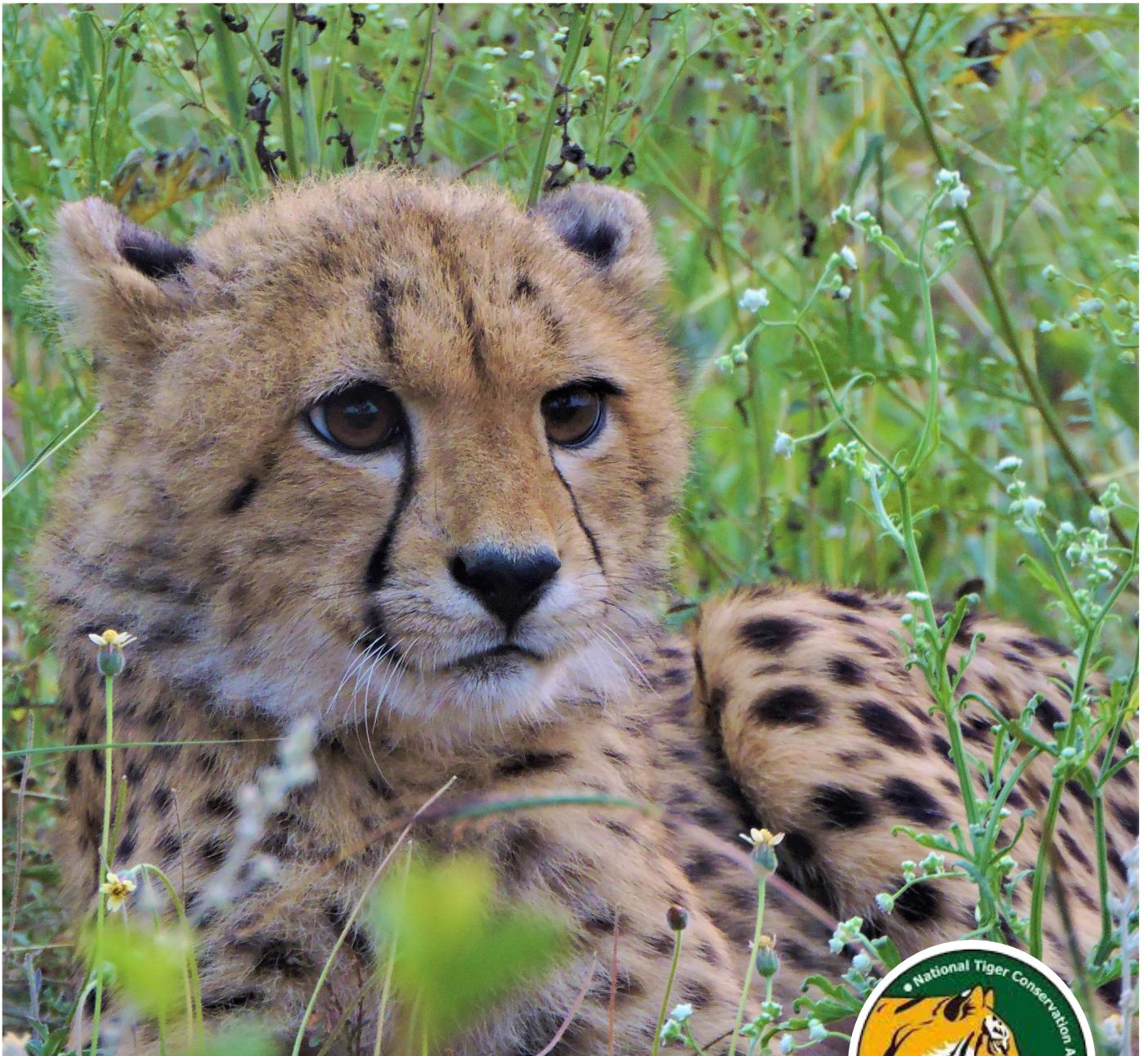


# STANDARD OPERATING PROCEDURE

---

TO DEAL WITH NURSING CHEETAH FEMALES, NEONATAL CARE AND ORPHANED/  
ABANDONED/INJURED CHEETAH CUBS AT CHEETAH INTRODUCTION SITES IN  
INDIA





**NATIONAL TIGER CONSERVATION AUTHORITY (NTCA)**

**THE MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE (MOEFCC),  
GOVERNMENT OF INDIA**

**Cover** ©Moulik Sarkar, WII

**Design** : Studio Lophius



# 01

Introduction

---

# 04

Annexure - I

---

# 10

Annexure - II

---

# 13

Annexure - III

---

# 18

Annexure - IV

---

# 24

Annexure - V

---

# 26

Appendix - I

---

# 28

References

---



©Shivang Mehta Team & WII

## NATIONAL TIGER CONSERVATION AUTHORITY (NTCA)

THE MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE (MOEFCC),  
GOVERNMENT OF INDIA

### STANDARD OPERATING PROCEDURE TO DEAL WITH NURSING CHEETAH FEMALES, NEONATAL CARE AND ORPHANED/ABANDONED/INJURED CHEETAH CUBS AT CHEETAH INTRODUCTION SITES IN INDIA

---

#### 1. Title

Standard operating procedure to deal with nursing cheetah females, neonatal care and orphaned/ abandoned/ injured cheetah cubs at cheetah introduction sites in India.

---

#### 2. Subject

Dealing with pre and post breeding situations in introduced cheetahs in India, including monitoring of pregnant/ lactating females, neonatal care and monitoring of cubs born and in circumstances requiring health/ veterinary management of orphaned, abandoned or injured cheetah cubs at cheetah introduction sites in India.

---

#### 3. Purpose

The primary objective of the Project Cheetah is to establish a viable metapopulation of cheetahs (*Acinonyx jubatus*) in India. This is to be achieved initially through introduction of healthy founder stock from Africa and later sustained through naturally breeding cheetah population at the introduction sites. Therefore, ensuring the welfare of each individual cheetah, particularly breeding females and cubs born in India, is crucial for the project's success. This not only necessitates vigilant monitoring of pregnant/ lactating females and their cubs with utmost caution, but also human interventions and veterinary care would also be necessary in some circumstances.

For example, though it is imperative to have naturally bred and wild raised cheetah cubs, there may be occasions where it becomes necessary to hand-rear cheetah cubs due to various factors such as maternal abandonment, health issues, or other unforeseen circumstances that might prompt the need for human intervention. This document outlines protocols for appropriate monitoring, veterinary care, and husbandry in such scenarios, while prioritizing, minimal disruption to the natural cheetah behaviour, its health as well as well-being and safeguarding the health concerns of field staff involved in such operations.

The purpose of rehabilitation of sick, injured, orphaned and abandoned animals is to eventually release them into free ranging environment being fully fit and functional as well as self-sustaining. To understand the success of rehabilitation, techniques employed must be accurately documented, replicable, and tested. The process of rehabilitation needs to be meticulously planned and organized with regard to habituation and behaviour development in captivity, as these developments can affect subsequent behavioural responses. Some of the steps required in cheetah rehabilitation before release into the wild are stimulation, hunting training, de-humanizing and predator avoidance programme etc. These steps require specific insights by experts involved in cheetah rehabilitation to develop appropriate training protocols and approaches specifically catering to the needs of the cheetahs. Prior to release into the wild, cheetahs need to be certified for adequate health and ensure diseases are not transmitted into wild populations, appropriate blood investigations and molecular testing needs to

be carried out.

## 4. Short Summary

This Standard Operating Procedure (SOP) outlines the essential criteria, actions, and precautions to be followed at the field level in cheetah introduction sites when managing pre and post-breeding situations in cheetahs introduced in India.

## 5. Scope

The SOP applies to all cheetah introduction sites and field formations with cheetah presence in India.

## 6. Responsibilities

For Protected Areas (National Park/ Wildlife Sanctuary), the concerned Protected Area manager would be responsible. In the case of other areas (revenue land/ Conservation Reserve/ Community Reserve/ Village/ Township) the Wildlife Warden, as per the Wildlife (Protection) Act, 1972, or Divisional Forest Officer (DFO)/ Deputy Conservator of Forests (DCF) under whose jurisdiction the area falls, would be responsible. The overall responsibility at the State level would rest with the Chief Wildlife Warden of the concerned State. The Cheetah Steering Committee, constituted by the Ministry of Environment, Forests, and Climate Change, Government of India in conjunction with the National Tiger Conservation Authority (NTCA), Government of India will be responsible for issuing specific advisories based on individual circumstances when deemed necessary.

## 7. Circumstances Covered Under the SOP

a. Presence of pregnant cheetah female at cheetah introduction sites and/ or adjacent areas (Reserve Forest, Revenue land, Conservation Reserve, etc.).

b. Confirmation of cub birth (parturition) in cheetah female/ nursing cheetah female at cheetah introduction sites and/ or adjacent areas.

c. Circumstances necessitating hand rearing of cheetah cubs due to orphaning ensuing mortality of mother (poaching/ inter or intra species negative interaction/ other natural causes) or abandonment by the mother or incapacitation of mother due to injury/ illness (natural or other causes); cubs with in-born incapacitation; weak cheetah cubs/ runt and injured/ sick cheetah cubs.

To comprehend the intricacies that could precipitate in above situations and to facilitate decision-making

process, essential knowledge of reproductive ecology and breeding behaviour in cheetahs is a prerequisite. A concise summary of this is provided as **Annexure I**. Additional literature listed below may be referred for a more comprehensive understanding of the subject.

- Crosier, A. E., Wachter, B., Schulman, M., Lüders, I., Koester, D.C., Wielebnowski, N., Comizzoli, P., Marker, L., (2017). Reproductive Physiology of the Cheetah and Assisted Reproductive Techniques. In Marker, L., Boast, L.K. and Schmidt-Küntzel, A. eds. Cheetahs: Biology and Conservation. United Kingdom: Academic Press. pp 385 – 402.
- Eaton, R.L. and Craig, S.J., 1973. Captive management and mating behavior of the cheetah. *The World's Cats*, 1, pp.217-254.
- Laurenson, M.K., 1993. Early maternal behavior of wild cheetahs: implications for captive husbandry. *Zoo Biology*, 12(1), pp.31-43.

## 8. Suggested Field Actions

a. At the outset, constitution of an Action Committee (herein after referred as the Committee) for technical guidance, monitoring and routine, as under -

- i. Field Director/ Protected Area Manager/ Division Forest Officer I/C-Member Convener
- ii. Nominee of the NTCA,
- iii. Nominee from Cheetah Steering Committee,
- iv. Nominee from Wildlife Institute of India (WII), and
- v. A team of field veterinarians (at least one each from NTCA, cheetah introduction site, and the WII).

