

# College of African Wildlife Management, Mweka



## Book of Abstracts 2022/2023





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Management, Mweka**

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# **D**oes variation in plant diversity and abundance influence browsing intensity in black rhinos?

*Emanuel S. Sisya, Francis Moyo, Emanuel H. Martin, Linus K. Munishi*

## **Abstract**

Variations in forage availability, selection and preferences can lead to intense foraging competition and depletion of food consequently lowering diet quality and population performance of black rhino species. This study investigated seasonal variations in rhino diet, foraging, preference and browsing intensity and how this is influenced by plant diversity and availability in Mkomazi National Park (MKONAPA). Fifty-eight square grids were randomly selected in each season, and plots were laid for vegetation assessment during wet and dry seasons in the sanctuary. Browsed species by rhinos were compared with rhino feeding data from fourteen rhino range areas within Africa. More than 85% of species edible in MKONAPA were similar to those in rhino range areas. *Acalypha ornata*, *Grewia similis* and *Commiphora africana* were highly utilised specie in both seasons. Diversity and abundance of consumed browses decreased towards the dry season while browsing intensity increased with forage preference in both seasons and was prominent when browse availability was low in dry seasons. Our study established seasonal variation in dietary composition, browsing intensity and preferences for black rhinos. We suggest establishing nutritional composition of preferred forages, assessing density of competitor browsers, translocating excess rhinos or expanding the sanctuary to meet the recommended ecological carrying capacity.

**Key Words:** black rhino forage, browse utilisation, browsing intensity, *Diceros bicornis*, forage availability, forage preference, Mkomazi rhino sanctuary

**Journal:** *African Journal of Ecology*

**DOI:** <https://doi.org/10.1111/aje.13145>

# **B**etween hunter and climate: the effects of hunting and environmental change on fecal glucocorticoid metabolite levels in two sympatric ungulate species in the Ruaha–Rungwa ecosystem, Tanzania

*Kwaslema Malle Hariohay, Louis Hunninck, Peter S Ranke, Robert D Fyumagwa, Rupert Palme, Eivin Røskoft*

## **Abstract**

Understanding the drivers of animal population decline is a key focus of conservation biologists. Anthropogenic activities such as hunting have long been established as potentially detrimental to a population's persistence. However, environmental perturbations such as increased temperature variability, exacerbated by climate change, can also have important effects on animal populations. Animals can respond to these challenges by adjusting both their behavior and physiology. We measured fecal glucocorticoid metabolites (FGMs) of common impala (*Aepyceros melampus*) and greater kudu (*Tragelaphus strepsiceros*), both currently in stable populations, to examine effects of hunting, forage availability, daily variability in temperature and group size on their physiological stress response. The study was conducted across two adjacent protected areas, (i) one non-hunted area (Ruaha National Park; RNP) and (ii) one area used for trophy hunting (Rungwa Game Reserve; RGR). Both impala and kudu had significantly higher FGM levels in the area that allows hunting, while FGM levels decreased with increasing forage availability and increasing daily temperature. Moreover, impala (but not kudu) had lower FGM levels with larger group sizes. Our results

indicate that the management regime can significantly alter the physiological state of wild ungulate populations. We also highlight the importance of considering the combined effects of anthropogenic, environmental and social contexts when studying the stress response of wild populations. Our results emphasize the value of protected areas and continued monitoring of hunting quota in order to maintain ungulate populations that are less vulnerable to population declines.

**Key Words:** trophy hunting, stress, population decline, fecal glucocorticoid metabolites, Anthropogenic activities

**Journal:** Conservation Physiology, *Volume 11, Issue 1*, 2023, *coad002*,

**DOI:** <https://doi.org/10.1093/conphys/coad002>

# Screening and evaluation of cytotoxicity and antiviral effects of secondary metabolites from water extracts of *Bersama abyssinica* against SARS-CoV-2 Delta

*Never Zekeya, Bertha Mamiro, Humphrey Ndossi, Rehema Chande Mallya, Mhuji Kilonzo, Alex Kisingo, Mkumbukwa Mtambo, Jafari Kideghesho, Jaffu Chilongwa*

## Abstract

*Bersama abyssinica* is a common herb in Africa, with diverse medical uses in different areas. The plant is well-known in Tanzania for treating respiratory disorders such as TB, tonsillitis, bronchitis, and asthma, and it has lately been utilized to treat COVID-19 symptoms. Water extract of leaf and stem bark has been registered as an herbal medication known as 'Coviba Dawa' in Tanzania for the relief of bacterial respiratory infections. The extracts, however, have not been scientifically tested for their anti-viral activities. The aim of this work was to test for the cytotoxicity and antiviral effects of bioactive ingredients from *B. abyssinica* extracts against the Delta variant of the SARS-CoV-2 coronavirus. *B. abyssinica* leaves and stem bark were dried under shade in room temperature and then pulverized to obtain small pieces before soaking into different solvents. One hundred grams of each, leaves and stem bark, were extracted in petroleum ether, dichloromethane, ethyl acetate and methanol. Water extract was obtained by decoction of stem bark and leaves into water. Phenols, flavonoids, tannins, and antioxidants were confirmed as components of the extracts. Analysis of polar extracts of bark stem bark and leaves was done. Antiviral screening and cytotoxicity experiments were conducted

in a Biosafety Level 3 (BSL-3) Laboratory facility according to International Standard Operating Procedures (SOPs).

