

Dry Season Field Work in Murchison Falls National Park

The rains have delayed this season. Usually, by this time of the year, the skies are dark with near daily billowing storm clouds. Instead, they are still dark with the migrating Abdim's stork, which spiral above in the hundreds. Taking advantage of the delayed onset of the rainy season, we easily maneuvered the terrain in our trusty Landcruiser. Without the long grasses to obscure warthog holes and termite mounds, and without the muddy waters filling the luggas, the off-road driving is 'relatively' easy, making surveys and behavioral observations an unobstructed endeavor.

This particular field season was busy for the research programme in Uganda. In addition to the annual population census, DNA sampling and collaring in Kidepo Valley National Park (NP) (outlined in the Kidepo Valley Field Report, April 2017), we also conducted our seasonal demographic surveys and resource selection studies to better understand the ecology of giraffe in Murchison Falls NP. Although the terrain is easier to navigate, the giraffe tend to be more dispersed in smaller groups throughout the Park during the prolonged dry season, making the work equally challenging and equally rewarding

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Deepening Our Understanding of Giraffe Population Dynamics: Examining Demography & Identifying Threats

One of the primary goals of this field season was to continue our long-term population ecology study in Murchison Falls NP. This population is the largest in Uganda and contains the most Nubian (formerly Rothschild's) giraffe of any known population, so understanding the dynamics of this imperiled taxa is an important conservation priority. In addition to providing valuable insights into the ecology of this changing system and deeper understandings of the mechanics of giraffe population ecology, this study has generated important data for the proposed National Giraffe Conservation Strategy and Action Plan, and its subsequent implementation.



This is our tenth season of demographic surveys in Murchison Falls NP. The Giraffe Conservation Foundation (GCF), in partnership with Dartmouth College and the Uganda Wildlife Authority (UWA), has worked since 2014 in implementing studies on the population ecology, spatial ecology and resource ecology of this population to ensure a sound scientific foundation for subsequent giraffe conservation strategies. As the giraffe population database grows in size and duration, we are able to piece together a more comprehensive picture of spatiotemporal variation of demographic parameters, population level dispersion and individual space use. Since giraffe are long-lived and relatively slow reproducing, the mechanisms behind some of the population level and spatial ecology patterns only become evident over time.

To begin to address these research and conservation themes, we have implemented seasonal photographic surveys. Our research team drives planned and consistent systematic routes through the entire expanse of the northern portion of the Park and we take photograph all giraffe that we encounter. In accordance with robust population survey protocols, we survey the entire extent of the Park twice during each seasonal transition. Since the spot patterns are unique to each individual giraffe, we can use them as identifying characteristics which enable us to monitor changes in and individual's geographic coordinates, social dynamics or health condition. We employ the use of WildID, a specially designed pattern recognition computer program to assist in correctly matching spot patterns of newly photographed giraffe to a database of thousands of previously encountered individuals. In addition to collecting images, we also take note of the age class, sex class, the presence of skin disease lesions, any signs of illegal snare wounds and the geographic coordinates of each observation.

The March/April 2017 field season was consistent with other dry season surveys in that we observed fewer giraffe in smaller, more dispersed groups. During this survey, preliminary analyses of data suggest that we encountered

