



RESEARCH ARTICLE - BEES

The Nominal Species of the Bee Genus *Centris* Described by Johan Christian Fabricius (Hymenoptera: Apidae)

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Abstract

In this paper the primary types of *Centris* bees described by the Danish entomologist Johan Christian Fabricius were studied. The primary types of *C. flavifrons*, *C. analis*, *C. furcata*, *C. haemorrhoidalis*, *C. lanipes*, *C. longimana*, *C. similis*, *C. tabaniformis*, and *C. versicolor* were analyzed, providing notes on their current status and depository. In addition, some photographs of selected species as well as morphological characteristics to recognize all Fabricius' *Centris* bees are also provided.

Introduction

Johan Christian Fabricius (1745–1808) was one of the most important entomologists of the 18th century, having named nearly 10,000 species of animals and established the basis for the modern insect classification (Zimsen, 1964; Tuxen, 1967). Born in Tönder, south Denmark, Fabricius had a very liberal upbringing for his time (Tuxen, 1967). When he was seventeen, he went to Copenhagen and later to Uppsala (Sweden) where he remained for two years studying with Carl Nilsson Linnaeus (1707–1778) (Tuxen, 1967). From Linnaeus' work Fabricius learned that "the systematic order with which the study of sciences ought to be pursued" and during his stay in Sweden, he began the study of insects (Papavero, 1971). In 1764, he returned to Copenhagen and there he laid the foundations of his "Genera Insectorum" (Fabricius, 1776), based on the small collection he possessed (Papavero, 1971).

In 1765, Fabricius went to Leipzig (Germany) to study economy. There he was zealously engaged in writing his "Systema Entomologiae" (Fabricius, 1775), and in collecting plants and insects of the neighborhood (Papavero, 1971). In 1767, Fabricius went to Edinburgh (Scotland) and later to London (England). There, he was part of the most intimate circle of the Swedish botanist Daniel Solander (1733–1782), at that time located at the British Museum (currently the Natural History Museum, London, NHMUK). Solander introduced Fabricius to the scientific clubs and to the British naturalist and botanist Joseph Banks (1743–1820). Thanks to the friendship with Banks, Fabricius established contact with other important naturalists who allowed him access to their important libraries and insect collections. During that time, he identified and described the insects of his colleagues, at the same time that his "Systema Entomologiae" gained ground considerably, as well as his own insect collection which was sent to Copenhagen (Papavero, 1971).



Between 1772 and 1775 Fabricius spent the winters in Copenhagen and the summers in London. His friends Banks and Solander had returned from their voyage around the world, and had brought numerous specimens, especially insects (Papavero, 1971). In 1775, Fabricius published his work “Systema Entomologiae”, which included the descriptions of the bees *Apis flavifrons*, *A. haemorrhoidalis*, *A. lanipes* and *A. versicolor*. All these species would be later transferred to the genus *Centris* Fabricius, 1804 that he would create subsequently.

Between 1798 and 1804, Fabricius went to Copenhagen every spring to describe the many new insects that his friends and students Count Ove Ramel Sehestedt and the Danish zoologist Niels Tønder Lund (1749–1809) accumulated (Papavero, 1971). In 1804, Fabricius published “Systema Piezatorum” which included several new species of insects from different parts of the world. In that book he described the genus *Centris*, including the species *C. longimana* and *C. tabaniformis*. Between the bees described, Fabricius also proposed *Bombus furcatus*, *B. similis* and *Anthophora analis* as new species. All these also currently placed in the genus *Centris*.

Fabricius' Hymenoptera collection

According to Papavero (1971) Fabricius' own collection remained in Kiel (Germany) after his death. In 1950, it was transferred from the Zoologisches Museum Kiel (ZMK) to the Natural History Museum of Denmark (NHMD, formerly the Zoological Museum of the University of Copenhagen ZMUC), where is now kept as a long term loan from the ZMK (Tuxen 1967). The Fabricius' collection is still arranged in the order of his monographs (Zimsen, 1964). The Hymenoptera collection consists of 24 boxes and it is no longer in Fabricius' original boxes, but the name label, however, has not been removed from the insects (Zimsen, 1964). Fabricius' hymenopterous is the collection in which the insects have most often been rearranged in the past, and this fact does not make the work easier for future specialists (Zimsen, 1964).

