Necrophagous or predators? The role of *Pheidole radoszkowskii* Mayr (Hymenoptera: Formicidae) on *Rattus norvegicus* (Berkenhout) carcasses (Rodentia: Muridae)

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**ABSTRACT**

This study aimed to identify the feeding habit of *Pheidole radoszkowskii* Mayr on *Rattus norvegicus* (Berkenhout) carcasses, as well as whether its presence limits the occurrence of flies. *Pheidole radoszkowskii* exhibited more necrophagous than predatory behaviour. Its abundance was inversely proportional to that of flies, confirming that this ant species may cause lesions in carcasses and its presence limits the occurrence of flies. This work clarifies the behaviour of an ant species often encountered on carcasses.

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Ants are often observed on cadavers soon after death or during the postmortem period (Campobasso et al. 2009), during all stages of decomposition (Luderwaldt 1911; Payne 1965; Monteiro-Filho and Penereiro 1987; Carvalho et al. 2004), either consuming carcasses directly or preying on the associated fauna. Therefore, their feeding activity can be considered necrophagous or predatory, either accelerating or retarding the decomposition process, respectively (Catts and Goff 1992; Oliveira-Costa 2003; Carvalho et al. 2004). The feeding action of these insects on carcasses can cause lesions that are easily confused with antemortem injuries (Campobasso et al. 2009).

Ants of the genus *Pheidole* (Formicidae: Myrmicinae) have a Neotropical distribution (Wilson 2003) and diversified feeding habits (Fowler et al. 1991). Reports in the literature confirm the occurrence of *Pheidole* sp. on carcasses of albino rats (Monteiro-Filho and Penereiro 1987), deer and caimans (Watson and Carlton 2005) and pigs (Cruz and Vasconcelos 2006). Despite these findings, little is known about the feeding behaviour of this ant genus.

As the presence of ants on carcasses can cause mistakes in determining the cause of death, the present study aimed to evaluate and report the feeding behaviour of *Pheidole radoszkowskii* (Hymenoptera: Formicidae) on carcasses of *Rattus norvegicus* (Rodentia: Muridae) and whether its presence limits the occurrence of flies, which are cited as one of the main factors in decomposition (Catts and Goff 1992).
The study was conducted in June 2009 at Universidade Federal de Juiz de Fora, located in the city of Juiz de Fora, Minas Gerais state, Brazil (21°46.780'S; 043°22.394'W), in an open anthropized area with exposed soil. Ants from two *P. radoszkowskii* nests were used, located about 13.5 m apart.

Previously, *R. norvegicus* carcasses (*n* = 6) of average weight (206.7 ± 35.00 g; 180–280 g) were placed individually in plastic boxes (15 × 26 × 10 cm) with the sides replaced by wire screen with 1.6-cm mesh to permit the flow of water and invertebrates and prevent the access of necrophagous vertebrates.

Each carcass was observed for 15 minutes during 12 intercalated days. As of the 9th day of observation, the carcasses had reached the skeletonized stage. Despite this, the observations continued for three more intercalated days to verify the presence of insects. As no insects were observed during this period, the results refer only to the 8 days of observations, during which there were 48 records.

We observed the feeding behaviour of the worker ants and recorded the frequency of individuals that fed directly on the carcass (pieces of flesh and/or exudates) or flies (larvae and/or adults), classifying their habits as either necrophagous or predatory, respectively. At the same time, every 3 minutes we recorded the abundance of ants and flies, for five repetitions during each 15-minute observation period.

To compare the frequency of ants with each of the two feeding behaviours, the data were converted to log (*x* + 1) and submitted to the Wilcoxon test, at 5% significance. The Spearman test was also used to verify the correlation between the mean abundance of flies and worker ants.

There was a significant negative correlation between the abundance of *P. radoszkowskii* and of the flies (*rs* = −0.4110; *p* = 0.0037). In most of the observations, the abundance of flies visiting the carcass was inversely proportional to the abundance of *P. radoszkowskii* (Figure 1). In this respect, Wells and Greenberg (1994) also found a negative correlation between the Diptera species *Cochliomyia macellaria* and *Chrysomya*

![Figure 1. Average number of ants (*Pheidole radoszkowskii*) and flies found on rat carcasses during the observations. Total number of records: *n* = 48.](image-url)
rupestris facies and the ant Solenopsis invicta. This suggests that the presence of ants on cadavers can inhibit the presence of flies because of competition for the same resource.

On the third day of observation, P. radoszkowskii workers and soldiers were seen to be preying on fly larvae and carrying them to the nest. This same finding was reported by Luderwaldt (1911) for the same genus. Predation on large larvae and adult flies was not observed. The same was reported by Moretti and Ribeiro (2006) for the species Cephalotes clypeatus, which suggests that the small mandibles of this species together with the body rigidity of the prey can explain the fact they do not prey on adults and larvae of the second and third instars.

Although they have been seen preying on fly larvae, the number of P. radoszkowskii workers that exhibited necrophagous behaviour was significantly higher than the number that showed predatory behaviour \( p < 0.0001; T = 16; Z = 4.9803 \) (Figure 2). Campobasso et al. (2009) pointed out that ants cause small lesions that are easily mistaken for antemortem abrasions and that they generally attack exposed areas of the cadaver. In this study, the workers mainly concentrated on hairless areas, such as the inner ear flaps and ear canals, paws, eyes, anus, genitalia and mouth.

General investigations suggest that these insects can present predatory action on fly eggs, larvae and adults and also cause lesions in cadavers. In this study, P. radoszkowskii mainly exhibited necrophagous behaviour, causing carcass injuries. Its inhibitory effect on the presence of flies can alter the decomposition process and induce errors in identifying the cause of death.

Ants are considered an important component of the sarcosaprophagous community, having been noticed in many studies to be present on cadavers in all stages of decomposition. The importance of this work is its clarification of the real action of a particular ant species, as previous studies of this nature have had a broader focus, generally at the genus level.

![Figure 2](image-url). Average number of Pheidole radoszkowskii that exhibited necrophagous feeding behaviour – NFB – (fed on exudates and on pieces of flesh from the carcass) and predatory feeding behaviour – PFB – (predated on fly larvae).
Future studies that limit the presence of these insects could discover their influence on the rate of decomposition. Also, studies focusing on the feeding behaviour of other ant species could clarify the real influence of these insects on carcasses, contributing to the formation of a database about these insects.

Disclosure statement

No potential conflict of interest was reported by the authors.

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