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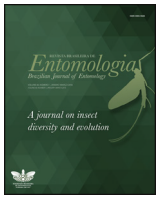

The type material of *Melipona postica* Latreille, the type species of the stingless bee genus *Scaptotrigona* Moure (Hymenoptera, Apidae)

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ABSTRACT

The present contribution deals with the recognition of the type material of *Melipona postica* Latreille and the identity of the taxon it represents. The origin of the specimens studied by Illiger and Klug, and which Illiger later sent to Latreille, is traced to Francisco Agostinho Gomes, who collected the material in Salvador, Bahia, and sent them to the Count von Hoffmansegg, in Prussia. Based on material located at the Museum für Naturkunde, in Berlin, a lectotype is designated for *Melipona postica* Latreille. The specimen is redescribed and illustrated. The name *Scaptotrigona xanthotricha* Moure is placed as a synonym of *S. postica*.

Introduction

Scaptotrigona Moure is one of the most species-rich genera of neotropical stingless bees, with 22 valid species (Camargo and Pedro, 2007; Camargo et al., 2023), and many additional ones waiting to be described. The genus is widely distributed in the neotropics, occurring from Mexico to Argentina, and their colonies are quite populous, with a few thousand workers, and are always built within tree holes.

Moure (1942) proposed *Scaptotrigona* as a subgenus of *Trigona* Jurine, choosing *Melipona postica* Latreille as its type species. There has been no investigation on the type material of *Melipona postica* and the name has been applied to various forms in the genus *Scaptotrigona* (see references in Camargo and Pedro, 2007; Camargo et al., 2023). Nogueira-Neto (1970, p. 40) discussed briefly the identity of *S. postica* and inferred, based on Latreille's original illustration, that it seemed to correspond to Moure's *S. xanthotricha* (Nogueira-Neto attributes this hypothesis to Moure himself). He also stated to have examined material from Latreille's collection in Oxford and to have seen a specimen labeled by Herbert Schwarz as *S. postica* that corresponded to a "mandaguari", the vernacular name that Nogueira-Neto used for what he was interpreting as *S. postica* (for *S. xanthotricha* he used the name "mandaguari amarelo"). Baker (1994) also revised the type material of bees in Latreille's collection deposited at the Hope Museum, Oxford University, and mentions specimens belonging to only four names proposed by Latreille, two referring to anthidiine bees and two to panurgine bees. At this point, one can assume that Latreille's collection at the Hope Museum likely does not have material of the true *S. postica*.

The present contribution deals with the recognition of the type material of *Melipona postica* Latreille and the identity of the taxon it represents. The origin of the specimens studied by Illiger and Klug, which Illiger later sent to Latreille, is clarified. A proper comprehension of the provenance of the specimens was only possible through the study of the historical documents housed in the Museum für Naturkunde, in Berlin. While the sources of specimens from Brazil obtained by Count von Hoffmansegg (and which soon after were incorporated in the Zoological Museum of the Friedrich-Wilhelms-Universität zu Berlin) were known to ornithologists for a long time due mainly to the work of Stresemann (1950a, b), little has been written by insect systematists (see Papavero, 1971, p. 47 for a short note on the subject).

Material and methods

The studied specimens belong to the DZUP – Coleção Entomológica Pe. Jesus Santiago Moure, Department of Zoology, Universidade Federal do Paraná, Curitiba, Brazil; NMW – Naturhistorisches Museum, Vienna, Austria; and to the ZMB – Museum für Naturkunde, Berlin, Germany.

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The color images were obtained on a camera Leica DFC295 associated with a stereomicroscope Leica M125 (DZUP) or on a camera Nikon Coolpix 995 attached to a stereomicroscope Leica MZ7 (ZMB). Image stacking was carried out in the software Zerene (ZMB) or Helicon Focus (DZUP).

Taxonomy

Scaptotrigona postica (Latreille, 1809)

Melipona postica Illiger, 1806: 157. Nomen nudum.

Melipona postica Klug, 1807a: 219. Nomen nudum.

Melipona postica Klug, 1808: 58. Lectotype worker, presently designated, Brazil: Bahia (ZMB). **Nomen oblitum.**

Melipona postica Latreille, 1809a: 337. Lectotype worker, presently designated, Brazil: Bahia (ZMB). **Nomen protectum.**

Scaptotrigona postica xanthotricha Moure, 1950: 78. Holotype worker, Brazil: São Paulo, Amparo (DZUP). **New synonym.**

Historical account

The name *Melipona postica* was first introduced by Illiger (1806) as a *nomen nudum*, in his review of Kirby's work on bees. In this work, Illiger proposed the genus *Melipona* to segregate the stingless bees from the genus *Apis* proper. The name was listed together with many additional names, which were mostly *nomina nuda* based mainly on material received from Brazil. The name was subsequently listed by Klug (1807a, p. 219) and mentioned by Klug (1807b, p. 265) in the description of his *Melipona testacea*, in both cases as *nomina nuda*.

