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Landscape drivers of mammal habitat use and richness in a protected area and its surrounding agricultural lands

Beatriz Bellón [a,b,*], Dominic A.W. Henry [d,e], Pierre-Cyril Renaud [b,c], Fabio de O. Roque [f], Cyntia Cavalcante Santos [f], Isabel Melo [f], Damien Arvor [g], Alta de Vos [a]

[a] Department of Environmental Science, Rhodes University, Makhanda 6140, South Africa
[b] Univ Angers, BiodivAG-IRL REHABS, F-49000 Angers, France
[c] Sustainability Research Unit, Faculty of Science, George Campus, Nelson Mandela University, George, South Africa
[d] Statistics in Ecology, Environment and Conservation, Department of Statistical Sciences, University of Cape Town, Rondebosch, South Africa
[e] Endangered Wildlife Trust, Johannesburg, South Africa
[f] Instituto de Biociências, Universidade Federal de Mato Grosso do Sul, Campo Grande, Mato Grosso do Sul 79070-900, Brazil
[g] CNRS, UMR 6554 LETG, Université Rennes 2, 35043 Rennes, France

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ABSTRACT

Protected areas (PAs) are key to conserving biodiversity and ecosystem services globally, but their effectiveness increasingly depends on the ability of the surrounding agricultural areas to support biodiversity and secure connectivity at the landscape level. This requires monitoring the broader multi-use landscapes in which PAs exist and identifying the landscape characteristics that support rich, functional wildlife communities. Here, we investigated the species richness and habitat use patterns of a mammal community in relation to different landscape variables and land use and land cover (LULC) types in a PA and its surrounding agricultural lands in the Cerrado. We first used a hierarchical multi-species occupancy model with input camera trap data and eight landscape variables (vegetation productivity, phenology, and heterogeneity, distance to water, roads and settlements, and the PA, slope, and elevation) to estimate the species richness and habitat use of 29 mammal species across the landscape. We then analyzed the relationships between the species richness and habitat use and the landscape variables at the site level, as well as the distribution of species at the landscape level in relation to the different natural and agricultural LULC types. We found that most species are present in the native forest areas across the landscape and that many species are also present in the croplands surrounding the PA. The results also showed that species' habitat use was especially determined by the productivity and heterogeneity of the vegetation cover, with a particularly strong positive relation in grasslands and pastures. These results suggest that the private properties surrounding the PA might be playing an essential role in supporting biodiversity in this region and provide insights on management practices that could largely contribute to maintaining or promoting a multifunctional landscape, such as maintaining the remaining forests or increasing the productivity and the heterogeneity (e.g., by increasing tree cover) in pastures.

1. Introduction

The capacity of protected areas (PAs) to preserve some habitats and species (Coetzee et al., 2014; Geldmann et al., 2013; Gray et al., 2016) make them critical for attaining global biodiversity conservation goals (CBD, 2020, 2016). However, the effectiveness of PAs largely depends on local contexts (Coetzee et al., 2014; Laurance et al., 2012), including the complex interactions (both positive and negative) with the surrounding agricultural areas (i.e., croplands, pastures) and human activities (Blanco et al., 2020; DeFries et al., 2010; Hansen and DeFries, 2007).

Indeed, local to international policies now recognize that PAs cannot be managed as islands (Cumming et al., 2015; Palomo et al., 2014) and that PAs are not sufficient, by themselves, to curb biodiversity loss whilst

* Corresponding author at: Department of Environmental Science, Rhodes University, Makhanda 6140, South Africa.
E-mail addresses: bellon.beatriz@gmail.com (B. Bellón), dominichenry@gmail.com (D. A.W. Henry), pierre-cyril.renaud@univ-angers.fr (P.-C. Renaud), roque.eco@gmail.com (F.O. Roque), cyntiasantos7@yahoo.com.br (C.C. Santos), imelov@gmail.com (I. Melo), damien.arvor@univ-rennes2.fr (D. Arvor), a.devos@ru.ac.za (A. de Vos).

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