

# Social and Reproductive Behaviours in the Cheetah (*Acinonyx jubatus*) in A Captive Population

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## **Chapter II**

### **General Methods**

The general methods used throughout the study are described in this section, with specific techniques described in further detail within the relevant chapters.

## Location

The cheetahs I used in the study were housed at Monarto Zoological Park (MZP), South Australia, which was set up by the Royal Zoological Society of South Australia. This society also established Adelaide Zoo. Monarto ZP is an open range park located 70 km from Adelaide and 12 km from Murray Bridge (latitude 35° 07' 06" S, longitude 139° 08' 22" E, elevation 116 m). At the time of this study it included 1000 ha of land, divided into enclosures, breeding areas and scrub/recreational areas (Figure 1). Originally developed as a breeding facility to support Adelaide Zoo, it had been open to the public for 10 years prior to the commencement of this study in 2001.

The weather station at Murray Bridge is closest to MZP and is situated approximately 12 km to the north. Murray Bridge receives an average annual rainfall of 347.2 mm, with the maximum mean precipitation occurring in June ( $\bar{X} = 37.1$  mm) and the minimum in January ( $\bar{X} = 16.4$  mm) (Bureau of Meteorology 2001, <http://www.bom.gov.au>). The area has a wide temperature range, with a minimum of -5°C in July and a maximum of 45.6°C in January.