Klug (1808) can be considered the first author to have validly introduced the name according to the current rules of nomenclature. In his article dealing with sexual differences in Hymenoptera, Klug pointed out that "*Melipona* Illig., in which it also has females with yellow antennae and face, as *M. postica* Illig. and with spotted face, as *M. favosa*." [in the original: "MELIPONA *Illig.*, bei welcher es auch Weibchen mit gelbem Fühlerschaft und Gesichte, wie die *M. postica Illig.* und mit geflecktem Gesichte, wie die *M. favosa*, giebt." (Klug, 1808, p. 58)]. The two characters provided for *Melipona postica* can be considered a description and would suffice to validly characterize the taxon. Klug himself attributed the name to Illiger, both in his paper and in specimen labels (see Fig. 3G). However, the name has been consistently associated with Latreille, who provided a formal description of the species in his 1809 work (see below). Here, Latreille's name is considered *nomem protectum*, while Klug's name is treated as *nomem oblitum*, an action taken in accordance with Article 23.9.1 of the Code (ICZN, 1999). Conditions required by Article 23.9.1.2 are met and can be verified by the numerous references given by Camargo and Pedro (2007, p. 484) under *Scaptotrigona postica*. Also, to the best of my knowledge, the condition in Article 23.9.1.1 also applies.

Latreille's work containing the description of *Melipona postica* was included in the livraisons 5 and 6 of volume 1 of Humboldt & Bompland's *Recueil d'Observations de Zoologie et d'Anatomie Comparée*. According to Sherborn (1899), these livraisons were distributed in 1809. The date of 1811 given by Camargo and Pedro (2007) refers to a reprint of the first volume, which also according to Sherborn (1899), appeared in 1812 and not in 1811 as given in the printed work. Also, Camargo and Pedro (2007, p. 484) attributed the name *Melipona postica* as first appearing in Latreille's (1807) 3rd volume of the *Genera Crustaceorum et Insectorum*. In reality, Latreille dealt with bees in his 4th volume, published in 1809 (Latreille, 1809b, p. 183), and not in the 3rd volume. However, in the 4th volume the name *postica* appears in a list of names attributed to *Melipona*, without any description, being therefore also a *nomen nudum*.

The specimens upon which Illiger proposed the name *Melipona postica* were collected by Francisco Agostinho Gomes in Brazil and sent to Johann Centurius Graf von Hoffmansegg, in Prussia (Gomes, 1800-1807) (see Pont, 1995, p.139 for the spelling of Hoffmansegg's name). Gomes was born in 1769 in Salvador, Bahia, and at an early age was sent to Portugal to be trained as a priest. With the sudden death of his father, he was called back to Brazil to assume the family business without completing his training. Little is known about Gomes in the years following his return to Brazil, but his name has been implicated in the sedition of 1798 in Salvador (Pedreira, 1977; Tavares, 2003). He was denounced to the Portuguese Crown on October 4th, 1798, and by January 1799, with the closure of the inquiries, he was considered innocent and embarked in the following month to Lisbon (Pedreira, 1977).

Soon after his arrival, Gomes got acquainted with Hoffmansegg, who was in Lisbon at the same time, on his second trip to Portugal (Stresemann 1950a, b). Hoffmansegg had arrived there one year earlier, in March 1798. During their overlap in Lisbon, Hoffmansegg made arrangements to receive material from Brazil through Gomes and gave him instructions on how to collect natural history specimens, especially birds and insects. By the end of 1799, Gomes dispatched his library, containing over 350 books, from Lisbon to Salvador (Neves and Neves, 2004), and according to Stresemann (1950a, b), he left Portugal to Brazil in April 1800. His first letter to Hoffmansegg, dating from May 16th, 1800, and sent from Salvador, started with the sentence "I arrived here fortunately after forty-one days of travel" [in the original: "J'ai arrivé ici heureusement apres quarante et un jours de voyage"]. In the first years of the 1800s, Gomes sent a number of shipments containing natural history specimens, receiving mainly books in return from Hoffmansegg (Gomes, 1800-1807). In addition to a large number of insects, he sent bird and mammal skins, preserved fishes, other invertebrates, and plant exsiccates. Part of Gomes' specimens became type material of iconic mammal species, such as the bristle-spined rat, *Chaetomys subspinosus* (Olfers) (see details in Voss and Angermann, 1997).

