IUCN SSC GOSG
GIRAFFE & OKAPI SPECIALIST GROUP

Giraffid

Newsletter of the IUCN SSC Giraffe & Okapi Specialist Group

Note from the Co-Chairs

Giraffe and okapi, suddenly they are everywhere – maybe not quite, but still! What an amazing last six months in the world of giraffids. A dedicated issue of African Journal of Ecology (including a policy paper on giraffe and okapi – see all abstracts from page 37), regular international press around the plight of giraffe and okapi, development of a new national strategy for giraffe conservation in Niger, ever-increasing field conservation programmes and much more. It seems that the time for giraffids has finally come as we are succeeding in drawing attention to these amazing animals – though not a moment too soon given the parallel and dramatic declines recently estimated for both taxa. Let's all continue with this hard work as the giraffid movement gains momentum.

The second-ever World Giraffe Day – 21 June, is just around the corner, and what an exciting time to further increase the international awareness and education for the world's tallest animals! Many have joined the cause and it is not too late for you to get on-board: go online to www.worldgiraffeday.org to find out more! And of course, this year support is being raised for 'Operation Twiga' – to help the Uganda Wildlife Authority translocate endangered Rothschild's giraffe back into former range in the country. We are also preparing for the third Giraffe Indaba, to take place in South Africa 23-28 August, where giraffid experts from around the world will gather to present and discuss topics from general giraffid ecology to urgent conservation issues, including a dedicated okapi session for the first time. The new IUCN SSC GOSG website is also due to go live soon, so look out for that.

On the okapi side, discussions are underway regarding how to better monitor okapi in the wild, given limited resources and the challenges of fieldwork across much of its range in DRC. A comprehensive database of all okapi survey data is also nearly complete and is helping to inform these discussions.

Another great issue of **Giraffid** brings you exciting news from across the world of these amazing species. From new genetic findings on giraffe to field reports on programmes in Uganda and DRC, from giraffe skin disease to new publications, this issue has it all. So sit back, grab your favourite drink and soak it all in.

Julian Fennessy & Noëlle Kümpel
Co-Chairs IUCN SSC GOSG

Volume 9(1), May 2015

Inside this issue:

Objective of the IUCN SSC Giraffe & Okapi Specialist Group (GOSG):
The IUCN SSC Giraffe & Okapi Specialist Group (GOSG) is one of over 120 IUCN-SSC specialist groups, Red List Authorities and task forces working towards achieving the SSC's vision of *"a world that values and conserves present levels of biodiversity"*. Made up of experts from around the world, our group leads efforts to study giraffe, okapi and the threats they face, as well as leading and supporting conservation actions designed to ensure the survival of the two species into the future.

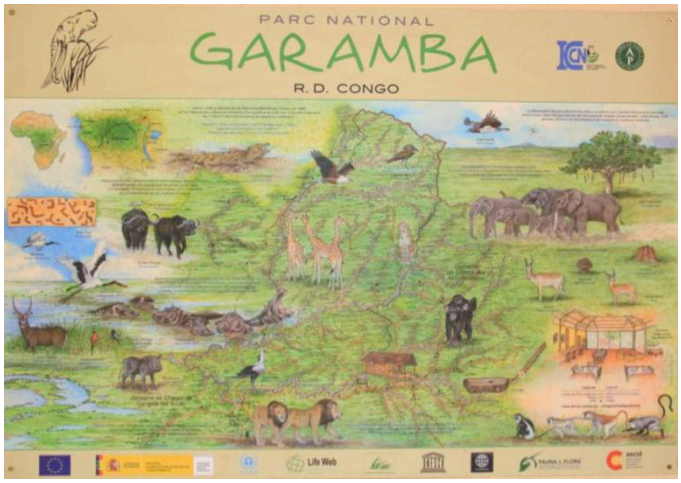
IUCN SSC GOSG is jointly hosted by the Giraffe Conservation Foundation and the Zoological Society of London.
Please send any questions, comments or articles for the next issue of **Giraffid** to the Editor at steph@giraffeconservation.org

ZSL LIVING CONSERVATION
GIRAFFE CONSERVATION FOUNDATION

True giraffe conservation work: a recce to Garamba National Park in the Democratic Republic of Congo

Julian Fennessy, Giraffe Conservation Foundation & Francois Deacon, University of the Free State

Garamba National Park (NP) in the Democratic Republic of Congo (DRC) historically conjured up images of early explorers crossing large open plains, on the edge of the forest, teaming with elephant, buffalo, rhino, giraffe and predators. Nestled into the north east of the country bordering (South) Sudan, Garamba NP is a World Heritage Site which was once home to the last remaining population of Northern White Rhino and the previously assumed Congo giraffe.



However, these were not exactly the images that first came to my mind when GCF was approached by African Parks Network (APN) together with the Congolese Institute for Nature Conservation (ICCN) to support an initiative to save the last giraffe in the DRC. I conjured images of the Lord's Resistance Army (LRA), Joseph Kony and child soldiers plundering communities and parks – images that have been splashed across the media for more than a decade. These images, understandably, had me thinking twice.

But, we are all about giraffe conservation and if any giraffe population needs help, this definitely was one to look out for. With valuable financial support from the Mohammed bin Zayed Foundation Species Conservation Fund, it was only a matter of convincing (Dr to be) Francois Deacon from the University of Free Sate, South Africa to join me and help assess the situation for DRC's last giraffe population. Once we had met up in Entebbe, Uganda in mid-February we chatted late into the night about the days ahead focussing on all things giraffe – and trying to have some perspective that this was not going to be Southern Africa, our home turf.

Early the next morning we flew to the northwest border town of Arua in Uganda together with Jean Labuschagne, APN's Manager: Special Projects in Garamba NP. After crossing the border with the help of local staff and a fixer, we weaved our way through the livestock, potholes and UN manned vehicles to the local airport in Aru, DRC, before being whisked off in the APN plane by Guy, APN's cool and calm Canadian pilot, to our final destination: Garamba NP. The most noticeable take-away message from the hour-long flight was the density of people, the sheer amount of cleared land and the lack of organised agriculture.

On arrival in Garamba NP the reality of where we were hit rather quickly. A UN envoy was camped close to the airstrip awaiting the potential of a voluntary declaration by the LRA as their impact was dwindling, yet the shock waves of an attack only a few kilometres up the road clearly resonated with everybody – the fight is clearly not over yet. Coupled with the reports of fresh poaching of elephant for their tail hair, Francois and I could only but feel how different the day-to-day life of a conservationist here was compared to the south of the continent.

But down to business. Our job was to assess the feasibility of a proposed fenced Sanctuary to conserve the last giraffe. We spent a full day out in the field with a team of rangers and monitoring staff, including Redebul (gives you wings) and Matokaloma ('Mato' to his mates) who had recently returned after two years of training in Rwanda.

Full of enthusiasm they identified different trees, giraffe forage preferences, seasonal habitats and the odd animal across the plains – and there were certainly not many of them. The Garamba landscape is large and includes the neighbouring 'domaine de chase' areas, encompassing more than 7,500km^2 in total. Whilst Acacia dot the landscape it is definitely not ideal habitat for giraffe and we got the feeling that after little evidence of giraffe (and no sightings) in the area propose for the Sanctuary that they required a larger area to sustain themselves. In this landscape giraffe would likely walk many kilometres a day in search of adequate forage and mates.

Back at the APN lodge (originally built to host the hopefully large numbers of tourists wanting to visit this iconic outpost) after an intense field day, lots of discussions continued on the bank of the Nagero River with APN's Manager Jean-Marc Froment, Jean and their team. It felt a little surreal in such a tranquil setting with hippos snorting and an array of lifers for any bird enthusiast! Many ideas were thrown around the proverbial table and we finally started to narrow down how best we could help save the last 30-40 giraffe in all of the DRC. This was now a mission!

On the last morning we were fortunate to take to the skies in search of giraffe, well more specifically to scope the lie of the land from above. Frank, the helicopter pilot, took us on an amazing tour of the core area of the Park where giraffe naturally inhabit and we got to fully appreciate the enormity of it all. We banked along the riparian forests in search of the elusive Garamba giraffe, passed over a wandering hyena and the sad sight of an elephant that had recently lost its mate – but so far no sighting of the illusive giraffe. We saw large herds of buffalo, which was comforting, and suddenly, like a mirage, Francois spotted four giraffe loping across the plains – this was the first sighting of Kordofan giraffe for both of us! The three bulls and one cow were literally in the middle of nowhere and made us wonder how and why they had survived here, while so many others had not. A truly amazing sighting and before we knew it, we were back on level ground – with an increased dedication to save those four giraffe and their remaining mates. After a meeting with the Park managers to discuss the way forward, next steps and our final recommendations, we used the remaining time to help Redebul and Mato set up a new giraffe ID database and explained how to use their camera with a scope, before Francois proudly showed them the sights and sounds of South Africa on his computer.

As we departed Garamba after what feels like a whirlwind, and slightly sleepless, few days we were full of enthusiasm, excited about the opportunities ahead and feel encouraged that we might be able to make a real difference. With new technologies for monitoring and tagging giraffe and teams, we feel our job is far from over in Garamba NP, and together we are keen to keep partnering and collaborating to help save the last giraffe in DRC. However, we are quickly brought back to the realities of operating in this unpredictable and potentially dangerous landscape as we receive reports of another security incident close by … till next time!

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Giraffe and okapi: new insights into Africa's disappearing megafauna

Noëlle Kümpel, Zoological Society of London & Julian Fennessy, Giraffe Conservation Foundation

Research published today in a special giraffe and okapi issue of the African Journal of Ecology reveals new information on these surprisingly enigmatic African cousins. Researchers warn that immediate action must be taken to secure the future of both giraffe (*Giraffa camelopardalis*) and okapi (*Okapia johnstoni*) before it is too late.

Giraffe numbers have plummeted from 140,000 in the late 1990s to less than 80,000 today. In the past 30 years, giraffe have become extinct in at least 7 African countries and okapi numbers are thought to have halved. This dramatic loss has gone largely unnoticed. The main threats to both species are habitat loss and, increasingly, illegal hunting/poaching.

The newly-formed IUCN SSC Giraffe & Okapi Specialist Group with support from the Giraffe Conservation Foundation (GCF) is currently conducting the first-ever detailed assessment of giraffe as a species as well as all its 9 subspecies and it is expected that by early 2016 most, if not all, will end up in one of the IUCN Red List threatened categories. The okapi was recently listed as 'Endangered' on the IUCN Red List following a IUCN SSC Giraffe & Okapi Specialist Group workshop, supported by the Zoological Society of London (ZSL) and the Congolese nature conservation institute (ICCN), bringing together okapi experts from across the species' range for the first time.

Dr Noëlle Kümpel, okapi expert from the Zoological Society of London (ZSL) and co-chair for okapi of the IUCN SSC Giraffe and Okapi Specialist Group, comments, "The giraffe is loved and known across the world, but very few people are aware that we are losing both this iconic species and its only close living relative, the okapi, at an unprecedented and alarming rate. We have both species at ZSL London Zoo and they are some of the most popular animals on display. I hope that these new insights will help raise awareness of the plight of both species and trigger efforts to conserve the shy and mysterious okapi."

Dr Julian Fennessy, Executive Director of the Giraffe Conservation Foundation (GCF) and co-chair for giraffe of the IUCN SSC Giraffe and Okapi Specialist Group, adds, "The giraffe is an African icon and the drop in numbers surprises even the most seasoned conservationists, as giraffe appear to be everywhere. The research that has been done so far is only starting to paint the bleak picture facing these gentle giants. It is time for the international community to stick their necks out to save giraffe before it is too late."

Despite being one of the most iconic and recognisable animals in the world, giraffe are probably the least researched large mammals in Africa. This special issue provides important new information on the ecology, population and distribution of giraffe and okapi, shedding light on poorly-understood behaviours such as the function of all-male giraffe herds and the leadership role taken by older females in the group. It also highlights how little we still know about these animals and calls for more research on and improved monitoring of both species.

Giraffe and okapi are the only living species in the Giraffidae family and share a number of common features, such as elongated necks and long, dark-coloured tongues (both adaptations for feeding on tree leaves). The giraffe is found in savannah regions of 21 countries across sub-Saharan Africa while okapi are restricted to the dense, lowland rainforests of central and north-eastern Democratic Republic of Congo (DRC).

African Journal of Ecology. June 2015. Vol. 53(2): 131–258
http://onlinelibrary.wiley.com/doi/10.1111/aje.2015.53.issue-2/issuetoc

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Murchison Falls Giraffe Project – Field report

Michael B. Brown, Dartmouth College & Giraffe Conservation Foundation

Expedition Overview

As part of the collaborative efforts of Giraffe Conservation Foundation (GCF) and Dartmouth College in partnership with the Uganda Wildlife Authority (UWA) and Uganda Wildlife Education Centre (UWEC), PhD student and researcher Michael B. Brown travelled to Murchison Falls National Park, Uganda to continue ongoing research and monitoring of the largest wild population of Rothschild's giraffe. This expedition provided an invaluable opportunity to establish monitoring protocol and lay a solid foundation for efforts to understand the population dynamics of the Rothschild's giraffe in Murchison Falls National Park. In addition to solidifying monitoring methods and conducting targeted giraffe surveys in the Park, this expedition provided useful time in-country to address the less glamorous but crucial aspects of field research including permit applications and developing partnerships in country. Building off of July 2014 field work, this expedition represents an important step in developing the first-ever comprehensive population study of Rothschild's giraffe in Uganda.

The report below outlines the expedition activities and preliminary findings from our study efforts.

Objectives

1. To establish survey routes for subsequent giraffe monitoring efforts.
2. To continue ongoing Rothschild's giraffe monitoring efforts and conduct the systematic photographic capture-recapture surveys of the entirety of the northern region of the park.
3. Establish relationships in Murchison Falls National Park to facilitate partnerships for long-term monitoring programme.

Team Personnel

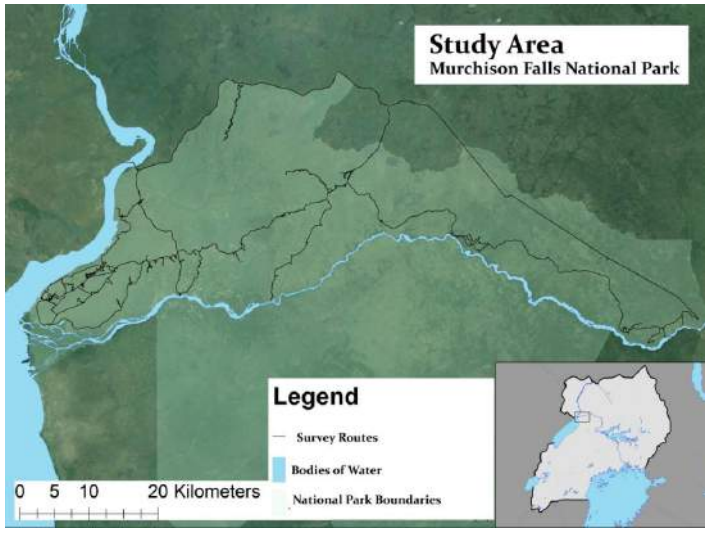
Michael Butler Brown

Study Area

Murchison Falls National Park is located in northwestern Uganda (02°15' N, 31°48'E), and encompasses an area of 3,840 km2. Murchison Falls National Park is Uganda's largest Park and, combined with the adjacent Karuma Wildlife Reserve and Bugungu Wildlife Reserve, forms part of the greater Murchison Falls Conservation Area (5,308 km^2). The Park itself is bisected by the Victoria Nile River, with the southern portion of the Park dominated by dense forest and the northern portion characterised by savanna, borassa palm woodland and riverine woodland. The current distribution of Rothschild's giraffe is limited to the northern portion of the Park, and as such restricted our giraffe surveys to this area.

One of the major objectives of this field trip was to establish a systematic survey route throughout the Park which would enable a representative sampling of the Park's giraffe population. As such, our first priority on the ground was to establish a standardised route for all subsequent survey efforts. During this process, we drove nearly every maintained road (and most unmaintained roads) and identified off-track routes to the more inaccessible areas of the Park. Visibility in the western delta region of the Park is outstanding, with clear views for kilometres across the open savanna. The eastern portion of the Park is comprised largely of dense woodland, limiting visibility and heavily restricting off-track navigation.