**Note :** An international expert with experience in cheetah care and husbandry (as identified by the NTCA).

b. Based on the available history with the resident veterinarian(s) and the insights provided by field monitoring team(s), clearly outlining the current situation at hand.

c. Communicating the latest situation to the above committee and outlining a precise action plan based on the inputs/ suggestions received.

d. In case of suspected pregnancy in cheetah female, confirmatory examination (visual, physical or ultrasound based) to be conducted by the resident veterinarian(s). Detailed protocol in this regard is placed as **Annexure II- Protocols for Pre-partum Management of Pregnant Cheetah at Cheetah Introduction Sites**.

e. In case of confirmed pregnancy in cheetah female, initiating round the clock non-intrusive field monitoring. Detailed protocol on watch and ward in such scenarios is placed as **Annexure II - Protocols for Pre-partum Management of Pregnant Cheetah at Cheetah Introduction Sites**.

f. If situation warrants capture and thorough physical examination of pregnant cheetah female, the same

may be carried out until advanced pregnancy period (>10 days of parturition) using chemical immobilization. Detailed protocol in this regard, including safe drug combinations, dosages and specific considerations, is placed as **Annexure II- Protocols for Pre-partum Management of Pregnant Cheetah at Cheetah Introduction Sites.**

g. Birth of cheetah cub(s) (denning) can occur either in enclosed/ protected environment (larger acclimatization enclosures) or in free ranging conditions, with each warranting different approaches. Detailed protocol to deal with both is placed as **Annexure III- Protocols for Post-partum Management of Pregnant Cheetah and Cubs at Cheetah Introduction Sites.**

h. Upon confirmation of birthing/ parturition, whether in a protected environment or free-ranging conditions, the den site should be located using telemetry data or visual observation. Restrictions on vehicular and human movement in the den vicinity should be promptly implemented and access to the area should be limited only to the veterinary team to ensure health and well-being of the mother and cubs. Detailed protocol in this regard is placed as **Annexure III - Protocols for Post-partum Management of Pregnant Cheetah and Cubs at Cheetah Introduction Sites.**

i. Circumstances involving orphaning/ abandonment/ or illness in cheetah cubs should be immediately intervened with, keeping the Committee outlined in para 8(a) informed. The underlying issue should be immediately assessed and if deemed necessary, cheetah cub(s) should immediately be brought under human care. Cheetah cubs under 60 days of age can be easily handled with physical restraint. Older cubs however may warrant chemical immobilization. Detailed protocol in this regard, including safe drug combinations and dosages is placed in **Annexure IV- Protocols for Dealing with Orphaning/ Abandonment/ or Illness in Cheetah Cubs at Cheetah Introduction Sites.**

j. Cheetah cub(s) under circumstances detailed in para 8 (i) should be closely examined by the field veterinary team and the findings should be communicated to the Committee constituted as suggested at para 8 (a) to make recommendations with respect to following objectives:

- i. Managing the cheetah cub(s)/ mother 'in-situ', if cubs are old enough and treatable in the field or still under mothers' care.
- ii. Temporarily managing the cheetah cub(s) 'ex-situ', providing neonatal care or hand-rearing or veterinary interventions with the ultimate goal of rehabilitating them into natural, free-ranging conditions.

iii. Permanently housing cheetah cub(s) with congenital incapacitation, lasting deformities/ injuries, or untreatable illness in 'ex-situ' setup/ dedicated cheetah captive care facility.

iv. Rehabilitation of hand-reared cheetah cubs into free ranging conditions.

k. Neonatal care and hand rearing of cheetah cubs is a specialized field, involving the provision of dedicated care, nutrition, and socialization to ensure the cubs' well-being and successful development. However, it is crucial to strike a balance and minimize human imprinting, as the ultimate aim is for these cheetahs to exhibit natural behaviours and thrive independently in free ranging conditions. Protocol to be followed in this regard, including feeding regimens, husbandry, veterinary care, prophylaxis, socialization, training and rehabilitation are placed as **Annexure IV- Protocols for Dealing with Orphaning/ Abandonment/ or Illness in Cheetah Cubs at Cheetah Introduction Sites and Annexure V- Captive Care and Cub(s) Rearing Infrastructure Prototype at Cheetah Introduction Sites.** Additionally, the *guidance notes in Standard Operating Procedure to Deal with Orphaned/Abandoned Tiger Cubs and Old/Injured Tigers in the Wild* by NTCA with descriptions and precautions about habituation, conditioning, critical distance and imprinting appropriate for cheetahs is placed as **Appendix I.**

l. A designated representative from the NTCA/Cheetah Steering Committee/ Forest Department/ WII should communicate with the media (when necessary) to ensure accurate information is disseminated regarding the management interventions during circumstances covered under the SOP. Sensationalism or misinformation can result in additional rumour mongering as well negatively impact the morale of the field personnel and the project as a whole.

m. The Member Secretary (MS) - NTCA and Chief Wildlife Warden of the concerned state, in consultation with the committee outlined in paragraph 8(a) will be responsible for taking the ultimate decision on circumstances warranting human interventions.

n. It is imperative to have dedicated captive care and cub(s) rearing infrastructure at each cheetah introduction sites. These include holding enclosures designed to cater to the behavioural and nutritional requirements of cheetahs, as well as a neonatal care setup, with readily available emergency medications and necessary equipment that would be required in hand rearing process.

**Note:** Recent advances in management/ healthcare/ drugs/ medicines shall be prudently taken into account wherever necessary based on established recommendations while cheetah are managed under Project Cheetah in multiple landscapes.

# ANNEXURE I

## REPRODUCTIVE ECOLOGY AND BREEDING BEHAVIOUR OF CHEETAHS

### I.1. Reproductive Ecology

Southern African Cheetah females exhibit a non-seasonal breeding behaviour in their native home ranges, indicating that sexually mature females in wild are typically either pregnant, lactating, or raising young (Laurenson *et al.*, 1992; Wachter *et al.*, 2011). Current literature suggests that captive cheetah females reach physiological puberty between 25–30 months of age (Maly *et al.*, 2015). Nevertheless, it is essential for a female to display receptiveness and breeding behaviour before allowing successful copulation by male(s). This age range aligns with information from free-ranging females, who presumably conceive shortly after puberty and have their first litter at an average age of 29 months (Crosier *et al.*, 2017). Male cheetahs in the wild typically delay reproduction until reaching prime adulthood, which occurs between 48 to 96 months of age when they are capable of acquiring and defending territories from conspecifics (Caro, 1994).

Females exhibit polyoestrous behaviour, with a typical estrous cycle lasting two weeks, during which the receptive period varies from one (01) to six (06) days (Brown *et al.*, 1996). However, captivity and other stressors can alter the cycle length and receptive period, with some captive females exhibiting cycle lengths ranging from five (05) to 30 days (Brown *et al.*, 1996; Crosier *et al.*, 2017). In quarantine or captive conditions, the co-habitation of unrelated female cheetahs in pairs can lead to suppressed ovarian cyclicity, likely due to stress-related factors, particularly among subordinate individuals (Jurke *et al.*, 1997; Wielebnowski and Brown, 1998; Wielebnowski *et al.*, 2002). Separating unrelated females with fence lines has however been shown to re-initiate ovarian activity in previously suppressed individuals. They also resume cyclicity quickly when a litter is lost (Laurenson *et al.*, 1992). Unlike many other felid species, behavioural signs of estrous are difficult to detect in female cheetahs and require considerable observation and field



**Image 1.** Spray urinating and frequent rolling may be overt indications of behavioural estrous in cheetah females © Bradford-Wright, 2013

experience (Wielebnowski, 1999). Receptive females spray urinate on bushes, trees, and rocks and often undertake extensive movement during the period. Other overt signs of behavioural estrous include

frequent rolling, rubbing, sniffing, vocalizing, and increased tolerance or affection toward male cheetahs in the vicinity (Wielebnowski and Brown, 1998).



(A)



(B)

**Image 2.** (A) Cheetah mating pair in Kuno National Park © Sanath Muliya, NTCA, (B) Cheetah male courting behaviour of display © Bradford-Wright, 2013

## I.2. Mating Behaviour

When a male cheetah detects the scent markings of a female in estrous, it begins calling out with a series of yelps or stutter calling (Eaton, 1974; Bradford-Wright, 2013). Following the female's trail, the male exhibits signs such as salivation, penis exposure, and sniffing. Meanwhile, the female displays behaviours such as tail swishing, rolling, and spray urinating in close proximity to the male or a coalition (Bradford-Wright, 2013).

As they approach each other, the mating pair stands side by side facing opposite directions, orienting their heads to sniff each other's genitals. This is followed by immediate copulation or circling each other before copulation (Eaton, 1974). Copulation typically lasts less than a minute. The female solicits copulation by crouching down and the male approaches from be-

hind. The male sometimes maintains a hold on the female's nape while mating by biting her nape region. Mounting occurs when the male cheetah lifts its front legs off the ground and brings them to rest on the back of the female cheetah. This behaviour may occur when the female is standing but typically occurs when the female is lying upright on the ground with all four legs semi-tucked under her body, a posture known as lordosis (Bradford-Wright, 2013). Following individual mating instances, the female immediately throws off the male and starts rolling vigorously from side to side. Male in turn hisses/ exhibits flehmen response. These behaviours consistently indicate successful copulation, as documented in facilities that have successfully bred cheetahs abroad (Frank and Saffoe, 2005; Ziegler-Meeks, 2009) and also observed in breeding cheetahs at Kuno.



(A)



(B)

**Image 3.** (A) Mating with female in lordosis, (B) Female immediately throwing off the male after completion of mating as observed in Kuno National Park © Sanath Muliya, NTCA



The mating pair typically stay together for a few days and mate several more times during this period, averaging three (03) to five (05) times per day. The male will stay close to her, following and sniffing the ground where she has been, until the female is not receptive anymore and leaves the male. Cheetahs exhibit a polygynous mating system where one male can mate with multiple females (Crosier *et al.*, 2017). Additionally, a female cheetah may mate with more than one male during her receptive period. Since several follicles mature simultaneously in female cheetahs, the same litter can have cubs from different fathers if the female mated with multiple males during estrous (Gottelli *et al.*, 2007; Crosier *et al.*, 2017). Multiple paternities are rare from males of the same coalition as the dominant male in the social group tends to get priority in mating (Mills and Mills, 2017). Nonetheless, most coalition members do share mating with same females.

### I.3. Pre-partum and Parturition and Post-partum Behaviour

Indications of pregnancy in cheetah may include an increase in appetite and weight and during the third

trimester, nipple development and visible relatively bulged belly (Ziegler-Meeks, 2009). Following a gestation period of three (03) months, female cheetahs give birth to litters of up to six (06) cubs (Gottelli *et al.*, 2007; Crosier *et al.*, 2017).

Birth takes place in bushy patches of vegetation, tall grass, or rock cavities, chosen for the protection they provide for the cubs (Sievert, 2020). Since all the introduced cheetahs in India are radio-collared, den site can precisely be identified post parturition as females tend to stay-put in same location for two (02)- three (03) days and then develop a star patterned movement (exploring different directions, but always returning to the same location). Following parturition, the female will immediately eat the afterbirth by delicately removing the foetal membrane with her teeth (Cheetah outreach, 2015). Mothers with newly emerged cubs spend a greater proportion of the day observing their surroundings and are more vigilant; these activities decline as cubs grow older. Cheetah cubs are born altricial (requiring significant parental care) and remain in the den for 51-65 days (Laurenson, 1993). Cubs open their eyes between four (04) and 14 days (average 10 days) and start crawling in about two (02) to three (03) days and walk at three (03) weeks of age.



**Image 4.** A pregnant cheetah female in its third trimester with visibly bulged belly in Kuno. © Sanath Muliya, NTCA



**Image 5.** One week-old cheetah cubs kept hidden by female in thick grass cover in Kuno. © Sanath Muliya, NTCA

During the first six (06) - seven (07) weeks of age, the female cheetah keeps her cubs hidden and nurses them in dense vegetation to avoid detection or predation. The mother may frequently change den sites, carrying one cub at a time by the nape of the neck for various reasons, including preventing smells from accumulating and attracting predators, or to move closer to concentrations of prey so she doesn't have to travel far to hunt. Lactation in cheetah females typically continues for several months; cubs are entirely dependent on milk until around 2 months of age (Caro, 1994; Mills *et al.*, 2017). By 4 months old, mothers cease nursing as the cubs have typically developed the ability to consume solid food (Caro, 1994; Mills *et al.*, 2017). Nursing is avoided by employing behaviours such as covering their nipples with hind legs, rolling onto their bellies, or sitting up (Caro, 1994; Mills *et al.*, 2017).

