

The species of the bee genus *Centris* Fabricius, 1804 described by Curt Schrottky (Hymenoptera: Apidae)

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Abstract. In this paper the primary types of *Centris* bees described by the German entomologist Curt Schrottky were studied. The type specimens of *C. anisitsi*, *C. brethesi*, *C. ehrhardti*, *C. garleppi*, *C. garleppi* var. *unifasciata*, *C. pectoralis* var. *flava*, *C. pocograndensis*, and *C. xanthocnemis* var. *perflava* were analyzed, providing notes on their current status and depository. To stabilize the application of the name *C. ehrhardti* a lectotype was designated. Notes and photographs of selected types are also provided.

Key-Words. Anthophila; Centridini; Neotropical Region; Solitary bees; Taxonomy.

INTRODUCTION

Curt Schrottky (1874-1937) was a Russian-born German entomologist that worked mainly in South America (Rasmussen *et al.*, 2009). During his youth he migrated to Brazil and in 1897 he started collecting bees and other insects in Jundiaí, São Paulo state (Rasmussen *et al.*, 2009). Schrottky realized that he was having difficulty identifying the many specimens collected and decided to contact the German melittologist Heinrich Friese (1860-1948) at that time, an authority on bees (Egler, 1963; Rasmussen *et al.*, 2009).

The bee collection made by Schrottky, along with Friese's assistance became an article titled "Ensaio sobre as abelhas solitárias do Brasil" published in by Schrottky in 1902b. That paper was written in Portuguese and it included morphology, diagnoses, notes and keys for species and families, along with the descriptions of new species and varieties. Among the new taxa proposed, were *Centris pocograndensis* Schrottky, 1902b; *C. ehrhardti* Schrottky, 1902b, and *C. xanthocnemis* var. *perflava* Schrottky, 1902b, all from São Paulo state.

In 1902, Schrottky moved to Argentina, and there he published some articles on new species of Hymenoptera. In Buenos Aires he met some prestigious researchers with which he exchanged specimens, as well as insect dealers who provided him with additional material for his studies (Rasmussen *et al.*, 2009). Among the articles published during that time he described

C. (Rhodocentris) brethesi Schrottky, 1902c and *C. (Melanocentris) lynchi* Schrottky, 1902a from San Juan province, Argentina, and *C. (Melanocentris) furcata* var. *friesei* Schrottky, 1902a from São Paulo state, Brazil. These three new taxa were described adopting the subgeneric categories proposed by Friese (1901), unlike the species he proposed as new in his article on the Brazilian bees (Schrottky, 1902b).

After his short time in Argentina, Schrottky moved to Paraguay, where he spent most of his time studying the unknown hymenopteran fauna of that country (Rasmussen *et al.*, 2009). In 1908, he published an article on the species of the genera *Epicharis* Klug, 1807 and *Hemisia* Klug, 1807 – currently a junior synonym of *Centris* Fabricius, 1804 – from Paraguay. In that article he described *H. anisitsi* Schrottky, 1908; *H. pectoralis* var. *clypeata* Schrottky, 1908; *H. pectoralis* var. *flava* Schrottky, 1908; and *H. burgdorfi* var. *ocellata* Schrottky, 1908 all from Asunción, southern Paraguay.

The last Schrottky's contribution on new species of the genus *Centris* was done in 1913 when he described *H. garleppi* Schrottky, 1913 and *H. garleppi* var. *unifasciata* Schrottky, 1913 based on single female specimens collected by Otto Garlepp in southern Peru.

The purpose of this article is to study taxonomically the bee species of *Centris* described by Schrottky. Their taxonomic status is evaluated, providing information on the depository of the primary types. Relevant notes on the morpholo-



gy of the species, as well as some photographs, are also provided.

MATERIAL AND METHODS

The primary types of the species of *Centris* described by Schrottky were recognized from their labels compared to the original descriptions and the Schrottky's catalogue published by Rasmussen *et al.* (2009). The acronyms of the institutions cited throughout the text are as follows: Coleção Pe. Jesus S. Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Brazil (DZUP); Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina (MACN); Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZSP); and Museum für Naturkunde, Berlin, Germany (ZMB). The specific features of the labels, like coloration or type of writing are presented in squared brackets ([]). All labels are yellowish white (due the effect of time) and rectangular, and the data contained on them is black, handwritten or printed, unless otherwise indicated. The images were originally published by Ramos *et al.* (2015) and were obtained from a Leica M205C stereoscope attached to a Leica DFC 295 video camera. The photographs were assembled with the Leica LAS (Leica Application Suite V3.6.0) and Helicon Focus (version 6.0.18) – render method based on Method C (Pyramid) and enhanced with Photoshop (ver. 7.0). The copyright of the photographs belongs to the MZSP. The morphological terminology follows Michener (2007).

