



Matrix of selection for Brazilian bee species to risk assessment

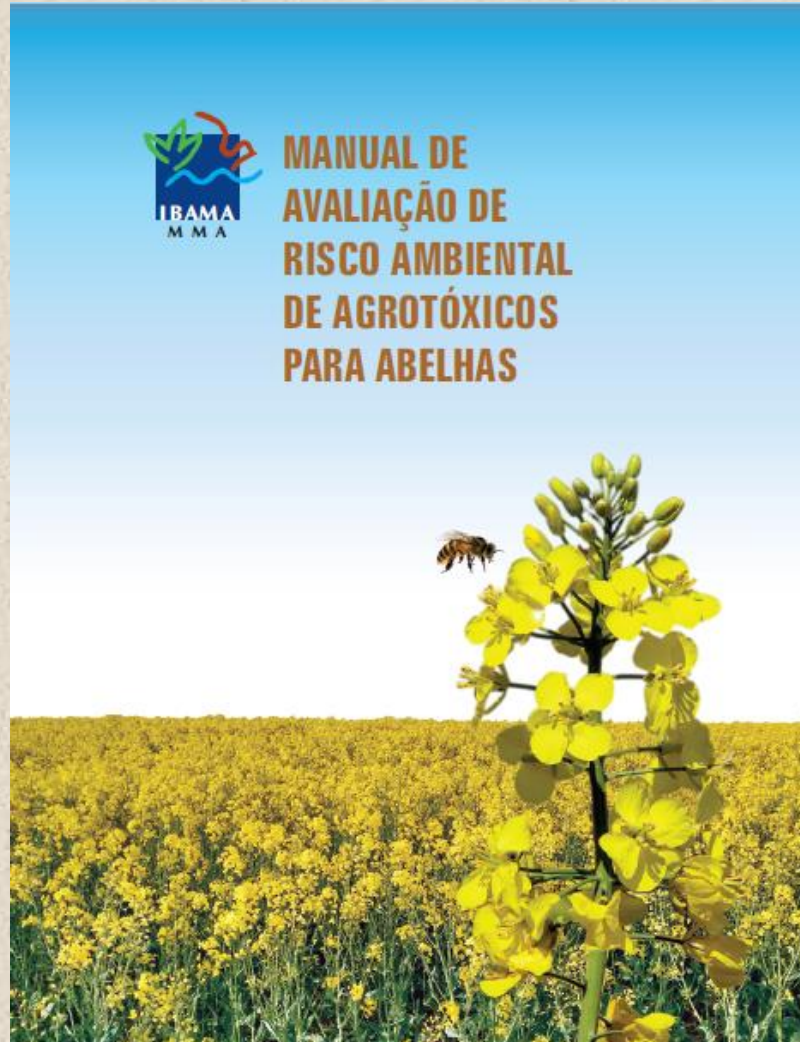
Nocelli, Roberta; Pires, Carmen; Torezani, Karoline; Cione, Ana; Shiwa, Andreia; Tonelli, Carlos; Marcondes, Cayssa; Belchior, Ceres; Viana-Silva, Flávia; Guimarães, Guilherme; Teixeira, Ivan; Cham, Karina; Borges, Leandro & Malaspina, Osmar.

Honeybees



IN nº 02,
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First rule based
on risk