By the use of LC–MS/MS analysis, this study confirmed the existence of four phenolic compounds in *B. abyssinica* water extract; 2,4-di-tert-butylphenol, 4-formyl-2-methoxyphenyl propionate, 7,8-Dihydroxy-4-methylcoumarin, and 2,3, 6-trimethoxyflavone with antioxidant activity. This study showed that, while the water extracts of *B. abyssinica* had significant antiviral activity against SARS Cov2 virus, it showed no cytotoxicity effect on Vero E6 cells. In particular, the water extract (Coviba dawa) showed 75% while ethylacetate fraction of *B. abyssinica* leaves showed a 50% in vitro viral inhibition, indicating that these substances may be useful for the development of future anti-viral agents. We therefore recommend isolation of compounds for further profiling and development with a broader concentration range. We further recommend studies that determine the antiviral activity of extracts of *B.abyssinica* on other viral pathogens of clinical concern.

**Key Words:** Bersama abyssinica, Bioactive compounds, Coviba Dawa, COVID-19, Traditional medicine, Tanzania

**Journal:** *Delta. BMC Complement Med Ther.* 2022 Oct 26;22(1):280,

**DOI:** [10.1186/s12906-022-03754-3](https://doi.org/10.1186/s12906-022-03754-3)

# **A**gricultural intensification with seasonal fallow land promotes high bee diversity in Afrotropical drylands

*Julius V. Lasway, Marcell K. Peters, Henry K. Njovu, Connal Eardley, Alain Pauly, Ingolf Steffan-Dewenter*

## **Abstract**

The exponential increase in the human population in tandem with increased food demand has caused agriculture to be the global-dominant form of land use. Afrotropical drylands are currently facing the loss of natural savannah habitats and agricultural intensification with largely unknown consequences for bees. Here we investigate the effects of agricultural intensification on bee assemblages in the Afrotropical drylands of northern Tanzania. We disentangled the direct effects of agricultural intensification and temperature on bee richness from indirect effects mediated by changes in floral resources.

We collected data from 24 study sites representing three levels of management intensity (natural savannah, moderate intensive and highly intensive agriculture) spanning an extensive gradient of mean annual temperature (MAT) in northern Tanzania. We used ordinary linear models and path analysis to test the effects of agricultural intensity and MAT on bee species richness, bee species composition and body-size variation of bee communities. We found that bee species richness increased with agricultural intensity and with increasing temperature. The effects of agricultural intensity and temperature on bee species richness were mediated by the positive effects of agriculture and temperature on

the richness of floral resources used by bees. During the off-growing season, agricultural land was characterized by an extensive period of fallow land holding a very high density of flowering plants with unique bee species composition. The increase in bee diversity in agricultural habitats paralleled an increasing variation of bee body sizes with agricultural intensification that, however, diminished in environments with higher temperatures.

*Synthesis and applications.* Our study reveals that bee assemblages in Afrotropical drylands benefit from agricultural intensification in the way it is currently practiced. However, further land-use intensification, including year-round irrigated crop monocultures and excessive use of agrochemicals, is likely to exert a negative impact on bee diversity and pollination services, as reported in temperate regions. Moreover, several bee species were restricted to natural savannah habitats. To conserve bee communities and guarantee pollination services in the region, a mixture of savannah and agriculture, with long periods of fallow land should be maintained.

**Key Words:** bee abundance, bee body size, bee species richness, forage resources, inter-tegular distance, mean annual temperature, northern Tanzania, species community composition.

**Journal:** *Journal of Applied Ecology*

**DOI:** <https://doi.org/10.1111/1365-2664.14296>

# Consistent diel activity patterns of forest mammals among tropical regions

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## Abstract

An animal's daily use of time (their "diel activity") reflects their adaptations, requirements, and interactions, yet we know little about the underlying processes governing diel activity within and among communities. Here we examine whether community-level activity patterns differ among biogeographic regions, and explore the roles of top-down versus bottom-up processes and thermoregulatory constraints. Using data from systematic camera-trap networks in 16 protected forests across the tropics, we examine the relationships of mammals' diel activity to body mass and trophic guild. Also, we assess the activity relationships within and among guilds. Apart from Neotropical insectivores, guilds exhibited consistent cross-regional activity in relation to body mass. Results indicate that thermoregulation constrains herbivore and insectivore activity (e.g., larger Afrotropical herbivores are ~7 times more likely to be nocturnal than smaller herbivores), while bottom-up processes constrain the activity of carnivores in relation to herbivores, and top-down processes constrain the activity of small omnivores and insectivores in relation to large

carnivores' activity. Overall, diel activity of tropical mammal communities appears shaped by similar processes and constraints among regions reflecting body mass and trophic guilds.

