains several errors, mainly related to the fact that Snelling did not study most of the type specimens of the species he cited. This fact led him to identify erroneously some species, as well as proposing new synonymies that are currently considered incorrect.

In total, Snelling described 23 species in *Centris*, four of them currently synonymized. His last contribution in the genus was the description of *C. gavisa* Snelling, 1988 from Cerro de La Neblina, southern Venezuela.

Centris aethiocesta Snelling, 1984

Centris (*Centris*) *aethiocesta* SNELLING, 1984: 18.

Type data. This species was proposed based on several specimens of both sexes collected in Panama, Costa Rica and El Salvador. The holotype female was collected by the American entomologist David Ward Roubik (1951–) at Isla El Rey, Panama flying around *Dioclea megacarpa* Rolfe (Fabaceae). The type is housed at LACM. Paratype female with the following data label: 11.00 min [handwritten]\ #50 [handwritten]\ PANAMA: Perlas Is. [printed] airstrip. Isl. del Rey 22 Feb [handwritten] 198 [printed] 1 [handwritten] D. Roubik no. [printed] 3 [handwritten]\ [yellow label] PARATYPE Centris [printed] *aethiocesta* ♀ [handwritten] R. R. SNELLING [printed] (NMNH). Paratype male with the following data label: PANAMA Varaguas Prov. Coiba Island [printed] 24 Oct 79 [handwritten] D. Roubik Coll. [printed] #17 [handwritten]\ [yellow label] PARATYPE Centris [printed] *aethiocesta* ♀ [handwritten] R. R. SNELLING [printed] (NMNH). 2 paratypes male with the following data label: PANAMA Varaguas Prov. Coiba Island [printed] beach 21 Oct 79 [handwritten] D. Roubik Coll. [printed] #2 [handwritten]\ [yellow label] PARATYPE Centris [printed] *aethiocesta* ♀ [handwritten] R. R. SNELLING [printed] (NMNH).
Type locality. Panama: Panamá Province: Islas Perlas: Isla El Rey.

Centris aethyctera Snelling, 1974

Centris (*Centris*) *aethyctera* SNELLING, 1974: 23.

Type data. This species was described based on male and female specimens collected at Hacienda Comelco, Guanacaste Province, Costa Rica. The holotype was collected by the ecologist Earl Raymond Heithaus (1946–) on flowers of *Caesalpinia eriostachys* Benth. (Fabaceae) and is currently housed at LACM. Paratype female with the following data label: 17761 [printed]\ Hacienda COMELCO 24 km. NW Canas, Inter-Am H'wy, Guanacaste Pvnce., Costa Rica. El. 50 m. Coll.: E. R. Heithaus [printed]\ On flowers of: Caesalpinia eriostachys Benth. Coll. No. 505 14-II-72 0730-0930 [printed]\ [yellow label] PARATYPE Centris (C.) aethyctera ♀ R. R. SNELLING 197 [printed] 4 [handwritten] (ZMB). Paratype female with the following data label: 17762 [printed]\ Hacienda COMELCO 24 km. NW Canas, Inter-Am H'wy, Guanacaste Pvnce., Costa Rica. El. 50 m. Coll.: E. R. Heithaus [printed]\ On flowers of: Caesalpinia eriostachys Benth. Coll. No. 505 14-II-72 0730-0930 [printed]\ [yellow label] PARATYPE Centris (C.) aethyctera ♀ R. R. SNELLING 197 [printed] 4 [handwritten] (NMNH). Paratype male with the following data label: 17781 [printed]\ Hacienda COMELCO 24 km. NW Canas, Inter-Am H'wy, Guanacaste Pvnce., Costa Rica. El. 50 m. Coll.: E. R. Heithaus [printed]\ On flowers of: Caesalpinia eriostachys Benth. Coll. No. 505 14-II-72 0730-0930 [printed]\ [yellow label] PARATYPE

Centris (C.) aethyctera ♀ R. R. SNELLING 197 [printed] 4 [handwritten] (NMNH). Paratype male with the following data label: 18192 [printed]\ Hacienda COMELCO 24 km. NW Canas, Inter-Am H'wy, Guanacaste Pvnce., Costa Rica. El. 50 m. Coll.: E. R. Heithaus [printed]\ On flowers of: [printed] *Caesalpinia* [handwritten] Coll. No. [printed] 505 16-II-72 0730 [handwritten]\ [yellow label] PARATYPE Centris (C.) aethyctera ♂ R. R. SNELLING 1973 [printed] (ZMB).
Type locality. Costa Rica: Guanacaste Province: Hacienda Comelco.

