

Association of necrophilous beetles (Coleoptera) with rat carcasses in a semi-arid area, Northeastern Brazil

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Abstract

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The association of beetles with rat carcasses exposed in a semi-arid area was examined. Samplings took place during rainy and dry seasons in an herbaceous-shrub Caatinga layer. The families represented; Histeridae, Scarabaeidae and Tenebrionidae, were collected in all seasons and vegetation layers. Four decomposition stages were recognized, in which the black putrefaction and the dry decay were the most attractive to Histeridae and Scarabaeidae, respectively. Considerations about ecology, behavior and use of these beetles in forensic entomology are also presented.

Additional key words: Caatinga, forensic entomology, Histeridae, Scarabaeidae.

Resumo

SANTOS DS, SANTOS WE. 2015. Besouros (Coleoptera) necrófilos associados a carcaças de ratos em área do semiárido, Nordeste do Brasil. ENTOMOTROPICA 31(20): 167-171.

A associação de besouros com carcaças de ratos expostas em área do semiárido foi examinada. As coletas foram realizadas durante as estações chuvosa e seca em um estrato herbáceo-arbustivo de Caatinga. As famílias presentes, Histeridae, Scarabaeidae e Tenebrionidae, foram coletadas em todas as estações climáticas e estratos de vegetação. Quatro estágios de decomposição foram identificados, sendo a putrefação escura e a decomposição seca os mais atrativos para Histeridae e Scarabaeidae, respectivamente. Considerações sobre ecologia, comportamento e uso desses besouros na entomologia forense também são apresentadas.

Palavras chave adicionais: Caatinga, entomologia forense, Histeridae, Scarabaeidae.

Introduction

Carcasses and cadavers provide conditions that attract certain groups of insects in a succession along the decomposition process (Bornemissza 1957). Necrophagous beetles usually are found during the end of decomposition while predator

beetles can appear early (Catts and Goff 1992). However, necrophagous beetles can arrive as early as at few days post death (Aballay et al. 2012). Such chain of events is what makes them

useful for the forensic entomology scope (Keh 1985).

The succession pattern of these beetles is useful for the estimation of postmortem interval (PMI) when skeletonized corpses are found (Kulshrestha and Satpathy 2001). In some cases, it is possible to estimate the PMI based on rates of development of some beetle species (Arnaldos et al. 2005). Beetles can also be used to support the PMI estimate from flies data (Goff and Flynn 1991).

In Brazil, forensic entomology has expanded outstandingly, but even so, there is a lack with regard to beetles associated with carcasses (Mise et al. 2007, 2010; Santos 2014), especially on Caatinga fauna (Mayer and Vasconcelos 2013, Santos et al. 2014). For this reason, the present study is focused on accomplishing an inventory of the beetles (Coleoptera) associated with rat carcasses, linking them to the seasons, vegetation and stages of decomposition.

Material and Methods

The study took place in a semi-arid area in Arapiraca, state of Alagoas, Northeastern Brazil (lat 9° 45' S, long 36° 39' W). The area is known as Campus UFAL, which is located at an altitude of 264 m and near an urban-rural border. The vegetation varies from open to shrub Caatinga, a seasonally dry tropical forest endemic to Brazil. Samplings occurred in September 2009 (rainy season) and May 2010 (dry season).

On both periods, two fresh rat carcasses, *Rattus norvegicus* (Berkenhout, 1769), weighing approximately 250 g each, were placed about 300 m apart in an herbaceous-shrub layer to decay and attract insects. Each carcass was placed in direct contact with the ground, in an iron cage, to prevent interference of vertebrate scavengers. Beetles were collected manually daily until the end of the decomposition, which lasted 11 days.

The identification of the beetles was done by specific literature (Almeida and Mise 2009,

Aballay et al. 2013). The specimens were incorporated into the Entomological Collection of the Departamento de Sistemática e Ecologia of the Universidade Federal da Paraíba (DSEC/UFPB).

Results and Discussion

At least nine species from three different families were collected. Histeridae had the highest richness with five species. There were no significant differences in species richness between climate seasons or vegetation layers. Four stages of decomposition were perceived and classified according Bornemissza (1957): Initial Decay, during 3 ± 1.4 days; Putrefaction, 2 ± 0 days; Black Putrefaction, 4 ± 1.4 days; and Dry Decay, 2 ± 0 days.

