

## NEST FOUNDATION AND DIVERSITY OF *Meliponini* (HYMENOPTERA, APIDAE) IN AN URBAN AREA OF THE MUNICIPALITY OF JUIZ DE FORA, MG, BRAZIL

### *NIDIFICAÇÃO E DIVERSIDADE DE Meliponini (HYMENOPTERA, APIDAE) EM UMA ÁREA URBANA NO MUNICÍPIO DE JUIZ DE FORA, MG, BRASIL*

Leonardo Almeida SOUSA<sup>1</sup>; Thatiana de Oliveira PEREIRA<sup>1</sup>; Fábio PREZOTO<sup>2</sup>; Georgina Maria FARIAMUCCI<sup>3</sup>

**ABSTRACT:** During the period of March of 2000 to July of 2001, we monthly sensed new nests foundation of the Meliponini bees in an urban environment, of Juiz de Fora, MG. The number of nests and substrata used for foundation was registered. The objective was to verify the diversity and some aspects of the habits of new nests. The average per month was 34.88 nests. The density calculated was 1/3.80 nest/ha. Four species: *Nannotrigona testaceicornis* (63.93%), *Tetragonisca angustula* (24.46%), *Trigona spinipes* (6.74%) and *Partamona* sp. (4.87%) were identified. There was positive correlation ( $r=0.6187$ ,  $p=0.0081$ ) between the temperature and abundance of nests. *Partamona* sp., *N. testaceicornis* and *T. angustula* species presented preference for human buildings (100.0%, 88.65% and 37.2%) and *T. spinipes* founded exclusively in trees. The results suggest that these species have a high capacity to habituate to the environment offered by the urbanization process.

**UNITERMS:** Stingless bees, Meliponini, Nest Foundation, Density of Nests, Urban environment.

## INTRODUCTION

The members of the tribe Meliponini (Hymenoptera, Apidae), known as “indigenous stingless bees”, are social species that present a restricted occurrence in the tropical and subtropical areas of the planet (MICHENER, 1974). There are more than 400 described species, and it is known that 300 occur in America (VELTHUIS, 1997).

Meliponini, generally, build nests in pre-existent cavities, as hollows of trees or in human constructions, in the ground, including abandoned or active, arboreal or terrestrial termites nests. The opening of entrance of the nests constitutes an important aspect used in the recognition of the species. For the construction of the nests several materials found in the nature can be used (feces, wood pulp), besides the resin and the wax produced by the bees. Usually, the space used by the colony is covered with batumen, material similar to the propolis, that supplies protection against the infiltration of water and possible

invaders (WILLE; MICHENER, 1973; MICHENER, 1974; KERR *et al.*, 1996; NOGUEIRA-NETO, 1997; VELTHUIS, 1997).

Meliponini have diversified habits of foundation, what reflects its potential adaptability (WILLE; MICHENER, 1973; ROUBIK, 1989; KERR *et al.*, 1996; NOGUEIRA-NETO, 1997). Although these bees can be easily found in the urban environment, few are the works about inventory and behavior of these species in these settlements (KERR, 1980; LAROCA *et al.*, 1982; CAMARGO; MAZUCATO, 1984; KNOLL, 1990; TAURA, 1990; TAURA; LAROCA, 1991; KNOLL *et al.*, 1993; OLIVEIRA *et al.*, 1995; JAMHOUR, 1998; FREITAS, 2001).

The changes caused in the environment by the growing urbanization, modify fast and drastically the existent niches, what carts an unbalance in the local communities, reducing populations of some species and favoring the expansion of others.

The objective of this study was to verify the

<sup>1</sup> Estagiário de Iniciação Científica do Curso de Ciências Biológicas, Universidade Federal de Juiz de Fora

<sup>2</sup> Professor do Instituto de Ciências Biológicas, Departamento de Zoologia, Universidade Federal de Juiz de Fora

<sup>3</sup> Professora do Curso de Ciências Biológicas, Universidade Presidente Antônio Carlos

diversity and habits of foundation of Meliponini found in an urban area of the Municipal district of Juiz de Fora, MG, identifying the relationship of the species with the urbanization process.

## MATERIAL AND METHODS

The surveys were accomplished in an urban area, comprising the dependences of the Campus of the Federal University of Juiz de Fora (21°46'S; 43°21'W), with 1.325.811 m<sup>2</sup> and altitude varying of 790-940m, placed in the district of Juiz de Fora, in the southeast of Minas Gerais State, Brazil (YACOUB, 1998).