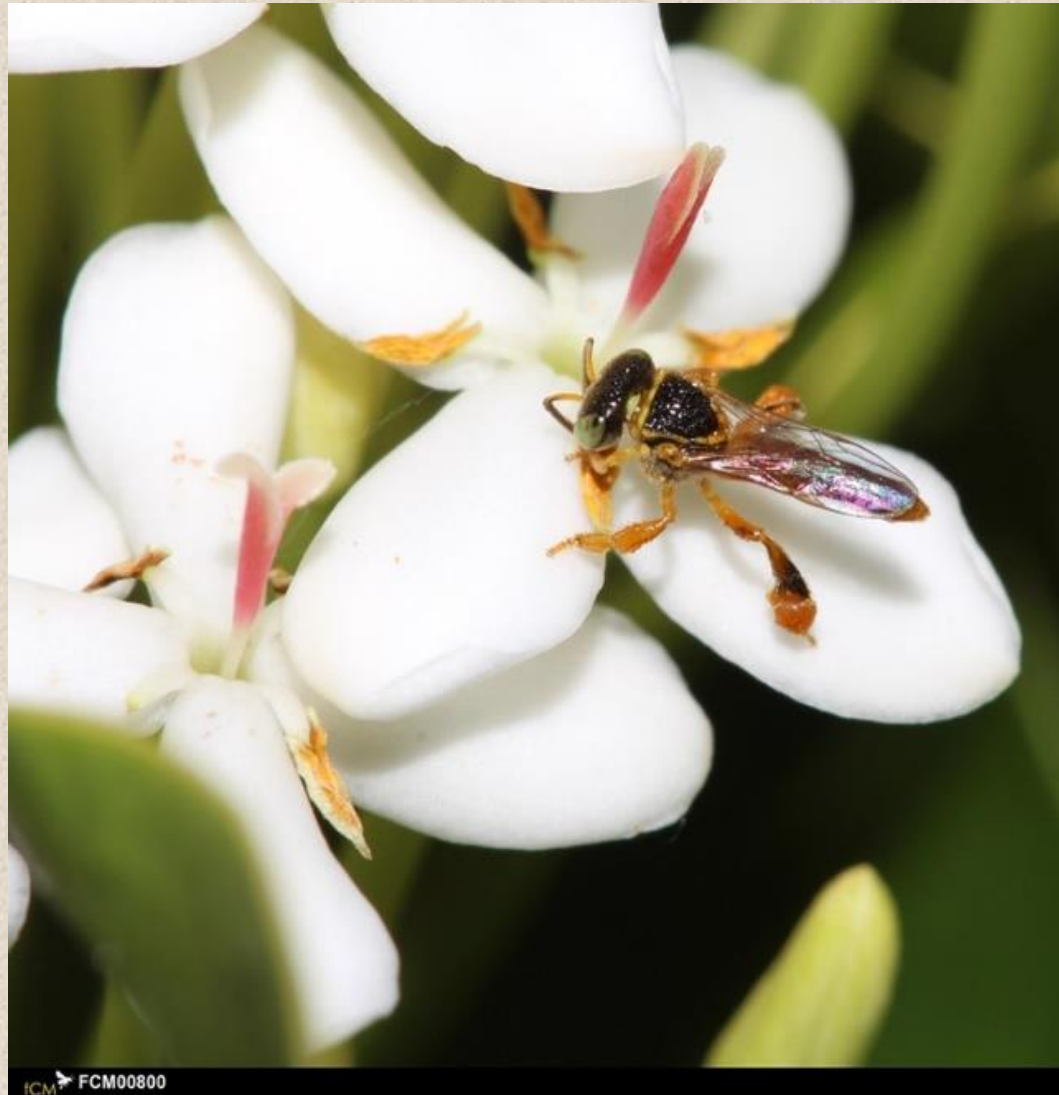
Guidance of
Ecotoxicological Risk
Assessment of Pesticides
for Bees

Available on
[http://www.ibama.gov.br/
agrotoxicos/reavaliacao-
ambiental](http://www.ibama.gov.br/agrotoxicos/reavaliacao-ambiental)

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Focus on native non-*Apis* bees

- 2015
- 2016
- What are the species with high exposure in agricultural crops?
- Matrix of selection



Step 1: List of bee species per crop

Agricultural crops			
Açaí berry	Cassava	Macadamia nut	Pumpkin
Annatto	Castor oil plant	Mango	Soybean
Apple	Citrus	Melon	Star fruit
Avocado	Coffee	Mulberry	Strawberry
Barbados cherry	Cotton	Okra	Sugar cane
Bean	Cucumber	Onion	Sunflower
Brazil nut	Eggplant	Passion fruit	Suriname cherry
Canola	Gliricidia	Peach	Tomato
Carrot	Guava	Pepper	Watermelon
Cashew	Jatropha	Pomegranate	Wheat

40 crops → 386 non-*Apis* species

Step 2: Criteria used

Main criterion	Secondary criterion
1. Geographical distribution	
2. Association with agricultural environments	2.1 Occurrence in crops 2.2 Abundance
3. Importance as pollinator	3.1 For the crop 3.2 For the natural vegetation
4. Collected resources	4.1 Nectar 4.2 Pollen 4.3 Floral oils 4.4 Resin
5. Biological aspects	5.1 Nidification inside the collecting area 5.2 Is it a managed specie? 5.3 Size of the colonies
6. Economic importance	6.1 Production of honey, propolis, pollen and royal jelly

Step 3: Matrix

- 48 bee species:
 - 20 social bee species;
 - 28 solitary bee species.

