

INSIDE JEB

Choosier small hive beetle males miss out when females score nutritious bee jelly



A small hive beetle, feeding from a nurse bee inside a Petri dish. Photo credit: Zoë Langlands.

Gorging on stored honey, pollen and developing brood, parasitic small hive beetles (*Aethina tumida*) can decimate a beehive in a matter of weeks. And even though infested bee colonies fight back, by incarcerating the intruders in crevices guarded by sentries without food for months, the cunning interlopers are able to deceive their custodians into passing on snacks. Posing as nurse and worker bees, the intruder beetles rub their mandibles and antennae against the heads of their captors in hope of receiving a sip of nectar or honey from their benefactor's crop. However, the ruse is not without risk. Sixty percent of beetle approaches end in assault, which made Christian Pirk and colleagues from the University of Pretoria, South Africa, and the University of Graz, Austria, wonder whether the beetles more often tried their luck with younger, docile young bees than older, more aggressive workers.

After fashioning impromptu beetle jails from transparent Petri dishes, Zoë Langlands, from the University of Pretoria, incarcerated small groups of the beetles with three bees – a newly emerged bee, a 6- to 7-day-old nurse bee and an older forager – recording the insects' interactions for 2 h. Filming the beetles approach their captors in search of food, the team was surprised that the male beetles were much more discerning than the females. They preferred to approach the youngest bees, while the females were equally as likely to approach a crabby forager, a nurse or a gentle newly emerged bee. And when the beetles hoodwinked their gaolers into providing them with a snack, the male beetles only sipped from the youngest bee groups, while the females fed from elderly and young bees alike, taking the longest draughts from the feisty nurses. In addition, when the researchers checked the bees' reactions to their inmates, they found that the youngest

bees had the mildest manners, rarely attempting to sting the impudent beetles, while the nurses stood their ground, stabbing at the begging beetles almost 200 times. Yet the bees allowed the beetles to dine for twice as long as members of their own community.

So, why were the female beetles prepared to gamble their chances on a sip from feisty nurse bees when the odds of an assault were stacked against them? 'Nurse bees are the workers that digest pollen and produce a protein-rich jelly that they feed to the larvae', says Ezette du Rand. Were the nurses providing their inmates with more than just a sip of honey to make the risk worthwhile? Langlands injected nurse bees with a radioactive amino acid, and staged more beetle/nurse beg-offs to determine whether the beetles were supping on the nurses' protein-rich jelly. And when she measured the amount of radioactivity in the beetles' bodies, 43% of the female beetles were 'hot', while only 31% of the males had consumed a protein-packed meal.

Female small hive beetles are better at persuading their captors to part with their nutritious jelly, which is usually reserved for the queen and her brood, probably because the females need the protein boost most when preparing to lay the eggs of the next generation of hive-busting beetle parasites.

10.1242/jeb.242214

Langlands, Z., du Rand, E. E., Crailsheim, K., Yusuf, A. A. and Pirk, C. W. W. (2021). Prisoners receive food fit for a queen: honeybees feed small hive beetles protein-rich glandular secretions through trophallaxis. *J. Exp. Biol.* **224**, jeb234807. doi:10.1242/jeb.234807

Kathryn Knight
kathryn.knight@biologists.com