**Keywords:** Body Mass, Camera traps, Mammal communities, Tropical Forest, Trophic guild

**Journal:** *Nature communications*,

**DOI:** <https://doi.org/10.1038/s41467-022-34825-1>

# **P**atterns Pertaining to Crocodile Attacks on Humans in Tanzania: Baseline Data to Support Mitigation Measures

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## **Abstract**

Studies of animal attacks on humans in Tanzania have been biased towards large mammals, such as elephants, lions, and hyenas, overlooking attacks from other taxa, including reptiles. Here, we used data from government institutions to explore patterns of attacks on humans by crocodiles in Tanzania between 2010 and 2019. We obtained a total of 575 crocodile attacks, with most of the attacks occurring within or adjacent to the Nile crocodile range. Crocodile attacks varied significantly by victim gender, with 81% of attacks involving males. Furthermore, 58% of the attacks were fatal, with the proportion being more significant to children than adult victims. To reduce the frequency of attacks and fatalities, we recommend the construction of crocodile exclusion enclosures in crocodile attack hotspots and raising awareness in riparian communities, especially for children in schools, regarding crocodile range, attacks, and how to avoid them.

**Keywords:** Nile crocodiles, African slender-snouted crocodile, human-crocodile conflict, human-wildlife conflict, crocodile attack hotspots, Tanzania.

**Journal:** Human Ecology,

**DOI:** <https://doi.org/10.1007/s10745-022-00355-z>

# **E**lectrified fencing as a mitigation strategy for **h**uman-elephant conflict in Western Serengeti: **C**ommunity perspectives

*Maria T. Matata, Juma J. Kegamba, Rudolf Mremi,  
Abraham Eustace*

## **Abstract**

Human-wildlife conflict (HWC) is a serious threat to communities living proximal to wildlife areas. Understanding the attitudes of local communities toward HWC management is critical for planning and designing effective and sustainable mitigation strategies. Here we used quasi-structured questionnaires to assess local community attitudes toward the electrified fencing installed in the Western Corridor of the Serengeti Ecosystem to mitigate human-elephant conflict (HEC). We found that most of the respondents agreed that the installed electrified fence effectively mitigates HEC. In addition, fencing has been perceived as effective in controlling problematic or dangerous animals other than elephants, and therefore increasing harvest yields, improving the physical security of farms and properties, minimizing illegal hunting, and reducing interaction between domestic and wild animals. Furthermore, the local people in the surveyed area expect that human-wildlife coexistence will improve after the fence installation. As the area is famously known for the annual great wildebeest migration, we recommend further studies on the ecological impacts of the installed fence.

**Keywords:** Community attitude Electric fence Human wildlife conflict (HWC) Perception Wildlife damage

**Journal:** *Journal for Nature Conservation*

**DOI:** <https://doi.org/10.1016/j.jnc.2022.126271>

# **C**o-limitation towards lower latitudes shapes global forest diversity gradients

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## **Abstract**

The latitudinal diversity gradient (LDG) is one of the most recognized global patterns of species richness exhibited across a wide range of taxa. Numerous hypotheses have been proposed in the past two centuries to explain LDG, but rigorous tests of the drivers of LDGs have been limited by a lack of high-quality global species richness data. Here we produce a high-resolution ( $0.025^\circ \times 0.025^\circ$ ) map of local tree species richness using a global forest inventory database with individual tree information and local biophysical

characteristics from ~1.3 million sample plots. We then quantify drivers of local tree species richness patterns across latitudes. Generally, annual mean temperature was a dominant predictor of tree species richness, which is most consistent with the metabolic theory of biodiversity (MTB). However, MTB underestimated LDG in the tropics, where high species richness was also moderated by topographic, soil and anthropogenic factors operating at local scales. Given that local landscape variables operate synergistically with bioclimatic factors in shaping the global LDG pattern, we suggest that MTB be extended to account for co-limitation by subordinate drivers.

**Keywords:** Anthropogenic factors, Global Forest inventory, Latitudinal diversity gradients, Metabolic theory of biodiversity, Tree species richness

**Journal:** *nature ecology & evolution*

**DOI:** <https://doi.org/10.1038/s41559-022-01831-x>

# Entomopathogenic fungi (*Aspergillus oryzae*) as biological control agent of cattle ticks in Tanzania

*Sylvia S. Msangi, Never Zekeya, Esther G. Kimaro, Lughano  
Kusiluka and Gabriel Shirima*

## Abstract

Ticks are the most important ectoparasites that are responsible for severe economic losses in livestock industry. The use of chemical acaricides is the most common method used to control ticks in livestock. This study was conducted to determine the efficacy of *Aspergillus oryzae* as an alternative biological agent in controlling ticks to enhance livestock productivity. The efficacy of *A. oryzae* at different concentrations was evaluated against larvae and adults of the hard tick genera *Rhipicephalus*, *Boophilus*, and *Amblyomma* using an immersion test under laboratory conditions. Field trials were conducted in two purposively selected cattle herds in Monduli district, northern Tanzania. *A. oryzae* at a concentration of  $1 \times 10^6$  conidial/ml was sprayed on all cattle tick-infested areas. The results demonstrated a concentration-related increase in mortality for both larvae and adult female engorged ticks. The mean mortality of larvae and female engorged ticks was statistically significant at  $p < 0.05$  and  $p < 0.001$ , respectively. Egg production was found to decrease with increased *A. oryzae* concentration. Additionally, there was a statistically significant difference in egg production index and oviposition reduction ( $p = 0.009$ ) while there was no significant difference in egg hatching and product effectiveness at  $p = 0.089$  and  $p = 0.004$ , respectively between the tested ticks' genera. Under field conditions, the bio-acaricide demonstrated a

statistically significant tick reduction in all the treated cattle. This study concludes that *A. oryzae* has good acaricidal activity against ticks and hence, is one of the potential tick control methods for sustainable tick control schemes.

