

SHORT COMMUNICATION

Sarcophagidae and Calliphoridae related to *Rhinella schneideri* (Anura, Bufonidae), *Bothrops moojeni* (Reptilia, Serpentes) and *Mabuya frenata* (Reptilia, Lacertilia) carcasses in Brasília, Brazil

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ABSTRACT. Sarcophagidae and Calliphoridae related to *Rhinella schneideri* (Anura, Bufonidae), *Bothrops moojeni* (Reptilia, Serpentes) and *Mabuya frenata* (Reptilia, Lacertilia) carcasses in Brasília, Brazil. This paper presents a list of necrophagous insects associated with small size carcasses of two reptiles and one amphibian, found in areas of riparian forests and Cerrado *sensu stricto* physiognomies in a Conservation Unit located in Brasília, Distrito Federal. We found seven species of insects related to these carcasses, being five Sarcophagidae, one Calliphoridae and one Braconidae parasitoid wasp. *Lucilia eximia* and *Peckia (Pattonella) intermutans* were the most abundant species in the study, corroborating with other studies that suggests that these species have specializations for colonization of small size animal carcasses.

KEYWORDS. Forensic entomology; fly colonization, herpetology, necrophagous insects; small size carcasses.

RESUMO. Sarcophagidae e Calliphoridae associados às carcaças de *Rhinella schneideri* (Anura, Bufonidae), *Bothrops moojeni* (Reptilia, Serpentes) e *Mabuya frenata* (Reptilia, Lacertilia) em Brasília, Distrito Federal, Brasil. Este trabalho apresenta uma lista de insetos decompositores associados a carcaças de pequeno porte de dois répteis e de um anfíbio, encontrados em áreas de matas de galeria e de cerrado *sensu stricto* em unidades de conservação do Distrito Federal. Foram encontradas sete espécies de insetos associados a essas carcaças, sendo cinco sarcófagídeos, um califorídeo e uma vespa parasitóide Braconidae. *Lucilia eximia* e *Peckia (Pattonella) intermutans* foram as espécies mais abundantes, corroborando com outros estudos que sugerem que estas espécies apresentam especializações para a colonização de carcaças menores.

PALAVRAS-CHAVE. Carcaças de pequeno porte; colonização por moscas; entomologia forense; herpetologia; insetos decompositores.

Flies are the main organisms responsible for carcass disintegration during the carrion decay process (Payne 1965; Jirón & Cartín 1981). Sarcophagidae and Calliphoridae are known to present immature stages that feed on vertebrate carcasses, being among the most responsible for corpse breakdown (Campobasso *et al.* 2001).

Knowledge about the biology of Sarcophagidae and Calliphoridae in natural habitats are fairly incipient, being the vast majority of these studies directed to forensic purposes (Campobasso *et al.* 2001; Carvalho *et al.* 2000). Most of the studies with necrophagous insects were conducted with mammal corpses (Johnson 1975; Jirón & Cartín 1981), especially pigs (Reed 1958; Payne 1965; Carvalho & Linhares 2001; Carvalho *et al.* 2004; Barros *et al.* 2008; Biavati *et al.* 2010), in order to extrapolate information from the decomposition process of these animals to human (Catts & Goff 1992; Schoenly *et al.* 2006). Therefore, it is noticed that there are not many decomposition studies with other taxa of terres-

trial vertebrates, especially amphibians and reptiles (Cornaby 1974; Kneidel 1984; Moretti *et al.* 2009). Similarly, it is also perceived that most studies of necrophagous insects were performed with large size animals, do not existing many decomposition studies directed to study insects related to small size animals (Moretti *et al.* 2008; Moretti *et al.* 2009).

Amphibians and reptiles are very abundant in communities and are considered as model-organisms for several types of studies (Huey *et al.* 1983; Shine & Bonnet 2000; Vitt & Pianka 2005). Moreover, most of these animals are of small size. Thus, studying necrophagous insects associated with this type of ephemeral resource can provide a lot of information about colonization and establishment of Sarcophagidae and Calliphoridae in small animal carcasses. Therefore, this present work aims to report the fauna of necrophagous insects emerged from two reptilian and one amphibian carcasses, occasionally found in conserved units in the Brazilian Cerrado.

