THE DANGER OF INTRODUCING BEE SPECIES: A CASE STUDY ON BRAZILIAN TROPICAL SAVANNA

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Summary

The introduction of *Apis mellifera* L. on Brazilian territory begun in the first half of IXX century and from that time on different subspecies were brought by European immigrants; however national honey production remained incipient. In 1956, queens of *Apis mellifera scutellata* Lepeletier (1836) were brought from Africa in a scientific attempt to increase Brazilian honey production. Unfortunately, 26 colonies swarmed due to an accident on the bee yard. The African and the European subspecies mated producing the Africanized *A. mellifera*. The hybrids presented a strong foraging activity, highly healthy colonies, strongly defensive and absconding behavior. Nowadays the Africanized *A. mellifera* is one of the most abundant floral visitors of mellitophilous plant species in the Neotropics, spread from Northern Argentina up to Southern United States. Myrtaceae is an ecologically important family in many different areas of Brazilian territory. *Campomanesia pubescens* is a native Myrtaceae from Brazil, its hermaphrodite flowers offer pollen as the sole resource attracting six bee species, but just one of them was considered pollinator, *Eulaema nigrita*. The most frequent and abundant visitor was the honeybee *A. mellifera* L., here considered as a pollen thief, unable to pollinate due to its size and behavior. The pollinating tests indicated *C. pubescens* was self-compatible, although fruit formation was increased by cross-

pollination. As *E. nigrita* avoided plants visited by many honeybees, fruit formation decreased in the presence of the honey bee. As there is an overlap in the distribution of *A. mellifera* and the genus *Campomanesia*, there is a need to observe these plants for a possible decline in abundance of its species in Latin America due to the pollinator deprivation, as observed on *C. pubescens*. These kind of data evidence the high impact that *A. mellifera* can produce on native bee fauna and consequently on American vegetation.

1. Introduction

Authorities from the Brazilian Federal Government and the São Paulo state asked professor Dr. Warwick Estevam Kerr to attempt to increase the national honey production. So, in November 1956, Dr. Kerr introduced 133 pure African queens of *Apis mellifera adansonii* Latreille (1804) in São Paulo state, Brazil. Later those bees were reported to be *Apis mellifera scutellata* Lepeletier (1836). From the initial group of 133 African queens, only 47 bees survived. In March of 1957, 35 pure *A. mellifera scutellata* colonies were moved to a bee yard at the Horto Florestal de Camaquan, an Eucalyptus forest 14 kilometers (8.7 miles) from Rio Claro city. Each colony had a double queen excluder in front of the hive entrance to avoid swarming events, as a secondary consequence the queen excluders caused large amounts of pollen to fall near the entrance. A visiting beekeeper observed the pollen lost near the hives and, trying to help the bees, he removed the double queen excluders from the hive entrances (Gonçalves 1974). Unfortunately, 26 colonies swarmed after that accident.

At that time, some *A. mellifera* subspecies were already present on South America. By the years of 1839, Father Antonio Carneiro brought the German *A. mellifera mellifera* Linnaeus (1758) and in 1870 the Italian bee *A. mellifera ligustica* Spinola (1806) arrived on Brazilian territory by European emigrants (Gonçalves 1989). Some other subspecies as *A. mellifera caucasica* Gorbachev (1916) and the African *A. mellifera carnica* Pollmann (1879) also were brought, but the predominant races were the German, the Italian and their hybrids.

The sexual isolation mechanisms developed since the Sahara desert became a natural barrier were not strong enough to avoid the foundation of many hybrid nuclei, so the African and the European subspecies of *A. mellifera* mated producing the Africanized *A. mellifera*. The hybrids presented a strong foraging activity, strongly defensive and absconding behavior, they also had highly healthy colonies due to the hygienic habits. The Africanized honey bee has colonized many areas, spreading into different Biomes in South America and is currently found from Northern Argentina up to Southern United States.

Nowadays the Africanized *A. mellifera* is one of the most abundant floral visitors of mellitophilous plant species in the Neotropics, mainly from the families Anacardiaceae, Asteraceae, Balsaminaceae, Euphorbiaceae, Labiatae, Moraceae, Myrtaceae, Palmae, Proteaceae, Rubiaceae and Sterculiaceae. The superiority of the Africanized honey bee in collecting flower resources is due to its big colonies, its efficient communication system and its highly competitive behavior. Consequently, the foraging patterns and the abundance of native Latin American pollinators have been altered, as observed on

different places out of that continent. During a period of one year, 107 bee species visited the flowers of Campos Rupestres, a peculiar type of Cerrado growing on rocky soil, at Minas Gerais state, Brazil. The most frequent species with 22.8 % of all the 819 flower visits was *A. mellifera*, its bee visited the biggest number of vegetal species. On a cerrado area from Corumbataí, São Paulo state, 119 vegetal species were observed in order to define the main floral visitors, from the 68 bee species collected on flowers *A. mellifera* was the most frequent and presented the biggest number of vegetal species visited. During approximately a one year study on Bico-do-papagaio region, Tocantins state (an area of cerrado-Amazonian rain forest mixed vegetation), 83 bee species were collected on flowers and *A. mellifera* was the most abundant of all, with 69.79% of the collected bees. These studies evidence the strong ability of *A. mellifera* to displace native pollinators.

Bees are the principal pollinators of Neotropical forests and Cerrado vegetation, the Brazilian tropical savanna. The Cerrado region has 821 bee species from 121 genera already recorded and this number probably is underestimated as it considers only 6.4% (60) of the 921 municipalities from Cerrado.

The Myrtaceae family is one of the most easily found on Brazilian territory, acting as a dominant plant in many different areas. It is compound by approximately 3,675 species distributed in 132 genus of herbs, lianas, shrubs and trees all over the world, specially in America and Australia. The Neotropical Myrtaceae belongs mainly to the sub-family Myrtoideae with 60 genus and about 2,375 species. Their floral resources (mainly pollen but also nectar and sweet petals) and fresh fruits make possible a great variety of interactions with animals, evidencing the ecological importance of its species in South American areas. They can easily be found with lots of small flowers per day on each plant, suggesting high levels of self-pollination, although many studies indicate that facultative alogamy is spread in the sub-family, with self-incompatibility and even late-acting self incompatibility mechanisms. Consequently, the presence of pollen vectors is fundamental to the maintenance of Myrtaceae species on native vegetation and also to the economic viability of many cultivars. The principal pollinators of Myrtaceae are the bees.

Here is presented a case study on a natural area of Cerrado vegetation at São Paulo state, Brazil, where *A. mellifera* disturbed native pollinators and decreased the fruit production of the native species *Campomanesia pubescens* (Myrtaceae).

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Biographical Sketch

Helena Maura Torezan Silingardi is a Brazilian biologist, graduated in Ecology and Conservation of Natural Resources by the Federal University of Uberlândia, Minas Gerais state, with doctorate in Entomology by the State University of São Paulo (USP - FFCLRP), Brazil. Her major interest in ecology is the study of plant-animal interactions, specially pollinators and floral herbivores. Nowadays, she is a pós-doctoral member of the staff of the Plant Reproduction Laboratory at Federal University of Uberlândia, studying the impact of pollinators and floral herbivores on plant fitness from Cerrado areas in central Brazil.