



## The origin of the stingless bee species described by Frederick Smith from Brazilian specimens brought to the London International Exhibition of 1862

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### ABSTRACT

For a long time, the provenance of the specimens used by Frederick Smith to describe the species of stingless bees from Brazil remained a mystery. The recent digitalization of 19<sup>th</sup> century publications has made possible to trace the origin of the material brought to the London International Exhibition of 1862 by the Brazilian delegation. We document that the bee specimens showed at the International Exhibition, and that served as type material of the species described by Smith, were collected by Manuel Ferreira Lagos, head of the Zoology section of the Comissão Científica de Exploração, during their stay in Ceará, from 1859 to 1861. Even if late, it is important to give due credit to the Comissão Científica de Exploração, and more specifically to Lagos, for the contribution to the knowledge of the stingless bee fauna from Brazil.

Frederick Smith (1805–1879) was a prolific English zoologist at the British Museum, having contributed massively to the description of hymenopterous species from the entire globe during the 19th century (Dunning, 1879). In a paper entitled “*Descriptions of Brazilian Honey Bees belonging to the Genera Melipona and Trigona, which were exhibited, together with Samples of their Honey and Wax, in the Brazilian Court of the International Exhibition of 1862*” and published in 1863, Smith recorded a total of 16 species of stingless bees and seven of social paper wasps based on material presented at the London International Exhibition of 1862. For the newly proposed taxa, Smith adopted the vernacular names as species epithets, with the exception of his *Trigona mellea* and *T. recursa*. He does not provide details of the provenance of the specimens and probably considered enough to know that they came from Brazil.

Earlier authors, such as Ducke (1916) and Schwarz (1932, 1948), paid little attention to the origin of the specimens brought to the London Exhibition. An exception was the short note made by Ducke (1910, p. 109) about the type material of Smith's *Trigona tataira*: “*The types of Smith are from Ceará*” (“*Les types de Smith sont du Ceara*”,

in the original). Apparently unaware of Ducke's statement, Camargo and Moure's (1996), in their revisionary work of *Geotrigona*, have taken the matter into consideration when discussing the identity of *G. mombuca*, one of the species described in the work of Smith. They reached the conclusion that the specimens were collected somewhere in southeastern Brazil, most likely in eastern Minas Gerais, considering their vernacular names derived from the Tupi language (Camargo and Moure, 1996, p. 110). This same assumption was followed by Pedro and Camargo (2003), when interpreting the identity of *Partamona cupira*, and by Melo (2003) in relation to *Melipona mondury*, additional species described by Smith (1863).

The first author has recently come across a digital copy of the report about Brazil's participation in the International Exhibition of London, prepared by Francisco Ignacio de Carvalho Moreira, Baron of Penedo, and published in 1863. Carvalho Moreira was assigned president of the Brazilian committee sent to represent the country during the event and made the report at the request of Dom Pedro II, Emperor of Brazil. The bees were treated in a section of their own of the “Annexo XXI”, written by John Miers, who served as a juror in the Brazilian section of the International Exhibition. On pages 67–69, Miers makes reference

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**Table 1**  
Brazilian stingless bees and social paper wasps brought to the London International Exhibition of 1862, listed according to Miers' report published by Carvalho Moreira (1863, p. 67).