Our efforts to establish survey routes throughout the Park led us to identify several off-road courses to access areas of the central Wankwar Region of the park that have never been explored for photographic giraffe surveys.



Population Assessment

The giraffe population in Murchison Falls National Park is the largest remaining natural Rothschild's giraffe population in the wild, with recent aerial surveys in 2012

suggesting a population of approximately 757 individuals (Rwetsiba *et al.* 2012). As such, conservation strategies for this unique subspecies of giraffe hinge on a comprehensive understanding of population dynamics of this specific population. Since conservation translocation has been identified as a potential goal for a future Uganda National Giraffe Conservation Strategy, a detailed understanding of population structure, recruitment and survival in the Murchison Falls National Park source population is an essential component to safely removing individuals and using them to propagate viable populations in other areas of Uganda. Additionally, the knowledge of group structure, preferred associations and social dynamics can provide a social consideration for selecting individuals for translocations.

Methods

To evaluate the current population status of Rothschild's giraffe in Murchison Falls National Park, we conducted a photographic survey of giraffe throughout the Park. This survey builds off previous survey efforts initiated in July 2014. We plan to conduct population surveys at 4-month intervals for the next 4 years to understand population growth and potential factors contributing to individual survival and reproductive rates throughout the different regions of the Park. The timing of these surveys coincides with seasonal transitions in the area so that we can monitor any potential influences of season and rainfall on survival and recruitment. We planned routes throughout the Park's road network to maximize coverage and drove the track network over the course of five days. On each survey, we stopped at every group of giraffe encountered and recorded the number in the group, the sex and age class of each giraffe and GPS coordinates. Additionally, we collected information on the presence of visible signs of skin disease and snare injuries on each giraffe (see following sections). We then photographed each individual giraffe. Using pattern recognition software (Wild-ID), we were able to identify the number of unique giraffe observed and begin to create individual observation records for each unique giraffe (Bolger *et al.* 2012).

Results

During this second survey of the Rothschild's giraffe population in Murchison Falls National Park, we photographed 356 unique individual giraffe in 42 different herds. Herds ranged in size from 2 - 51 individuals (Fig 1). Giraffe were distributed unevenly throughout the Park, with the greatest observed density in the western delta region (Fig 3). Of the uniquely identified individuals, 179 were males, 151 were females and 26 were of an unknown sex, suggesting a relatively even sex ratio of approximately 1:1. The majority of observed giraffe were classified as adult (see Figure 2). Approximately 20% of the observed giraffe were classified as juveniles, indicating a potential for increased population growth.

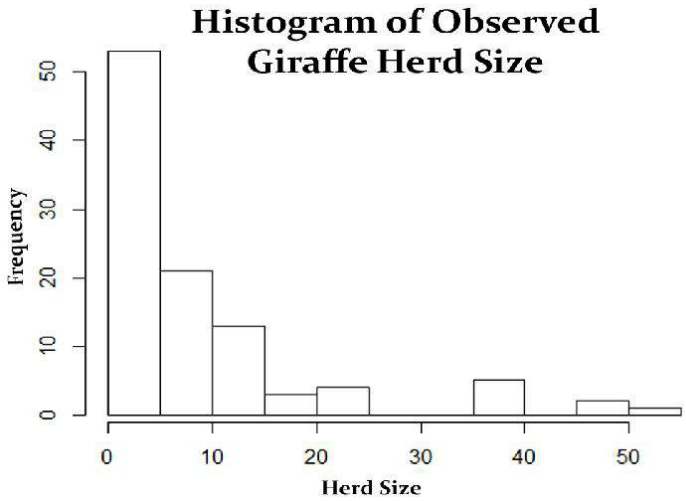


Fig 1: Histogram of the observed giraffe groups size. Surveyed herd size reached a maximum of 51 individuals. The largest observed single group was located at the far western region of the Park in the savanna areas of delta area.

Giraffe Database Status

This survey represents the continuation of ongoing Rothschild's giraffe monitoring efforts following July 2014 where we conducted the first preliminary photographic survey in the Park. As we continue successive survey efforts, we hope to develop a more complete representation of the giraffe population within the Park. During the first round of surveys, of the 356 uniquely identified individuals, we re-sighted 118 individuals from the July survey, which represents 32% recapture rate. During our combined survey efforts so far, we have identified 650 unique Rothschild's giraffe in Murchison Falls National Park. As we continue to conduct comprehensive surveys of the Park, we will be able to more closely monitor survival of giraffe and vital reproductive rates that will give a better understanding of population dynamics in the Park. Additionally, we will develop a more complete representation the entire giraffe population in the database.

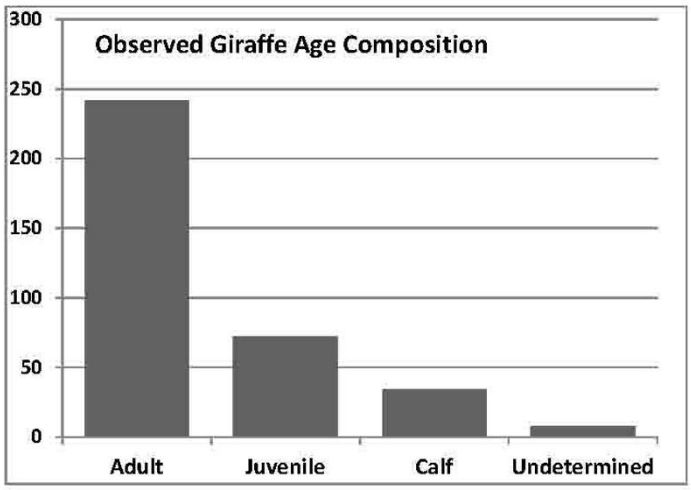
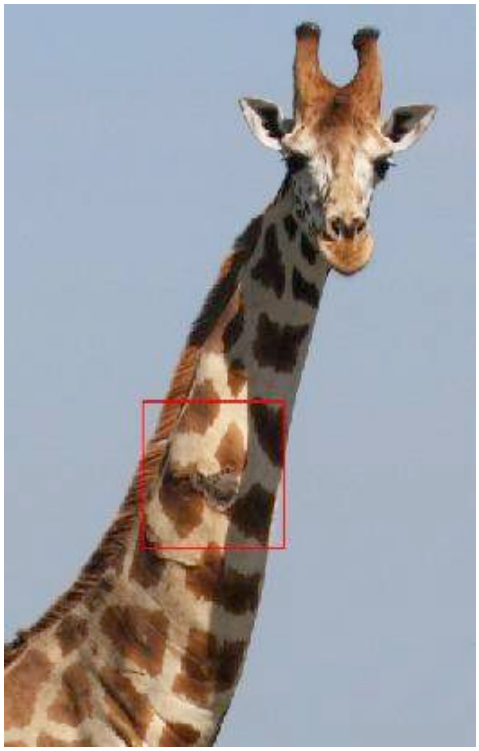


Fig 2: Observed age sex structure of Rothschild's giraffe in Murchison Falls National Park, Uganda.

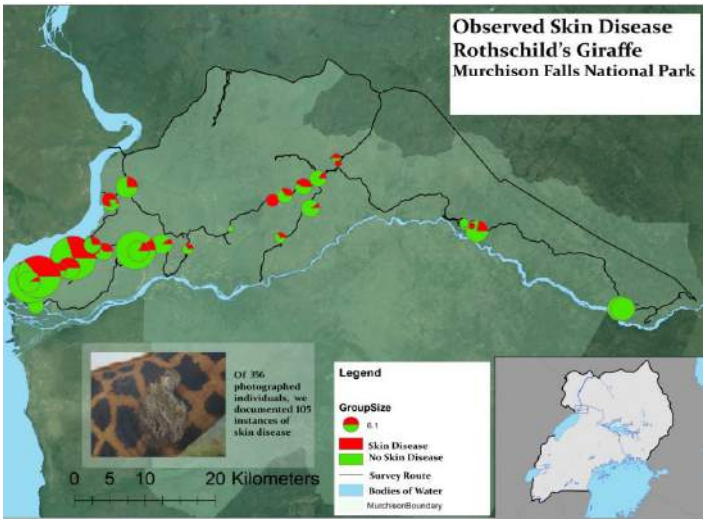
Giraffe Skin Disease

Giraffe skin disease (GSD) is a poorly understood disorder in Murchison Falls National Park with visible symptoms of crusty sores mainly along the necks of Rothschild's giraffe (see photo). GSD have been observed on Masai giraffe in Mikumi, Ruaha, Selous and Tarangire National Parks in Tanzania, and on South African giraffe in northern Botswana and Kruger National Park, although it is unknown if any of these diseases are pathogenically related. It is still unclear what effect, if any, the disease has on survival and reproduction of giraffe in Murchison Falls National Park, and as such, we plan to closely monitor the prevalence, distribution and persistence of skin disease to understand potential impacts on fitness.



Methods and Results

During our surveys, we visually inspected each giraffe for visible lesions, which represent the signs of GSD. We observed signs of GSD on 105 individuals (approximately 29%) of all observed giraffe during surveys. This figure represents a much larger percentage of afflicted individuals than previous surveys suggested. Additionally, we observed evidence of GSD in portions of the Park east of the Ayago River, which is an area where we did not observe any GSD during the July 2014 surveys. This finding indicates that GSD is even more prevalent in the Murchison Falls National Park population than we initially suspected.



Snare Injuries

UWA Park officials identify illegal snaring as a conservation threat to Rothschild's giraffe in Murchison Falls National Park (see photo). The Park borders areas of relatively dense human population and as such, the large populations of wildlife within the Park represent a readily available source of protein for local communities. Giraffe are likely not the primary target of snares, but fall victim to the indiscriminate nature of these traps, resulting in debilitating injuries. Anecdotally, Park officials suggested that much of the snaring pressure comes from individuals in the areas across Lake Albert who boat into the delta region of the Park under the cover of darkness to set and check snare sets.

This giraffe lost its hind foot to injuries sustained from a snare. It was observed in a large herd but was still managing to move on three legs.

Methods and Results

To monitor the distribution and prevalence of snare-related injuries of Rothschild's giraffe in Murchison Falls National Park, we conduct field observations as well as visually inspect each photographed giraffe for signs of scarring and injury. Using the pelage pattern as a unique identifier, we are able to track the recovery or decline of individual giraffe that have been identified with prior snare injuries. We observed snare damage on 7 individuals (approximately 2%). Interestingly, none of these individuals were the same individuals observed to have had snare damage during July 2014. Of the 7 giraffe observed to have snare damage during July 2014, we re-sighted 3 individuals, but did not note any obvious signs of snare damage during this trip. The observed instances of snare damage were in close proximity to the waterways, supporting the claim that giraffe are most at risk for incidental snare damage in the western portion of the Park closest to Lake Albert.

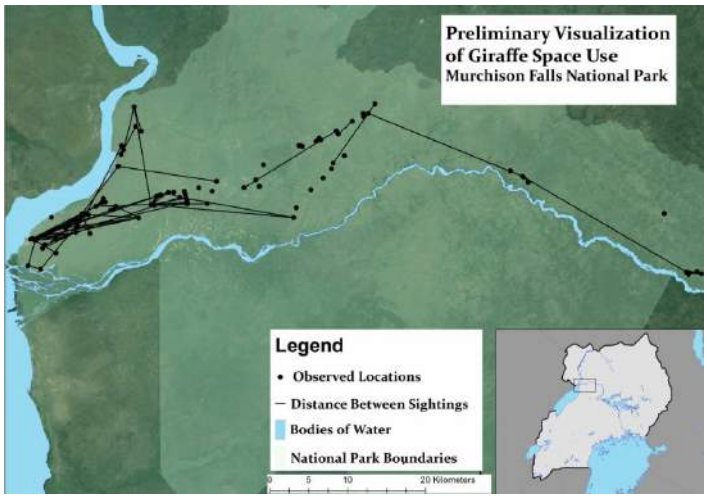
These observations should be interpreted with caution. We do not yet know effects of snare injuries on giraffe survival. As such, this figure of 2% of the observed population represents only live individuals with visible scarring, injury or disfigurement attributed to snare wounds. Furthermore, tall grass throughout the Park prevents a close inspection of the lower legs of all giraffe, so the estimate is conservative. It should be noted that individuals with verified snare injuries exhibited decreased mobility and poor body conditions. As we continue to collect longitudinal data on giraffe survival in the Park, we will be able to better assess the risk that snares can pose on giraffe survival and population trends throughout the Park.

An understanding of the prevalence and distribution of snare injuries can support UWA's ongoing efforts to patrol high-risk snare areas. De-snaring patrols are already a priority for rangers and Park officials in Murchison Falls National Park, with rangers regularly recovering hundreds of wire snares and dozens of leg hold traps.

Preliminary Space Use Analysis

Through repeated survey efforts, we are beginning to examine coarse patterns in giraffe space use within Murchison Falls National park to better understand how intra-population movement might impact population level processes. Having conducted two rounds of surveys, we examined the individuals sighted on multiple surveys to look for differences in location between the two survey events. Preliminary analyses of re-sight data yielded some potentially interesting results. Much of the displacement between re-sights occurred within the savanna on the western region of the Park. Perhaps more interestingly, however, some individuals were sighted in both the eastern Chobe region and the central Ayago region and the Ayago region and Wankwar Region respectively. This preliminary finding suggests that the dense woodlands of the north-central portions of the Park and the Ayago River are not significant barriers to movement and that giraffe have capacity to move throughout these areas. It is not yet clear how much movement might occur between these areas of the Park. Survey data represent only a coarse view of space use, and more detailed mechanistic movement studies are required to better understand how Rothschild's giraffe move across this landscape. We are currently working to develop further studies that provide a more nuanced understanding of environmental factors contributing to giraffe space use within Murchison Falls National Park. These preliminary survey-based findings cast light on the potential role that movement might play

in population-level processes throughout the Park and highlight the need for further studies on giraffe movement ecology in the Park.



Note: The lines depicted on this map do not represent the movement paths of animals but rather the shortest distance between two sightings of the same individual

Uganda Wildlife Authority Ranger Support

As part of our mission to conserve the Rothschild's giraffe in Uganda, we support the efforts to UWA rangers in the field. These rangers are on the front line of giraffe conservation and very often spend days in the bush on patrol. While on patrol, they work to find and remove poachers' snares and identify threats. In addition to patrol and policing, the rangers also accompany researchers (including us!) during our field work. Their intimate knowledge of landscape and experience in bush helps immensely in navigating the Park and putting our studies into the greater context of the Park as a whole. These men and women are an extremely dedicated and professional work force that risks their own safety to ensure the wildlife and resources of the Park are well protected.

During this expedition, we donated more binoculars and GPS units to the UWA staff in Murchison Falls National Park. These binoculars and GPS units will be used by the rangers on patrol to map snares and poaching incidents throughout the Park, allowing for a more detailed understanding of the spatial distribution of poaching intensity. This knowledge can then be used to better direct patrol efforts to maximize their efforts to conserve and protect the wildlife of the Park.

UWA Rangers are on hand to receive a donation of equipment to support their patrols

Additional Field Notes

As we further develop the research programme in Murchison Falls National Park, I look forward to learning more about the ecological systems of the Park. The UWA research rangers proved to be extraordinarily valuable contributors to this endeavour. With their in depth knowledge of the Park, unparalleled professionalism and enthusiasm for contributing to the study, they consistently help us to find and photograph giraffe as well as provide useful anecdotes to help contextualize our studies. During this trip we witnessed the transition from the wet to the dry season. During our relatively short stay this change was quite remarkable. In our first week of surveys rain fell almost every afternoon causing the roads and grounds to turn into an inauspicious quagmire. By the time we left, however, the ground had dried and fire had emerged as the dominant force on the landscape. Indeed the Park officials plan and manage fires throughout the park grassland systems to maintain this disturbance regime and maintain a healthy grassland. It was quite an impressive thing to see.

