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Abstract: The integration of wild cheetahs from Namibia into captivity at Lion Country Safari is observed and commented. Cage size and structure, group composition, food quality and quantity as well as the method of food distribution are discussed.

8 Management and Behavior of Wild Cheetahs in Captivity

I have expressed my views on the ability of many American zoos in keeping and breeding endangered species. Even the best zoos often have a higher mortality than birth rate. This is abominable and inexcusable, especially regarding rare and endangered species. During visits and lectures at the best American zoos, the number of species on display, sometimes several thousand, were proudly pointed out to me. It is usually the case in the zoo world that quality is measured by number of species.

This approach is wrong. The goal should be to improve the quality of displays for a few species. No zoo is qualified to properly design displays for so many species. Nor can any particular zoo expect to keep thousands of species in artificial habitats that attempt to duplicate each species' natural setting. Instead, one zoo should specialize in a few groups of animals, say carnivores, large African mammals, or aquatic birds. Each zoo could then establish the protocols for improved keeping and breeding of its animals.

An animal in a barren cage with a plaque listing the animal's scientific name, range, and food habits is meaningless to the great majority of zoo tourists. I am optimistically convinced that hamsters, bull-snakes, and house cats, properly displayed, could prove more educational and interesting than thousands of labeled cages, one after the other. Zoos should rely on their animals' behavior to entertain and inform the public. We

have museums that display the wonder of diversity that exists in nature. Zoos should be where the behavior of animals is observed, but behavior requires space, and often several individuals of the same species.

Some zoos are now expanding their displays, including several species in one area, for example wolves and bears. Others are developing wild animal parks which are modeled after Lion Country Safari. The emergence of the private-enterprise wildlife park has stimulated this new movement in the zoo world, and will lead to improvements for the researcher, the animal, and the tourist. Of particular value is the increased amount of space available to large mammals in the animal park. While cheetahs have been bred recently in conventional zoos, for example Whipsnade, England; Prague, Czechoslovakia; and Toledo, Ohio, I believe that these births are exceptional, owing to particularly tolerant individuals, and recent arrival as adults from the wild state. What is needed is the best way to predictably breed the majority of captive cheetahs. The wild animal parks should establish these protocols, and are making progress toward this end.

In the cheetah, space is critically important to allow courtship and mating, and at Lion Country Safari courtship behavior was readily observed. Also significant to breeding success is the information gathered on managing wild cheetahs in seminatural conditions. (Eaton and Craig, 1973a).

It must be realized that the environment of the wildlife park established for tourist visitation is unique. The problems of successfully managing exotic species are qualitatively different from those in the zoological garden. The fact that Lion Country Safari had the world's largest collection of cheetahs made it a desirable research site to assist in laying the groundwork for large-scale breeding programs. At World Wildlife Safari we have established a breeding area for our cheetahs which is outside the drive-through reserve. If we succeed in breeding them, we might display them to visitors, but otherwise will not. Lion Country Safari has removed several of their cheetahs to a remote hillside for breeding purposes (Fig. 8-11), a decided improvement; however, behavioral disruption resulting from previous crowding might prove to be irreversible.

At Lion Country Safari most of the cheetahs appeared to adapt within a period of two weeks to the new area and to customer traffic. Since it was necessary to provide an attractive display to the public a certain amount of conditioning was necessary. This was accomplished by: (1) driving cheetahs out of areas where they were not easily visible from the road; (2) placement of shade trees near the road; and (3) feeding only in certain areas. For the most part the cheetah appeared to be oblivious to customer traffic. Since there was always a sufficient number of cheetahs on display, those individuals that did not respond well to training methods were not continually harassed.



Figure 8-1 Bill York of Lion Country Safari releases cheetahs from South West Africa. (Photo: B. Koch.)

After two months the cheetahs became so accustomed to traffic that they followed individual cars through the section in order to lie in their shade. In many instances cheetah were lying partially under the car. Contrary to expectation, most cheetahs responded neutrally to a high frequency of low-flying jet aircraft. At all times during visiting hours it was possible to maintain a display of at least two-thirds of the cats within 30 ft of the road. I should note here that while cars and aircraft appeared not to disturb cheetahs, appearances are deceiving. In live-trapping red and gray foxes in South Carolina, red foxes exhibited many signs of stress and threatened frequently. On the other hand, gray foxes appeared quite relaxed and were virtually placid. Once released in a captive area and observed from a great distance, both species exhibited high levels of activity in looking for an escape route. I became convinced that we too often expect overt behavior to reflect internal moods.

