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Abstract: A hi-fi sound system playing recorded lion and hyena's calls was used to learn how cheetah mothers contend with the threat of predators. Results showed that there is a positive relationship between the strength of the female's reaction and the success in the rearing of her cubs and that this relationship was more evident in aged mothers.

With a roar and a whimper

Sarah Durant

Cheetahs are predators - but they have predators, too. What factors decide which one of every 20 cheetah cubs will survive to adulthood? Dr Sarah Durant used a sound system on the Serengeti plains to find out.

My alarm went off at 5.45am. Time to get going. At dawn, Audrey the cheetah and her two cubs would be on the move and difficult to find. Having located and followed Audrey until dusk the previous evening, I now planned to play the sound of a lion roar to her. It would be a key to learning about how cheetahs survive.

is that because of the pervasive effects of human expansion all around the globe, their numbers are in decline. A worldwide survey in the mid-seventies put their numbers at only 14,000. Cheetahs are a threatened species.

Although historically they were widespread, covering most of Africa and Asia, cheetahs have declined because of human persecution and habitat destruction. Their densities are naturally so low - only around one per 100 square kilometres (40 square miles) - that only the largest protected areas can support viable populations.

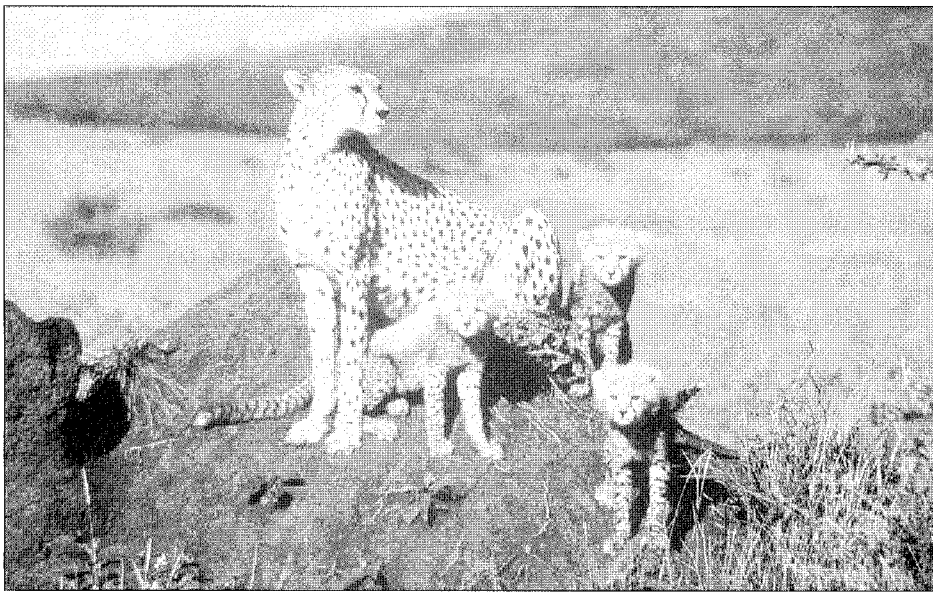
generations, and have taught us much of what we know about cheetahs in the wild.

A cheetah mother typically gives birth to three or four cubs, in a grassy lair in a clump of thick vegetation. For the first two months of their lives the cubs are kept in this lair by their mother; they are immobile and defenceless, and particularly vulnerable. In the late eighties, a study by Dr Karen Laurenson showed that more than 70 per cent of cubs die in the lair - and nearly two-thirds of those deaths are from predators. When killers were seen, which was rare, they were nearly always lions; as these weigh four times more than a cheetah mother, she is defenceless against them.

Even after they leave the den, cheetah cubs may be killed by predators such as lions and hyenas; overall, only 1 in every 20 cubs born survive the 14 months to adolescence. They become independent of their mother at 18 months, but don't produce their first cubs until they are at least two years old.

Over the past four years I've been using a hi-fi sound system to play recorded lion and hyena calls, to learn more about how cheetah mothers contend with the threat of predators. It's powered by the battery of my Land Rover and includes a digital audio-tape (DAT) recorder, a 200-watt amplifier (essential for playing the roars of lions, which peak at 116 decibels) and a studio monitor speaker. The speaker and DAT player ensure accurate representation.

