THE USE OF TREES FOR NESTING BY STINGLESS BEES IN BRAZILIAN CAATINGA

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Stingless bees (1)

- Large perennial colonies
- Complex nest structures
- Morphological castes

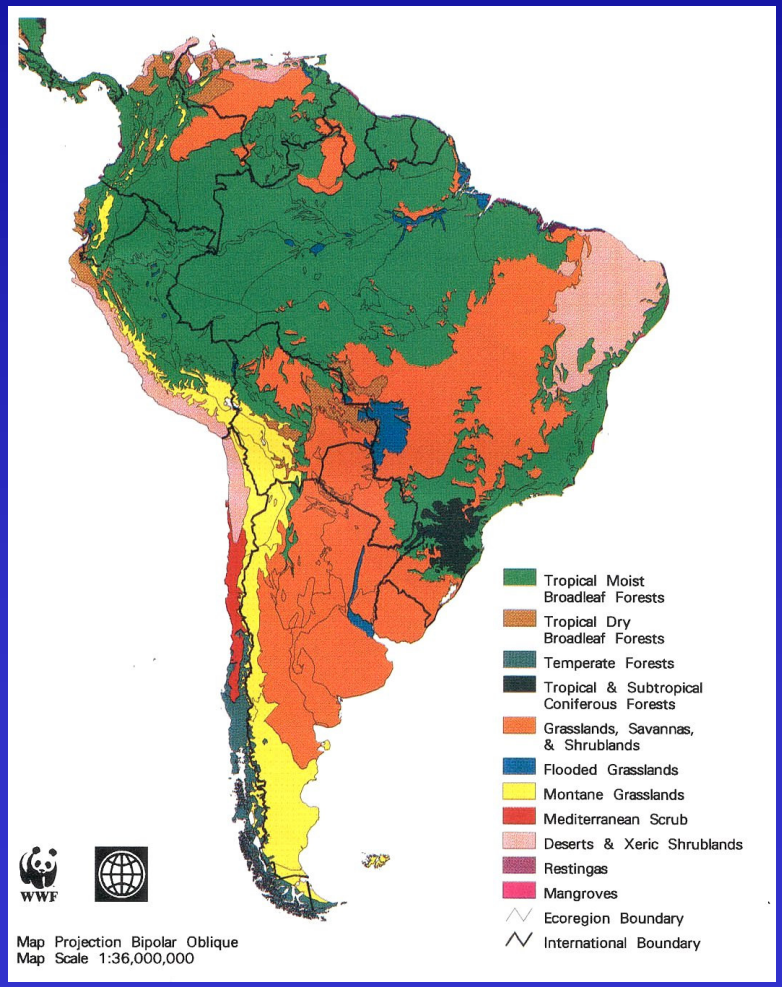
Trigonini queens are reared in larger brood cells
Meliponini queens are reared in normal sized brood cells

Stingless bees (2)

- Egg laying by one queen: unique for the POP syndrome
- Complex division of labor among nestmates
- Recruitment for food sources
- Honey and pollen storage
- Colony reproduction by swarming

Stingless bees in caatinga

- Caatinga is a large dry area in northeast Brazil, where stingless bees rearing has a popular tradition



Caatinga

- Caatinga suffers from two main human impacts: the cutting of trees for firewood and its use as cattle land. The studied area has the lowest precipitation (300-500 mm per year) of all ecosystems known for Brazil