**Keywords:** *Aspergillus oryzae*, bio-acaricide, entomopathogenic fungi, cattle, ticks, Tanzania

**Journal:** *Journal of Veterinary Medicine and Animal Health*

**DOI:** <https://doi.org/10.5897/JVMAH2022.0985>

# Occupancy winners in tropical protected forests: a pantropical analysis

*Asunción Semper-Pascual, Richard Bischof, Cyril Milleret, Lydia Beaudrot, Andrea F. Vallejo-Vargas, Jorge A. Ahumada, Emmanuel Akampurira, Robert Bitariho, Santiago Espinosa, Patrick A. Jansen, Cisquet Kiebou-Opepa, Marcela Guimarães Moreira Lima, Emanuel H. Martin, Badru Mugerwa, Francesco Rovero, Julia Salvador, Fernanda Santos, Eustrate Uzabaho and Douglas Sheil*

## Abstract

The structure of forest mammal communities appears surprisingly consistent across the continental tropics, presumably due to convergent evolution in similar environments. Whether such consistency extends to mammal occupancy, despite variation in species characteristics and context, remains unclear. Here we ask whether we can predict occupancy patterns and, if so, whether these relationships are consistent across biogeographic regions. Specifically, we assessed how mammal feeding guild, body mass and ecological specialization relate to occupancy in protected forests across the tropics. We used standardized camera-trap data (1002 camera-trap locations and 2–10 years of data) and a hierarchical Bayesian occupancy model. We found that occupancy varied by regions, and certain species characteristics explained much of this variation. Herbivores consistently had the highest occupancy. However, only in the Neotropics did we detect a significant effect of body mass on occupancy: large mammals had lowest occupancy. Importantly, habitat specialists generally had higher occupancy than generalists, though this was reversed in

the Indo-Malayan sites. We conclude that habitat specialization is key for understanding variation in mammal occupancy across regions, and that habitat specialists often benefit more from protected areas, than do generalists. The contrasting examples seen in the Indo-Malayan region probably reflect distinct anthropogenic pressures.

**Keywords:** biodiversity patterns, camera-traps, community structure, functional traits, habitat specialization, hierarchical occupancy modelling

**Journal:** *Biological Sciences*

**DOI:** <https://doi.org/10.1098/rspb.2022.0457>

# **R**ole of water users in the conservation of forests on the southern slopes of Mount Kilimanjaro

*Emmanuel H. Lyimo , Daniel Kessy, Rudolf Mremi and Alex Kisingo*

## **Abstract**

Mount Kilimanjaro Forest (MKF) is recognized as a major provider of hydrological services to people in northern Tanzania. However, little is understood in terms of the roles of upstream and downstream communities in protecting and conserving MKF. This article applies binomial generalized linear models to understand the role of the community in supporting the protection and conservation of MKF based on data collected through a questionnaire survey from 90 households on the southern slopes of Mount Kilimanjaro. Results showed that 99% of respondents were aware of the value of MKF as a major provider of hydrological services, however, this did not vary significantly across age groups, gender, level of education, and location (upstream vs. downstream). Further results showed that, contrary to downstream communities, upstream communities play a significant role in supporting the ecological integrity and hydrological functions of MKF by planting and protecting tree cover, joining efforts through conservation clubs, donating cash to finance its protection, and adhering to bylaws governing environmental management. Hence, adopting an approach that integrates upstream and downstream communities in managing catchment forests and ensuring the sustainable flow of hydrological services is critical. The study also has unleashed water user behavior that have enlightened demand for more studies in the area.

**Keywords:** catchment forest, downstream community, hydrological services, upstream community, water

**Journal:** *Water and Climate Change*

**DOI:** <https://doi.org/10.2166/wcc.2023.434>

# **S**urvivorship of the Reintroduced Kihansi Spray Toads *Nectophrynoides asperginis* in a Soft Release Experiment at the Kihansi Gorge, Tanzania.

*Nassoro Mohamed, John Magige, F*

## **Abstract**

The Kihansi Spray Toad (KST) *Nectophrynoides asperginis* is endemic to the unique wetland habitat surrounding the Kihansi Falls, Tanzania, with which it was associated. The species was declared extinct in the wild in 2009 by the International Union for Conservation of Nature (IUCN), following the loss of its unique habitat due to the diversion of the Kihansi River for hydropower production. This study is an initial attempt to determine the survivorship and possible sources of mortality of newborn and adult KSTs placed in cages in their original habitat in the Upper Spray Wetland (USW) and Lower Spray Wetland (LSW) areas. The cages were made of wooden frames covered with galvanized wire mesh to prevent the toads from escaping while allowing their prey (live invertebrates) to enter. There was a significantly higher survivorship of adult toads in the USW (29.2%) compared to those in the LSW (4.2%) ( $\chi^2=36.7$ ,  $DF=1$ ,  $P < 0.0001$ ). The newborn toads showed equally high survivorship rates in both USW (70%) and LSW (80%) ( $\chi^2=0.1441$ ,  $DF=1$ ,  $P=0.7042$ ). Newborn toads had a higher survivorship (75%) than adults (17%) ( $\chi^2=16.7$ ,  $DF=1$ ,  $P<0.0001$ ). Thus, we conclude that newborns were the more suitable life-stage for successful reintroduction of the KST back into its natural habitat. Therefore, we recommend continual reintroduction of newborn toads until the population stabilizes. Further studies should be conducted on other factors affecting the

population dynamics of released KST, such as predation, diseases and both inter- and intra-specific competition. Maintenance of the habitat and constant monitoring programmes for the reintroduced KST should be continued.

