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Abstract: The authors describe their research on cheetahs during 3 years. The research depended in part upon their ability to recognize individual animals, which they identified by photographing every cheetah they saw and then comparing their spot patterns. They have now information on four generations in one cheetah family line and three generations in several others. Some research results and stories about cheetah families are given in the article.

Stalking the spotted cat

"OUR THREE YEARS WITH CHEETAHS"

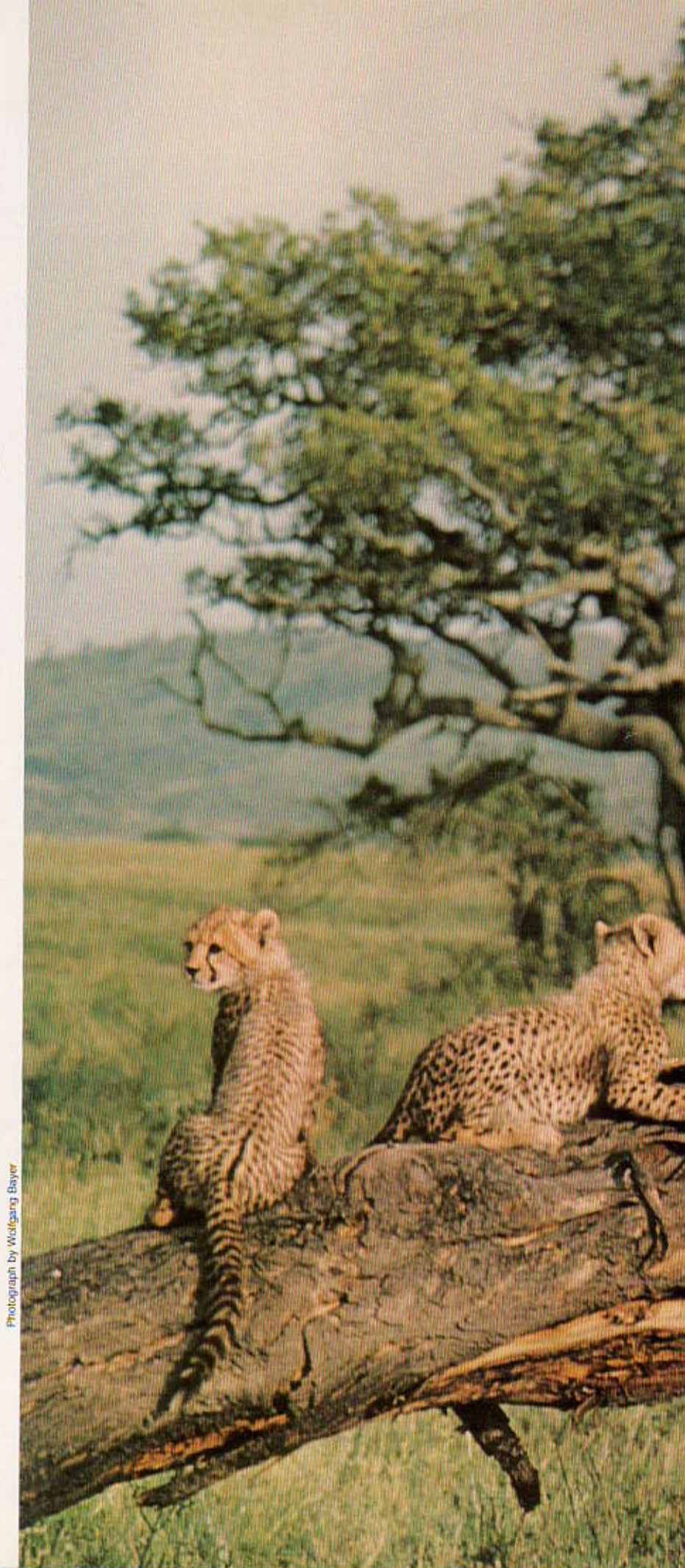
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AS we looked on through our binoculars across the glare and shimmer of midmorning heat, a herd of tiny Thomsons gazelles grazed calmly in the distance. There was no visible sign of danger. But suddenly, as though on signal, the tommies exploded in a widening fan. They fled in unison, their black side stripes flashing up and down with every bound. Then they looked back and, for the first time, we saw the reason for their alarm: a single cheetah just giving up the short chase.

