

seed dispersal), and the importance of redundancy, complementarity and dominance within dung beetle communities. The results show that the proportion of dung and three size classes of seeds removed increased as functional group richness increased, and that there was transgressive overyielding for mixtures of diurnal and nocturnal rollers, diurnal and nocturnal tunnellers, and diurnal and nocturnal tunnellers and rollers together. Diurnal beetles appear to complement nocturnal beetles and rollers and tunnellers only show complementarity when functional group richness is highest and both diurnal and nocturnal groups are present. These results suggest that the loss of entire functional groups can have strong effects on ecosystem functioning, and that the nature and magnitude of these effects depends on the identity of the functional group being lost. In the system studied, large nocturnal tunnellers are the most important functional group in maintaining the ecosystem function of dung removal and secondary seed dispersal. In conclusion there is clear evidence that ecosystem functioning increases with an increase in functional group richness.

FLIGHT TIME OF COPROPHAGOUS SCARABAEIDAE IN A BORDER OF ATLANTIC FOREST FRAGMENT AND PASTURE IN BRAZIL

S. Y. Tanabe, V. Gomes Tabet, W. Mesquita Filho & C. A. H. Flechtmann

Department of Plant Protection, FEIS/UNESP, Ilha Solteira/São Paulo, Brazil. E-mail: siltanabe@gmail.com

Dung beetles belong mainly to family Scarabaeidae (*sensu lato*), and in pastures they are of special importance, where they constitute the most practical and economically feasible way of removal of cow pads. Cow pads are an environment for development of several parasitic pests of cattle, such as the horn fly, *Haematobia irritans*, and gastrointestinal nematodes. By removing and burying such pads, dung beetles contribute to the enhancement of the physical and chemical properties of the soil, while helping to control cattle parasites. The main objective of this experiment was to determine the flight peak of coprophagous Scarabaeidae found at the border of a fragment of Atlantic forest and a pasture area at UNESP Farm, in Selviria, state of Mato Grosso do Sul, Brazil. Beetles were attracted to pitfall traps baited with fresh cattle droppings (set at 7:00am and replaced by fresh dung again at 6:00pm) and trapped insects were collected at 20-min intervals for a period of 24 h, once a week, from September 2005 until March 2006. A total of 33 species were trapped, and the 15 most abundant were included in the statistical analyses. *Canthidium barbaticum*, *Canthon septemmaculatus* and *Eurysternus* near *hirtellus* were significantly trapped more in the morning, *Onthophagus* near *hirtulus* in the afternoon and *Dichotomius bos*, *Dichotomius carbonarius*, *Dichotomius nesus*, *Ontherus appendiculatus* and *Ontherus sulcator* at night, while no species showed to fly preferably between midnight and sunrise. Of the morning species, flight peak of *C. barbaticum* was from 6:20am - 7:00am, in *C. septemmaculatus* between 8:40am and 10:20am, and in *E. near hirtellus* at 11:40am. In the only vespertine species, *O. near hirtulus*, flight peak occurred at 16:40 h. In the nocturnal species, *D. carbonarius* flight peak was at 7:20pm, in *D. nesus* at 7:40pm, in *O. sulcator* at 8:20pm and in *D. bos* it was between 8:20pm and 9:20pm, in *O. appendiculatus* at 8:40pm. Results indicate for several species there is no overlapping in peak of flight time, which could be advantageous for these species in the sense food resources would be better exploited while at the same time reducing competition among species.