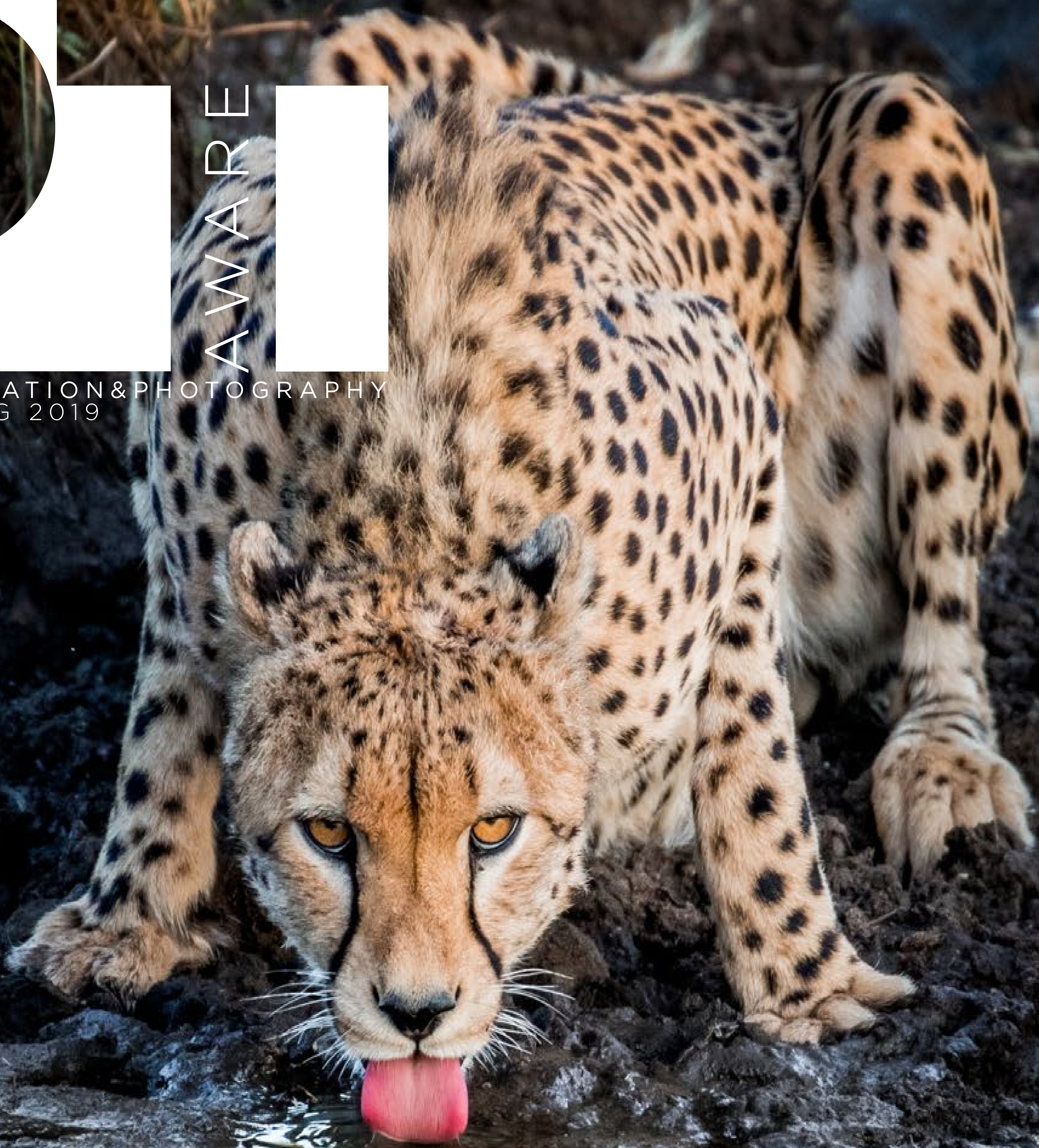


# PR AWARE

CONSERVATION & PHOTOGRAPHY  
JUL / AUG 2019



**CHEETAH  
CONSERVATION**  
BY PETER HUDSON



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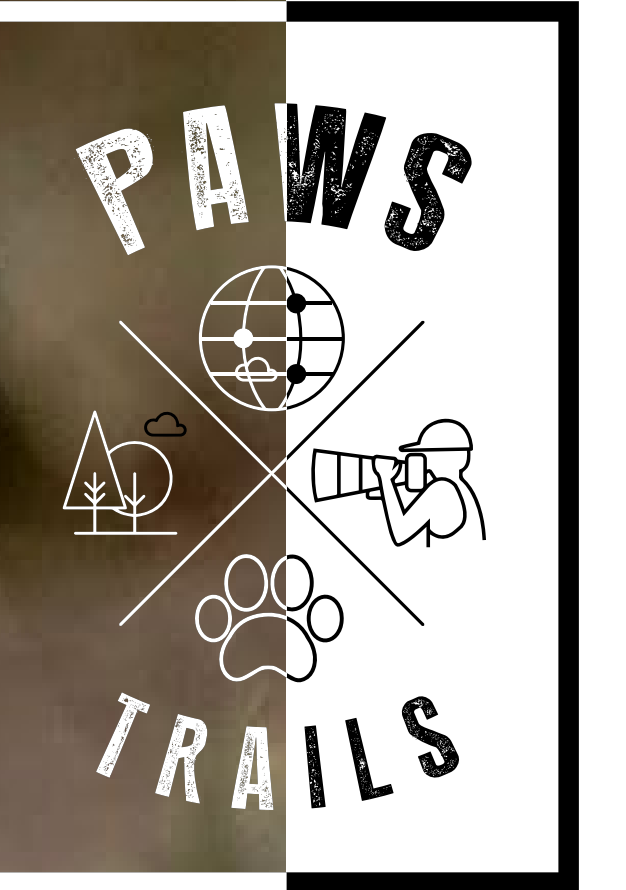


Photo By:  
Hermis Haridas

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Raghu Patteri  
Editor

There are hardly any grander sights in the natural world than a Cheetah in a full blooded chase across the African savannah. The best known exponents of pace in the animal world is a sight to behold and a true marvel of bio-engineering. Virtually everything in the Cheetah's physiology is engineered to satisfy the need for speed. These marvelous creatures are known to accelerate upto 120 km/h over short sprints, making them the fastest land animal.

The ability of the Cheetah to attain astonishing speed, tremendous acceleration and execute sharp turns during chases are essential to a successful hunt and important in ensuring the survival of the species. But is this enough? Or is the astonishing agility hiding other important factors of the Cheetah's biology which might be threatening the very existence of these enigmatic cats?

Explore all these and other intriguing facts about the Cheetah with Dr. Peter Hudson in this edition of PT Aware.

PT Aware is our attempt to bring the latest scientific perspective on conservation issues in a short, crisp format to our readers around the world.

We aim to bring together the knowledge of the best minds in the scientific community and the splendid photography of the vast PawsTrails community, in an easy to consume online format.

Building and collaborating with a worldwide community of conservation photographers is an important objective for PawsTrails. We see community participation and awareness as the corner stones of success for conservation efforts.

Thanks again to all our contributors over the years and we sincerely hope that we have used your photographs to highlight conservation issues around the world.

Our next edition will focus on the Houbara bustard, therefore prepare to start uploading your photographs of these birds! A selection of your photographs will be chosen for publishing.

