A checklist of arthropods associated with rat carrion in a montane locality of northern Venezuela.

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Abstract

This is the first report of arthropods associated with carrion in Venezuela, using laboratory bred rats (*Rattus norvegicus*). Rat carcasses were exposed to colonization by arthropods in neighboring montane savanna and cloud forest habitats in the state of Miranda. The taxonomic composition of the arthropods varied between both ecosystems. Scarabaeidae, Silphidae, Micropezidae, Phoridae, Vespidae and one species of ant, were collected only in the cloud forest. *Dermestes maculatus*, *Chrysomya albiceps*, Termitidae and most species of ants, were found only in the savanna. Fourteen species were considered to be of primary forensic importance: *Dermestes maculatus*, *Oxelytrum discicolle*, *Calliphora* sp., *Cochliomyia macellaria*, *Compsomyiops* sp., *Chrysomya albiceps*, *Phaenicia cuprina*, *P. sericata*, *P. eximia*, *Fannia* sp., *Puliciphora* sp., *Megaselia scalaris*, *Ravina* sp. and *Sarcophaga* sp.

Key words: Coleoptera, Diptera, Forensic entomology, Venezuela.

Introduction

There is relatively little information available regarding insects associated with animal carrion and human corpses in South America [1]. In Brazil, Moura et al. [2] made a preliminary analysis of the insects of medico-legal importance in Curitiba, in the state of

Paraná; Carvalho et al. [3] identified arthropods associated with pig carrion and human corpses in Campinas, in the state of São Paulo. Recently, forensic entomology was applied to estimate the postmortem interval (PMI) in homicide investigations by the Rio de Janeiro Police Department, Brasil [4]. In Colombia, Wolff et al. [5] determined the succession of insects colonizing a cadaver using pig carrion in Medellín; Barreto et al. [1] identified flies and beetles from human corpses in Cali. In Peru, Iannacone [6] studied the pig arthropod fauna of forensic importance in Callao. In Argentina, methodical studies of insects found on human corpses have been conducted since 1993, ranging from forensic expertise to trapping and rearing species [7, 8, 9].

In Venezuela, there are no published records of arthropods of forensic importance and the generation of data of this type will be beneficial to forensic investigation by Venezuelan justice institutions. In order to establish baseline data, this study was designed to determine the arthropods associated with rat carrion exposed in two different mid-altitude montane ecosystems: savanna and cloud forest, close to the capital city of Caracas.

Methods

This study was carried out in two different environments within the forest zones of Altos de Pipe, Miranda state, 11 km southwest from Caracas. One site was established in a sunlit savanna (10°20'N, 67°02'W, 1,635 m) consisting of an understory dominated by Poaceae, Hypolepidaceae (*Pteridium* sp.), Melastomataceae and Clusiaceae (*Clusia* sp.). The second site was located in a shaded cloud forest (10°24'N, 66°58'W, 1,689 m) dominated by Apocynaceae (*Aspidosperma fendleri*) and Podocarpaceae (*Podocarpus pittieri*), reaching up to 20-25 m, with many bamboos, mosses and litter. The averages of minimum and maximum temperatures, relative humidity and photosynthetically active radiation recorded in the savannah were 22.5°C, 32.3°C, 70% and 1300 $\mu\text{mol.m}^{-2}.\text{s}^{-1}$, respectively; in the cloud forest

the same values were 15.2°C, 21.6°C, 97% and 25µmol.m⁻².s⁻¹. In both localities, 2 carcasses of laboratory bred rats (*Rattus norvegicus*) weighing approximately 500g each were used as bait. They were killed by contusion and immediately placed in the selected localities. The rat carcasses were separated from each other by 1 m at each site, and every carcass was placed within metal cages to exclude vertebrate scavengers. Observations and collections of arthropods were made daily during April 2003. Arthropods, both adults and immature, were either captured with an insect net, forceps or manually. Specimens were preserved in 75% ethanol, except the larvae, which were fixed in Kahle's Solution [95% Ethanol (30ml); Formaldehyde (12ml); Glacial Acetic Acid (4ml); Water (60ml)]. Arthropods collected were identified in the Museo del Instituto de Zoología Agrícola, Universidad Central de Venezuela. The identifications of the Calliphoridae were made according to Carvalho and Ribeiro [10], Greenberg and Kunich [11], and Mariluis [12].

