Habitat differences in dung beetle assemblages in an African savanna–forest ecotone: implications for secondary seed dispersal

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Abstract

The probability and pattern of secondary seed dispersal by dung beetles (Scarabaeinae) depend on their community structure and composition at the site of primary deposition, which, in turn, seem to be strongly determined by vegetation. Consequently, we expected pronounced differences in secondary seed dispersal between forest and savanna in the northern Ivory Coast, West Africa. We found 99 dung beetle species at experimentally exposed dung piles of the olive baboon (Papio anubis (Lesson, 1827)), an important primary seed disperser in West Africa. Seventy-six species belonged to the roller and tunneler guilds, which are relevant for secondary seed dispersal. Most species showed a clear habitat preference. Contrary to the Neotropics, species number and abundance were much higher in the savanna than in the forest. Rollers and tunnelers each accounted for approximately 50% of the individuals in the savanna, but in the forest rollers made up only 4%. Seeds deposited into the savanna by an omnivorous primary disperser generally have a higher overall probability of being more rapidly dispersed secondarily by dung beetles than seeds in the forest. Also, rollers disperse seeds over larger distances. In contrast to other studies, small rollers were active in dispersal of large seeds, which were seemingly mistaken for dung balls. Our results suggest that rollers can remove seeds from any plant dispersed in primate dung in this ecosystem.

Key words: Africa, baboon defecations, guild differences, Scarabaeidae, secondary seed dispersal.

INTRODUCTION

Most tropical tree species produce seeds embedded in fleshy fruit pulp for endozoocorous dispersal by frugivorous animals (Howe & Smallwood 1982). After initial dispersal, seeds may be exposed to a variety of post-dispersal hazards (Fenner & Thompson 2005). As a result, the probability of any seed establishing is low (Wenny 2001, and references therein). Therefore, post-dispersal seed fate is a crucial aspect in understanding plant-frugivore interactions (Vander Wall et al. 2005).

Adult dung beetles (Coleoptera, Scarabaeidae) are important secondary seed dispersers (Andresen 1999; Vulinec 2002; Chapman et al. 2003; Culot et al. 2009). They can be assigned to one of four functional groups (guilds): rollers, tunnelers, dwellers, and kleptoparasites. “Rollers” form dung balls and roll them on the soil surface away from the dung pile. Most dung balls are buried, but some Sisyphini deposit their dung balls on the soil surface (Walter 1980). “Tunnelers” pull dung portions into tunnels dug under or near the dung pat. “Dwellers” and “kleptoparasites” do not remove dung from the site of deposition and, therefore, are not involved in seed dispersal (Cambeafort & Hanski 1991). Dur-