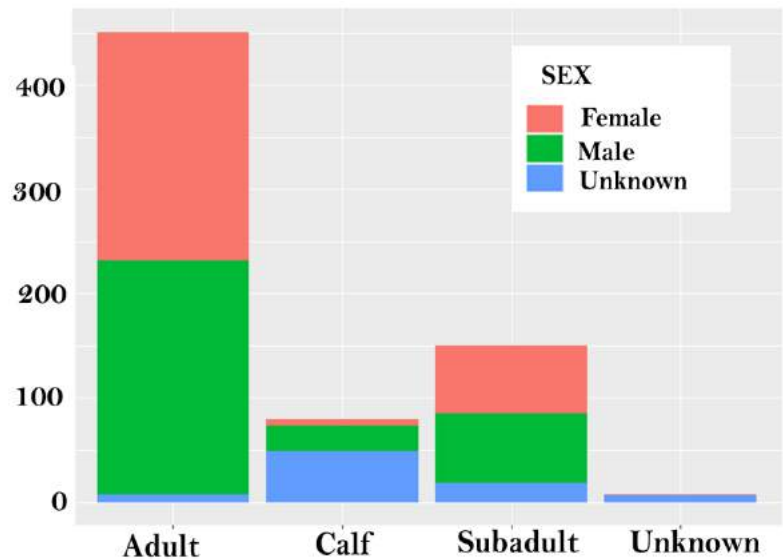


Fig 1: Sex composition across age classes. n= 686 giraffe

668 unique individual giraffe. The age class distribution was consistent with previous surveys, suggesting a population age structure consisting primarily of adults (Fig1). Preliminary analyses of data suggests that we recorded 42 new calves that were not identified during any previous survey efforts.

Sex distribution among all the observed unique individuals across all recognised age classes was approximately 1 male: 1 female. Determining the sex of calves is sometimes challenging under field conditions, given the lack of development of apparent secondary sex characteristics, so many of the observed calves were of undetermined sex.

During the two rounds conducted, we encountered **98 herds of giraffe** throughout the Park. Herds ranged in size from 2-84 individuals (Fig 2). Although herd sizes ranged considerably, the mean herd size was 10.34 giraffe (standard deviation = 13.13). Unlike in the wet seasons, when large aggregations of giraffe were observed in the western delta portion of the Park, during this field season, some of the larger herds of giraffe were observed in the central Wankwar portion of the Park.

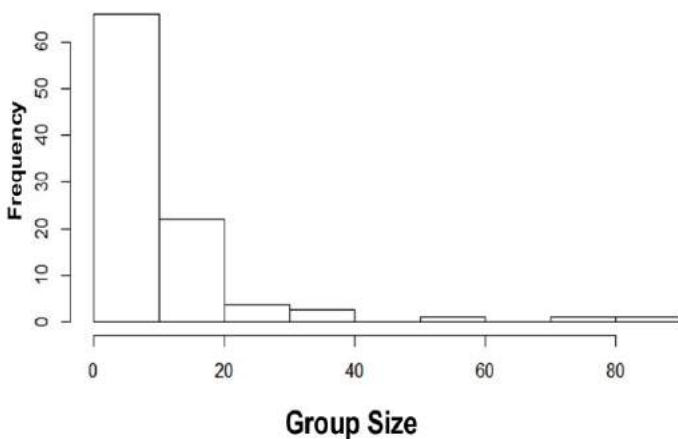


Fig 2. Histogram of observed giraffe herd size across both survey rounds

In addition to studying spatiotemporal variation of giraffe demographic parameters, we also utilised the opportunities afforded by our spatially explicit individual encounters to monitor the geographic distribution and demographic effects of other potential threats to the population, including giraffe skin disease (GSD) and evidence of illegal snaring.

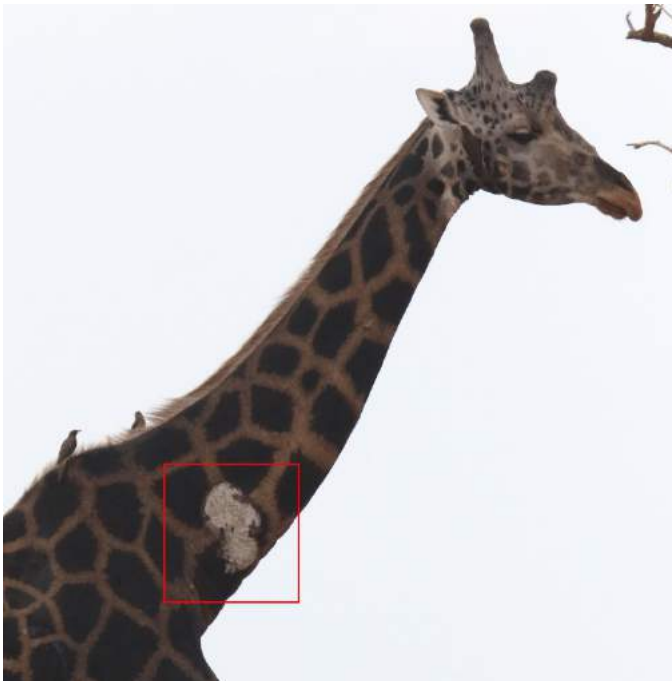


Fig 3: A photograph of a skin disease lesion on the neck of a male giraffe

GSD is a poorly understood affliction that occurs across various giraffe populations throughout Africa. In Murchison Falls NP, the disease is characterised by hyperkeratotic lesions mainly along the necks of giraffe (Fig 3).