Centris agameta Snelling, 1974

Centris (*Acritocentris*) *agameta* SNELLING, 1974: 37.

Type data. This species was proposed based on male specimens collected by the ornithologist Charles Vaurie (1906–1975) and his wife entomologist Patricia (1909–1982) in 1953 at Tequila, Jalisco State during the David Rockefeller Mexican Expedition of the American Museum of Natural History. The holotype is housed at AMNH and has the following data label: Tequila Jalisco, Mex. VII-18-53 [printed]\ D. Rockefeller Mex. Exp. 1953 [printed] C. & P. Vaurie [printed]\ [red label] HOLOTYPE [printed] *Centris agameta* ♂ [handwritten] R. R. Snelling [printed] (AMNH). Paratype male with the following data label: CuautlaMor Mex July Aug03 [printed]\ W. L. Tower Collection [printed]\ [black rimmed margin] *albiceps* Friese? [handwritten] Det. J. S. Moure 19 [printed] 57 [handwritten]\ [yellow label] PARATYPE [printed] *Centris agameta* ♂ [handwritten] R. R. Snelling [printed] (AMNH).
Type locality. Mexico: Jalisco State: Tequila.

Centris agiloides Snelling, 1984

Centris (*Melanocentris*) *agiloides* SNELLING, 1984: 27.

Type data. SNELLING (1984) described this species using specimens of both sexes collected in Heredia and Cartago Provinces, Costa Rica. The specimen chosen as holotype was collected by the American biologist and pioneer of the exploration of the rain forest canopy Donald R. Perry at Finca La Selva, near Puerto Viejo, Heredia, and is currently housed at LACM. Of the series of paratypes, three were found at ZMB and one at MNHP, as follows: Paratype female with the following data label: COSTA RICA, Heredia Prov.: Finca La Selva. ca. 500 ft. [printed] 6.V.1979 [handwritten] D. R. Perry [printed]\ on flowers of Dussia 1045-1115 hrs. [printed]\ 7 [printed]\ [yellow label] PARATYPE Centris (Melanocentris) agiloides R. R. SNELLING [printed] (ZMB). Paratype female with the following data label: COSTA RICA, Heredia Prov.: Finca La Selva. ca. 500 ft. [printed] 6.V.1979 [handwritten] D. R. Perry [printed]\ on flowers of Dussia 1045-1115 hrs. [printed]\ 7 [printed]\ [yellow label] PARATYPE Centris (Melanocentris) agiloides R. R. SNELLING [printed]\ [light yellow label] 537/3 [handwritten]\ ZMB [printed]\ Centris agiloides ZMB 537/3 [printed] (ZMB). Paratype male with the following data label: COSTA RICA, Heredia Prov.: Finca La Selva, nr Puerto Viejo, elev. ca. 500 ft. [printed] 6.V.1979 count 5 [handwritten] D. R. Perry [printed] 0945-1045 [handwritten]\ sp. 45 [handwritten] on flowers of Dussia [printed]\ 24 [printed]\ [yellow label] PARATYPE Centris (Melanocentris) agiloides R. R. SNELLING [printed]\ [light yellow label] 537/3 [handwritten]\ ZMB [printed]\ Centris agiloides ZMB 537/3 [printed] (ZMB). Paratype male with the following data label: COSTA RICA, Heredia Prov.: Finca La Selva, nr Puerto Viejo, elev. ca. 500 ft. [printed] 6.V.1979 count 5 [handwritten] D. R. Perry [printed] 0945-1045 [handwritten]\ sp. 45 [handwritten] on flowers of Dussia [printed]\ [yellow label] PARATYPE Centris (Melanocentris) agiloides R. R. SNELLING [printed] (MNHP).
Type locality. Costa Rica: Heredia Province: Puerto Viejo.

