

## MISCELLANEOUS OBSERVATIONS ON THE BEHAVIOUR OF *SCHWARZIANA QUADRIPUNCTATA* (HYM., APIDAE, MELIPONINAE)

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OBSERVAÇÕES GERAIS SOBRE O COMPORTAMENTO DE *SCHWARZIANA QUADRIPUNCTATA* (HYM., APIDAE, MELIPONINAE)

### RESUMO

Apresentamos aqui alguns aspectos novos das atividades de rainhas virgens, rainhas grávidas e machos de *Schwarziana quadripunctata*.

Em uma colônia encontramos duas rainhas grávidas, sendo que apenas uma delas punha ovos; a principal atividade da outra rainha era o trabalho com cerume na região do tubo de entrada da colmeia.

As principais atividades dos machos na colônia eram as relacionadas com o néctar: foram observados machos desidratando néctar e trabalhando como receptores de néctar. Possivelmente o néctar seja desidratado para consumo próprio. Estes fatos não foram observados anteriormente nos Apidae sociais, onde machos não trabalham.

### ABSTRACT

This work presents some new aspects of the activities of virgin queens, pregnant queens and males of *Schwarziana quadripunctata*.

Some work with cerumen was performed by the queens of *Schwarziana quadripunctata*. Two pregnant queens were found in a colony: the activity of the oldest was related to the oviposition; the youngest queen worked with cerumen in the canal entrance.

The chief activities of the males of *S. quadripunctata* inside their colony are related to nectar. Some males were seen working with cerumen and other working as nectar receivers and dehydrating nectar. Possibly this nectar was dehydrated for their own nourishment. In other social Apidae, the males don't work.

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A colony of the subterranean stingless bee *Schwarziana quadripunctata*, from Teresópolis (RJ), arrived at our bee Laboratory in January 1972. The nest structures were built with cerumen, but there was also mud inside the hive (a wooden box). An exoinvolucrum was present between the mud and the nest, over a lot of layers of involucrum.

Schwarz (1948: 416) reported on the available literature on *S. quadripunctata*. Smith (1868: 134), H. von Ihering (1903: 227-228), Mariano (1911: 123-124), Bertoni (1911: 142), Ducke (1925: 426), Schwarz (1948: 410-416) described the nest, the subterranean habit and the systematics of this bee, but didn't mention its behaviour.

In meliponine colonies, what first attracts attention is the behaviour of the queen in relation to the behaviour of workers and males. Therefore, the comb and the brood cells are observed (in a experimental hive) chiefly because these are places of the colony where most of the contacts between the different castes occur.

#### *The comb, the construction of cells and emergence of adults*

*S. quadripunctata* has a comb that may have at the same time several cells in different stages of construction (we observed up to 6 of such cells, and our colony was not a very strong one). However, only one cell is ready at a time, as in *Melipona quadrifasciata anthidioides* (see Sakagami *et al.*, 1965: 581).

The queen "fixes" the cell, and some workers (generally 4) put the larval food inside it. Other workers may insert their heads in the cell after the food has been discharged in it. The queen inspects the cells, puts her metasomal tip in it rapidly and oviposits. Sometimes there are ovipositions from workers. The rounded egg of workers is put in the upper margin of the collar of the cell. The queen eats the egg of workers, and soon afterwards she oviposits.

The sealing of the cell does not differ from the kind of sealing observed by Sakagami *et al.* in other species of meliponines (Sakagami *et Zucchi*, 1963: 505).

When a prepupa spins its cocoon of silk, the workers begin to take away the cerumen of the cells. When the pupae are almost ready to emerge, the cocoons are so transparent that it is possible to distin-

guish males from females by the size of their eyes, without opening the cells.

After the emergence of the adults, fecal pellets can be seen in the bottom of the cell; they are individualized and therefore do not form a uniform mass, as in other species we studied (*Plebeia remota*, *P. saiqui*, *P. droryana*, *Paratrigona subnuda*, *Melipona quadrifasciata anthidioides*, *Melipona rufiventris flavolineata*, *Melipona compressipes*, *Nanotrigona testaceicornis*, etc.). Nogueira-Neto (1963: 83-107) made a detailed study of such fecal pellets inside the brood cells. He described them in several meliponines, but not in *S. quadripunctata*. Salt (1929: 442) was the first to mention these pellets in stingless bees.

On March 1972, we saw combs that contained only males, and others that contained males and workers. The males present in the colony at this time were studied, and some important aspects of their biology will be presented here.

#### *Activities of the males*

Males emerge with a whitish colour, and they keep quiet on the comb and on the region of the involucre. However, some males are very active since the emergence: it was observed that they can have specific activities in the hive.

Until the age of seven days, they stay generally on a comb and on the region of the involucre. Afterwards they go to the region of the entrance canal and the region of the honey and pollen pots. Some of the males were seen on the region of the entrance canal, which would suggest a guard activity: others were nectar receivers on the region of the entrance canal and others dehydrated nectar on the warmest places of the hive. It was not possible to verify whether the nectar dehydrated by the males was used as their own nourishment or whether the males put that honey in the honey pots.

Only three males were seen uniting cells with cerumen. Only one male was seen with cerumen in the jaw beside the involucre of the comb.