To better understand the potential effects of GSD on giraffe demography, we monitor individual giraffe with skin disease across space and time. During this survey, each giraffe was visually inspected for visible lesions characteristic of the GSD infection. There were observed signs of skin disease on **253 unique individuals** (representing approximately 36% of all unique observed giraffe). It is not yet known what effect, if any, this affliction may have on survival, but as additional surveys are conducted over a longer time span, GCF will continue to evaluate any potential effects of skin disease on giraffe demographic parameters. Additionally, we evaluated the spatial distribution of visible skin disease lesions across all observed giraffe during the survey period. As stated above, a larger proportion of the population was observed in the central Wankwar area relative to the western delta/Pakuba areas of the Park. Notably, although giraffe were observed throughout the entire extent of the Park, visible lesions were largely absent from the Ayago and Chobe areas of the central and eastern portion of the Park (Fig 4).

As with previous survey efforts, we also monitored the prevalence and spatial distribution of snare wounds on giraffe (Fig 5). Previously, officials from the UWA had identified illegal cable snares as a potential key threat to giraffe and other wildlife species in the Park. By most accounts, giraffe do not seem to be the intended targets of these traps but instead fall victim to the indiscriminate traps, resulting in deep cuts that often get infected and swollen and in at least instances have resulted in the amputation of the effected limbs.