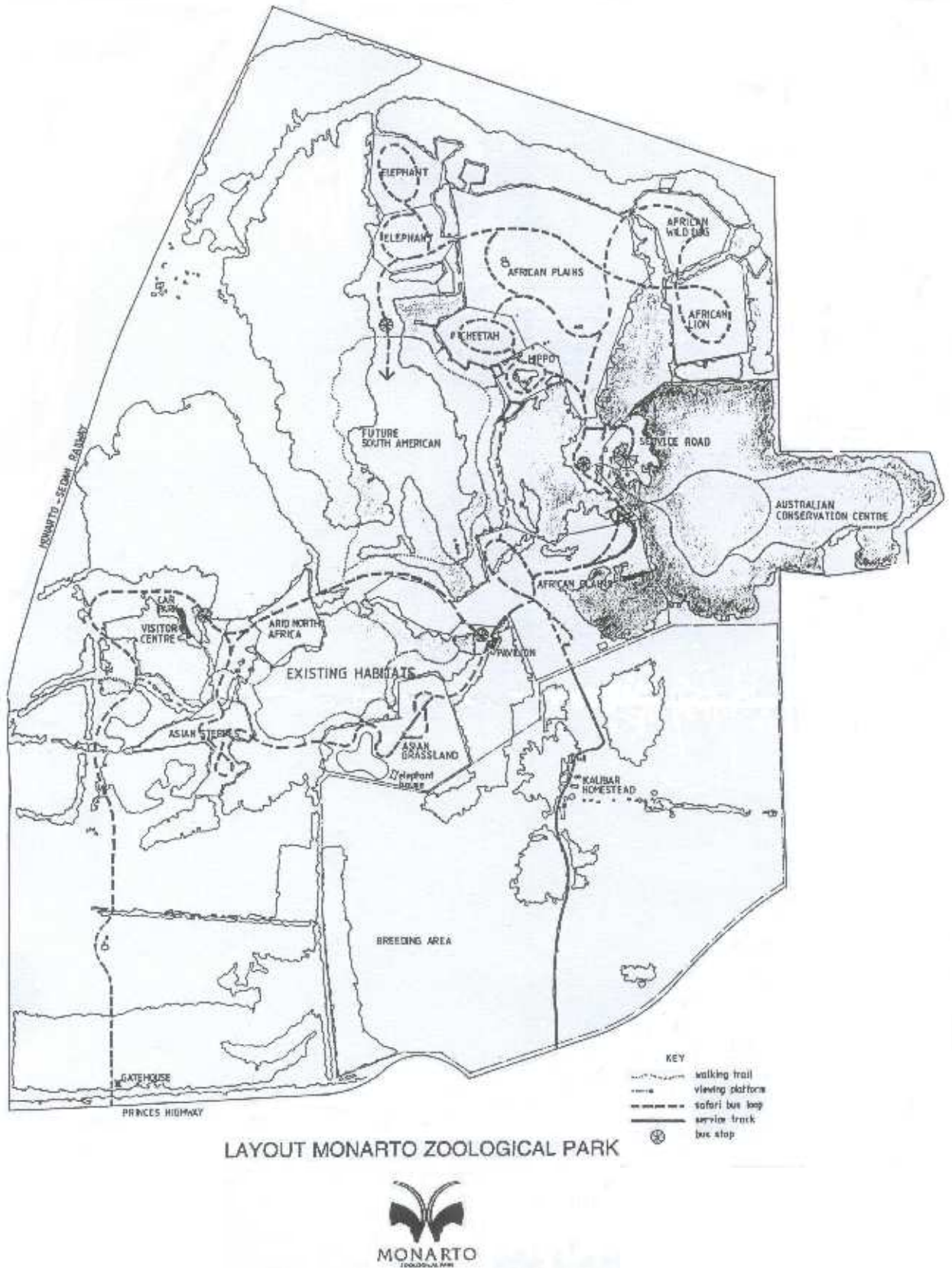


Figure 1. Map of Monarto Zoological Park (MZO) showing existing and proposed exhibits, 2001 (courtesy of the Royal Zoological Society of South Australia).

The cheetah enclosure (Figure 2) is situated in the ‘African Plains’ section of MZP. Cheetahs, on the eastern side of the park, were initially isolated from all other species until July 2001. At this time, development began on an enclosure for the African Painted Dog (*Lycaon pictus*). This enclosure is south of the cheetah enclosure and its night-yards are partially within visual range of the cheetah enclosure. During the course of the study, white rhinoceros (*Ceratotherium simum*) and lions (*Panthera leo*) were also introduced to the African Plains area of the park. The rhinoceros exhibit was built alongside the cheetah exhibit yards within visual, auditory and olfactory range. Later, the lion exhibit was built to the south of the cheetah exhibit, within auditory range.



Figure 2. *The cheetah enclosure at Monarto Zoological Park*

## Subjects

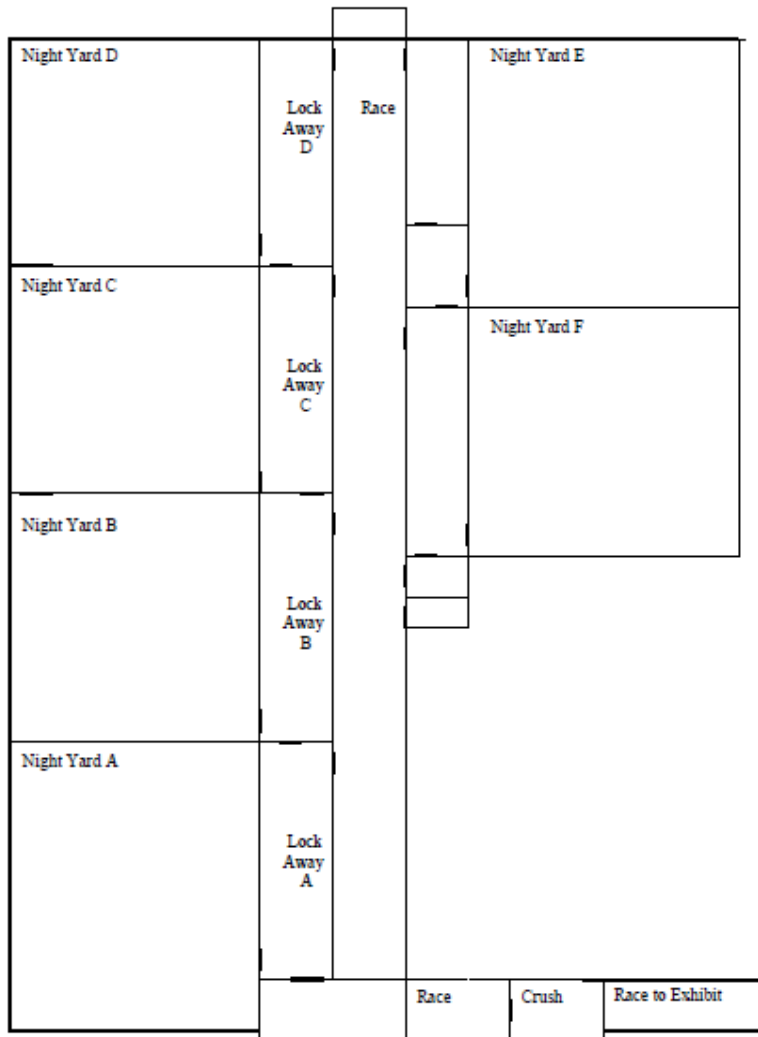
The initial subjects were eight cheetahs that had been acquired by the Royal Zoological Society in 1999 from Hoedspruit Endangered Species Center in South Africa. These cheetahs were housed at MZP. The group consisted of five males: three brothers Umballa, Iziphoh and Nyomfoza, approximately 4 years and 5 months old (at the

beginning of observation, 20<sup>th</sup> of January 2001), Ndonda, 4 years and 5 months old and Induna, 5 years and 2 months old. Three unrelated female cheetahs were also held at MZP. They were Pinda, 4 years and 1 month old, Lula, 4 years and 10 months old and Bopha, 5 years and 1 month old at the beginning of this study. All of the cheetahs were parent-reared in South Africa.