**Keywords:** extinct in the wild, Kihansi Spray Toad, reintroduction, soft release, survivorship

**Journal:** *Journal of Humanities & Social Science (JHSS)*,  
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# **A**vifaunal Biodiversity in Peril: Pre- and Post-Vegetation Clearance Survey of Avifauna in a Fragmented Thicket in an Urban Landscape, Dar Es Salaam City, Tanzania

*Chacha Werema, Ramadhani B.M. Senzota, Nassoro Mohamed*

## **Abstract**

In contrast to the bird faunas of most protected areas in Tanzania, those found in urban areas have poorly been studied. In December 2009 and May 2010, using mist netting and audio-visual observations, we undertook surveys of birds at Kituo cha Biomazingira Dar es Salaam (KIBIDA), a privately owned 6 ha area, as an initial attempt to ascertain which bird species are found there. In 2012 and 2017 this 6 ha area (dominated by thickets) was cleared by unknown people further reducing it to about one-third and one-sixth of the original area, respectively. This led us to further assess whether the birds were negatively affected by habitat reduction after one-third and one-sixth of the study area remained. In both cases we continued to use mist nets augmented by audio-visual observations of birds. We detected a total of 98 species of which 62, 48, 53 and 42 were recorded before wood vegetation in the original 6 ha area was cleared, during clearing, two years and six years after it was cleared, respectively. Some of the species detected were forest-dependent and Palearctic migrants suggesting that remnant thickets and forest patches in urban landscapes are important for conservation of forest dependent and migrant birds. Twenty-two species that were detected before the wood vegetation in the area was cleared were neither found

during the time of clearance nor after clearance suggesting possible emigration or local extinction. Similarly, 44 species that were not found in the study area prior to clearance were either observed or mist netted afterwards as a result of turnover in species composition during the sampling period. The results suggest that there is a need to continue to protect KIBIDA and other similar habitats in urban landscapes in order to preserve their avifauna. The results further imply that should such habitats continue to be cleared for provision of settlement, some of the bird species found in them will be lost leading to local extinction. As such, the study recommends conserving thickets and forest patches in urban landscapes as habitats for birds and other fauna.

**Keywords:** remnant thicket, habitat reduction, urbanization, avifauna, mist netting, Dar es salaam

**Journal:** *Journal of East African Natural History* 108(2), 65-80

**DOI:** <https://doi.org/10.2982/028.108.0202>

# **R**einroduction of the Kihansi Spray Toad **N**ectophrynoides asperginis Back to its Natural Habitat by Using Acclimatizing Cages

*Charles Msuya, Nassoro Mohamed*

## **Abstract**

The Kihansi Spray Toad (*Nectophrynoides asperginis*) is considered to be extinct in the wild. Captive breeding populations exist in Bronx and Toledo zoos in USA and in two captive breeding facilities in Tanzania. Efforts to reintroduce the species back to its natural habitat at Kihansi Gorge wetlands have become a long process. Both ex-situ and in-situ experiments have revealed promising outcomes but when the toads are freely (hard) released in the wetlands they disperse widely and detection becomes difficult. Cages for acclimatizing the toads before hard release have been constructed in two of the Kihansi Gorge spray wetlands. Factors such as density dependence, predators, food availability and diseases have been identified of concern to successful reestablishment of the species in its natural environment. The use of large cages (60 m<sup>2</sup>), close monitoring and partial control of the factors as a new approach has shown promising results at present and for future reintroduction processes of the Kihansi Spray Toad.

**Keywords:** Kihansi Spray Toad; Reintroduction; Hard release; acclimatizing cages

**Journal:** *Tanzania Journal of Science*

**DOI:** <https://www.ajol.info/index.php/tjs/article/download/192925/182050>

# **C**ontribution of Food Tourism to Local **C**ommunity Livelihoods in Tanzania: The Case of Moshi and Hai Districts

*Titu, Awadhi Mussa*

## **Abstract**

Indigenous peoples worldwide are urgently calling for recognition of the importance of culture for the viability of their traditional food. The study focused on the contribution of food tourism to local community livelihoods in Tanzania, specifically in Moshi and Hai districts of the Kilimanjaro region. The study employs both qualitative and quantitative research approaches. Purposive and snowball sampling techniques were used for sample size. A self-administered questionnaire and interview were employed for primary data meanwhile secondary data were used to enrich the study findings. Results show that local food tourism has created job opportunities for locals, but despite the economic benefits of food tourism, most of the local people face challenges including a lack of knowledge in the tourism industry, and initiatives adopted do not seem to have reduced local people's poverty levels or increase their income. The study recommends that the government should make more efforts to promote local food tourism both within and outside the country and that local food tourism should be developed as an outstanding segment on its own, for the well-being of local communities.