It is not clear who was the collector of some of the Fabricius' *Centris* bees. In *C. analis*, *C. furcata*, *C. longimana*, *C. similis*, and *C. tabaniformis* he only cited it as “Schmidt”. According to Belkin et al. (1965) those specimens were collected by the surgeon Johan Christian Schmidt, an employed in Saint Croix, then a Danish possession in the West Indies. Belkin et al. (1965) pointed out that the majority the mosquitoes species described by Fabricius's and collected by Schmidt do not occur in the island of Saint Croix or in the Lesser Antilles and furthermore the locality “America meridionali” probably indicates the South American continent. This also may apply to some of the bees described by Fabricius, like *C. furcata*, *C. longimana* and *C. similis*. Schmidt visited several West Indian islands, certain places in South America mainland, such as Essequibo in Guyana (Zimsen, 1964). Therefore, all of the South American species cited as having been collected by him can with certainty be considered as coming from the vicinity of the named locality.

In “Systema Entomologie” Fabricius (1775) mentioned “Rohr” as one of the collectors of some of the specimens he studied. Julius Philip Benjamin von Rohr (1735–1792) was a naturalist and medical who went to the West Indies in 1757 and again in 1783 (Zimsen, 1964). By order of the Government of that time, he made a zoological journey to Puerto Rico, Jamaica, the Lesser Antilles and the nearest countries along the coast of South America, mainly Cayenne, French Guiana (Zimsen, 1964). From that trip he sent to Denmark a large collection of insects that were studied later.

The specimens of the collection of Count Ove Ramel Sehestedt are an important part of the Fabricius collection, and many of its types are very well preserved (Zimsen, 1964). This collection includes many tropical insects that came to Fabricius' collection through Danish officers sent to the colonies of Denmark in Guinea (now Ghana), Tranquebar (now India) and to the West Indies. Sehestedt combined his collection with that of Lund, and this latter was the one with the right of possession. Due to his unexpected death on the way to Norway, the collection was sold by his widow to the Danish State (Zimsen, 1964). Sehestedt and Lund were in contact with several tropical collectors, many of whom sent their insects to Fabricius.

Of the approximately 1500 new taxa described by Fabricius (1775) in “Systema Entomologie”, one third was from Joseph Banks's collection, including the type specimen of *C. flavifrons*. Banks (1743–1820) was a British naturalist and his collection, including the large number of Fabrician types, went to the British Museum via the London Linnean Society. The Banks collection is currently housed at the NHMUK.

The Neotropical bee species described by Fabricius were originally studied by Moure (1960). However, in this article is presented additional information on the species belong to the genus *Centris* which complement that provided by Moure (1960).

Material and Methods

The primary types were personally studied. All labels are yellowish white (due to the effect of time) and rectangular, and the data contained on them is black, handwritten or printed, unless otherwise indicated. The specific features of the labels, like coloration or type of writing are presented in squared brackets ([]). The morphological terminology follows Michener (2007).

Results

Recognition of Fabricius' primary types

According to Moure (1960) the primary types of *Centris longimana* and *C. similis* were in the Zoological Museum of the University of Copenhagen (now NHMD), while those of *C. analis*, *C. haemorrhoidalis* and *C. lanipes* were in the Museum of Kiel (ZMK). However, all these

types are currently housed at NHMD. The primary type of *C. flavifrons* is housed in the NHMUK at the Banks' collection. Fabricius did not indicate the sex of the species described nor the number of specimens he used on each description. His type specimens can be recognized by his handwritten labels (see Fig 1 in Ruta 2013 and Fig 1, plate 19 in Horn & Kahle 1936).

Systematics

Genus *Centris* Fabricius, 1804

Centris (*Centris*) Fabricius, 1804

Centris flavifrons (Fabricius, 1775)

Apis flavifrons Fabricius, 1775: 383.

Type data

This species was described based on an unknown number of specimens collected in an undetermined locality in Brazil ("Brasilia"). Fabricius (1775) did not indicate the sex of the specimen(s) he studied, but Moure (1960) found a single male in the Banks collection, assuming it was the holotype. The specimen is currently housed at NHMUK and it has the following data label: [circular white label without text] [black-rimmed] *Apis flavifrons*. Fabr. Sp. Nel.[?] n°41 [handwritten] BMNH(E) #668695 [printed] (NHMUK).

Type locality

Brazil ("Brasilia") [probably near Rio de Janeiro, see Moure (1960)].