Through monthly senses, accomplished from March 2000 to July 2001, the study area was inspected (constructions, gardens and forest fragments), enrolling the number of Meliponini nests and the habits of foundation of the found species (identification of the used substratum and height of the nest in relation to the ground). This information was correlated (Sperman rank correlation test) with the temperature data, relative humidity of the air and precipitation obtained by the Main Climatological Station of Juiz de Fora.

## RESULTS AND DISCUSSION

During the study period a monthly medium number of 34,88 ± 6,67 nests of Meliponini was found in the studied area, the density calculated was 1 nest for 3,80 hectare. This result was larger than that found by Oliveira et al. (1995) in risings of Meliponini in Amazônia, even so it was smaller than the values found in inventories made in Goiás, Mato Grosso and Sao Paulo (KERR, 1980; FREITAS, 2001) (Table 1). It was possible to identify four species of bees occurring in the study place: *Nannotrigona testaceicornis* Lepeletier, 1836 (63,93%), *Tetragonisca angustula* Latreille, 1811 (24,46%), *Trigona spinipes* Fabricius, 1793 (6,74%) and *Partamona* sp. Schwarz, 1938 (4,87% of total) (Table 2; Figure 1).

The same species of Meliponini found in this study, were also encountered by Pinheiro-Machado; Kleinert (1993) in the Campus of the São Paulo University, by Carvalho; Marchini (1997) in the Campus of the Superior School of Agriculture "Luiz de Queiroz" in Piracicaba-SP and by Freitas (2001) in the Campus of USP in Ribeirão Preto-SP. In these works *T. angustula* was to more abundant species, followed by *N. testaceicornis*.

From June to Setembro/2000, a reduction was observed in the number of active nests (Table 2), what can be explained by the unfavorable climatic conditions to the development of the colonies of bees in that period.

The cold and dry season (winter), reduced the food availability in the environment, and therefore, inhibits new nests foundations. Many authors (PEDRO, 1992; KERR et al., 1996; NOGUEIRA-NETO, 1997; LIMA et al., 2000), also observed a reduced number of colonies of other social Hymenoptera, during the cold and dry season (June to September) in agreement with the observed in this study.

A positive correlation ( $r=0.6187$ , for  $p=0.0081$ ) was found between the temperature and abundance of nests of stingless bees in the studied area. On the other hand that was not found for relative humidity of the air and precipitation ( $r=-0.1311$  for  $p=0.6161$  and  $r=0.2225$  for  $p=0.3907$ , respectively), suggesting that elevated temperature favors the abundance of colonies of Meliponini.

From October to November/2000, was enrolled an increase of 31 to 35 nests of Meliponini. From January to February/2001, were verified 12 foundations, being ten colonies of *N. testaceicornis* and two of *T. angustula*, again demonstrating that the high temperatures stimulate swarming.

A direct interference by *Apis mellifera* Linnaeus, 1784 on a colony of *Partamona* sp. was observed in a human building. After aggressive events between the two species, *Partamona* sp. was expulse from the nest. Kearns; Inouye (1997) and Wilms (1996) describe that *A. mellifera*, competes directly for floral resources with a lot of species of indigenous bees, confirming the impact caused by the species introduced on the native bees.

In agreement with Kerr et al. (1996), the bees Iraí (*N. testaceicornis*) generally made their nests in pre-existent cavities in the ground, in constructions and in hollows of trees; the Jataí (*T. angustula*) uses cavities in hollows of trees, constructions and abandoned termite nests; the Irapuás (*T. spinipes*) build aerial nests in forks of trees; and the Tupi (*Partamona* sp.) nests in pre-existent cavities in constructions.

The categories of substrata used for nest foundation by the species of Meliponini found are presented in the Table 3 and demonstrate that *N. testaceicornis* presented a great preference for constructions (88,65%) and *T. angustula* exhibited the use of the largest diversity of substrata, although the preference was also for constructions (37,2%). The nests of *T. spinipes* and *Partamona* sp. were found exclusively in trees and constructions, respectively (Table 3).

The choice of a good foundation place provides protection for the colony, as mentioned by Michener (1974) and Kerr et al. (1996), besides influencing directly the abundance of nests in a certain area. The observation in our work of re-occupation of 12 abandoned nests, frequent

phenomenon, was already observed registered by Kerr *et al.* (1996) for Meliponini.

The results suggest that the species *N. testaceicornis*, *T. angustula*, *T. spinipes* and *Partamona* sp., many times presents in risings of Meliponini (SOUZA *et al.*, 1993; FREITAS, 2001), have a high capacity to habituated to the urban environment, exploring the available niches offered by the urbanization process.

## CONCLUSION

Our study contributes to the knowledge on the behavioral ecology of the Meliponini species in the urban environment, surviving with success behind of the human actions.