Gomes obtained most of the specimens sent to Hoffmansegg in Salvador, Bahia, and its surroundings, indicating that Salvador should be considered the type locality for most taxa whose descriptions were based on Gomes' specimens. The material received from Gomes was kept by Hoffmansegg in Braunschweig, together with Hellwig's collection, and was studied first by him and Illiger, who lived in Hellwig's house then (Stresemann, 1950a, b). Klug also started to publish new taxa based on material from Hoffmansegg's collection, but it is not clear how he had access to them since he lived in Berlin. Some specimens might have been taken from Braunschweig to Berlin by Hoffmansegg himself, who made them available to Klug. This seems to be the case involving *Oxaea flavescens* Klug, since Illiger and Klug were not aware of each other studies (see Klug, 1807c, 1810; details of this case will be presented in a forthcoming contribution). By the early 1820s, with the acquisition of Hoffmansegg's insect collection, the specimens were incorporated in the Zoological Museum of the Friedrich-Wilhelms-Universität zu Berlin, founded in 1810 (Klug, 1824).

Among the documents preserved in the Museum für Naturkunde (Historische Bild- und Schriftgutsammlungen), there are manuscript lists compiled by Illiger (or perhaps Hoffmansegg) of taxon names based on the specimens received from shipments sent by Gomes. In a list referring to the shipment from 1801, the name "Apis postica N." already shows up (Fig. 1), pointing out that material from this stingless bee was received in the first shipment.

Over the years, material from the Zoological Museum in Berlin, including those received from Gomes, were exchanged with other entomologists by Klug. This explains why specimens of what is here

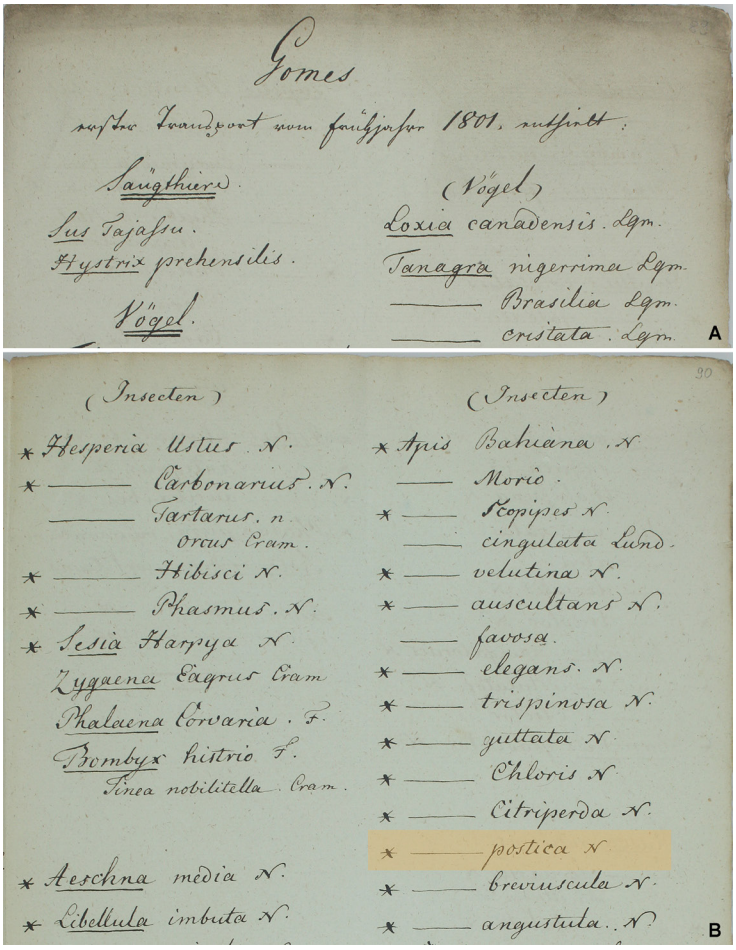

Figure 1 Photographs of manuscript lists compiled by Illiger (or perhaps Hoffmansegg) of taxon names based on the specimens received from shipments sent by Francisco Agostinho Gomes (documents filed under "Gomes, Franz August" in the Historische Bild- und Schriftgutsammlungen of the Museum für Naturkunde, in Berlin). A. Top section of front page of sheet 89; the heading reads "Gomes' first shipment from Spring 1801 contained" (in the original "Gomes erster Transport vom frühjahre 1801, enthielt"). B. Upper half of front page of sheet 90 containing a list of insects. The taxa considered as undescribed species are indicated by an asterisk and are followed by "N.", an abbreviation of "Nobis", meaning "to us" (as a new species). The right column gives names of bees, all placed in the genus *Apis*; the name "Apis postica" is highlighted.

considered part of the type series of *Melipona postica* ended up in Winthem's collection, which, after his death, was acquired by the NMW in 1852 (see Pont, 1986, p. 206; 1995, p. 148). Winthem's name is listed by Klug (1824, p. xii) among those with whom he had exchanged specimens. Winthem's letters to Klug, preserved in ZMB's Historische Bild- und Schriftgutsammlungen, span from September 28th, 1819 to April 23rd, 1841.