Centris angustifrons Snelling, 1966

Centris (*Paracentris*) *angustifrons* SNELLING, 1966: 13.

Type data. SNELLING (1966) proposed this species based on a single female specimen collected by the professional insect collector Ernest John Oslar (1858–1944) at Huachuca Mountains, Arizona State, southern United States. The type specimen is currently housed at LACM.
Type locality. United States: Arizona State: "Huachuca Mountains".

Centris anomala Snelling, 1966

Centris (*Melanocentris*) *anomala* SNELLING, 1966: 31 (Junior synonym of *C. aterrima* Smith, 1854).

Type data. SNELLING (1966) described this species based on male and female specimens collected by the entomologist, embryologist and ethologist Francis Xavier Williams (1882–1967) in Guadalajara, Jalisco State, Mexico. The holotype male is housed at CAS and has the following data label: MEXICO: 8 mi. S. Guadalajara, Jal. [printed] late Sept. [handwritten] 1954 F. X. Williams [printed]\ California Academy of Sciences Type No. [printed] 6681 [handwritten]\ [light red label] HOLO [handwritten] TYPE Centris [printed] *anomala* ♂ [handwritten] R. R. Snelling [printed] (CAS).
Type locality. Mexico: Jalisco State: Guadalajara.

Centris anthracina Snelling, 1966

Centris (*Paracentris*) *anthracina* SNELLING, 1966: 14 (Junior synonym of *C. nigrocaerulea* Smith, 1874).

Type data. SNELLING (1966) described this species based on male and female specimens collected by the American lepidopterist Roger N. Williams in Uyaca Mountain, Yoro Department, Honduras. The holotype male is housed at MCZ. Paratype female with the following data label: Costa Rica San Mateo [printed] 5. [handwritten] 19 [printed] 21 [handwritten]\ *Centris clypearis* ♀ [handwritten] 1920 Friese det. [printed] Fr. [handwritten]\ [red label] Typus [printed]\ Am. Mus. Nat. Hist. Dept. Invert. Zool. No. [printed] 25614 [handwritten]\ [yellow label] PARATYPE Centris [printed] *anthracina* ♀

[handwritten] R. R. Snelling [printed] (AMNH). Paratype male with the following data label: Costa Rica San Mateo [printed] 12. [handwritten] 19 [printed] 20 [handwritten]\ *Centris clypearis* ♀ [handwritten] 1921 Friese det. [printed] Fr. [handwritten]\ [red label] Typus [printed]\ Am. Mus. Nat. Hist. Dept. Invert. Zool. No. [printed] 25614 [handwritten]\ [yellow label] PARATYPE Centris [printed] *anthracina* ♂ [handwritten] R. R. Snelling [printed] (AMNH). Paratype male with the following data label: Antigua Guatemala A. Pelén. [handwritten]\ *Centris clypeata* z [handwritten]\ [yellow label] PARATYPE Centris [printed] *anthracina* ♂ [handwritten] R. R. Snelling [printed] (AMNH). Paratype female with the following data label: Antigua Guatemala Dec. 17 A. Pelén. [handwritten]\ *Centris clypeata* z [handwritten]\ [yellow label] PARATYPE Centris [printed] *anthracina* ♀ [handwritten] R. R. Snelling [printed] (NMNH). Eight paratypes male with the following data label: Ecua [handwritten]\ Collector CF Baker [printed]\ PARATYPE Centris [printed] *anthracina* ♂ [handwritten] R. R. Snelling [printed] (NMNH). Paratype male with the following data label: Ecua [handwritten]\ Collector CF Baker [printed]\ [black rimmed label] *Centris clypeata* Fr. [handwritten] Det. J. S. Moure 19 [printed] 57 [handwritten]\ PARATYPE Centris [printed] *anthracina* ♂ [handwritten] R. R. Snelling [printed] (NMNH).
Type locality. Honduras: Yoro Department: Uyaca Mountains.