The beetles were absent in the Initial Decay. Species of Histeridae were present on the carcasses from the Putrefaction until the Black Putrefaction, being more diverse in the Black Putrefaction. Species of Tenebrionidae were collected only in the Black Putrefaction and species of Scarabaeidae only in the Dry Decay (Table 1).

The higher richness of the family Histeridae was due to the fact that their species are predators of fly larvae (Smith 1986). This food resource is available on carcasses mainly during the Black Putrefaction stage.

Aballay et al. (2012) and Santos et al. (2014) found *Xerosaprinus diptychus* (Marseul, 1855) on pig carcasses in different arid environments also with preference for dry season. *Euspilotus azureus* (Sahlberg, 1823), *Hister punctifer* Paykull, 1811 and *Omalodes foveola* Erichson, 1834, beetles with large body size, were found only in rainy season as well in another Caatinga area (Santos et al. 2014). This seasonality may be due to biological aspects of these species still unknown.

Most of Scarabaeidae are detritivorous, with larvae feeding on dung or pieces of

Table 1. Beetles (Coleoptera) associated with rat carcasses in a semi-arid area, State of Alagoas, Brazil, with their respective season, vegetation and stage of decomposition. HB. Herbaceous; SH. Shrub; ID. Initial Decay; PT. Putrefaction; BP. Black Putrefaction; DD. Dry Decay.

Species	Rainy season		Dry season		Stage of decomposition			
	HB	SH	HB	SH	ID	PT	BP	DD
Histeridae								
<i>Euspilotus azureus</i>	x	x				x	x	
<i>Hister punctifer</i>	x						x	
<i>Omalodes foveola</i>	x						x	
<i>Phelister</i> sp.		x		x			x	
<i>Xerosaprinus diptychus</i>			x	x		x	x	
Scarabaeidae								
<i>Canthon</i> sp. 1		x	x	x				x
<i>Canthon</i> sp. 2	x		x					x
<i>Coprophanæus pertyi</i>		x						x
Tenebrionidae								
<i>Tenebrioninae</i> spp.	x	x	x	x			x	

decomposing carcasses (Smith 1986). The studies by Luederwaldt (1911) and Pessôa and Lane (1941) about Scarabaeidae associated with carcasses of diverse animals are important references. Together, these authors recorded 124 species, most of them belong to the genera *Canthidium*, *Canthon* and *Coprophanæus*.

Species of *Canthon* present generalist alimentary habits (Hernández 2007), and are commonly found on carcasses in various environments (Rosa et al. 2011, Mayer and Vasconcelos 2013). On the other hand, *Coprophanæus pertyi* (Olsoufieff, 1924) is a necrophagous species endemic to Caatinga areas (Hernández 2007, Santos et al. 2014). Therefore, if these beetles were found on a corpse in a different environment this would indicate a displacement from the place of death (Benecke 1998).

It is worthwhile to stress that Dermestidae and Cleridae, families widely collected from carcasses in Brazil (Souza and Linhares 1997, Mise et al. 2007, Santos et al. 2014), have not been found

in the present study. Also, these beetles prefer apparently more arid environments (Rosa et al. 2011, Mayer and Vasconcelos 2013, Santos et al. 2014). However, they are not commonly found on small carcasses (Monteiro-Filho and Penereiro 1987, Moura et al. 1997).

The diversity of beetles was different from studies carried out in other regions, which may be a result not only of different environments (Mise et al. 2007, 2010), but also of different capture method and the animal model adopted (Mayer and Vasconcelos 2013, Santos et al. 2014).

The present study is the first contribution to forensic entomology in the State of Alagoas, Northeastern Brazil. Future studies are required to understand the role of these beetles on carcasses and their possible forensic utility at the region.

Additionally, since each region has its peculiar carrion insect fauna (Corrêa et al. 2012, Farias et

al. 2013, Santos et al. 2013), the coleopterofauna found reinforces the need of regional studies about the composition of insects associated with carcasses throughout Brazil.

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