<http://www.pawstrails.com/register>

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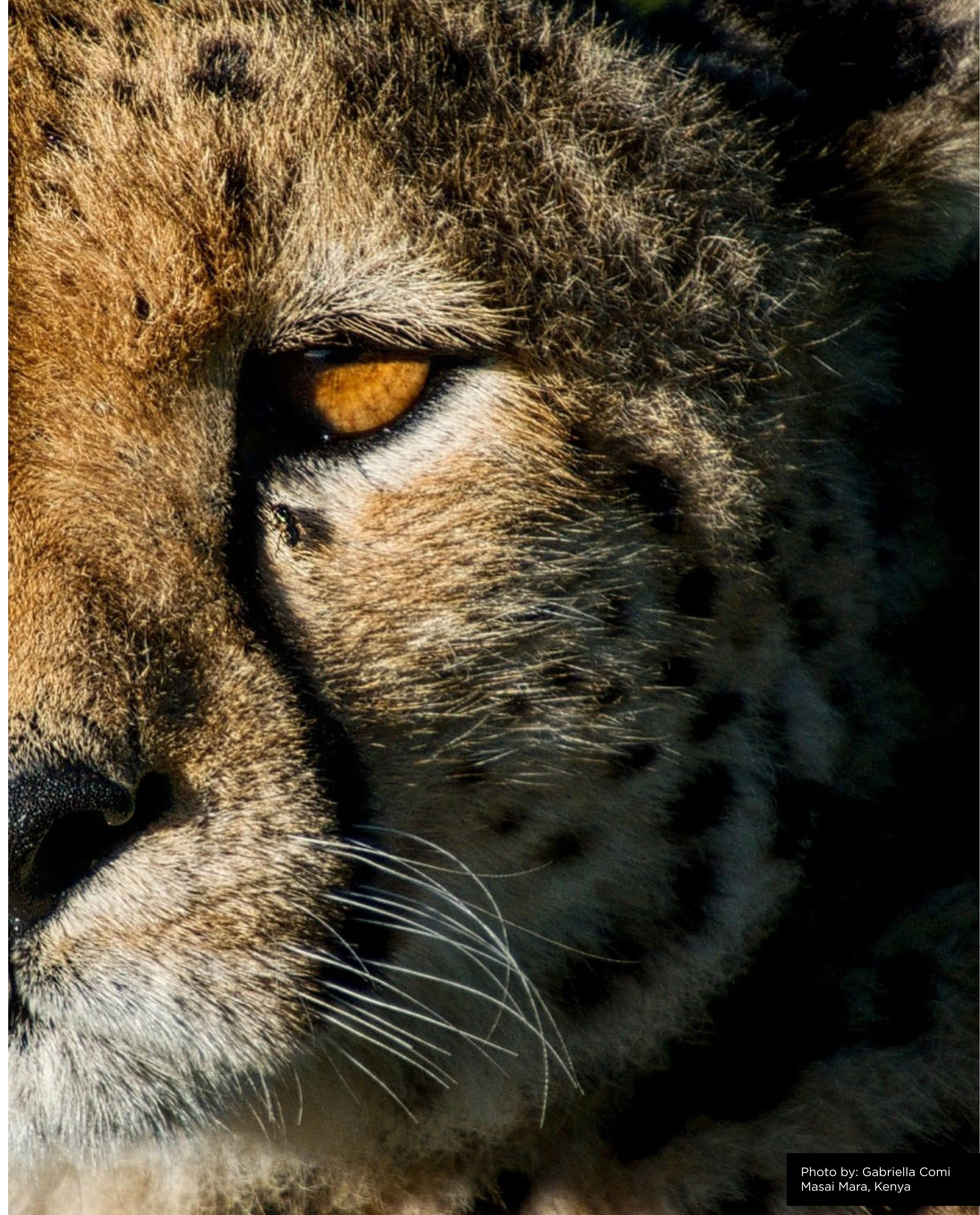


Photo by: Gabriella Comi  
Masai Mara, Kenya

**EDITOR'S DEN**





## FOUNDERS' NOTE

Being frequent visitors to Masai Mara, it is hard for us to imagine that landscape without the Cheetah.

Over the years, we have been lucky to witness some high speed Cheetah chases, and we can vouch that it is an unbelievable experience which makes you even forget to breathe. It is one of those experiences which is impossible to witness without being touched, and you return with renewed respect for these marvelous cats.