At first sight the Lion Country Safari cheetahs appeared to be one large, socialized group which indeed they were—all cheetahs tolerated and were generally friendly to one another (except for the injured female). However, within this large group, definite social affinities existed. In one area of shade there were commonly the same 10–12 individuals. The other 12 made up one smaller group of three to five and one or two lone individuals that periodically associated with one or both of the two groups or lay up alone. During hot summer months the two groups were relatively stable and they lay up together throughout most of the day from 9:30 a.m. to 5:00 p.m. The larger group lay up under an olive tree 20 ft from the road. Most of the other cheetahs avoided traffic and lay up at a rockpile or in the moat surrounding the section. In early morning, cheetahs were usually seen at the higher elevations in the section either visually exploring outside or resting. Play fighting and chasing was frequent in the early hours but this was completely exhibited by two or more of the same four or five cheetahs. These same cheetahs elicited play stalking and charges toward the keeper during their play sessions.

In summer cheetahs retired to shade before mid-morning, at about the time of the first tourists' arrival. The larger group went to the olive tree. Certain individuals exhibited more amicable behavior—greeting and social grooming to all other cheetahs but at higher frequencies to the more responsive individuals. Following feeding amicable behavior was frequent but social preferences were less obvious.

In favored lying-up spots, activity was initiated by one cat rolling over or changing its position among a tightly clustered group. This often initiated grooming sessions. It also resulted in abbreviated spats between only two cats or spreading through the entire group until all cats were involved. Following this domino effect, most cats were sitting up before all lay down again. From the onset of the first cheetah's rolling over and initiating a series of aggressive encounters until return of peace usually 10–15 seconds passed. Occasionally, one or two individuals left the group and moved to nearby shade areas where they lay up alone or in smaller groups.

In the later afternoon, with temperatures dropping, cheetahs became more active. Marking, drinking, and movement throughout the section was accompanied by sitting or lying down while visually scanning the surrounding area and often fixing on antelope in the adjacent section. On a large log in a higher area in the compound, fully mature cheetahs often stood and visually scanned for as long as 20 minutes. While visually oriented to the area outside the section, several mature males sat on high areas and uttered a meow-like sound, to which no other cheetahs responded.

Shortly after arrival, during the summer months there was considerable courting behavior. One female was actively courted until late November,

while no other females courted after August. Behavioral estrus lasted two weeks on the average and there was usually a two week inter-estrous period. In August and September, the one female exhibited behavioral estrus for five consecutive weeks; and she was given a hormone shot (Stilbesterol: 75 mg) on October 16, 1970. After the hormone administration there was no increase in ongoing courtship behavior. She was seen mated on three occasions, July 21 and 31 at 7:30 P.M. and 8:30 P.M.; and October 1, at mid-day. The mated female was isolated on December 20, 1970, in case she was pregnant, although a mating was not observed in December. Later she died from an apparent liver ailment, the only mortality in the group.

As winter set in, many of the cheetahs were found together in one large group lying on the straw in the hut, or occasionally lying on the straw in one or more small groups outside the hut. The entire huddle of 20 or more cheetahs exhibited social affinities in that certain pairs or small groups preferred lying next to each other. For example, the two largest and apparently oldest males were usually together. They were nearly identical in appearance and I believe them to be brothers. The two males followed each other and fed together, did not compete for food, and were often seen lying together away from the group. The group of five (1:4) cheetahs that so often exhibited play were nearly always together when the hut was inspected in early morning. These five looked very much alike and appeared to be at the same age at arrival. There is little doubt that these associations reflect social groups from the wild.

FEEDING AND BEHAVIOR

The diet was varied little throughout the study. The staple ration was cut up, freshly slaughtered horsemeat, totaling about 4 pounds per day, 5 days a week. The amount fed was altered according to the cheetahs' appearance—whether thin or heavy. Water consumption was extremely low. Tidbiting amounted to a small portion of food but was used to manipulate the location of cheetahs to enhance the display. During the nine-months study period, cheetahs were fed a number of live prey and whole carcasses including: 15 goats, 7 moufflon sheep, 1 horse, 2 camels, 2 giraffe, 1 black buck, 1 ostrich, and many chickens and rabbits (Fig. 7-1). Aggressive behavior was intense when carcasses were fed since there wasn't enough space for all cheetahs to feed at one time. Of all the carcasses only the second camel was not entirely consumed. After the first camel was eaten, there were many piles of vomit on the following morning. Both camels weighed about 800 pounds and it was thought that perhaps overeating was the cause of vomiting; however, vomiting was also common after the

second camel was fed although less than half of it was eaten. Furthermore, on a later date five moufflon sheep and one giraffe totaling at least 1200 pounds were fed at the same time and all but the large bones, skin, and stomach contents were consumed. Using 60% of carcass weight, the average amount eaten by each cheetah was nearly 30 pounds over a ten-hour period. The next morning every cheetah's belly was highly distended. They showed no activity and did not vomit. Chickens and rabbits were fed periodically and used as a medium for transfer of worming medicine. A specially prepared vitamin-mineral powder supplemented the meat diet.