Stingless bees in caatinga

Melipona asilvae
- rajada

Melipona subnitida
- jandaira

Frieseomelitta varia
- breu

Frieseomelitta sp
- amarela

Plebeia sp
- jati

Scaptotrigona sp
- canudo

Stingless bees in caatinga

- *Melipona subnitida* is the main species

- Nest Entrance

Stingless bees in caatinga

- *Melipona asilvae* is another potential source of benefits for local people

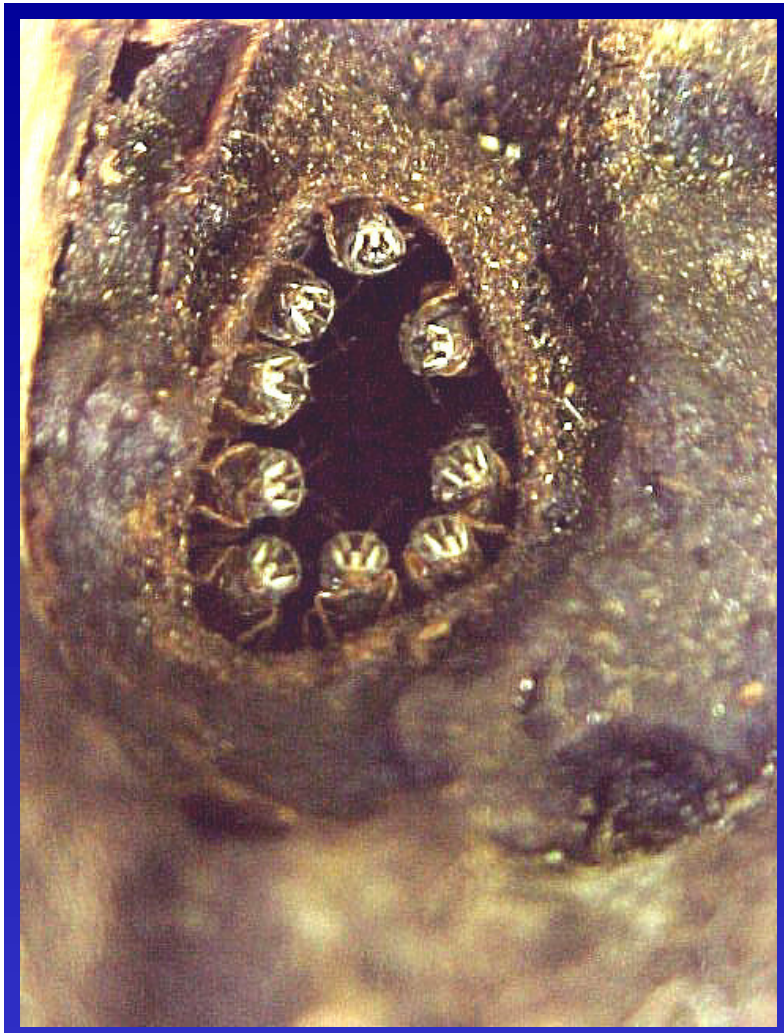
Stingless bees in caatinga

Frieseomelitta varia dispar

Stingless bees in caatinga

Frieseomelitta aff. *duoderleini*

Stingless bees in caatinga



Plebeia flavocincta

Plebeia sp

Stingless bees in caatinga

Scaptotrigona aff. *depilis*

Stingless bees nests in caatinga

- Our survey was done in two Caatinga regions of North-eastern Brazil and involved stingless bees nests encountered in tree trunks and in trees in the field;

- The obtained information is a first step towards a better conception of the use of trees by stingless bees in this area

Stingless bees nests in caatinga

- Facts about nests were obtained directly from trees in the field or from trunks with living nests, which had been gathered by local Meliponine beekeepers

- First, the species of bees and the species of tree in which it nested were determined. Next, the external perimeter was measured through which the diameter could be calculated.

Stingless bees nests in caatinga

- In case a tree or trunk was not evenly cylindrical, two measurements were taken, one at its smallest and one at its biggest perimeter, together rendering an average perimeter value

Stingless bees nests in caatinga

- In the cases where a colony was transferred from its trunk to a rational hive, it was possible to measure the internal trunk diameter and precise height of the nest. This consequently made it possible to calculate the volume a colony occupied

- For obtaining information about the bee nests, 198 trunks and 29 trees in the field were examined

Stingless bees nests in caatinga

- A great part of the nests in trunks were of *Melipona subnitida*, (n = 130) of which 50.0% was found in *C. leptophloeos* and 22.3% in *C. pyramidalis*. (Figure 1)

- *Melipona asilvae* was predominantly found in *C. pyramidalis* (92.3 %, n = 39). (Figure 2)

Stingless bees nests in caatinga

Table 1: Stingless bees nests in caatinga

Melipona subnitida	57.3%
Melipona asilvae	17.2%
Frieseomelitta varia dispar	13.7%
Frieseomelitta aff. *doederleini*	5.3%
Plebeia flavocincta	1.8%
Plebeia sp	1.2%
Scaptotrigona aff. *depilis*	3.5%