While we urge you to grab any opportunity to witness these enigmatic species, please do so respecting the personal space of the animal. This is even more important while visiting cubs, a group of vehicles and a barrage of cameras in near proximity will spook the mother and force her to move the cubs. Many cubs are lost this way by getting exposed to other competing animals.

It is sad that these animals have been wiped out from most of their historic ranges and are only seen in few parts of Africa and just one country in Asia. The causes are many, but the human impact has also been pivotal in this tragic loss. Habitat fragmentation by the increased influence of human activities are driving many species to the brink of extinction.

We thank all the wonderful photographers for your wonderful Cheetah images and sincerely hope that we have done justice to your photographs in this edition. Please continue to contribute by submitting your images online. Your images, married with the latest in scientific knowledge will be powerful tools for conservation.

[www.pawstrails.com](http://www.pawstrails.com)

**Hermis Haridas & Nisha Purushothaman**

Founders - Paws Trails Explorers



THE STORY

# Cheetah Conservation: Genetic and population issues threaten the most enigmatic of the big cats

By Peter Hudson,  
Conservation Director, Paws Trails







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**Peter Hudson is a scientist, photographer and conservationist. He undertook his first scientific expedition to Africa at the age of 21 and has been a regular visitor ever since. Passionate about nature, he manages his own 36-hectare nature reserve in Pennsylvania which is home to bears, bobcats and other animals.**

In his professional career, Peter is the Willaman Professor of Biology at Penn State University. The focus of his research has been the infectious diseases of wildlife and in particular how new diseases emerge. He has been running scientific studies on the wolves in Yellowstone, tortoises in the Mojave Desert and bighorn sheep in Idaho. He is currently involved in a major project in Australia investigating the viruses associated with bats.

**Peter established a new global health institute at Penn State that seeks to develop the concept of One Health, whereby the future health of humans is dependent on that of the environment, livestock management and the conservation of wildlife. He is an adjunct Professor at The Nelson Mandela African Institute of Science and Technology based in Arusha, Tanzania and a Fellow of the Royal Society.**

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Photo by: Todd Gustafson  
Nduu, Ngorongoro Conservation, Tanzania



## Watching Cheetahs in the Mara

Last December I was fortunate enough to go on a Paws Trails trip to the Masai Mara and very fortunate to be in a Landcruiser with Nisha Purushothaman and driven by the inimitable Johnny Temut to watch the coalition of five cheetahs (*Acinonyx jubatus*) known as the “Fast Five”, or in Swahili as Tano Bora - the “incredible five”. This is a group of cheetahs consisting of two pairs of two brothers plus another single male that was formed in December 2016 and is still active more than 2 years later. Not only does the hunting success rate go up when cheetahs hunt together, but they also can catch and pull down much larger animals like Zebra and Wildebeest. We watched as they stalked slowly in the fading light, first a herd of Zebra and then Eland. Eland are very large bull like antelope, far too big for them to even consider but when one of the cheetahs went for a calf and successfully grabbed it, the other cheetahs helped it by causing total confusion amongst the herd which failed to defend the calf and providing the cheetahs a good meal. An astonishing spectacle, nicely captured by Nisha on her Nikon D850, and skillfully predicted by Johnny. Like many before us, we were mesmerized and ecstatic at what we saw, the whole hunt just illustrated the beauty and elegance of the cheetah as a specialized high-speed hunter from the initial stalk, the chase, and the kill - magical. Indeed, during the trip, we saw several groups of cheetahs and even some young, so we all went home

with excellent images. We came away with the feeling that the cheetahs were happy and healthy and doing well in the protected areas of the Mara - but was this a true reflection of the state of the animal across its distribution? Do they have sufficient protection and what are the pressures upon them?

### Cheetah Biology and Genetic Issues

We all recognize cheetahs as the fastest land mammal in existence, shaped like a greyhound with a small head, long legs, slim body that doubles up during the sprint to provide huge leaps forward. They also have enlarged heart muscles to help with the sprint and semi-retractable claws which allow them to run as if they are wearing spiked running shoes.