Initially, a pickup truck with a specially caged-in bed was used to feed. The cheetahs soon became conditioned and ran toward the truck as it approached the section. Once in the section the truck stopped and individual pieces of meat were thrown out after being dipped in the powder supplement. Extra pieces for any supplementary feeding were left with the warden. Transferring the meat from truck to warden involved the warden leaving his jeep and passing near feeding cheetahs. Two medium-sized mature males commonly charged the warden; they dropped their meat and approached in the typical threat posture—head down, shoulders up, mouth open, tail curled under the stomach—accompanied by the moaning and spitting vocalizations and the foot stamping at the termination of the charge 10–20 ft from the warden (Fig. 6–5). After several months one of these same males charged closer, stopping only three or four feet away; physical contact was not made. Flight was readily induced by rushing at the threatening cheetah. Eye-to-eye contact with a cheetah induced threat, and when prolonged, resulted in flight and the avoidance of the human.

Feeding pieces of meat to all the cheetahs at one time did not reflect dominance. However, it was difficult to keep track of individuals and the outcome of competitive encounters. Typically the cheetah grabbed a piece of meat and ran away 30–50 meters before lying down to eat. Tugs of war occurred when two cats grabbed the same piece of meat and ran with it across the section, both gripping the meat in their mouth. The contests lasted as long as 10 minutes before one cat gave up or the meat was torn into two pieces. Consumption of a four-pound piece of meat normally required one to two minutes or less. Cheetahs with bony pieces first ate the meat then chewed on the bones for 5–15 minutes; those with pure meat were soon up, walking around, inspecting the ground for more, or approaching a feeding cheetah.

The approach consisted of trotting or walking to the feeding cat and when only three or four feet away, wheeling around with the rear end close to the feeding animal's head. The "presenter" then moved slowly backwards until his rear end was only inches from the other's head, and

finally turned and attempted to grab the meat in its mouth. The actual sequence is variable; sometimes the feeding cheetah simply got up and ran off with its meat. Other times there was a tug of war. In many individual encounters between possessor and competitor for meat, it was possible to identify the cheetahs. Usually it was the larger male that was able to approach a possessor directly without the rear-end presenting and take the meat away. The possessor was usually a smaller individual but would not readily yield. Instead, it swatted and clawed the competitor on the head. All cheetahs fed in sternal recumbency with the meat between but not gripped in their forepaws. Hide was rarely eaten and then only when a small piece was swallowed whole. Fatty tissues were eaten readily but bone was not ingested.

After the summer months, with less traffic there was improved visibility of the approaching meat truck; the cheetahs saw it coming $\frac{1}{4}$ mile away. They approached the truck and the entrance gate. This posed a security problem since the adjacent section contained hoof stock. The problem was solved at first by the Warden getting out of his jeep with pole in hand and directly confronting the cheetahs while leaving just enough space for the truck to enter the section. The cheetahs also became conditioned to the time of day for feeding and began orienting their vision and movements to the entrance gate at a similar hour every day. The security problem became more acute so the truck entered the exit gate. From where the cheetahs lay up they did not have visual contact with the truck until it was already in the section. Another modification in feeding was to transfer meat from truck to jeep outside the cheetah section then feed directly from the jeep. In a short time cheetahs generalized to all jeeps. All Lion Country jeeps are marked identically, and starting at midday, the usual feeding time, cheetahs chased jeeps until fed. The chases were short in length if no meat was dropped. They came to discriminate time of day and entrance through the exit gate. The jeeps that were chased most fit into this overall stimulus pattern.

One of the most important releasers in all feeding responses was a cheetah running. Once any cheetah got up and ran, the others in view got up and ran in the same direction.

A reasonably high activity level should stimulate natural conditions and increase the probability of breeding. It is plausible that activity from hunting stimulates production of hormones. We induced activity in many ways, for example by tying a burlap bag on the end of a rope and dragging it behind a fast-moving jeep. The cheetahs chased the bag around the road. Tidbiting away from favored lying-up spots induced running toward the jeep and competitive interactions. The use of recorded cheetah vocalizations played repeatedly over the jeep's loud haler stimulated approach and inspection but in time there was partial habituation. The use

of live prey released more regularly would probably meet a desired level of activity; however, no matter how critical this might be for successful breeding, public pressure and humane laws could prevent it. It is encouraging that the successful breeding program at San Diego Wild Animal Park has involved regular feeding of live prey, and that the public is made aware of it (Herdman, 1972).