Two workers were also sent to Spinola in Italy, and they are still preserved in his collection in Turin (see below). Spinola (1840) lists them on page 124 as "*Melipona postica* Latr. 2 individus du Brésil" and states on page 134 that he received a large number of stingless bee specimens from Klug in 1837. Spinola's letters to Klug, preserved in ZMB's Historische Bild- und Schriftgutsammlungen, span from March 13th, 1808 to January 5th, 1845.

Type specimens

A single worker, assumed here to belong to the original type series, has survived in the ZMB collection. It fits Latreille's description perfectly and, except for lacking the head and the left hind leg apically to the coxa, the specimen is in good condition (Fig. 2). Also, in addition to the pin hole, it has an extra hole on the right ventral side of its mesepisternum, whose diameter is smaller than that of the current pin, suggesting that the original pin was likely replaced. When located in the collection, it bore the labels "386", "Mus.\ Berol." and "Postica\ N.\ Latr. (Humb.).\ Bahia. Gom." (Fig. 2F), with the last label folded in the pin. The first label refers to the accession number in the "Generalkatalog Hymenoptera"; the corresponding entry in the catalog repeats the same information found in the 3rd label and also indicates that five specimens were found in the collection at the time it was compiled (at some time by the end of the 19th century). There is a pencil note following the entry pointing to the fact that two specimens were missing. The presence of five specimens is also indicated under the name *Melipona postica* in the old "Generalkatalog Hymenoptera", prepared in 1853.

Latreille (1809a, p. 337) does not mention the number of specimens he had when preparing the description. He wrote simply "This species is found in Brazil, and it was sent to me by Mr. Illiger" [in the original: "Cette espèce se trouve au Brésil, et m'a été envoyée par M. Illiger."]. Since Latreille does not specify the number of specimens and states that he received the material from Illiger, we can assume that the specimens remaining in Hoffmansegg's collection can be considered part of the type series. Article 72.4.1.1 of the Code (ICZN, 1999) states "For a nominal species or subspecies established before 2000, any evidence, published or unpublished, may be taken into account to determine what specimens constitute the type series". Therefore, the worker present in the ZMB collection is here designated as lectotype and has been labeled as such (Fig. 2F).

