

Land use changes in the African savanna have eroded the cheetah's habitat and affected its food chain. But there are signs that it is adapting. Lena Godsall Bottriell reports on the evolution of a species

There is a big cat like no other in zoological history. Instead of having spots where it should have spots, it has embossed, unbroken stripes running the length of its spine. Over its flanks, legs and chest are blotches like irregularly-shaped ink blots, also raised above the base fur. This cat has a striped and ringed tail—not spotted—a longer mane and distinctive fur.

Over the last 100 years, some 60 specimens of cheetah have been recorded. All with the same pattern configuration, never an in-between and only in Africa: *Nsulfisi*—the leopard-hyaena legend of the Manica tribe of eastern Zimbabwe and Mozambique—emerged from obscurity in the 1920s as the striped cheetah of Africa. Recog-▶

Knocking spots off the cheetah

◀ nised by science and given a new name, the king cheetah had arrived.

Apart from a flurry of excitement around the time of its official discovery in 1927, when it was named a new species—a decision that was later revoked—the king cheetah has been a victim of common confusion between cheetah and leopard. In the 1930s, it was put in a new genus by taxonomist Miklos Kretzoi who considered it a possible geographic race—one which evolves in a particular area—developing in parallel with the spotted form. But as William Blake's famous dictum goes, 'science is blind to inconvenient evidence', and to many conventional zoologists the king cheetah is just that—an inconvenient cat.

But 60 is a staggering number for any mutation with such an intricate pattern and uniformity of appearance. If it is a throwback—rather than a recent geographic or environmental adaptation—one would expect to find evidence of it. Yet, *nsuifisi* aside, records of striped cheetah can't be traced beyond 1870.

Considered to be the first 'big cat' to have evolved, some five to six million years ago, the species we know today, the modern cheetah, has been cosmetically divided in two. As recently as 1900, the African and Asiatic cheetah still roamed from India across the Russian steppes through western Asia to Africa and down to the Cape. But in less than

100 years, its habitat has been eroded to a fraction of that range.

Its demise in India, as recently as this century, was the combined result of hunting, adult cheetah being taken from the wild for use in the chase, reductions in habitat and prey base due to human expansion and even viruses passed on by domestic pets brought in by Europeans.

Yet when left to their niche, cheetah do rather well. Remnants of Asiatic cheetah populations still survive today in Iran's cold desert regions. These cheetah have longer fur and neck ruffles, so thick that the fur hangs in matted, rastafarian-style ringlets—and the cheetah moult annually as a result. It is a matter of debate among zoologists as to whether this is the cheetah adapting to its colder climate or whether the Asiatic cheetah has genetically diverged from the African cheetah into a different race.

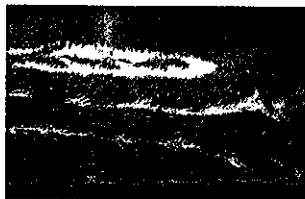
However, in Africa too, the cheetah has been forced to adapt. The fastest animal on Earth, it has evolved to a genetic optimum; there's probably never been a requirement for anything better. Only recently,

however, has it been found wanting, a direct result of human-induced habitat loss. During the mass purges of the 1950s and 1960s, tens of thousands of the cheetah's prey animals from Kenya to South Africa were shot by government hunters. They held the misguided belief that they would eradicate tsetse fly and halt the spread of rinderpest and foot and mouth—until then, nature's control against cattle, sheep and goat numbers. This marked the real demise of Africa's wildlife; one ranch in the 1960s was supplying 100 zebra skins a day to local tanners.

This tragedy was followed by intensive aerial spraying with highly toxic chemicals which affected bird, fish, insect, reptile and animal populations. Most recently, poor management in many of the remaining game areas has resulted in excess culling. The prey base has never recovered to the levels Africa enjoyed prior to 1945; in addition, natural diversity has inevitably suffered. The only respite has been in the more wooded areas not considered suitable for large-scale cattle farming.