The trip was also important for exploring the area around the Park and learning more about the surrounding communities. This program is planned to continue for

several more years, so developing ties to support local education and awareness, along with learning about the best supply locations will most certainly pay dividends down the road. Finding a reliable mechanic and identifying the best place to purchase fuel are indeed some of the most important aspects of our work. It also never hurts to make a friend or two.

Throughout Murchison Falls National Park and the surrounding communities, managed burning of grasslands

Next Steps – Short- to Medium-Term

- Further develop the Rothschild's giraffe research programme in Murchison Falls National Park.
- Continue regular photographic surveys of Murchison Falls National park at 4-month intervals.
- Develop robust photographic capture- recapture population models for the Rothschild's giraffe population in Murchison Falls National Park.
- Analyze spatial distribution and movement data collected from Murchison Falls National Park giraffe survey.
- Assess the south side of the Nile in Murchison Falls National Park and Lake Mburo for potential giraffe translocation suitability using the IUCN Guidelines for Conservation Translocations, with a focus on intensive ecological surveys and in-depth stakeholder analysis.
- Conduct a survey of Kidepo Valley National Park Rothschild's giraffe population to better inform a national conservation strategy in Uganda.
- Using parameters derived from the Murchison Falls National Park population, create a species distribution model to identify viable translocation sites throughout Uganda.

Acknowledgements

Dartmouth College, Giraffe Conservation Foundation, Uganda Wildlife Authority, Blank Park Zoo, Cleveland Metroparks Zoo, Leiden Conservation Foundation, Auckland Zoo, African Fund for Endangered Wildlife, Marasa Africa, Cleveland Zoological Society, Girry Trust, Freunde Hauptstadtzoos, Uganda Wildlife Education Centre, Utah's Hogle Zoo, Dallas Zoo.

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Spot the difference – Namibia's 'new' giraffe

Julian Fennessy & Steph Fennessy, Giraffe Conservation Foundation

While giraffe numbers have plummeted across the African continent in the past decade and a half, Namibia's giraffe population continues to grow and expand its range. This is against the tide in comparison to most other giraffe populations in Africa and deserves a huge congratulation to the amazing conservation efforts of all Namibians!

However, before we congratulate ourselves too much, it is always surprising that for such distinct animals – the tallest in the world – there is still such a lack of basic understanding and knowledge about these 'Forgotten Giants'. Guides often share interesting 'facts' about giraffe. We were recently told that the heart of a giraffe stops when they drink – interesting! Imagine that happening to any living being – it would be short lived, no doubt. Aside from this obvious 'guide tale', how many species or subspecies of giraffe are there? Where do they live? What type of giraffe do we have in Namibia? But then again, does it really matter – a giraffe is a giraffe ... or so we keep being told!

These questions have important implications for giraffe conservation. Giraffe are widely distributed across sub-Saharan Africa and are currently recognised as one species and nine subspecies – based on a combination of distribution, coat pattern, morphology and some genetic data. However, giraffe populations across Africa have shrunk considerably in recent years, due to habitat loss, habitat fragmentation and poaching. Best estimates suggest there are now less than 80,000 giraffe left, down by >40% in the last fifteen years. Two of the nine subspecies are listed as Endangered on the IUCN Red List: West African giraffe (*Giraffa camelopardalis peralta*) and Rothschild's giraffe (*G. c. rothschildi*), numbering 400 and 1,100 individuals respectively. However, part of the reason for all the confusion around taxonomy is that scientists cannot agree on a way to identify different species or subspecies. This is a little frustrating as it becomes part-science, part-art, as there is considerable variability in the characteristics within subspecies too.

One of the ways to solve this dilemma is using DNA to understand the differences between animals in different populations, and that is what we at the Giraffe Conservation Foundation (GCF) in collaboration with geneticists in Germany are currently doing. For more than a decade we have collected giraffe skin samples from across their range in Africa, but who would have thought that we would find some rather surprising results right on our doorstep here in Namibia?

Surprising distribution

It was always assumed and widely accepted that giraffe populations in northeast Namibia and northern Botswana were Angolan giraffe (*G. c. angolensis*), while populations further south in Botswana as well as in South Africa and Zimbabwe were South African giraffe (*G. c. giraffa*) – see map for the currently recognised understanding of giraffe distribution in Africa. Our recent conservation research efforts at GCF in collaboration with geneticists at the LOEWE Biodiversity and Climate Research Centre (BiK-F) proved these assumptions wrong. The new data reveals a rather complex history with the two subspecies found in neighbouring areas yet in distinct populations.

While most giraffe in Namibia are indeed Angolan giraffe, this is not the case for giraffe in Bwabwata National Park. According to their mitochondrial (maternal) DNA, these giraffe are South African giraffe. In fact, South African giraffe are found both north (including northeast Namibia) and south of a population of Angolan giraffe in the Central Kalahari Game Reserve in Botswana. This is very surprising, particularly as this means that both subspecies live in close proximity while at the same time showing significant genetic differences. This suggests that for conservation purposes it is important to take measures to protect the giraffe populations outside of the protected

game reserve, in order to preserve as much giraffe diversity as possible.

Geographic barriers

Today, there are no geographic barriers, such as rivers or mountain ranges, which would inhibit a natural mixing of these two giraffe subspecies. So what is the reason for such a strong genetic split between two subspecies that are within walking distance from one another?

The division appears to be an ancient one, originating in the Pleistocene: between 500,000 and two million years ago, when giraffe split into separate subspecies, the mountain range along the East African Rift System lowered and numerous lakes and other water bodies developed. At the same time, the palaeo-lake Makgadikgadi was at its largest. These water bodies could have separated different populations for a long period of time and acted as a substantial barrier separating the giraffe populations and likely resulted in the genetic differences – the proverbial "cryptic" rift valley. We further assume that female giraffe were a little more sedentary than their male partners and did not migrate extensive distances. This behaviour would support the distinct separation of maternal genetic lines. Although the barrier is now gone and the two populations could intermix, behavioural factors and ecological reasons likely ensure this genetic separation is maintained. This could also explain the similar observations of geographically close but genetically distinct populations in other animals in this part of Africa e.g. zebra, elephant and impala.

Impact on giraffe conservation

The study shows that there are significant differences in the mitochondrial DNA of these two subspecies, which in turn has a great impact on conservation and management of these giraffe and others across Africa. A comprehensive understanding of the taxonomy of giraffe, their subspecies as well as their distribution is important to allow for better protection of specific subspecies as well as giraffe as a species. In future, using nuclear DNA might uncover different relationships than studies, like this one, using mitochondrial DNA which, as this is inherited only via the female line, does not take into account the dispersal of males between populations.

A better understanding of giraffe populations and their genetics will help us to provide valuable conservation management support to government authorities and wildlife managers throughout Africa. The uniqueness of these two subspecies highlights the need to improve our understanding of the taxonomy of all giraffe. Unravelling giraffe taxonomy will not only satisfy our curiosity, but also make a significant contribution to conserving these magnificent animals for future generations.

Publication

Bock F, Fennessy J, Bidon T, Tutchings A, Marais A, Deacon F, Janke A. 2014. Mitochondrial sequences reveal a clear separation between Angolan and South African giraffe along a cryptic rift valley. BMC Evolutionary Biology 2014, 14: 219.

The published article can be downloaded in full here: http://www.biomedcentral.com/1471-2148/14/219

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Restoring the integrity of the Okapi Wildlife Reserve in the Democratic Republic of Congo

Jean-Joseph Mapilanga, Institut Congolais pour la Conservation de la Nature (ICCN)

The Okapi Wildlife Reserve is a World Heritage site located in north-eastern Democratic Republic of Congo (DRC). Since 1998 the reserve has been listed as a World Heritage site 'in danger' due to various threats affecting its biodiversity, which includes endemic species (okapi), important populations of large mammals (elephants, chimpanzee, buffalo, etc.) and specific, characteristic habitats.

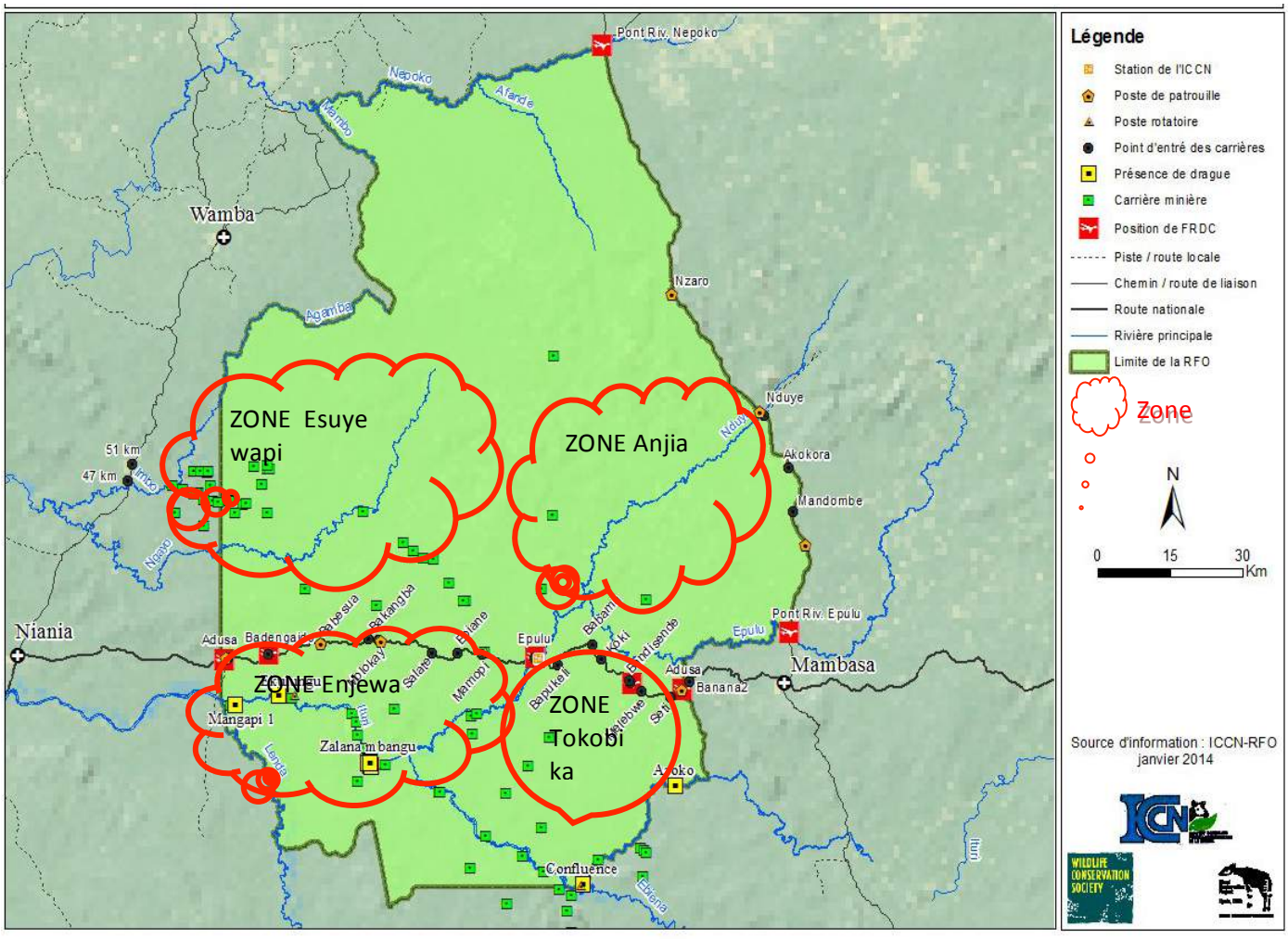
In late June 2012 the headquarters of the reserve were attacked by a well-known militia leader called Morgan .During the attack 14 okapi were killed and all operational equipment and basic infrastructure were looted and destroyed. With the loss of the reserve's operational means, this resulted in people illegally entering the reserve, including an influx of hundreds of miners for gold exploitation.

This has negatively affected the reserve's integrity and biodiversity. Apart from direct impacts in terms of habitat degradation due to the settlement of mining camps within the reserve, there has also been associated bushmeat trade, armed poaching and trafficking in guns.

ICCN and its partners in the Okapi Wildlife Reserve (Gilman International Conservation, Wildlife Conservation Society and the German Agency for International Cooperation) raised emergency and longer-term funds in order to restore the reserve's management functions.

In addition to the funds collected by traditional partners, UNESCO's World Heritage Center allocated an emergency fund to ICCN to rebuild patrol posts and purchase basic equipment to support joint operations to clear out the remaining militia inhabiting the reserve.

However, although security was slowly being restored in



the reserve, at the same time mining camps attracted thousands of new immigrants (more than 30 mining sites with an average of 500 people each), causing subsequent negative impacts on the reserve's integrity.

Mining camp destroyed after miners left

Due to the complexity and scale of evicting these illegal miners, ICCN adopted an approach which relied on an awareness campaign, encouraging the miners to leave on their own initiative and allocating a deadline. The Governor of Oriental Province, a highly regarded and dedicated conservationist, Jean Bamanisa, played a key role in this by signing a communiqué that was broadcast over local and national radio, asking miners to quit the reserve within three months.

After the three-month deadline, joint contingents of rangers and army personnel were deployed to different camps to force remaining miners to leave the reserve.

The intermediate result of this effort appears positive so far: more than 30 camps have closed and more than 10,000 miners have been ejected from the reserve. Details are recorded in the table below according to data compiled by the Chief Warden of the reserve's field report.

Table 1. Summary of mining sites closed and associated villages people

Sector	Number of mines closed	Number of miners evicted
South-western sector	7	10,130
South-eastern sector	12	400
Central sector	4	160

After closing these illegal gold mining camps, ICCN and partners' efforts are now focusing on setting up rotating ranger posts for continuous surveillance of these particular sectors, to reinforce their control and discourage any further incursions.

So far these joint efforts are showing great progress in restoring the integrity of the Okapi Wildlife Reserve that will contribute to safeguard the key okapi populations within.

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Rangers checking a closed gold mine. © ICCN Okapi Wildlife Reserve

Scratching at the surface of Giraffe Skin Disease

Robert Montgomery & Arthur Muneza, Michigan State University

The second World Giraffe Day is around the corner and once again presents an excellent opportunity to stand tall in the protection of the beautiful megafauna that is the giraffe. One of the best ways to positively impact giraffe conservation is to better understand the different factors that threaten the persistence of this majestic species. One of the emerging threats for giraffe conservation is a skin disease which appears to affect a number of different giraffe populations throughout Africa. This disease which manifests as chronic and severe scabs, wrinkled skin, encrustations and dry or oozing blood is broadly referred to as Giraffe Skin Disease (GSD). The etiological agent of GSD has not yet been identified but researchers suspect that the disease might make affected giraffes more vulnerable to carnivore predation. Given the lack of information on GSD further research is warranted.

This month researchers from Michigan State University, in collaboration with the Giraffe Conservation Foundation, will initiate investigations of GSD. This work is being conducted as part of Mr. Arthur Muneza's graduate research in Dr. Robert Montgomery's laboratory at Michigan State University and is being supported by the MasterCard Foundation, the Leiden Conservation Foundation, and the Giraffe Conservation Foundation. The first objective is to develop a database describing the distribution of GSD across the different giraffe populations in Africa. Preliminary data suggests that GSD is regionally variable. For instance, GSD in Uganda has been observed to affect the back and neck of giraffes while in Tanzania, GSD seems to afflict the forelimbs and brisket areas. Could it be the same disease or two different infections? Does the disease manifest itself differently in different giraffe subspecies? We don't yet know the answers to these and so many other questions relating to GSD. Further, we need to substantiate reports of GSD in Botswana, Zimbabwe and South Africa.