At 6 weeks of age, the cubs start to follow their mother, but they return to their den by the end of the day until about 8 weeks. After 8 weeks, they continuously follow her, settling down for the night wherever they are (Cheetah outreach, 2015). From 6 weeks to 3 or 4 months is the most vulnerable period for cubs, with predation and starvation being the primary causes of death. Cubs are most susceptible to predation while still in the den or when left alone for extended periods while their mother hunts. Young cubs exhibit a notable failure to recognize danger and react to other carnivores typically scattering when their mother runs. Mothers with young cubs that have exited the den exhibit heightened vigilance, detecting predators at greater distances (Caro, 1994). This heightened vigilance may manifest as stalking, chasing, slapping, or attempts to bite predators or large herbivores (Laurenson, 1994). A cheetah mother will aggressively confront smaller predators and may even confront hyenas and leopards threatening her cubs to pro-

vide them with an opportunity to escape. However, when approached by humans or large predators, she can only simulate charges and vocalize without actual physical attacks (Cheetah outreach, 2015). By the age of 5 or 6 months, cubs become more aware of predators' presence and respond by either remaining still or running directly away from danger instead of scattering. They can usually outrun most carnivores except other cheetahs. In the event of separation, the female reunites with her cubs by emitting chirping calls, a bird-like sound that may deceive other predators (Cheetah outreach, 2015).

Female cheetahs remain with their cubs until they are approximately 18 months old, during which they teach vital survival skills such as predation and predator avoidance (Caro, 1994). Play behaviour in cubs during the period is also believed to serve as training for future survival and propagation (Caro, 1987, 1995). Four categories of play behaviour have been distinguished in cheetah cubs: locomotor play, primarily seen in very young cubs, possibly enhancing their evasion skills against predators; noncontact social play, which includes crouching and stalking family members, necessary skillsets for successful hunting; contact social play; and object play (Caro, 1995). The last two categories are mainly observed in older cubs and object play entails the mother capturing and releasing live prey for the cubs to refine their hunting abilities (Caro and Hauser, 1992).

Once independent, adolescents usually remain in a sibling group for up to another six months after separation from mother. Female siblings may stick together for a few additional weeks before becoming solitary and establishing separate, albeit largely overlapping, home ranges proximal to their natal territory (Caro, 1994; Frame, 1984; Marker *et al.*, 2008). In contrast,

male siblings frequently establish coalitions, maintaining lifelong bonds, and disperse to settle away from their natal range (Caro, 1994; Caro and Kelly, 2001). Solitary males from a litter, if any, may choose to remain solitary or join other solitary males or a coalition (Caro, 1994; Mills *et al.*, 2017). In cheetahs, paternal involvement in offspring rearing is absent, leaving the responsibility of parental care solely to females. Exam-

ining maternal-offspring interactions provides valuable insights into the life history decisions of female cheetahs, including the allocation of time towards weaning, vigilance, predator defence, teaching hunting skills, and determining the timing of offspring separation.



**Image 6.** Female cheetah with her two week old cubs at den site in Kuno National Park © Onkar Anchal, MPFD

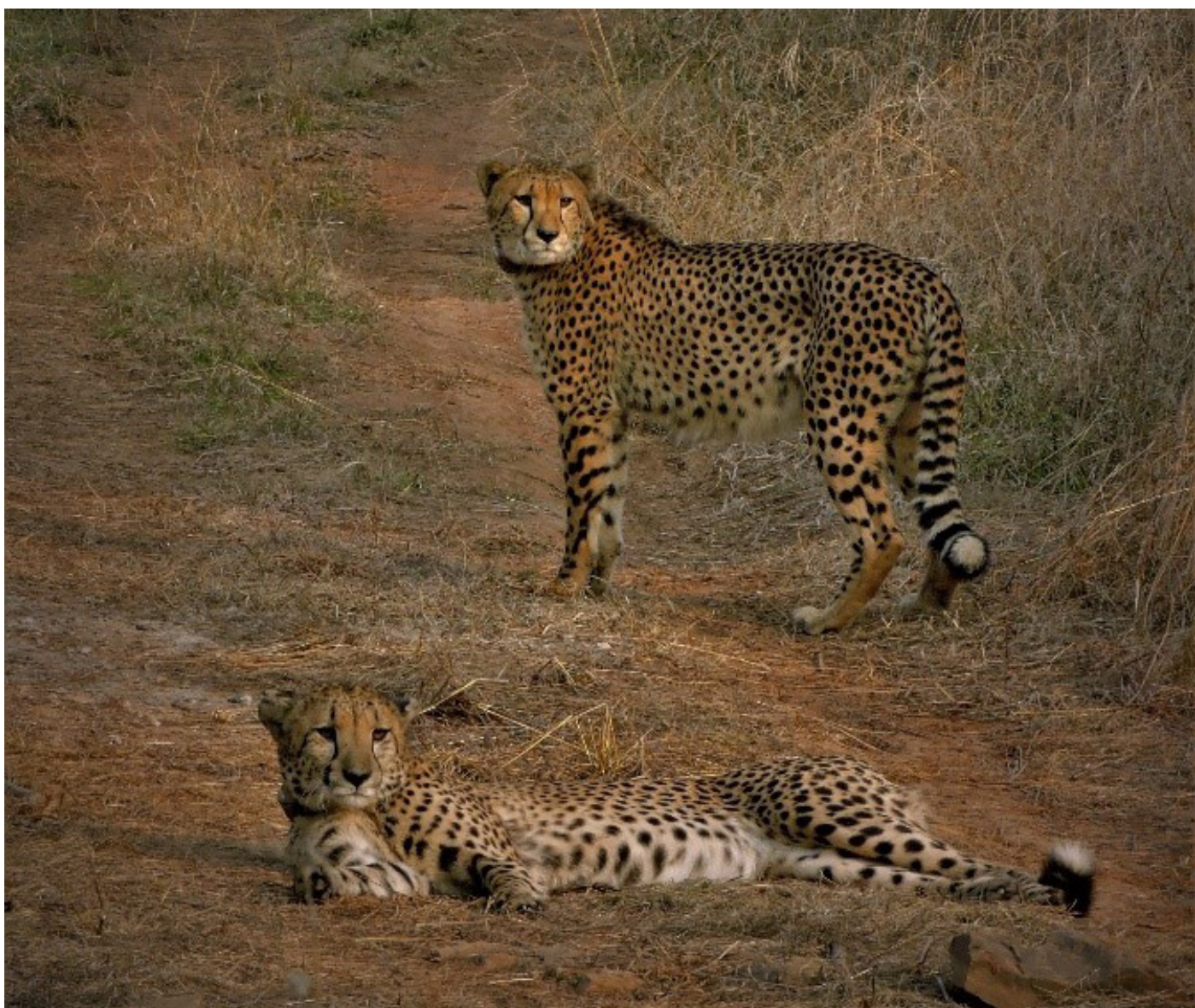
#### **I.4. Nutritional Requirements of Cheetah during Pre- and Post-partum period**

The nutrition of both mother and cubs is initially interlinked, as maternal nutrition and body stores play a crucial role in providing nourishment for foetal growth and development during gestation (lasting 90-95 days) and are equally important during the nursing period of cubs (0-4 months old) (Caro, 1994). In the wild, cubs also rely on their mothers for the supplementation of prey during the weaning process, which typically begins at approximately 5 weeks of age, and continue to depend on maternal provisioning post-weaning until they become independent hunters (12-18 months old). During late pregnancy and lactation, energy expenditure in female cheetahs can increase up to two to five-fold due to activities such as predator avoidance, searching for water and food,

and securing safe places for cubs (Laurenson, 1995a). Cheetah cubs develop more quickly than young of any other large felid, gaining about 45 grams of weight daily (Cheetah outreach, 2015). In the wild, maternal food intake exceeding 1.5 kg per day is necessary to maintain adequate milk production for cub growth, while cub growth decreased when maternal intake fell below 1.5 kg per day, with no added benefit observed with higher intake levels (up to 5 kg per day) (Laurenson, 1995b). To sustain higher intake levels, cheetahs adjust their diet by hunting and targeting larger prey, which in turn increases the proportion of large prey killed (Cooper *et al.*, 2007); lactating female cheetahs consume 65-97% more food compared to non-reproductive females.



**Image 7.** Two week old cheetah cubs at den site in Kuno National Park ©Onkar Anchal, MPFD



**Image 8.** Male cheetah coalition in Kuno © Moulik Sarkar, WII

## ANNEXURE II

### PROTOCOLS FOR PRE-PARTUM MANAGEMENT OF PREGNANT CHEETAH AT CHEETAH INTRODUCTION SITES

#### II.1. General Considerations

- All introduced cheetahs in India are equipped with radio collars and are regularly tracked by dedicated field teams on a daily basis. This meticulous monitoring allows for close observation of each cheetah, including documenting their hunting activities, interactions with other individuals, and instances of successful mating.
- These occurrences should be carefully recorded, and such females should consistently be visually assessed for signs of pregnancy, such as increased appetite, weight gain, nipple development, and a visibly swollen abdomen, beginning as early as the second month after mating. Pregnancy can however be difficult to confirm, especially during the first trimester and if the female is bulkier or carrying a small litter.
- A day-to-day record of activities and kills made by suspected pregnant females should be maintained through unobtrusive monitoring, with bi-weekly supervisory checks by veterinarians and weekly checks by the concerned authority of Park Management.
- Pregnant cheetahs have substantially increased nu-

tritional requirements. If the pregnancy occurs within fenced area or larger acclimatizing boma, adequate prey base should always be maintained through frequent prey supplementation to aid in successful hunts.

- In free-ranging cheetahs, pregnant females will have ample prey available. Nonetheless, in case of prolonged fasting bouts (> 5 days) or presence of pregnant females in areas with lower prey density, dressed meat may be supplemented after thorough review of the situation.
- In drier areas/ months, adequate arrangements for multiple water source shall be additionally made/ installed in areas harbouring pregnant females.
- While monitoring is essential, it is important to strike a balance to avoid too much human presence around such cheetahs, so as to prevent undue stress.
- In fenced areas, restrictions to non-essential personnel shall be strictly enforced.
- In free-ranging environments, areas that are known to harbour pregnant females should be restricted from tourist access.



*Image 9. Male cheetah coalition in Kuno © Moulik Sarkar, WII*

## II.2. Capture and Chemical Immobilization and Health Care

- Pregnant cheetahs with sufficient prey availability typically do not require any veterinary interventions or nutritional supplements. Nonetheless, decision on the same shall be taken on case-by-case basis in due consultation with the committee outlined in paragraph 8(a).
- Capturing and handling of pregnant or suspected pregnant cheetah females should only be conducted when absolutely essential.
- Instances such as replacing radio collars with depleted batteries to maintain uninterrupted monitoring, veterinary interventions for treating injuries or illnesses, and confirming pregnancies in suspected cases within free-ranging or wild settings may unavoidably require capture.
- The MS-NTCA and Chief Wildlife Warden of the concerned state, in consultation with the committee outlined in paragraph 8(a) will be responsible for taking the ultimate decision on circumstances warranting capturing of pregnant females.
- If situation warrants, capture and thorough physical examination of pregnant female may be carried out in early to advanced pregnancy period (>10 days of parturition date) by chemical immobilization by qualified personnel using following drug combination:

***Ketamine-Medetomidine-butorphanol combination at dose rate of 3 mg/kg, 0.04 mg/kg and 0.2 mg/kg respectively, reversed with atipamezole at 4X medetomidine dose.*** Said combination has proven to be safe in pregnant cheetahs in Kuno National Park.