Due to the great fragmentation of habitats, that now are subject the different biomes, and the importance of Meliponini as pollen vectors in different ecosystems, more studies are necessary so that these species can be protected and managed as an important component of the biodiversity, since the destiny of many native plants depend on the preservation of its relationships with these pollinators.

## ACKNOWLEDGMENTS

The authors thank to Doctor Artur Andriolo for the review of this manuscript.

---

**RESUMO:** Com o objetivo de se verificar a diversidade e a relação de abelhas Meliponini em um ambiente urbano, registrou-se por meio de senso mensais, o número de ninhos e substratos utilizados para nidificação de algumas espécies, durante o período de março de 2000 a julho de 2001, no Campus da Universidade Federal de Juiz de Fora, Juiz de Fora-MG. Encontrou-se um número médio mensal de 34,88 ninhos de Meliponini, cuja densidade foi 1/3,80 ninho/ha. Foram identificadas quatro espécies: *Nannotrigona testaceicornis* (63,93%), *Tetragonisca angustula* (24,46%), *Trigona spinipes* (6,74%) e *Partamona* sp. (4,87%). Houve correlação positiva ( $r=0,6187$ , para  $p=0,0081$ ) entre a temperatura e abundância de ninhos. Com relação ao substrato utilizado para nidificação, *Partamona* sp., *N. testaceicornis* e *T. angustula* apresentaram preferência por edificações humanas (100,0%, 88,65% e 37,2%). *T. spinipes* nidificou exclusivamente em árvores. Os resultados sugerem que estas espécies possuem uma alta capacidade para explorar e se adaptar ao ambiente oferecido pelo processo de urbanização.

**UNITERMOS:** Abelhas Indígenas, Meliponini, Ninhos, Densidade de Ninhos, Ambiente Urbano.

---

## REFERENCES

- CAMARGO, J. M. F.; MAZUCATO, M. Inventário da apifauna e flora de Ribeirão Preto, SP, Brasil. **Dusenía**, Curitiba, v. 14, n. 2, p. 55-87, 1984.
- CARVALHO, C. A. L.; MARCHINI, L. C. Abundance of Meliponinae nests in the urban biotype of the municipality of Piracicaba, SP, Brasil. In: INTERNATIONAL CONGRESS OF APICULTURAL, 35., 1997, Antwerp. **Proceedings...** Antwerp: Apimondea. 1997, p. 77.
- FREITAS, G. S. **Levantamento de ninhos de meliponídeos (Hymenoptera, Apidae) em uma área urbana: campus da USP, Ribeirão Preto/SP.** Ribeirão Preto, 2001, 83f. Dissertação (Mestrado em Ciências: Entomologia) – Curso de Pós-Graduação em Ciências, Universidade de São Paulo, Ribeirão Preto. 2001.
- JAMHOUR, J. **Abundância relativa, fenologia e flores visitadas por abelhas silvestres (Hymenoptera, Apoidea) em uma área restrita de Pato Branco (Paraná, Brasil).** Curitiba, 1998, 95f. Dissertação (Mestrado em Entomologia) – Curso de Pós-Graduação em Ciências, Universidade Federal do Paraná, Paraná. 1998.
- KEARNS, C. A.; YNOUYE, D. W. Pollinators, flowering plants and conservation biology. **Bioscience**, Washington, v. 47, n. 5, p. 297-307, 1997.

KERR, W. E. **História parcial da ciência apícola no Brasil.** In: CONGRESSO BRASILEIRO DE APICULTURA, 5., 1980, Viçosa. **Anais...** Viçosa, 1980, p. 47-60.

KERR, W. E.; CARVALHO, G. A.; NASCIMENTO, V. A. **Abelha Uruçu: biologia, manejo e conservação.** Belo Horizonte: Littera Maciel Ltda., 1996. 143p.

KNOLL, F. R. N. **Abundância relativa, sazonalidade e preferências florais de Apidae (Hymenoptera) em uma área urbana (23°33'S;46°43'W).** Ribeirão Preto, 1990, 127f. Tese (Doutorado em Ciências: Entomologia) – Curso de Pós-Graduação em Ciências, Universidade de São Paulo, Ribeirão Preto. 1990.

KNOLL, F. R. N.; BEGO, L. R.; IMPERATRIZ-FONSECA, V. L. As abelhas em áreas urbanas: um estudo no campus da Universidade de São Paulo. In: PIRANI, J. R.; CORTOPASSI-LAURINO, M. (Org.). **Flores e abelhas em São Paulo.** São Paulo: Edusp, 1993. p.31-42.