Therefore, Mr. Muneza, Dr. Montgomery, and Dr. Julian Fennessy of the Giraffe Conservation Foundation have developed a survey which will be distributed among the entire community of biologists studying wild-living giraffes across Africa. This survey intends to gather key data on recorded incidences of GSD made via observations, anecdotal data, unpublished reports, and published reports/journal articles. The survey should take 5-10 minutes to complete and respondents will be asked to forward relevant written and photographic information describing GSD in their study area to Mr. Muneza's attention. From this survey, Mr. Muneza and colleagues will write a review paper detailing spatial variation in the manifestation, severity and prevalence of GSD across Africa. In addition to this survey, Mr. Muneza will also initiate a field study of GSD in Ruaha National Park, Tanzania this month. His study intends to calculate the proportion of the Ruaha giraffe population affected by this disease using photographic mark-recapture methods and, via video-monitoring, to analyze whether giraffes with severe GSD move differently to unaffected giraffes. This latter technique will be used to assess whether GSD might be a mechanism increasing the vulnerability of giraffes to carnivore predation.

The data that Mr. Muneza gathers in collaboration with the Giraffe Conservation Foundation will be vital to the development of progressive policies intending to conserve giraffes across Africa.

Please click on the below link to complete the survey and help us better understand Africa's giraffe:
https://docs.google.com/forms/d/1LrNn2bMYcQUNOR_Z4RrU_BySG6tSMUcsbB0mu83hMxU/viewform

Acknowledgements:
Special thanks to Ruaha Carnivore Project, Giraffe Conservation Foundation, Leiden Conservation Foundation, Cleveland Metroparks Zoo, RECaP Laboratory at Michigan State University and the MasterCard Foundation Scholars Program for their continued support to carry out this research.

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Preliminary study on the urine proteome of giraffes (*Giraffa camelopardalis*)

Sabrina Fasoli *et al*., University of Bologna

Introduction

Recently, the wild population of the giraffes was significantly reduced and the numbers of giraffe in the wild have been decreasing since 1990 (around 40%). Because of the exploitation by humans, habitat loss, habitat fragmentation and severe poaching some subspecies are endangered. The International Union for Conservation of Nature (IUCN) listed both the subspecies *G. c. peralta* (2008) and subspecies *G. c. rothschildi* (2010) as "Endangered" (EN) (Dagg, 2014a).

Studies in the field of the health status of the giraffes are extremely important, both for wild specimens and for those kept in captivity.

In the recent years, the assessment of animal welfare has benefited from increased interest in the awareness of human activities impact on the animals.

The welfare of animals housed in captive environment might be compromised whether the animal exhibits did not provide the conditions to show similar behaviour to that of natural habitats' animals. At the same time, the awareness of the importance of animal welfare has led to improve the animal husbandry in order to enhance the quality of captive animals' lives (Hosey *et al*., 2009).

Stress' sources for animals living in captivity could include the forced proximity to humans as well as the handling by humans for the clinical evaluation (Morgan & Tromborg, 2006). In particular, these procedures in giraffes are complicated by their cardiovascular physiology and the immobilization could be dangerous and even lethal (Dagg, 2014b). In order to improve animal welfare, non-invasive techniques and tools to evaluate the health status are necessary (Hosey *et al*., 2009). Urine can be considered an excellent biological sample since the urine test can give important information regarding not only the kidney function but also the general health status. Furthermore collection of urine requires no, or minimal, contact with the animal, precluding the need for veterinary or trained personnel to collect samples with invasive methods and allowing routine sampling over long periods of time.

The aim of this study was to study the urine proteome by means of quantitative and qualitative techniques.

Materials and methods

For this study, 29 urine samples were obtained from four giraffes (Figure 1) of different age and subspecies (Table 1). Urine samples were collected from August to October 2013 at Parco Natura Viva, Zoological Park, nearby Verona. Five mL of urine were collected immediately after micturition, from the ground with a syringe.

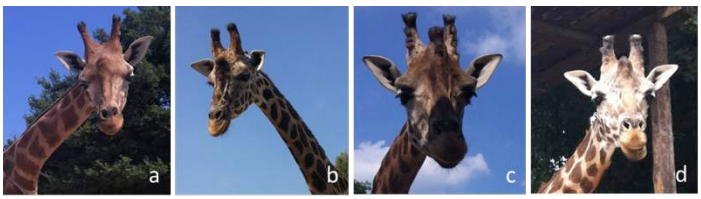

Fig. 1 Giraffes housed in Parco Natura Viva (VR). a. Primo; b. Secondo; c. Terzo; d. Quarto.

Table 1 Subjects signalling.

Animal	Species	Subspecies	Sex	Age
Primo (Macchia)	*Giraffa camelopardalis*	*camelopardalis*	M	5 years-old
Secondo	*Giraffa camelopardalis*	*hybrid*	M	11 years-old
Terzo (Akasha)	*Giraffa camelopardalis*	*rothschildi*	M	7 years-old
Quarto	*Giraffa camelopardalis*	*hybrid*	M	9 years-old

All samples were centrifuged at 1500g for 10 min and the supernatants stored at -80°C. Urine total proteins (UTP) and creatinine were measured by automated methods (AU 400 Olympus/Beckman Coulter) and urine protein-to-creatinine ratios (UPC) were calculated.

To separate the urine proteome, sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) was performed on urine supernatants, using the electrophoresis NuPAGE® system (Invitrogen) and the gels were stained with SilverQuest™ Staining Kit.

Each gel was immediately digitalized with a digital camera and analysed using the software GelAnalyzer2010.

Descriptive statistic was performed by the software R® (Version 2.15.1).

Results

The values of UTP, creatinine and UPC are reported in Table 2.

UTP values ranged from 2.35 to 29.41 mg/dL with a mean of 12.14 ± 0.59 mg/dL and a median of 8.4 mg/dL.

Creatinine values ranged from 45.4 to 381 mg/dL with a mean of 181.83 ± 11.25 mg/dL and a median of 119 mg/dL.

UPC values ranged from 0.04 to 0.082 with a mean of 0.06 ± 0.01 and a median of 0.06.

Table 2 Urine total protein (UTP), creatinine and UPC for the samples analysed.

Animal	Sex	UTP (mg/dL)	Creatinine (mg/dL)	UPC
Primo	M	29.41	358.510	0.082
Primo	M	17.72	267.430	0.066
Secondo	M	2.35	45.370	0.052
Secondo	M	2.63	46.960	0.056
Terzo	M	18.39	251.870	0.073
Terzo	M	11.02	201.030	0.055
Quarto	M	25.71	366.220	0.070
Primo	M	7.5	96	0.08
Secondo	M	10.9	196	0.06
Secondo	M	3.3	66	0.05
Secondo	M	4.3	99	0.04
Terzo	M	8.4	119	0.07
Terzo	M	6.5	119	0.05
Terzo	M	5.68	114	0.05
Quarto	M	28.24	381	0.07

Representative examples of SDS-PAGE of the urine samples are reported in **Figure 2**.

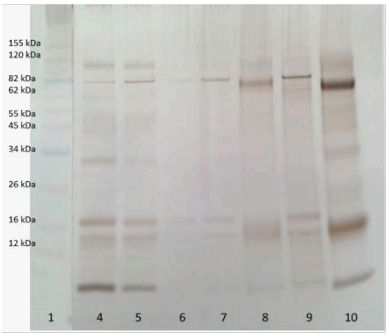

Fig. 2 Electrophoresis (SDS-PAGE)
Lane 1: PINK Prestained Protein Marker.
Lane 4: Primo;
Lane 5: Primo;
Lane 6: Secondo;
Lane 7: Secondo;
Lane 8: Terzo;
Lane 9: Terzo;
Lane 10: Quarto.
The numbers to the left of the figure indicate the molecular weights of the marker

A similar electrophoretic profiles with little inter-individual differences were found in urine samples. The number of bands detected in urine samples ranged from 2 to 10, with an average of 7 bands. Regarding individual variability, small differences were found between the samples. A single band with MW of 161 kDa was identified only in Terzo's urine sample; it is the only one with the high molecular weight bands whereas in all other samples the bands does not exceed 117 kDa.

In the area between 120 kDa and 62 kDa, a band with a MW of 98 ± 7 kDa, 83±3 kDa and a band with 70 ± 5 kDa can be found.

Between 62 kDa to 16 kDa, the inter-individual variability was more evident than between other bands but common bands were easily distinguishable. The bands were little stained and the MW ranged from a maximum of 54 kDa to a minimum of 17 kDa. Within this range, we found - in Primo, Secondo and Quarto - 4 bands with MW of 49 ± 2 kDa, 39 kDa ± 3, 28 ± 2 kDa and 20 ± 3 kDa; Terzo had only the first (49 ± 2 kDa) and the last (20 ± 3 kDa) band.

In the area with MW less than 16 kDa bands with MW of 15, 13 and 9 kDa were present.

The most of specimens presented eight common bands, with MW of 91, 83, 70, 49, 28, 15, 13 and 9 kDa. Representative pherograms are shown in **Figure 3**.

Discussion

To minimize the stress of the animals, urine samples were collected from the ground using a syringe, according to Glatston & Smith (1980). The authors in their study adopted this technique for the analysis of urine in the okapi. To our knowledge, in the literature reference intervals for UTP, creatinine and UPC have not been reported for the giraffes. Therefore, our results can be considered the first data referring to this species in captivity. We can hypothesize that the animals analysed in our study can be considered non-proteinurics, since dogs and cats are considered healthy when the UPC is lower than 0.2 (IRIS; Lees *et al.,* 2005).

Electrophoretic fractioning revealed that most of the samples had in common some protein bands, which could represent a typical set of proteins of healthy giraffe urine.

In this species, the low MW proteins are proportionally more represented in comparison to high MW proteins. Comparing our data to what has been described in the literature for humans and animals of veterinary interest, six of these common proteins could be identified.

The protein band with a MW of 91 kDa could be Uromodulin (UMo; Tamm-Horsfall protein). The UMo is one of the most abundant urinary proteins in mammals and it has been described in the urine of camels, dogs, cats, rats and humans (Calzada-Garcia *et al.*, 1996; Serafini-Cessi *et al.*, 2003; Nagaraj & Mann, 2010; Alhaider *et al.*, 2012; Brandt *et al.*, 2014; Miller *et al.*, 2014; Ferlizza

et al., 2015). The second band, with a weight of 83 kDa, could be the transferrin found in rat and dog (Brandt *et al.*, 2014; Calzada-Garcia *et al.*, 1996). The third band of 69-70 kDa could be albumin, which was described in many species, such as humans (Nagaraj & Mann, 2010), dogs (Miller *et al.*, 2014; Brandt *et al.*, 2014), cattle (Pyo *et al.*, 2003), rats (Calzada-Garcia *et al.*, 1996), kids (Ozgo *et al.*, 2009) and also camels (Alhaider *et al.*, 2012). The following two bands (49 and 28 kDa) could be the heavy and light chains of immunoglobulins, also described in the urine of camel (Alhaider *et al.*, 2012), rat (Calzada-Garcia *et al.*, 1996) and dog (Brandt *et al.*, 2014). Finally, the band at 13 kDa could be beta-2-microglobulin, also described in camels (Alhaider *et al.*, 2012), rats (Calzada-Garcia *et al.*, 1996) and dogs (Miller *et al.*, 2014).

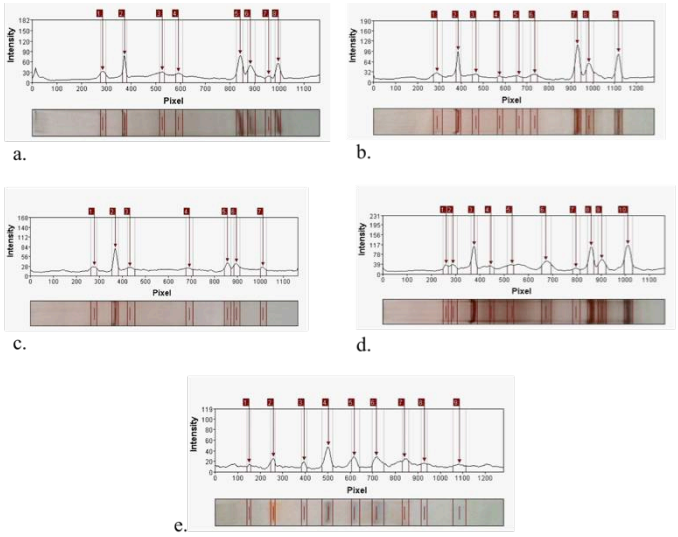

Fig. 3 Pherograms of Primo (a.); Secondo (b.); Terzo (c.) e Quarto (d.); marker See Blue Plus 2 Prestained Standard (e.).

Conclusion

This study reported the first data on the analysis of the urine and the separation of the urinary proteome of giraffe (*Giraffa camelopardalis*). The sampling and the analytical protocol produced reliable and reproducible results without causing stress to the animals.

Our preliminary data of UTP, creatinine and UPC represent a first attempt to define reference values for healthy specimens of giraffe.

After SDS-PAGE, it was possible to detect some protein bands in most of the samples, which could represent the urinary proteome of giraffes in good health. Electrophoresis seems to be a useful diagnostic tool that might be able to help clinicians in qualitative evaluation of proteinuria and for monitoring of renal function even in giraffes.

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Tall blondes in the limelight: a new giraffe documentary will be ready in 2015

Herbert Ostwald, Freelance Producer

“Giraffe are boring” and “giraffe don’t fit into the 16 by 9 TV format“. Statements like these are often heard in the wildlife filmmaking scene. Not much about the iconic animals of Africa was ever done in wildlife films. Mostly they had short appearances as “B-actors“ which had too often to step in the background when the stars of the savannah entered the natural theatre. Lions, elephants and leopards sell better than giraffe some say.

As a wildlife film author and director I wanted to change the situation. Under the working title “High Society” different German film crews followed giraffe all over Africa. The Austrian company *terramater*, a daughter of Red Bull Media House is producing a one hour show in cooperation with the well known US channel *Nat Geo Wild*. The experienced Marco Polo Film AG from Heidelberg was contracted for the filming. I wanted to know: What does it mean to be a giraffe? What are the challenges and disadvantages to live as the tallest animal on the planet? The answers have been revealed by five cameramen in seventy shooting days. We visited four different countries to find answers to my questions and captured nearly one hundred hours of footage.

We learnt that science does not know much about these top models of the savannah. For a long time the tallest animals have been overlooked by zoologists. It didn’t make the filming easier. Anyway, we tried our best and we have been lucky to meet some of the top researchers in the field of giraffe. The filming started in August 2013, following the Giraffe Conservation Foundation’s (GCF) darting and research of Rothschild giraffe in Murchison Falls Park (Uganda). More than a year later the film crew visited the Angolan giraffe in the Hoanib River in Namibia. GCF’s Julian Fennessy supported the four weeks of filming with his excellent knowledge of the subspecies and their habitat. In January and February 2015 the film team followed Francois Deacon collaring two South African giraffe in the Free State, South Africa. Cameraman Klaus Scheurich was able to attach a small GoPro camera on the head of a female giraffe – a first for such an experiment. Sections of the one-hour footage will be edited into the documentary.

Last but not least the film crew visited Kenya to film at the Nairobi Giraffe Centre and Soysambu Conservancy. With the support of Christine Odhiambo and Kathryn Combes the team was able to get wonderful insights in giraffe behaviour. Cameraman Erik Sick captured great aerial shots from a flying drone over the heads of unimpressed Rothschild’s giraffe. Additionally small cameras on the ground, at trees and under water caught new and never seen perspectives of the longnecks. Without the incredible support of all the giraffe researchers we worked with, we would not have been able to get the beautiful and breath taking footage.

The film edit will be ready by September 2015 and the movie will hopefully be international broadcasted soon after – so stay tuned!