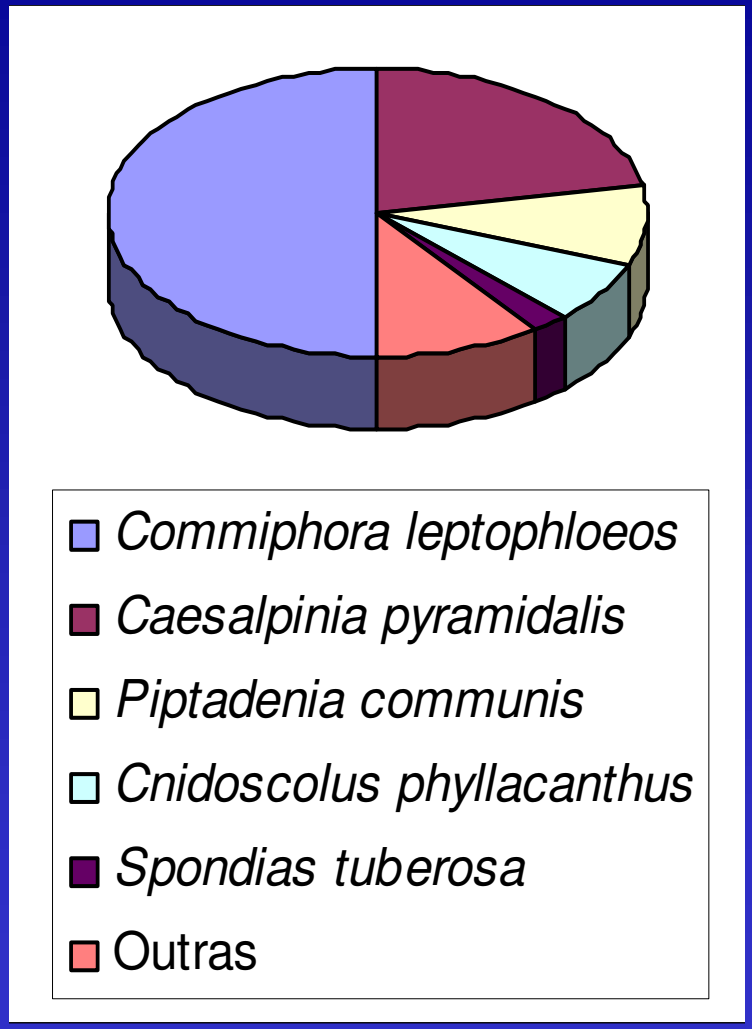


Figure 1. *Melipona subnitida*

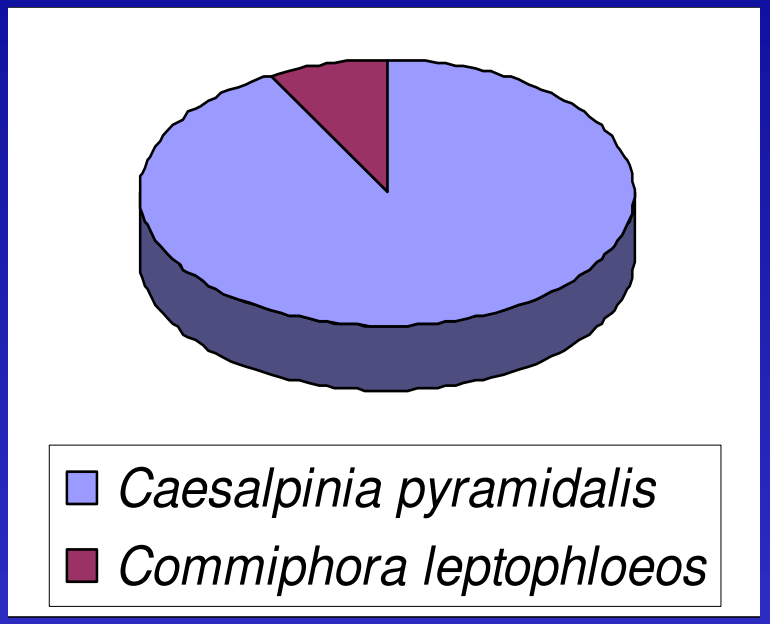


Figure 2. *Melipona asilvae*

Trees for bees

Table 2. Tree species used as nest by Meliponinae. Ms.= *Melipona subnitida*, Ma.= *Melipona asilvae*, Fd.= *Frieseomelitta aff. doederleini*, Fv.= *Frieseomelitta varia*, Pf.= *Plebeia flavocincta, Psp.= Plebeia sp*. and Sd= *Scaptotrigona aff. depilis.*