**Keywords:** food tourism; local community; livelihood; development; cultural tourism

**Journal:** *African Journal of Hospitality, Tourism and Leisure*

**DOI:** <https://doi.org/10.46222/ajhtl.19770720.286>

# **H**uman Resources Compliance in Selected Large Tour Companies in Arusha, Tanzania

*Titu, Awadhi Mussa, Viales Joel Kabonda, Jacob Jeremiah Ulomi*

## **Abstract**

The achievement of higher productivity in various sectors has been influenced by human resources that can provide quality services in order to meet the needs of customers. It is the right moment to adapt to some changes in human resources for the tourism sector. Due to the growth of the tourism industry, this study is intended to determine human resources compliance in selected large tour companies in Arusha, Tanzania. The study employs a qualitative research approach. The saturation point was reached using purposive and simple random sampling techniques. The interviews and focus group discussions (FGDs) were employed for primary data collection from the 8 key informants, representing 8 large tour companies, and 5 FGDs composed of tour guides and administrative staff from similar companies. In content analysis, the obtained data is then analyzed and thematically interpreted. The results revealed various uncomfortable human resource practices and other areas that need the restructuring of the system in place to benefit both employers and employees. Therefore, to make this successful, the study recommends that the government and potential tourism stakeholders advocate tourism development on human resources and the entire working conditions for improving the operations of tour companies.

**Keywords:** Employees; employer; human resources; key informant; tour operator

**Journal:** *African Journal of Hospitality, Tourism and Leisure*

**DOI:** <https://doi.org/10.46222/ajhtl.19770720.302>

# Wildlife Tour Guiding

*Kokel Melubo and Alex Kisingo*

## **Abstract:**

Wildlife tour guiding is the service of a person who leads others (by foot, vehicle, boat or other means) to view wildlife and provides interpretation of natural and cultural resources to individuals or groups around places of interest such national parks, museums and other sites. This entry on the Encyclopedia of Tourism Management and Marketing acknowledges the pivotal role of wildlife or safari guide in enhancing the overall visitor experience, company reputation and boost destination image, and consequently the development of a tourism destination. The tasks and duties in environmental sustainability, and range of challenges besetting the profession are also discussed. The entry concludes by stating that in order for safari guides to remain relevant in the modern world, tour guides must evolve with and respond to digital technologies.

**Keywords:** Safari tourism, Tanzania, Wildlife tour guide

**Journal:** *Encyclopedia of Tourism Management and Marketing*

**DOI:** <https://doi.org/10.4337/9781800377486.wildlife.tour.guiding>

# **I**mpacts of Land Cover Change on Conservation, a Linkage of Spatial Analysis and Anthropogenic Activities in Tanzania.

*Herman N. Nyanda<sup>1</sup>, Juma J. Kegamba, Kamaljit K. Sangha*

## **Abstract**

We used spatial analysis to assess the Land Use Land Cover (LULC) changes, and studied the impacts of LC changes on conservation of buffer zone of the Selous Game Reserve (SGR) and their implication on community's livelihood in Vikumbulu Ward of Kisarawe District, Tanzania. Socio-economic data from Kisarawe District and TNBS were linked to spatial data to offer an integrated perspective of LULC change in the Ward. Three cloud free image dates of 1998, 2011 and 2015 were analysed using System for Automated Geoscientific Analyses (SAGA) GIS for three categories of land cover, i.e. forest, wooded grassland and bare land/settlements/cultivation. Vikumbulu demographic and socio-economic data were linked to spatial data applying distance as a function of LULC change. Spatial analysis has shown a decreasing trend of forest and woodland cover in Vikumbulu Ward between 1998 and 2015. The sharp decline indicates increasing social economic activities such as shifting agriculture and charcoal burning as an outcome of population growth and poverty. Rapid conversion of forest cover to wooded grassland occurred between 1998 and 2015 in Vikumbulu Ward. However, loss of forest cover was associated with a decreasing trend in wooded land in the ward between 2011 and 2015. As there was only 0.15% area under crop cultivation in Vikumbulu until 2015, it is highly likely that LC change is caused by charcoal burning and shifting cultivation.

This study suggests developing integrated strategies that target LULC change, conservation and people's livelihoods to effectively improve the current situation in rural areas of Tanzania

**Keywords:** Land Use and Land Cover Changes, Poverty, Charcoal, Vikumbulu Wards, SGR Buffer Zones

**Journal:** *Open Journal of Forestry*

**DOI:** <https://doi.org/10.4236/ojf.2018.83022>

# **I**mpact of land use intensification and local features on plants and pollinators in Sub-Saharan smallholder farms

*Nicola Tommasi, Paolo Biella, Lorenzo Guzzetti, **Julius Vincent Lasway**, Henry Kenneth Njovu, Andrea Tapparo, Giulia Agostinetto, Marcell Karl Peters, Ingolf Steffan-Dewenter, Massimo Labra, Andrea Galimberti*

