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# Large trees, acacia shrubs, and the density of *Thallomys nigricauda* in the Thornveld savannah of South Africa

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**Abstract**

We investigated the density of *Thallomys nigricauda* (acacia rat or black-tailed tree rat) in correlation to habitat characteristics at the Molopo Nature Reserve (S 25°50′; E 22°55′, South Africa). Data on nest trees and vegetation were sampled on 15 study sites along a transect of 25 km. Abundance of acacia rats was estimated using a combined count of nests and scat accumulations. Large live trees of *Boscia albitrunca* (>5 m) were preferred for nesting. Nests with offspring had significantly more often food plants (*Acacia mellifera* or *A. luederitzii*) close to the nest tree than non-reproductive nests or controls. Hierarchical partitioning revealed the density of large *B. albitrunca* trees and *Acacia erioloba* of various size classes were positively correlated to the abundance of the acacia rats. The significance of medium sized *A. erioloba* disappeared when we used only nests as a measure of acacia rat abundance. Density of food plants showed no significant effect on the abundance of acacia rats. Overall our results differ greatly from observations in other areas, where the acacia rat prefers *Acacia* trees for nesting.


*Keywords:* Black-tailed tree rat; Hierarchical partitioning; Selection index; Manly's alpha

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## 1. Introduction

Throughout the world, the use of savannahs by domestic stock and game animals influences the composition and dynamics of the vegetation (Delany and Happold, 1979; Jeltsch et al., 1997; Schultka and Cornelius, 1997; Joubert and Ryan, 1999). This change in the vegetation is characterized by a general decrease of vegetation cover and a relative increase of annual plants and shrubs. That process has consequences for the diversity of animals living in the savannahs (Rosenzweig and Winakur, 1969; Adler, 1995; Nyako-Lartey and Baxter, 1995; Fuller and Perrin, 2001, Salvatori et al., 2001). Especially ground-dwelling small rodents respond to changes in the vegetation (e.g. Shenbrot, 1992; Rosenstock, 1996; Whitford, 1997; Joubert and Ryan, 1999). Most ground-dwelling rodents are herbivores and/or granivores, and a well-developed grass matrix triggers abundance and species richness. Arboreal mammals, however, may react in a quite distinct way to the spatial and temporal dynamics of the vegetation (Henderson et al., 1985; Shepherd and Swihart, 1995; Milner and Harris, 1999; Gaylard and Kerley, 2001; Taulmann and Smith, 2004). Arboreal mammals collect food in the shrub and tree layer, which makes them widely independent of the grass matrix. Furthermore, an increased shrub cover provides better protection from aerial predators.

*Thallomys nigricauda* (acacia rat or black-tailed tree rat) is an arboreal rodent of medium body size (up to 100 g). This species is widespread across the dry savannahs of southern Africa. Together with the dormice (*Graphiurus*), the acacia rat is one of the few arboreal rodents of the region (Apps, 2000). Acacia rats build nests within cavities of large trees and other suitable tree structures (Shortridge, 1934; Nel, 1975). Observations made in the Kalahari suggested that acacia rats prefer *Acacia erioloba* (camelthorn) for nesting (Nel and Rautenbach, 1975; de Graaff, 1978). Leaves, gum and pods of *Acacia* trees provide also the main food source (Skinner and Smithers, 1990; Nowak, 1991; Kingdon, 1997). Recent studies underlined the importance of certain *Acacia* trees for feeding. An analysis of faeces collected in summer and winter at our study area revealed 95% of identified fragments were leaves of either *Acacia mellifera* or *A. luederitzii* (Meyer, 2004).

In the present paper we analyse the habitat requirements of the acacia rat in the Thornveld savannah of South Africa. We posed three questions. First, do acacia rats select certain tree species or type of trees for nesting? Second, is the density of acacia rats correlated to the selected tree species? Third, to which extent is the density of acacia rats influenced by the occurrence of food plants? The answers to these questions provide baselines to understand the response of arboreal mammals to the changes in the vegetation of African savannahs.

## 2. Material and methods

The study was carried out in the Molopo Nature Reserve (MNR) (S 25°50′; E 22°55′; 1000 m a.s.l., South Africa). The reserve is situated in the semi-arid part of the Kalahari (mean annual rainfall 332 mm; SD = 158; $n = 50$ years). The vegetation is classified as Kalahari Thornveld (Acocks, 1988). Between the 1960s and the mid 1980s, the reserve was used for cattle farming. Except for occasional fires for keeping open grassy sites, the area is now allowed to develop without further management. The most abundant trees are *Boscia albitrunca* (shepherd tree), *A. erioloba* (camelthorn) and to some extent *Terminalia sericea* (silver cluster leaf). *A. mellifera* (black thorn), *A. luederitzii* (false umbrella thorn), *Grewia*