

# COSMOS magazine

## Online feature

### Pretenders to the throne

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**Life as queen of the hive can be all honey and sex, but the stingless bee of Brazil should always be wary of the restless underclass and their revolting tendencies.**

In a lonely chamber, a voluptuous queen sits upon her throne. A servant slides her food through a small opening and then quietly leaves the queen alone. After the death of her lover, she is being held prisoner, locked away in her cell forever, producing baby after baby. Around her, loyal female subjects tend to her young ones; these nursemaids were born to serve, that is their fate, but something is afoot. Mutiny is rising in the working class. A small, rebellious band of females are looking to defy their working class origins and take over the colony to claim the throne as their own.

This then is the story of the stingless bee, *Schwarziana quadripunctata* and the struggle of the dwarf queen; a female born into the working class with designs to rise above her fate and rule the swarm.

*Schwarziana* are a type of stingless bee, native to Brazil. As their name suggests, they do not possess the usual sting in the tail, instead they have other methods of defence. One mode is to fly into the ears of their enemy and it is not uncommon for *Schwarziana* to pull on the hair of human intruders. Ordinarily, the social structure of *Schwarziana* looks like that of many other stingless bees. A large mature queen is held in a specialised cell, where after losing her virginity to a suitable young male, she is left in her chamber to reproduce for the colony.

Large numbers of devoted female subjects that are seemingly destined for lives as workers are produced in the hive. Compared to the female workforce only a few male drones are produced as their role is primarily to court the queen. Workers are the ones that keep the hive going, dutifully serving their queen, providing her with food and nursing her young. However a few individual worker females are defying the socially imposed caste system. Recent evidence presented by Tom Wenseleers of Britain's University of Sheffield has shed light on the phenomenon of the dwarf queens.

Caste status within social insects like the bee, are generally determined by nutrition. Like many other species of stingless bee, in *Schwarziana*, growth is limited by food supply; forcing young females into a life of labour. In contrast, queens are fed consistently and abundantly in their specialised cells near the periphery of the comb. This helps the queen gain her well-rounded figure, ideal for attracting male suitors and producing hundreds upon hundreds of offspring.

However, Wenseleers latest research on this particular species of Brazilian bee, finds that young females can escape the fate of the worker lifestyle by developing into a 'dwarf queen'. "A dwarf queen is the same size as a worker and develops in a worker cell, meaning it doesn't get any extra food to develop but unlike the average worker it is reproductively functional." says Wenseleers.

So unlike other species of bees, in *Schwarziana* caste status isn't determined by nutrition. Wenseleers presents the argument that the driving force behind a young worker female developing into a dwarf queen is self-determination.



The queen bee of a *Schwarziana quadripunctata* hive

Image: Tom Wenseleers

The idea that social insects, like *Schwarziana*, can control their own fate is remarkable. Wenseleers claims it is "an adaptive strategy designed to gain the maximum fitness benefits."

Of course, climbing through the ranks to royalty is not as easy as simply deciding to do so. There are many disadvantages that come with becoming a dwarf queen and for those who do go for the position of queen bee it may lead to execution.

Unfortunately for the dwarf queen, her reproductive status is not quite up to par with a normal queen. A normal queen has had all the advantages of a royal upbringing, from the construction of her cell to the extra portions of food, all of these privileges have allowed her to become the perfect reproducing machine for the swarm. The dwarf queen on the other hand, has fought her way up from the working class with no real advantages. For this reason, the dwarf queen is no match for the normal queen in the reproductive stakes. Sadly, this is not good news for the young dwarf queen; for the rest of the colony she is a liability. Her very existence means that there is one less nursemaid to help rear the young and her less than impressive sexual prowess means that the future of the group may not be assured.

So what happens to the dwarf anarchists with big plans and no one on her side? The answer is a case of cold-blooded murder. Without the benefit of a "wax boudoir", as Wenseleers puts it, the dwarf queen has nowhere to hide. Once her coup is revealed her siblings quickly get to work on tearing her mandible by mandible until the young upstart is no more. This policing of the swarm by workers in the colony has previously been documented by Wenseleers in another stingless bee (*Merlipona beechii*) where young females are allowed to develop as queens for only 27 hours before being killed by their fellow worker nursemaids. So with all this bloodshed is being queen for a day really worth it?

The evidence shows the majority of all queens produced are dwarf queens (86 per cent) and although the majority of them are dormant or slaughtered, some 22 per cent do go on successfully to head their own colony. For the victorious few, this means that they may enjoy the perks of royal life and ultimately a secure future for their own offspring. Wenseleer comments, "As individualistic humans we may well applaud the high status that these former lower class individuals achieve. Indeed, equal opportunity is a goal all modern democratic societies strive toward."

A newly inaugurated queen sits in her chamber, a hatch opens and food pours in, recalling leaner days she greedily eats it. Outside, her workers tend to her thriving number of sons and daughters. Life is good, not bad for a working class girl. Now all she has to worry about are those pesky, scheming, dwarf queens.

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