Just as I was fascinated by the cheetahs in the Mara, people throughout history have been mesmerized by these very special cats. William the Conqueror, the Mogul emperor Akbar and Chinese emperors all kept cheetahs for sport hunting and as pets. Since these early times, the global population of the cheetahs have shrunk - more about that later - and naturally there is concern amongst conservationists about the future of these animals. To build up a global zoo population of animals, as a kind of genetic reserve and to also increase public awareness about the animals, zoos often see if animals can be bred in captivity. In several instances, zoos have helped recover animal populations after they have been hit badly by heavy harvesting, poisoning or poaching. While there is an ongoing debate about breeding big cats in captivity, the process has not



Photo by: Srikanth Santhinathan  
Masai Mara, Kenya





Photo by: Vishal Agrawal  
Masai Mara, Kenya



been too difficult. This is not the case with cheetahs – getting them to breed is almost impossible and even when they do, the cubs rarely make it past the first two months so the majority of cheetahs in zoos or collections are rescue animals. One issue they face is that the male cheetahs have really low sperm counts – the counts are just 10% of other cats – and even then, 70% of the sperm are malformed. Under natural conditions we expect genetic variation, even in the basic enzymes and we expect to see 15-50% variation between individuals of the same species. The astonishing thing about cheetahs is that they are all very, very similar – almost no genetic variation what so ever – even between different populations. This is most unusual in a wild animal and only ever seen among inbred animals that have been bred sister to brother for several generations and yet, wild cheetahs roam over huge areas and select their mates.

Genetic variation is important in the fight against disease and of course there are biological processes to increase the variation in immunological response between individuals. In most animal species, including humans, this means you have to take great care during organ transplants to select donor and host with similar genetics or the organ will be rejected by the host body. This is not the case with cheetahs, in this instance if you do a simple skin graft from one cheetah to the next it is not rejected – in contrast a skin graft from a domestic cat is rejected. This tells us that there is very little variation in the immune system of cheetahs, although it is different and still working against other







species. This is true for both the south African cheetahs and the east African cheetahs – very little genetic variation within each subpopulation and very little between the two populations, even though they are considered different subspecies! In effect this means that if cheetahs are susceptible to one infection then they will all be affected in the same way<sup>1</sup>. For example, the domestic cat has little problem throwing off the Feline Infectious Peritonitis Virus (FIPV) but when this hits any cheetah in captivity they invariably die and causes the very high mortality amongst cubs raised in captivity.

Why do cheetahs have such low genetic diversity? The simplest explanation is that at some point in their past, cheetahs had experienced a massive drop in numbers and passed through what is called “a genetic bottleneck” which resulted in massive inbreeding for several generations and the loss of genetic variation<sup>1</sup>. The best guess is that this happened 12,000 years ago at the end of the Pleistocene era, when the most recent ice age coincided with the loss of cheetahs from America and much of Europe.

This is an added burden for cheetah conservation – not only to zoos but also the maintenance of cheetahs in the wild. To increase the genetic variation the cheetahs must be in large free mixing populations with good movement between the populations. When there is any beneficial mutation this can be mixed through the population and selected for and genetic variation restored as long as there is no mating between closely related individuals. Now let us look at the



population status of the cheetah.

### Cheetah status

Fossil records indicate that the cheetah evolved from a common ancestor with the Puma (*Puma concolor*) some 5 million years ago in North America. Cheetahs were once distributed across North America and Europe where they preyed on animals like the Pronghorn. However, by the end of the last glacial period, the cheetah's distribution had shrunk, and they only remained in Africa and part of Asia. So, the issue facing the cheetah is

that it needs to increase its population size and ensure the populations are connected. Unfortunately, this is not happening – habitat destruction and in particular the conversion of African plains to agricultural land is fragmenting the habitat.

