

BIODIVERSITY AND SUSTAINABLE USE OF POLLINATORS, WITH EMPHASIS ON BEES

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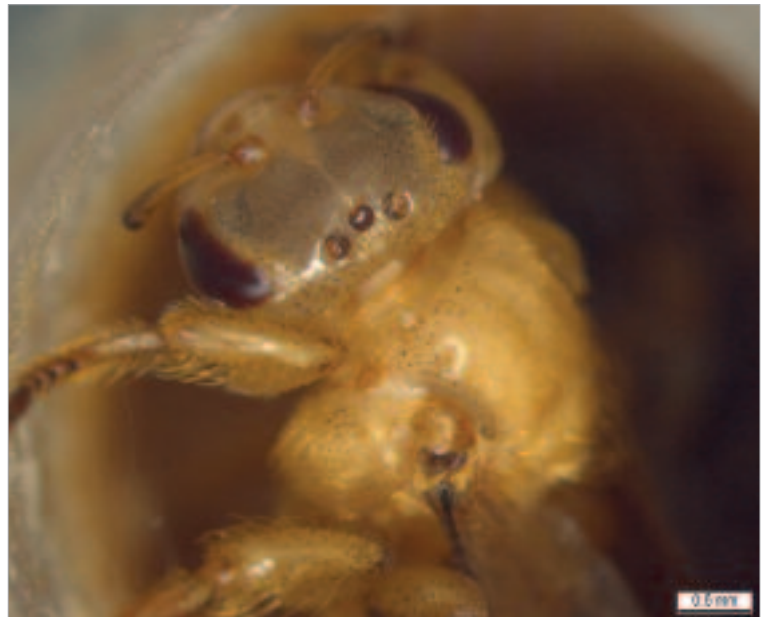
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The Convention of Biological Diversity and the United Nations Millennium Assessment Program (www.millenniumassessment.org) considers environmental services provided by pollinators, with emphasis on bees, as a priority for the 21st century. Conservation and sustainable use of pollinators helps to ensure food security, sustainable agriculture and wild plant conservation.

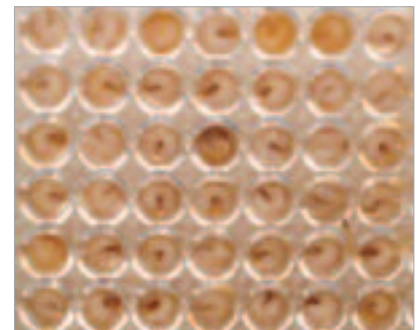
This project has four components: i) evaluation of the status of the interactions between bees and plants; ii) population dynamics of native bees, using molecular tools; iii) problems that limit the use of bees in agriculture; iv) information Technology tools for research and extension in ecosystem services (with emphasis on bees as pollinators).

Improvement of the knowledge base on bees focuses on reproductive aspects (individual and colonial), swarming, nest founding, colony growth, protein diets for colony feeding, sex allocation, automatic monitoring of colony growth and flight activity and studies of bees on flowers. Trap nests will be used to study solitary bee diversity in habitat fragments. Nogueira-Neto meliponaries in São Simão (SP), Luisiania (Goiás) and Xapuri (Acre) will be intensively studied, as well as stingless bees nests found on the university campuses in São Paulo and Ribeirão Preto will be used, as control.

A field station will be established in Mossoró (Rio Grande do Norte), where



Above, in vitro reared queen and on right, in vitro reared larvi



colony absconding is very frequent (30% to 50% of colonies in apiaries). A new program for beekeeping development was established at this location, monitoring absconding and correlated environmental conditions. Artificial diets and foraging behavior will also be studied, including efficiency on some crops, including sunflower and melon. This research will also include a study of Africanized bee biology and dynamics, using morphometrics to help understand their migratory behavior.

Amongst the social bees, stingless bees (Meliponini) are very representative in tropical areas and could be used as crop pollinators, as well as for wild flower pollination.

SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

We have developed a system for automatic identification of Meliponini species to determine their areas of occurrence, the study of swarming activity with trap nests for stingless bees, rearing queens *in vitro* and the effects on inbreeding, through studies of meliponaries and regional mating, analyzing sex ratios, queen supersedure and colony development. Molecular studies are also under development in a stingless bees beekeeping project, to determine if diploid males develop, with a good possibility of a new method for detecting them in nature by analyzing adult bees. *Melipona scutellaris* is a key species with great potential for beekeeping and pollination; an intensive study of this species is under development.

Research is being done on improving stingless bees beekeeping, with focus on potentially useful species, including *Scaptotrigona depilis*, *Nannotrigona testaceicornis*, *Melipona bicolor*, *Melipona quadrifasciata*, *M. rufiventris*, *M. scutellaris*, *Schwarziana quadripunctata* and *Tetragonisca angustula*.

The conflict between workers and queens to produce sexuals is also under investigation in stineless bees (Meliponini), through analysis of the maternity of the males with molecular tools (microsatellites). Colony conflict also includes queen production by the colonies. Producing enough queens is a limitation for large-scale breeding of stingless bees. Because of this, rearing queens *in vitro* is being investigated, with very good results until now. These queens have been studied, and they perform appropriate adult activities. This is a very relevant point of this project.

We are also working on a data bank of bees that are in CEPANN collections with around 40,000 bees, representative of São Paulo state and other areas where research of the Biosciences Institute bee lab has been done. A XLM schema was developed for the plant-pollinator relationships. This schema can be consulted and is under development in the site of Taxonomic Database Working group (TDWG) in <http://wiki.tdwg.org/twiki/bin/view/DarwinCore/InteractionExtension>. We will include 17,000 records of bees on flowers available for bees deposited in the CEPANN collection.

Another resource is the study of bee nests. Trap nests are a standard method for evaluating solitary bees (under development in part 3 of this project). Trap nests for Meliponini bees are also being studied. We are recording the swarming frequency and behavior of some species that use our trap nests, the size of new populations and how successful they are. A survey of trees as a nest resource in Brazil is under development, as well as lists of trees used by stingless bees for nesting to help orient environmental restoration. To facilitate these studies, a software was developed for the pocket PC platform. Field data recording and transfer to computers are facilitated with this Trap nest scouter.

MAIN PUBLICATIONS

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