LAROCCA, S.; CURE, J. S.; BORTOLI, C. A associação das abelhas silvestres (Hymenoptera, Apoidea) de uma área restrita no interior da cidade de Curitiba (Brasil): uma abordagem biocenótica. **Dusenya**, Curitiba, v. 13, n. 3, p. 93-117, 1982.

LIMA, M. A. P.; LIMA, J. M.; PREZOTO, F. Levantamento dos gêneros, flutuação das colônias e hábitos de nidificação de vespas sociais (Hymenoptera, Vespidae) no Campus da Universidade Federal de Juiz de Fora, MG). **Rev. bras. Zoociências**, Juiz de Fora, v. 2, n. 1, p. 69-80, 2000.

MICHENER, C. D. **The Social Behavior of the Bees.** [s.l.]: Harvard University, 1974. 404p.

NOGUEIRA-NETO, P. **Vida e criação de abelhas indígenas sem ferrão.** São Paulo: Nogueirapis, 1997. 445p.

OLIVEIRA, M. L.; MORATO, E. F.; GARCIA, M. V. B. Diversidade de espécies e densidade de abelhas sociais sem ferrão (Hymenoptera, Apidae, Meliponinae) em floresta de terra firme na Amazônia Central. **Rev.. Bras. Zool.**, Curitiba, v. 12, n. 1, p. 14-24, 1995.

PEDRO, S. R. M. **Sobre as abelhas (Hymenoptera, Apoidea) em um ecossistema de cerrado (Cajuru, NE do Estado de São Paulo): composição, fenologia e visita às flores.** 1992. 200f. Dissertação (Mestrado em Ciências: Entomologia) – Curso de Pós-Graduação em Ciências, Universidade de São Paulo, Ribeirão Preto. 1992.

PINHEIRO-MACHADO, C.; KLEINERT, A. M. P. Abundância relativa e distribuição de ninhos de meliponídeos (Apidae, Meliponinae) numa área urbana (23°33'S;46°43'W): dados preliminares. In: REUNIÃO ANUAL DA SBPC, 45., 1993, Recife. **Anais...** Recife, [s.n.].1993, p.911.

ROUBIK, D. W. **Ecology and natural history of tropical bees.** [s.l.]: Cambridge University Press, 1989. 541p.

SOUZA, V. C.; CORTOPASSI-LAURINO, M.; SIMÃO-BIANCHINI, R.; PIRANI, J. R.; AZOUBEL, M. L.; GUIBU, L. S.; GIANNINI, T. C. Plantas apícolas de São Paulo e arredores. In: PIRANI, J. R., CORTOPASSI-LAURINO, M. (Org.). **Flores e abelhas em São Paulo.** São Paulo: Edusp, 1993. p.43-179.

TAURA, H. M. **A comunidade de abelhas silvestres (Hymenoptera, Apoidea) do Passeio Público, Curitiba, Paraná, Sul do Brasil.** 1990, 145f. Dissertação (Mestrado em Entomologia) – Curso de Pós-Graduação em Ciências, Universidade Federal do Paraná, Paraná. 1990.

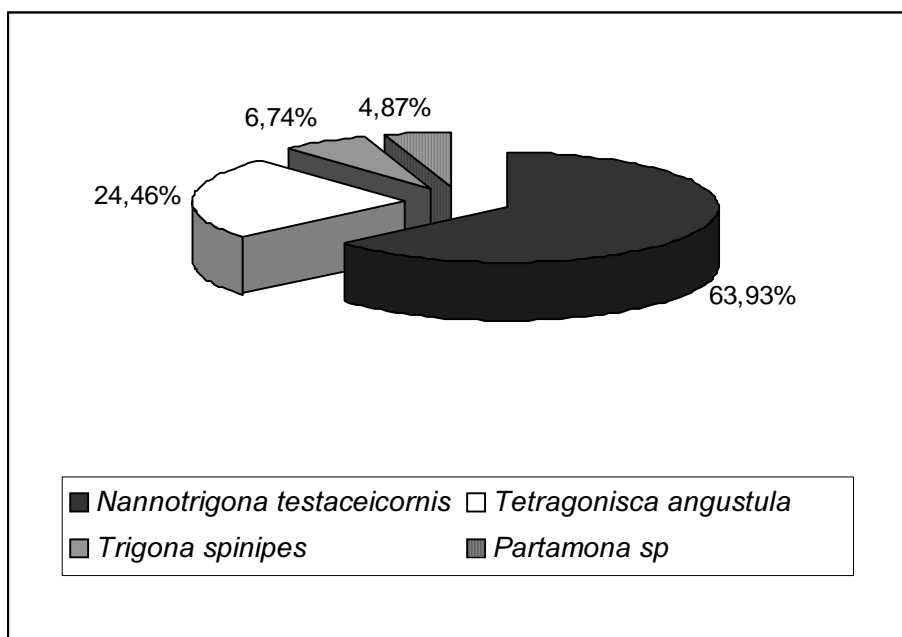
TAURA, H. M.; LAROCCA, S. Abelhas altamente sociais (Apidae) de uma área restrita em Curitiba (Brasil): distribuição dos ninhos e abundância relativa. **Acta Biol. Par.**, Curitiba, v. 20, n.1-4, p. 85-101, 1991.