- ***Any combinations with tiletamine and zolazepam should especially be avoided*** in pregnant females as safety of the drugs in said cases are unclear.
- The administration of veterinary medicines, particularly those contraindicated during pregnancy such as dewormers, must be completely avoided.
- Under no circumstances should physical restraint or cage capturing techniques be employed with preg-

nant females to prevent unnecessary stress and complications.

- If circumstances necessitate the capture of pregnant females, it is imperative that the team from the National Tiger Conservation Authority and Kuno National Park, who possess expertise in handling cheetahs, be invariably engaged.

## II.3. Ex-situ Management of Pregnant Females

- If situation warrants prolonged veterinary interventions in pregnant female, it should be immediately shifted to the quarantine/ treatment facility after due certification from on-site veterinarian(s) and in due consultation with the committee outlined in paragraph 8(a).
- Transportation of capture site to quarantine/ treatment facility shall be carried out with utmost precautions, during cooler periods of the day, utilizing appropriate cheetah crates and in the presence of onsite veterinarian(s).
- The quarantine/ treatment facility selected for holding pregnant females shall be in an isolated section, devoid of other cheetahs and frequent human presence.
- A machan or raised platform should be constructed with adequate concealment measures adjacent to quarantine/ treatment facility to allow for continuous monitoring of these cheetahs without disrupting their natural behaviours or causing unnecessary stress.
- Due to the significant stress that captivity can impose on pregnant females, their time in captivity should be curtailed to the absolute minimum necessary period.
- Since provision to natural prey is not feasible in captivity, adequate dressed meat shall be provided until release into wild. Said meat shall be procured from a certified vendor and subjected to thorough examination by onsite veterinarians before feeding.
- Feeding should be carried out by providing a large meal (15 – 20 kg) every third or fourth day during the period, mimicking the natural feed starvation cycle. Under no circumstances should daily feeding be carried out, as cheetahs are very prone to gastrointestinal disorders



(A)



(B)

**Image 10.** Appropriate crate for long distance transport of cheetahs; (A) Wooden crate & (B) Metal crate used in Kuno.  
© Moulik Sarkar, WII

arising out of such unnatural feeding regimen.

- The holding enclosures containing pregnant females should be regularly cleaned of excreta and leftover meat to prevent the buildup of pathogens. However, housekeeping activities in such enclosures should be kept brief to minimize stress on the pregnant cheetahs.
- The onsite veterinarian(s) shall record all the observations in well-defined formats with respect to feeding, health and well-being, including veterinary interventions and husbandry activities that were carried out.
- Said records shall be monitored by the Deputy Director and the Field Director on regular basis and

communicated to the committee outlined in paragraph 8(a) for necessary recommendations.

- External veterinary expertise shall be availed on case-by case basis whenever necessary, in due consultation with the committee outlined in paragraph 8(a).
- The MS- NTCA and the Chief Wildlife Warden of the concerned state, in consultation with onsite veterinarian(s) and the committee outlined in paragraph 8(a) will be responsible for taking the ultimate decision regarding such cheetah on either extending captivity or release back to wild.



**Image 11.** A treatment enclosure in Kuno for short-term holding of cheetah. © Moulik Sarkar, WII

## II.4. Watch and Ward of Pregnant Females

- The on-site veterinary team should visit the pregnant females, at least once a day for visual health examination.
- The dedicated field monitoring teams already established at each cheetah introduction site will also be responsible for the surveillance and care of pregnant females.
- The field monitoring staff shall be well versed in normal behaviour of the cheetahs to notice any deviance and sensitive to wild carnivore behaviour. This is especially with respect to appearance, gait and feeding habit of individual animals.
- Training on above aspects shall routinely be imparted on field monitoring staff by the onsite veterinarians and WII research team.
- In wild conditions, the staff shall ensure that no domestic livestock including stray dogs are present in the vicinity of pregnant females.

- The staff shall record all the observations in well-defined formats with respect to hunting, inter-species interactions, behavioural and health parameters.
- The staff shall be equipped with wireless sets to communicate any exigency/ change from routine.
- The staff shall promptly communicate to the onsite veterinary team of any irregularities or even the slightest suspicion of ill health immediately.
- The following records shall be maintained which shall be monitored by the Range Forest Officer in their entirety. Test check of records shall be carried out by the concerned authority of the Park management every month during field visits/ surprise checks
  - a. General Appearance and Belly Scores
  - b. Habitat Interventions
  - c. Feeding Pattern/ Release of Prey
  - d. Maintenance Activities
  - e. Reporting/ Wireless register

## ANNEXURE III

### PROTOCOLS FOR POST-PARTUM MANAGEMENT OF PREGNANT CHEETAH AND CUBS AT CHEETAH INTRODUCTION SITES

#### III.1. General Considerations

- All introduced cheetahs in India are equipped with radio collars and are regularly tracked by dedicated field teams on a daily basis. This meticulous monitoring allows for close observation of each cheetah, including successful parturition/ cub births.
- The frequency of locations communicated by the radio-collar should be kept at one-hour interval, starting at least five days before the anticipated parturition date and continuing until at least four (04) to six (06) weeks after birth.
- Upon confirmation of parturition, the den site shall be promptly located using telemetry data or visual monitoring. After parturition, den sites can be accurately identified as females typically remain stationary in the same location for two (02) to three (03) days around the birth date. Subsequently, they exhibit a pattern of movement resembling a star shape, as observed in telemetry data, wherein movement is in various directions but consistently returning to the initial location.
- Den information shall only be securely shared with essential field personnel responsible for monitoring the cheetah female.
- Restrictions on vehicular access and excessive human movement in the den vicinity shall promptly be implemented.
- Den sites should be inspected by veterinary team within the first weeks of denning to evaluate litter size and cub survival. Checking dens can be performed by one or two persons while the female is away hunting, which can be confirmed through radio-telemetry. It is essential to refrain from handling cubs during this period to minimize disturbance to the denning process.
- A day-to-day record of activities and kills made by nursing females should be maintained through unobtrusive monitoring, with daily supervisory checks by veterinarians and weekly checks by the concerned authority of Park Management.
- The cubs typically open their eyes around 10 days af-

ter birth. After this period, they shall be physically examined by the veterinarian(s) and weighed to assess their health and well-being. This examination should occur while the cheetah female is away hunting, as previously mentioned. Handling should be done gently, swiftly, and minimally, with the use of gloves and other personal protective equipment (PPE) to prevent the transmission of pathogens and minimize the transfer of human scent.

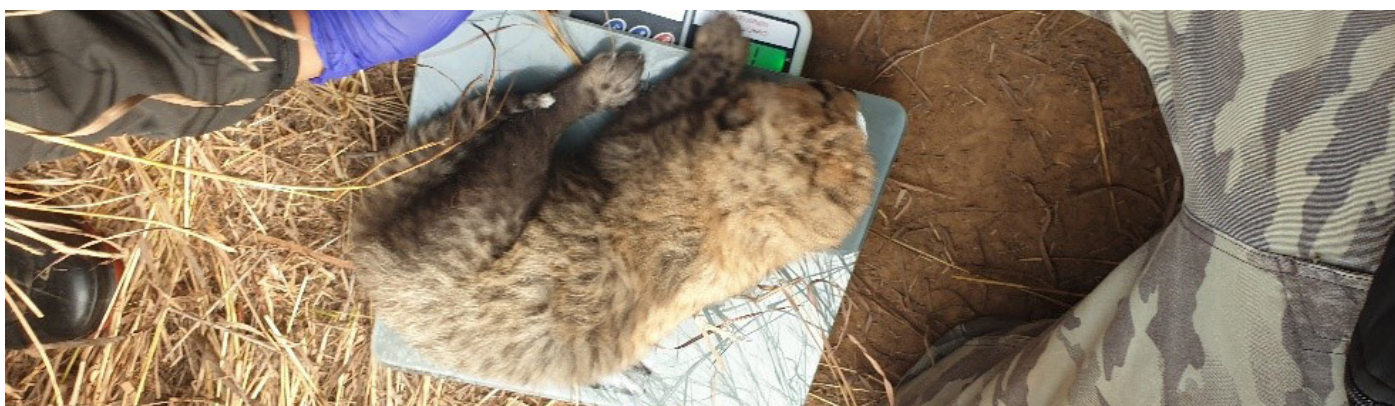
- This process should be repeated with periodic checks whenever opportunities arise until the cheetah cubs reach approximately one month/ three (03) to four (04) weeks of age. Regular monitoring during this critical period helps ensure the proper development and care of the cheetah cubs.

- By the sixth week of age, the cheetah cubs will become increasingly mobile, making them difficult to catch as they scurry upon approach. Therefore, handling should be strictly avoided unless absolutely necessary for prophylaxis or treatment purposes. It is crucial to minimize human intervention and allow the cubs to continue their development and adaptation to their environment without undue disturbance.

- Between six (06) to eight (08) weeks of age, cubs begin venturing out of the den site accompanied by their mother. To ensure the well-being of both the mother and cubs, concealed trail cameras shall be set up along probable trails and around the den vicinity. This allows for continuous monitoring of the mother and cubs without direct human interference, providing valuable insights into their health and behaviour.

- Routine monitoring by the veterinary team should also persist during the aforementioned period until 18 months of age, allowing for visual observation of the cubs with their mother whenever opportunities arise. This ongoing monitoring ensures that any potential health issues or concerns be addressed promptly.

- In free-ranging cheetahs, nursing females will always have ample prey available. Nonetheless, in case of prolonged unsuccessful hunts or frequent encounter of female with belly score less than two (02), dressed meat shall be supplemented as and when necessary.



**Image 12.** A cheetah cub being weighed in field conditions at Kuno. © Sumit Patel, WII





**Image 13.** Watchful female cheetah nursing her two week old cubs at den site in Kuno National Park © Onkar Anchal, MPFD



**Image 14.** Female cheetah feeding on supplemented carcass with her two month old cubs in Kuno National Park Sanath Muliya, NTCA

## III.2. Specific Considerations

Births of cheetah cubs (denning) can take place either in fenced areas/ larger acclimatization enclosures or in free-ranging conditions. While general considerations apply to both scenarios, each situation warrants specific considerations as outlined below:

### III.2.1. Fenced Areas/ Larger Acclimatization Enclosures

- Similar to pregnant cheetahs, nursing mothers have substantially increased nutritional requirements. If the birthing occurs within fenced area or larger acclimatizing boma, ad libitum prey base should always be maintained through frequent prey supplementation to aid in successful hunts.
- Though fenced areas are relatively large, they will have limited availability of space, provision for adequate spots with denning area, shade, vegetation and water source shall be created well in advance to the parturition dates.
- Alternatively, cheetahs may be relocated to adjacent

or different fenced areas/ acclimatization enclosures where these requirements are naturally available.

- Fences shall regularly be checked for breaches or intrusion by large predators.
- Since fenced areas provide some sort of protection from predators, the watch and ward shall be limited to periodic observation by veterinary team as elaborated under general considerations above.
- Contingency plans for emergencies such as adverse weather, forest fire, etc shall be laid down in writing.
- Presence of cheetah male(s) shall be avoided in adjacent fenced or larger acclimatization enclosures.
- While enclosures or bomas are typically designed to be predator-proof, smaller carnivores such as foxes, jungle cats, or scavengers like wild pigs may still inhabit them. It is essential to promptly remove these potential threats from birthing enclosures well before parturition to prevent cub predation events.