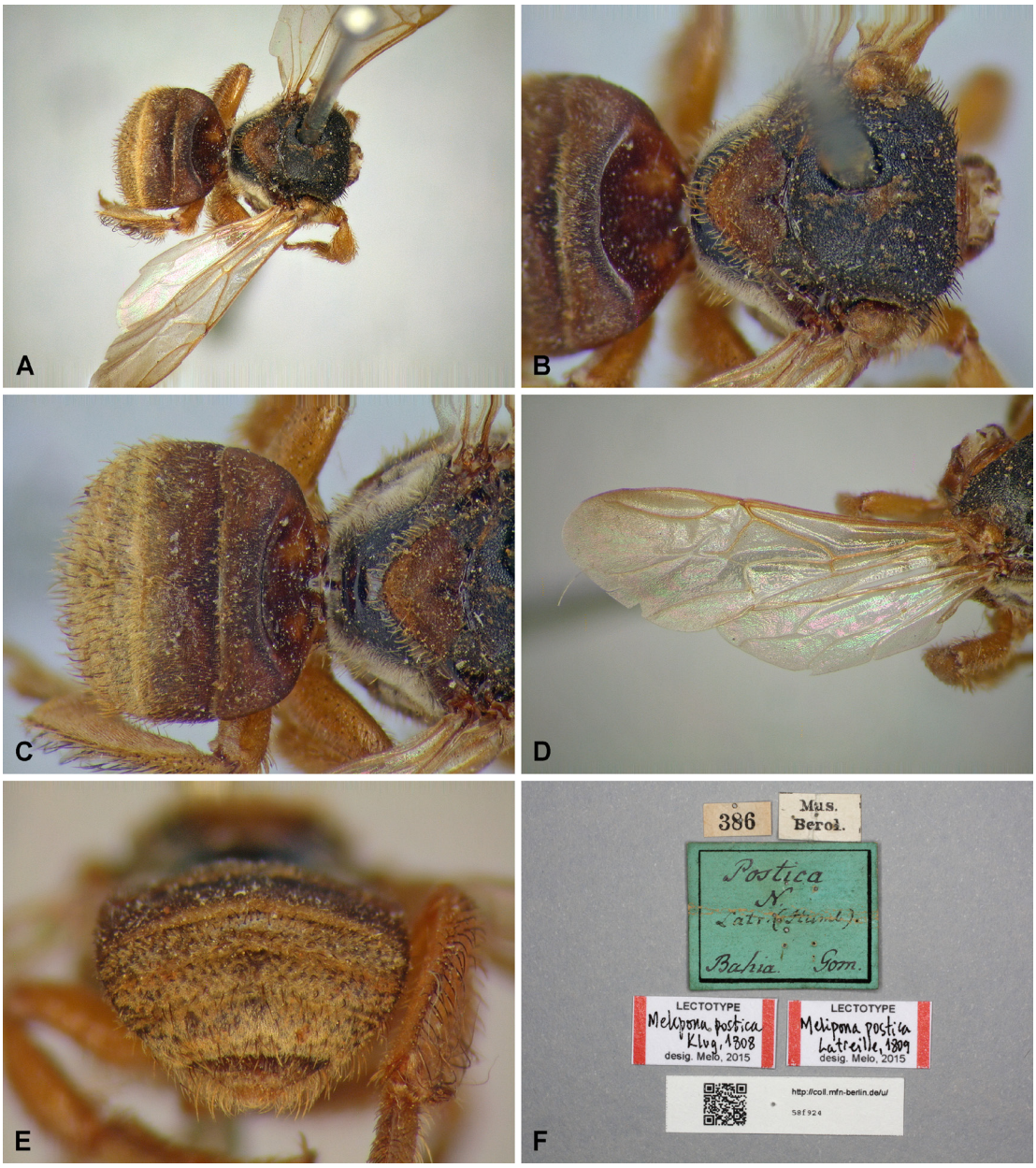

Figure 2 Lectotype worker of *Melipona postica* Latreille, 1809, deposited at the Museum für Naturkunde, Berlin, Germany. A. Dorsal habitus. B. Mesosoma and anterior portion of metasoma, dorsal view. C. Posterior portion of mesosoma and metasoma, dorsal view. D. Wings. E. Metasoma, posterodorsal view. F. Specimen labels.

In the NMW collection there is a worker from Winthem's collection, bearing a label in Klug's handwriting, that can be considered as belonging to the type series as well (Fig. 3). It bears the labels: "Wthm." (printed), "postica\ Ill\ Bahia" (manuscript in black ink in an old paper; Klug's handwriting) and "T. dorsalis\ det. Friese" (1st line manuscript in black ink, 2nd line printed; handwriting and label format do not correspond to those of Friese and indicates that the labels were added by someone else). The specimen is in good condition, missing only the right foreleg and 5th tarsomere of the right hindleg. Considering the relatively large hole on its mesoscutum and presence of glue holding the specimen to the pin ventrally, we can infer that the original pin was replaced. It has a combination of lower face, scutellum and hind tibiae testaceous, with metapostnotum and propodeum mostly testaceous. Although it differs from the lectotype in minor details of the integument coloration, I believe it belongs to the type series. It received a label of paralectotype (Fig. 3G).

There are eight additional workers from Winthem's collection in the NMW that might also belong to the original series. They bear the labels "Wthm." (printed), and "T. dorsalis\ det. Friese" (as in the paralectotype; see details above). They are structurally identical to the paralectotype (and to the lectotype, for that matter), differing only in minor details of integument coloration. Compared to these other specimens, the paralectotype is the only one exhibiting the combination of testaceous lower face, scutellum, and hind tibiae, with the metapostnotum and propodeum predominantly testaceous and with little pilosity on T2. The other eight workers are slightly darker than the paralectotype, having at least one brown spot on the hind tibiae and darker metapostnotum and propodeum. The color of the scutellum and of the lower face, as well as the pilosity on the T2, vary in these specimens. I believe that this variation corresponds to what I have observed among the material from the Atlantic Forest of southern Bahia and that can be considered normal for this form.

