



UNIVERSITY OF GOTHENBURG

# **Herbivory and Biodiversity Conservation of the Savannah Habitats in Akagera National Park, Rwanda**

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Göteborg 2013

The thesis will be publicly defended on Friday 26<sup>th</sup> April, 2013, at 14 p.m., in Hörsalen, Department of Biological and Environmental Sciences, Carl Skottbergs gata 22B, Göteborg.

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ISBN: 978-91-85529-56-8  
<http://hdl.handle.net/2077/32604>



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Gatali, Callixte. 2013. Herbivory and Biodiversity Conservation of the Savannah Habitats in Akagera National Park, Rwanda. Doctoral thesis. ISBN: 978-91-85529-56-8

### Abstract

Savannahs make up about 20% of the world's land surface, whereas African savannahs constitute 50% of the land area and have been used as parks to conserve nature and for outdoor recreation. However, conserving biodiversity in these ecosystems has been challenging due to increasing pressures, potential loss of habitat and species or lack of up-to-date data in some of the protected areas. In this thesis, I investigated the state of biodiversity in Akagera National Park (ANP), Rwanda, and factors affecting its distribution. The work of this thesis is based on the results of large-scale, replicated point counts and presence-absence surveys conducted between August 2009 and August 2011 in the savannah habitats of the park. ANP plays an important role in conserving about 525 bird species known from the park and > 50 species of large mammals. Systematic plots of equally-spaced 1-km<sup>2</sup> ( $n = 266$ ) were used for both bird and large mammal censuses. The Chao2 estimator and the Simpson index were used to estimate and compare bird species richness and diversity, respectively, between inside and outside the park. Generalized linear models (GLMs) were used to investigate relationships between bird diversity and habitat structure, whereas Distance sampling methods were used for estimating both population sizes and densities of large mammals.

Despite recent important changes in habitats and fauna of the ANP, the results of this thesis show that the park has maintained an important diversity of birds. The 301 bird species recorded during my study represents 43% of Rwanda's checklist of birds (i.e. 697 species), underlining that ANP still contributes to the conservation of birds (Paper I). The results highlight that ANP still maintained special and important ornithological features, including the presence of endemic species of the Lake Victoria region, globally threatened species, those that have not previously been recorded in Akagera and a large number of Palearctic and Afrotropical migrants (Paper I). The abundance of bird species was found to be linked to human influence (Paper II). In fact, this thesis found large human effects on both the grassland habitat (e.g. reduction of grass biomass and the presence of tall grass by 57% and 76%, respectively) and bird species richness which significantly varied between inside and outside the park due to different land use practices between the two types of habitat. However, human activities did not affect species diversity.

This thesis further revealed significant relationships between habitat structure and bird species richness that varied between inside and outside the park (Paper III). However, habitat structure did not correlate with species diversity. Paper III also demonstrated that single savannah species use habitats differently due to individual niche characteristics and niche interactions with other species. Estimates of the total population and density of large mammals varied for each species and the most abundant large herbivores were impalas, buffaloes, topis, baboons and zebras (Paper IV). High population sizes and densities of Ankolé found both inside and outside the park might have an impact on wildlife. Similarly, large population sizes of large mammals that are still outside the park pose a conservation challenge. Compared to previous surveys of the park (e.g. 1990, 1997/1998, 2002 & 2010), the findings of this thesis demonstrate that most large wild herbivores declined between 1990 and 2011 except zebras, warthogs and duikers that rather increased. Habitat structure was also found to affect the distribution and abundance of large mammals. Finally, I hope that my results provide new inputs for further strengthening of efforts to conserve the park's biodiversity and might be useful for further assessment of the relationships between species diversity/richness and community stability as well as ecosystem function.

**Keywords:** Akagera National Park, biodiversity, birds, East Africa, habitat structure, human impact, landscape and local/plot scales, large herbivores, Rwanda, savannah, species-habitat relationship, species- richness, detectability, diversity.