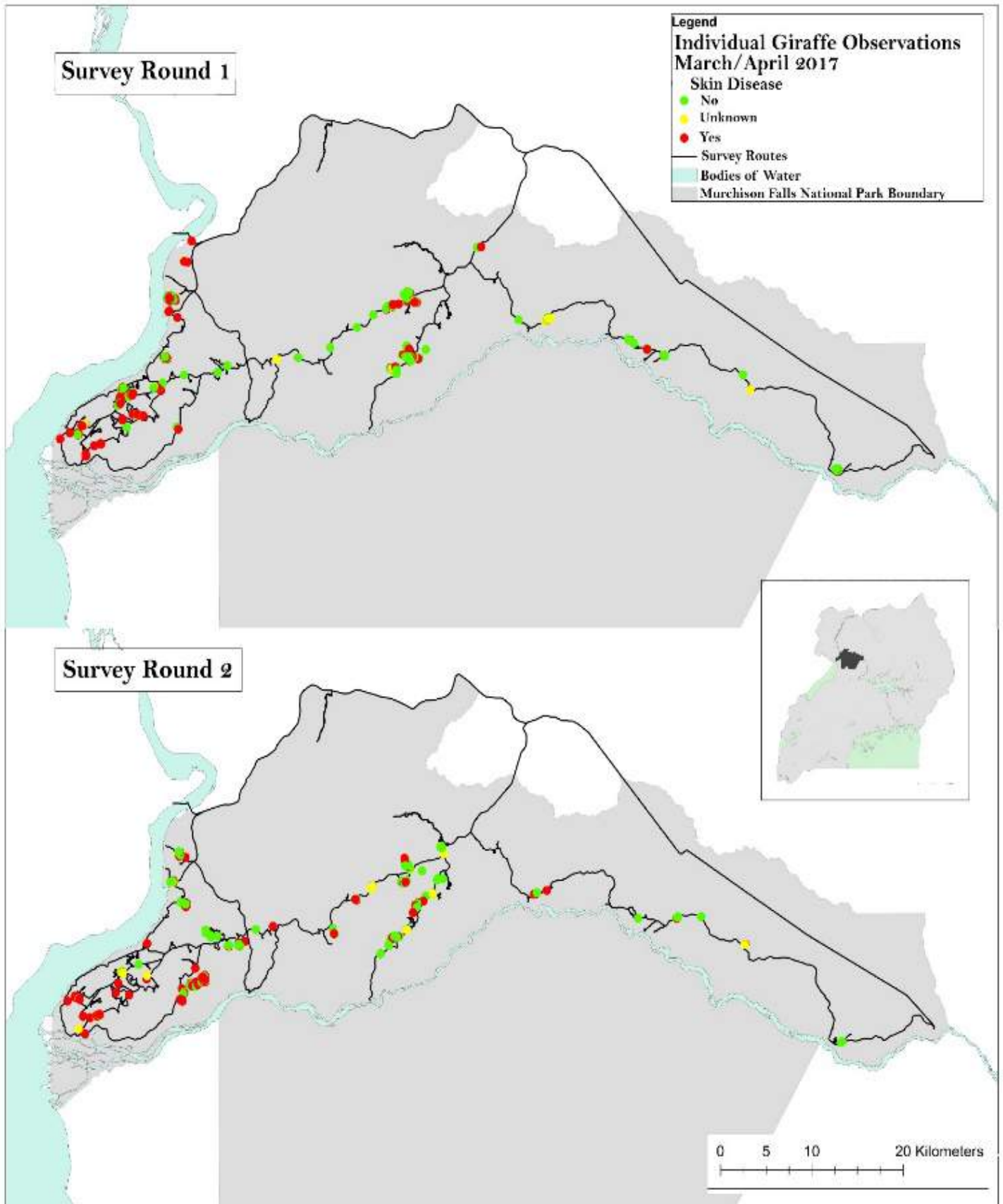


Fig 4: The spatial dispersion of all giraffe observations with an emphasis on the distribution visible signs of giraffe skin disease

To evaluate the potential effect that the illegal snaring of Murchison Falls NP may have on the giraffe populations and to compile a spatially explicit record of snaring risk throughout the Park, all photographed giraffe were visually inspected for scars, snares or other signs of snare-related injuries. Over repeated survey efforts, we are monitoring the individual survival and behavior of individuals with known encounters with snares (Fig 5)

There were observable snare injuries on **20 individuals** during this round of surveys. Of the uniquely identified snared giraffe, 4 were adult females, 12 were adult males, 1 was a juvenile male and one was an unknown calf. During this field season, we encountered no giraffe with snares still attached. Since snare wounds are typically observed on the lower legs of the giraffe, the shorter grass during this dry season survey provided better unobstructed views of giraffe for assessing injuries.

Consistent with previous field seasons, most giraffe with visible snare wounds were encountered along the waterways of the westerns Delta and Pakuba. Alarmingly, however, we documented signs of



Fig 5. A photograph of a young giraffe with a snare wound

snaring on giraffe for the first time in the eastern Chobe sector of the Park. During our surveys, we encountered two new giraffe carcasses where the carcass itself had visible signs of having been snared suggesting that snaring may have played some role in their demise. Although rangers here are heroic in their efforts to patrol for snares, this illegal activity is still a concern for the giraffe in this crucial population.



Evaluating Giraffe Resource Ecology in a Seasonal Savannah

Giraffe undoubtedly live in a complicated landscape, where resources vary in quantity and quality over both space and time. As nearly exclusive browsers, some of the most critical resources for giraffe include the types of leaves on woody vegetation upon which giraffe feed. These 'bottom-up' effects on population regulation can play an important role in determining how many giraffe a given system can feasibly support and how this population of giraffe might shift spatial patterning in response to changing seasonal distribution of resources.

As such, to better understand bottom-up effects on population-level processes, it is necessary to understand the effects of resource distribution on giraffe foraging behaviors. Evaluating the variation of diet and nutritional profiles of available and consumed plant species is an essential component of examining giraffe resource ecology. Over the three previous field seasons we have conducted behavioral/foraging focal follow observations. While scan sampling methods offer a broader spatial perspective on the species of plants consumed by giraffe, studies seeking to examine the phytochemical and nutritional mechanics of diet composition should employ continuous behavioral sampling of single individual over the span of at least a day. Focal follows allow for a better understanding of nutrient uptake as a function of estimated quantity of ingested plant items. Additionally, focal follows provide a temporal criterion for diet selection, in which we can examine the potential diet regulation over the course of the observation period, evaluating how individual giraffe may modify their diet as a result of previously ingested food items.