RESULTS

Systematics

Genus *Centris* Fabricius, 1804

Centris anisitsi (Schrottky, 1908)

Hemisia anisitsi Schrottky, 1908: 141.

Type data: This species was described based on a single male collected in Asunción, Paraguay by the Hungarian biologist János Dániel Anisits (1856-1911). Anisits migrated to Paraguay where he worked actively conducting explorations and collecting biological material (Magyarország és Latin-Amerika, 2019). The holotype is currently housed at ZMB and has the following data label: Asuncion, Paraguay J.D. Anisits [printed] XII 04 [handwritten]\ [red label] Type [handwritten in white ink]\ *Hemisia anisitsi* Schrottky ♂ [handwritten] (ZMB).

Comments: This is a poorly known species only recorded by a couple of specimens collected in Paraguay. Both sexes can be recognized by the square trochanter of fore and middle legs, the yellow pubescence on mesoscutum and mesoscutellum which contrasts with the dark brown to black hairs covering the rest of the body, and by the

clypeus and labrum blackish with coarse and very dense punctuation.

Centris brethesi Schrottky, 1902

Centris (Rhodocentris) brethesi Schrottky, 1902c: 117.

Type data: This species was described from a single female specimen collected in the province of San Juan, Argentina. The holotype is currently housed at MACN and it has the following data label: [green label with black rim] Typus [handwritten]\ *Centris (Rhodocentris) brethesi* Schrottky ♀.

Comments: This species has been recorded in the Argentinean Provinces of Buenos Aires, Catamarca, Chubut, Córdoba, Jujuy, La Rioja, Mendoza, Neuquén, Salta, San Juan, San Luis, and Tucumán (Moure *et al.*, 2007). Figures of both sexes can be found in Zanella (2002).

Centris burgdorfi ocellata (Schrottky, 1908)

Hemisia burgdorfi var. *ocellata* Schrottky, 1908: 139, 140.
Junior synonym of *C. burgdorfi* Friese, 1901 (Roig-Alsina, 2000).

Type data: Schrottky (1908) proposed this variety of *C. burgdorfi* studying an undetermined number of females and males that belonged to the collection of Anisits collected in Asunción, Paraguay. Moure *et al.* (2007) were unable to locate the type series and unfortunately it was not found during the development of this article. Its current condition and depository are unknown.

Comments: According to the information on the original description, the type specimens have two spots of yellowish pubescence on the mesonotum. However, the pilosity of *C. burgdorfi* is very variable, being possible to find specimens with the dorsal surface of the mesosoma completely covered by blackish or yellowish pubescence, including intermediary forms. This species has been recorded in Argentina (provinces of Misiones and Corrientes) (Roig-Alsina, 2000), Brazil (Ceará, Distrito Federal, Minas Gerais, Paraná, Pernambuco, Rio Grande do Sul, and São Paulo states) and in Paraguay (Central and Guairá departments) (Moure *et al.*, 2007).

Centris ehrhardtii Schrottky, 1902

Centris ehrhardtii Schrottky, 1902b: 579. Junior synonym of *C. dorsata* (Friese 1904; Schrottky, 1904).

Type data: Schrottky (1902b) described this species from a couple of males collected by Wilhelm Ehrhardt in Rincão, southeastern Brazil. Ehrhardt (1860-1936) was a Guyana-born German animal collector and an excellent taxidermist that operated in Brazil around the early 20th century. He collected thousands of specimens of various animal groups, among them some amphibian, fish,

mammal and insect species (Gutsche *et al.*, 2007). Both syntypes are housed at MZSP being here designated the lectotype the one in best condition (Figs. 2A, B). The specimen has the following data label: 97250 [printed]\ 1360 [handwritten]\ ♂ [handwritten]. The paralectotype has the following data label: 97250 [printed]\ 1360 [handwritten]\ ♂ [handwritten].

Comments: Schrottky (1902b) mentioned that the type specimens were collected on a Caesalpiniaceae, probably *Cassia* sp. According to the accession book at MZSP the number 1,360 refers to the following data: "Brazil, São Paulo, Rincão, ii.1901, D. Ehrardt col" (Ramos *et al.*, 2015). *Centris dorsata* has been recorded in Bolivia (Cochabamba department) and Brazil (Goiás, Mato Grosso do Sul, Minas Gerais, Paraná, Santa Catarina, and São Paulo states) (Moure *et al.*, 2007).

***Centris furcata friesei* Schrottky, 1902**

Centris (Melanocentris) furcata var. *friesei* Schrottky, 1902a: 312. Junior synonym of *C. obsoleta* Lepeletier, 1841 (Friese, 1904).

