

# Oryx

## Counting spots: estimating density and survival rates of leopards in Zambia

By Milan Vinks, 14th December 2021

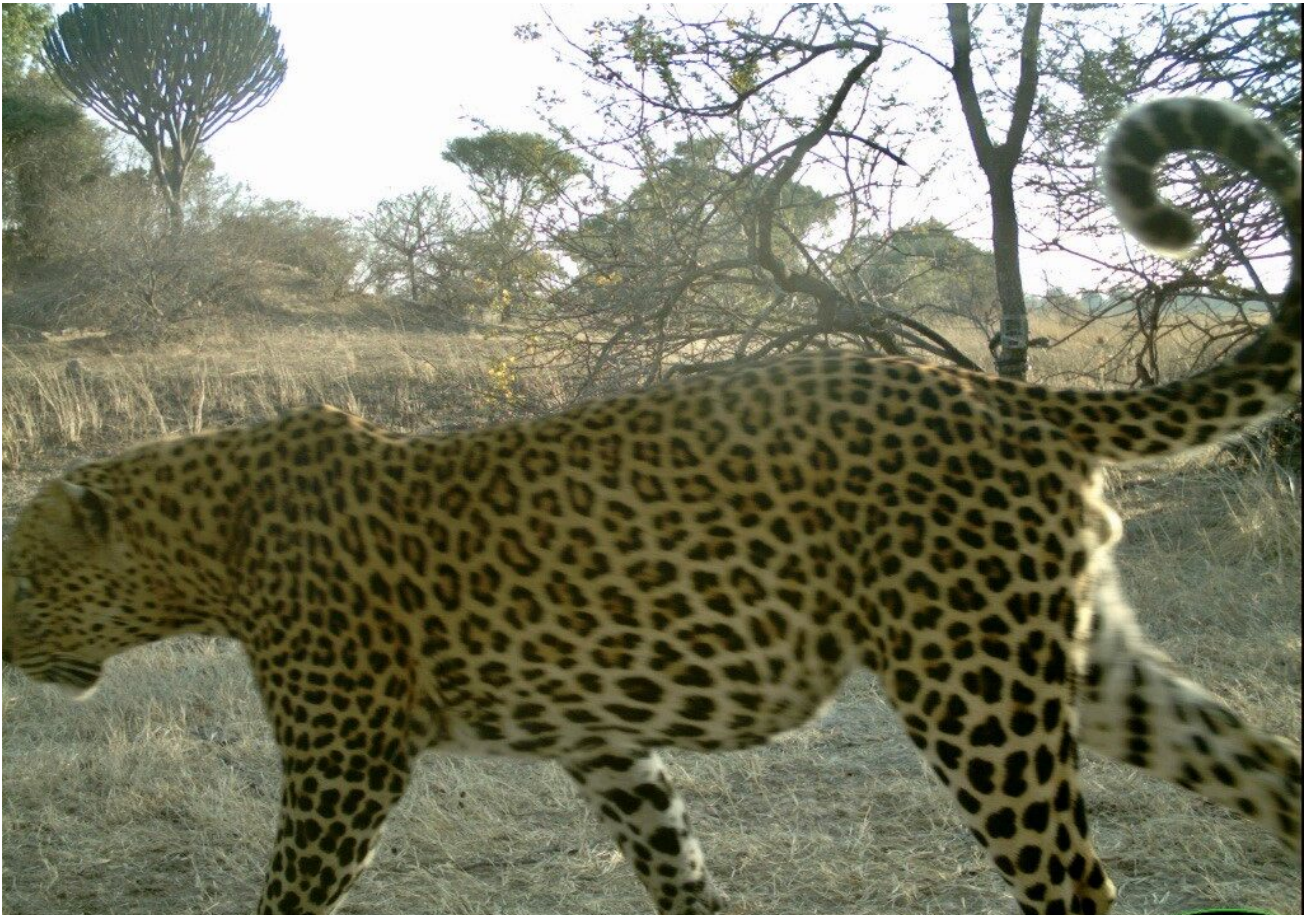
Western Zambia's Greater Kafue Ecosystem, an extraordinary wilderness complex comprising Kafue National Park and surrounding Game Management Areas, is one of Africa's largest protected area networks and is home to an incredible variety of wild flora and fauna. Unfortunately, poaching and encroachment pose a serious threat to the ecological integrity and economic value of this ecosystem. Long-term poaching activity has led to severe declines in the abundance of many species in the diverse ungulate community, depleting the prey base for Kafue's large carnivores, such as leopards.



