Melipona trinitatis and *Melipona favosa*, the only species of the Genus *Melipona* in Trinidad.

by Marinus J. Sommeijer and Luc L. M. de Bruijn,
Bee Research Department, State University of Utrecht, Netherlands.

The stingless bees (Meliponinae) compose together with the Honeybees (Apinae), the Bumlebees (Bombinae) and the Orchid bees (Euglossinae) the family of the Apidae (Michener 1974). All species of the stingless bees are "eusocial"; this implies that, in a similar way to the honeybee (*Apis mellifera*) they live in permanent colonies with specialized queen and worker castes. The Meliponinae (about 400 species) form a diverse group. The smallest bees measure only 2 mm., while the largest (much bigger than the honeybee) measures about 15 mm. All species have a distribution restricted to the tropics. In Trinidad about 15 species of stingless bees are known to occur, among which are the well known "pegone", *Trigona amalthea*, and various small black bees (some of which are called "sweat bees").

The subfamily of stingless bees can be divided into various groups. One major group is formed by the species of the neotropical genus *Melipona*, with a distribution ranging from Argentina to Mexico. The systematics of this groups are still insufficiently studied. The largest stingless bees, and possibly as a consequence also those that are important for domestication, belong to this genus.

In addition to their great ecological value as the most important pollinators of the tropics, the stingless bees are valuable also for the production of honey and wax. This form of beekeeping, meliponiculture, was very widespread in the American tropics before the introduction of the European honeybee, *Apis mellifera*, by Spanish settlers. Archeological data and historical accounts indicate the great importance of stingless bees in the Maya and Aztec cultures of Meso-America and at the present time meliponiculture is still very common in this region.

The Genius *Melipona* in Trinidad.

Only two species of this group are recorded from Trinidad: *Melipona favosa* (cover illustration) and *M. trinitatis* . *M. favosa* in Trinidad belongs to the subspecies *M. favosa favosa*. This subspecies is also recorded from Tobago, Surinam, Guyana, French Guyana and Venezuela, while other subspecies are recorded from Panama, Colombia, Ecuador etc.

M. trinitatis was considered a subspecies of *M. fasciata*. The *fasciata* group forms a large complex (many subspecies) with a wide distribution. The Trinidad species has also been named *M. scutellaris trinitatis*. The fact that the Trinidad subspecies is rather distinct in varoius characteristics supports its separation as a distinct species (Roubik, pers. comm. 1985). Pending further taxonomic treatment, we will here refer to this species as *M. trinitatis*. At present this species has been recorded only from Trinidad.

M. trinitatis and *M. favosa* are widespread on the island of Trinidad; we collected both species at various localities from Chaguaramas to Rio Claro. It is evident however that *M. trinitatis* is much more abundant than *M. favosa*. In Trinidad both species are found especially in forested areas. Local names are "Moko grande" for *M. trinitatis* and "Moko chiquite" for *M. favosa*.

Nest Sites and Architecture of Nest Sites

The nests of Melipona bees are constructed in cavities, mostly in hollow trees. From outside only a narrow entrance is visible, surrounded in both species by a structure of radiating mud ridges. This narrow entrance allows for efficient guarding of the nest by only a single bee. Various tree species are used: mango, tropical almond, immortelle, etc.

The architecture of the nest inside the cavity has the general characteristics of the nests of most stingless bee species (Fig. 1). The broodcells are constructed in a system of horizontal

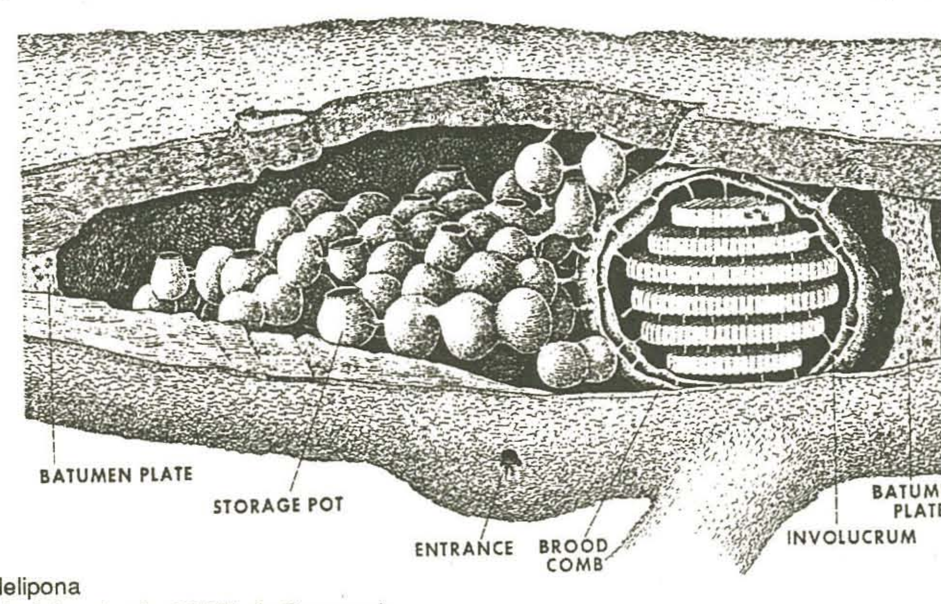

Fig.1 Diagram of nest of Melipona
(from Michener 1974; original drawing by J.M.F. de Camargo)

disks enveloped by waxy sheets: the involucrum. The cells are used only once. As soon as the bees have emerged, the remains of the cells are removed. Gradually a whole comb is removed. When the bees have built their broodnest up to the ceiling of the nest cavity, they will start to utilize the space that became free at the bottom of the broodnest. So, there is a cyclic movement of the place where the young combs are located in the broodnest. The storage pots for honey and pollen are several times bigger than the brood-cells. They are arranged in an irregular compact cluster separated from the brood unit.