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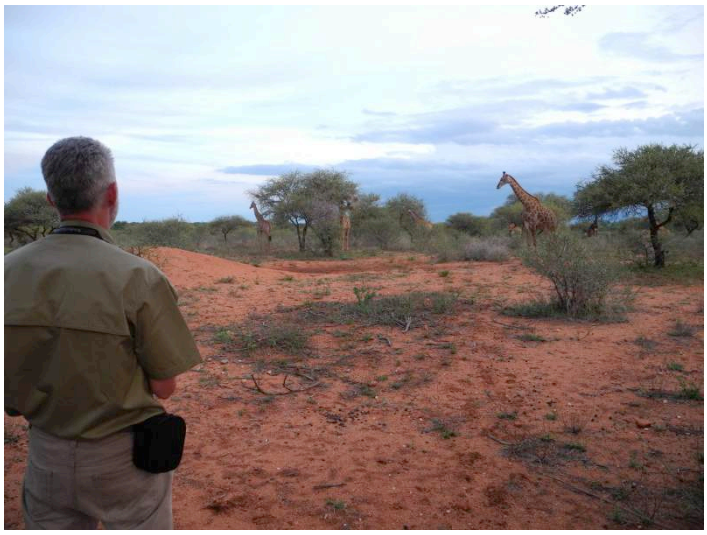
Mogalakwena: Space for studying and researching giraffe

Pascal Fust & Jacqueline Loos, Mogalakwena Research Centre

Field studies tend to take a significant part of the budget in a research project, as a result of e.g. logistical expenditures, equipment, entry fees and/or guiding salaries. This is of particular importance in projects focusing on the study of behaviour or demographical dynamics of wild animals, because such research usually involves long and frequent periods of observation in the field. Recording animal behaviour, movement of individuals or social herd dynamics often requires a short observation distance to identify animals individually and to ensure the correct recording of the activities. However, due to anthropogenic pressure on wildlife habitat and resources, wild animals adjust their flight distances accordingly, and recent increases in poaching activities in many parts of the world further reduced chances for conscientious close encounters between beast and man. Observations in close proximity of a herd require habituation of the animals, an effort that often goes beyond the scope of any research project's schedule and funding. Consequently, especially for independent and young researchers in an early stage of their career, reduced access to funding resources can substantially limit the possibilities to work on wild animals such as giraffes. Nevertheless, recent increase in interest of researchers and conservationists in the ecology of this taxon uncovered many gaps in the understanding of behavioural patterns of giraffes, thereby creating a demand for more long-term data, expertise and education.



Currently, only few research projects on giraffes propose the active collaboration with volunteers and independent researchers to ensure the continuous collection of data over long periods, although this involvement of externals has proven to constitute a valuable support. Mogalakwena Research Centre (MRC), located in the North-Western part of Limpopo province in South Africa, has been collecting ecological data on their giraffe population since 2007, relying on the commitment of volunteers and university students besides their permanent research staff. In December 2014 and January 2015, we joined the researchers at MRC to support their on-going research program on the feeding ecology and social behavior of the South African giraffe (*Giraffa camelopardalis giraffa*) in the arid savannah habitat. In their fenced, predator-free (and malaria-free) reserve of 1,500 ha, the population is thriving since the start of the monitoring program in 2006, from 10 animals in 2007 to 26 individuals currently. Thanks to almost continuous observation activities throughout the years, the population is semi-habituated, and even mothers with babies (6 new-borns in 2014, 3 during 2013) are relatively easy to approach on foot. In an initial phase, our task was to learn the identification features (e.g. neck pelage patterns) of all the individuals as well as the potential food tree and shrub species. During our 23-days stay at MRC, we accomplished 23 walks, resulting in 18 encounters with 178 individuals and 73 observation minutes of feeding behaviour. We were recording diet composition, duration of feeding bouts, relative feeding height as well as the type of browsing (stripping, picking, etc.). Observation distances varied with environmental factors such as wind speed, time of the day and vegetation density, but could be as low as 10-15m. Such conditions allow efficient observations. The data collected on feeding ecology indicate that a wide variety of plant species are being eaten by the giraffes, depending on season and age of individuals. While we were able to extend the list of food species by two additional trees, *Albizia harveyi* and *Commiphora glandulosa*, a total of 25 food species has so far been identified, mainly dominated by *Acacia tortillis*, *Terminalia prunioides*, *Acacia nigrescens* and *Dichrostachys cinerea* (see table below). There are strong indications for significant differences in importance of the

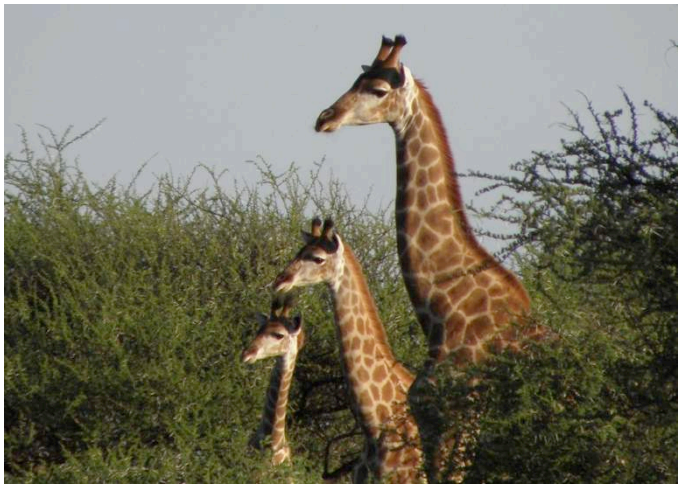
feeding tree species e.g. between the wet and dry season: while the observed animals were feeding more often on *Boscia albitrunca* and *Sclerocarya birrea* during the dry season, *Dichrostachys cinerea*, *Grewia sp* and *Commiphora mollis* grew in importance during the rainy season. However, in this period of the year, juvenile giraffes did not show any interest in the evergreen *Boscia albitrunca*, while *Commiphora mollis* was of particular importance for sub-adults.

Food species of giraffe at Mogalakwena

Acacia erubescens	*Commiphora mollis*
Acacia karoo	*Dichrostachys cinerea*
Acacia mellifera ssp. detinens	*Grewia bicolor*
Acacia nigrescens	*Grewia flava*
Acacia senegal	*Grewia flavescens*
Acacia tortillis	*Lannea schweinfurthii*
Adansonia digitata	*Philenoptera violacaea*
Albizia harveyi	*Schotia brachypetala*
Boscia albitrunca	*Sclerocarya birrea*
Cassia abbreviata	*Sterculia rogersii*
Combretum apiculatum	*Terminalia prunoides*
Combretum imberbe	*Ziziphus mucronata*
Commiphora glandulosa	

Research activities on giraffe in the reserve are not restricted to the two currently running projects on feeding ecology and social behaviour. Since the establishment of MRC in 2006, research project topics on the giraffes of the reserve were multifarious: studies on daily movement patterns, social structure of the population, habitat use, population management and spatial ecology, to name only a few examples, have been conducted by national and international researchers, students and volunteers.

While the current focus in giraffe research at MRC is on feeding ecology and demography, the centre is open for suggestions and other ideas. As potential future topics it offers e.g. the use of water resources, reproductive behaviour but also the expansion of research on the population in a mountainous reserve associated with the centre. However, for future investigations and taking into account the restricted size of the reserve, the ecosystem's carrying capacity, the continuous browsing pressure due to the fencing, and the recent gain in animal numbers, we suggest keeping a close eye on the population management aspect. Likely, this is a potential general problem in small fenced reserves that house giraffe populations and an interesting topic for comparative studies. Sex ratio of the adult and sub-adult population at Mogalakwena is currently 1:1, but needs to be monitored to minimize reproductive stress levels and risk of inbreeding. Results of a recent study on the social structure depicted a change in group composition finding adult male animals less often isolated but in association with groups of females and subadults, a process that is assumed to be related to the increased stocking rate. Current habitat management activities to reduce bush encroachment by mechanically removing *Dichrostachys cinerea* might also have a direct influence on the giraffes, as it currently constitutes a substantial percentage of their diet; the reciprocal impacts of the removal of sickle bush as food resource and control of its proliferation by browsing could therefore represent another interesting topic to be considered in the research program of the centre.



The large number of activities at the research facilities of MRC is only possible by active participation of beginner, amateur and professional researchers working on giraffes but also many other wildlife species. While the summer period generally tends to be fairly busy in the centre due to the presence of many students and student groups – e.g. each year, MRC hosts a field module for the University of Queensland, introducing young scientists to the particularities of sub-Saharan wildlife -, it provides very good (and affordable) conditions for research on African wildlife, particularly from autumn to spring. For further information on the activities at Mogalakwena Research Centre, please contact either the research centre manager directly, (Caroline Kruger research@mogalakwena.com), or visit their homepage (www.researchlimpopo.com).

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Our understanding of giraffes does not measure up

Natalie Angier, New York Times

For the tallest animals on earth, giraffes can be awfully easy to overlook. Their ochered flagstone fur and arboreal proportions blend in seamlessly with the acacia trees on which they tirelessly forage, and they're as quiet as trees, too: no whinnies, growls, trumpets or howls. "Giraffes are basically mute," said Kerryn Carter, a zoologist at the University of Queensland in Australia. "A snort is the only sound I've heard."

Yet watch giraffes make their stately cortege across the open landscape and their grandeur is operatic, every dip and weave and pendulum swing an aria embodied.

To giraffe researchers, the paradox of this keystone African herbivore goes beyond questions of its camouflaging coat. Giraffes may be popular, they said — a staple of zoos, corporate logos and the plush toy industry — but until recently almost nobody studied giraffes in the field.

"When I first became interested in giraffes in 2008 and started looking through the scientific literature, I was really surprised to see how little had been done," said Megan Strauss, who studies evolution and behavior at the University of Minnesota. "It was amazing that something as well known as the giraffe could be so little studied."

Giraffes are the "forgotten megafauna," said Julian Fennessy, a giraffe researcher and the executive director of the Giraffe Conservation Foundation. "You hear all about elephants, Jane Goodall and her chimpanzees, Dian Fossey and her mountain gorillas, but there's been a massive paucity of information about giraffes."

Now all that is changing fast, as a growing cadre of researchers seek to understand the spectacular biology and surprisingly complex behavior of what Dr. Fennessy calls a "gentle giant and the world's most graceful animal." Scientists have lately discovered that giraffes are not the social dullards or indifferent parents they were reputed to be, but instead have much in common with another charismatic mega-herbivore, the famously gregarious elephant.

Female giraffes, for example, have been found to form close friendships with one another that can last for years, while mother giraffes have displayed signs of persistent grief after losing their calves to lions.

"Giraffes have been underestimated, even thought of as a bit stupid," said Zoe Muller, a wildlife biologist at the University of Warwick in England. But through advances in satellite and aerial tracking technology, improved hormonal tests and DNA fingerprinting methods to extract maximum data from giraffe scat, saliva and hair, and a more statistically rigorous approach to analyzing giraffe interactions, she said, "we've been able to map out their social structure and relationships in a much more sophisticated way; there's a lot more going on than we appreciated."

For their part, male giraffes ever in search of the next mating opportunity have been found to be astute appraisers of the local competition and will adjust their sexual strategy accordingly. Males generally gain in rank and access to fertile females with age, and the alpha bulls flaunt that seniority physically and behaviorally: The twin ossicones that sprout like a snail's tentacles on top of a giraffe's head thicken and lose their charming tuftiness; a bony mass bulges up in the middle of the forehead; the neck musculature grows visible; and the male's posture becomes ever prouder and more unflinchingly vertical.

Andre Ganswindt of the University of Pretoria in South Africa and his colleagues have found that young bulls recently launched on their rutting career will, when they're on their own, mimic the basic demeanor of their elders: head held high, neck puffed out, females pursued and prodded and their urine sniffed for signs of estrus. But should a dominant bull saunter into view, the younger males instantly drop their sexual antics and seek to make themselves look small and innocent.

"It's a case of 'When I'm alone I'm the big giraffe,' " Dr. Ganswindt said. "But as soon as there are bigger bulls present, 'No, no, no, I'm just a child.' "

The younger bulls have reason to fear their elders' wrath. Dominance clashes between male giraffes can be terrifying spectacles, as each bull repeatedly "necks" the other, using his massive neck as a sling to slam his head against his rival, sometimes to devastating, even lethal effect.

Dr. Ganswindt saw one bull that had somehow survived with a broken neck. “The neck grew together again,” he said, “but at a funny angle.”

Giraffes are found throughout sub-Saharan Africa, currently classified as a single species with up to nine subspecies that differ by features like head shape and whether the fur on their legs is plain or patterned. The species is not listed as endangered, but researchers point with alarm to evidence that in the past 15 years, the giraffe population has plummeted some 40 percent, to less than 80,000 from 140,000.

Partly to highlight the crisis, conservationists this year declared June 21 the first World Giraffe Day — the longest day for the tallest animal, they said.

Researchers also emphasize the ecological importance of giraffes. “As large browsers, they’re habitat changers,” Dr. Fennessy said. “They spend a hell of a lot of time feeding, pruning, distributing seeds across the landscape, keeping the habitat open for other wildlife to use.” By going from tree to tree and blossom to blossom, he added, they even serve as pollinators.

A giraffe’s extraordinary mouth is like a set of human hands, its thick, prehensile lips and 18-inch-long, prehensile tongue can together grasp a leafy branch and then deftly pluck away the leaves while avoiding intervening thorns and barbs. Each day, and often well into the night, a giraffe consumes about 75 pounds of leaves, shoots, vines and occasional bits of dried meat licked from bones, all digested in its four-chambered ruminant stomach.

Giraffes also have excellent vision. Their eyes are among the largest of terrestrial mammals’, they can see in color and over great distances frontally, and their peripheral vision is so wide-angled they can essentially see behind themselves as well. Their keen eyesight lets them scan for predators, especially lions, which are their biggest threat apart from humans, and to keep track of each other.

Dr. Carter, of Queensland, and her colleagues followed more than 400 giraffes for six years, identifying their home ranges and who associated with whom. As the researchers reported in the journal Animal Behaviour, the females displayed clear and persistent social preferences. Some giraffes with overlapping home territories would never be found together, while others were sighted associating a good 80 percent of the time.

Female giraffes can live 20 years or more, Dr. Carter said, and it makes sense they might rely on each other for clues to the best feeding grounds, help with calf caretaking “or to reduce stress, just by having somebody nearby.”

Thriving Under Pressure

Or perhaps to console each other. Giraffe calves are extremely vulnerable to predators, and though mothers will fight valiantly to keep their young alive — kicking their powerful legs forward and backward, sometimes delivering blows that can break a lion’s jaw — half or more of all calves are killed in their first year of life.

Echoing similar sightings by others, Dr. Strauss, the Minnesota researcher, described one case in which a mother spent four days lingering at the place where a lion had seized her calf, forgoing food and often in the company of two other adult females. “We’re just at the beginnings of trying to understand this kind of behavior,” she said.

Also of interest is the giraffe’s exceptional cardiovascular system. A large giraffe can stand 20 feet tall — the height of a second-story window — with its neck accounting for roughly a third its span and its long legs the same. The multitiered challenge, then, is how to both pump blood very high and retrieve it from far below while avoiding burst capillaries in the brain or blood pooling around the hooves.

As part of the Danish Cardiovascular Giraffe Research Program, scores of scientists have traveled to South Africa to study giraffe physiology. They have measured blood pressure at different sites and found readings that range from high to ridiculous — up to five times human blood pressure — yet with none of the organ damage commonly seen in hypertensive patients.

Instead, the giraffe has extremely thick blood vessel walls to prevent blood from leaking into surrounding tissue, while rugged, inflexible collagen fibers in its neck and legs help keep the blood traffic moving, rather as the tight antigravity suits worn by astronauts and fighter pilots will maintain blood flow under the most extreme gravitational shifts. A complex mesh of capillaries and valves store and release blood in the neck, allowing the giraffe to bend over for a drink of water and then raise its head again quickly without fainting; when the giraffe is standing still, sphincters at the top of the legs limit circulation to the lower extremities, to minimize the risk of fluid build-up around the hooves.

Researchers were also surprised to find that contrary to old textbook wisdom, giraffes do not have unusually large hearts for animals their size. "It's half a percent of body mass, and that's the same as we see in a cow, dog or mouse," said Christian Aalkjaer of the department of biomedicine at Aarhus University in Denmark.

Moreover, Dr. Aalkjaer and his colleagues have determined that the giraffe's cardiac output — the amount of blood pumped into circulation each minute — is modest, proportionally lower than it is in humans. That finding could help explain why giraffes rarely run for very long: Their hearts can't deliver oxygen to their muscles fast enough to power extended aerobic exertion.