The cheetah sat awhile, then headed toward another promising area, detouring to avoid a second cheetah and five cubs in a patch of grass. Such evasiveness was only to be expected, as cheetahs tend to be loners.

The predator's new course led close to our car but the animal ignored us, for this was one of the tourist-wise cats of Tanzania's Serengeti National Park. We studied the pattern of spots on the face and chest and on the insides of the legs. Quickly, we identified Female No. 22, or Malaika, one of the 155 cheetahs we have learned to recognize. She was lactating, which meant she must have a new litter of cubs hidden nearby. If we

Jade and her cubs are under surveillance frequently as the authors gather obscure details on their lives. Able to identify 155 individual cheetahs in Tanzania's Serengeti National Park, the scientists hope to learn enough about the cats to help them survive.



Photograph by Wolfgang Bayer



could follow at a respectful distance after her hunt, perhaps she would lead us to her lair.

Malaika crossed a quiet area, then topped a rise — and stopped dead at the sight of a dozen tommy's grazing in the distance. We'd seen the same scenario unfold many times before, but it never failed to thrill us. First would come the nerve-jangling, start-and-stop approach that, more than a half hour later, would bring the stalking cat to within 50 or 60 yards of her prey. Then, Malaika would leap forward in a burst of incredible speed so exhausting that she would get only one brief try.

THIS time Malaika did not fail. She zeroed in on one adolescent female tommy, chasing her for about 220 yards, losing ground on the turns but gaining on the straightaways. With a forepaw, Malaika bowled the gazelle over and then went for the throat with a suffocating bite. She dragged her limp prey to the concealment of a tall clump of grass where, after a few minutes' rest and panting, she proceeded to gorge herself. In about an hour, all that remained of the tommy were its entrails, some skin and most of the skeleton. Malaika washed her face with a paw, apparently in no hurry to return to those cubs we wanted so much to see.

But if our studies of cheetah behavior have taught us anything, it is to wait — wait, watch and record in minute detail everything we see as we roam our carefully designated area in the park. Keeping an eye on the nomadic cats, we follow them with our safari-rigged vehicle across their ever-shifting hunting grounds. We spy on them as they mate, hunt and care for their young. We have seen events in the cheetah's life that few have ever witnessed before in the Serengeti — and that none would ever see again in India and other parts of the species' rapidly deteriorating range.

It is all part of our work at the Serengeti Research Institute, a wildlife group formed in 1966 by a number of worldwide conservation organizations. Its purpose is to study what remains of the fabled East African wildlife and to advise park authorities how to conserve it.

Through our careful observations, we hope to develop clues as to how the cheetah might, in the Serengeti at least, be saved from the sad fate it has



suffered elsewhere. As we fill our hour-by-hour logbooks of cheetah behavior, perhaps patterns will emerge pointing to new ways in which man can manage the park to contain the wide-ranging cat's movements, while regulating tourism and other disruptive human activity. The ultimate objective is to give the cheetah the best possible chance of surviving, cub to adult, in balance with its habitat, prey species and such competitive predators as lions and spotted hyenas. That balance is especially delicate in the case of the cheetah, for it is the least adaptable of the Serengeti's large meat-eaters.

Our research depends in part upon our ability to recognize individual animals, which we identify by photographing every cheetah we see and then comparing their spot patterns.

From our own observations and the work of previous researchers at the Institute, we now have information on four generations in one cheetah family line and three generations in several others.