Results and discussion

Insects played a significant role in the decomposition process of rat carcasses in the two ecosystems (Table 1). In both the savannah and the forest, the Diptera were the first to colonize the carcass and the Coleoptera appeared later, remaining until the last stages of decomposition, as was observed by Carvalho [3] and Wolf [5]. The insect species whose larvae were observed to feed and develop exclusively on the carcass were classified as species of primary forensic importance, which could possibly be used to estimate the PMI. The stage of development of species can be used to estimate the time of death, because the developmental time reflects the time period over which the corpse has been exposed to insect activity. Of the 29 collected species, 14 were considered of forensic importance: *Dermestes maculatus*, *Oxelytrum discicollae*, *Calliphora* sp., *Cochliomyia macellaria*, *Comptosomyia* sp.,

Chrysomya albiceps, *Phaenicia cuprina*, *P. sericata*, *P. eximia*, *Fannia* sp., *Puliciphora* sp., *Megaselia scalaris*, *Ravina* sp. and *Sarcophaga* sp.

The taxonomic composition of the colonising fauna varied between the two ecosystems, which may be due to the different effect of microclimatic conditions. Scarabaeidae, Silphidae, Micropezidae, Phoridae, Vespidae and one species of ant, were collected only in the cloud forest. *Dermestes maculatus*, *Chrysomya albiceps*, Termitidae and most species of ants, were found only in the savanna.

Although a smaller number of species were collected in this study, they did not differ from species collected in other countries of South America, such as Argentina [7, 8, 9], Brazil [2, 3], Colombia [1, 5] and Peru [6]. There may have been more insect species with a larger number of replicate mice or with a larger carcass (e.g. Pig carcass).

Venezuela contains a remarkable range of environments and an ample variety of habitats available for carrion flies and beetles. Among the different habitats, it is possible to recognize desert regions, savannas, forests of many types from xerophitic to very moist montane, high mountain thickets and paramos [13]. Approximately 150 different types of vegetation have been defined within the country [14]. Therefore, it is necessary to evaluate the entomofauna composition at least within the most contrasting of these habitats as well as throughout different altitudinal gradients, at different times of the year. This kinds of studies will help establish baseline forensic entomological information for Venezuela, on colonization and succession, and allow for the application of forensic entomology techniques in different regions of the country.

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Table 1. Arthropods associated with rat carrion in a savanna (A) and a cloud forest (B), in Altos de Pipe, Miranda state, Venezuela.

Class	Order	Family	Genus/species	Locality	SFI
Acari	-	-	-	Both	-
Insecta	Coleoptera	Dermestidae	<i>Dermestes maculatus</i>	A	X
		Histeridae	-	Both	-
		Leiodidae	-	Both	-
		Scarabaeidae	<i>Deltochilum</i> sp.	B	-
			<i>Euristernus</i> nr. <i>velutinus</i>	B	-
		Silphidae	<i>Oxelytrum discicolle</i>	B	X
		Staphylinidae	-	Both	-
	Diptera	Anthomyiidae	-	Both	-
		Calliphoridae	<i>Calliphora</i> sp.	Both	X
			<i>Cochliomyia macellaria</i>	Both	X
			<i>Compsomyiops</i> sp.	Both	X
			<i>Chrysomya albiceps</i>	A	X
			<i>Phaenicia cuprina</i>	Both	X
			<i>Phaenicia sericata</i>	Both	X
			<i>Phaenicia eximia</i>	Both	X
		Micropezidae	-	B	-
		Muscidae	<i>Fannia</i> sp.	Both	X
		Phoridae	<i>Puliciphora</i> sp.	B	X
			<i>Megaselia scalaris</i>	B	X
		Sarcophagidae	<i>Ravina</i> sp.	Both	X
			<i>Sarcophaga</i> sp.	Both	X

Hymenoptera	Formicidae	<i>Camponotus</i> sp.	A	-
		<i>Cephalotes</i> sp.	A	-
		<i>Linepithema</i> sp.	B	-
		<i>Pheidole</i> sp.	A	-
		<i>Pseudomyrmex</i> sp.	A	-
		<i>Solenopsis geminata</i>	A	-
	Vespidae	<i>Polybia</i> sp.	B	-
Isoptera	Termitidae	-	A	-

SFI indicates species of forensic importance.

* Indicates that these species were identified with the larvae.