Long-term projects such as this one are invaluable, since most of the female cheetahs participating in the playbacks were first seen as cubs. So I knew their age and also how many cubs each had reared. The oldest female in the study, a cheetah I called Moshi, was a remarkable 14 years old; in captivity cheetahs live longer; sometimes up to 20 years. I used this information to examine whether reactions to lion roars could be related



I rolled over, grabbed my Thermos for a cup of luke warm tea, and crawled out of my sleeping bag into the chilly air of my roof tent.

Quickly I dumped my night things on the bonnet of the Land Rover, dismantled the tent and then, from the back of the car, hauled out a 100 metre reel cable which I placed on a specially designed pole welded to the side of the roof rack. I started off just as the sun began to climb over the horizon, casting its red glow over the vast plains of the Serengeti.

Of all the large cats, cheetahs are perhaps the most elegant. As children, we learn that they are the fastest land mammals:- capable of sprints of up to 110kph (70mph). What we don't learn

The Serengeti National Park in Tanzania, with 13,500 square kilometres of protected land, surrounded by almost the same area of game reserves, is one such.

Finding the causes of low density has been the objective of my research in the Serengeti over the last six years. For more than 20 years, the cheetahs living on the Serengeti plains have been the focus of the only long-term study of these animals in the wild. Year-round, researchers on the project locate and photograph cheetahs, identifying individuals by their unique patterns of spots, and noting and photographing new cubs. These records have enabled us to build many complete maternal family trees, stretching back as far as six



to the mothers' success at rearing cubs. What I found was surprising and showed the important part other predators play in shaping cheetahs' behaviour and movement patterns.

Cheetah mothers of any age had a relatively small reaction to recorded hyena calls, suggesting that those animals are not a great threat, but with lion calls, it was a different story. Some mothers would move with their cubs up to 500 metres away within half an hour of hearing a recorded roar.

Interestingly, those cheetahs who showed the strongest reaction to lion playbacks were those who had reared the most cubs. However, age was also important. A young mother would react less strongly, and her reaction was unrelated to how successful she was at rearing cubs. By contrast, the reaction of an older mother was directly related to her success in cub-rearing.

The explanation is simple. Young mothers, inexperienced in rearing cubs, show little variation between their response to lions; any initial success they have is largely due to chance. However, as they get older, mothers either learn to avoid lions, and are consistently successful at rearing cubs; or they never learn - and never become very successful. This meant that the most successful

cheetahs were least often found close to lions.

This work shows that when moving or reintroducing cheetahs, avoiding other predators is important. Not responding to potential predators and being unable to recognise dangerous situations, is a common cause of mortality when animals raised in captivity are released into the wild. Reintroduced cheetahs are just as vulnerable. If they are to be released into areas with lions, they need first to be taught to avoid them.

Our research on the southern Serengeti plains raises doubts about the common assumption that

cheetahs are creatures of the open plains. There, their cubs suffer enormous mortality and mothers must be constantly vigilant against predators, which can readily find small cubs. But in more wooded habitats, cheetahs can hide easily in thick bush and may be missed, even by a lion wandering close by. Cheetahs may do a lot better in wooded areas.

To test this theory the project is now expanding to look at cheetahs in woodland areas, which cover most of the Serengeti. Some cheetahs, fitted with radio collars, will be closely monitored to assess their cubs' survival, so we can discover whether cubs have higher survival in this habitat and, if so, why. This will enable us to determine the best areas for cheetah conservation - and mark another step towards understanding the factors that limit the numbers of these rare, beautiful creatures.

Dr Sarah Durant will be giving an illustrated talk on 30th April, see back page for details. Dr Durant is a research fellow at the Institute of Zoology, Zoological Society of London. Her work is funded by the Zoological Society of London, the People's Trust for Endangered Species, the Royal Society, the US National Geographic Society and Frankfurt Zoological Society. The work is supported by Tanzanian National Parks.