Or maybe the giraffes are worried about tripping over their own feet. Heather More and Shawn O'Connor of Simon Fraser University in British Columbia and their colleagues measured so-called sensorimotor responsiveness in the giraffe: how long it takes a nerve signal to travel from a muscle in the ankle up to the brain and back again. Reporting in the Journal of Experimental Biology, the researchers found that the nerve conduction rate in the giraffe is pretty much the same as it is in a shrew, rat or any other mammal.

Given the comparatively greater distance a nerve signal has to travel in the giraffe, Dr. More said, it's possible the giraffe faces real challenges in reacting quickly to events down under — a rock beneath its hoof, or a bite to its ankle.

Evolution is always a trade-off, but for the giraffe the feeding advantages that came with elongation clearly outweighed any diminution in reflex speed. No need to run when you can be a quiet poem masked by a tree.

Reprinted from the New York Times
http://www.nytimes.com/2014/10/07/science/our-understanding-of-giraffes-does-not-measure-up.html?_r=0

First Announcement

Chicago Zoological Society/Brookfield Zoo in concert with the Giraffe Resource Group will host a giraffe/okapi conference from **9 to 12 May 2016** in Chicago, Illinois, USA.

For more details contact

GiraffeConference@czs.org

Giraffe Conservation Status Report – Country Profile: Republic of Cameroon

Andri Marais, Stephanie Fennessy & Julian Fennessy, Giraffe Conservation Foundation

Sub-region: Central Africa

General statistics
Size of country: 475,400 km²

Size of protected areas / percentage protected area coverage: 15.2 %

(Sub)species
Kordofan giraffe *(Giraffa camelopardalis antiquorum)*

Conservation Status
IUCN red list (IUCN 2012):
Giraffa camelopardalis (as a species) – Least concern

Giraffa camelopardalis antiquorum – not assessed

In the Republic of Cameroon:
Giraffe in the Republic of Cameroon (referred to as 'Cameroon' in this report) are classified as a Class A species under Wildlife Law No. 94/01 of 1994 to lay down Forestry, Wildlife and Fisheries Regulations. Class A species includes rare or endangered species that benefit from full protection and may consequently not be hunted.

Issues/threats
Cameroon faces major conservation challenges and despite the country's natural riches, several wildlife species are threatened (WCS 2012). Population growth, war, illegal hunting and habitat destruction have negatively affected the distribution and range of giraffe and other wildlife in the country (WCS 2011).

Cameroon's human population is largely impoverished and many rural communities depend on the hunting of bushmeat for food and as a source of income when sold at local and urban markets (WCS 2012; Kramkimel *et al.* 2004). The large number of people who are involved in the illegal wildlife trade in Cameroon makes conventional law enforcement difficult (WCS 2012). Commercial hunting further decimates wildlife populations across the country.

An ever growing human population results in an increase in development that encroaches upon and fragments habitats, and causes increased conflict between people and wildlife (Omondi *et al*. 2008; Tsakem *et al*. 2007; Kramkimel *et al*. 2004; Mayaka 2002). Several protected areas in Cameroon are surrounded by densely populated human settlements and, as a result, are under severe anthropogenic pressure (Foguekem *et al*. 2010; Omondi *et al*. 2007; Tsakem *et al.* 2007; Kramkimel *et al*. 2004). High densities of livestock inside and at the peripheries of national parks, alongside numerous human activities such as farming, logging, illegal hunting and other forms of development, are causing rapid habitat loss that is leading to a decline in overall Cameroons' wildlife numbers (IUCN PACO 2011a, 2011b; Foguekem *et al*. 2010; Omondi *et al.* 2007; Tsakem *et al*. 2007; Kramkimel *et al*. 2004; Mayaka 2002).

Cameroon also faces numerous governance challenges (WCS 2012). Illegal activities are aggravated by ineffective and inadequate protection of national parks resulting from weak or inexistent management structures and law enforcement (Foguekem *et al*. 2010). Very little resources have been set aside by Government for park security patrols and wildlife protection (IUCN PACO 2011a). Lack of motivation, infrastructure and equipment further prevents efficiency (Foguekem *et al.* 2010; Omondi *et al*. 2008). If trends continue, the long-term viability of numerous wildlife species in protected areas may be seriously endangered (Foguekem *et al*. 2010).

Economic and political instabilities across Central Africa further complicate efforts to sustainably manage Cameroon's natural resources (WCS 2011). Rampant illegal hunting across borders, involving organised hunters with modern weapons travelling on horseback, is decimating wildlife species (Nouredine 2012). Waza National Park is located in close proximity to the borders of Chad and Nigeria from where cross-border trafficking and illegal hunting of wildlife occurs (IUCN PACO 2011b). Although incursions of rebels into Bouba Ndjida National Park have been ongoing throughout the years, a major upsurge of illegal hunting occurred in 2012, when hundreds of elephants were slaughtered (Cameroon tribune 2012; Nouredine 2012). These transgressions were allegedly committed by heavily armed Sudanese rebels, while other sources indicate mixed teams of Sudanese and Chadian hunters supported by local hunters (Nouredine 2012). Fortunately, it appears as if this elephant massacre did not negatively affect other wildlife species such as giraffe (P. Bour pers. comm.).

Gold mining activities in transitional areas surrounding Benoue National Park and petroleum exploration on the northern boundary of Waza National Park provide additional threats to park ecosystems and the wildlife they contain (IUCN PACO 2011a,b).

Estimate population abundance and trends

Taxonomic confusion has surrounded the (sub)species occurrence of giraffe in Central Africa. The giraffe population of Cameroon were formerly thought to be West African giraffe (Giraffa camelopardalis peralta) (Dagg 1962), but recent genetic work undertaken by Hassanin *et al*. (2007) suggests that giraffe in Cameroon are actually Kordofan giraffe (G. c. antiquorum). However, further genetic sampling and analysis of the Cameroon giraffe population, along with other giraffe from the region, is needed to confirm this assumption.

Historic

Kordofan giraffe formerly occurred widely in the Far North Region and North Region (North Province until 2008) of Cameroon (East 1999)[1]. Giraffe have historically been restricted to the northern savanna woodlands and Sahel Zone, with the North Region being the species' natural southern limit in the country (East 1999). An estimated 1,000 giraffe occurred in Cameroon in the late 1950s (Dagg 1962; Jeannin & Barthe 1958).

East (1999) reported that Waza National Park protected an important and viable giraffe population. From the early 1960s to the early 1990s, giraffe in the park were generally estimated to number between 1,000 and 2,000 individuals (East 1999). Population trends show a decline in giraffe numbers from 1962 to 1977. The giraffe population of Waza National Park was estimated at approximately 2,000 individuals in 1962 (Flizot 1962). In January 1977, van Lavieren (1977) estimated approximately 1,091 giraffe, while an aerial survey conducted in December 1977 estimated approximately 1,262 giraffe (Esser & van Lavieren 1979). This apparent decline was likely due to the rinderpest outbreak of 1968 and the drought of 1972-73 (Vanpraet 1976; Beauvilain 1989). After being stable between 1977 and 1980 (Ngog 1983), the giraffe population of Waza National Park appeared to increased somewhat over the next decade.

Aerial sample counts of the park carried out in 1991 estimated approximately 1,516 giraffe (Tchamba & Elkan 1995).

The first documented ground surveys of Benoue National Park was conducted in 1975 and estimated the giraffe population at approximately 17 individuals (Stark 1977).

Recent

Giraffe in Cameroon were largely restricted to protected areas by the late 1990s, when an estimated 1,360 individuals occurred in the country (East 1999). Waza National Park remained an important refuge for giraffe, while the species occurred at lower densities in Bouba Ndjida, Benoue and Faro National Parks, and the adjoining hunting zones of the North Region (East 1999).

Giraffe in Waza National Park showed a declining trend since the 1991 census. A wildlife survey of the park conducted in 1994 estimated the giraffe population at approximately 340 individuals (East 1999). However, as this census concentrated mostly on areas around the park's waterholes (East 1999), this could have been an undercount.

During ground surveys of Benoue National Park and adjacent hunting zones one and four conducted in 1999, four giraffe were observed in the park, while no giraffe were recorded in the hunting zones (Gomse & Mahop 2000). Following a ground survey of the same area in 2004, Donfack & Tsakem (2004) reported insufficient observations of giraffe. In 2007, eight giraffe were observed during ground surveys of Benoue National Park, while no giraffe were recorded in the two hunting zones (Tsakem *et al.* 2007).

Current

During a total aerial count of wildlife in Waza National Park conducted in 2007, 604 giraffe were counted (Foguekem *et al*. 2010; Omondi *et al*. 2007). The survey showed giraffe to occur in high densities in the central part of the park although they were also seen widespread in low numbers, except in the eastern section of the park (Foguekem *et al*. 2010; Omondi *et al*. 2007).

Total aerial counts of Benoue, Faro and Bouba Ndjida National Parks, as well as adjacent hunting zones, were conducted in 2008 (Omondi *et al.* 2008). Six giraffe were recorded in Benoue National Park, 27 in Bouba Ndjida, and two each in hunting zones 16 and 23 (Omondi *et al.* 2008). No giraffe were observed in Faro National Park

[1] Although East (1999) referred to *G. c. peralta and G. c. antiquorum* collectively as western giraffe, *G. c. antiquorum* is now assumed to be Kordofan giraffe as referred to throughout this document.

(Omondi *et al*. 2008). Giraffe in Bouba Ndjida National Park are estimated to have increased to 40 individuals by 2013 (P. Bour pers. comm.).

In summary, current giraffe numbers for Cameroon are estimated at <660 Kordofan giraffe, most of which occur in Waza National Park, with low numbers occurring in Bouba Ndjida National Park and a few in Benoue National Park and the hunting zones outside of these protected areas.

Future Conservation Management

The following are proposed conservation management options for giraffe in Cameroon:

- Greater understanding of giraffe population numbers, range and conservation status across the country, including (sub)speciation;
- Development of National Giraffe Strategy for Cameroon;
- Support to dedicated giraffe conservation, habitat protection, anti-poaching, education and awareness initiatives (government, NGO and academic).

Acknowledgements

We would like to thank Paul Bour for his valuable input. This study was financially supported by the Giraffe Conservation Foundation, the Mohamed bin Zayed Species Conservation Fund and Blank Park Zoo.

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Help wanted?!? Understanding the underlying causes driving the decline of giraffe in Hwange National Park, Zimbabwe

Emilien Dautrey, Student Researcher, Giraffe Conservation Foundation

Biodiversity is going through an unprecedented crisis, and experts estimate that the current extinction rate of species is 100-1,000 times higher than previously known (Rockström 2009). Humans are largely responsible for this crisis – global warming, habitat loss and fragmentation, unsustainable use of natural resources, poaching, invasive species and disease. These threats have and continue to lead to smaller, isolated populations, not only impacting endangered species but also currently widespread species. They are often associated with changes in interspecific interactions and ultimately a loss of ecosystem services.

Large herbivores are not spared by these threats. A recent study from Ripple *et al.* (2015) indicates that 60% of large herbivores are currently threatened, yet they are essential for their environment and landscapes, as ecosystem engineers, seed dispersers and primary source of food for predators. If they become extinct in the wild, subsequent ecosystems will be affected and will have a negative impact on humans. Nevertheless, shamefully, little is known about many of these species, and basic ecological research is critical to assist conservation actions.


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Giraffe, as one of these essential large herbivores, has experienced a staggering rend and its wild populations having plummeted across Africa by an alarming 40% in the last 15 years (Giraffe Conservation Foundation 2013; Kümpel *et al*. 2015). It is the case for the giraffe population in the northern sector of Hwange National Park, Zimbabwe, where the estimated giraffe population density has dropped from ~1.5/km² to ~0.5/km² over the past decade (H. Fritz, unpublished data). No study has investigated the underlying mechanisms of this decline in Zimbabwe's premier National Park, Hwange. Throughout this present proposal, I hope to secure the support of more partners alongside the Zimbabwe Parks Authority, University of Lyon and Giraffe Conservation Foundation (GCF) to better understand the causes of this decline and support the future giraffe conservation of this forgotten giant.

Objectives of the Project

This conservation project, as part of my PhD thesis, will first gain basic knowledge about this little known giraffe population (subspecies identification, individual identification, population dynamics, and social interactions). It will further allow investigating possible causes of the decline of the giraffe population abundance reported in this ecosystem. I plan to first assess the effects of exploitative competition from elephant on key resources of giraffe during the dry season. After which, I propose to study the impacts of lethal and non-lethal effects of predation by lion on this population. Because the Hwange ecosystem has experienced noticeably more severe droughts over the past decades (Chamaillé-Jammes *et al.* 2007), the project will focus on the interplay between this increased aridity and the interspecific interactions (elephant-giraffe, predator-prey) mentioned above.

Additionally, this project will address timely ecological questions such as influence of climate change on biotic interactions, role of megaherbivores in their ecosystems, and non-lethal effects of predation.

The results obtained will seek to provide practical conservation and management implications:

- At a local scale, it will help the managers of Hwange National Park to set up adequate management and monitoring plans to conserve this iconic species. Additionally, it will analyse which giraffe subspecies occurs in the Park and in turn support the current evaluation of giraffe and its IUCN Red List status for long-term conservation actions and policy.

- From a global perspective, my results will be relevant for other giraffe studies and their conservation management in other ecosystems in Africa.

This conservation project will be carried out in the framework of a collaboration between the Biometry and Evolutionary Biology Laboratory (LBBE) from Lyon https://lbbe.univ-lyon1.fr/?lang=en, le "Centre National de la Recherche Scientifique" (the French National Centre for Scientific Research - CNRS), the Zimbabwe Wildlife Authority, and GCF, the only international charity that concentrates solely on the conservation of Africa's giraffe (www.giraffeconservation.org). The project will benefit from the complementary experiences and expertise of Dr. Hervé Fritz (co-supervisor – LBBE, Director of the Long Term Ecological Research site of Hwange), Dr. Julian Fennessy (co-supervisor – Executive Director, GCF), Dr. Marion Valeix (co-advisor – LBBE) and Dr. Christophe Bonenfant (co-advisor – LBBE).

How you can help us?

Do you want to help conserve one of Africa's most important giraffe populations? I need critical funding for this project (stipend, field and running costs). Ideally, the project could employ me in partnership with a zoo as a field conservationist, especially a zoo who holds giraffe and wants to play an important role in their conservation in the wild. This concept would directly support the "One Plan Approach" of zoos, which is "the development of management strategies and conservation actions by all responsible parties for all populations of a species, whether inside or outside their natural range", and which was created by the IUCN Conservation Breeding Specialist Group (CBSG). This integrated approach would directly link with the LBBE and GCF, and facilitate a larger and more efficient impact on species conservation in the wild. Thanks to this strategy, zoos could directly manage and support a project in the wild and they would benefit from the results for visitor education and awareness, conservation support and through international attention.

With respect to the field costs, sadly nothing comes for free. It is anticipated that the conservation project will be less than Euros 100,000 over three years. A detailed budget and schedule is available on request and includes: return flights to Zimbabwe, Zimbabwe ranger fees, vehicle expenses, DNA sampling and analysis, field equipment, etc. If you are a member of a zoo, an association, a company or an individual, and you are interested in supporting part of these running costs, please do not hesitate to contact me.

We are counting on you and your generosity to support this valuable conservation project. Please do not hesitate to contact me if you would like any more information about the project and how we can partner to help Zimbabwe's giraffe.

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Book Review: Giraffe. Biology, Behaviour and Conservation

Brian Shorrocks, University of York

According to the preface in this volume, Anne Dagg has been captivated by *Giraffa camelopardalis* since she was a toddler. This is apparent in her subsequent publications. In 1976, she co-authored, with Bristol Foster, '*The Giraffe: Its Biology, Behaviour and Ecology*', and in 1982, she updated this book. This was one of two giraffe books I bought many years ago when I was first captivated by the reticulated race of this species. The other was *The Book of the Giraffe* by Clive Spinnage. In those days, information about the giraffe was limited. Now there is a plethora of scientific papers, reports and websites on this quintessential African animal. Anne Dagg's new book continues the tradition of her earlier two books, but clearly benefits from the flood of new material that is now available for *Giraffa*. There are 11 chapters in this book.