Comments

Despite the antiquity of the specimen, it is very well-conserved. *Centris flavifrons* is widely distributed in the Neotropical region, ranging from Argentina to Mexico. It has different phenotypes that were formally proposed as new nominal species, subspecies or varieties, which are now considered junior synonyms (see Moure et al., 2007). This species has yellowish pubescence on mesoscutum and mesoscutellum, and an intertegular band of blackish hairs, sometimes covering almost completely the dorsal surface of the mesosoma, or very reduced, almost absent. Females have the trimmal angle rounded and well-developed (Fig 14 in Snelling, 1984). Males have a narrow band of whitish pubescence on the distal margin of terga 2 to 4 interrupted in the middle or if complete, then with shorter hairs in the middle (Snelling, 1984). This species has metander males which have the clypeus smooth and polished with scatter punctures, and the black marks of clypeus extending onto the disc (Snelling, 1984).

Centris haemorrhoidalis (Fabricius, 1775)

Apis haemorrhoidalis Fabricius, 1775: 386.
Figs. 1, 2

Type data

Fabricius did not indicate the sex or how many specimens he used to describe this species. Moure (1960) designated the lectotype choosing a female now housed at NHMD. The specimen has the following data label: *haemorrhoidalis*. [handwritten] [white label with black rim] LECTOTYPE *Centris haemorrhoidalis* Fabricius [handwritten] Det. J. S. Moure 19 [printed] 58 [handwritten] (NHMD). A headless male paralectotype without labels is also housed at NHMD.

Type locality

Fabricius (1775) indicated the type locality as "America", but Moure (1960) cited it as "Americae insulis" [probably Greater Antilles, see Moure (1960)].

Comments

Fabricius (1775) did not mention the collector of the type specimens. This species has been recorded in Cuba, Grenada, Jamaica, Puerto Rico (Moure et al., 2007), British Virgin Islands, Hispaniola Island and United States Virgin Islands (Genaro & Franz 2008). Both sexes have blackish pubescence covering the body almost completely, except on distal terga and sterna. Females have blackish metasoma with greenish or bluish metallic reflections, except terga 4 to 6 orange (Figs 1, 2). Males' metasoma is similar, except for



Figs 1-2. *Centris haemorrhoidalis* (Fabricius, 1775) (lectotype female). Fig 1: Habitus, dorsal view (scale bar 1 mm). Fig 2: Habitus, lateral view (scale bar 1 mm).

a yellowish spot on lateral sides of tergum 2 and the orange terga extend from segments 4 to 7 (Figs. 3, 4).

Centris tabaniformis Fabricius, 1804

Centris tabaniformis Fabricius, 1804: 358. Junior synonym of *C. haemorrhoidalis* (Moure 1960).

Figs. 3, 4

Type data

This nominal species was described based on at least two males collected in an undetermined locality cited as “America meridionali”. Both specimens are housed at NHMD, one of them designated the lectotype by Moure (1960). The specimen has the following data label: *C. tabaniformis* [indecipherable writing] Schmidt lectotype- ♂ *haemorrhoidalis* (F.) Moure 1958 X [handwritten] [red label] TYPE [printed] [white label] ZMUC 00241527 [printed] (NHMD).

Type locality

“America meridionali”.

Comments

The type specimen was collected by Schmidt and belonged to the Sehestedt collection. Moure (1960) considered that “America meridionalis” corresponds to a continental site in South America, specifically Guyana. Nevertheless, for the label of the type of *C. tabaniformis* he interpreted that it was a mistake for “America Meridionalis Insulis” (Lesser Antilles), since at that time he had only seen specimens from islands of that region.

Centris versicolor (Fabricius, 1775)

Apis versicolor Fabricius, 1775: 386.

Figs. 5, 6

Type data

This species was proposed based on an unknown number of specimens collected in an undetermined locality in America. Three females of two different species compose the type series. Moure (1960) designated lectotype the specimen better conserved and the only one with original Fabricius' label. The specimen has the following data label: *versicolor* [handwritten] [white label with black rim] LECTOTYPE *Centris versicolor* [handwritten] Det. J. S. Moure 19 [printed] 58 [handwritten] (NHMD). The paralectotypes are badly damaged, they belong to *C. smithii* Cresson, 1879 and they do not have labels.

Type locality

America [probably Lesser Antilles, see Moure 1960].