During the course of the study, further animals were introduced to MZP. The additional animals came from both transfers for breeding (A female, Zilkaat, on loan from Perth Zoo) and births within the park. During the study, animals were also occasionally sent out of the MZP on breeding loan. In total, 20 cheetahs of all ages were housed at MZP over the study period, but the primary group of eight cheetahs, with the additional female from Perth Zoo, were used as the focus subjects.

### Access to animals/Facility set up

Access to the animals was virtually unrestricted, as long as at least two animals were in the exhibit yard for the first public viewing at approximately 10:45 h. This access meant that groups could be manipulated with only minor restrictions. All cheetahs were held in smaller night-yards overnight. These yards ranged in size, with yard A being 25x35 metres, yards B-D were approximately 25x25 metres and yards E and F were 28x28 metres. The night-yards were attached to a series of small pens and race-ways that were used to maneuver animals within the facility, isolating individuals and also providing contact to all other cheetahs in the facility. Cheetahs were also moved to and from the exhibit yard via these race-ways (Figure 3). Visual barriers were erected within the facility through the study. Initially an iron fence was placed between yards A and B at the end of July 2001. Further visual barriers, made from brush fencing and shade cloth were erected at the end of December 2001 (see Chapter 6 Figure 1).



*Figure 3. Night yard facilities at Monarto Zoological Park at the beginning of observations.*

Cheetahs were normally fed off-display in their night quarters. Occasionally, carcass feeds were performed on exhibit for special tours or behavioural enrichment purposes. Feeding occurred at approximately 16:30 h and all animals fasted for one day per week. The diet of cheetahs at MZP consisted of fresh carcass meat (cow, sheep, horse, chicken, rabbit, kangaroo and emu) supplemented with thiamine 2-3 days per week. When cheetahs were given carcasses with soft fur (rabbit/kangaroo), an additional supplement of Catlax® was provided due to occasional fur blockage problems. The Perth female was initially fed on de-boned meat and supplements, but carcass meat was gradually introduced after settling at MZP.

At the beginning of the study a number of veterinary exclusions were in place that limited the use of some animals. These exclusions were based on poor health

(Nyomfoza) and aggression levels (Induna). The health restriction was lifted early in the experimental stage of the study. However, the aggression restrictions limited the use of Induna in mixed sex introductions for over a year. After a number of meetings with zoo staff, appropriate protocols were developed to handle any aggressive behaviour. Unrestricted access was provided for all animals from that time forward.

### Identification Criteria

Cheetahs needed to be easily identifiable from one another before data collection began. Initial recommendations from park staff included the use of specific microchips, identification tags or coloured collars. However, this was unsuitable as the animals were unable to be handled and regular microchip scanning would require ‘crushing’, where animals are locked into a small wire cage to restrict movement. This process is very distressing to the animal and inappropriate when trying to mimic a natural environment, as in this study. The use of tags or collars was also rejected as they infringed on the ‘natural’ aesthetic of the park. Hence, facial and tail markings were used to distinguish between individuals.

### *Testing Conditions*

Initially, I observed the eight cheetahs from numerous points around the enclosure’s boundary, ‘lock-away’ and night-yard fences. All cheetahs were observed so that individuals could be accurately distinguished from any point along the fence line to the furthest areas in the enclosure. The initial identification period ran for 60 h. Further observation periods were performed throughout the study as new animals were introduced. Behavioural data was not collected during these periods to ensure correct identification of cheetahs from all locations, at all times.

I made identification notes that detailed each animal’s facial markings. These markings were recorded through notes, drawings and photographs. Descriptions were taken from the front and sides of the face. Details of each animal’s tail markings were also recorded from both sides. All cheetahs received official names to replace any ‘house’ names. This was important to aid in identification of cheetahs and improve the transfer of information within the team (park staff members/researchers). This was particularly important for male cheetahs, where different house names for an individual animal were being used by various members of staff. A clear naming criteria, along



with staff training on identification, meant that unsupervised keepers could move the correct cheetahs and place them in specific groups.

### Checks on the Identification Process

After an initial confidence-building period, two different trials were performed to test the accuracy of identification of individual cheetahs.

#### ***Trial One***

Three, third year Animal Behaviour students from Flinders University were used in trial one. These students had not previously observed cheetahs at MZP. Participants were given a copy of identification notes a week before the trial to examine the various morphological differences between the animals. I then tested all three participants to see if they could determine the different animals at both close range and from a distance (using binoculars, Bushmaster 8-20 x 40).