Cheetahs are one of the most wide-ranging carnivores, home ranges can exceed 3,000 km<sup>2</sup> (740,000 acres) such that densities are really low and seldom exceed two per hundred km<sup>2</sup> and can be 100 times lower at two per

10,000 km<sup>2</sup> (2,500,000 acres). Cheetahs are now restricted to just 9% of their previous range (Fig. 1) and resulted in highly fragmented populations<sup>2</sup>. Small populations with less than 100 individuals are highly vulnerable to a series of random damaging events, partly when they have low genetic diversity. Even if the normal threats are not large, a simple epidemic can wipe them out, a couple of bad years result in no recruitment even if the threats are not large, and if not connected to a larger population they often get wiped out.

Currently, the global cheetah population is just over 7,000 individuals, divided into 33 populations. 90% of these populations has less than 200 individuals and 6 populations less than 10 individuals.

In Africa, more than half are in Southern Africa with about 1000 individuals in East Africa. They occupy just 13% of their historical range and fragmented into 30 populations. In general, we don't know much about the trends of many of these isolated populations but amongst 18 populations, 14 are thought to be declining, 3 stable, and only 1 maybe increasing. More than 65% of cheetahs are not in protected areas but in areas where they face increased pressures from humans from the over hunting of the prey cheetah need, significant habitat loss and fragmentation from agriculture as well as illegal trafficking. The Asiatic cheetah, a subspecies (*Acinonyx jubatus venaticus*), has been lost from 98% of their historical range and survives only in Iran in just 3 populations. They are in a very vulnerable state and really face imminent extinction. This is a point being made by scientists<sup>2</sup> and since most animals do not live in protected areas, they face some serious threats that are very different to those that have been monitored inside protected areas. What is more, most cheetah populations are probably in serious decline and this is not being detected.