Social bee species

Social bee species	Final score
<i>Trigona spinipes</i>	28
<i>Tetragonisca angustula</i>	24
<i>Nannotrigona testaceicornis</i>	22
<i>Melipona scutellaris</i>	21
<i>Melipona quadrifasciata</i>	20

Trigona spinipes (Arapuá, Dog Bee)



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Trigona spinipes

Pros

- Wide geographic distribution



- Representative (n=32)
- Colonies with large number of bees

Cons

- No methods to manage colonies in laboratory conditions
- Not available commercially, very aggressive
- Protocols for acute toxicity tests available but not standardized
- No protocols for semi-field or field tests

Tetragonisca angustula (Jataí)



Tetragonisca angustula

Pros

- Wide geographical distribution



- Relatively representative (n=19)
- Commercially available and easy to manage

Cons

- No protocols for toxicity or semi-field and field tests

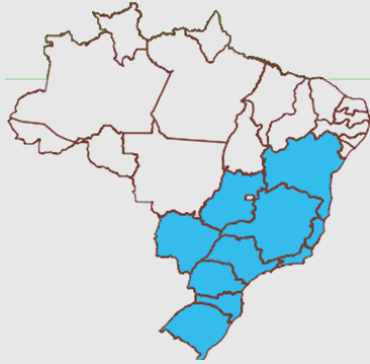
Nannotrigona testaceicornis (Iraí)



Nannotrigona testaceicornis

Pros

- Geographical distribution in northeast, southeast and south, but not in legal Amazon



- Easy to manage
- Hives available commercially

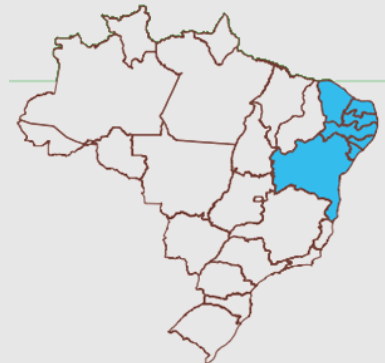
Cons

- Low occurrence in crops (n=5)
- No methods to manage colonies in laboratory conditions
- No protocols for toxicity, semi-field or field tests

Melipona scutellaris (Uruçu)



Melipona scutellaris

Pros	Cons
<ul style="list-style-type: none">• Biology well known• Easy to manage• Toxicity can be tested using standardized protocols (lab/field)• Hives commercially available	<ul style="list-style-type: none">• Geographical distribution restricted to Northeast  <ul style="list-style-type: none">• Included in the national list of threatened species• Low occurrence in crops (n=4)• Method for larvae available but not standardized

Melipona quadrifasciata (Mandaçaia)



Melipona quadrifasciata

Pros

- Easy to manage
- Geographical distribution in northeast, southeast and south, but not in legal Amazon



- Toxicity can be tested using standardized protocols
- Hives available commercially

Cons

- Colonies with medium number of bees
- Low occurrence in crops (n=9)

Solitary bee species

Solitary bee species	Final score
<i>Xylocopa frontalis</i>	20
<i>Xylocopa grisescens</i>	19
<i>Eulaema nigrita</i>	18
<i>Centris aenea</i>	17
<i>Centris tarsata</i>	
<i>Exomalopsis analis</i>	16
<i>Epicharis flava</i>	