### III.2.2. Free-Ranging Conditions

- In the wild, cheetah females and their cubs face numerous threats to their survival, with predation from other carnivores being the primary challenge. Cub mortalities or emergencies in such conditions are expected to be extremely high due to the harsh realities of the natural environment.
- This in turn necessitates enhanced monitoring, protection measures, preparedness, and contingency plans to effectively address and mitigate such emergencies.
- In addition to veterinary monitoring, round-the-clock non-intrusive presence of a field monitoring team in the vicinity but not too close shall be ensured to offer protection to the den site. This continuous presence serves as a deterrent to potential threats and provides an additional layer of security for the cubs when mother is away hunting.
- Non-intrusive observation techniques, such as trail cameras or field installable solar powered remote monitoring, to minimize disturbances to the natural behaviour of the animals.
- Pregnant cheetah females typically avoid human-dominated areas for denning. However, if a situation arises where a mother cheetah is found far away from the Protected Area during last trimester, she shall be promptly relocated to a suitable Protected Area well in advance of the parturition dates.
- In free-ranging conditions, nursing cheetah females will always have ample prey available. Nonetheless, in case of prolonged unsuccessful hunts or frequent encounter of female with belly score below two, dressed meat shall be supplemented as and when necessary.
- A field veterinary unit shall be on standby at all times to intervene promptly in case of any emergent situations. This ensures rapid response and effective management of any medical or health-related issues that may very well arise in free ranging condition.

### III.3. Capture and Chemical Immobilization and Health Care of Pregnant Cheetahs

- Nursing cheetahs with sufficient prey availability typically do not require any veterinary interventions or nutritional supplements. Nonetheless, decision on the same shall be taken on case-by-case basis in due consultation with the committee outlined in paragraph 8(a).
- Capturing and handling of nursing cheetah females and her cub(s) should only be conducted when absolutely essential.
- Instances such as veterinary interventions for treating injuries or illnesses, administration of prophylaxis, etc. within free-ranging or wild settings may unavoidably require capture.
- The MS-NTCA and the Chief Wildlife Warden of the concerned state, in consultation with the committee outlined in paragraph 8(a) will be responsible for approving each such operations.
- If situation warrants capture and thorough physical examination of nursing cheetah female, it should be carried out by chemical immobilization by qualified personnel using either of the following drug combination, ***Ketamine-Medetomidine-butorphanol combinations at dose rate of 3 mg/kg, 0.04 mg/kg and 0.2 mg/kg respectively, reversed with atipamezole at 4X medetomidine dose.***

OR

***Tiletamine-Zolazepam and Medetomidine combination at dose rate of 30 — 25 mg (total dose) + 2 mg (total dose), respectively, reversed with atipamezole at 4X medetomidine dose.***

- The procedure of capture by chemical immobilization and thorough physical examination of nursing cheetah female shall be carried out with utmost care and precaution.
- Whenever a nursing mother cheetah is immobilized, particularly in wild conditions, it is crucial to also capture and secure the cubs in crates until the mother is reversed out of anesthesia, so as to ensure their safety.
- Cheetah cubs below two (02) months of age can easily be captured using physical restraint.
- Cubs above two (02) months of age shall be captured using chemical immobilization by qualified personnel if situation warrants, using either of the following drug combination:

***Ketamine-Medetomidine-butorphanol combinations at dose rate of 3 mg/kg, 0.04 mg/kg and 0.2 mg/kg respectively, reversed with atipamezole at 4X medetomidine dose.***

OR

***Tiletamine-Zolazepam and Medetomidine combination at dose rate of 30 — 25 mg (total dose) + 2 mg (total dose), respectively, reversed with atipamezole at 4X medetomidine dose.***

- During both the above scenarios, capture and handling process shall be gentle, swift, and minimal to avoid undue stress to the cheetah cubs and possible maternal rejection due to human scent. Once the cubs are crated, disturbance, activities and noise around the crates shall also be kept minimal.
- Cheetah cub(s) shall be subjected to appropriate prophylaxis measures as tabulated below.
- If circumstances necessitate the capture of nursing cheetah females or cubs, the veterinary team from the

Measure	Drug/ Vaccine	Schedule	Note
Vaccination	Rhinotracheitis-Calci-Panleukopaenia-Chlamydia Psittaci Vaccine	First dose at 06-07 weeks of age. Booster at 09 – 10 weeks of age Yearly annual booster	<ul style="list-style-type: none"> <li>• Non adjuvanted and killed vaccine such as TruFel™ HC2PCh or Fel-O-Vac to be used.</li> <li>• Live attenuated or inactivated vaccines should be completely avoided.</li> <li>• Vaccine to be administered subcutaneously</li> </ul>
	Rabies vaccine	First dose at 04 months of age. Booster at 01 year age Yearly annual booster	<ul style="list-style-type: none"> <li>• Non adjuvanted recombinant vaccines such as PUREVAX Feline Rabies Vaccine to be used.</li> <li>• Vaccine to be administered subcutaneously</li> </ul>
Deworming	Pyrantel pamoate	First dose at 06 weeks, repeated after a month, and every 03 months until adulthood.	<ul style="list-style-type: none"> <li>• To be administered orally at dose tare of 3-5 mg/kg</li> </ul>
External parasiticial	Fluralaner	Above 06 months of age, single application effective for 04 months	<ul style="list-style-type: none"> <li>• To be used judiciously, preferably during monsoon/ post monsoon/ humid weather.</li> <li>• To be administered topically or orally</li> </ul>



**Image 15.** Monitoring cheetah cubs with trail cameras in Kuno National Park © MPFD and WII

NTCA, Kuno NP and WII, who possess expertise in handling cheetahs, shall be invariably involved.

### III.4. Ex-situ Management of Nursing Cheetah Females and Cubs

- If situation warrants prolonged veterinary interven-

tions in nursing female, it should be immediately shifted to the quarantine/treatment facility along with all the cubs after due certification from on-site veterinarian(s) and in due consultation the committee outlined in paragraph 8(a).

- Protocols as described above for ex-situ management of pregnant female shall also be applicable here, with following additional considerations.
- Transportation from capture site to quarantine/ treatment facility shall be carried out with utmost precautions, during cooler periods of the day, utilizing appropriate cheetah crates and in the presence of onsite veterinarian(s).
- Cheetah cub(s) and mother shall be transported in separate crates to avoid injury to cubs during the process.
- The quarantine/ treatment facility selected for holding such females shall be in an isolated section, devoid of

other cheetahs and frequent human presence. Fencing of said enclosure should also be covered with green shade netting to provide secluded environment.

- The holding enclosures containing nursing females and cubs should be regularly cleaned of excreta and leftover meat to prevent the build-up of pathogens. However, housekeeping activities in such enclosures should be kept absolutely brief, with one or two persons involved. This needs to be carried out on feeding days.
- The MS-NTCA and the Chief Wildlife Warden of the concerned state, in consultation with onsite veterinarian(s) and the committee outlined in paragraph 8(a) will be responsible for taking the ultimate decision on either extending captivity or release of such cheetah back to wild.



**Image 16.** Female cheetah resting with her two month old cubs in Kuno National Park © Sanath Muliya, NTCA

## ANNEXURE IV

### PROTOCOLS FOR DEALING WITH ORPHANING/ ABANDONMENT/ OR ILLNESS IN CHEETAH CUBS AT CHEETAH INTRODUCTION SITES

#### IV.1. General Considerations

• All introduced cheetahs in India are fitted with radio collars and are meticulously tracked by dedicated field teams on a daily basis. This rigorous monitoring, combined with the protocols outlined in **Annexures II & III**, facilitates close observation of each cheetah, including instances of orphaning, abandonment, or illness in cheetah cubs.

In cases where the mother is still alive, every effort should be made to reunite the cubs with her and support natural parenting behaviour.

• Circumstances such as orphaning due to mortality or incapacitation of the mother caused by injury, illness (natural or otherwise), abandonment, cubs with in-born incapacitation, weak cheetah cubs, runts, and injured or sick cheetah cubs will inevitably necessitate hand-raising and human interventions for the survival and well-being of the cubs.

• Before being brought under human care, cub(s) should undergo on-site evaluation by the veterinary team to assess for health problems, hydration status, and congenital defects. The findings of this evaluation should be promptly communicated to the field director, who will then relay the information to the committee outlined in paragraph 8(a).

• The MS-NTCA and Chief Wildlife Warden of the concerned state, in consultation with the committee outlined in paragraph 8(a) will be responsible for taking the ultimate decision on circumstances warranting neonatal care and hand raising of cheetah cubs.

• Before attempting transportation for neonatal care or hand-rearing, necessary veterinary intervention, including on-site health stabilization, should be carried out to ensure the well-being of the cubs. Additionally, a field veterinary unit equipped with necessary emergency medication shall accompany the veterinary team at all times to intervene promptly in case of emergent situations, ensuring the safety and health of the cubs during transportation and subsequent care.

• When situation warrants, cheetah cubs below two (02) months of age shall be captured using physical restraint. Cubs above two

(02) months of age shall be captured using chemical immobilization by qualified personnel as described in **Annexure III**.

• Transportation from capture site to hand rearing/ treatment facility shall be carried out with utmost precautions, during cooler periods of the day, utilizing appropriate cheetah cub crates and in the presence of onsite veterinarian(s).

• To prevent exposure to infectious diseases, handling of cub(s) should always be carried out while wearing proper personal protective equipment, including gloves, gowns, masks, and boots.

• Neonatal care and hand rearing shall be carried out

with the utmost caution, providing dedicated care, appropriate nutrition, and socialization to ensure the well-being and successful development of the cubs.

• During above interventions, every effort should be made to minimize human imprinting, as the ultimate goal is for these cheetahs to exhibit natural behaviours and thrive independently in free-ranging habitats. This involves minimizing unnecessary human interaction and providing secluded and safe environment, ensuring that the cubs retain their natural instincts and behaviours to increase their chances of successful integration into the wild.

#### IV.2. Consideration for Neonatal Care in Cheetah Cubs

Cheetah cubs are born altricial, meaning they are relatively underdeveloped at birth and require significant parental care, especially during the initial days of life. Cubs that have not received sufficient colostrum, the first milk produced by the mother, are more susceptible to infectious diseases due to their decreased immunity resulting from the failure of passive transfer of antibodies. A large percentage of hand-reared cubs in captive setups abroad have been observed to die before reaching 30 days of age due to these reasons, highlighting the criticalities involved in neonatal care and management of cheetah cubs. The following specific considerations shall thus be followed to maximize their welfare and chances of survival:

• To prevent exposure to infectious diseases, neonatal care should be conducted in an isolated room by qualified veterinarian(s) only, who are equipped with appropriate personal protective equipment.

• The room designated for neonatal care should be temperature-controlled to ensure optimal conditions for the health and well-being of the cheetah cubs. Ideally, it should also be equipped with a veterinary incubator.

• The room designated for neonatal care should be equipped with a foot dip at the entrance to prevent the spread of pathogens, along with adequate sanitary facilities to maintain cleanliness and hygiene standards.

• Neonates should be placed in a disinfected incubator set to a temperature range of 85-90°F or in a clean box lined with fresh towels over a heating pad, with an adjustable heat lamp positioned above. This practice is especially crucial for cubs less than 10 days old to ensure that they remain within the appropriate temperature range at all times, supporting their physiological needs and promoting their health and well-being.