The fact that no cheetahs have yet given birth at Lion Country Safari is an indication of the unsuitability of the breeding program. After the assumed stress of transport from South West Africa and introduction and adaptation into an unusual environment, we expected nothing more during the first nine months. Courtship and mating were relatively frequent, as described above and there was only one reproductively mature female present during the period of intense mating. Since the injured female's recovery and return, she was an outcast and this might have affected her mating activity. Of the other four females, all subadults on arrival, only one was courted. San Diego Zoo received five females and though they were all mature there was only one birth during the same study period (R. Herdman, 1973). The greater amount of physical and social space afforded at San Diego, as compared to Lion Country, and the absence of human disturbance, might easily be the factors in breeding success.

Seasonality of mating is possible, as Herdman (1973) predicted in the San Diego cheetahs. It should be kept in mind that if contact and mere proximity of foreign males is a factor in inducing estrus, mixing the cheetahs at Lion Country Safari after a period of separation may have been sexually releasing. Since estrous periods are relatively long in cheetahs, which could be an adaptation to the female's solitary way of life, it is plausible that foreign males have an additional stimulatory effect on an estrous female. In any event, the adult female is an unsociable animal and should be kept isolated until signs of heat appear. This is not done at San Diego Wild Animal Park, and may explain why only one of their ten females has conceived in nearly three years. At World Wildlife Safari we separate males from females except for breeding. At this writing, our cheetahs are still in their first breeding season.

Lion Country Safari has the world's largest collection of cheetahs and keeps them in a relatively small area. The habits of the wild pregnant female lead one to believe that once a female is pregnant there must be some accommodation for allowing her to avoid contact with other cheetahs. There are a number of ways in which this can be done. The pregnant female probably requires an area large enough to be able: to move away from her cubs to feed after they are first born; to move her cubs in the area, for which shrub plantings or artificial platforms can be provided; and to be free of contact of any kind with other cheetahs or

fearful stimuli that could induce abandonment of cubs. These provisions would come as close to the female's behavioral requirements as is possible (with also feeding live animals). Cheetahs prefer lying up areas which provide good visibility, and in addition they actively seek out higher elevations, such as dirt mounds, hills, logs, rock piles, from which they view the surrounding landscape. It should be possible for the expectant female to satisfy these apparent needs in the captive environment.

Concerning sex ratios, Lion Country Safari chose the high number of males to attempt to duplicate the natural setting of several males or groups pursuing and courting an estrus female. If several females come into heat at the same time, one group of courting males may not be optimal. Furthermore, there are cases in captivity of several females being in heat at the same time (Herdman, 1973), in which case several groups of males might be an improvement. However, frequency of copulation is low and all adult males, properly fed and in good health, should produce fertile sperm during the breeding season. I would consider two competing males optimal for impregnating a receptive female.

There are many factors which must be considered, and it is difficult to make absolute recommendations. For example, wild cheetahs kept in two adjacent paddocks in Kenya, both with identical ground cover and food, had strikingly different breeding success (W. York, pers. comm.). Litters were born in both areas but survival was higher in the 5-acre than in the 20-acre area. The smaller compound had a mother and her subadult cubs which apparently posed little threat to their mother's second litter. Two litters born in the much larger paddock apparently suffered from high intraspecific predation. The individuals in the latter area were foreigners when enclosed. Owing to the nature of their social relationship cheetahs bred better in the smaller area. Both groups of cheetahs hunted and killed Thomson's gazelle regularly, but most captive breeding programs to date have not carried out live feeding involving high activity in hunting on a routine basis. The limited amount of live feeding is normally kept secret because well-meaning preservationist groups would be highly resistant. Furthermore, enough space combined with an agile, speedy prey would come close to recreating a natural setting.

Of all the Felidae, the cheetah has been the least successful in breeding relative to its numbers in captivity. Obviously cheetahs breed well in the wild. Any cheetah breeding program should strive to duplicate the natural setting initially, and then, with success, experimentally eliminate those conditions or factors that are not essential.

The most successful cheetah breeding to date has been at San Diego (Herdman, 1972, 1973), where a female's second litter is being raised not by hand but entirely by the female. These cubs are killing rabbits and are growing up as cheetahs would in the wild, socialized to cheetahs, not to

men, and perfecting predatory skills. They are likely to contribute a third generation when adults, and continued study will lay further groundwork for reintroduction programs in the wild when and if the need arises.

Postscript:

Four cubs were born at World Wildlife Safari on 8 September, 1973, a little more than one year after the cheetahs were imported and placed in the secluded compound. Mating occurred in June shortly after the two males were placed with the female. The mother is caring for the cubs.

13 September, 1973

R. I. E.