Centris carolae Snelling, 1966

Centris (*Xanthemisia*) *carolae* SNELLING, 1966: 24.

Type data. This species was described based on a single male collected at Tuxtla Chico, Chiapas State, Mexico. According to SNELLING (1966) the type specimen belonged to the duBois collection, probably the American coleopterist John Jay duBois. The type specimen is deposited at LACM.
Type locality. Mexico: Chiapas State: Tuxtla Chico.

Centris ectypha Snelling, 1974

Centris (*Paracentris*) *ectypha* SNELLING, 1974: 11.

Type data. This species was described based on two males collected by the American entomologist Charles Francis Harbison (1904–1989) in Bahía San Francisquito, Baja California State, Mexico. The type specimens are housed at LACM. The paratype has the following data label: MEX., Baja Calif.: 7mi. W. San Francisquito Bay IV-14-1947 [handwritten]\ C. F. Harbison Collector [printed]\ [yellow label] PARATYPE [printed] *Centris ectypha* ♂ [handwritten] R. R. Snelling [printed] 1973 [handwritten]\ LACM ENT 247012 QR code [printed] (LACM).
Type locality. Mexico: Baja California State: Bahía San Francisquito.

Centris eurypatana Snelling, 1984

Centris (*Trachina*) *eurypatana* SNELLING, 1984: 38.

Type data. This species was described based on specimens of both sexes collected in the Mexican States of Jalisco and Sinaloa. The holotype male was collected by the American entomologist Stephen H. Bullock at Estación de Biología Chamela, Jalisco State and is housed at LACM. Paratype female with the following information label: MEXICO: Sinaloa [printed] Villa Union 30 mi E 570 m [handwritten] J.L. Neff [printed] 20-III-80 [handwritten]\ K11946 [printed]\ [yellow label] PARATYPE [printed] *Centris eurypatana* ♀ [handwritten] R. R. SNELLING [printed] (CTMI).
Type locality. Mexico: Jalisco State: Estación de Biología Chamela.

Centris fisheri Snelling, 1974

Centris (*Paracentris*) *fisheri* SNELLING, 1974: 12.

Type data. SNELLING (1974) proposed this species based on two males collected by the American dipterologist specialist in robber flies (Asilidae) Eric Martin Fisher (1942–) who sent many specimens collected in Baja California State to LACM. Both specimens were collected at 5 miles northwest of San Ignacio, in southern Baja California, Mexico. The type material is deposited at LACM.
Type locality. Mexico: Baja California Sur State: "5 mi NW San Ignacio".

Centris gavisa Snelling, 1988

Centris (*Melanocentris*) *gavisa* SNELLING, 1988: 13.

Type data. This species was described based on four females collected by the German botanist Susan Sabine Renner (1954–) in 1985 in the Venezuelan Amazon between January 31st and February 9th. The holotype and one paratype are housed at NMNH while the other paratypes are in LACM. The holotype has the following data label: Camp VII, Neblina 00°52'N, 65°58'W Amazonas, VENEZ. 8 Feb. 1985 2100m coll. S.S. Renner [handwritten]\ No. 536, om flrs *Disterigma humboldtii* [handwritten]\ [red label] HOLOTYPE [printed] *Centris* (*Melanocentris*) *gavisa* [handwritten] R. R. SNELLING [printed]\ [red label] Type Number [printed 104256 [handwritten] U.S.N.M.\ [yellow label] NMNH ENT 00534195 barcode [printed] (NMNH). Paratype female with the following information: Camp VII, Neblina 00°52'N, 65°58'W Amazonas, VENEZ. No. 526 31 Jan 1985 coll. S.S. Renner [handwritten]\ No. 526, on flrs. *Saxofridericia compressa* [handwritten/\ [light yellow label] PARATYPE Centris [printed] *gavisa* ♀ [handwritten] R. R. SNELLING (NMNH).
Type locality. Venezuela: Amazonas State: Cerro de La Neblina.

Centris gelida Snelling, 1984

Centris (*Melanocentris*) *gelida* SNELLING, 1984: 30.