Order in report	Vernacular names (see report)	Genera and species (text as given in report)	Name given by Smith (1863) <sup>1</sup>	Nr. in label	Nr. in article
1	Limão	Melipona Limão. Smith.	<i>Trigona Limão</i>	1	1 [T]
2	Cupira	" Cupira. Sm.	<i>Trigona Cupira</i>	2 <sup>2</sup>	2 [T]
3	Jaty	" Jaty. Sm.	<i>Trigona Jaty</i>	3	3 [T]
4	Mandaçaia	" Fuscata. St. Farg.	<i>Melipona Mandaçaia</i>	NP	1 [M]
5	Canudo	Melipona Bipunctata. St. Farg. (Mesma especie que o "Urussú.")	<i>Trigona bipunctata</i>	NE	4 [T]
6	Vamos embóra	" Recursa. Sm.	<i>Trigona recursa</i>	6	5 [T]
7	Tataira	" Tataira. Sm.	<i>Trigona Tataira</i>	7	6 [T]
8	Tubibá	" Tubibá. Sm.	<i>Trigona Tubiba</i>	8	7 [T]
9	Arapna [sic] <sup>3</sup>	" Ruficrus. Latr.	<i>Trigona ruficrus</i> , Latr.	NE	8 [T]
10	Mombuca	" Mombuca. Sm.	<i>Trigona Mombuca</i>	14 <sup>4</sup>	9 [T]
11	Urussú	" Bipuncata St. Farg. (mesma especie que o "Canudo.")		NE	4 [T]
12	Mosquito	" Mosquito. Sm.	<i>Trigona Mosquito</i>	16	10 [T]
13	Sanharó	" Amalthea. Fabr.	<i>Trigona amalthea</i>	NE	11 [T]
14	Moça branca	" Dorsalis. Sm.	<i>Trigona dorsalis</i>	18 <sup>5</sup>	12 [T]
15	Cutiao de purga	" Mellea. Sm.	<i>Trigona mellea</i>	NE	13 [T]
16	Mondury	" Mondury. Sm.	<i>Melipona Mondury</i>	NP	2 [M]
17	Manoel d'Abreu	" Longipes. Sm. <sup>6</sup>	<i>Trigona longipes</i> <sup>7</sup>	NE	14 [T]
18	Enxú	Nectarina Analis. Perty.	<i>Nectarina analis</i> , Shuck.	NE	1 [N]
19	Enxuy	Polybia Enxuy. Sm.	<i>Polybia Enxuy</i>	NE	5 [P]
20	Capuchú	" Socialis. Sauss.	<i>Polybia socialis</i> , Sauss.	NE	1 [P]
21	Caboclo	" Sericia. Oliv.	<i>Polybia sericea</i> , Sauss.	NE	2 [P]
22	Boca torta	" Occidentalis. Sm.	<i>Polybia occidentalis</i> , Sauss.	NE	3 [P]
23	Amarello	" Fuscicornis. St. Farg.	<i>Polybia fuscicornis</i> , St. Farg.	NE	4 [P]
24	Chapéó	Apoica Pallida. St. Farg.	<i>Apoica pallida</i> , St. Farg.	NE	1 [A]

T = *Trigona*; M = *Melipona*; N = *Nectarina*; P = *Polybia*; A = *Apoica* (see Smith, 1863); NP = no numbering label present in the specimens; NE = specimens not examined. <sup>1</sup>Smith was consistent in writing the species epithets given after vernacular names in capital letter. <sup>2</sup>In addition to the worker lectotype, Pedro and Camargo (2003, p. 69) also list four additional workers, all of them bearing the numbering label "2". <sup>3</sup>Correct spelling "Arapuá". <sup>4</sup>In addition to the worker lectotype, Camargo and Moure (1996, p. 109) also list two additional males, all of them bearing the numbering label "14". <sup>5</sup>Based on the type specimen of *Trigona meadewaldoi* Cockerell deposited at the USNM. <sup>6</sup>Originally described by Smith (1854) based on specimen from "Pará" (= Belém; collected by Bates). <sup>7</sup>The taxon described by Smith (1863) under the name *Trigona longipes* was given the new name *Melipona longicrus* by Dalla-Torre (1896, p. 580).

that the wax and honey brought to the Exhibition were produced by different qualities of bees from the "Provincia do Ceará". He then continued and stated that specimens of these same bees, as well as of honey-producing wasps, were also brought to the Exhibition. He also reports to have shown these specimens to Frederick Smith, who offered to study them and publish a memoir on these Brazilian insects. Miers' report contains a list of the material shown in the Exhibition which, between bees and wasps, amounts to a total of 24 samples (see Table 1). In the same document, the "Annexo XLIV" deals with the awards received by the Brazilian exhibitors, where figures again the honey, wax and bees but now including the exhibitor in charge: "excellent wax and bees that produce it" exposed by M. F. Lagos and awarded with a medal, and "collection of bees that produces wax" by the same expositor and rewarded with honorable mention (both on page 507).