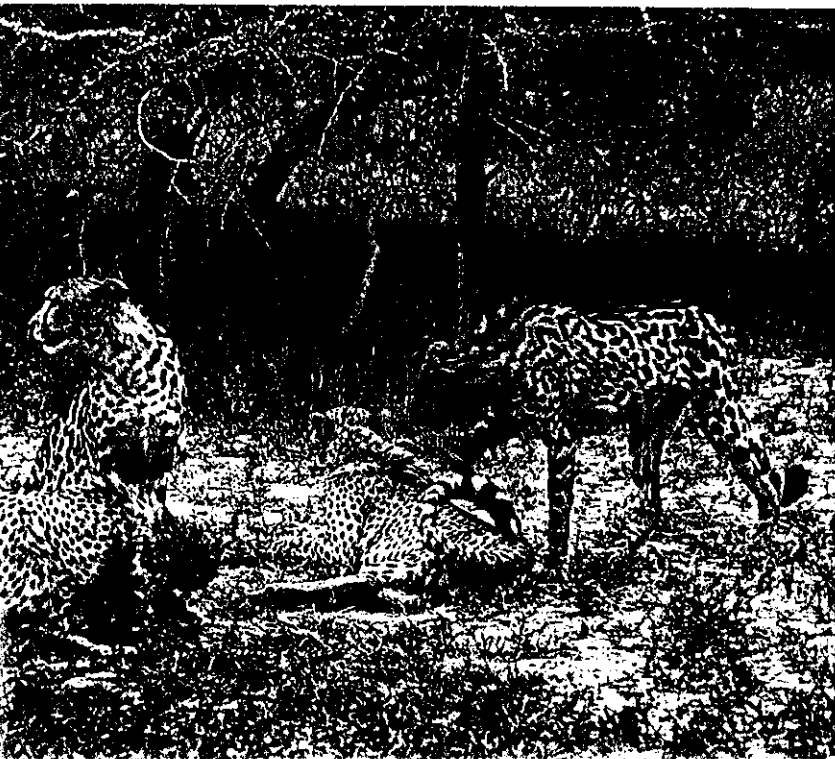
Natural selection

It is to these woodlands that the cheetah, an inhabitant of open grasslands, has been driven. But it has had to adapt, and this could be what we're witnessing in king cheetah—a cat which has evolved a pattern coloration better suited to scrubland or woodland in order to improve its chances of survival. Something had to change,



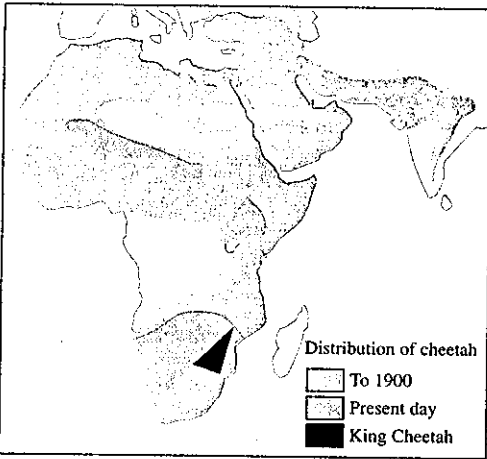
The king cheetah's stripes are raised above its fur—providing vital camouflage

Below: king cheetah thrive alongside endangered spotted cheetah at Malamala reserve, southern Africa



and why not the pattern? Human logic would say that numbers are best protected by increasing the reproduction rate. But imagine the ecological catastrophe that would create. There would be thousands of highly successful hunters running riot in the grasslands, cutting a swathe through the prey base at a rate the biomass might find hard to cope with.

Significantly, as cheetah decline in the wild, more king cheetah are being sighted in the wild. Recent sightings of kings have been made in a belt of scrubland country stretching from Mozambique across Kruger Park into the reserves of eastern Transvaal. To date, king cheetah have only been recorded south of the Zambezi in a triangle of country sweeping down eastern Zimbabwe and the edges of Mozambique, over the Limpopo river into Northern Transvaal, and across into northeast Botswana. Bounded by the Zambezi, a formidable geographic barrier which has always



The cheetah's habitat is now only a fraction of what it was in 1900

prevented the migration of cheetah north or south of it, it's a vast area connected by geography, vegetation, climate and soil. All of which adds weight to the argument that Africa's striped cheetah is an environmental adaptation evolving in response to human-induced pressures.