A young male leopard beginning an evening hunt along a remote road in the heart of Kafue National Park. Photo: Milan Vinks

The leopard is one of the most adaptable felids. However, this charismatic species faces many anthropogenic threats, including habitat loss and fragmentation, prey depletion, negative interactions with people, unsustainable trophy hunting, poaching for body parts, and indiscriminate killing. As a result, the leopard is declining across its extensive range. The effects of specific human pressures such as prey depletion are still poorly known, and baseline information on population status and trends is lacking across a large portion of the leopard's range.

Historical data has helped identify Kafue as a potential stronghold for the leopard, although previously little was known about the status of leopards in this ecosystem. Our team focused on estimating density and survival rates of leopards in the northern portion of Kafue National Park.



The left side of a previously identified male leopard captured on one of the study's camera traps. Photo: Zambian Carnivore Programme

Because leopards are solitary and elusive they can be a challenging species to study. Fortunately, individual leopards are identifiable from their unique markings, facilitating monitoring of known individuals using camera traps. Between 2013 and 2019, the Zambian Carnivore Programme team, in collaboration with the Zambia Department of National Parks and Wildlife, deployed camera traps in the northern portion of Kafue National Park to photo-capture individual leopards, and used these images and established modelling frameworks to estimate annual abundance and survival.



Left: The right side of a previously identified female leopard captured on one of the study's camera traps. Right: The left side of a previously identified female leopard captured on one of the study's camera traps. Photo: Zambian Carnivore Programme

Given the previously demonstrated depletion of Kafue's large carnivore prey base, we predicted leopard density and survival to be lower than that of leopard populations in systems with relatively more protection. Contrary to our predictions, our results indicated that estimated density and survival of leopards in this part of the Park were generally good. We suspect this may be because smaller prey preferred by leopards (such as puku and impala) have been relatively less impacted by long-term poaching in this part of the Park than larger prey preferred by lions (such as hartebeest and buffalo). As a consequence, leopards may be benefitting from both pockets of relatively abundant preferred smaller prey and a reduction in the density of dominant competitors (lions) in response to the loss of larger prey.



Zambian Carnivore Programme Intern Frazer Zulu deploying a camera trap in the field. Photo: Thandiwe Mweetwa

Our study site was located in a part of the Kafue that receives higher levels of protection relative to other portions of the ecosystem. For that reason, we nevertheless expect average leopard density across the entire Kafue Ecosystem to be lower than in our study area and to reflect overall lower abundance of the leopard's preferred prey. This highlights the value of directly examining leopard density and survival in areas of the protected area network where encroachment and poaching are more severe.

Estimates of population size for leopards in Miombo woodland (such as the Greater Kafue Ecosystem) are rare, especially where ungulate prey is also depleted. For this reason, our density and survival estimates are highly valuable for the conservation and management of leopards in this ecosystem as well as for other Miombo woodland ecosystems facing poaching and encroachment challenges.

Prey depletion has generally been expected to reduce the overall density of all large carnivore species within an ecosystem. However, our findings highlight that the effects of prey depletion can be more complex than a uniform decline of all large carnivore species, and we hope that this research will inspire further investigation into this topic.

The article [Leopard \*Panthera pardus\* density and survival in an ecosystem with depressed abundance of prey and dominant competitors](#) is available in *Oryx—The International Journal of Conservation*.



## Milan Vinks

Milan was a long time member of the Zambian Carnivore Programme team and focused on the effects of illegal offtake on large carnivores and their prey for his graduate work. He is currently a member of Montana Fish, Wildlife & Parks' Northern Continental Divide Ecosystem Grizzly Bear Trend Monitoring team, Montana, USA, and still collaborates with colleagues in Zambia. Milan's research interests include population ecology, spatial ecology, predator-prey dynamics, and anthropogenic impacts on species of concern.