Xylocopa grisescens



Xylocopa frontalis



Epicharis flava



Exomalopsis analis

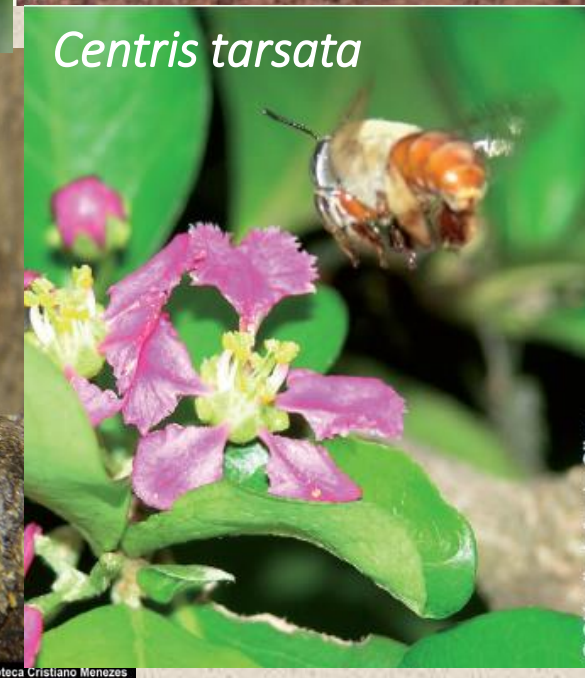
Paula C. Montagnana



Eulaema nigrita



Centris aenea



Centris tarsata

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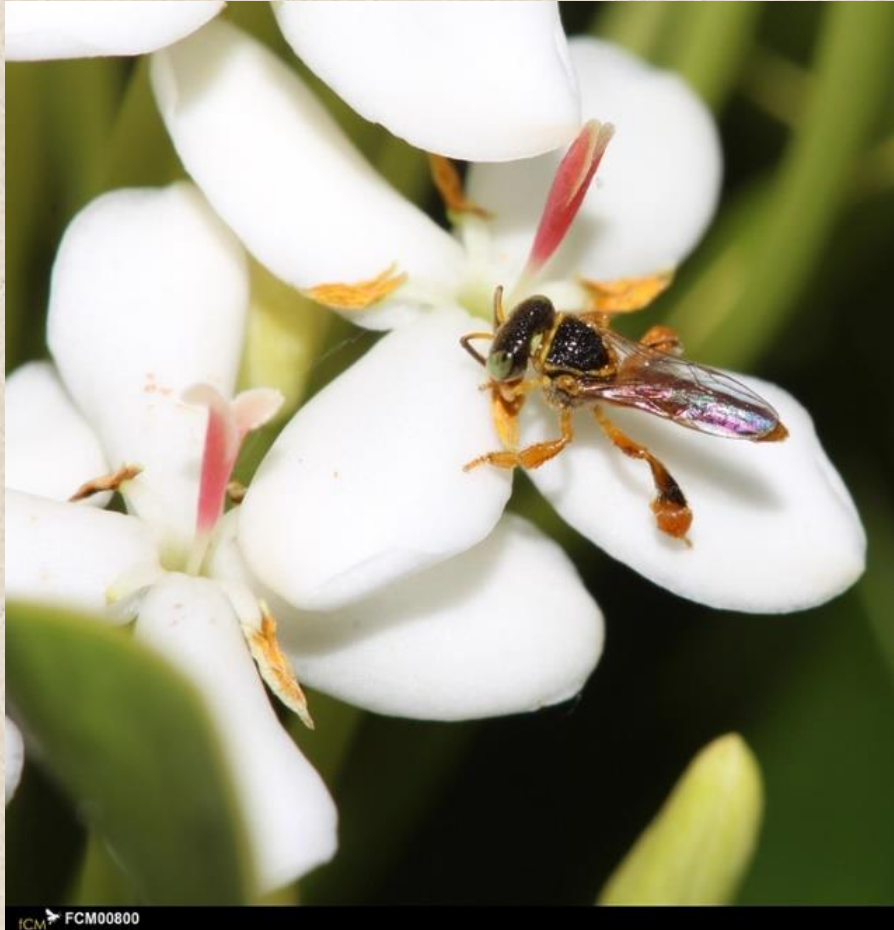
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Conclusions

- The matrix proved to be a useful tool
- To be considered as the most representative species:
 - wide geographic distribution &
 - at least 4 agricultural crops
- Meliponini = stingless bees
- *Tetragonisca angustula* → very good option. Is she more sensitive than *Apis*?
- Consider that the matrix is a dynamic tool
- Some crops: no bees or lack of research?

Next steps



- Call for research in order to fill the gaps and assess the need of inclusion of a native bee in the risk assessment scheme and development/adaptation of protocols and tools.
- Assess the need of changes in the risk assessment procedure for bees

Working Group on Risk of Pesticides to Bees in Brazil



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Thank you for your attention!

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