During our continuous behavioral observations of a focal individual, we begin our observation period at sunrise (~07:00) and continue our observations until sunset (~18:00). Although giraffe are known to forage during night hours, current logistical constraints and risk of excessive disturbance of the



Fig 6: A large male giraffe feeds on the leaves of a well-browsed *Crateva adansonii*.

animals prevent the continuation of focal follows into the night; however, nocturnal activity budgets suggest that giraffe reduce feeding time by as much as 50% and instead allocate more time to ruminating. During these focal follow observations, we record foraging behaviors at each feeding station that the focal giraffe encounters. We defined a feeding station defined as the vegetation available to a forager without moving its front legs. At each foraging station, we collect a suite of data, including the spatial coordinates, the species of plant being consumed and the type/quantity of plant being consumed.

In this field season, we completed 10 full days of behavioral and foraging focal follow observations resulting in approximately 100 hours of giraffe observations. During this period, we observed giraffe feeding on at least thirteen recognised plant taxa. Although giraffe were observed to forage upon a number of plant species, a large percentage of the overall documented diet during the time

period consisted of *Crateva adansonii* (27% of all cumulative observed feeding, Fig 6), *Acacia sieberiana* (27% of all cumulative observed feeding, Fig 7), and *Harrisonia abyssinica* (16% of all cumulative observed feeding, Fig 8). There was considerable variation in the quantity of estimated biomass consumed across all observed giraffe. As we develop a better understanding of the composition of the diet and the sequencing of foraging behaviors, we will be able to test competing hypotheses for diet selection and evaluate how changing plant community composition can have a cascading effect on individual giraffe foraging behaviors, giraffe population dispersion and giraffe population dynamics. Additionally, nutritional and phytochemical analyses of sampled plant species can offer better insights into the nutritional and chemical components of these plant/browser interactions which play such a prominent role in giraffe population regulation.

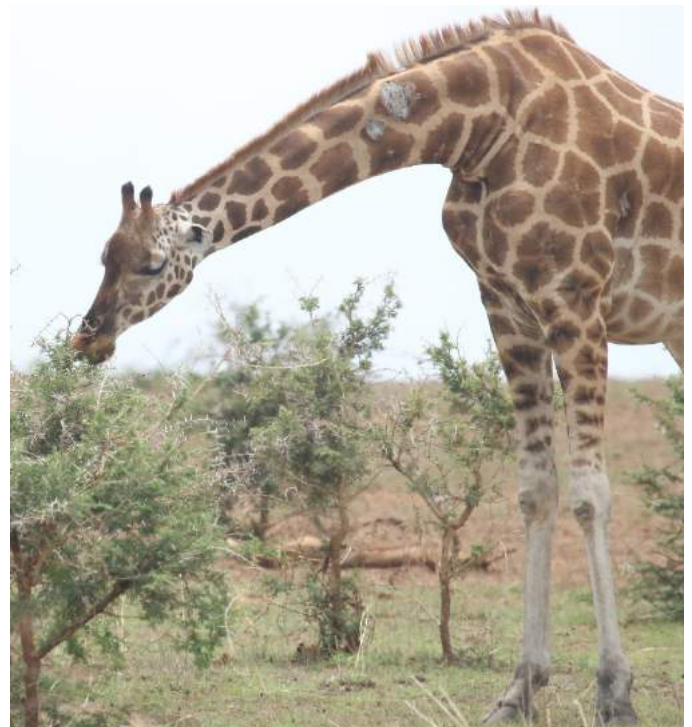


Fig 7: A female giraffe with skin disease browses on the leaves of *Acacia sieberiana*