• The routine neonatal examination should include monitoring of body temperature (normal range 98-100° F) and weight (normal range 350-500g), along with other necessary vital parameters.

• If cubs have not suckled (in cases of maternal aban-

donment/ death immediately after parturition), a plasma transfusion from the mother (if alive) or another cheetah shall be carried out. Plasma shall be obtained by centrifugation of freshly drawn blood for 10 minutes at 1,000-2,000 x g using a refrigerated centrifuge.

- Plasma shall be given to the cubs subcutaneously or by mouth at rate of up to 10% of cubs body weight, every two (02)-three (03) days for the first one (01)—two (02) weeks.
- Adequate provisions shall be made to ensure the availability of clean bottles and nipples for every feeding of the neonatal cheetah cubs.
- After each use, used bottles should be thoroughly disinfected and rinsed well, and then sterilized (autoclaved) on a daily basis.
- Commercially available kitten feeding bottles, equipped with slow-flow (preemie) nipples, are recommended for feeding neonates, as they are suitable for their delicate feeding requirements and help minimize the risk of overfeeding or aspiration.
- Feeding in neonates shall be carried out only when they are in stable, alert and responsive state. Force feeding while sleeping or unresponsive state should be totally avoided.
- The initial feeding attempt for neonatal cheetah cubs should always be with 5% dextrose in water. This is done to evaluate the suckle response of the cubs. If the suckling reflex is strong and the cubs demonstrate an ability to nurse effectively, further feeding can then be initiated using an appropriate milk formula or replacer.
- Neonates shall be nursed with commercially available Kitten Milk Replacers (KMR: Royal Canin® Baby Cat Milk, Beaphar® Lactol Kitten Milk, Bio PetActive KMR etc. are readily available in India). Alternatively, freshly milked goat milk (with dilutions suggested below) may also be used (previously used in successfully hand raising a cheetah cub in Kuno).
- Feeding with the above formulations should begin with a dilution of 25% liquid KMR/ sterilized goat milk and 75% Oral Rehydrating Solution (ORS)/ Pedialyte. There should be at least three (03) feedings at this strength before increasing to a 50:50 ratio. The 50:50 ratio should be fed for a minimum of 48 hours before further increasing to a 75:25 ratio.
- If diarrhoea occurs after changing the concentrations as stated above, the concentration of the milk formula should be reverted to the previous dilution until stools appear solidified. This approach helps ensure that the cheetah cubs receive the appropriate balance of nutrients and hydration while minimizing the risk of gastrointestinal upset.
- While using commercially available KMR, lact-aid or any other commercially available supplements with combination of prebiotics, enzymes, and probiotics (e.g. Gutwell®) shall be added to aid in digestion.
- Neonates should be bottle fed every 2 hours until 2 weeks of age (roughly around 10 — 11 feedings per day)
- The average growth rate in a healthy hand-reared cheetah cub averages 48 g/ day and amount of formula per feeding shall always be determined by cub's weight.
- Amount of milk formula shall start around 10%—12% of body weight per day and is gradually increased to

15%—20%. If problem such as indigestion or diarrhoea persists, amount may be reverted back to earlier percentages.

- For ease of understanding, following example is being provided:

For a cub weighing 500g at birth, the total milk formula requirement per day is 60ml (at 12%), followed by gradual rise to 100ml (at 20%) over first couple of days. The said amount is divided into 10 - 11 feedings per day until two (02) weeks of age: Thus 05 — 06 ml/feeding of milk formula shall initially be provided and gradually raised to 09 — 10 ml/feeding, fed every 02 hours until 02 weeks of age. As weight increases, amount shall also be increased as per above calculations.

- Overfeeding (quantity more than mentioned above) shall be avoided at all times even if cubs appear hungry after above feedings. In such instances, ORS may be supplemented to calm the cubs.
- By the third week, number of feeding per day shall further be decreased to 07 — 08 feedings per day, while keeping the amount fed at around 20% of the body weight/day.
- To determine the amount and strength of the milk formula to be provided, the cheetah cubs should be weighed at the same time every day, preferably early in the morning after defecation and urination.
- This consistent weighing schedule helps ensure accurate monitoring of the cubs' growth and nutritional needs, allowing for daily adjustments to the milk formula as necessary.
- Since neonates often do not urinate or defecate on their own, they require stimulation to achieve these. This involves gently massaging around the anal and genital area with a warm water swab to stimulate the natural elimination reflex. Said procedure needs to be carried out consistently before weighing, as well as before and after every feeding.
- Any other illness or situations warranting additional veterinary interventions shall be made on case-by-case bases in due consultation with the committee outlined in paragraph 8(a).

### IV.3. Consideration for Hand Rearing and Ex-situ Care in Cheetah Cubs

- After reaching one month of age, cheetah cubs shall be shifted to a nursery area equipped with adequate access to appropriate environmental stimuli and social interactions essential for their physical and behavioural development.
- Adequate arrangements shall be made to ensure a smooth transition, including appropriate facilities and protocols for the transfer process.
- This may involve considerations such acclimatization to the new environment, and continued monitoring and care by qualified veterinary personnel to support the cub(s) development and well-being in the nursery enclosure.
- The nursery area should be meticulously designed to closely mimic natural habitat conditions, while also prioritizing the safety and well-being of the cheetah cubs.

- Nursery area should provide opportunities for natural behaviours, such as exploration, climbing, and hiding, while also ensuring that potential hazards are minimized. Features such as varied terrain, vegetation, hiding spots, and enrichment activities should be incorporated to promote physical and mental stimulation.
- Careful consideration shall also be given to enclosure design to prevent escape and minimize stress for the cubs.
- Throughout the nursery period, it is crucial to provide nursery-reared cheetahs with sufficient age-appropriate enrichment.
- A suitable surrogate may be provided to simulate the maternal body, so as to provide comfort and stimulation for the cheetah cubs. A stuffed animal can serve this purpose effectively, but any surrogate should be selected with the following criteria in mind:
  - o Durable fake fur that is not easily pulled free and ingested.
  - o Absence of buttons, strings, or other ornamentation

that might be pulled free and ingested by the cubs. The surrogate should be completely washable to maintain cleanliness and hygiene standards.

- Additionally, cheetah cub(s) shall be provided with a soft bedding/ nest or hiding spot with the above relevant criteria to ensure their comfort and security in nursery area.
- As the cubs become more capable of moving and start to explore their environment, a selection of suitable toys shall be introduced.
- These toys should be routinely inspected for safety and rotated to provide variety and novelty, stimulating the cub(s) curiosity and development.
- Additionally, items such as browse and wood shall be included in the enclosure gradually as age advances to offer natural enrichment opportunities. These materials allow the cubs to engage in natural behaviours such as chewing and scratching, promoting physical and mental stimulation.



(A)



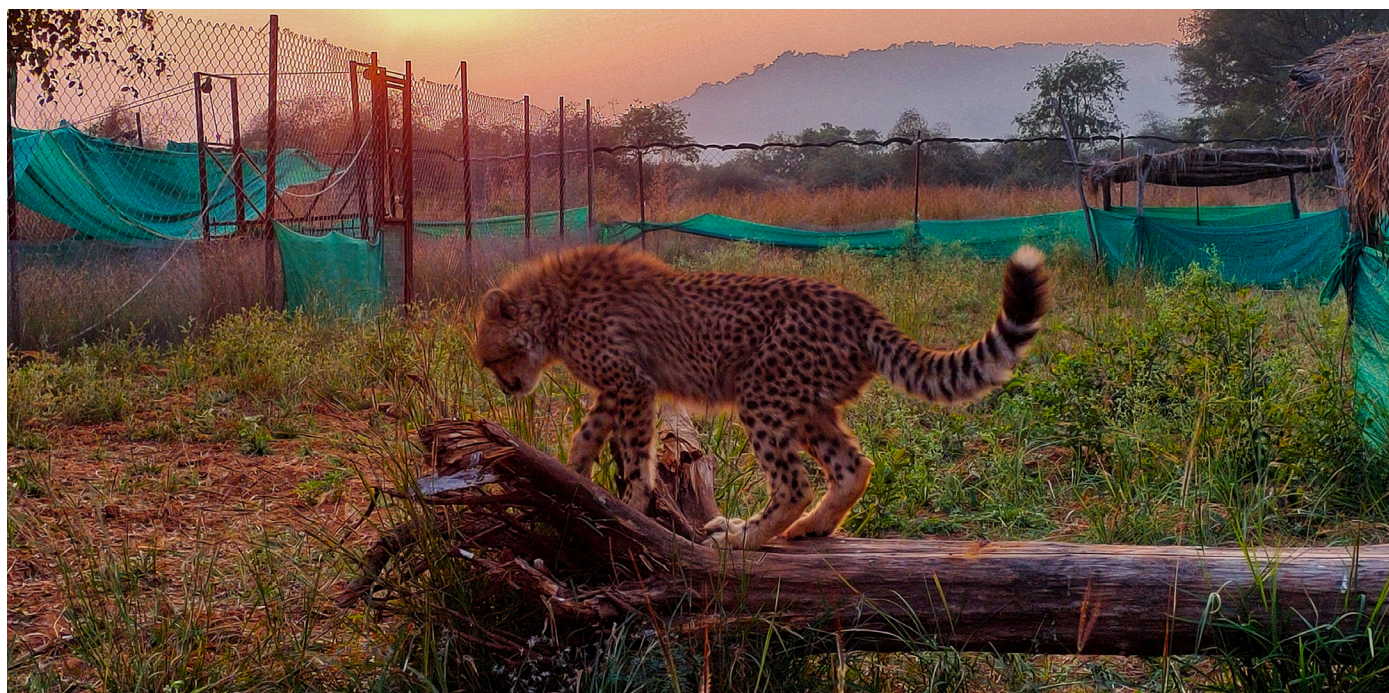
(B)

**Image 17.** Cheetah cub provided with (A) Surrogate © Ziegler—Meeks, 2009 & (B) Soft bed to ensure comfort © Sanath Muliya, NTCA

- Balanced nutrition is essential for cheetah cubs to prevent deficiencies and nutritional disorders throughout their growth phase and into adulthood. Therefore, a diet plan shall be formulated while considering the recommendations placed below.
- Meat-based foods shall be added at 03 weeks of age and if doing well, cooked meat is added to the diet, followed by raw meat, around 04—05 weeks of age. Cubs shall then be gradually weaned from milk replacer by 06—07 weeks of age.
- Diet fed to cub(s), especially supplemented meat, can vary significantly in vitamin and mineral content, predisposing cheetahs to nutritional disease, such as metabolic bone disease. Thus, diet should be carefully evaluated, particularly in growing cheetahs, to ensure that

they not only meet dietary recommendations for felids, but also that circulating levels of nutrients are adequate.

- While chicken meat can be suitable initially, red meat from goat or buffalo shall be provided as they grow. Red meat provides essential nutrients and proteins necessary for the healthy development of cheetah cubs, while mimicking their natural diet more closely.
- Additional vitamin and mineral supplements shall also be provided periodically to avoid deficiencies and nutritional disorders.
- Recommended feeding schedule for cheetah cubs is as follows (Adopted from Ziegler-Meeks, 2009 and Colburn *et al.*, 2018 and learnings from Kuno).