In order to assemble, inventory and select national products to be sent for exposition at London, the Brazilian Empire, in partnership with two private institutions, organized a Brazilian exposition that took place in December of 1861, at Rio de Janeiro, Capital of the Empire (Cunha, 1862; Martins, 2020). All Brazilian provinces were invited to contribute sending and cataloging local products, either natural or manufactured. The products would then be exhibited and evaluated by a specialized jury, divided in five categories, which yielded the reports compiled and published by Antonio Luiz Fernandes da Cunha, in 1862. The bees and their samples of honey and wax appear in the report about the agricultural industry, which mentions that

it was up to Mr. Manoel Ferreira Lagos the glory of presenting the best collection that has been seen of this

genre; this gentleman exhibited no less than 24 different species or varieties of bees from Ceará, preserved dry in a beautiful frame, and in vials with alcohol; they were accompanied by the respective samples of wax and honey. (Cunha, 1862, p. 146).<sup>1</sup>

It is also mentioned that Mr. Lagos received an honorable mention, especially due to his collection of bees and their products.

In Cunha's (1862) report, the section about the manufacturing industry, written by Luiz Cypriano Pinheiro de Andrade, lists some of the products chosen to be exhibited at the Universal Exposition, among them

a board with 24 species of bees, from Ceará; 23 vials with prepared bees, from the same province; samples of different species of wax from these same bees, and different species of honey. (Cunha, 1862, pp. 314–315).

Apparently, the board was exhibited in London identically as it was in Brazil, agreeing with the list provided in Miers' report in Carvalho-Moreira (1863). It is worth mentioning that seven of the 24 species cited as indigenous bees are in fact social wasps that Smith (1863) attributed to the genera *Apoica*, *Nectarina* and *Polybia* (Table 1). Also, as far as we could investigate (see details in Table 1), many of the specimens studied by Smith (1863) bear a numbering label, which to a certain degree correspond to the order in which the

<sup>1</sup>Here and in the following sections, the text of the original documents was freely translated from Portuguese into English by the authors.

species are listed in Miers' report and presented in Smith's paper. In addition, some of them bear an additional label in which the vernacular name is accompanied by the same number written in the smaller numbering label, as for example in the types of *Trigona jaty* and *T. mombuca*. We believe that these numbers correspond to some sort of numbering system used by Lagos when preparing the board. However, further study of this material will be required to better understand these number labels.

The link between the bee species described by Smith (1863) with the information provided by the reports of Carvalho Moreira (1863) and Cunha (1862) reveals that the voucher specimens were collected during a well-known historical expedition in Brazil that took place between 1859 and 1861, conducted by the Comissão Científica de Exploração (Scientific Commission of Exploration, CCE). This scientific commission was proposed by the Instituto Histórico e Geográfico Brasileiro (Brazilian Historical and Geographical Institute, IHGB) in 1856 and approved by the government in the same year. The goal of this commission was to explore and gather information about the most unexplored provinces of Brazil, which led them to travel to the province of Ceará in 1859. To reach this objective, the commission counted with the participation of Brazilian naturalists and engineers (Dias, 1862; Braga, 1962; Teixeira, 2014; Santos, 2020).

The CCE was composed of five sections: (1) Geology and mineralogy, (2) Astronomy and geography, (3) Botany, (4) Zoology, and (5) Ethnography and travel narrative. A president was assigned to coordinate the mission, while each section had its own head person. The section's heads were responsible for writing the guidelines for the activities of their respective sections during the travel in the province of Ceará (Dias, 1862). The zoology section, by which the collection of the bees, wax and honey exposed in London was obtained, was headed by Manuel Ferreira Lagos, zoologist and director of the division of comparative anatomy of the Museu Nacional, in Rio de Janeiro. The zoology section was given the assignment to assemble, list and describe the local fauna, including both vertebrates and invertebrates, either exotic or native to the province of Ceará. Whenever possible, the uses of the animals and their products by humans should be described, aiming to increase the knowledge on the natural resources of Brazil.