Type data: This variety was proposed based on an undetermined number of males collected in São Paulo state, southeastern Brazil. Moure *et al.* (2007) mentioned the existence of a holotype housed at MZSP but no primary types of this species were found in that collection (Ramos *et al.*, 2015). The current condition and depository are unknown.

Comments: According to the original description (Schrottky, 1902a) the type specimen was deposited in Schrottky's own collection. Unfortunately, it is very probable that the type specimen is lost or destroyed, as well as a large number of his primary types (Rasmussen *et al.*, 2009). *Centris obsoleta* is widely distributed in South America, being recorded in Argentina (Corrientes province), Brazil (Amazonas, Ceará, Mato Grosso, Pará, and São Paulo states), French Guiana, Paraguay and Venezuela (Mérida state) (Moure *et al.*, 2007). Both sexes of this species have a strong variation in the coloration of the pubescence, which led different authors to describe subspecies, varieties or new species based on this character. Photographs of both sexes can be found in Vivallo & Zanella (2012).

***Centris garleppi* (Schrottky, 1913)**

Hemisia garleppi Schrottky, 1913: 708.

Type data: This species was described based on a single female collected by Otto Garlepp in Apurímac, southern Peru. Garlepp (1864-1959) was a German naturalist and, as well as his brother Gustav (1862-1907), a professional collector that worked actively in South America. The holotype is currently housed at DZUP but according to Moure (1999) it belongs to the MZSP. The specimen has the following data label: Apurimac Peru [handwritten]\

[black-rimmed] *Hemisia garleppi* Schrottky ♀ [handwritten] C.S. Schrottky det. 19 [printed] 12 [handwritten]\ recibido de J.F. Zikán Pe Moure 1942 [handwritten].

Comments: This is a poorly known species recorded only in Peru. Considering the dark metasoma with terga 4 to 6 reddish brown, this species is probably related to *C. caelebs* Friese, 1899 which also has the same pattern of coloration.

***Centris lynchii* Schrottky, 1902**

Centris (Melanocentris) lynchii Schrottky, 1902a: 312. Junior synonym of *C. nigriventris* Burmeister, 1876 (Roig-Alsina, 2000).

Type data: This species was described based on an undetermined number of specimens of both sexes collected in the province of San Juan, northwestern Argentina. The type series was not found during the development of this research and it is apparently lost (Roig-Alsina, 2000).

Comments: Schrottky (1902a) dedicated this species to the Argentinean zoologist and ornithologist Enrique Lynch Arribálzaga (1856-1935) who funded with his countryman the botanist, zoologist and geologist Eduardo Ladislao Holmberg (1852-1937) in 1878 "El Naturalista Argentino", the first journal of Natural History of Argentina (López *et al.*, 2008). This species occurs exclusively in Argentina with distribution records in the provinces of Buenos Aires, Catamarca, Chaco, La Rioja, Mendoza, San Luis, Santa Fe, Santiago del Estero, Salta, and Tucumán (Roig-Alsina, 2000).

***Centris pectoralis clypeata* (Schrottky, 1908)**

Hemisia pectoralis var. *clypeata* Schrottky, 1908: 142. Junior secondary homonym of *C. clypeata* Lepeletier, 1841. Junior synonym of *C. obsoleta* (Moure *et al.*, 2007).

Type data: This species was apparently described based on a single male collected by János Anisits in Asunción, Paraguay. The current condition and depository of the holotype are currently unknown.

Comments: Moure (1950) mentioned the variability in the coloration of the pubescence of *C. pectoralis* Burmeister, 1876 (= *C. obsoleta*) indicating that the varieties described of that species must be suppressed, which would include *C. pectoralis* var. *clypeata* and *C. pectoralis* var. *flava* (see below). However, the synonymy between this latter variety and *C. obsoleta* was only formally indicated by Moure *et al.* (2007).

***Centris pectoralis flava* (Schrottky, 1908)**

Hemisia pectoralis var. *flava* Schrottky, 1908: 142. Junior synonym of *C. obsoleta* (Moure *et al.*, 2007).



Figure 1. *Centris pocograndensis* Schrottky, 1902 (holotype male). (A) Head, frontal view (scale bar: 2 mm). (B) Habitus, dorsal view (scale bar: 5 mm).



Figure 2. *Centris ehrhardti* Schrottky, 1902 (lectotype male). (A) Head, frontal view (scale bar: 2 mm). (B) Habitus, dorsal view (scale bar: 5 mm).



Figure 3. *Centris xanthocnemis* var. *perflava* Schrottky, 1902 (holotype male). (A) Head, frontal view (scale bar: 2 mm). (B) Habitus, dorsal view (scale bar: 5 mm).