Espécies de abelhas	Ms.	Ma.	Fd.	Fv.	Pf.	Psp.	Sd.	TOTAL	%
Espécies vegetais									
Commiphora leptophloeos	65	3		6			3	77	33,9
Caesalpinia pyramidalis	29	36	9	12	4	3	2	95	41,9
Piptadenia communis	11							11	4,8
Cnidoscolus phyllacanthus	9							9	4,0
Spondias tuberosa	3		1	1			1	6	2,6
Anadenanthera collubrina	2							2	0,9
Aspidosperma pyrifolium	2							2	0,9
Lycania rigida	1							1	0,4
Tabebuia caraiba			1				2	3	1,3
Mimosa acutistipula			1					1	0,4
Astronium urundeuva				2				2	0,9
Schinopsis glabra				10				10	4,4
Outros	8							8	3,5
TOTAL	130	39	12	31	4	3	8	227	
%	57,3	17,2	5,3	13,7	1,8	1,3	3,5		

Bees and *C. pyramidalis*

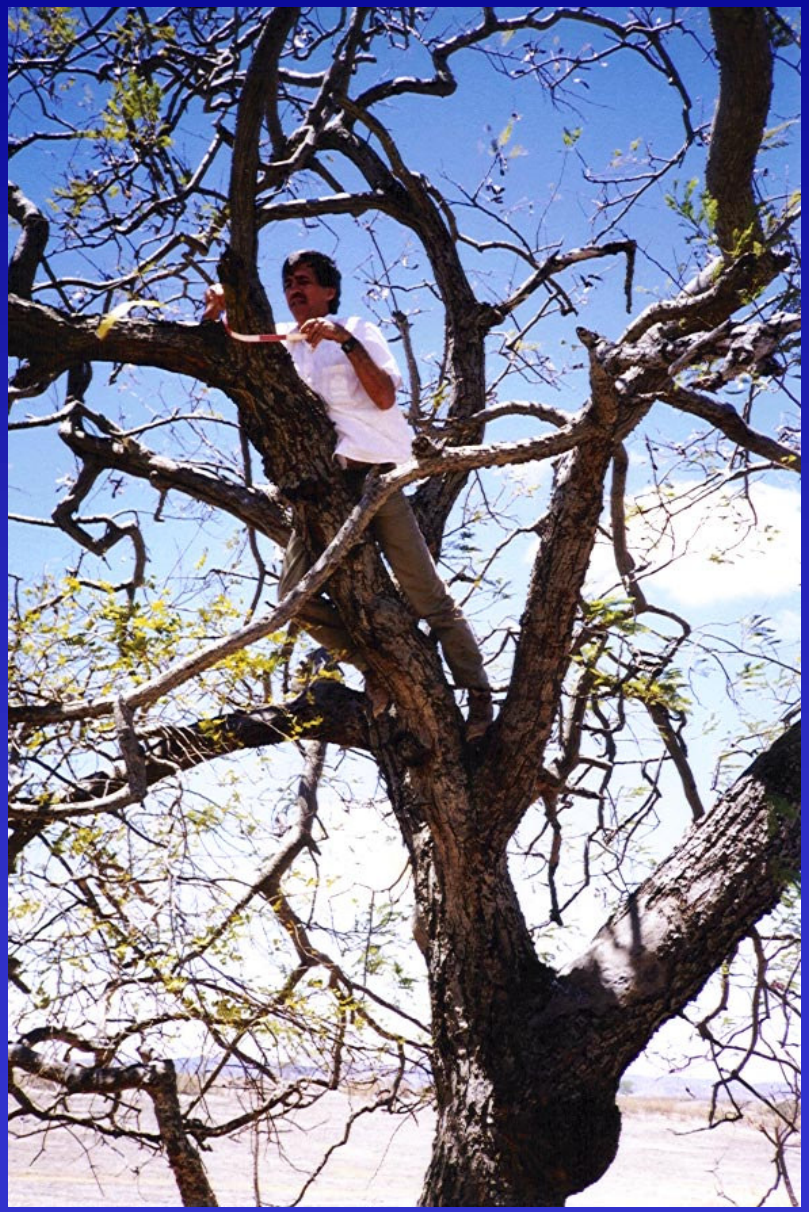
- *C. pyramidalis*

- *Melipona subnitida*, *Melipona asilvae*, *Frieseomelitta varia dispar*, *Frieseomelitta aff. duoderleini*, *Plebeia flavocincta*, *Plebeia sp* and *Scaptotrigona aff. depilis*

Caesalpinia pyramidalis
(“Catingueira”, Caesalpiniaceae)

Commiphora lepthophoeos
("Imburana", Burseraceae)

Tree diameters and nest volumes



- The diameters of trees and trunks used by the bees reached from 9 up to 82 centimetres (mean = 20.7 cm, n = 227, table 3)

- More than 80.0% of the nests were encountered in diameters above 13 centimetres, more than 56.0% were encountered in diameters above 16 centimetres. The larger diameters to be found were ranging from 39 up to 50 cm in diameter.

