

Dramatic declines in Kenya's wildlife demand an urgent response

Wildlife populations in Kenya are decreasing at an alarming rate as land use and cover changes, increasing numbers of livestock and over-grazing put pressure on rangelands. Unless drastic improvements are urgently made, this loss is expected to continue to escalate. Dr Joseph O. Ogutu, senior statistician at the University of Hohenheim and expert in wildlife population dynamics, has been studying aerial surveys of Kenya's wildlife between 1977 and 2018. Along with associates Drs Hans-Peter Piepho and Eivin Roskaft, Dr Ogutu hopes to improve understanding of this decline so that more pointed efforts can be made to protect Kenya's biodiversity.

Home to Africa's big five: lions, leopards, buffalo, elephants and the rare black rhino, Kenya is well known for its iconic wildlife and impressive migrations. Each year, thousands of wildebeest, zebra, Thomson's gazelle and eland begin the long journey north, through the Masai Mara, bordering Tanzania, along well-established routes. The horizon teems with beasts jostling for position and the air grows thick with bellows and brays as wildebeest rut and mate over several months. The diverse horde looks as though it could go on forever, but following a worrying trend of extreme wildlife decline across Africa, the end could be in sight after all.

Reports of wildlife declines across the globe are becoming increasingly common. Continually growing human populations and agricultural expansion are putting more and more pressure on the environment, with dire consequences for both flora

and fauna. This trend has become starkly apparent in Africa. Despite numerous resources and great effort being put into conservation, Kenya's wildlife declined by around 68% in under 40 years. With the country's biodiversity at stake, it is vital that we understand what is contributing to this loss and which species are most at risk so that improvements can be made. Dr Joseph O. Ogutu a senior statistician at the University of Hohenheim, has been studying this decline and the reasons behind it for several years with startling findings.

A BIRDS-EYE VIEW

In 2016, Dr Ogutu, along-side fellow biostatistician, Prof. Dr Hans-Peter Piepho, published a report detailing the status of wildlife in the rangelands of Kenya using data gathered from aerial observations conducted by the Directorate of Resource Surveys and Remote Sensing of Kenya (DRSRS). Over the study period, they would cover a total of 511000 km² of Kenya's rangelands,



A herd of plains zebra at a water point. Photo Credit: Mr Reto Buehler.



A mixed herd of common eland, plains zebra and white-bearded wildebeest in Masai Mara, Kenya. Photo Credit Mr Reto Buehler.

and would come to focus most intensely on the Nairobi and Lake Nakuru National Parks, the Masai Mara and Kajiado county. Their ongoing goal as part of an EU funded Project called AfricanBioServices, coordinated by evolutionary ecologist, Professor Eivin Roskaft, at NTNU in Trondheim, Norway, is to build upon previous data to provide a wider analysis of wildlife declines in Kenya as a whole and propose sustainable solutions.

In addition to the severe overall rates of decline between 1977 and 2016, some species were seen to decline by as much as 88%. By 2013, seven wildlife species across Kenya were classed as critically endangered, 19 as endangered and 37 as vulnerable. Also, 44 ecosystems or areas are currently (2018) classed as endangered. A few years on and the decline shows no signs of stopping, with species like the Thomson's gazelle, warthog and oryx among others, now under severe threat. Numbers of Grevy's zebra and waterbuck have fallen lower than 2000, putting them amongst a number of species whose future viability is under extreme risk.

Dr Ogutu and his team suggest several potential factors that may have influenced this widespread decline, including increased human and livestock populations and climate change. Nearly 70% of Kenya's wildlife occurs in private or community areas, away from the protection of national parks and game reserves. Although some species appear to do well when living in conjunction with humans according to Dr Ogutu's work, this has led to those which are particularly vulnerable to human expansion suffering some of the

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hardest losses. Significant degradation and fragmentation of rangeland habitats, through this expansion, clearing for agriculture, settlements and uncontrolled logging for the charcoal trade may be preventing wildlife from utilising certain areas. The team also found that some migratory species, such as wildebeest and zebra, are less likely to venture into the Mara region during dry seasons than previously seen, suggesting that these factors are contributing to a disruption of migration routes.