Because No. 22, Malaika, had seen many tourists in the Serengeti Park, she had little regard for human visitors like ourselves. Yet she behaved naturally enough to give us some firsthand insights into the behavior of her kind. Now that she had a new litter, she would be especially valuable to us, as we might not again get a chance to observe cubs as young as hers promised to be.

Scientists though we are, we marveled at Malaika's beauty as we waited. We reflected on how short-sighted man is to greedily destroy wildlife and its habitat. On the other



Photographs by George and Lory Herbison Frame

Close-up research

The studied studies the studier as a cheetah tries to stare down George Frame through a windshield. Frame, who perfected his research techniques on black bears and polar bears in North America, now specializes in the spotted cats. Lory Herbison Frame, shown with a tame cheetah about to be released into the wild, has studied African birdlife and is currently concentrating on wild hunting dogs. The husband-and-wife team has completed three years of a five year cheetah-dog research project. They have equipped their car to enable them to follow subjects day and night, for up to ten days at a time. One maintains watch on the study animal while the other sleeps, eats and transcribes a continual flow of data.



hand, numerous African nations have in recent years established national parks, many of which contain excellent cheetah habitat. It would be ideal if cheetahs could be preserved within these parks. But because cheetahs tend to follow gazelles far and wide to where the forage is best, few parks are big enough to encompass their movements.

We were jolted back to reality when Malaika began walking again. Normally she was so tame that she sometimes would climb on top of our car to examine her reflection in the windshield and fender mirrors, or to look for distant prey. But now that she was a mother with tiny dependent cubs, she demonstrated an uncharacteristic aloofness.

Nearly two hours passed before Malaika entered the dense vegetation

of a drainage line. When she disappeared into a depression under an eroded bank, we approached slowly and quietly until she was once again in sight.

For awhile, Malaika carefully looked around her, but we could see no cubs. Then, satisfied that all was safe, she uttered several throaty staccato purrs. These were answered by barely audible chirps, as three small blackish cubs climbed clumsily through the dense grass. Their eyes were open but they were still unsteady on their feet, which put them at three weeks old or slightly less. The tiny puffballs tottered and looked up into their mother's face in a searching way. Malaika lowered her head to lick them, then moved to the shade of a small tree and lay down. Her cubs snuggled beside her. For us,

this marked the start of a long vigil.

Every day or two, Malaika moved her tiny cubs to a new hiding place, but all these lairs were within an area less than a half square mile. Because prey was relatively abundant, Malaika used a hunting area of only four square miles. By the time she took her cubs to their first kill at about five weeks of age, they would have occupied 15 to 20 different lairs. As the cubs grew larger, Malaika would gradually take them farther and farther over her yearly range of about 400 square miles, and at times they would be outside the relative safety of the park.

We had to accept the fact that the odds were against the cubs' survival. At least two of them probably would die, for our statistics place cheetah cub mortality in the Serengeti at

Three hunters on the Serengeti

Lisa

After a 50-yard chase, Lisa gorges on a gazelle fawn. Because the short grass in the Serengeti attracts gazelles while taller vegetation provides cover for the cats to stalk prey, cheetah densities here are high. Like some other cheetahs in the Frames' study group, Lisa is radio collared for easier tracking.



Photographs by George and Lory Herbison Frame

about 70 percent. Most of the deaths occur during the first three months, when the tiny young are easily preyed upon by spotted hyenas, leopards, lions and possibly birds of prey. And if the grass dries and the gazelles and wildebeest migrate, the young cheetahs are likely to face starvation when their mother's hunting trips become too long.

Even if hyenas or lions do not kill the unguarded cubs, or if a sudden rainstorm does not inundate their hiding place, there is still the fatal possibility that their mother might not return. On the other hand, those of Malaika's cubs that did survive their first three months would be almost sure to live until they were at least 14 to 18 months old — at which time their mother would desert them.

Malaika, her months of careful feeding, tending and teaching over, would not take much time to enjoy her newfound independence. She might conceive a new litter only days after abandoning her cubs.

