



A Case Study for Introducing African Cheetah in Kuno National Park Sheopur, Madhya Pradesh, India

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Ecology, as a scientific discipline, operates on a well-established framework of principles that govern the functioning of ecosystems. In this research paper, we explore the tragic extinction of the Indian Cheetah (*Acinonyx jubatus venaticus*) and investigate the role of habitat alteration in its demise. The last known Indian Cheetah was fatally shot in 1952, within a habitat characterized by open grasslands and shrubs within the arid and sub-arid ecosystem. Subsequently, changes in the habitat forced the last surviving Cheetah to seek refuge in the wooded Sal (*Shorea robusta*) forest, situated in the then region of Madhya Pradesh. Introducing Cheetahs (*Acinonyx jubatus*) from

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South Africa and Namibia is the world's first inter-continental large wild carnivore translocation project. This research paper critically examines the decision to introduce Cheetahs (*Acinonyx jubatus*) from Namibia as a conservation measure. While acknowledging the worsening ecological situation, this paper argues that such an action may have been taken hastily, without due consideration of the cheetah's guild ecology. 5 females, 3 males from Namibia, and 7 males, 5 females from South Africa were relocated to Kuno National Park on 17th September 2022 and 18th February 2023 respectively. The idea to introduce the African cheetah was first discussed in 2009. In 2013, a decision of the Forest Bench of the Supreme Court on Asiatic lion translocation found massive flaws with the proposed introduction of African cheetahs to Kuno. In an ambitious endeavor during 2022, African Cheetahs were carefully selected and introduced on an experimental basis into a specifically chosen habitat in India. Relocation of cheetah populations is considered by India to have vital and far-reaching conservation consequences, and to achieve a number of ecological objectives i.e., improving the enhancing the livelihood options and economies of the local communities and re-establishing the function role of cheetahs within their historical range in India. Government has a plan to translocate 12 cheetahs annually for the next eight to 10 years.

Keywords: *Kuno national park; asiatic cheetah; grassland; biomass; prey base; southern tropical dry deciduous forest; Savanah.*

1. INTRODUCTION

The Cheetah is believed to have originated from the ancient Sanskrit word "chitraka" meaning "spotted," and has a rich history in India. Evidence of their presence in the country dates back to 2500 to 2300 BCE through cave paintings found in the Kharvai, Khairabad, and Chambal valleys of Madhya Pradesh. Historical reports suggest that Cheetahs once roamed across various regions of India, including West Bengal, the United Provinces, Punjab, Rajputana, central India, and the Deccan. During ancient times, the country provided favorable conditions for Cheetahs to thrive. The ecosystem offered an abundant prey base, and the unfragmented habitats provided ample opportunities for the cheetahs to hide, hunt, and regulate their body temperature. However, since the sighting of the last Cheetah in 1952, their habitat has undergone significant changes, transforming from vast grasslands to woodlands. The Action Plan on Cheetahs aims to reintroduce the species to revive India's grasslands. However, the process is not as straightforward as it may seem. Kuno National Park, selected as a potential site, boasts a high density of leopards, estimated at around nine per 100 sq. km. The presence of leopards in a fenced enclosure may pose a threat to the Cheetahs and result in competition for prey, which is a natural outcome considering the leopards' familiarity with the area. To mitigate these challenges, a 12 km long and 9 feet high fence with eight compartments has been constructed within Kuno NP. This enclosure aims to house up to 12 Cheetahs in the initial phase and prevent

leopards from entering the Cheetah's territory. Additionally, the leopards will be collared to enable park authorities to monitor their movements and prevent inter-specific conflicts during the early stages of introduction. During the initial phase, the Cheetahs will be gender-segregated but kept in adjoining compartments to foster familiarity before their eventual release into the open habitat. This approach is designed to allow the Cheetahs to develop a positive association with each other, increasing the chances of successful integration into the ecosystem. Cheetahs are going to be kept away based on gender, but they'll be kept next to one another to get to know one another before being released into the wild. The cheetahs would be kept in Kuno NP's predator-proof fenced enclosures, which range in size from 0.7 to 1.1 km² and cover an area of 6 km². They would be monitored round-the-clock by a number of high-resolution CCTV cameras.