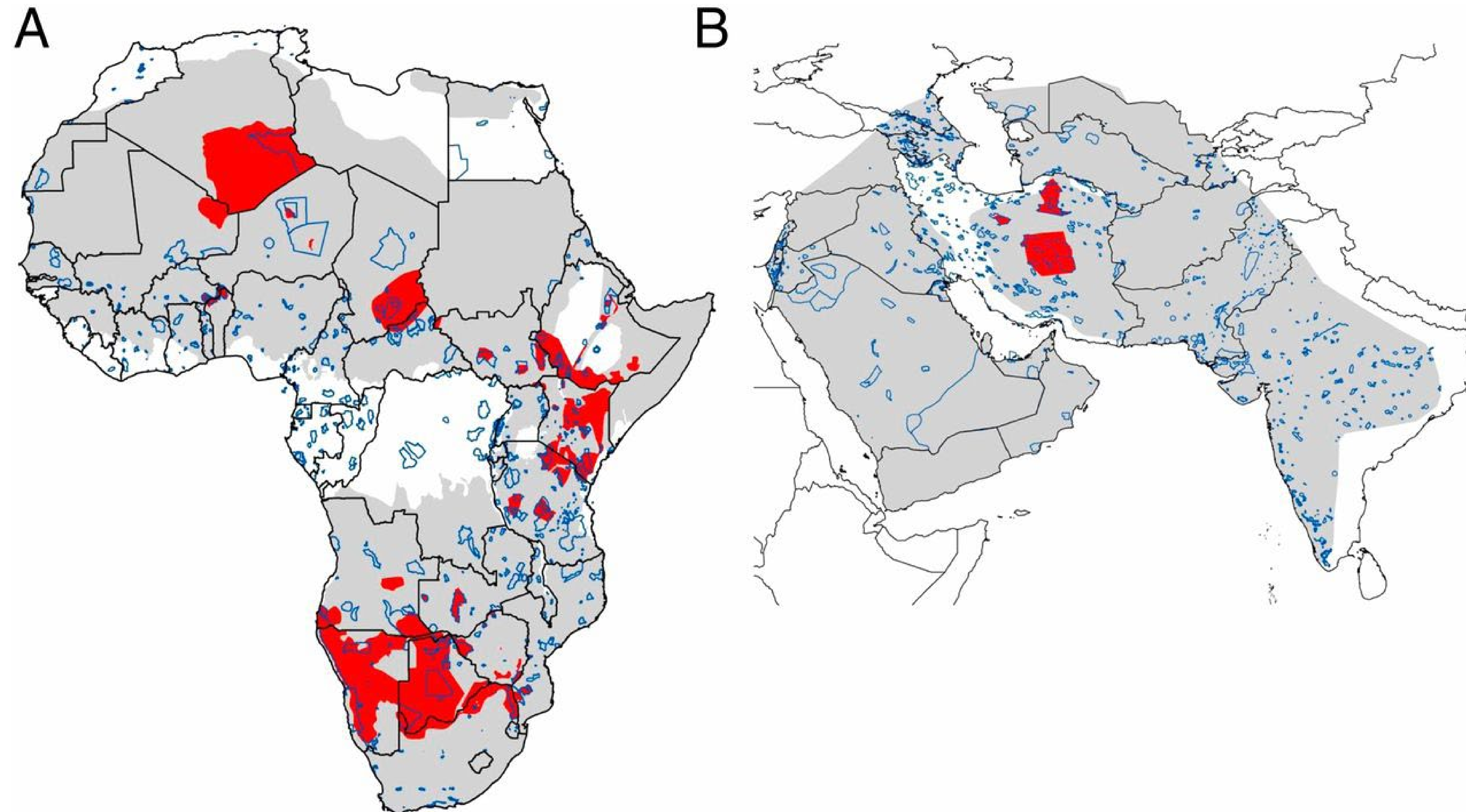


Figure 1: Distribution of cheetah in Africa and Asia. Gray shading denotes the historical range, and red shading shows the range where cheetah are known to be resident. Boundaries of protected area are marked in blue. After Durant et al. 2017<sup>2</sup>

### Cheetah conservation - Vulnerable or endangered?

At the current time, the cheetah is classified by the International Union for the Conservation of Nature (IUCN) as Vulnerable. This means it is facing





Photo by: Nisha Purushothaman  
Masai Mara, Kenya





Photo by: Amit Vasani  
Masai Mara, Kenya

by undertaking scenario modelling where they show very clearly that spatial variation in the threats of a species across its range dramatically increases extinction risk. This is particularly true when they live in small populations with insufficient young being produced for adult replacement. They go on to propose that, “in line with the precautionary approach and in the absence of alternative information, our analysis suggests that cheetah should be up-listed to endangered under IUCN Red List criterion A3b”.

There is also a more general note from this work, since they are proposing that we need a paradigm shift in conservation that moves away from a primary focus on protection toward a more inclusive framework that incorporates incentive-based approaches. Conservation in effect would need new policy, management, and financial tools that promote coexistence between people and wildlife outside and adjacent to protected areas. At the end of the day, in conservation, we need to secure sustainable solutions for wildlife and people, specifically in situations where threatened species share their habitat with vulnerable human communities. Without it - the future of wide-ranging and highly threatened species, such as the cheetah, are in jeopardy.

#### References

1. O'Brien, S.J. 2005, Tears of the Cheetah and other tales from the genetic frontier. St Martin's Griffin.
2. Durant, S.M. et al., 2017 The global decline of cheetah (*Acinonyx jubatus*) and what it means for conservation. PNAS 114 528-533

challenges to its population such as habitat loss and fragmentation and is likely to become endangered unless these threats change soon. Is this the right classification given that the threats facing cheetahs are really to the population

outside protected areas? In reality it would seem that the Cheetah should be reclassified as Endangered since it appears to be facing a very high risk of extinction in the near future. This is the second most severe conservation

status that requires immediate action after the critically endangered species.