In 1992, for the first time, king cheetah have turned up outside this area—a poached skin in Burkina Faso, far away from Southern Africa. This means either that striped cheetah are developing where cheetah are rare anyway, or that the skin has travelled north via an illegal trade route. Plans are afoot to DNA fingerprint the tissue obtained from the skin to help confirm its origin. Further analysis, involving comparisons between East, West and Southern African cheetah, kings and Iran's cheetah, may produce a clearer picture of differences between



The artist's record



As hunting companions to people of rank and privilege—from Africa to Europe and across Asia—cheetah have enjoyed an excellent relationship with art since early Sumerian and Egyptian dynastic times. Held in the highest esteem by powerful masters, they have been portrayed across a range of backdrops from ancient shrines to 20th Century paintings. Art has provided a 5,000 year old documentary record of what the cheetah has looked like through recorded history. Given this long artistic and historical love affair, it's not unreasonable to expect an animal as singular looking as the king cheetah to be recorded for posterity. Yet like the written records, art's archives depict cheetah consistently as spotted, just as its hindi name 'spotted one' suggests. Of striped cheetahs, there is nothing. Paul Bosman's stunning portrait of a king cheetah (above) is the first of several works that have only appeared since its existence has been confirmed.

the zoogeographic groups and determine whether the division between Asiatic and African cheetahs is tenable.

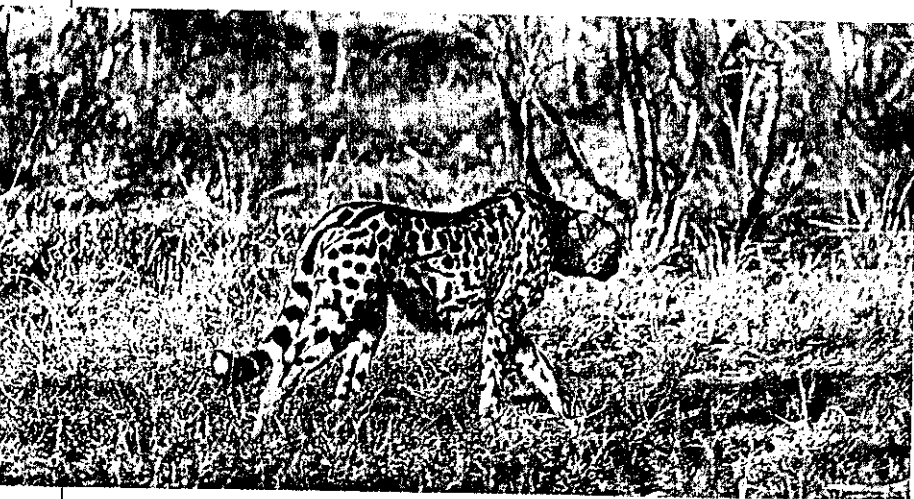
Going undercover

The king cheetah is an excellent example of disruptive camouflage. Another example is the giraffe, which their size, are one of the least conspicuous animals in the wild. Like tiger, their patterns enable them to merge with their surroundings. This 'dismembering colouration', which stripes and blotches carry off so well, destroys the impression of a solid form. In the case of king cheetah it may serve two purposes: defensive and offensive camouflage. Offering infinite flexibility, an animal doesn't have to keep to a particular environment, and its range expands as a result.

Is the king cheetah pattern nature's answer for a big cat: designed for the chase yet increasingly forced into scrubland and woodland where camouflage not speed becomes all important? Blotches on its flanks would offer straightforward camouflage in such an environment, allowing it to get that bit closer to its prey before launching a final running attack—vital in woodland where, for a sprinter, injury during the chase increases tenfold.