**Image 18.** A fallen tree provided to hand-raised cub as enrichment in Kuno. © Moulik Sarkar, WII

Age	Feeding Schedule
Week 03	Milk formula divided into 08 feedings per day
Week 04	Milk formula divided into 08 feedings per day Gradually introduce small quantities of cooked meat (chicken or goat) along with the formula, while keeping the total feeding volume still at 20% body weight
Week 05	05 feedings of milk formula/day, decreasing to 03 days by the end of the week. Continue weaning onto meat Meat shall be cooked 75% for 3 days, 50% for 03 days, then raw meat shall be fed
Week 06	Boneless meat chunks with added essential vitamin-mineral supplements, divided over 05 meals per day
Week 07 – 15	Boneless meat chunk with added essential vitamin-mineral supplements, divided over 05 meals per day Over time, gradually introduce pieces of meat with larger bones that are large enough to prevent swallowing but still provide dental benefits and additional nutrients
04 – 08 months	Large meat pieces on bone divided over 03 meals per day until 05 months and 02 meals per day thereafter
Above 08 months – 01 year	Large meat pieces once a day
01 year and above	Single, large enough chunk of red meat, every alternate day Consuming a single substantial portion of red meat every other day or two is imperative to replicate the feeding-starvation cycle crucial for preserving typical gut health in cheetahs



- Cheetah cub(s) shall also be subjected to appropriate prophylaxis measures as described in **Annexure III**.
  - In addition to the veterinary team, a select group of committed caretakers shall be chosen from the field staff. These individuals will undergo regular training and sensitization sessions conducted by onsite veterinarians, with valuable insights provided by the experienced veterinary team in Kuno.
  - The designated caretakers will be responsible for various tasks including feeding, caring for, and managing the nursery enclosures, as well as maintaining cleanliness and hygiene standards within those areas by following the enclosure cleaning protocols described in **Annexure III**.
  - Meticulous daily record keeping plays a crucial role when hand rearing cheetah cubs. These data will be valuable for comparative study and early detection of medical problems.
  - Developmental data such as weight, eyes and ears opening, dental status and locomotion as well as appetite, vitality, stool and urine production shall thus be promptly be noted.
  - The onsite veterinarian(s) shall record all the above in well-defined formats. Said records shall be monitored by the Deputy Director and the Field Director on regular basis and communicated to the committee outlined in paragraph 8(a) for necessary recommendations.
  - Effective communication between caretakers and the veterinarians should also be ensured and, concerns or changes if any shall promptly be discussed with onsite veterinarian(s).
  - Exceptional caution must be exercised to prevent imprinting, a learning process in which the cub(s) forms a deep attachment to a specific object or person(s) during its critical developmental phase. This emphasis is crucial as the ultimate goal for these cubs is to be successfully rehabilitated into the wild.
  - Any other illness or situations warranting additional veterinary interventions shall be made on case-by-case bases in due consultation with the committee outlined in paragraph 8(a).
  - External veterinary expertise shall be availed on case-by case basis whenever necessary, in due consultation with the committee outlined in paragraph 8(a).
  - The MS- NTCA and the Chief Wildlife Warden of the concerned state, in consultation with onsite veterinarian(s) and the committee outlined in paragraph 8(a) will be responsible for taking the ultimate decision regarding rehabilitation and release of such cheetah cubs into the wild in future or to place them in permanent captive cheetah care facility.
- #### IV.4. Considerations for Rehabilitation of Captive Reared Cheetah Cubs into Wild and Free-Ranging Conditions
- Before considering the captive reared cheetah cubs for the rehabilitation process in free- ranging conditions, the health, behaviour, and natural instincts of the cheetah cubs shall be thoroughly assessed. Additionally, ensure that they are physically fit and free from any health issues that could hinder their rehabilitation process.
  - If found fit, cheetah cubs shall gradually be introduced to a controlled natural environment, such as a large enclosure designed to mimic their future habitat. Cubs shall be allowed to explore and familiarize themselves

- with natural elements like vegetation, terrain, and climate.
- Activities that stimulate hunting instincts should also be initiated, such as providing smaller live prey for the cubs to chase and catch. Further, encourage natural hunting behaviours through these interactive plays and simulated hunting scenarios.
- Human interaction should be limited to prevent imprinting and to ensure the cubs maintain a healthy fear of humans. Caretakers especially should minimize direct contact and use techniques that maintain a respectful distance from the cubs being prepped for rehabilitation into the wild.
- Essential survival skills, including hunting techniques, territory marking, and predator avoidance, should be imparted by providing protected access to experienced individuals or surrogate adult cheetahs if available and with careful consideration.
- Protected interactions (over fencing or by keeping in adjacent enclosures) with other cheetahs should be followed to promote socialization and the development of natural social structures.
- Bonding with sibling(s) shall be encouraged if available, or compatible cheetah companions introduced to foster social skills.
- Cheetah cub(s) should gradually be transitioned to a larger, more expansive natural habitat as they demonstrate proficiency in hunting and survival skills.
- While male sibling(s) should always be moved together, female(s) above 18 months of age should be moved into solitary enclosures to mimic natural social structure.
- Monitor and promptly record their adaptation to the new environment while providing support as needed during the adjustment period.
- Progress during the period should be communicated promptly to the committee outlined in paragraph 8(a) to aid in the decision-making process.
- Once the cheetahs exhibit self-sufficiency and readiness, facilitate their release into protected wild areas where they have the opportunity to thrive.
- External expertise during the entire process shall be availed whenever necessary, in due consultation with the committee outlined in paragraph 8(a).
- Based on progress, the MS-NTCA and the Chief Wildlife Warden of the concerned state, in consultation with onsite veterinarian(s) and the committee outlined in paragraph 8(a), will be responsible for making the ultimate decision regarding rehabilitation of such cheetahs into wild and free ranging conditions.
- Post release of cheetahs into wild and free ranging conditions, progress, behaviour, and health of the individuals shall be continuously monitored. Continued support, such as supplementary feeding, if necessary, shall be provided while allowing the cheetahs to maintain their independence in the wild.
- The process of their integration into the wild population shall be rigorously monitored to ensure their long-term success.
- To enhance endeavours such as rehabilitation of captive reared cheetahs into the wild and free ranging conditions as well as grasp the scientific insights and methodologies involved in introduction of cheetahs in India, researchers from the Wildlife Institute of India (Project Cheetah) will

play a pivotal role. Documenting and periodically disseminating insights gained from the entire process to the committee outlined in paragraph 8(a) will inform

future captive management strategies and improve the efficacy of rehabilitation initiatives.



**Image 19.** One year old hand reared cheetah cub in large enclosure in Kuno National Park © Sanath Muliya, NTCA

## ANNEXURE V

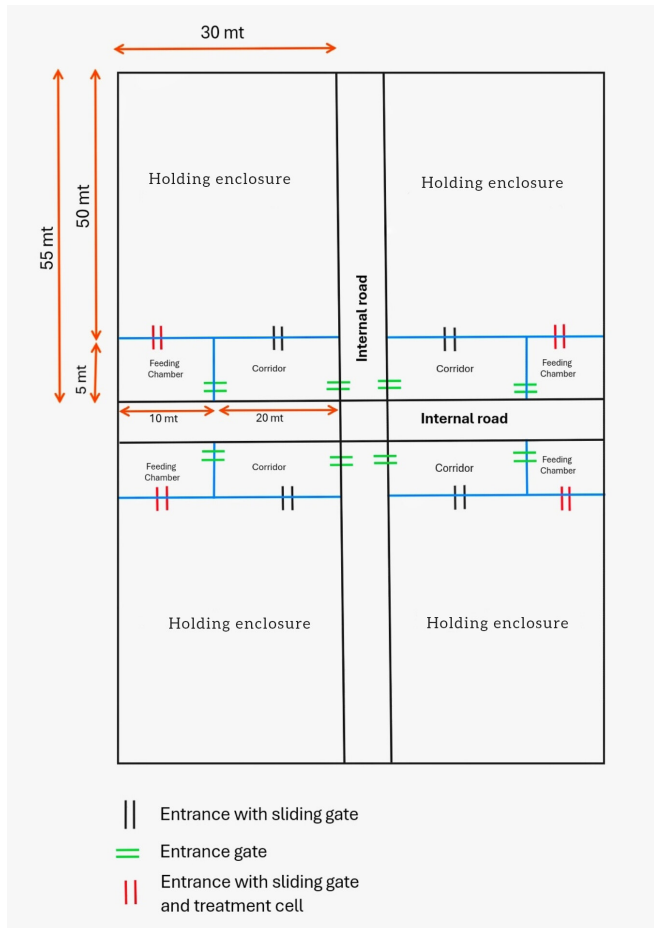
### CAPTIVE CARE AND CUB(S) REARING INFRASTRUCTURE PROTOTYPE AT CHEETAH INTRODUCTION SITES

#### V.1. General Considerations

Given their unique anatomy, physiology, and vulnerability to illnesses in captive settings, managing cheetahs presents significant challenges. Effectively caring for these animals within enclosures hinges upon a thorough comprehension of their physical, physiological, behavioural and clinical management requirements. This entails not only recognizing their distinctive needs but also implementing appropriate protocols to address them, thereby ensuring their well-being and longevity in captivity. A facility for captive cheetah care should thus be meticulously designed to function as a secure containment structure, ensuring the safety and well-being of the animals during both short-term and long-

term stays. It should encompass distinct units such as holding enclosures, feeding chambers, transfer areas, shelter spaces, water sources, and corridors, all tailored to fulfil the fundamental requirements of cheetahs under human supervision.

The holding facility constructed within Kuno National Park for captive care of cheetahs have a rectangular configuration measuring 55 × 30 meters. They include a holding space of 50 × 30 meters, along with a corridor area measuring 30 × 05 meters. This corridor is subdivided into a kraal area measuring 20 × 05 meters and a feeding chamber measuring 10 × 05 meters, equipped with a double-sided cage as depicted below.



**Figure 1.** Diagram of holding facility for captive care of cheetahs.

**Image 20.** Aerial view of the holding facility for captive care of cheetahs in Kuno National Park © Amritanshu Singh, MPFD

## Key requirements of the Captive Care Enclosure:

- **Enclosure Location:** The enclosure site must be carefully chosen, ideally in a secluded area away from high human activity. It should provide ample space and incorporate multiple holding areas to accommodate the needs of cheetahs. Sturdy fencing surrounding the enclosure is essential to prevent any escape attempts and guarantee the safety of both the mother cheetah and her cubs.
- **Bedding and Nesting Materials:** The enclosure should provide soft and cushiony materials such as grasses, hay, and straw to create a warm and cozy environment reminiscent of the cheetah's natural habitat. This ensures the comfort and well-being of both the mother and her cubs.
- **Temperature Control Facility:** Considering the dry and hot climate of Indian summers, the enclosure must incorporate temperature control measures. This could include ambient shading structures, both natural and artificial, as well as sprinkler systems to regulate temperature fluctuations and maintain a comfortable environment for the cubs.

- **Feeding Area:** Proper nutrition is vital for the healthy growth and development of the cubs. The enclosure should be equipped with dedicated feeding stations, especially if the mother is with the cubs, or areas where nutritious food can be provided in a naturalistic manner.
- **Regular Health Examination and Veterinary Care:** The enclosure should be easily accessible to veterinary staff for regular health check-ups and medical interventions if necessary, ensuring the ongoing well-being of the cheetahs.
- **Enrichment and Stimulation:** To foster the social and cognitive development of the cubs and manage stress, the enclosure should provide opportunities for natural enrichment and mental stimulation. This could include features such as running spaces, climbing structures, and wooden logs to encourage natural behaviours.
- **Security and Monitoring:** Surveillance cameras and monitoring systems should be installed to observe the cheetahs without causing disturbance. Additionally, the enclosure should be secured with locks and alarms to prevent unauthorized access and ensure the safety of the animals.