## **Abstract**

Sub-Saharan African crop production largely relies on smallholder farms, located both in urban and agricultural landscapes. In this context, the investigation of plant and pollinator diversity and their interactions is of primary importance since both these factors are threatened by land use intensification and the consequent loss of natural habitats. In this study, we evaluated for the first time how plant and pollinator insect assemblages and interactions in Sub-Saharan farming conditions are shaped by land use intensification. To do that, we complemented biodiversity field surveys in Northern Tanzania with a modern DNA metabarcoding approach to characterize the foraged plants and thus built networks describing plant-pollinator interactions at the individual insect level. Moreover, we coupled this information with quantitative traits of landscape composition and floral availability surrounding each farm. We found that pollinator richness decreased with increasing impervious and agricultural cover in the landscape, whereas the flower density at each farm correlated with pollinator richness. The intensification of agricultural land use and urbanization correlated with a higher foraging niche overlap among pollinators due to convergence of individuals'

flower visiting strategies. Furthermore, within farms, the higher availability of floral resources drove lower niche overlap among individuals, while a greater flower visitors abundance shaped higher generalization at the networks level (H2'), possibly due to increased competition. These mechanistic understandings leading to individuals' foraging niche overlap and generalism at the network level, could imply stability of interactions and of the pollination ecosystem service. Our integrative survey proved that plant-pollinator systems are largely affected by land use intensification and by local factors in smallholder farms of Sub-Saharan Africa. Thus, policies promoting nature-based solutions, among which the introduction of more pollinator-friendly practices by smallholder farmers, could be effective in mitigating the intensification of both urban and rural landscapes in this region, as well as in similar Sub-Saharan contexts.

**Keywords:** Bees, DNA metabarcoding, ecosystem services, hoverflies, plant-pollinator interaction and sustainability

**Journal:** *Agriculture, Ecosystems & Environment*

**DOI:** <https://doi.org/10.1016/j.agee.2021.107560>

# **Rainfall, fire and large-mammal-induced drivers of *Vachellia drepanolobium* establishment: Implications for woody plant encroachment in Maswa, Tanzania**

*Houssein Samwel Kimaro & Anna C. Treydte*

## **Abstract**

Worldwide, open grass areas of savannah ecosystems are being transformed into shrubland. This woody plant encroachment is likely a result of factors such as rainfall, fire and secondary dispersal by ungulate herbivory. However, few experiments have been conducted to disentangle and quantify the role of these factors for seed germination in savannahs. We assessed in situ germination success of *Vachellia drepanolobium* seeds under simulated rainfall variability patterns, fire treatments and dung experiments in Maswa Game Reserve, Tanzania. Fire reduced seed germination by more than 13%, whereas germination in buffalo and elephant dung increased by 1% and 3% respectively. Additionally, intermediate simulated rainfall was more beneficial for seedling emergence success than large, infrequent simulated rainfall amounts, while shoot growth was twice as high under frequent and intermediate simulated rainfall treatments than under large infrequent simulated rainfall. Our results provide insights that bush fires, drought stress, and large rainfall events can suppress *V. drepanolobium* seedling emergence and growth. Hence, bush encroachment may be linked to management practices such as fire regimes and climatic conditions, i.e., frequent low rainfall conditions. Our results can help predict future patterns of encroachment under varying rainfall and fire events.

**Keywords:** germination, root, seedling, Serengeti ecosystem, shoot, vachellia drepanolobium

**Journal:** *African Journal of Ecology*

**DOI:** <https://doi.org/10.1111/aje.12881>

# **T**heory and practice of conservancies: evidence from wildlife management areas in Tanzania

*Fidelcastor F. Kimario, Nina Botha, Alex Kisingo, Hubert Job*

## **Abstract**

The integrity of Protected Areas depends on the surrounding communities and their land as they provide crucial ecological functions as wildlife corridors. Hence, the paper analyses the performance of Tanzanian Wildlife Management Areas (WMAs) to better understand their relevance for safeguarding biodiversity outside of traditional protected areas, e.g. national parks. The article assesses the potential of WMAs, which have complex social and ecological processes and interactions, to achieve their environmental and socio-economic goals from a governance perspective. Therefore, a combination of two theoretical approaches – the Social-Ecological Systems Framework (SESF) and the Sustainable Livelihoods Approach (SLA) – was employed to provide a thorough and methodical evaluation of their system dynamics. This research mainly presents data gathered in 2017 in eight fully authorised WMAs of different ages, and which represent a tourist activity gradient from no nature-based to well-developed. Qualitative empirical research included focus group discussions, field observations and semi-structured interviews with key persons and representatives of different organisations. These include local managers and members of WMAs, regional District Councils officials from the areas where the WMAs have been established, and international stakeholders. The study shows that local governance of wildlife resources in most WMAs is still

plagued by understaffing, inadequate funding, insufficient skills and knowledge, and investment issues. As a result, it takes time for the tourist industry to find confidence in the WMA concept, but recent figures show that WMA related tourism facilities which are increasingly sponsored by private investors, show higher revenues. Therefore, for WMAs to be sustainable, it is imperative to address the concerns mentioned above. Community-based conservation is part of development and the improvement of the overall wellbeing of people. However, in practice, everything is still only valued in terms of direct cash benefits. Where the analysed WMAs are failing it is mostly because unsustainable revenue sources cannot provide in their daily operational needs or adequately fund community development projects. Hence, because conservation is expensive, the key to the long-term sustainability of WMAs remains impeccable governance and financial stability.