During the years of 2007 and 2008, three carcasses (two reptiles and one amphibian) were occasionally found in decomposition process in the APA Gama-Cabeça-de-Veado protection area during long-term field works with herpetological studies. The APA Gama-Cabeça-de-Veado is a area located in the Distrito Federal, in the center of the Brazilian Cerrado, and is composed by several other conservation units; among them, the Reserva Ecológica do IBGE and the Estação Ecológica do Jardim Botânico de Brasília (EEJBB) (Fig. 1).

In January 2007, a juvenile frog *Rhinella schneideri* (Werner, 1894) (aprox. 55 mm) was found dead at the edge of a riparian forest in the EEJBB. In February 2007 and adult snake *Bothrops moojeni* Hoge, 1966 (aprox. 100cm) was found in the interior of a riparian forest at the Monjolo stream, in the Reserva Ecológica do IBGE. In the same conservation unit, an adult lizard species *Mabuya frenata* (Cope, 1862) (snout-vent length = 60mm) was found in a cerrado *sensu stricto* physiognomy under controlled experimental fire regimes (Miranda *et al.* 2011), in September 2008. All carcasses were found with signs of advanced decomposition (bloating and putrid odor) and had insect larvae activity.

The carcasses were collected on the same day they were found and were taken to the laboratory of forensic entomology at the Universidade de Brasília, where each one was placed inside plastic recipients containing vermiculite for insect pupation. Due to the size of the *Bothrops moojeni* carcass, this specimen was sectioned in three parts and each

one was stored separately. All recipients were covered with escaline textile fabric and bound with rubber bands and transferred to B.O.D. chamber adjusted to temperature of 25° C, relative humidity of 60% and photophase of 12 hours.

After emergence, the insects were quantified and identified with the support of the taxonomic keys of McAlpine *et al.* (1981), Mello (2003) and de Carvalho & Mello-Patiu (2008). All material was deposited in the Coleção Entomológica do Departamento de Zoologia, in the Universidade de Brasília.

Only one species of Sarcophagidae emerged from the carcasses of *Rhinella schneideri* and *Mabuya frenata*. From the carcass of the snake *Bothrops moojeni*, three Sarcophagidae species, one Calliphoridae and one Braconidae parasitoid wasp emerged (Table I).

Sarcodexia lambens (Wiedemann, 1830), *Peckia (Pattonella) intermutans* (Walker, 1861) and *Peckia (Squamatodes) trivittata* (Curran, 1927), found in the studied carcasses, were also found in carcasses of pigs in the Cerrado (Barros *et al.* 2008; Rosa *et al.* 2009), but always in lower abundance levels than other necrophagous flies of the community. Moretti *et al.* (2008) found that *P. (P.) intermutans* occurred in all experiments with small size rodent carcasses, suggesting that this species has a specialization to the colonization of animal carcasses with small sizes.

Peckia (Squamatodes) trivittata is known to only occur in *campo cerrado* regions (Lopes 1973), and in this study