All participants were able to identify individual cheetahs using the identification notes. Identification from the lock-away and night yards was extremely successful, with only 2 mistakes made (but later self-corrected) out of 24 trials (3 participants x 8 cheetahs). However, longer distances posed some problems, with 5 mistakes out of 24 identification attempts. Problems arose especially when differentiating between the faces of Nyomfoza and Izipho – two brothers. Caro and Durant (1991) reported that related cheetahs often have similar coat patterns. Hence, this similarity is a possible reason for the mistaken identification. Nevertheless, identification was seen as successful as each participant had only spent approximately one hour in front of the two enclosures to view cheetahs.

#### ***Trial Two***

Trial two involved one participant from trial one taking ten photos of each of the cheetah and identifying each of the cheetah as the photos were taken. Each series of photographs included some shots of the entire animal, including the tail, as well as some shots of just the face. This process occurred independent of my observations and the 80 photographs were then randomised and given to me for identification.

Seventy-nine out of 80 identifications were correct, with a face shot of Nyomfoza mistaken for Izipho in one instance. As stated previously, these two cheetahs

are brothers and are very similar in appearance. It is likely that if these animals were viewed in their exhibit, with the ability to see tails and facial movement, I would not have made this mistake.

### Observation and Recording Equipment

In observing the cheetahs, I had to use multiple positions around the enclosures to enable cheetahs to be seen with the naked eye where possible. However, at times this was impossible and equipment was needed. The equipment used for the initial development of identification notes for each cheetah included binoculars (Bushmaster 8-20 × 40 mm) and a telescope (Tasco 35×, model 57T). A Ricoh 35mm camera with a 35-70 mm lens was initially used to take photographs of cheetahs, but later in the study a digital camera, Olympus C-740 Ultra Zoom, and a video camera, JVC GR-520 EA, were used. Identification photographs were taken when cheetahs were in their night-yards and lock-away areas. A *Realistic*® Minisette-20 tape recorder was used for recording continuous behaviour.

### Data Recording Measures

The data recording methods for all of the work I performed on the cheetahs was based on the methods set out by Martin and Bateson (2000). For all chapters, data was collected using focal sampling-focusing on the behaviour of one individual whether they were housed socially or in isolation. Recording of data was then dependant on the relevant chapter. For Chapter 3 I used continuous recording, with observation periods of one hour. Data collection was performed by behaviours being spoken into a tape recorder and later transcribed. This method of data recording was chosen as I needed to obtain an accurate description of all behaviours displayed by the cheetahs as well as information on when behaviours were first observed for individuals. Continuous recording was also used for Chapter 4 as it was important to record all behaviours and their frequencies for females over the observation periods. For Chapter 5 I used multiple methods of data collection. Again continuous recording was used for parts of the analysis, however the primary form of data collection was instantaneous sampling, with sampling occurring every two minutes and creating 30 sampling points per observational hour. Data collection check sheets were developed in the basic grid design as described by Martin and Bateson (2000) Lastly, for Chapter 6 I used continuous

recording again. For this component of data collection video recording was used. As focal sampling was important, video recording enabled data to be collected on multiple individual simultaneously and then transcribed to each animal later. Further data collection techniques are described in the relevant chapters.

### Statistical Analysis

The data collected from this study was analysed in a number of ways. Initially, descriptive data was recorded and examined to ascertain basic trends and establish hypotheses. When experiments were set up to test these hypotheses, the resulting data was examined using non-parametric and parametric statistics using SPSS (Version16). Further statistical analyses are described in the relevant chapters.

### Ethics and Safety

As cheetahs are classed as dangerous animals, numerous safety protocols and procedures were put into practice. Ethics approval was obtained through the Royal Zoological Society of South Australia. These were then ratified before any work began by the School of Biological Sciences, Faculty of Science and Engineering, Flinders University. Before data collection commenced, I was shown all of the relevant practices and procedures performed by the keeping staff on a day-to-day basis and undertook their normal training regime. As the majority of the author's time was spent alone in the park, a two way radio was provided to establish communication if necessary. The author's mobile phone number was also provided to all MZP staff as a secondary means of contact. MZP staff were always notified (by phone or radio) when visits to MZP were underway, as it was common not to see any members of staff during the course of the experiments. All relevant fire training and emergency procedures for MZP were undertaken and frequent meetings were held with the occupational health and safety officer to discuss the research methods.

## **References**

Martin, P & Bateson, P. (2000) Measuring Behaviour: An Introductory Guide. 2<sup>nd</sup> Ed. Cambridge University Press. Cambridge.