The guidelines prepared by Lagos include a special observation on native bees, referring more specifically to the stingless bees:

In collecting Hymenoptera, great attention must be paid to our species of bees, which are numerous, provide wax in abundance, and a somewhat fragrant honey; although it cannot be said that the quality of their products may rival with those of the common bee (*Apis mellifica*), it would be desirable to try to explore them. (Dias, 1862, p. XXIX).

This part of the text evidences the special care given to the bees by Lagos, who aimed to show the relevance of commercially exploring the products of native bees.

The results of this directive are dealt in the report prepared by Lagos, read in the session of the IHGB of December 6<sup>th</sup>, 1861:

Collecting hymenopterans was very profitable, serving as proof the frame shown in the national exposition, that took place recently in this Court, in which 26 species of bees, native to the province of Ceará, were accompanied by samples of honey and wax produced by each of them; some of these honeys have an exquisite flavor, and others are recommended for their medicinal properties. (Lagos, 1862, p. CLXV).

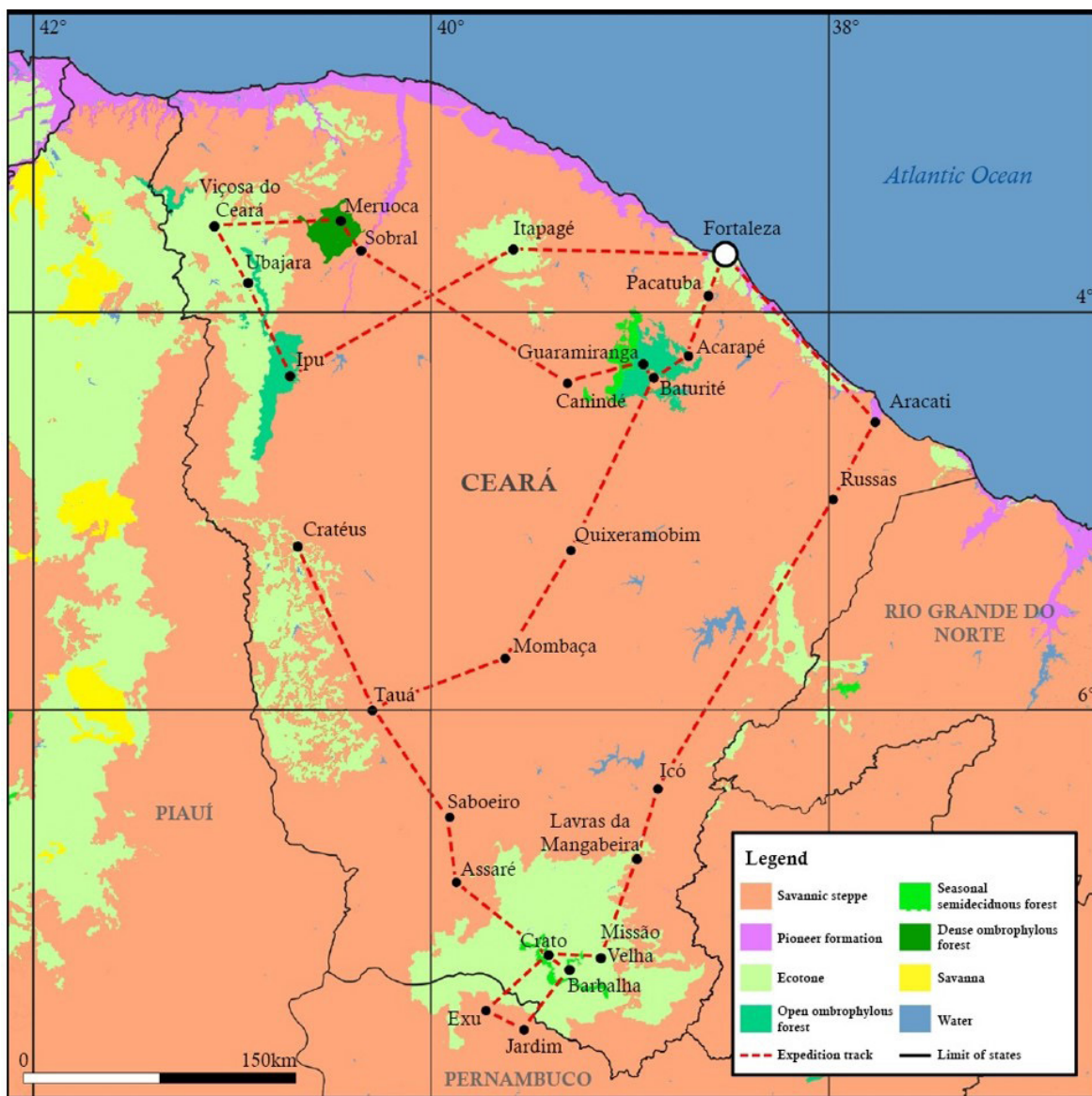
In his report, Lagos then ensued:

Beekeeping, which could flourish in that province and produce a good profit, is not properly exploited there, and only a few people keep nests out of curiosity or for domestic use: the indigenous wax and the honey that is sold are almost entirely collected in the woods. One wishes to see followed the example of Mr. Francisco Alves de Lima, a public teacher at Missão Velha, who in the backyard of his house has gathered about 150 colonies, in tree trunks, of the species of bees called canudo, mandaçaia, tubiba, moça-branca and cupira, whose honey he sells at 320 reis the bottle, also taking advantage of the wax. (Lagos, 1862, p. CLXVI).

The CCE's expedition through Ceará lasted two years and by July, 1861, their members had returned to Rio de Janeiro. They brought back around 14,000 plant exsiccates, 17,000 animal specimens, among them circa 12,000 insects and 4,000 bird skins, as well as a large number of indigenous artifacts (Braga, 1962). In spite of the painstaking efforts to carry out the expedition, its results were never gathered in major publications as it was initially intended by the involved participants. This was partly caused by the premature death of a member of the Botany section, health problems faced by the head of this same section, the transference of Lagos and the head of the Geology section to positions in the government, and the diversion of resources from the Brazilian Empire to the Paraguayan War (Teixeira, 2014).

As mentioned earlier, many of the objects brought from Ceará by the CCE were shown in the national exposition, in December, 1861, and some of them were chosen to integrate the Brazilian samples taken to the International Exhibition of London, among them the frame prepared by Lagos with the social bees and wasps. Before the national exposition, Lagos exposed in the Museu Nacional many of the objects he assembled during the expedition, in an event open to the public from the 7<sup>th</sup> to the 15<sup>th</sup> of September (reported in the editions of September 7<sup>th</sup> and September 9<sup>th</sup>, 1861, of the newspaper "Diário do Rio de Janeiro"; see also Braga, 1962, pp. 115-129). In the first newspaper article, from September 7<sup>th</sup>, it is mentioned the collection of "bees" assembled by Lagos in Ceará, in which "*one finds exposed eighteen qualities with their honey and their wax*" and seven species of wasps, giving a total of 25 species.

Little can be said about how the samples of bees and wasps were obtained, since no detailed report was ever published by Lagos. Information on the localities visited by the Zoology section during the expedition comes from reports made by the Botany section, since both delegations remained together for most of the trip, with only a few divergences along the way (Dias, 1862, p. LXVIII). The itinerary of the trips made by the Botany section can be found in the report written by Francisco Freire Alemão, head of this section (Alemão, 1862). Further details of the localities and events can be found in the manuscripts and letters of Freire Alemão, assembled and transcribed by Damasceno and Cunha (Alemão, 1964), and in his transcribed diary published posthumously (Alemão, 2011). The expedition departed from the town of Fortaleza in February of 1859, and, after going through the state, it returned to Fortaleza and then back to the Capital of the empire in July, 1861. Unfortunately, the specific localities where bees were collected could not be found in any of the texts derived from the works of the CCE nor from the manuscripts of Alemão. It is known that the expedition has basically been kept within the boundaries of the province of Ceará, with short visits to two nearby localities in the province of Pernambuco (Fig. 1). Given this, we can safely assume that all specimens examined by Smith (1863) originated from Ceará, although we cannot completely discard the possibility that some might have been obtained in these



**Figure 1** Track of the travels in Ceará of the Botany section of the Comissão Científica de Exploração, during the years of 1859 to 1861. The plant physiognomies were based on IBGE (2004). The localities are indicated under their current names. See text for further details.

nearby localities in Pernambuco. Even if this latter possibility might have occurred, the taxonomic and biogeographic interpretations related to the origin of the specimens would be basically the same.