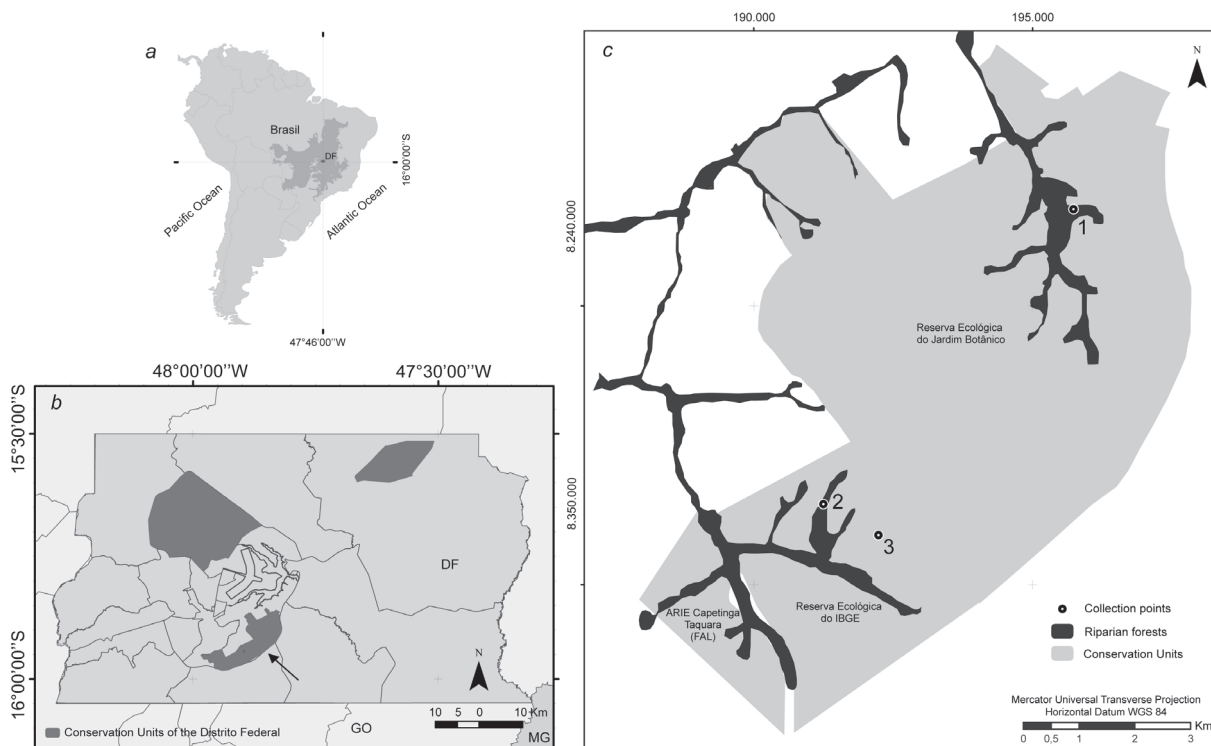


Fig. 1. Places where we found the carcasses of this study. (a) South America indicating the Cerrado domain and the Distrito Federal-DF, in central Brazil. (b) The Distrito Federal indicating the APA Gama-Cabeça-de-Veado (arrow). (c) Part of the APA Gama-Cabeça-de-Veado indicating the Reserva Ecológica do Jardim Botânico de Brasília and the Reserva Ecológica do IBGE, with the localities where we found the three carcasses: 1. *Rhinella schneideri*; 2. *Bothrops moojeni*; 3. *Mabuya frenata*.

Table I. Frequency of insects associated to *Rhinella schneideri* (Anura, Bufonidae), *Bothrops moojeni* (Reptilia, Serpentes) and *Mabuya frenata* (Reptilia, Lacertilia) carcasses in conservation units of the APA Gama-Cabeça-de-Veado, in Brasília, Brazil. The numbers below represent emerged insect abundance for each species.

Species composition	Toad (<i>Rhinella schneideri</i>)	Lizard (<i>Mabuya frenata</i>)	Snake (<i>Bothrops moojeni</i>)
Diptera			
Sarcophagidae			
<i>Sarcodexia lambens</i> (Wiedemann, 1830)	4	–	–
<i>Oxysarcodexia</i> sp.	–	–	1
<i>Dexosarcophaga</i> sp.	–	–	4
<i>Peckia (Squamatodes) trivittata</i> (Curran, 1927)	–	5	–
<i>Peckia (Pattonella) intermutans</i> (Walker, 1861)	–	–	17
Calliphoridae			
<i>Lucilia eximia</i> (Wiedemann, 1919)	–	–	31
Hymenoptera			
Braconidae			
<i>Braconidae</i> sp.	–	–	7

this species was registered in another Cerrado physiognomy, a cerrado *sensu stricto*. However, this result does not contradict the previous studies of this species occurrence, since the area we recorded this insect is a cerrado *sensu stricto* disturbed by a recurring fire regime, which may influence the vegetation structure of this physiognomy (Miranda *et al.* 2011).