The Behaviour Inside the Nest

In both species behavioural characteristics are found that are typical of all stingless bees. The egg-laying behaviour (oviposition) and the system of larval feeding are basically different from that of the honeybee.

1. Mass-Provisioning of Brood Cells

The total amount of larval food is discharged into the broodcell immediately prior to oviposition by the queen. The egg is placed vertically on the surface of the liquid larbal food. Immediately after oviposition the cell is closed by a single worker who in a rotating movement folds the cell-collar inwards.

2. Rhythmicity of Oviposition Behaviour

The construction of broodcells takes place during periods of several hours that are well separated from the periods in which oviposition takes place. These oviposition periods are typically very short (minutes), during which the cell is also filled with larval food. The activities of the oviposition period can be performed in this short time because of the synchroneous increase of activity of queen and workers, giving this period an appearance of excitment.
The temporal sequence of the acts and the cyclic occurrence of cellbuilding, cell provisioning and oviposition are very typical of all stingless bees.

3. Laying Workers

In comparison with the social behaviour of the honeybee where the queen blocks ovary-activation in workers, it is remarkable that *Melipona* workers commonly release eggs in the presence of their queen. These worker eggs are released during the oviposition period, immediately after the provisioning of the broodcell with larval food. As soon as the laying worker withdraws from the cell her egg is eaten by the queen. After this the queen will proceed with her own oviposition in this cell.

Behavioural Interactions Between Queen and Worker.

The intranidal behaviour was especially studied in *M. favosa*. Here the queen rests during the cell construction phase at fixed places away from the cell. She becomes active only shortly before the provisioning of the broodcell. The court of workers surrounding the queen during the extra-oviposition period at her resting place is formed principally by those workers who are also actively participating in cell building in that period. These bees shuttle frequently between the cell which they are building and the distant resting queen. The typical court behaviour is characterized by antagonistic behavioural elements and was found to be imprtant for the regulation of the activity of the queen. By this behaviour workers inform the queen about the state of cell construction (Sommeijer and Bruijn 1984).

Foraging Behaviour and Foodplants

In 1979 we made a first comparative study of foodplants of stingless bees and honeybees in Trinidad by means of an analysis of pollen samples. Returning pollen foragers were intercepted and samples were taken from the corbicular pollen loads. These samples were further analysed at the palynological institute of Utrecht University (Sommeijer, et al 1983)

Recording the pollen flights, we found that pollen was collected especially from 0530 to 0900 hours with a peak at 0800 hours. The nectar flights were most frequent between 1000 and 1600 hours. We found a considerable overlap of pollen spectra for the different species of bees. There was an evident interspecific similarity between *M. favosa* and *M. trinitatis*. Major foodplants for both *Melipona* species were *Spondias mombin* (hogplum), *Mimosa pudica* and *Psidium guajava* (guava). However, some plants were of major importance to the honeybees but not to *Melipona*, eg. *Cocos nucifera* (coconut).

M. trinitatis differed from *M. favosa* by collecting considerable quantities of pollen from unidentifiable palms, hereby ressembling *Apis mellifera*. Nectar samples, too, were collected from these bees but still await analysis so a list of the more important nectar-supplying plants cannot be given.

Meliponiculture

In Trinidad the domestication of stingless bees is common, especially in the Central Range. Nearly all domesticated colonies are *M. trinitatis*; *M. favorsa* is only rarely domesticated. The honey, which is sold at a high price, is called bush honey or forest honey. It is used for regular consumption, for various medical treatments and in religious ceremonies. The domesticated nests are generally located in wooden boxes of about 75 x 30 x 30 cm. The extraction of the honey is performed only once a year. The amount harvested does not exceed the contents of a few bottles, which is considerably less than the harvest of a honeybee hive. Next to the domestication of colonies in hives, the regular extraction of honey from a nest at its natural forest site is not uncommon. The advent of Africanized honeybees (an African race of *Apis mellifera*) is causing great difficulties for apiculture with the well known races of *Apis mellifera* which were originally introduced from Europe. In Trinidad the agressiveness of the present bybirds is also responsible for an increasing interest in the development of meliponiculture with the indigenous stingless bees.

References

Michener, C. D. (1974). The social behaviour of the bees. Belknap Press of Harvard University Press, Cambridge, Massachusetts, 404 pp.

Sommeijer, M.J., De Rooy, G.A., Punt, W.A. and de Bruijn, L.L.M. (1983). Comparative study of foraging behaviour and pollen resources of various stingless bees (Hym., Meliponinae) and honeybees (Hym., Apinae) in Trinidad, West-Indies. Apidologie 14(3) : 205-224.

Sommeijer, M.J. and de Bruijn, L. L. M. (1984). Social behaviour of stingless bees: "bee-dances" by workers of the royal court and the rhymicity of brood cell provisioning and oviposition behaviour. Behaviour 89 (3/4): 229-315.