VELTHUIS, H. H. W. **Biologia de abelhas sem ferrão**. São Paulo: Edusp, 1997. 33p.

WILLE, A.; MICHENER, C. D. The nest architecture of stingless bees with special reference to those of Costa Rica. **Rev. Biología Tropical**, San José, v. 1, n. 21, p. 1-278. 1973.

WILMS, W. The highly eusocial bees of Boracéia: community structure, resource partitioning, and their role as pollinators. In: ENCONTRO SOBRE ABELHAS, 2., 1996, Ribeirão Preto-SP. **Anais...** Ribeirão Preto: [s.n.], 1996, p.196-204.

YACOUB, L. B. D. **Manual do aluno: UFJF**. Belo Horizonte, Gráfica, 1998. 89p.



**Figure 1.** Percentage of colonies of Meliponini species found in an urban area of Juiz de Fora city, MG during the period of March 2000 through July 2001.

**Table 1.** Comparison among nests of Meliponini surveys in Brazil (modified by OLIVEIRA *et al.*, 1995).

Places	Area (ha)	Number of Nests	Density of Nests/ha	Number of Species	Author
Goiás	38,0	64	1/0,60	-	KERR (1980)
Mato Grosso	114,0	380	1/0,30	-	KERR (1980)
Amazonas	1,0	1	1/1,00	1	OLIVEIRA <i>et al.</i> (1995)
Amazonas	100,0	15	1/6,67	9	OLIVEIRA <i>et al.</i> (1995)
São Paulo	574,63	566	1/1,01	19	FREITAS (2001)
Minas Gerais	132,58	34,88	1/3,80	4	This Study

**Table 2:** Monthly total Meliponini nests of, species and average number, observed in an urban area of Juiz de Fora city, MG during the period of March 2000 through July 2001.

Month of Observation	Sp1	Sp2	Sp3	Sp4	Total	Temperature mean (°C)	Humidity mean (%)	Precipitation mean (mm)
March/2000	23	5	2	2	32	20,3	85,0	166,3
April	23	7	2	2	34	19,1	80,5	23,5
May	24	7	2	2	35	17,2	78,0	8,1
June	15	6	2	2	25	17,1	74,0	0,0
July	14	6	2	2	24	15,2	80,5	9,5
August	15	6	3	2	26	16,8	72,5	57,2
September	14	6	3	2	25	17,1	81,0	152,7
October	19	7	3	2	31	21,4	72,0	95,2
November	23	7	3	2	35	19,6	84,0	144,7
December	23	11	3	2	39	21,0	83,0	269,7
January/2001	25	10	3	2	40	22,1	77,0	136,5
February	29	11	2	2	44	22,8	76,0	235,9
March	28	11	2	1	42	21,7	79,4	319,0
April	27	11	2	1	41	21,2	75,5	3,8
May	27	11	2	1	41	17,9	79,1	46,2
June	25	11	2	1	39	17,5	76,0	2,0
July	25	12	2	1	40	16,7	53,0	1,0
Number Mean	22,30	8,53	2,35	1,70	34,88	--	--	--

Sp1 *Nannotrigona testaceicornis*;

Sp2 *Tetragonisca angustula*;

Sp3 *Trigona spinipes*;

Sp4 *Partamona* sp.

**Table 3.** Substrata preference in percentage used for foundation by the species of Meliponini found in an urban area in Juiz de Fora, MG during the period of March 2000 through July 2001.

Observed species	Categories of Substrata				
	Constructions	Trees	Nests of Termite unoccupied	Cavities in the ground	Rational boxes
<i>Nannotrigona testaceicornis</i>	88,65%	8,97%	-	2,33%	-
<i>Tetragonisca angustula</i>	37,20%	4,81%	23,47%	-	33,8%
<i>Trigona spinipes</i>	-	100%	-	-	-
<i>Partamona</i> sp.	100%	-	-	-	-
<b>TOTAL</b>	<b>70%</b>	<b>14%</b>	<b>6%</b>	<b>0,5%</b>	<b>9%</b>