Type data. SNELLING (1984) described this species based on four females collected in Guatemala and Mexico. The holotype

was collected by the American evolutionary biologist Stevan James Arnold (1944–) in Santa Rita, Sololá Department, Guatemala on flowers of *Canavalia villosa* Benth. (Fabaceae). This specimen is housed at CAS and has the following data label: Santa Rita 10mi. E. Nahuala, Solola Dept. Guatemala 7100ft. 3-IX-1965 [printed]\ Canavalia villosa [printed]\ 05:20-06:10 [handwritten]\ S. J. Arnold collector [printed]\ [red label] HOLOTYPE [printed] *Centris gelida* ♀ [handwritten] R. R. SNELLING [printed]\ California Academy of Sciences Type No. [printed] 15189 [handwritten] (CAS).
Type locality. Guatemala: Sololá Department: Santa Rita "10 miles east Nahuala".

Centris griseola Snelling, 1984

Centris (*Xerocentris*) *griseola* Snelling, 1984: 4.

Type data. *Centris griseola* was described based on four females collected by the American botanist, entomologist and pioneer chemist Robert Rickert Dreisbach (1888–1964) in Iguala, Guerrero State, Mexico. In 1907, Dreisbach began his plant collection, but by 1932 his interests had begun to swing to insects, and plant collecting became a secondary but important hobby. Collecting trips took him to many parts of the United States, Mexico, and Central America in search of insects and plant specimens. His insect collection grew to be one of the largest private collections in the nation (Fletcher, 1964).
The holotype of *C. griseola* is deposited at SEMK. Paratype with the following data label: Iguala, Mex. 2000' II-4-54 R. R. Dreisbach [printed]\ [yellow label] PARATYPE [printed] *Centris* (*Xeroc.*) *griseola* ♀ [handwritten] R. R. SNELLING [printed]\ LACM ENT 247013 QR code [printed] (LACM).
Type locality. Mexico: Guerrero State: Iguala.

Centris harbisoni Snelling, 1974

Centris (*Paracentris*) *harbisoni* Snelling, 1974: 14.

Type data. This species was described based on male and female specimens collected by Charles F. Harbison at the same locality where the type specimens of *C. ectypha* were collected. The holotype male of *C. harbisoni* is housed at LACM. Paratype male with the following data label: MEX., Baja Calif.: San Francisquito Bay IV-3-1947 [handwritten]\ C. F. Harbison Collector [printed]\ [yellow label] PARATYPE [printed] *Centris harbisoni* ♂ [handwritten] R. R. Snelling [printed] 1973 [handwritten]\ LACM ENT 247006 QR code [printed] (LACM).
Type locality. Mexico: Baja California State: Bahía San Francisquito.

Centris heithausi Snelling, 1974

Centris (*Trachina*) *heithausi* Snelling, 1974: 20.