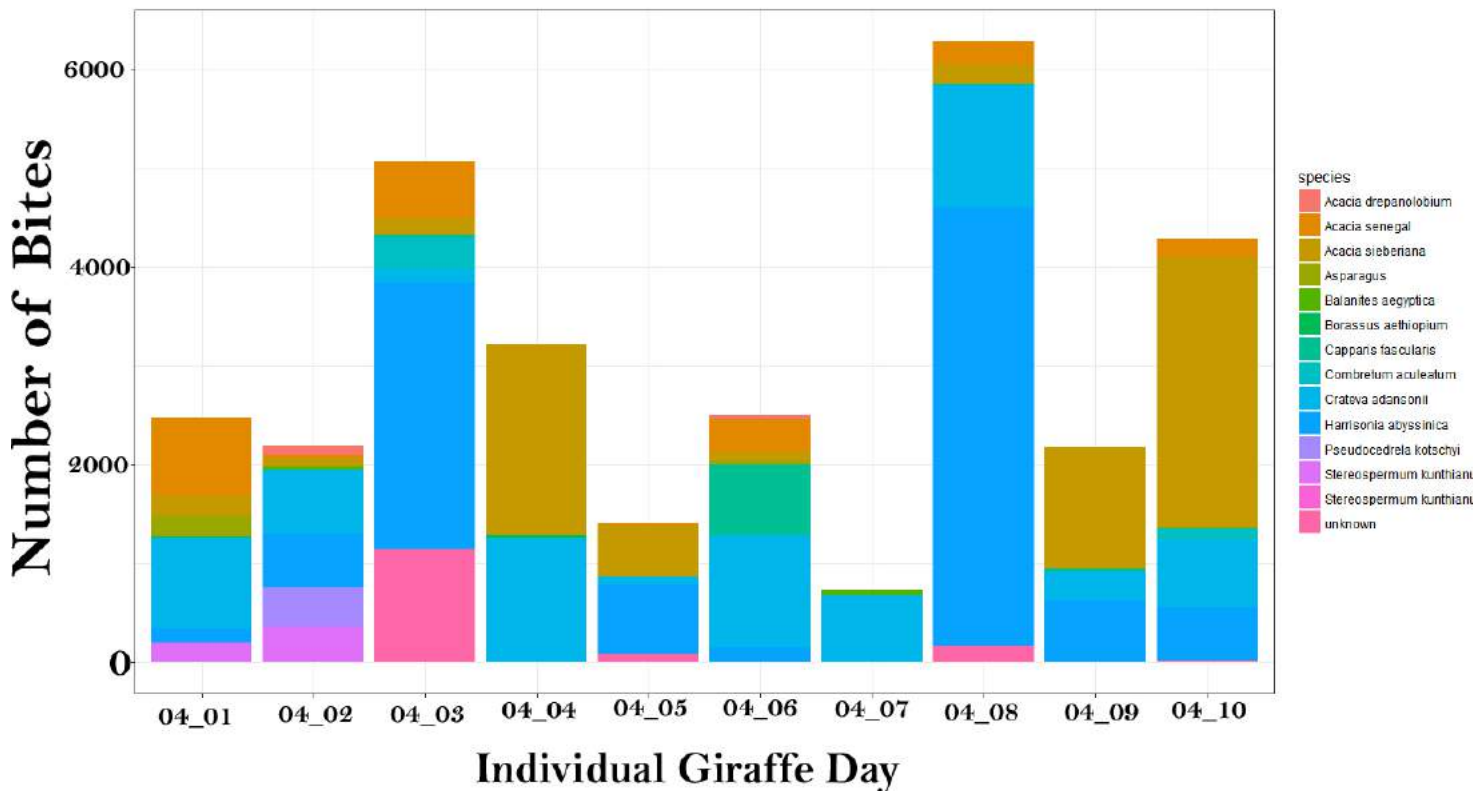


Fig 8: Stacked bar charts indicating the diet composition and the quantity of constituent forage species consumed during each day of behavioral focal follow observations.

In the News

The early part of 2017 has yielded a bit of exposure for the Murchison Falls NP and our giraffe conservation research programme in the popular press. See below for links to articles and videos that feature our work in Uganda:

The cover story March 2017 edition of Smithsonian Magazine featured ongoing work in Murchison Falls NP:

<http://www.smithsonianmag.com/science-nature/save-giraffes-put-our-necks-out-180962128/>

We were also interviewed for an article on giraffe skin disease by Smithsonian.com:

<http://www.smithsonianmag.com/smithsonian-institution/how-tiny-worm-is-irritating-most-majestic-giraffes-180963260/?no-cache>

The Carter's W.A.R (Wild Animal Response)

television show episode that was filmed in

December 2016 also aired in in early March 2017:

<https://www.youtube.com/watch?v=vXJ6ifHMyCs>



Acknowledgements