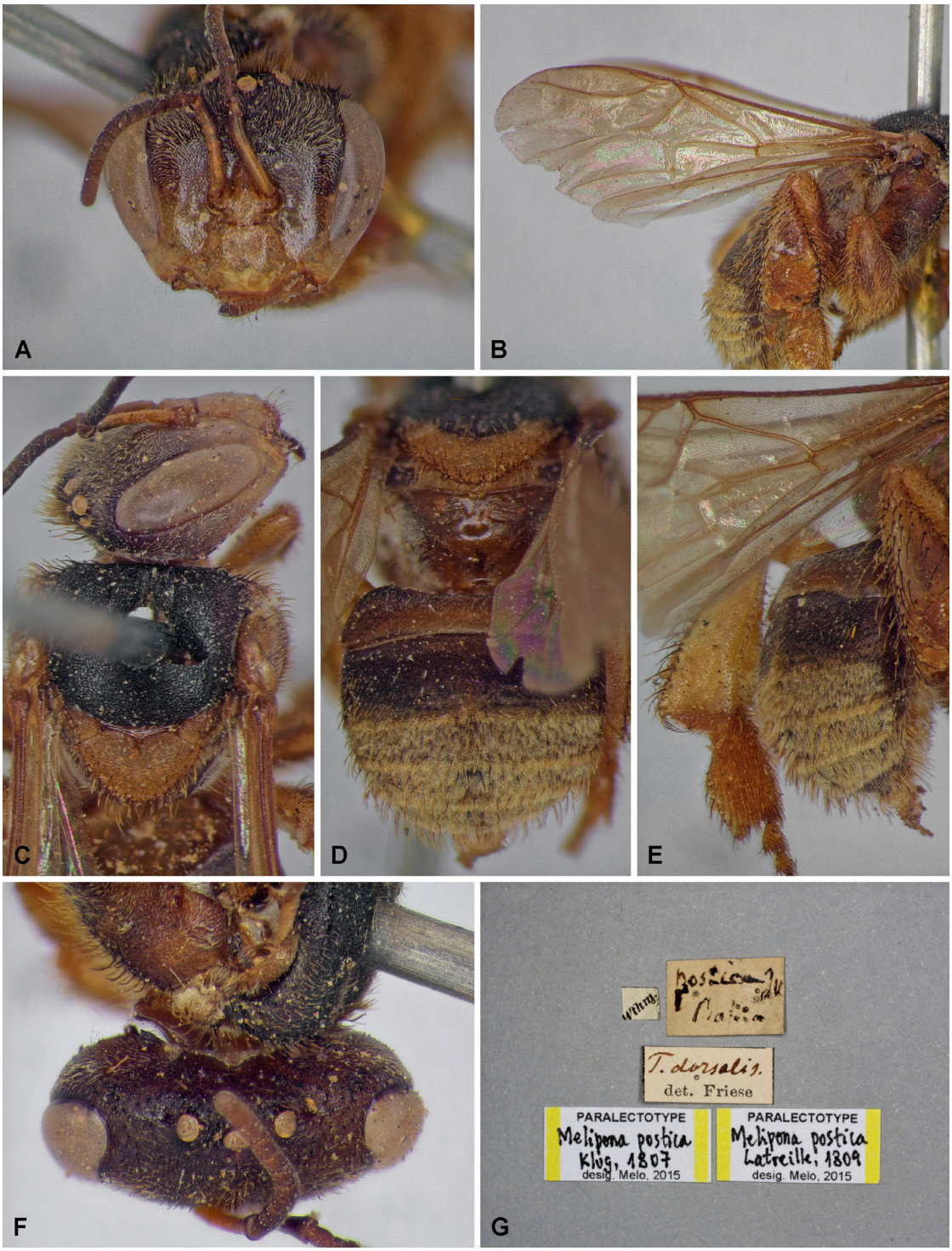

Figure 3 Paralectotype worker of *Melipona postica* Latreille, 1809, from the Naturhistorisches Museum, Vienna, Austria. A. Head, frontal view. B. Wings. C. Head and mesosoma, dorsal view. D. Posterior portion of mesosoma and metasoma, dorsal view. E. Mesosoma, laterodorsal view. F. Head, dorsal view. G. Specimen labels; the first paralectotype label should read "Klug, 1808", but by mistake I wrote "Klug, 1807".

Redescription

Lectotype worker (Fig. 2). Measurements (in mm): forewing length, 5.7; intertegular distance, 2.0; width of 2nd metasomal tergum, 2.65. Pronotum, mid and hind legs testaceous. Mesepisternum, scutellum and lateral surface of propodeum varying from brown to reddish brown; metanotum reddish brown; mesoscutum, axilla, metaposnotum and posterior surface of propodeum dark brown to black. Tegula, forewing veins, and pterostigma testaceous; wing membrane light yellow infumated, and becoming brown infumated in the wing apex. Terga laterally reddish brown; remainder of 1st tergum and most of 2nd tergum brown, marginal zone of 2nd tergum testaceous; sterna dark reddish brown. Setae on fore, mid, and most of hind legs reddish testaceous; hind tibia also with many long, dark brown to black setae on its outer surface; penicillum brown. Erect setae on anterior and lateral borders of mesoscutum brown with reddish apex; those on pronotal lobe,

mesepisternum and scutellum reddish brown. Dorsal surface of 1st tergum with only short reddish setae, except for a few longer erect setae laterally; 2nd tergum with short setae anteriorly and progressively longer setae towards its central and lateral portions, posterior margin of the tergum with a fringe of plumose setae; exposed surface of terga 3-5 entirely covered with dense indument of decumbent plumose pale yellow hairs; erect tergal setae mostly brown basally and with a reddish apex, intermingled with a few entirely yellow ones; 6th tergum with a few plumose hairs, most of its surface not covered by indument, long erect setae yellow on tergum apex and reddish on disc and laterally; curled setae on sterna entirely pale yellow. Setae along anterior margin of mesoscutum, in particular those placed more laterally, measuring 0.20-0.24 mm; those on posterior margin of scutellum with 0.28-0.34 mm in length; erect setae on central portion of T3 measuring 0.16-0.20 mm, those on T4 and T5 becoming slightly longer; longest setae on lateral portions of T6 with 0.36-0.40 mm in length.