Comments

The type specimens were collected by Julius Rohr, who also collected the primary types of *C. lanipes*. Both sexes



Figs 3-4. *Centris tabaniformis* Fabricius, 1804 (lectotype male). Fig 3: Habitus, dorsal view (scale bar 1 mm). Fig 4: Habitus, lateral view (scale bar 1 mm).

of this species have the mandibles blackish. Females have the mesosoma covered by orange to light orange pubescence as well as the scopa, and the metasoma has the first three terga and the anterior half of the fourth with bluish metallic reflections. The rest of the terga are orange and covered by yellow hairs (Figs. 5, 6). Males have similar pubescence than females.

Centris (Hemisiella) Moure, 1945

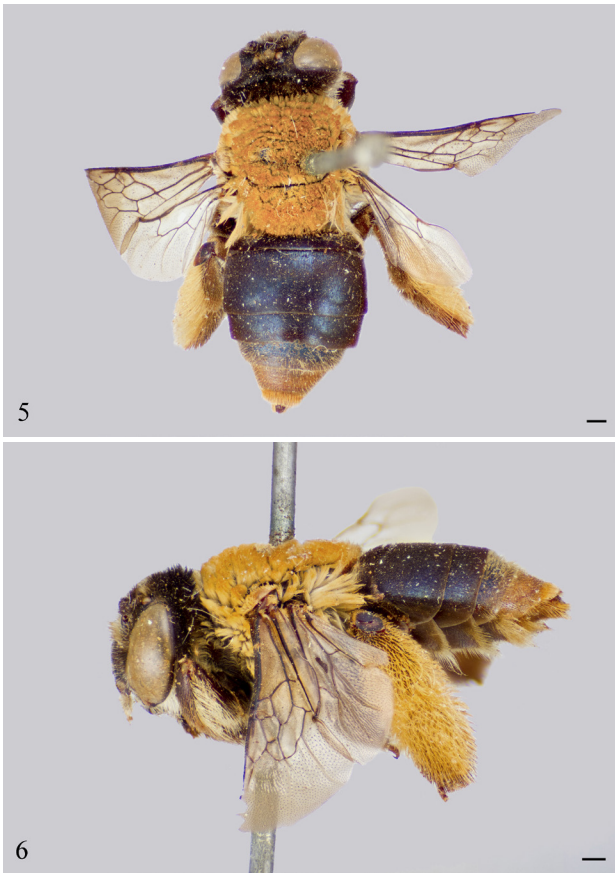
Centris lanipes (Fabricius, 1775)

Apis lanipes Fabricius, 1775: 386.

Figs. 7, 8

Type data

Fabricius proposed this species based on an unknown number of specimens collected in an undetermined locality in America. The type series was composed at least by four females and one male currently housed at NHMD. In 1960, Moure designated one of the females as the lectotype, choosing the specimen with original Fabricius' label. The lectotype has the following data label: *lanipes* [handwritten] [white label with black rim] LECTOTYPE *Centris lanipes* F ♀ [handwritten] Det. J.S. Moure 19 [printed] 58 [handwritten] (NHMD). One of the females was collected in Brazil and it represents a different species. The rest of the paralectotypes do not have labels and are in general badly damage.



Figs 5-6. *Centris versicolor* (Fabricius, 1775) (lectotype female). Fig 5: Habitus, dorsal view (scale bar 1 mm). Fig 6: Habitus, lateral view (scale bar 1 mm).

Type locality

America [probably Greater Antilles, see Moure 1960].

Comments

The type specimens were collected by Julius Rohr, who also collected the primary types of *C. versicolor*. This species is only known from the type specimens. Genaro & Franz (2008) cited it in several Caribbean islands, but unfortunately as result of a misidentification. The mesoscutum and mesoscutellum are covered by light orange pubescence, darker in the scopa; the basitarsus of middle legs has orange hairs; the clypeus does not have a longitudinal raised line, and the metasoma is uniformly orange (Figs 7, 8). Additional information on the morphology of this species can be found in Moure (1960).

Centris (Heterocentris) Cockerell, 1899

Centris analis (Fabricius, 1804)

Anthophora analis Fabricius, 1804: 375.

Type data

This species was described based on an unknown number of males. Two syntypes were found at NHMD and the

one collected by Schmidt was designated by Moure (1960) as the lectotype. The specimen has the following data label: *A: analis* ex Am: mer: Schmidt Lectotype *C. (Heterocentris)* ♂ Moure 58 X [handwritten] [red label] TYPE [printed] [white label] ZMUC 00241561 [printed] (ZMC). The paralectotype was not studied.

