



# SCARABAEINAE BEETLES (COLEOPTERA, SCARABAEIDAE) ATTRACTED TO SHEEP FECES IN EXOTIC PASTURES: EFFECTS OF HERBIVORE OCCUPANCY ON THE ABUNDANCE AND DIVERSITY OF DUNG BEETLES

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## INTRODUÇÃO

Scarabaeinae beetles (Coleoptera: Scarabaeidae) are most responsible for the incorporation and removal of animal manure in pastures (Halffter & Matthews, 1966). They are represented by approximately 6,000 species in about 200 genera (Halffter, 1991). In Brazil, exotic pastures (mainly *Brachiaria* spp.) are generally used for the creation of herbivorous mammals, including cattle, horses, goats and sheep. Sheep farming is an activity that has gained importance and plays a role in Brazilian livestock. The occupation of sheep in pastures prior to cattle and horses can cause the formation and/or modification of a detritivorous insect community, especially dung beetles which would use the manure provided by these animals (Lobo *et al.*, ., 2006).

Variation in the quantity and availability of food resources can affect the population dynamics of dung beetles, since these factors directly influence richness, taxonomic composition and abundance of this group (Lobo *et al.*, ., 2006). Thus, the availability of resources may lead to a new organization in the community structure present at the site. Pastures shared by cattle, horses and sheep can provide greater availability of food for dung beetles, however the effect of the sharing

of these areas by these animals and even the substitution by sheep has been little studied in the world. In Brazil, there is only the study performed by Stumpf (1986) that focused on identifying the species attracted to dung of sheep.

## OBJETIVOS

In this this work information are provided on the effects caused by the occupation of large herbivorous mammals (cattle) on the community of dung beetles attracted to sheep feces in exotic pastures.

## MATERIAL E MÉTODOS

Trapping (duration 48 hours) was performed in January 2011 in exotic pastures (*Brachiaria* spp.) in a transition area between the Cerrado and Pantanal ecosystems, in Aquidauana, Mato Grosso do Sul, Brazil. Two areas were selected with the constant presence of cattle (average 0.7 adult cattle ha<sup>-1</sup>) and another two without the presence these animals. In each area one plot was used for allocation of 10 *pitfall* traps (1000 mL) installed at the height of the soil at points separated by a distance of 20 m. Fresh sheep feces was used as bait

placed in plastic containers (50 mL) at the center of the trap with a wire.

A rarefaction analysis based on the number of individuals captured was used to compare patterns of species richness and sampling strength for the different pastures. Comparisons between pastures were performed visually with the curve of the confidence interval (CI) 95% (EstimateS 7.5; Colwell, 2005). The percentage of the average sampling efficiency of three estimators of diversity (Chao 1, Jackknife 1 and ACE) was calculated with the program EstimateS 7.5 (Colwell, 2005). Nonmetric Multidimensional Scaling (NMDS) was used to verify the occurrence of distinct groups between pastures with and without cattle. These tests were performed in the program Primer v.6 (Clarke & Gorley, 2006). An additive partitioning model was used to explain the contribution of pastures with and without cattle on the total local diversity (Veech *et al.*, 2002), where total wealth is distributed as follows:  $W = W_1 + W_2 + W_3$ , where  $W_1$  is the diversity of the *pitfall*,  $W_2$  is the exchange of species between the *pitfalls* in the same pasture and  $W_3$  is the exchange of species between pastures with and without cattle. The observed and estimated values of  $W$  and diversity were obtained using the program PARTITION (Veech & Crist, 2009).

## RESULTADOS

A total of 2,285 individuals were captured belonging to 16 species, nine genera and five tribes: Ateuchini (three genera, three species); Canthonini (one species); Coprini (three genera, nine species), Onthophagini (one genus, two species) and Phanaeini (one species). Fifteen species were caught in areas without cattle, eight in areas with the presence of animals and seven were common to both areas. An increased number of species and individuals was found in pastures with the absence of cattle (95%, CI).

Despite the small capture strength, sampling efficiency was high. For the pasture without cattle grazing the average of the estimators (Chao 1, Jackknife 1 and ACE) indicated that 93.45% of species were caught, while for areas with cattle, the estimate was 92.10%. The pasture without cattle showed greater evenness. *Dichotomius* (*Dichotomius*) *bos* (Blanchard, 1843) and *Trichillum* sp.1 were dominant in both pasture areas. The assembly structure of dung beetles was different between pastures with and without cattle (ANOSIM,  $R = 0.13$ ,  $p < 0.05$ ), indicating that the presence of the cattle influences the assembly that uses resources in the pasture. In hierarchy level 1 (diversity of sampling point) and 1 (species turnover between sampling points) the distribution of species occurred by chance ( $p < 0.05$ ). For the most elevated level (2), more than 50% of the exchange of species between the pastures

with and without cattle grazing was due to beta diversity ( $p < 0.05$ ).

The lack of pressure exerted by cattle grazing allows increased growth of exotic grasses and native herbs, altering the microclimatic characteristics of the areas. In environments of greater air humidity, as in the case of pastures with more plant biomass, sheep droppings can be rehydrated with dew or rain to become more attractive to beetles for a longer period (*e.g.*, Lumaret & Kirk, 1987). This probably favors the assembly of dung beetles that may use sheep feces as a resource. Results also demonstrated that the presence of pastures with or without cattle grazing is important to ensure a wide local diversity.

## CONCLUSÃO

The results of this study point to a need to investigate the actual role of the resource sharing (cattle feces + sheep feces) in exotic pastures. Apparently a possible substitution of cattle livestock sites for sheep production did not affect the community of dung beetles active in exotic pastures of the Brazilian Cerrado - Pantanal ecotone.

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