Species identity

Although the type material of *Melipona postica* has not been reexamined by modern authors, the name has been consistently applied to stingless bee species that Moure (1942) segregated under the genus-group name *Scaptotrigona*. Despite choosing Latreille's taxon as the type species of his *Scaptotrigona*, Moure did not know to which species the name should be applied. The few specimens placed under *S. postica* in his working collection in the DZUP have Moure's handwritten labels, indicating that he did not consider them as true "postica", suggesting that he changed his interpretation over the years. He has seen in Turin the two workers sent by Klug to Spinola (see above), and wrote only a brief note about them: "*postica* 2 specimens from Brazil = my *ochrotricha* with the lower half of the face, scutellum, etc. yellow, the tergites 3-5 densely yellow tomentose and the erect setae yellow" (translated from original manuscript notes in Portuguese; May 5, 1958). It seems likely that Moure did not realize that these two workers could be part of the type series of *Melipona postica* and probably gave no importance to them. Mention of "my *ochrotricha*" refers to *S. xanthotricha*, as can be deduced from what Moure wrote in his article containing the description of this latter taxon (see Moure, 1950, p. 76). The specimens in the NMW collection (see above) might have been examined by Moure, who visited there between May 29th and June 10th, 1958, although no entry on them was found in his notes.

It is possible that Friese examined specimens from the ZMB collection, although this cannot be known for sure. He described only two species now placed in *Scaptotrigona* and did not refer to Latreille's species in his papers. The material from Vienna was seen by Friese (Fig. 3), who misinterpreted it as Smith's *Trigona dorsalis*, a species now placed in the genus *Tetragona* Lepeletier & Serville. Indeed, Ihering (1903, p. 211) used the name *Trigona dorsalis* for what has been interpreted as *Scaptotrigona xanthotricha*, probably based on Friese's identification of his material.

Moure's *Scaptotrigona xanthotricha* is placed here as a synonym under *S. postica*. He conceived his taxon under a broad scope, including material from Bahia to Paraná in the type series, although he pointed out that some specimens from Bahia had a darker coloration, with only the tip of the scutellum testaceous (Moure 1950, p. 78). The holotype of *S. xanthotricha* is identical to the lectotype of *Melipona postica* in structure and color of the integument and pilosity, differing only in