We have learned that young adult females spend their entire lives in approximately the same home range as their mother. But most young adult males are surplus, for it seems the mature breeding males force the younger males to migrate to distant areas, often outside the park.

Abundant prey and plenty of cover with adequate water enable many of these normally solitary predators to

coexist, temporarily, at least, in a small area. During the dry season we saw at least four adult males, ten females and 16 cubs living within some 70 square miles. Several additional adult males and females appeared to be transients. This was a density of at least one resident cheetah for every 2.3 square miles. For brief periods, the cheetah density increased to one cheetah for every square mile, and sometimes the adults were clearly visible to each other.

These are higher cheetah densities than have been reported anywhere else in Africa. But such crowding can be misleading; it simply means that unusual conditions briefly can bring together in one place a high concentration of the spotted cats. Range conditions change rapidly and the hard-pressed prey moves on to greener pastures, again dispersing the cheetahs, who must follow their food source. If a mother cheetah gives birth to a litter just as all the prey leaves the area, the cubs are almost certainly doomed.

Under present conditions in the Serengeti, the generally high loss of young cheetah cubs is harsh but acceptable, because the cheetah population of about 500 is, for now, at least stable, and possibly even rising.

Recently, we spent seven days and nights following a female cheetah during estrus and mating. We took turns sleeping in the back of our four-

wheel-drive safari vehicle. During the first five days of our observation, the cheetah traveled about nine miles in a circle. She frequently scent-marked trees and termite mounds in order to establish contact with a male. On the morning of the sixth day, we saw a male a half mile away, intently sniffing one of the scent marks. He immediately began calling with yelps alternating with staccato purrs.

When the female heard the male, she responded by moving in his direction. As soon as the male saw her, he trotted right over. The female then lay down and the male immediately mated for 20 seconds. After mating, the male lay next to the female. He always followed closely whenever she moved. They lay together all day, and in the evening they mated a second time. All night and the following morning they stayed together, but did not mate again. Then in the late afternoon of the seventh day, while the male was asleep, the female cautiously stole away.

SUCH observations of the behavioral and ecological conditions surrounding the mating of wild cheetahs may eventually make it possible to improve the success of captive cheetah breeding programs by recreating conditions similar to those that the cheetah requires for mating in the wild. Offspring produced in this way may



Brigitta

Stopping in mid-meal, Brigitta and one of her cubs growl as a lion moves closer. No match for lions, spotted hyenas, leopards or even large groups of vultures, cheetahs lose up to ten percent of their kills to competitors. In this case, the cheetahs' dinner went to the lion.



Amber

Termite mounds are frequently scent marked by cheetahs. Like Amber and her cubs, the animals also use them as a high point to look for prey and other cheetahs.

one day be necessary for the survival of the species as its prospects worsen.

Norman Myers, noted ecologist and roving editor for this magazine, recently completed an Africa-wide cheetah survey for the International Union for Conservation of Nature and Natural Resources (IUCN). He concluded that cheetahs may presently number about 8,000 to 25,000 in all of Africa, but their numbers are declining so rapidly that within ten years only half as many may survive. The main reason is loss of habitat and prey caused by the development of cattle ranches and human settlements.

The IUCN Red Data Book classifies the African cheetah as "vulnerable." However, the Asian race, perhaps numbering only hundreds, is classified "endangered." It occurs in fairly arid areas from the southern U.S.S.R. through Afghanistan and westward, possibly as far as Egypt. This race is believed extinct in India; the last three were reported killed in 1951. Only in Iran, where 200 or more cheetahs exist in new well-protected wildlife reserves, is there any hope that the Asian cheetah will survive.

But before the Asian cheetah's grim history is replayed over all of Africa, the spotted cats of the Serengeti may have a chance if man can alleviate the major hazards to their survival. These include the animal's own movements beyond the park's arbitrary boundaries, plus the cheetah's

inability to compete with other predator species and tourism.