In a recent paper<sup>2</sup>, Sarah Durant and her team from the Institute of Zoology in London examine this specific question









Photo by: Todd Gustafson  
Nduu, Ngorongoro Conservation, Tanzania





Photo by: Peter Hudson  
Ndotu, Ngorongoro Conservation, Tanzania





Photo by: Nagarajan P  
Masai Mara, Kenya

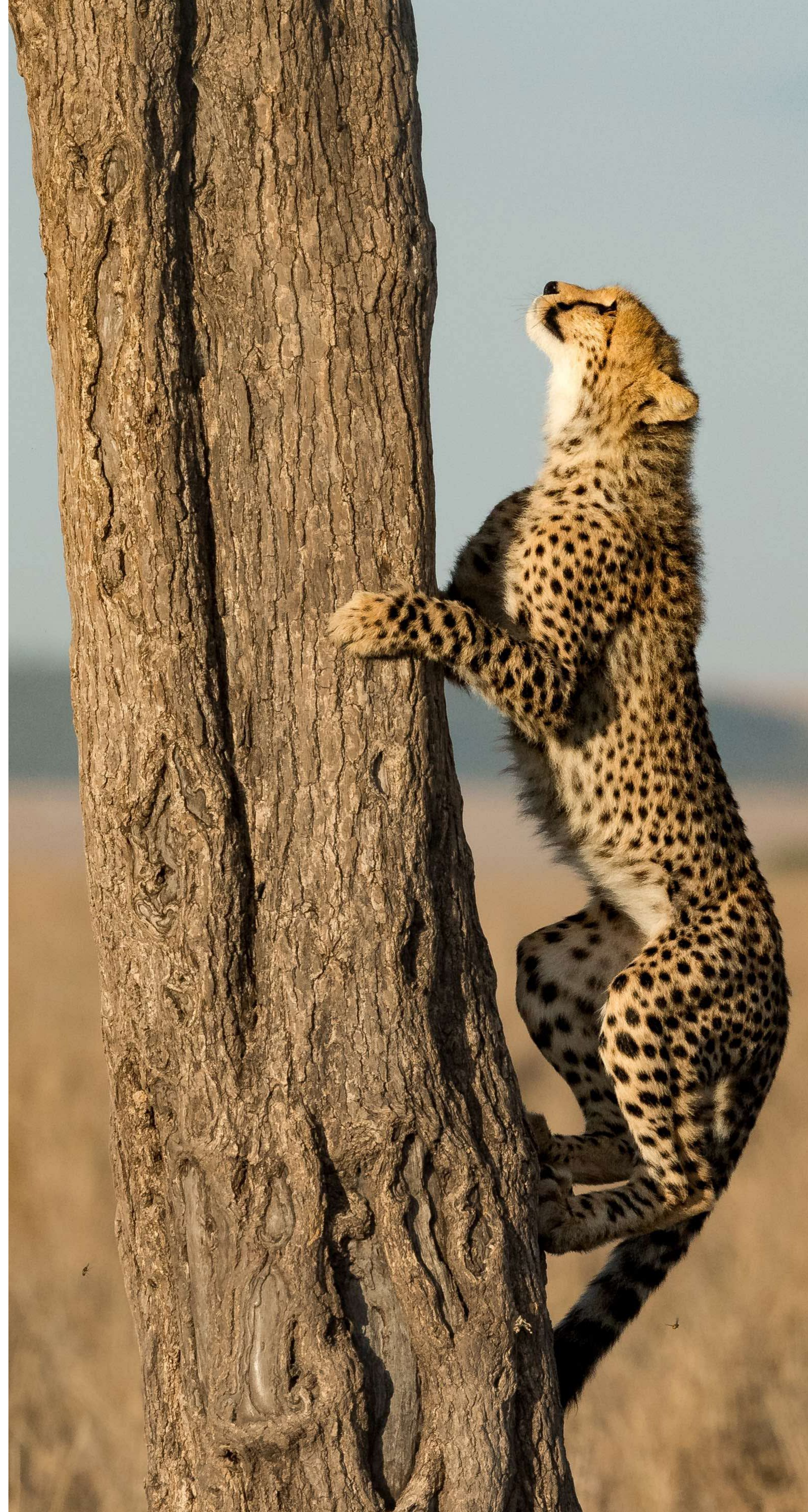


Photo by: Athira Mohan Krishnan  
Masai Mara, Kenya



Photo by: Jyoti Sahu  
Masai Mara, Kenya





Photo by: Shyam Menon  
Masai Mara, Kenya









Photo by: Renny Poullose  
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