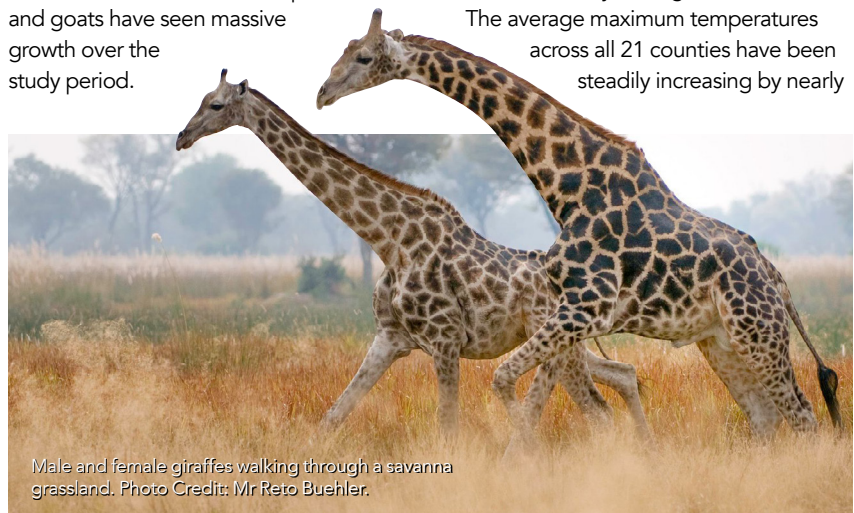
DESPERATE TIMES

Overgrazing, causing the degradation of forage resources is also having a significant impact according to Dr Ogutu. While numbers of cattle have also decreased, those of sheep and goats have seen massive growth over the study period.

Between 1977 and 2016, the populations of sheep and goats increased by more than 76%. It is likely that this increase in livestock is putting added grazing pressure on land that is shared with wildlife, restricting their access to resources and cover. For example, competition with livestock, aggravated by poor forage due to steadily climbing temperatures, has driven wild buffalo from some areas altogether.

Camels have also been on the rise, which Dr Ogutu attributes to their ability to adapt to the increasingly harsh conditions seen throughout Kenya making them popular among livestock owners looking to cope with the effects of climate change. Temperature changes have been noted in 21 Kenyan rangeland counties.

The average maximum temperatures across all 21 counties have been steadily increasing by nearly



Male and female giraffes walking through a savanna grassland. Photo Credit: Mr Reto Buehler.



Cattle herd resting outside a Maasai homestead (boma) in the morning in Masai Mara, Kenya.
Photo Credit: Mr Reto Buehler.

two degrees Celsius over the study period. Minimum temperatures have also increased by up to two and a half degrees Celsius in all the 21 rangeland counties of Kenya. This persistent change in climate has led to more frequent occurrences of intense droughts in these areas, further exasperating habitat destruction and fragmentation.

Dr Ogutu says the rates of decline observed call into question the effectiveness of current conservation efforts and highlight a need for policy changes to make it easier for landowners to benefit from having wildlife on their land. Previously, government policy has made it difficult for landowners to benefit in any way from having wildlife on their land. Once primarily nomadic, the pastoralists of Kenya have been encouraged to become sedentary.

Most wildlife in Kenya is found outside of protected areas like the Masai Mara National Reserve and tends to occur in areas also occupied by humans, leading to conflict when crops get trampled or eaten by wildlife or when there is a risk of disease transmission to livestock or humans. This makes conservation efforts outside of these areas all the more important but with no effective wildlife management agency and rampant habitat degradation in these areas, things are looking rather bleak for Kenya's wild fauna.

