

Predation of *Scarabaeus cristatus* F. (Coleoptera, Scarabaeidae) by jerboas (*Jaculus* sp.: Rodentia, Dipodidae) in a Saharan sand dune ecosystem

Depredación de *Scarabaeus cristatus* F. (Coleoptera, Scarabaeidae) por jerbos (*Jaculus* sp.: Rodentia, Dipodidae) en un ecosistema de dunas sahariano

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Dung beetles are preyed by a diverse array of predators. Adults are predated by insects such as Cicindelidae and Staphylinidae (Young, 1980, 1998) and are included in the diet of many birds (e.g., Tejero *et al.*, 1982; van Manen, 1996; Obuch & Kristin, 2004) and mammals (e.g., Martín-Piera & Lobo, 1995; Sleeman & Hutton, 2005). In addition to predation on adult dung beetles, some insects and mammals have also been reported to predate on dung beetle nests, consuming the larvae developing within the brood masses (e.g., Kingston & Coe, 1977; González-Megías & Sánchez-Piñero, 2003). Despite the fact that predation may be an important interaction affecting dung beetles, as suggested by the presence of diverse defensive mechanisms (as cuticular glands secreting repellent substances, nocturnal activity and deep nest burrowing; Kingston & Coe, 1977; Halfpter & Edmonds, 1982: 25; Mena, 2001), predation on dung beetles is very poorly known (Hanski, 1991: 370-371). In this note, predation of *Scarabaeus cristatus* Fabricius, 1775 by jerboas (*Jaculus* sp.) on a Saharan sand dune ecosystem is recorded.

Observations were carried out on 6 April 2007 at Erg Chebbi (Taffilalt, SE Morocco). A total of 13 *S. cristatus* burrows were located following the tracks of the beetles in the sand at sunrise. Nine burrows contained one beetle with a camel dung ball inside. Four burrows were found open, with

remains of the beetles (pieces of the head, legs, elytra, etc.) at the entrance of the burrows (Fig. 1). One camel dung ball was found inside each of these four burrows, ca. 30 cm deep in the sand. In all these four burrows found open with beetle remains, the tracks of *Jaculus* sp. [probably *Jaculus jaculus* (Linné, 1758); see Aulagnier & Thevenot 1986], easily recognizable by foot prints with three toes, were visible in the sand. Rodents had approached the burrows, excavated them and, apparently, taken the beetles out of the burrows to eat them. In addition, one *S. cristatus* track led to an 'abandoned' camel dung ball. In this case, the tracks of the rodent approached the beetle tracks, leaving a confusing mix of prints around the dung ball, but no beetle remains were found. Whether it was a successful



Fig. 1.—*Scarabaeus cristatus* burrow excavated by a jerboa. Beetle remains (a front leg and head parts) and rodent tracks are visible at the open entrance of the burrow.

Fig. 1.—Galería de *Scarabaeus cristatus* excavada por un jerbo. Restos del escarabajo (una pata anterior y partes de la cabeza) y huellas del roedor son visibles a la entrada abierta de la galería.

predation event (the rodent may have taken the beetle somewhere else to eat it) or not (the beetle may have avoided the rodent by flying out of the scene) was not possible to determine because the rodent tracks were lost in the hard, gravel interdune valley.

These data suggest that rodent predation on *Scarabaeus cristatus* in Saharan sand dunes could be high (4 recorded eaten beetles out of 13 beetle burrows found, ca. 30%). However, if jerboas are able to successfully capture *S. cristatus* beetles when constructing or rolling their dung balls, predation may be even higher.

Although jerboas (*Jaculus* sp.) are considered as strict granivores or herbivores (Kadhim, 1979; Happold, 1984; Aulagnier & Thevenot 1986; Nowak, 1999), they are known to include insects in their diet (Le Berre, 1990). In fact, as in other desert rodents, dietary patterns can be highly variable depending on resource availability (Kerley, 1989) and insects may constitute an important part of the diet of these animals to maintain water balance in areas where green vegetation is scarce (Walsberg, 2000; Tracy and Walsberg, 2002). In addition, in many desert locations rodents predate also on large tenebrionid beetles [such as *Pimelia* spp., *Prionotheca coronata* (Olivier, 1795) in southern Morocco; F.S. Piñero, pers. obs.] and are known to affect the distribution and abundance of their prey (Yom-Tov, 1970). Whether predation by rodents is an important factor in the population dynamics of *S. cristatus* in this desert system remains a question requiring further study.

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