Although most of Ceará is covered by dry savannic steppes (also known as caatinga), other five types of vegetation can be found to a smaller extent within the state's territory (IBGE, 2004). Probably due to the Botany section's interest in maximizing the diversity of plants sampled, all different formations in the state were visited during the trip (see Fig. 1), which may have influenced the diversity of bees sampled as well. Given that samples of wax and honey were present, as well as multiple specimens of each species, it is likely that most or all of the samples were collected directly from colonies. Additional evidence on that direction is the presence of males and of teneral adults (as for example the type material of *Trigona mosquito*) among the preserved material. According to the vernacular names mentioned by Lagos (1862) for the bees reared in the municipality of Missão Velha (see above), it is possible that at least the type material of *Melipona mandacaia* (mandaçaia), *Trigona cupira* (cupira), *T. meadewaldoi* (moça

branca) and *T. tubiba* (tubiba), as well as the specimens of *Scaptotrigona bipunctata* (canudo), might have been collected from nests found at this locality. Although the precise provenance of the specimens for each of the species likely will never be known, case-by-case studies might help pinpoint the probable region of Ceará from which the specimens originated. A detailed documentation of the distribution of the stingless bees in the state of Ceará will certainly contribute to reach this goal. Also, possible changes to current taxonomic interpretations involving the taxa proposed by Smith (1863) are being dealt by the authors and will be published soon in forthcoming contributions.

At the time, the CCE ended up being seen as a project that did not meet expectations and investments (Teixeira, 2014) and its contributions have gradually fallen into oblivion (Braga, 1962). Even if late, it is important to give due credit to Manuel Ferreira Lagos for his contribution to the knowledge of the stingless bee fauna in Brazil by collecting the material in Ceará. This early contribution of the CCE unfortunately went unnoticed because the origin of the material studied by Smith was not made explicit in his original article.

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## Conflicts of interest

The authors declare no conflicts of interest.

## Author contribution statement

MMC: Formal analysis (Equal), Investigation (Equal), Methodology (Equal), Resources (Equal), Writing – original draft (Supporting), Writing – review & editing (Equal). AL: Formal analysis (Equal), Investigation (Equal), Methodology (Equal), Resources (Equal), Writing – original draft (Lead), Writing – review & editing (Equal). GARM: Conceptualization (Lead), Formal analysis (Equal), Investigation (Equal), Methodology (Equal), Resources (Equal), Writing – original draft (Supporting), Writing – review & editing (Equal).