Chapter 1, called 'Time-line of giraffe', is a rather mixed bag of four topics. All are related to the giraffes 'history'. There is a short discussion of the 'old chestnut' as to why the giraffe has a long neck. Is it food or sex that Natural Selection has worked on? I wonder why the neck, rather than the ossicones, long tongue, bilobed canines, long legs, pelage pattern or a dozen other features of *Giraffa camelopardalis*, is the one seized upon by some biologists. This chapter also has a short account of fossil remains, the formation of races (discussed in more detail in chapter 11) and the giraffe in European history.

Chapter 2 is titled 'The giraffes environment' and briefly examines how changes in the Serengeti have possibly influenced giraffe numbers, and how the giraffe can interact with its environment to change it. This includes the production of forage stimulated by browsing and the stimulation of plant defences, such as spines, tannins and ants. Of course, these tropics are not specific to giraffes, but apply to many other herbivores as well. Chapter 3 examines the giraffe's browse diet: what species are eaten, differences between males and females, seasonal shifts in diet and the role of browse availability in closed, often small, reserves.

In chapter 4, the book looks at giraffe social behaviour, including a nice summary of their fission–fusion group behaviour, an exciting topic that has recently taken on new perspectives using social network analysis in several giraffe subspecies (reticulated giraffe: Shorrocks & Croft, 2009; the Angolan giraffe: Carter *et a*l., 2013a,b; and Thornicroft's giraffe: Bercovitch & Berry, 2013). The chapter also looks briefly at population densities, sex ratios, age structure and predation. However, many of these are prone to bias because researchers who "*know the terrain and the habits of their animals*" can unwittingly be misled if well researched, and standard methods for population studies are not followed. For example, reported sex ratios in the literature usually show a bias towards females. However, females tend to be in groups (which are more easily seen) and males tend to be loners (which are less easily seen) so this may be an artefact of observer bias. Chapter 5 is an eclectic mix of 'individual behaviours' with such diverse topics as walking, home ranges, drinking, rumination, sleep and vigilance. The section on movement is rather similar to that in Anne Dagg's previous two books and unfortunately lacks much newer work on animal locomotion and movement (Alexander, Langman & Jayes, 2009 and many previous Alexander papers).

Chapter 6 examines external features, mainly pelage and horns, while chapter 7 looks at the internal anatomy. This latter chapter details teeth, skeleton, the digestive system and refers briefly to the nervous system and kidneys. Chapter 8 is about physiology, although reproduction and ageing are dealt with in chapter 9. The first of these chapters deals with the cardiovascular system (blood pressure at some length), the respiratory system and thermoregulation. The latter chapter looks at pregnancy, births, growth and male and female anatomy. Chapter 10 looks at 'giraffe in zoos' and the problems involved in their maintenance. These include diet, parasites and locomotor and behaviour problems.

The last chapter is on 'giraffe races' and is an extremely valuable chapter. How many races are there and are they races or species? This has been an area of debate over many years, and the debate is becoming more exciting with recent genetic studies, using mitochondrial DNA sequences and nuclear microsatellite loci, such as that of Brown *et al.* (2007) and the modern view of species (Groves & Grubb, 2011).

The book is a delightful summary of much new giraffe research and personal observations, as well as much that originates in Anne Dagg's previous two books on giraffe. I found some of the chapters a rather eclectic mix of topics and some of her statements lacking the rigid scientific base that African wildlife discussion needs to encompass. However, if you are captivated by the giraffe, this is a lovely, and essential, book to possess. Read it many times.

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*Reprinted from African Journal of Ecology, **53**, 257-258 (2014).*

Tall Tales

Weather prevents different giraffe species from interbreeding

In zoos, different giraffe species will readily mate, but if the species cross paths in the wilds of Kenya, their rain-driven mating cycles won't be in sync.

We tend to think of giraffes as a single species, but in Kenya not one but three types of giraffe occupy the same scruffy grasslands. These three species–the Masai, Reticulated and Rothschild's giraffe–often encounter one another in the wild and look similar, but they each maintain a unique genetic makeup and do not interbreed. And yet, throw a male Masai and a female Rothschild's giraffe, a male Rothschild or a female Reticulated–or any combination thereof–together in a zoo enclosure, and those different species will happily devote themselves to making hybrid giraffe babies.

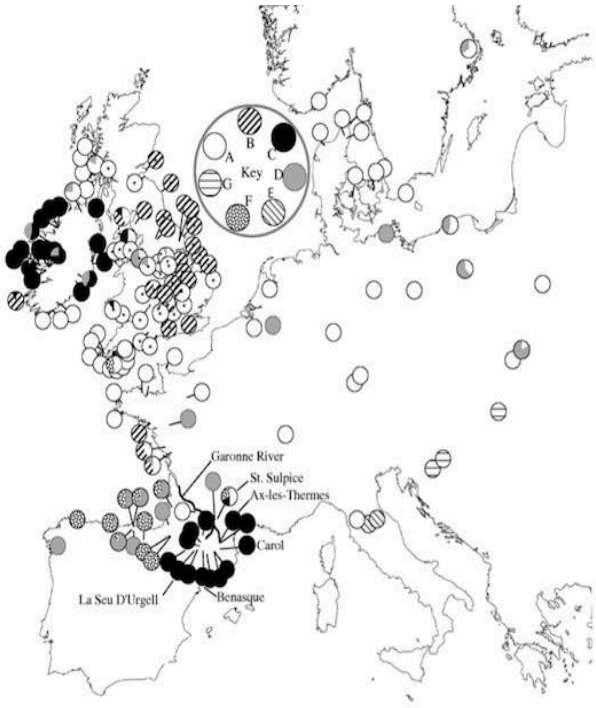
What is it, then, that keeps these species apart in the wild?

Researchers from the University of California, Los Angeles, may be close to an answer. In nature, at least one of four potential barriers typically keeps similar-looking and similar-acting but distinct species from becoming intimate: distance, physical blocks, disparate habitats or seasonal differences, like rainfall. In the case of the Kenyan giraffes, the researchers could simply look at the habitat and know that physical barriers could probably be ruled out; no mountains, canyons or great bodies of water prevent the giraffes from finding one another. Likewise, giraffes sometimes have home ranges of up to 380 square miles, and those ranges may overlap. Distance alone, therefore, was probably not stopping the animals from meeting.

Either habitat or seasonal differences, they suspected, was the likely firewall preventing species from getting up close and personal with one another. To tease out the roles of these potential drivers, the authors built computer models that took into account a range of factors, including climate, habitat, human presence and genotypes from 429 giraffes that they sampled from 51 sites around Kenya. Just to make sure they weren't unfairly excluding distance and physical obstacles from the list of possible dividers, they also included elevation values–some giraffes were found in the steep Rift Valley–and the distance between populations of giraffes sampled.

According to their statistical model, regional differences in rain–and the subsequent greening of the plains that it triggers–best explain genetic divergence between giraffe species, the researchers write in the journal PLoS One. East Africa experiences three different regional peaks in rain per year–April and May, July and August and December through March–and those distinct weather envelopes trisect Kenya.

So, although the trio of giraffe species sometimes overlap in range, the authors samples as well as previous studies revealed that they tend to each live and mate in one of those three geographic rain pockets, both within Kenya and throughout the greater East Africa region.



The researchers' model used 10,000 randomly selected locations in Kenya to predict where each giraffe species would occur based on rainfall. Red corresponds with Rothschild's, blue with Reticulated and green with Masai. The authors then overlaid those predictions with actual observations of where groups of those species occur. Crosses correspond with Masai, triangles with Rothschild's and asterisks with Reticulated. Photo by Thomassen et. al, PLoS One

Giraffe species sync their pregnancies up with rain patterns to ensure enough vegetation is around to support the energetically taxing processes of gestation, birth and lactation for mother giraffes, the authors think. Not much information is available on giraffe births, but the few observations on this topic do confirm that giraffe species tend to have their babies during the local wet season, they report.

And while the models indicate that rain is the primary divider keeping giraffes apart, the authors point out that the animals also may be recognizing differences in one another's coat patterns, for example. But scientists do not know enough about how giraffes chose mates or whether they can distinguish potential mates between species to give the species possible due credit for recognizing one another.

Whether rain alone or some combination of rain and recognition trigger mating, in the wild, at least, those mechanisms seem to work well for keeping giraffe species apart. It will be interesting to see whether this separation is maintained as climate changes.

This article was reprinted from http://www.smithsonianmag.com/science-nature/weather-prevents-different-giraffe-species-from-interbreeding-4766316/?no-ist

Giraffes now top poacher hit list

The national symbol, giraffe, is increasingly becoming an endangered species as poachers have now turned their merciless rifles on the tall spotted mammal.

Giraffes are now on receiving end of poachers' rifles with their illegal killing gaining roots in Simanjiro District, Manyara Region.

Investigations conducted by 'Daily News' revealed that poaching is more notorious in the wilderness surrounding Ndovu and Naberera villages, where other environmental destructive activities such as forest burning are threatening the area.

A resident of Naberera, Mr Eliya Nyerere, and three other persons have been reporting the incidences to authorities, but they are now renegades after receiving death threats from some unknown people.

At the moment, they have fled from Simanjiro and filed complaints at the Usa River Police Station near Arusha. It is believed that the bone marrow found in the gigantic mammals' skeletons can cure HIV/AIDS thus the craving for giraffe meat among the local population.

Some of the meat is transported to other parts of the country where it commands hefty prices. District Wildlife Officer Jatha Mollel, while admitting that poaching is rife in the area, refuted allegations that the illegal hunters are simply targeting giraffes.

"Last weekend, we arrested nine suspects and sent them to Arusha for the necessary legal measures; but they have been killing all types of wildlife including gazelle, antelope, zebra and in some cases, giraffes," stated Mr Mollel.

The wildlife officer stated that the major problem being faced by the authorities in the district is deforestation as people flock from as far as Arusha and other parts of Manyara to fetch wood for charcoal making purposes.

"But for giraffes that is just a coincidence because as people hunt game meat, they may find the mammals along the way and kill them. But they usually target gazelles and antelopes," he stated.

Giraffe poaching comes at the time when the whole world is aghast on increasing cases of jumbo killings by poachers who target their tusks, mainly for export to Asia.

This article was reprinted from http://www.dailynews.co.tz/index.php/local-news/38359-giraffes-now-top-poacher-hit-list

Painful lesions may make giraffes more vulnerable to lions

In the wild, most adult giraffes are capable of fending off lions. Evidence from Ruaha National Park, however, suggests that's changing.

Across Africa, adult giraffe numbers are declining as the iconic animals are becoming an important prey species for lions. Michigan State University researcher Robert Montgomery and his graduate student, Arthur Muneza, suspect that a skin disease plaguing giraffes may be making them vulnerable to attacks.

In May, Montgomery and Muneza will conduct a field study in the greater Ruaha ecosystem, which includes Ruaha National Park in Tanzania, Africa, to see if they can help find a solution.

"What we know now is that this is a pressing conservation issue," said Montgomery, an assistant professor of fisheries and wildlife. "However, we have yet to fully understand how skin diseases might be affecting these populations."

In Ruaha, the skin disease affects the legs of giraffes, causing lesions and sores that crack open, ooze and bleed. The sores are uncomfortable and may hinder their mobility, making them easier targets. Ruaha National Park is home to 10 percent of the world's lion population and a globally important giraffe population, so the location is a perfect place to learn more about this relationship, Montgomery said.

Muneza, a Rwandan educated in Nairobi, Kenya, and a MasterCard Foundation scholar at MSU, and Montgomery are finding out the hard way that they may be breaking new ground.

"Giraffes are a really interesting species," Muneza said. "People tend to be quite familiar with giraffes because of interactions at zoos, but we know surprisingly little about their lives in the wild."

Muneza conducted an extensive literature review of giraffe research, which resulted in fewer than 60 published manuscripts and reports and only one scientific book, published just last year.

"While this is scant information on a relatively familiar species, I'm really excited for Arthur," Montgomery said. "Being able to conduct research – with adequate funding and interest – requires the right timing and really a lot of luck. The time to conduct this research is right now, and I can think of no better person to work on this project than Arthur."

The researchers will conduct vehicle-based surveys to photograph giraffes. They also will set up cameras throughout the park to evaluate the giraffe population. This research will identify the number of giraffes affected by the disease, document its severity and determine if there are areas in the park where the disease is more common.

"We're lucky to be working in Ruaha. The national park staff feels that this is an important conservation issue, and they have already collected important baseline data on giraffe skin disease," said Montgomery, who leads MSU's Research on the Ecology of Carnivores and their Prey laboratory.

Several giraffe populations are suffering skin diseases of varying types and severity throughout Africa. Thus, this research contributes to a broader effort focused on conserving these incredible animals throughout Africa. In fact, Montgomery and Muneza are working with the Giraffe Conservation Foundation to share what they learn with other researchers around the world.

"As a graduate student, it is an amazing experience to work with a large network of scientists to reveal the basic ecology of a species that we know so little about," Muneza said. "Yet the public perception is that we know everything about giraffes."

This article was reprinted from http://msutoday.msu.edu/news/2015/painful-lesions-may-make-giraffes-more-vulnerable-to-lions/

What a neck!

Just when you think you've seen everything, an animal comes along and surprises you. Take this giraffe for instance. Witnessed on the andBeyong Klein's Camp private wildlife concession by Head Ranger Erasto Gurty, this giraffe clearly dislocated a vertebrae or perhaps even broke its neck way back. Although it does look desperately uncomfortable, the young male seems to be coping and adapting just fine.

Without a formal x-ray one can never know for certain what really happened to this bull; however, it is assumed that his injury resulted from a fight for dominance with another male. During these battles, giraffes lunge forcefully at each other using their necks, which can often result in broken horns, legs or necks. Some believe this giraffe might have even fallen down head first.

Whatever the case, it's certainly an interesting and uncommon sighting and yet another reminder that when you're on safari, expect the unexpected.

Images courtesy of andBeyond Klein's Camp Head Ranger, Erasto Gurty. www.andbeyond.com/kleins-camp

Cyclist allegedly killed by giraffe

Polokwane – A cyclist was killed when he was allegedly attacked by a giraffe in Bela Bela at the weekend, Limpopo police said on Monday.

Colonel Ronel Otto said the body of the man was found by guests at the Thabo Monate Game Lodge on Sunday afternoon. "He had gone cycling alone. That area of the lodge is known as a habitat for giraffes," she said. "He was allegedly attacked, or trampled, by a giraffe. An inquest docket has been opened and a post mortem would be done later today [Tuesday] to determine the cause of death."

In 2013 a giraffe attacked two cyclists in the Groenkloof Nature Reserve in Pretoria. The animal reportedly trampled one of their bikes and chased them before giving up. The incident was captured on video.

This article was reprinted from http://www.news24.com/SouthAfrica/News/Cyclist-allegedly-killed-by-giraffe-20150428

Recently published research

Obari TO. 2015. Population ecology of Masai giraffe (*Giraffa camelopardalis tippelskirchi* Matschie) in relation to climate variability in southern Kenya rangelands. PhD-thesis. Nairobi. Kenya.

Wildlife and the natural areas that it occupies constitute an important resource base for development of eco-tourism in Kenya. However, wildlife populations and their habitats are facing serious threats from global changes in climate and human development activities. Large herbivores with slow reproductive rates, bulk food requirements, wide foraging ranges and high potential value are highly vulnerable to those changes. Their responses to environmental pressures and human-induced landscape changes are however, not well understood. The purpose of this study was to generate essential data and information that can support sustainable conservation and management of Maasai giraffes in the rapidly changing landscape of southern Kenya.

The specific objectives of the study were i) To determine the size, age-structure and trends in the Maasai giraffe population over time, ii) determine trends in climatic conditions and their effects on availability of food and water to Maasai giraffes, iii) determine factors that influence local habitat use by Maasai giraffes, iv) determine home range sizes and movement patterns of Maasai giraffes and v) determine human impacts on the giraffes and their habitats.