DESPERATE MEASURES

Dr Ogutu suggests that more needs to be done to encourage wildlife conservancies across Africa, not just in Kenya. By making it economically viable for poor landowners to volunteer their land for use by wildlife and working to prevent the poisoning and poaching

Competition with livestock, aggravated by poor forage availability and quality due to steadily climbing temperatures, has driven wild buffalo from some areas altogether.



A female elephant with three young elephants.
Photo Credit: Mr Reto Buehler.

of wild species, it may be possible to start restoring populations and their ecosystems. This won't be an easy feat by any means but some success has been seen with conservancies such as the Nakuru Wildlife Conservancy. Within this conservancy area, many previously declining species showed a marked increase between 1996 and 2015. This success was made possible through the cooperation between private landholders, government and non-government partners to actively conserve wildlife on their land. This not only provides protection for wild species in the area but also provides the much-needed space caused by limits on the expansion of national parks and reserves.

The introduction of The Wildlife Conservation and Management Act in 2013 in Kenya also offered a glimmer of hope but Dr Ogutu recognises several gaps in this Act that still require attention if any real progress is to be made. He says that along with the introduction of Wildlife conservancies, some restrictions need to be placed on land fragmentation such as through fences, illegal livestock grazing in parks, reserves and conservancies and livestock levels to reduce the impact of grazing on the rangelands. This is especially important as some landowners use the money from conservancies to build fences and increase their livestock herd size, causing further competition between their livestock and wildlife benefiting from the conservancies.

The complex network of factors influencing these declines is still relatively poorly understood, making continued monitoring of population trends and dynamics necessary for the realisation of conservation goals, says Dr Ogutu. He believes these Wildlife conservancies, paired with policy reviews, effective wildlife management institutions and vibrant markets for wildlife will be the best way forward for conservation in Kenya. Not only do they encourage the restoration of habitats outside of protected areas like the Masai Mara National Reserve, they also provide jobs and income for the people who live there. With continued support for conservancies and better understanding gained through the work of Dr Ogutu and others in the AfricanBioServices Project, the wildlife of Kenya may one day thrive again.



Behind the Research

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W: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0169730> **W:** <https://benthamopen.com/contents/pdf/TOECOLJ/TOECOLJ-7-1-9.pdf> **W:** <https://pdfs.semanticscholar.org/1d4b/b7143097f8bf94efd9ad64c74e9c1999d20d.pdf>
W: <https://africanbioservices.eu/> **W:** <https://scholar.google.de/citations?user=nq7uFDQAAAAJ&hl=en> **W:** www.researchgate.net/profile/Joseph_Ogutu2 **W:** www.uni-hohenheim.de/en/organization/person/dr-joseph-o-ogutu

Research Objectives

Dr Joseph O. Ogutu hopes to improve our understanding of the decline in wildlife population in Kenya.

Detail

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Bio

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- Prof Eivin Røskoft, Dept. of Biology, Norwegian University of Science and Technology (NTNU), Trondheim, Norway.

References

- Bedelian, C. and Ogutu, J. O. (2017). 'Trade-offs for climate-resilient pastoral livelihoods in wildlife conservancies in the Mara ecosystem, Kenya', *Pastoralism*, 7(1).
- Ogutu, J. O. et al. (2016). 'Extreme wildlife declines and concurrent increase in livestock numbers in Kenya: What are the causes?', *PLoS ONE*, 11(9).
- Ogutu, J. O. et al. (2017). 'Wildlife population dynamics in human-dominated landscapes under community-based conservation: The example of Nakuru Wildlife Conservancy, Kenya', *PLoS ONE*, 12(1).



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Personal Response

What has been the biggest challenge you've faced in this research and what will/did it take to overcome it?

/// The biggest challenge we faced in this research was checking the digital aerial survey records against the original field records for accuracy. This required many data entry clerks to whom we are most grateful. This process is still ongoing for data on settlements and environmental features collected during the aerial surveys. Combining all the 1000 plus aerial survey data sets on animal numbers, settlements and environmental features into one large data set for analysis has been challenging. Also, it was only possible with the help of data recovery experts to access data sets archived in various old storage media. ///