Table 3. Diameters (cm) of tree species used as nest by Meliponinae.

Espécies de abelhas / Espécies vegetais	*M. subnitida* N	Range	X	s	*M. asilvae* N	Range	X	S	*F. aff. doederleini* N	Range	X	s	*F. varia dispar* N	Range	X	s
Commiphora leptophloeos	65	9-47	17,4	5,15	3	12-33	21	10,90					6	10-25	13,8	5,64
Caesalpinia pyramidalis	29	9-33	15,8	4,74	36	12-40	22,9	6,30	9	9-17	13,7	2,87	12	10-40	28,4	13,06
Piptadenia communis	11	12-30	17,5	3,75												
Cnidoscolus phyllacanthus	9	14-34	18,4	4,51												
Spondias tuberosa	3	12-20	16,0	4,00					1	22	22,0	-	1	22	22,0	-
Anadenanthera collubrina	2	15-28	21,5	9,19												
Aspidosperma pyrifolium	2	32-39	35,5	4,95												
Lycania rigida	1	82	82,0	-												
Tabebuia caraiba									1	50	50,0	-				
Mimosa acutistipula									1	31	31,0	-				
Astronium urundeuva													2	26	26,0	0,00
Schinopsis glabra													10	20-40	29,0	8,75
Outros	8	10-18	14,2	2,60												
TOTAL	130	9-82	17,7	7,79	39	12-40	22,7	6,60	12	9-50	18,8	11	31	10-40	25,4	11,22

Bee species / Plant species	*S. aff. depilis* N	Range	X	s	*Plebeia flavocincta* N	Range	X	s	*Plebeia sp.* N	Range	X	s
Tabebuia caraiba	2	40-50	45,0	7,10								
Caesalpinia pyramidalis	2	20	20,0	0,00	4	12-19	15,7	2,98	3	9-16	13,3	3,78
Commiphora leptophloeos	3	78-78	78,0	0,00								
Spondias tuberosa	1	28	28,0	-								
TOTAL	8	20-78	49,0	26,00	4	12-19	15,7	2,98	3	9-16	13,3	3,78

Melipona subnitida nests

- Internal diameter and height of six *M. subnitida* nests varied from 5 up to 13 cm (mean = 8 cm) and from 63 up to 150 cm (mean = 112 cm) respectively, representing volumes of 2.4 up to 8.6 litres (mean = 5.6 litres).

Are stingless bees opportunists in their use of tree cavities for nesting?

- This study shows that stingless bees nests can be encountered in many different tree species, which in case of *M. subnitida* was eight species;
- From our data, a possible preference of certain bees for trees is suggested

Do stingless bees compete with honeybees for nest sites?

- Castro, in caatinga from Bahia state, found *Apis mellifera* nests hanging from *Schinopsis brasiliensis* branches, in tree trunks (*Caesalpinia ferrea, Caesalpinia pyramidalis, Commiphora lepthophoeos, Spondias tuberosa*) and in an arboreal termite nest. They are strong competitors for nests sites

Are these trees used by local people?

- Several of the caatinga tree species have a local economic value:
  - for construction and firewood (*Commiphora lepthophoeos*, *Caesalpinia pyramidalis*, *Anadenanthera collubrina*, *Piptadenia communis*, *Aspidosperma pyrifolium and Lycania rigida*)
  - for cattle food (*Caesalpinia pyramidalis*, *Cnidoscolus phyllacanthus*, *Spondias tuberosa* and *Anadenanthera collubrina*) (Castro, 2001).

Are nest sites available?

- Availability of tree cavities can also be limited by a too small amount of trees related to alterations in vegetation like deforestation or natural disasters;
- Areas having a similar kind of vegetation can differ significantly in floral composition, which may reflect disturbance by human interference;

Are nest sites available?

- Where trees were cut, stingless bees nest in tree roots, as shown here for *Melipona asilvae*.

Imburana's branches sprouting

Acknowledgments

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