But, in the process, the leopard will become its rival, and just as tiger won't suffer competition from leopard, the latter will kill and even eat cheetah. This is where the stripes would be invaluable. As a leopard peers down from a vantage point in a tree, those spinal stripes would break up the king's shape, perhaps even giving the appearance of branches blocking the way. ▶

Top: in woodland, camouflage becomes more important than speed. The king cheetah's markings destroy the impression of a solid form



Above: in the Kruger national park, king cheetah have adapted to live in scrubland—their patterning blending in with the surroundings. Right: a comparison of cheetah and king cheetah skins show the distinct differences between the two

◀ The leopard would delay attack momentarily—just enough time for the king to be too far away for a clean strike. This is disruptive camouflage at work—the same camouflage that works for tiger in its jungle environment, zebra in grassland, leopard in the dappled cover its patterning mimics or serval, the dainty African cat whose shoulder barring echoes the spiked tops of the tamboukie grass in the habitat it favours.

A doomed species

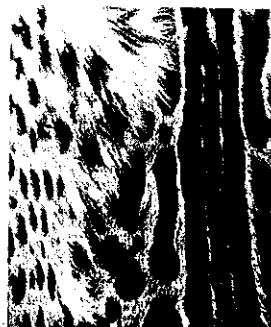
The cheetah has balanced the scales of evolution for thousands of years. A unique chaser, it has never produced variants in significant number. To those with field knowledge of the cheetah, the findings from analysis of captive-bred specimens—which revealed low levels of genetic variation, and low levels of male fertility—came as no surprise. The cheetah is, after all, the most specialised of the big cats; a highly evolved, successful hunter with a kill rate in the savanna that betters even the lion. Having evolved to a genetic optimum, it arguably doesn't need to change. Which is why the intricate pattern change of king cheetah, in a species that is considered to be one of the most genetically uniform species to have evolved, has caused such an uproar.

The king cheetah's occurrence is unprecedented—it's a zoological phenomenon. Yet conventional zoology still opts for a simple explanation. Some suggest that the genetic action responsible is comparable to what, in the domestic cat, produces the change from 'wild type' striped tabby to blotched tabby. Put simply, the complex king cheetah pattern—which includes changes in mane and fur length, tail markings and stripes as well as blotches—is due to a single genetic difference. Questions of why such dramatic change isn't occurring in other spotted cats—

likely, given their higher levels of genetic variation—are cast aside. It's an uncomfortable hypothesis based on lineage data of captive-bred cats, and not any genetic analysis programme. The analysis that revealed a lack of genetic variation and low fertility in captive-bred cheetah led a number of zoologists to hypothesise. They believe that at some stage in the distant past, following an ecological upheaval, the cheetah went through a population bottleneck, leading to inbreeding and, as a result, genetic uniformity, increased sperm abnormalities and low fertility, and a prevalence to disease and high cub mortality. But something doesn't fit. In accepting this theory of the cheetah as a 'doomed species'—which is what it amounts to—how has it managed to survive? With a medical chart like this, it should have been extinct thousands of years ago.

Captive breeding

Because genetic differences have yet to be established, some breeders have randomly mixed cheetah from the zoogeographic groups, arguing they are adding to genetic diversity. While this has some merit, there are currently so many captive-bred cheetah in the world there's nowhere for them to go. Little of the remaining



wild habitat is unthreatened by human activity, and zoos already have enough cheetah. National parks and reserves have become isolated from each other, in many cases fenced off, compounding the problem of restrictions on game movement. There

are breeding programmes—like Pretoria's De Wildt which produced the first king cheetah to be born in captivity—that have been so successful, many claim the cheetah is no longer in danger of extinction. It's a telling comment on human inability to balance logic with geographic reality. The irony is that while cheetah have been bred to saturation point in captivity—the ethos behind the whole breeding drive being to release the animals into the wild—spotted cheetah numbers have dropped even lower in the wild. Meanwhile king cheetah, driven by some geographic imperative, have increased in the wild. Perhaps this is the stuff that new races are made of. □

Lena Godsall Bottrill and her research partner Paul Bottrill have spent years looking for evidence of king cheetah in the wild. They are currently giving a UK lecture tour on their research and fieldwork to date.

Below: so far, king cheetah have only been found in a triangle south of the Zambezi river in southern Africa