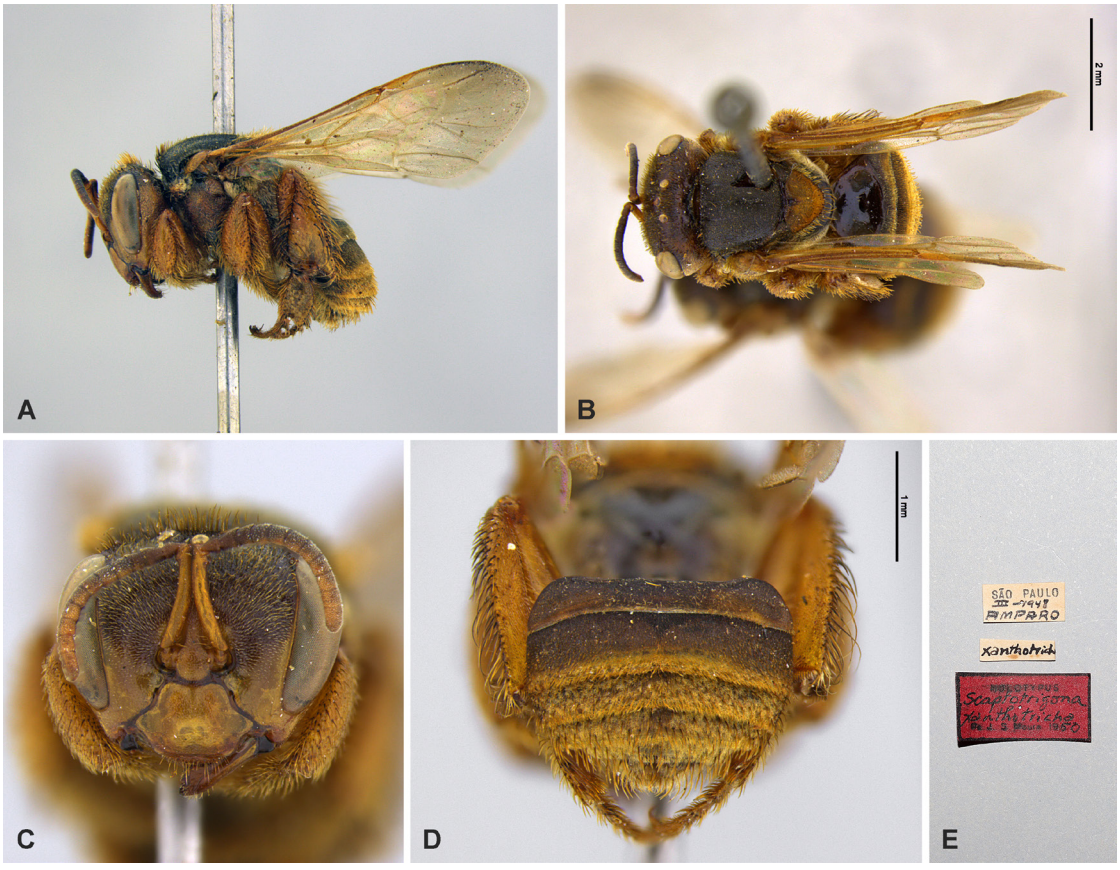

Figure 4 Holotype worker of *Scaptotrigona postica xanthotricha* Moure, 1950, deposited at the DZUP collection, Universidade Federal do Paraná, Curitiba, Brazil. A. Lateral habitus. B. Dorsal habitus. C. Head, frontal view. D. Metasoma, posterodorsal view. E. Specimen labels. A-B, C-D, respectively, at same scale.

Figure 5 Entrance tubes of natural nests of *Scaptotrigona postica*. A, Nest found in the campus of the Universidade de Santa Cruz, Ilhéus, Bahia. B, Same, close-up view of entrance tube. C, Nest found in the campus of the Universidade de Santa Cruz, Ilhéus, Bahia. D, Nest found in the Reserva Biológica União, Casimiro de Abreu, Rio de Janeiro. E, Two nests found at same tree in Fazenda Morro do Capim, Sete Barras, São Paulo. F. Same, close-up view of the lower nest entrance.

the lighter color of the scutellum and of the metasomal tergal bristles (Fig. 4). It also closely agrees with the paralectotype deposited in the NMW collection in features of the head, except for having a dark outline along the epistomal suture.

With the synonymy proposed here and maintaining Moure's interpretation, *S. postica* is recognized as a species restricted to the Atlantic Forest along eastern Brazil, from Salvador, Bahia, in the north, to Paraná's coast, in the south (Fig. 5). In Minas Gerais its distribution extends further inland following the basins of the Doce and Paraíba do Sul rivers. Workers from southern São Paulo and Paraná are considerably darker and might represent a separate species.

Concluding remarks

A historical investigation surrounding the type material of *Melipona postica* is provided in the present contribution. Proper comprehension of the significance of the studied specimens was only possible due to the author's access to documents stored in ZMB's Historische Bild- und Schriftgutsammlungen. A longer stay at the ZMB also allowed a better understanding of the documents associated with the specimens, such as the historic catalogs and the old labels. Repeated examination of a large number of labels allowed for recognition of individual handwriting, such as that of Friedrich Klug. In its turn, this made possible the recognition of specimens originating from the ZMB collection that are currently deposited in other institutions, such as Winthem's collection in the NMW. This type of investigation takes time to mature and is less likely to be successful during short visits to museums holding old, historic collections.

A total of 107 bee specimens collected by Gomes, including the lectotype of *Melipona postica*, were located in the ZMB collection. Many of them refer to names proposed by Illiger that are *nomina nuda* and, therefore, have no taxonomic value. Some of them, however, are true type specimens, such as those of *Melipona scutellaris* Latreille and *Oxaea flavescens*. Additional information on this material will be published in forthcoming contributions.

Scaptotrigona postica was conceived here under a broad concept, comparable to that given by Moure (1950) when proposing his *S. xanthotricha*. Future studies might show that it is composed of two or three different forms that deserve separate species status. Proper investigation of this matter may require molecular markers from a reasonable number of samples covering the entire distribution of this complex.

Acknowledgments

Most of this work was carried out during a sabbatical year spent in the Museum für Naturkunde (ZMB), Berlin, studying the type material of Neotropical bees. I am in debt to Michael Ohl for hosting me and for providing the necessary conditions to develop my studies at the ZMB. Thanks are due also to Frank Koch for granting access to the bee collection, Sabine Hackethal for her kind help in locating and granting me access to the historical documents housed in the Historische Bild- und Schriftgutsammlungen, and Bernhard Schurrian for directing me to the Dr. Hackethal. Dominique Zimmermann and Manuela Vizek are thanked for their support during my short visit to the Naturhistorisches Museum, in Vienna. For help with fieldwork during which the nests

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Conflicts of interest

The author declares no conflicts of interest.

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