

Short Note

Neotropical stingless bees *Melipona quadrifasciata* exploit the carcass of the giant toad *Rhinella icterica* in Southeast Brazil

IVAN SAZIMA

*Museu de Zoologia, Caixa Postal 6109, Universidade Estadual de Campinas, 13083-863
Campinas, São Paulo, BRAZIL*

* Corresponding Author: Ivan Sazima (isazima@gmail.com)

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Stingless social bees (Meliponini) occur in most tropical and subtropical regions of the world, including Africa, America, Australia and Southeast Asia¹. As occurs with most bee species, the meliponines forage on flowers from which they gather their most important food resources, nectar and pollen¹. Aside from flowers, some meliponine species exploit less conventional resources such as carrion, blood, urine, animal flesh or hide, fungi, and rotten fruits, and in the Neotropics, a variety of meliponine bees forages habitually on carrion, notably several species of the genus *Trigona*^{1,2,3,4,5,6,7,8}.

Giant toads of the *Rhinella marina* group are renowned for their large parotoid glands that secrete powerful venom⁹. This venom notwithstanding, a few opportunistic vertebrate scavengers such as snakes, birds, and mammals feed on dead giant toads, although the venom glands are not consumed^{10,11,12}. However, most small carcasses such as those of toads are consumed mostly by insects, which seem immune to bufotoxins^{10,11,13}. Various stingless meliponine bee species, including two or three of the genus *Melipona*, exploit vertebrate carcasses^{4,7,8}, but I found no records of meliponine bees making use of toad carcasses, still less those of the large species of the genus *Rhinella*². I report here on the mandaçaia stingless bee (*Melipona*

quadrifasciata) exploiting the carcass of the yellow cururu toad (*Rhinella icterica*), a species of the *R. marina* complex, in the Atlantic Forest of the Rio de Janeiro highlands in Southeast Brazil.

I observed the bees on the toad carcass at the edge of a trail (22°26'40''S, 44°36'40'' W, 936 m altitude) in a highland Atlantic Forest at the Itatiaia National Park in Itatiaia, Rio de Janeiro state, southeast Brazil, on 22 September 2017. I recorded the behavior of the bees on the toad carcass near midday, at a temperature ranging about 30° C and air humidity of about 40%. I observed the bees with unaided eyes from a distance of 30-50 cm and documented their behaviour on the carcass with photographs. During the observational sessions, I used the *ad libitum* and sequence samplings¹⁴, both of which are adequate to record fortuitous or rare events. No vouchers were taken due to the status of protected area at the observation site. This characteristic meliponine species was provisionally identified in the field and latter confirmed in the lab as *Melipona quadrifasciata anthidioides*¹⁵.

One to two *Melipona quadrifasciata* individuals exploited the toad carcass at the time of the observations. The bees hovered over or moved on the remains, where they investigated the surface with their antennae, stopping from time to time at some



FIGURE 1. The stingless bee *Melipona quadrifasciata* exploits the eye socket of the carcass of the giant toad *Rhinella icterica*. Note the large almond-shaped venom gland behind the toad's eye.

particular places of the carcass that was at the least stage of decomposition (dry). One of them stopped at the eye socket of the carcass (Fig. 1), where it seemed to chew a little and regurgitate a liquid (water?) and imbibe it again two to three times, flying away afterwards. This exploiting behaviour was repeated at some other parts of the carcass, including a broken hind limb and the venom gland. At a given moment, one of the individuals stopped to clean the antennae with its forelegs, while the other entered the carcass through a rupture on the back (Fig. 2). It emerged about 30 sec latter and proceeded to investigate the carcass. I was unable to say whether the individuals were the same through the whole observation period, despite their striking yellow markings on the black abdomen.

The exploitation of *Rhinella icterica* toad carcass by *Melipona quadrifasciata* is a

novel information on carrion use by meliponine bees. In a study that used lizard and toad carcasses as bait in Costa Rica, seven species of the meliponine genus *Trigona* exploited the carcass of the large lizard *Iguana iguana*, but the carcass of the giant marine toad *Rhinella marina* received no visits of meliponine bees². Carrion-exploiting meliponine bees are found mostly among *Trigona* species^{1,4}. However, the behaviour I report herein for *M. quadrifasciata* was somewhat similar to that described for these carrion-feeding *Trigona* species, including to regurgitate water on the carcass and imbibe it again¹. Carrion exploitation by meliponine bees seems related to intake of some nutrients such as salts, amino acids, lipids and others, which would vary with the carrion type, *i.e.* animal species, and decay stage¹.



FIGURE 2. Two *Melipona quadrifasciata* individuals exploit the carcass of the giant toad *Rhinella icterica*, one of them entering through a rupture on the toad's back.

Meliponine carrion feeders find carcasses quickly during the dry season^{2,3}, and the observations I report herein were undertaken after an unusually warm and dry austral autumn in the Itatiaia highland forest. Apparently, the toad carcass attracted the meliponine bees despite its dryness, and the regurgitating and imbibing behaviour I recorded may compensate for the carcass dryness. The exploitation of the desiccated venomous toad by *M. quadrifasciata* seems noteworthy, as fragments of sun-dried carcasses of the invasive giant marine toad *R. marina* are highly toxic to aquatic Australian native vertebrates and invertebrates¹⁶. This latter study¹⁶ partly disagrees with the notion that toad venom is ineffective for invertebrates¹⁰. The toxicity of *R. marina* sun-dried carcasses endures for many months after the animal's death and

desiccation¹⁶. Studies using carcasses of venomous toads as bait would be instructive to investigate whether meliponine bees exploit this carrion type very occasionally, or whether toad carrion exploitation by meliponines is restricted to particular individuals, populations, sites, or seasons.

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