Lucilia eximia (Wiedemann, 1919) was the most abundant species in the *Bothrops moojeni* snake carcass. This species is widely distributed in the Americas, from the southern United States to Paraguay and Argentina and has been found causing myiasis (Lopes & Leite 1989) in other vertebrates carrions, such as pigs (Biavati *et al.* 2010), and the same presents forensic importance, because it occurs in carcasses since the beginning stages of decomposition (Moura *et al.* 1997; Carvalho *et al.* 2000). Moretti *et al.* (2008) reported that *L. eximia* was the most abundant species in studies of colonization in small size carcasses of rodents, and with *P. (P.) intermutans*, occurred in all experiments with this kind of carrion, suggesting that this species has a high specialization in the colonization of small size carcass resources.

The present work similarly found some individuals of Sarcophagidae (genus *Dexosarcophaga*) emerged from the carcass of the snake *Bothrops moojeni* that could not be identified. Moretti *et al.* (2009) pointed out that there are very few studies of vertebrate small size carcasses decomposition, especially of non-mammals, and, therefore, it is perfectly plausible to find new insect species associated with such ephemeral resource. Furthermore, the Brazilian Cerrado is highly diverse, poorly studied and under intense anthropogenic activity (Myers *et al.* 2000; Mittermeier *et al.* 2005), with estimates that more than a half of this area has been devastated (Klink & Machado 2005).

Studies, such as Denno & Cothran (1976), pointed out that Sarcophagidae and Calliphoridae have different strategies in use of carcass resources. In Sarcophagidae, most species are viviparous, eliminating first-instar larvae directly into the posture, which immediately begin their feeding on the

corpse. Calliphorids, in turn, are oviparous and require an additional time for egg hatching (Denno & Cothran 1976; Shewell 1987). Based on this, Barros *et al.* (2008) hypothesized that Sarcophagidae presents pioneerism in corpse colonization in relation to Calliphoridae. Based on this hypothesis, we could expect that the pioneerism of Sarcophagidae in relation to Calliphoridae could be reflected clearly in small size corpses, since this type of carrion contains little resources and that directly placed larvae in this substrate (which is the case of Sarcophagidae) would use the resource in shorter time, not enough time for the development of Calliphoridae larvae. According this work, this hypothesis was supported. Carcasses of the lizard and the frog had only registers of Sarcophagidae species. In the same way, from the snake carrion emerged five species and three were sarcophagids. *Lucilia eximia* was the only calliphorid registered in this study, emerged from the snake carrion. However, studies testing this hypothesis need to be performed. Apparently, the colonization of necrophagous insects on small size carrions is different from large size carrions (Blackith & Blackith 1988; Moretti *et al.* 2009; Moretti 2006). Except for *Lucilia eximia*, it is probable that Sarcophagidae is the main family of necrophagous insects related to small size carrion reduction in the Cerrado, because of the life history traits of this family. Supporting this point of view, there are several records of Sarcophagidae in small size Invertebrates, such as cockroaches (*Periplaneta americana*), lepidopteran larvae and gastropods (Lopes 1973). In the same way, there are no records of blowflies (Calliphoridae) colonizing invertebrate carcasses of small size (Moretti 2006).

ACKNOWLEDGEMENTS

We thank G.R. Colli, coordinator of the long-term project entitled Ecology of Lizards in Riparian Forests of the Cerrado, for allowing study with the carcasses used in this work. This study received financial supports of CNPq, CAPES, and FINATEC.

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Received 1/9/2011; accepted 2/7/2012

Editor: Mauricio Oswaldo Moura