Type data: This variety was proposed based on a single male specimen collected by Janós Anisits, the same collector of the type specimens of *C. anisitsi* and *C. pectoralis* var. *clypeata* in Asunción, Paraguay. Moure et al. (2007) were unable to locate the holotype but it is actually housed at ZMB. The type specimen has the following data label: Asuncion, Paraguay J.D. Anisits [printed] 11.II.06 im garten [handwritten]\ *C. pector. f. flava* Schrott. ♂ [handwritten] Strand det [printed].

Comments: *Centris obsoleta* is widely distributed in South America with records from Argentina, Brazil, French Guiana, Paraguay, and Venezuela (Moure et al., 2007).

***Centris pocograndensis* Schrottky, 1902**

Centris pocograndensis Schrottky, 1902b: 578, 579.
Junior synonym of *C. collaris* Lepeletier, 1841 (Moure, 2002).

Type data: This species was described based on a single male specimen (Figs. 1A, B) collected in Poço Grande, an old farm near the city of Juquiá (Moure, 2002). The holotype is currently housed at MZSP and it has the following data label: [black rimmed] *Centris pocograndensis* Shrottky ♂ Poço Grande Brasil [handwritten]\ [red label with black rim] *Melanocentris pocograndensis* (Schr.) ♂ [handwritten] P. Moure det [printed] 1945 [handwritten] Ducke det. 15. Unico! [handwritten].

Comments: Friese (1904) erroneously mentioned this species as junior synonym of *C. dorsata* Lepeletier, 1841. *Centris collaris* has been recorded in Paraguay and in the Brazilian states of Mato Grosso, Minas Gerais and São Paulo (Moure et al., 2007).

***Centris unifasciata* (Schrottky, 1913)**

Hemisia garleppi var. *unifasciata* Schrottky, 1913: 708.

Type data: The holotype of *C. garleppi* var. *unifasciata* was also collected by Otto Garlepp in the same locality that *C. garleppi*. The holotype is housed at DZUP, but according to Moure (1999) it also belongs to the MZSP. The specimen has the following data label: Apurimac Peru [handwritten]\ [black-rimmed] *Hemisia garleppi* Schrot. f. *unifasciata* Schr. ♀ [handwritten] C.S. Schrottky det. 19 [printed] 12 [handwritten]\ M. Zool. USP [handwritten]\ [black-rimmed] *Centris unifasciata* Schr. ♀ [handwritten] P. Moure det. [printed] 1948 [handwritten]\ *C. (Paracentris) v. unifasciata* Schr. [handwritten with blue ink].

Comments: This is a rare species of the subgenus *C. (Paracentris)* only known from the type specimen. It was erroneously cited to Chile by Zanella (2002). Unfortunately, nothing is known about its bionomy or distribution range.

***Centris xanthocnemis perflava* Schrottky, 1902**

Centris xanthocnemis var. *perflava* Schrottky, 1902b: 576.
Junior synonym of *C. xanthocnemis* (Perty, 1833) (Moure et al., 2007).

Type data: This variety of *Centris xanthocnemis* was described based on a single male specimen collected in "Jundiah" (= Jundiaí), southeastern Brazil (Figs. 3A, B). The holotype is housed at MZSP and it has the following data label: 97262 [printed] 1376 [handwritten]\ [red label without text].

Comments: The type specimen was caught by the insect collector Max Beron. It is a male of *C. xanthocnemis* with yellow pubescence on the mesosoma and hind legs instead of the blackish hairs found in most males. According to the accession book at MZSP the number 1,376 refers to the following data: "Brazil, São Paulo, Jundiaí, M. Beron col" (Ramos et al., 2015).

DISCUSSION

Schrottky is the seventh major descriptor of Neotropical bees and the second in names proposed currently considered valid (Melo, 2007). Of the 12 species and varieties described by him in the genus *Centris*, only four of them are at present treated as valid. The main problem with the *Centris* species described by Schrottky is that they were proposed based on coloration mainly of the pubescence of male specimens. However, this character is very variable in several species of the genus, principally in that sex.

Some of the Schrottky's primary types were not found during the development of this article. According to Rasmussen et al. (2009), several Schrottky's types are currently lost or were destroyed. Unfortunately, it is not clear how many types were effectively destroyed, because part of his collection was widely scattered and sent to several institutions being difficult to track where a specific primary type is currently housed.

Schrottky's descriptions are very generic and short, similar to those made by other melittologists of his time, like Heinrich Friese (1860-1948) and Theodore Dru Alison Cockerell (1866-1948). In general, the species proposed by these three researchers are difficult to identify without examining the primary types of the species they proposed.

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