## References

- Alemão, F.F., 1862. Relatórios dos membros da Comissão lidos no Instituto Histórico e Geográfico Brasileiro: secção botânica. In: Lagos, M.F. (Ed.), *Trabalhos da Comissão Científica de Exploração*. Laemmert, Rio de Janeiro, pp. XCIII–CXIX.
- Alemão, F.F., 1964. Os manuscritos do botânico Freire Alemão: catálogo e transcrição. *An. Biblioteca Nac.* 81, 1–368.
- Alemão, F.F., 2011. *Diário de viagem de Francisco Freire Alemão (1859–1861)*. Fundação Waldemar Alcântara, Fortaleza, 591 p. (Silva Filho, A.L.M., Lopes, R., Rios, K.S., organizadores)
- Braga, R., 1962. *História da comissão científica de exploração*. Imprensa Universitária do Ceará, Fortaleza, 405 p.
- Camargo, J.M.F., Moure, J.S., 1996. Meliponini neotropicais: o gênero *Geotrigona* Moure, 1943 (Apinae, Apidae, Hymenoptera), com especial referência à filogenia e biogeografia. *Arq. Zool.* 33 (2-3), 95–161.
- Carvalho Moreira, F.I., 1863. *Relatório sobre a Exposição Internacional em 1862 apresentado a S. M. o Imperador*. Thomas Brettell, London.
- Cunha, A.L.F., 1862. *Relatório geral da Exposição Nacional de 1861 e Relatório dos Jurys Especiais*. Typografia do Diário do Rio de Janeiro, Rio de Janeiro, 527 p.
- Dalla-Torre, C.G., 1896. *Catalogus Hymenopterorum; Hucusque Descriptorum Systematicus et Synonymicus*. Vol. 10. Engelmann, Leipzig.
- Dias, A.G., 1862. Parte histórica. In: Lagos, M.F. (Ed.), *Trabalhos da Comissão Científica de Exploração*. Laemmert, Rio de Janeiro, pp. VII–XCI.
- Ducke, A., 1910. Contribution à la connaissance de la faune hyménoptérologique du nord-est du Brésil. III. Hyménoptères récoltés dans l'Etat de Ceará en 1909 et suppléments aux deux listes antérieures. *Rev. Entomol. Caen* 28, 78–122.
- Ducke, A., 1916. Enumeração dos Hymenopteros colligidos pela Comissão e Revisão das espécies de abelhas do Brasil. *Comm. Lin. Teleg. Estr. M. Gr. ao Amazonas*, 35–36, 1–171.
- Dunning, J.W., 1879. Biographical notices. No. III. Frederick Smith. *Entomologist* 12, 88–92.
- Instituto Brasileiro de Geografia e Estatística - IBGE, 2004. *Mapa de vegetação do Brasil*. Available in: <https://www.ibge.gov.br/geociencias/informacoes-ambientais/vegetacao/10872-vegetacao.html?=&t=acesso-ao-produto> (accessed 28 February 2023).
- Lagos, M.F., 1862. Relatórios dos membros da Comissão lidos no Instituto Histórico e Geográfico Brasileiro: secção zoológica. In: Lagos, M.F. (Ed.), *Trabalhos da Comissão Científica de Exploração*. Laemmert, Rio de Janeiro, pp. CXLIV–CLXX.
- Martins, M.D.S.N., 2020. O espetáculo da economia: a primeira exposição nacional da indústria no Império do Brasil, em 1861. *Topoi (Rio J.)* 21, 497–517.
- Melo, G.A.R., 2003. Notas sobre meliponíneos neotropicais, com a descrição de três novas espécies (Hymenoptera, Apidae). In: Melo, G.A.R., Alves-dos-Santos, I. (Eds.), *Apoidea Neotropica: homenagem aos 90 anos de Jesus Santiago Moure*. Editora UNESC, Criciúma, pp. 84–91.
- Pedro, S.R., Camargo, J.M.F., 2003. Meliponini neotropicais: o gênero *Partamona* Schwarz, 1939 (Hymenoptera, Apidae). *Rev. Bras. Entomol.* 47, 1–117.
- Santos, P.C., 2020. A Província e a ciência nacional: a Comissão Científica de 1859 no Ceará. *Khronos* 10, 159–179.
- Schwarz, H.F., 1932. The genus *Melipona*. The type genus of the Meliponidae or stingless bees. *Bull. Am. Mus. Nat. Hist.* 63, 231–460.
- Schwarz, H.F., 1948. Stingless bees (Meliponidae) of the Western Hemisphere. *Bull. Am. Mus. Nat. Hist.* 90, 1–546.
- Smith, F., 1854. *Catalogue of Hymenopterous Insects in the Collection of the British Museum, Part 2. Apidae*. British Museum, London.
- Smith, F., 1863. Descriptions of Brazilian honey bees belonging to the genera *Melipona* and *Trigona*, which were exhibited, together with samples of their honey and wax, in the Brazilian Court of the International Exhibition of 1862. *Trans. Entomol. Soc. Lond.* 11, 497–512.
- Teixeira, K.V., 2014. Comissão Científica de Exploração: uma experiência de transição no fazer científico brasileiro. *Cad. Hist. Cienc.* 9 (2), 42–65.