Several times it was seen that immediately after the oviposition of the queen, the males that were resting or walking near the comb tried to copulate with the queen.

Table I — Activity of two males of *S. quadripunctata*

## a) number 22

Age (days)	Activity
4	walks on the surface of the comb
7	works with cerumen in the involucre of the comb
9	puts cerumen over the cells of the comb
11	tries to copulate with the queen soon after the oviposition
13	in the canal entrance region; in trophalaxis with other male
14	dehydrating <sup>in</sup> the canal entrance

## b) number 42

Age (days)	Activity
7	puts cerumen over the cells of the comb
10	tries to copulate with the queen; touches her metasoma with his antennae
12	in the region of the entrance canal
13	tries to copulate with the queen soon after the oviposition; dehydrating nectar.

It was noticed here only some special activities of the marked males, and in table II for instance, the periods of rest of males in the hive are not shown. It was also not observed the flight of the drones, and the exact period of their life, in autumn.

Table II — Activities of Males of *Schwarziana quadripunctata*

Age (days)	Activity	resting on comb region	putting cerumen over the cells	working with cerumen in involucra	attacked in the hive	trying to copulate with the queen	On pots region	in trophalaxis	in the canal entrance	receiver of nectar	dehydrating nectar	guard
1	*											
2	*****							*				
3	***											
4	*****											
5	*				*							
6	*****				*							
7	***	**	*	*								
8	***	**										
9	**						*					
10	**				*	**		*				
11	*			*	*		*	***				
12	***	*						***				
13	*	*			*		***	*****	*****	*		
14	**							***	*****	*****		
15	*		*				**	*****	*	*		
16								***	*			
17								*				
18												*
19												
20								*				

There are very few references about the activities of males of meliponines. Drory (1873) observed that drones of *Melipona marginata* secrete wax. Later, Nogueira Neto and Kerr confirmed this fact (Nogueira Neto, 1951: 74). Nogueira Neto also (1963: 690) saw males of *Nannotrigona testaceicornis* secreting wax.

Sakagami & Laroca (1963) observed drones of *Lestrimellita limao* trying to copulate with a physogastric queen of the same species. Naves da Silva (personal communication) and Nogueira Neto (personal communication), independently of each other, opened colonies of *Melipona quadrifasciata* in the bee yard and saw some males trying also to copulate with the laying queen. I saw the same thing in a colony of *Paratrigona subnuda* but in this case the mated queen was not yet laying and the colony was inside the laboratory.

Nogueira Neto (personal communication) saw a male of *M. scutellaris* collecting nectar in flowers of *Hyptis* sp., in his garden in São

Paulo. V L. I. Fonseca & M. A. C. Oliveira (in press) saw males of *P. saiqui*, inside observation hives, with cerumen in their jaws and, frequently, others dehydrating nectar. I. Fonseca also observed males dehydrating nectar in *Paratrigona subnuda* (Moure).

### *Queen behaviour*

There was a laying queen in the colony, apparently healthy, although she had torn wings. However another queen appeared and certainly was fecundated, because her abdomen was much enlarged. This new pregnant queen did not participate in the oviposition processes of the colony, but she was seen several times working with cerumen in the exoinvolucrum and chiefly near the entrance.

In September 1972 I saw again the presence of a young queen recently fecundated in the colony, besides the old one, which had the wings much torn and worn. Immediately the young pregnant queen (with smooth and intact wings), began to repair the damaged involucra, trying to fix its cerumen to the glass plate covering the observation hive. This queen walked actively in the colony. Generally she had no court of workers. For four days she remained near the entrance tube, working with cerumen. She built and afterwards demolished what she had made. Her work consisted of cutting small pieces of cerumen of any part of the nest. Such pieces were then carried by the queen with her jaws to a place where she used them to build other structures.

The majority of the colonies of meliponines have only one pregnant queen. We find two or more queens normally in *Melipona nigra nigra*. We received from Barra do Corda (Ma) a colony of *Melipona rufiventris flavolineata* that had two pregnant queens, and probably both put eggs (I. Fonseca e Ceccato, n. p.). Naves da Silva (1972: 267) observed in *Plebeia droryana* two pregnant queens, and saw that both put eggs normally. In this case, the presence of a physogastric young queen and a physogastric old queen, was related with the process of queen substitution.

I suppose that in our study in *S. quadripunctata* we would probably had a queen substitution if the colony conditions were better.

About the work of queens of meliponines I saw some virgin queens of certain species (*Plebeia remota*, *Paratrigona subnuda*) working with cerumen. This kind of work is similar to the work done by the queen of *S. quadripunctata* described above. The virgin queens work chiefly in pillars.

To observe better the activity of the virgin queen of *S. quadripunctata*, I put in a small hive some workers, males and a virgin queen, besides candy and water.

All the bees ate very well. The males were not attracted by the virgin queen (I observed once in *P. subnuda* (1970: 34-38) in a similar box, that the queen was mated: this is very important for genetics experiments). The queen constructed, with cerumen, a kind of chamber. The construction was done in two hours. The queen took out the cerumen from other structures, and put it where she was working. When a worker came near the queen, some prolonged antennal contacts could be observed and finally the worker left the chamber.

It was interesting that one or two males stayed often near the construction made by the queen, and they were not disturbed by her.

#### A C K N O W L E D G M E N T S

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