Type data. Snelling (1974) described this species based on male and female specimens collected by the same collector in the same type locality of *C. aethyctera* –E. R. Heithaus at Hacienda Comelco, Guanacaste Province, Costa Rica– visiting *Caesalpinia* (Fabaceae). The holotype is deposited at LACM. Paratype female with the following data label: 17732 [printed]\ Hacienda COMELCO 24 km. NW Canas, Inter-Am H'wy, Guanacaste Pvnce., Costa Rica. El. 50 m. Coll.: E. R. Heithaus [printed]\ On flowers of: Caesalpinia eriostachys Benth. Coll. No. 505 14-II-72 0730-0930 [printed]\ [yellow label] PARATYPE [printed] *Centris heithausi* ♀ [handwritten] R. R. Snelling [printed] '74 [handwritten]\ AMNH_ENT AMNH_BEE 00107907 QR code [printed] (AMNH). Paratype male with the following data label: 17731 [printed]\ Hacienda COMELCO 24 km. NW Canas, Inter-Am H'wy, Guanacaste Pvnce., Costa Rica. El. 50 m. Coll.: E. R. Heithaus [printed]\ On flowers of: Caesalpinia eriostachys Benth. Coll. No. 505 14-II-72 0730-0930 [printed]\ [yellow label] PARATYPE [printed] *Centris heithausi* ♂ [handwritten] R. R. Snelling [printed] '74 [handwritten]\ AMNH_ENT AMNH_BEE 00107907 QR code [printed] (AMNH). Paratype male with the following data label: 17887 [printed]\ Hacienda COMELCO 24 km. NW Canas, Inter-Am H'wy, Guanacaste Pvnce., Costa Rica. El. 50 m. Coll.: E. R. Heithaus [printed]\ On flowers of: Caesalpinia eriostachys Benth. Coll. No. 505 14-II-72 0730-0930 [printed] 10 15 [handwritten]\ [yellow label] PARATYPE *Centris* (*Trachina*) *heithausi* ♂ R.R. SNELLING [handwritten] (NMNH). Paratype female with the following data label: 18226 [printed]\ Hacienda COMELCO 24 km. NW Canas, Inter-Am H'wy, Guanacaste Pvnce., Costa Rica. El. 50 m. Coll.: E. R. Heithaus [printed]\ On flowers of: Coll. No. [printed] 505 16-II-72 0730 [handwritten]\ [yellow label] PARATYPE *Centris* (*Trachina*) *heithausi* ♀ R.R. SNELLING [handwritten] (NMNH).
Type locality. Costa Rica: Guanacaste Province: "24 km NW of Cañas, Hacienda Comelco, 50 m".

Centris laevibullata Snelling, 1966

Centris (*Paracentris*) *laevibullata* Snelling, 1966: 17 (Senior synonym of *C. satana* Snelling, 1984).

Type data. This species was described based on two Mexican females, holotype and paratype, collected by the American entomologists Lionel Alvin Stange (1935–2020) and Arnold Menke (1930–) in Orizaba, Veracruz State, and Zitácuaro, Michoacán State, respectively. The holotype is currently housed at LACM.
Type locality. Mexico: Veracruz State: Orizaba.

Centris meaculpa Snelling, 1984

Centris (*Centris*) *erubescens* Snelling, 1974: 27 (Junior primary homonym of *C. costaricensis* var. *erubescens* Friese, 1925).
Centris meaculpa Snelling, 1984 (*nom. nov.* for *C. erubescens* Snelling, 1974).

Type data. *Centris meaculpa* was described based on two females collected by the American zoologist, ecologist and entomologist specialist in Lepidoptera Thomas Chadbourne

Emmel (1941–2018) near Escárcega, Campeche State, Mexico. The holotype is housed at LACM.
Type locality. Mexico: Campeche State: "67 km east of Escárcega".

Centris ruthannae Snelling, 1966

Centris (*Melanocentris*) *ruthannae* Snelling, 1966: 28.

Type data. This species was proposed based on male and female specimens collected by the surgeon and former director of Science of the Los Angeles County Museum John Adams Comstock (1883–1970) at Santa Rita Mountains, Arizona State, United States. The holotype male is currently housed at LACM. Paratype male with the following data label: Baboquivari Canyon W. side Baboquivari Mts. Pima Co. Ariz. 25-27:VII.52 [printed]\ H. B. Leech J. W. Green Collectors [printed]\ PARATYPE printed] *Centris* (*Melanocentris*) *ruthannae* ♂ [handwritten] R. R. Snelling [printed] (CAS).
Type locality. United States: Arizona State: Madera Canyon.

Centris satana Snelling, 1984

Centris (*Acritocentris*) *satana* Snelling, 1984: 11 (Junior synonym of *C. laevibullata* Snelling, 1966).

Type data. This species was described based on male specimens collected in Mexico and the United States. The holotype was collected in August 28th 1964 by Eric. M. Fisher and the American botanist David Verity (1930–2020) at Tepoxtlán, Morelos State, Mexico. The holotype is housed at LACM. A paratype male was found at MNHP with the following data label: [green label with black rimmed margin] Mexique [handwritten]\ [green label with black rimmed margin] Guanajuato [handwritten]\ [black rimmed] Dugès [handwritten]\ [greenish label] MUSEUM PARIS COLLECTION ERNEST ANDRÉ 1914 [printed]\ [yellow label] PARATYPE Centris [printed] (*Acritocentris*) *satana* ♂ [handwriten] R. R. SNELLING [printed] (MNHP).
Type locality. Mexico: Morelos State: Tepoxtlán.