The cheetah's movements beyond the park are a consequence of the migrations of such prey as gazelles and wildebeest. The Thomsons and Grants gazelles, for example, migrate onto the short-grass Serengeti plains during the rainy season, then return to the woodland when the grass becomes dry. Serengeti National Park includes 5,600 square miles of woodlands and grasslands within its boundaries, but this represents less than half of the total area throughout which the prey animals roam. To a large extent, the cheetahs must follow.

MUCH of our cheetah-watching is in ideal habitat — short grassland with scattered clumps of taller vegetation, forming a mosaic with woodland or brushland. These conditions seem optimum for high cheetah densities because the short grass attracts gazelles. The interspersed clumps of taller vegetation provide cover for stalking prey and for hiding from other predators; they also serve to insulate cheetahs from each other.

If this kind of habitat begins to deteriorate, it is possible to take remedial action. Controlled burning, depending upon the season and the method by which it is applied, can be used to maintain the desired variety of vegetation types, thereby favoring

optimum numbers of all prey and predator species. Sometimes it may be necessary to harvest a percentage of the grazing animals before the range becomes barren. Also, if the Serengeti's large populations of spotted hyena and lion continue to increase, it may be necessary to cull them to reduce competition with cheetahs for food and to afford more protection for cheetah cubs.

The cheetah, because of its slender build and tiny head, is no match when forced to compete with spotted hyenas, lions, leopards or even a large group of vultures. The Serengeti cheetahs lose about ten percent of their kills to other predators and scavengers. We saw a good example of this one hot and sunny midmorning when a cheetah with two cubs stalked and killed a gazelle.

The mother cheetah, named Brigitta, lay three minutes with her teeth firmly grasping the neck of an adult female Thomsons gazelle. The 20-second chase had tired her and she panted heavily. Suddenly she dropped the suffocated gazelle and sat up, looking and growling at two adult male lions that were lying under a tree 90 yards away. Both of Brigitta's cubs, Tomoko and Tonga, were sitting three yards from their mother, panting and watching the lions.

Ten minutes passed. Then, Tomoko crept over next to her mother, crouched against her, and began to

On the move, a cheetah investigates scent marks and makes her own. Outside the Serengeti, the cats — which follow prey species beyond park borders — are menaced by human activities, especially expanding farmlands and villages which destroy habitat.

eat while her mother and Tonga watched the lions. Soon all three were eating, but taking turns watching the lions. When one lion stood, Tomoko instantly sat up, growling. Finally, the lion approached at a trot. Brigitta, who had been eating quickly as she watched, retreated with her cubs. Vultures dashed in and snatched a few bites of the carcass before the lion grabbed the gazelle, carried it five yards and lay down to eat.

Brigitta and her cubs slowly walked away. Fortunately they had been able to eat some of the gazelle before losing it. Often, cheetah kills are lost in this way because tourist onlookers and their vehicles attract the attention of spotted hyenas and other predators and scavengers.

The tourists so ubiquitous in the Serengeti and other national parks also cause problems for the cheetahs in other ways. Tourism itself has helped tremendously in conserving wildlife, of course; exchange earnings are a powerful incentive for developing countries to set aside large areas for parks and reserves. In the actual management of these parks, however, it has become clear that control of the tourists is necessary. Not only do the tourists often spoil the cheetah's hunts, but they also congregate to watch cheetah cubs, attracting predators which sometimes eat the defenseless creatures. In parks where tourism is intense, it is essential to develop an extensive system of small roads and require all vehicles to stay on them.

On the surface, these recommendations for improving the lot of the Serengeti's cheetahs and their habitat seem straightforward enough. But how many conservationists are willing to support the perhaps extreme measure of shooting large numbers of lions and spotted hyenas in a national park, even if it is necessary to save cheetahs from extinction? Even a measure so seemingly simple as regulating tourist vehicles can raise the hackles of park visitors.

Such questions add up to a dilemma increasingly common in conservation today: the know-how for effective management is often available but will the public buy it? ■



Photograph by George and Lory Herbison Frame