Type locality

“Amer. mer.” [according to Moure (1960) probably from Guiana].

Comments

The type specimen was collected by Schmidt and it belonged to the collection of Niels Tønder Lund. Moure wrote the word “lectotype” directly on the original Fabricius’ label. The females of this species have the lower corner of the pronotum with a few yellow to orange, long, coarse and simple hairs. Males have the mandible tridentate with the innermost teeth small and close to each other, and a yellow spot on the anteroapical surface of the scape. This species was correctly interpreted by Snelling (1984) and Thiele (2003).

Centris (Melanocentris) Friese, 1901

Centris furcata (Fabricius, 1804)

Bombus furcatus Fabricius, 1804: 350.



Figs 7-8. *Centris lanipes* (Fabricius, 1775) (lectotype female). Fig 7: Habitus, dorsal view (scale bar 1 mm). Fig 8: Habitus, lateral view (scale bar 1 mm).

The primary type of this species was recently studied so it seems not necessary to cite the same information here. For information about the label as well as notes of the morphology of the species see Vivallo (2016).

Centris (Trachina) Klug, 1810

***Centris longimana* Fabricius, 1804**

Centris longimana Fabricius, 1804: 356.

Type data

This species was proposed based on an undetermined number of specimens collected in “America meridionali”. The type series, currently housed at NHMD was studied by Moure (1960) who designated a female as the lectotype. The specimen has the following data label: *C: longimana* ex Am: mer: Schmidt Holotype ♀ Moure 1954 X [handwritten] \ [red label] TYPE [printed] (NHMD). According to Moure (1960) this specimen, along with the male that compose the type series belonged to the Sehestedt's collection.

Type locality

“America meridionali” [according to Moure (1960) probably Guiana].

Comment

Females have the interantennal and paraocular areas with yellowish pubescence; the vertex, mesoscutum and mesoscutellum with the base of the hairs grayish or whitish and dark brown apex; the labrum and the mandibles mostly yellow, and the clypeus dark brown with a relatively narrow yellow inverted T-like stain. Males have the mesosoma with brownish pubescence, with slightly lighter hairs on mesoscutellum; the clypeus relatively convex (in lateral view) with two large dark brown spots projected downwards and surpassing the upper half.

***Centris similis* (Fabricius, 1804)**

Bombus similis Fabricius, 1804: 351.

Type data

Fabricius (1804) described this species based on two females from “America meridionali”.

One of the syntypes, currently housed at NHMD was studied by Moure (1960) designating it as the lectotype. The specimen has the following data label: *Bo similis* ex Am: mer: Schmidt X [handwritten] \ [red label] TYPE [printed] \ LECTOTYPE [printed] *Centris similis* (F) [handwritten] J. S. Moure [printed] 1958 [handwritten] (NHMD). According to Moure (1960) there is an additional specimen of the type series, now paralectotype, housed at NHMD but it was not examined during the development of this article.

Type locality

“America meridionali” [according to Moure (1960) probably Guiana].

Comments

The specimen was collected by Schmidt, the same collector of the primary types of *C. analis* and *C. furcata*. The specimen belonged to the Lund's collection. Morphological characters to identify this species can be found in Snelling (1984).

Discussion

All the Fabricius' species were described in the same very short manner: the name, an extremely short diagnosis, and a reference to the locality and collector. Unfortunately, he generally mentioned the locality in the broadest sense: “America”, “America meridionali” or “America insulis”, which turn almost impossible to determine the real locality where the specimens were collected. Due the way in that Fabricius described his species the direct study of their primary types is fundamental to recognize them, as was originally done by Moure (1960) and now in the present paper. This also applies to other old entomologist, like Amédée Louis Michel Lepeletier de Saint-Fargeau (1770–1845), Heinrich Friese (1860–1948) and Theodore Dru Alison Cockerell (1866–1948), three of the most important melittologist that worked with bees from the New World and whose species can only be identified studying their type specimens.

Some of the species described by Fabricius are very common and occur widely in the Neotropical region, like *Centris analis*, *C. longimana* and *C. similis*. However, other species, like *C. lanipes* and *C. versicolor* have been misidentified for a long time, originating incorrect information about their bionomy and distributional range.

The primary types of the *Centris* bees described by Fabricius are well curated and in a very good condition, despite their antiquity. This fact is very important for the taxonomists that will need to study these and other type specimens in the future.

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