**Keywords:** protected areas, Wildlife Management Areas, Tanzania, governance, Conservancies, sustainability

**Journal:** *Erdkunde*

**DOI:** <https://doi.org/10.3112/erdkunde.2020.02.03>

# Potential and challenges of the Serengeti-Ngorongoro Biosphere Reserve, Tanzania

*Nina Botha, Hubert Job, Fidelcastor F. Kimario*

## Abstract

This article examines whether the Serengeti-Ngorongoro Biosphere Reserve, Tanzania, is successfully mitigating the immense challenges that rising population density and growing land-use pressure, as well as climate change and tourism, pose to vulnerable biodiversity hotspots, such as ancient Afromontane forests. The biosphere reserve's management approach to ecological and socio-cultural heritage was analysed using the Global-Local Drivers of Change model as a theoretical basis, together with The Economics of Ecosystems and Biodiversity (TEEB) analysis framework. This empirical study of a relatively old Sub-Saharan African biosphere reserve (established in 1981) used a qualitative research approach, where data was collected from focus groups living in the reserve, and semi-structured interviews with Ngorongoro Conservation Area officials and other main stakeholders. Results show that the management focus on environmental conservation over socio-cultural heritage has led to population growth, cultural change and landscape transformation, leading to human-wildlife conflicts and negative park-people relationships. It is concluded that this biosphere reserve needs to better exploit its vast potential and adjust its institutional structure and operational strategies to align with modern Other Effective Area-Based Conservation Methods.

**Keywords:** biosphere reserve, human-wildlife conflicts, park-people relations, Serengeti-Ngorongoro, Sub-Saharan Africa

**Journal:** *Journal on Protected Mountain Areas Research and Management*

**DOI:** <https://doi.org/10.1553/eco.mont-13-sis27>

# **P**ositive effects of low grazing intensity on East African bee assemblages mediated by increases in floral resources

*Julius V. Lasway, Ingolf Steffan-Dewenter, Henry K. Njovu, Neema R. Kinabo, Connal Eardley, Alain Pauly, Marcell K. Peters*

## **Abstract**

Livestock grazing is widespread and increasing in the African grasslands, with largely unknown consequences for bee pollinators. Here we assessed the direct and indirect impacts of livestock grazing intensity on bee assemblages in East African grasslands and tested if the effect of grazing intensity on bee assemblages depends on temperature. We collected data on 24 study sites representing three different levels of livestock grazing intensity in northern Tanzania. Ordinary linear models and path analysis were used to test the effect of grazing and temperature on floral resources and bee diversity. Non-metric multidimensional scaling (NMDS) and permutational MANOVA were used to analyze changes in bee community composition and bee-visited plant community with grazing intensity and temperature. We found that moderate livestock grazing slightly increased bee species richness while high grazing intensity led to a strong decline. Further, bee species richness was highest at moderate temperatures and significantly lower in colder and very hot environments. Path analysis results showed that the effect of livestock grazing and environmental temperature on bee species richness is mediated by a positive effect of moderate grazing on floral resource richness. Livestock grazing led to a significant change in the species composition of bee

communities, this effect was stronger in environments with very high temperatures. Our study reveals that bee communities of the African savannah zone may benefit from low levels of livestock grazing as this proliferates the growth of flowering plant species. However, livestock grazing at high intensity will cause significant species losses and turnover of bee species communities; effects which may increase with climatic warming.

**Keywords:** Bee abundance, Bee community composition, Bee species richness, Floral resources, livestock grazing intensity, Tanzania.

**Journal:** *Journal of Biological Conservation*

**DOI:** <https://doi.org/10.1016/j.biocon.2022.109490>

# **I**ndigenous Tourism in Africa

*Kokel Melubo*

## **Abstract**

It is estimated that Africa is home to 50 million self-identifying indigenous people with some of the richest and most diverse cultural expressions of humankind. The cultural riches of the African indigenous people, including distinct languages, cultures, and traditions, have the potential to attract tourists who wish to experience indigenous tangible and intangible African heritage. While indigenous heritage is seen as a vehicle for spurring cultural interaction, bolstering employment, and empowering communities, especially women, and allows indigenous people to retain their relationship with the land, in Africa, indigenous tourism remains underdeveloped. The natural assets (i.e., wildlife and landscapes) have become a powerful and dominating attraction for tourists to Africa, particularly Sub-Saharan Africa. Encouragingly, countries such as South Africa, Kenya, Botswana, and Tanzania have not only recognized indigenous cultures as a stand-alone tourism product but integrated them into their overall tourism development strategies. This chapter briefly explores key trends and issues associated with indigenous tourism in Africa. The analysis indicates that with the loss of prime native lands, loss of human dignity, the commoditization of art and culture, and diminishing cultural values, in many instances, the negative impacts of tourism appear to outnumber the positives to indigenous peoples in Africa.

**Keywords:** Africa, Culture, Cultural heritage, Native lands, Tourism

**Book:** *Cultural Heritage and Tourism in Africa*

**DOI:** <https://doi.org/10.4324/9781003153955>



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