Giraffe population characteristics were investigated through observations and counts of giraffes along belt transects established in Nairobi, Amboseli and Tsavo West National Parks located in the River Athi basin. The primary data were used to analyze giraffe population structure and changes in its spatial and temporal distribution. Ten-year annual census data collected in the three national parks by different researchers within Kenya Wildlife Service were also used to determine giraffe population trends over time.

Primary data were collected on mean annual rainfall amounts and temperature ranges. Similarly, secondary data on the above variables for the past 30 years were reviewed to determine the long term rainfall and temperature variability in the three study sites. Data was collected on the distribution of water sources in Amboseli, Nairobi and Tsavo West National Parks. Data was also collected on giraffes' habitat use and occupancy and the number of plant species eaten by giraffes during the wet and dry seasons.

Giraffe home range sizes were determined using both 95% and 50% Minimum Convex Polygon (MCP) and Kernel Density (KD) methods. Data on human impacts on giraffe and its habitats was collected and assessed to determine the magnitude of the impacts.

One-way ANOVA was used to test if there were significant differences in the mean number of giraffes of different age-classes in the different habitats. When tests were performed on groups of adult males, there was no significant difference in the mean number of giraffes in this age-class ($F_{1,4} = 7.71$, $p > 0.05$). When a similar test was performed on groups of adult females, there was still no significant difference in the mean number of giraffes in this age-class ($F_{1,4} = 7.71$, $p > 0.05$). However, a test performed on groups of sub-adult males, showed a significant difference in this age-class ($F_{3,18} = 3.16$, $p < 0.05$). Independent samples test using Levene's F test for equality of variances showed no significant difference in the mean number of giraffes during the wet and dry seasons in the three study sites ($F_{1,4} = 12.22$, $p > 0.05$). Chi-square tests showed no significant difference in giraffe numbers in the different habitat types ($X^2_{0,05,4} = 9.49$, $p > 0.05$).

Pearson correlation tests performed on rainfall amounts and giraffe numbers in Amboseli ecosystem showed a strong correlation between annual rainfall amounts and giraffe numbers ($R^2 = 0.941$, N= 12, $P > 0.01$). A two-sample Mann-Whitney (U) signed rank test showed no significant difference ($p > 0.05$) between the wet and dry season giraffe home range sizes in the three study sites ($U_{0.05,5,5} = 2$, $p > 0.05$).

This study concluded that the number of giraffes had increased over time inside protected areas as compared to that outside protected areas. The study recommended that a concise study be carried out on how Maasai giraffe population trends and distribution are related to the current land use changes and infrastructure development in Southern Kenya rangelands.

Awour FO. 2015. Impacts of military training on the distribution and abundance of small versus large wildlife herbivores on Mpala Ranch, Laikipia, Kenya. Afr. J. Ecol. 53(2): 238-241.

Introduction: Since the wars in Afghanistan and Iraq began, Kenya's training grounds have become increasingly relevant to the British Army Training Unit in Kenya (BATUK). This has seen ranches hosting the army in Laikipia increase to eleven in 2009 from one in 1964 when training began on Mpala Ranch. This was necessitated by the need for BATUK to train in an area similar to and close to the warzone. Training in the region involves drills, use of fire arms and explosives, helicopters and other military aircrafts. On Mpala Ranch, training typically involved drills and the use of fire arms. They would be conducted 9 days every month for 3 months in a row. A break of 4 months followed, then two of training and another three of no training. Whereas it is reported that the economic benefits of hosting the army for training have been enticing, concerns have been aised over the possible impacts of the war games on wildlife conservation and tourism (Wadhams, 2009). The trainings occur in Ewaso ecosystem (Georgiadis, 2011), which is home to half of Kenya's black rhino (*Diceros bicornis*), second largest population of the African elephant (*Loxodonta africana*) and the globally threatened grevy's zebra (*Equus grevyi*) (Laikipia Wildlife Forum, [LWF], 2014). Consequently, this study aimed to provide the information necessary for informed decision making on the compatibility of military training and wildlife conservation.

Bercovitch FB & Berry PSM. 2015. Giraffe birth locations in the South Luangwa National Park, Zambia: site fidelity or microhabitat selection? Afr. J. Ecol. 53(2): 206-213.

Birth site location can have enormous implications for female reproductive success. Some ungulate species demonstrate consistent birth site fidelity, while others shift birth locations during their lifetimes as a function of ecological and social factors. We plotted 39 years of birth records from a wild population of Thornicroft's giraffe, *Giraffa camelopardalis thornicrofti*, to test the hypothesis that giraffe use consistent locations for birth. Data from 29 calves born to nine females revealed that birth seasonality was absent and that ecological zone had no significant impact on birth locations. Consecutive births by individual females were not limited to certain locations, with the distance between sequential birth sites tending to be greater if a calf failed to survive the first year of life. Our evidence conflicts with the suggestion that giraffe cows regularly return to special locations for bearing calves. We suggest that the choice of birth location is a function of nonseasonal breeding, predator pressure and extensive variation in microhabitat characteristics within ecological zones. Female giraffe have evolved a flexible reproductive strategy, whereby they regulate choice of birth site location based upon their past reproductive history, current ecological conditions (including both resource availability and predator pressure) and present social surroundings.

Bercovitch FB & Berry PSM. 2015. The composition and function of all male herds of Thornicroft's giraffe, *Giraffa camelopardalis thornicrofti*, in Zamibia. Afr. J. Ecol. 53(2): 167-174.

Temporary all-male social groups are formed in a number of animal species. We examined 34 years of data collected from 36 male Thornicroft's giraffe in the Luangwa Valley, Zambia, to test a set of predictions related to five possible functions of all-male herds (predator protection, practicing aggressive skills, prolonging life, nutritional demands and resource learning). We found that all-male herds were significantly smaller than mixed-sex herds, usually contained a mature bull, and were not dependent upon season or habitat. Dyadic associations between males in single sex herds were quite weak, with <25% of potential male dyads sighted together in an all-male herd. Our data are best explained as a resource learning strategy adopted by males to obtain more extensive knowledge about the habitat, including both food and female distribution. However, other benefits in the form of predator protection, dietary intake and sharpening competitive skills for future contests over estrous females also seem to mediate formation of giraffe all-male groups. We conclude that the primary advantage of roaming in all-male herds changes during the life history of males.

Bercovitch FB & Deacon F. 2015. Grazing a giraffe gyroscope: where are we going? Afr. J. Ecol. 53(2): 135-146.

Giraffe are popular animals to watch while on wildlife safaris, and feature prominently in zoos, advertisements, toys and cartoons. Yet, until recently, few field studies have focused on giraffe. We introduce this giraffe topic issue with a review essay that explores five primary questions: How many (sub) species of giraffe exist? What are the dynamics of giraffe herds? How do giraffe communicate? What is the role of sexual selection in giraffe reproduction? How many giraffe reside in Africa? A

confluence of causes has produced drastic declines in giraffe population numbers in Africa, and we conclude that guiding giraffe conservation plans depends upon evaluation of the five key quandaries that we pose.

Berry PSM & Bercovitch FB. 2015. Leadership of herd progressions in the Thornicroft's giraffe in Zamibia. Afr. J. Ecol. 53(2): 175-82.

In cohesive social groups, travel progressions are often led by dominant or older individuals, but the leadership traits of individuals residing in flexible social systems are poorly known. Giraffe reside in herds characterized by fission–fusion dynamics frequently mediated by kinship. We analyzed 41 years (1971–2012) of longitudinal data collected from a community of Thornicroft's giraffe (*Giraffa camelopardalis thornicrofti*) living around South Luangwa National Park, Zambia, to assess the characteristics of herd leaders. Movement of giraffe in a single file progression was not associated with either season or time of day, but progressions were significantly more likely to occur when giraffe traveled in open areas. The oldest female in a herd was significantly more likely to be at the front position than expected, occupying the leadership niche on 79% of observations. We reason that matriarchal leadership in giraffe, as in African elephants, *Loxodonta africana*, is associated with resource learning. Giraffe societies are constructed on a heretofore unrecognized foundation that integrates relatedness and familiarity with matriarchal leadership in herd movement.

Halloran KM, Murdoch JD & Becker MS. 2015 Applying computer-aided photo-identification to messy datasets: a case study of Thornicroft's giraffe (*Giraffa camelopardalis thornicrofti*). Afr. J. Ecol. 53(2): 147-155.

Digital photography enables researchers to rapidly compile large quantities of data from individually identifiable animals, and computer software improves the management of such large datasets while aiding the identification process. Wild-ID software has performed well with uniform datasets controlling for angle and portion of the animal photographed; however, few datasets are collected under such controlled conditions. We examined the effectiveness of Wild-ID in identifying individual Thornicroft's giraffe from a dataset of photographs (n = 552) collected opportunistically in the Luangwa Valley, Zambia from March to October 2009. We assessed the programme's accuracy in correctly identifying individuals and the effect of five image quality factors on identification success: blurriness, background type and complexity, amount of sky and the presence of other giraffe. The programme correctly identified individuals in 71.6% of photographs. Background complexity was the only significant variable affecting identification success and removing background imagery reduced identification error by 52.8% (from 28.4 to 13.4%). Our results indicate higher levels of error than previously reported for Wild-ID. However, they also suggest the programme is an effective tool for quickly identifying individuals in large field datasets, especially if photograph backgrounds are removed beforehand and postanalysis visual verification is performed.

Kiffner C, Wenner C, LaViolet A, Yeh K & Kioko J. 2015. From savannah to farmland: effects of land-use on mammal communities in the Tarangire-Manyara ecosystem, Tanzania. Afr. J. Ecol. 53(2): 156-166.

Land-use change is considered a major driver of biodiversity loss. In the western part of the Tarangire–Manyara ecosystem, we assessed large mammal species richness along a land-use gradient (national park, uninhabited pastoral area and settled pastoral- and farmland). We found the highest species richness in the national park and in the pastoral area and lowest species richness in the settled and farmed area. There was little evidence of seasonal changes in species diversity. Except for top-order carnivores, all functional feeding guilds were still represented in pastoral and settled areas. Although we did not find significant differences in body mass distributions and species' representation of feeding guilds between the study sites, there was a trend that omnivores, mesopredators and top-order carnivores tended to occur at lower species richness in agricultural areas than in the pastoral and fully protected areas. These results indicate that areas used for livestock keeping can maintain high wildlife species richness and that direct and indirect effects of agricultural and settlement expansions are the main drivers of species richness loss in the Tarangire–Manyara ecosystem and possibly other African savannah ecosystems. These results are useful for informed land-use planning that aims to maintain species diversity and ecological connectivity between protected areas.

Kümpel NF, Quinn A & Grange S. 2015. The distribution and population status of the elusive okapi, Okapia *johnstoni*. Afr. J. Ecol. 53(2): 242-245.

Introduction: The okapi (*Okapia johnstoni*) is one of only two remaining giraffid species. This elusive animal is endemic to the central and north-eastern rainforest of the Democratic Republic of Congo (DRC) and is poorly known. As part of a multipartner, rangewide okapi conservation project, in 2013, the IUCN SSC Giraffe and Okapi Specialist Group (IUCN SSC GOSG), the Institut Congolais pour la Conservation de la Nature (ICCN) and the Zoological Society of London (ZSL) organized a participatory, multistakeholder workshop in Kisangani, DRC to review the conservation status of okapi and develop the first-ever okapi conservation strategy (ZSL, 2013). The workshop highlighted a substantial decline in okapi populations over the last decades and was the basis of an IUCN Red List reassessment, resulting in the species' re-classification as 'Endangered' (previously 'Near Threatened'; Mallon et al., 2013). Here, we summarize the latest information on the distribution and population status of okapi, highlighting the major threats facing this unique and iconic species.

Kümpel NF, Grange S & Fennessy J. 2015. Giraffe and okapi: Africa's forgotten megafauna. Afr. J. Ecol. 53(2): 132-134.

Policy piece: The Giraffidae family includes only two living species of ungulates: the giraffe (*Giraffa camelopardalis*) and the okapi (*Okapia johnstoni*), both restricted to the African continent. Taxonomically, the *Giraffa* and *Okapia* genera separated from each other approximately 16 million years ago, and they now exhibit as many differences as similarities. Today *Okapia* is represented by one species (*Okapia johnstoni*), though with surprisingly high genetic variation, whereas nine subspecies of giraffe are currently recognized (although ongoing research is underway): *Giraffa camelopardalis angolensis*, *G. c. antiquorum, G. c. camelopardalis*, *G. c. giraffa*, *G. c. peralta*, *G. c. reticulata*, *G. c. rothschildi*, *G. c. thornicrofti* and *G. c. tippelskirchi*.

O'Connor DA, Butt B & Foufopoulos B. 21015. Foraging ecologies of giraffe (*Giraffa camelopardalis reticulate*) and camels (*Camelus dromedaries*) in northern Kenya: effects of habitat structure and possibilities for competition? Afr. J. Ecol. 53(2): 183-193.

The foraging ecologies of reticulated giraffe (*Giraffa camelopardalis reticulata*) and domestic camels (*Camelus dromeda*rius) were examined in the Laikipia District of Kenya, where these species have recently become sympatric.

Camels increased popularity in the region has lead to concerns about their environmental impacts and possible competition with wild giraffe for resources. We gathered foraging data on both species using 2-min group scans that recorded feeding heights and plant food preferences. Transects sampled the vegetation in areas where foraging observations were recorded. Giraffe females feed at lower elevations than males, while female camels feed below both sexes of giraffe. There was very little observed overlap in food preferences between the species. However, habitat type has an effect on foraging ecologies of both giraffe sexes, but habitat did not influence camel foraging. Camel herder husbandry techniques also influence camel foraging dynamics. These findings have important implications in achieving the twin objectives of wildlife conservation and pastoralist livestock production in northern Kenya.

Stanton DWG, Hart J, Kümpel NF, Vosper A, Nixon S, Bruford MW Ewen JG & Wang J. 2015. Enhancing knowledge of an endangered and elusive species, the okapi, using non-invasive genetic techniques. J. Zool. 295(4): 233-242.

The okapi *Okapia johnstoni* is an endangered, even-toed ungulate in the family Giraffidae, and is endemic to the Democratic Republic of Congo (DRC). Okapi are highly elusive and very little is known about their behaviour and ecology in the wild. We used non-invasive genetic methods to examine the social structure, mating system and dispersal for a population of okapi in the Réserve de Faune à Okapis, DRC. Okapi individuals were found to be solitary, but genetically polyga- mous or promiscuous. There was no evidence for any close spatial association between large groups of related or unrelated okapi for either sex, but we did find evidence for male-biased dispersal. An isolation by distance pattern of genetic similarity was present, but appears to be operating just below the spatial scale of the area investigated in the present study. We describe how the analyses used here can infer aspects of behavioural ecology and discuss the strengths and limitations of these analyses. We therefore provide a guide for future studies using non- invasive genetics to investigate behavioural ecology of rare, elusive animals. This study furthers scientific knowledge about a species that has recently been recog- nized by the IUCN as

endangered, and is a potentially important flagship species for Central Africa.

Stanton DWG, Hart J, Vosper A, Kümpel NF, Wang J, Ewen JG & Bruford MW. 2014. Non-invasive genetic identification confirms the presence of the Endangered okapi *Okapia johnstoni* south-west of the Congo River. Oryx: 1-4.

The okapi Okapia johnstoni, a rainforest giraffid endemic to the Democratic Republic of Congo, was recate- gorized as Endangered on the IUCN Red List in ***2013***. Historical records and anecdotal reports suggest that a dis- junct population of okapi may have occurred south-west of the Congo River but the current distribution and status of the okapi in this region are not well known. Here we de- scribe the use of non-invasive genetic identification for this species and assess the success of species identification from dung in the wild, which varied throughout the range. This variation is probably attributable to varying okapi popu- lation densities and/or different sample collection strategies across the okapi's distribution. Okapi were confirmed to occur south-west of the Congo River, in scattered localities west of the Lomami River. We demonstrated that non-in- vasive genetic methods can provide information on the dis- tribution of cryptic, uncommon species that is difficult to obtain by other methods. Further investigation is required to genetically characterize the okapi across its range and to investigate the biogeographical processes that have led to the observed distribution of okapi and other fauna in the region.