Centris strawi Snelling, 1966

Centris (*Melanocentris*) *strawi* Snelling, 1966: 27 (Junior synonym of *C. albiceps* Friese, 1899).

Type data. This species was described based on a male specimens collected by Ralph Straw near San Luis de La Paz, Guanajuato State, Mexico on flowers of *Penstemon potosinus* Straw (Scrophulariaceae). The holotype is currently housed at LACM.
Type locality. Mexico: Guanajuato State: "25 miles E of San Luis de la Paz, 7300 ft".

Centris xochipillii Snelling, 1984

Centris (*Trachina*) *xochipillii* Snelling, 1984: 43.

Type data. This species was proposed based on specimens of both sexes collected in Oaxaca State, Mexico. The holotype male, as well as some paratypes were collected by Robert R. Dreisbach, the same collector of the type specimens of *C. griseola*, at Tehuantepec. The holotype is housed at SEMK. Paratype female with the following data label: 20 m. W. Tehuantepec Mex. II-18-54 R. R. Dreisbach [printed]\ 18 [printed]\ [yellow label] PARATYPE [printed] *Centris xochipillii* ♀ [handwritten] R. R. SNELLING [printed]\ SM0430839 KUNHM-ENT barcode [printed] (SEMK). Paratype female with the following data label: Tehuantepec, Mex. II-18-54 R. R. Dreisbach [printed]\ 19 [printed]\ [yellow label] PARATYPE [printed] *Centris xochipillii* ♀ [handwritten] R. R. SNELLING [printed]\ SM0430844 KUNHM-ENT barcode [printed] (SEMK). Paratype female with the following data label: Tehuantepec, Mex. II-18-54 R. R. Dreisbach [printed]\ 15 [printed]\ [yellow label] PARATYPE [printed] *Centris xochipillii* ♀ [handwritten] R. R. SNELLING [printed]\ SM0430840 KUNHM-ENT barcode [printed] (SEMK). Paratype male with the following data label: Tehuantepec, Mex. II-18-54 R. R. Dreisbach [printed]\ 4 [printed]\ [yellow label] PARATYPE [printed] *Centris xochipillii* ♂ [handwritten] R. R. SNELLING [printed]\ SM0430842 KUNHM-ENT barcode [printed] (SEMK).
Type locality. Mexico: Oaxaca State: Tehuantepec.

Centris zacateca Snelling, 1966

Centris (*Paracentris*) *zacateca* Snelling, 1966: 11.

Type data. Snelling (1966) proposed this species using male and female specimens collected by Ralph Straw near Piños, Mexico on flowers of *Penstemon tenuifolius* Benth (Scrophulariaceae). The holotype male is currently housed at LACM.
Type locality. Mexico: Zacatecas State: 32 miles W of Piños, 7100 feet.

DISCUSSION

Although at first it may seem irrelevant, the detailed transcription of the labels of the type material is essential to unequivocally recognize the specimen or specimens that were used to describe a certain species.

In many cases, only through this procedure is possible to detect errors or inconsistencies between the information contained in the original descriptions and on the labels of the primary types, allowing in many cases, to confirm or not the identity of a species in particular. This point is especially important in those cases where the species were described based on syntypes, which ended up being distributed in different collections. Probably the best and most emblematic example of this can be observed in the species described by Friese (see Rasmussen & Ascher, 2008; Rasmussen & Vivallo, 2014; Vivallo, 2019c, 2020e), whose primary types or type series are found in different museums in Europe and the United States.

It is also interesting to mention that several of the specimens that were used to describe the species studied here

were not collected by entomologists specializing in bees, but rather by ecologists, botanists, ornithologists, and zoologists in general. This demonstrates the interactivity that exists between scientists from different areas, which sometimes as a result of their own research, end up providing valuable material for other specialists, in this case, entomologists who had the opportunity to contribute to the knowledge of the biodiversity of bees of the genus *Centris*.

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