*Image 21. Male cheetah coalition patrolling their territory © Bipin C M, WII*

# APPENDIX 1

## “GUIDANCE NOTES

### 1. Habituation

Habituation is a learning process where animals ‘learn’ not to respond to certain stimuli which have proved ‘harmless’ or of ‘no consequence’. It is a common phenomenon and plays an important role in selection of habitats and inter-specific relationships between wild animals. Thus, a wild animal, if placed in new surroundings, may initially exhibit fear but would subsequently lose the fear owing to habituation. Further, congenial habituation may also result in positive response in such animals. Thus, during in-situ rearing of cubs repeated familiarization with human beings or objects may result in strong habituation making ‘wilding’ difficult.

### 2. Conditioning

It is a behavioural response which is acquired by an organism through experience, usually through the association of a stimulus with a reward. If the said stimulus is associated with a rewarding experience, it results in a ‘positive reinforcement’. On the other hand, ‘negative reinforcement’ takes place if the stimulus results in a ‘painful’ experience to the animal. Thus, in the process of in-situ rearing association of sounds (opening of enclosure gates, sound of vehicle movement etc.) with the availability of food would result in conditioning to such stimuli which would hamper wilding.

### 3. Critical distance (wilding/rewilding)

‘Critical distance’ may be understood as the minimum distance to an unfamiliar/strange object tolerated by wild animal. Violation of this distance would elicit a response which may result in fleeing of the wild animal from the site or attack by the wild animal on the object. Such a critical distance in the context of human-beings is non-existing in domesticated animals. In the wilding process of cubs reared under in-situ conditions, it is extremely important to restore the behaviour relating to critical distance (wilding) by ensuring complete seclusion from human-beings and their associates (unobtrusive monitoring).

### 4. Imprinting

This is a process of learning wherein an animal recognizes and becomes attached to a particular object in its early life (critical time). The critical time of imprinting may vary from few hours to several days, soon after birth depending on the species. In the wilding process of cubs, this social attachment requires to be carefully avoided.”

**Source-** *Guidance Notes in Standard Operating Procedure to Deal with Orphaned/Abandoned Tiger Cubs and Old/Injured Tigers in the Wild*





## References

- Bradford-Wright, R. R., & Hons, B. A. (2013). Social and reproductive behaviours in the cheetah (*Acinonyx jubatus*) in a captive population. Flinders University of South Australia, School of Biological Sciences.
- Caro, T. M., & Hauser, M. D. (1992). Is there teaching in nonhuman animals? *The quarterly review of biology*, 67(2), 151-174.
- Caro, T. M., & Kelly, M. J. (2001). Cheetahs and their mating system. *Model Systems in Behavioral Ecology: Integrating Conceptual, Theoretical and Empirical Approaches*. Princeton University Press, Princeton.
- Caro, T. M. (1994). *Cheetahs of the Serengeti Plains: group living in an asocial species*. University of Chicago press.
- Caro, T. M. (1995). Short-term costs and correlates of play in cheetahs. *Animal Behaviour*, 49(2), 333-345.
- Cheetah Outreach (2015). cheetah@intekom.co.za [Http://www.cheetah.co.za](http://www.cheetah.co.za) Homes Provided by Heartland and Eikendal.
- Colburn, A. M. W., Sanchez, C. R., Citino, S., Crosier, A. E., Murray, S., Kaandorp, J., ... & Marker, L. (2018). Clinical management of captive cheetahs. *Cheetahs: Biology and conservation*, 335.
- Cooper, A. B., Pettorelli, N., & Durant, S. M. (2007). Large carnivore menus: factors affecting hunting decisions by cheetahs in the Serengeti. *Animal Behaviour*, 73(4), 651-659.
- Crosier, A. E., Marker, L., Howard, J., Pukazhenth, B. S., Henghali, J. N., & Wildt, D. E. (2007). Ejaculate traits in the Namibian cheetah (*Acinonyx jubatus*): influence of age, season and captivity. *Reproduction, Fertility and Development*, 19(2), 370-382.
- Crosier, A. E., Wachter, B., Schulman, M., Luders, I., Koester, D., Wielebnowski, N., ... & Marker, L. (2018). Reproductive physiology of the cheetah and assisted reproductive techniques. *Cheetahs: Biology and Conservation*; Valutkevich, A., Ed.; Elsevier Inc.: London, UK, 385-402.
- Eaton, R. L. (1974). *The cheetah: the biology, ecology, and behavior of an endangered species*. New York, Van Nostrand Reinhold Company, 1, 107-118.
- Eaton, R. L., & Craig, S. J. (1973). Captive management and mating behavior of the cheetah. *The World's Cats*, 1, 217-254.
- Frank, J., & Saffoe, C. (2005). Breeding Management Strategy for Cheetahs (*Acinonyx jubatus*) at the Smithsonian's National Zoological Park. In *Animal Keepers' Forum*.
- Jurke, M. H., Czekala, N. M., Lindburg, D. G., & Millard, S. E. (1997). Fecal corticoid metabolite measurement in the cheetah (*Acinonyx jubatus*). *Zoo Biology: Published in affiliation with the American Zoo and Aquarium Association*, 16(2), 133-147.
- Koester, D. C., Freeman, E. W., Brown, J. L., Wildt, D. E., Terrell, K. A., Franklin, A. D., & Crosier, A. E. (2015). Motile sperm output by male cheetahs (*Acinonyx jubatus*) managed ex situ is influenced by public exposure and number of care-givers. *PLoS one*, 10(9), e0135847.
- Koester, D. C., Freeman, E. W., Wildt, D. E., Terrell, K. A., Franklin, A. D., Meeks, K., & Crosier, A. E. (2017). Group management influences reproductive function of the male cheetah (*Acinonyx jubatus*). *Reproduction, Fertility and Development*, 29(3), 496-508.
- Koester, D. C., Wildt, D. E., Brown, J. L., Meeks, K., & Crosier, A. E. (2017). Public exposure and number of conspecifics have no influence on ovarian and adrenal activity in the cheetah (*Acinonyx jubatus*). *General and Comparative Endocrinology*, 243, 120-129.
- Laurenson, M. K. (1993). Early maternal behavior of wild cheetahs: implications for captive husbandry. *Zoo Biology*, 12(1), 31-43.
- Laurenson, M. K. (1994). High juvenile mortality in cheetahs (*Acinonyx jubatus*) and its consequences for maternal care. *Journal of Zoology*, 234(3), 387-408.

- Laurenson, M. K. (1995). Behavioral costs and constraints of lactation in free-living cheetahs. *Animal Behaviour*, 50(3), 815-826.
- Laurenson, M. K. (1995). Cub growth and maternal care in cheetahs. *Behavioral Ecology*, 6(4), 405-409.
- Laurenson, M. K., Caro, T., & Borner, M. A. R. K. U. S. (1992). Female cheetah reproduction. *National Geographic Research and Exploration*, 8(1002), 64-75.
- Macdonald, D. W. (1984). In Macdonald, DW (ed) *The Encyclopaedia of Mammals*.
- Marker, L. (2002). *Aspects of cheetah (Acinonyx jubatus) biology, ecology and conservation strategies on Namibian farmlands*. Oxford: University of Oxford.
- Marker, L. L., Dickman, A. J., Jeo, R. M., Mills, M. G. L., & Macdonald, D. W. (2003). Demography of the Namibian cheetah, *Acinonyx jubatus jubatus*. *Biological Conservation*, 114(3), 413-425.
- Mills, M. G. L., & Mills, M. (2017). *Kalahari cheetahs: adaptations to an arid region*. Oxford University Press.
- National Research Council, Division on Earth, Life Studies, Committee on Animal Nutrition, Subcommittee on Dog, & Cat Nutrition. (2006). *Nutrient requirements of dogs and cats*. National Academies Press.
- Marker, L., Boast, L. K., & Schmidt-Küntzel, A. (Eds.). (2018). *Cheetahs: biology and conservation*. United Kingdom: Academic Press.
- O'Brien, S. J., & Johnson, W. E. (2005). Big cat genomics. *Annu. Rev. Genomics Hum. Genet.*, 6, 407-429.
- O'Brien, S. J., Roelke, M. E., Marker, L., Newman, A., Winkler, C. A., Meltzer, D., ... & Wildt, D. E. (1985). Genetic basis for species vulnerability in the cheetah. *Science*, 227(4693), 1428-1434.
- O'Brien, S. J., Wildt, D. E., Goldman, D., Merrill, C. R., & Bush, M. (1983). The cheetah is depauperate in genetic variation. *Science*, 221(4609), 459-462.
- Sievert, O. (2020). *Early post-release movements, prey preference and habitat selection of reintroduced cheetah (Acinonyx jubatus) in Liwonde national park, Malawi (Doctoral dissertation, Stellenbosch: Stellenbosch University)*.
- Wachter, B., Thalwitzer, S., Hofer, H., Lonzer, J., Hildebrandt, T. B., & Hermes, R. (2011). Reproductive history and absence of predators are important determinants of reproductive fitness: the cheetah controversy revisited. *Conservation Letters*, 4(1), 47-54.
- Wielebnowski, N., & Brown, J. L. (1998). Behavioral correlates of physiological estrus in cheetahs. *Zoo Biology: Published in affiliation with the American Zoo and Aquarium Association*, 17(3), 193-209.
- Wielebnowski, N. C., Ziegler, K., Wildt, D. E., Lukas, J., & Brown, J. L. (2002, November). Impact of social management on reproductive, adrenal and behavioural activity in the cheetah (*Acinonyx jubatus*). In *Animal Conservation forum* (Vol. 5, No. 4, pp. 291-301). Cambridge University Press.
- Wildt, D. E., Brown, J. L., Bush, M., Barone, M. A., Cooper, K. A., Grisham, J., & Howard, J. G. (1993). Reproductive status of cheetahs (*Acinonyx jubatus*) in North American zoos: the benefits of physiological surveys for strategic planning. *Zoo Biology*, 12(1), 45-80.
- Yuhki, N., & O'Brien, S. J. (1990). DNA variation of the mammalian major histocompatibility complex reflects genomic diversity and population history. *Proceedings of the National Academy of Sciences*, 87(2), 836-840.
- Ziegler-Meeks, K. (2009). *Husbandry manual for the cheetah (Acinonyx jubatus)*. Jacksonville, FL: White Oaks Conservation Centre.



### **Acknowledgements**

Dr. Rajesh Gopal, Dr. S. P. Yadav, Dr. P.K. Malik, Shri Aseem Shrivastava,  
Dr. G.S. Bhardwaj, Shri Subharanjan Sen, Dr. Rajendra G. Garawad and Dr. Vaibhav C.  
Mathur

### **SOP is prepared with inputs from the following experts/managers:**

Dr. Sanath Muliya, Sh. Bipin C. M., Dr. Onkar Anchal, Dr Jitendra K. Jatav, Dr. Sumit  
Patel, Sh. Moulik Sarkar, Sh. Kathan Bandyopadhyay, Sh. Uttam Sharma, Dr. Amit  
Mallick, Sh. Virendra R. Tiwari, Sh. Qamar Qureshi, and in consultation with Madhya  
Pradesh Forest Department and Wildlife Institute of India.





---

**National Tiger Conservation Authority**  
B-1 Wing, 7th Floor, Pt Deendayal Antyodaya Bhawan, CGO  
Complex, Lodhi Road, New Delhi 110003, India

<https://ntca.gov.in/>