Kuno NP is classified under the Semi-arid – Gujarat Rajputana (zone 4B) bio-geographic zone [1]. The average maximum summer temperature has been reported as 42.3°C, while the lowest winter temperatures are between 6 and 7°C [2]. The average annual rainfall in the area is about 760 mm.

2. METHODOLOGY

The methods to evaluate the effect of ecology on the reintroduction of African Cheetahs in Kuno National Park were the thorough reading of scientific papers, reports on this animal, Govt reports, and fieldwork.

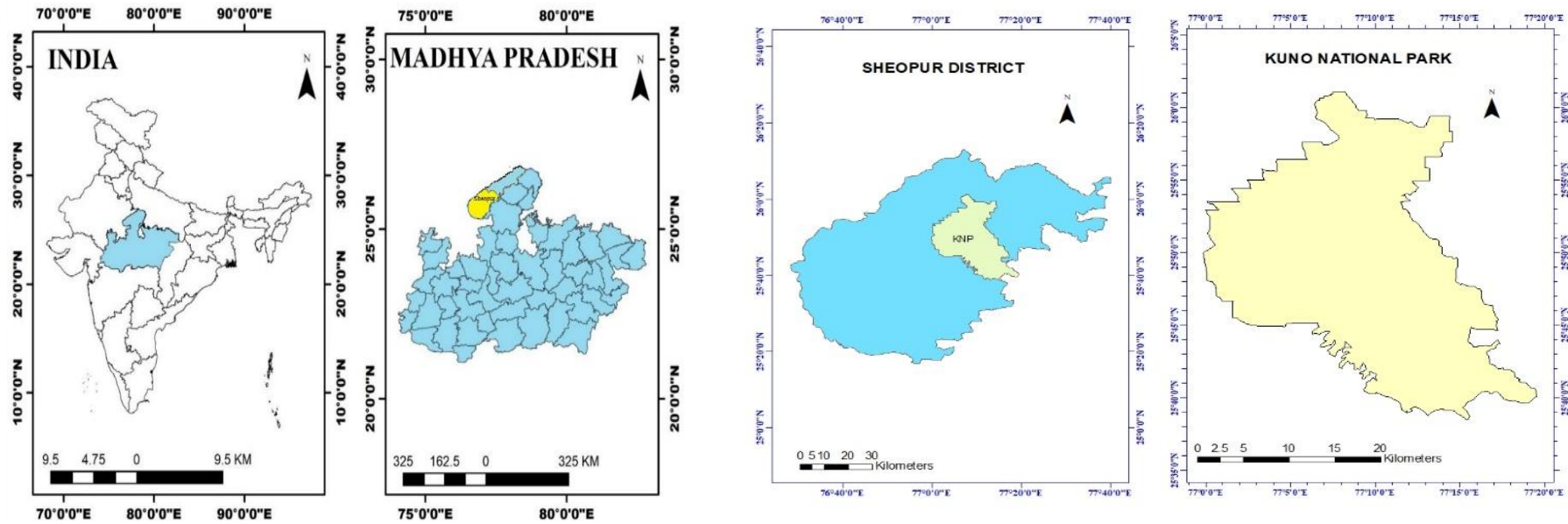


Fig. 1. Location map of the study area

3. A BRIEF HISTORY OF CHEETAH REINTRODUCTION IN INDIA

A study was carried out to find out the chronology of the project Cheetah introduction since the early days, and this was Zafar Fateh Ali, honorary secretary of WWF in the early 1980s. The Rann of Kutch was first selected as the site to release Cheetah, and this concept seems better than the one picked from Kuno NP. Cheetah relocation operations in India initially began in earnest in 2009, but it wasn't until 2020 that the Supreme Court of India ultimately approved them. An expert committee completed an assessment of the sites to which the cheetah can be relocated set up by the Ministry of Environment, Forests, and Climate Change. Early in the 1970s, the first attempt to reintroduce the cheetah was made. The Negotiations with the Iran government went well and Iran promised to give cheetahs. But potential release sites needed to be upgraded with an increase in prey base and better protection. This is no longer possible as the cheetah population in Iran has declined to under 50. In addition, the Kenyan government was also requested to send a few Cheetahs; possibly, this was an act to prevent breeding. This idea was again revived in 2009 by the then minister of environment and forest and moved forward by requesting again to the government of Iran to lend a few Cheetahs, but seemingly Iran always looked hesitant to commit to this idea. The paper further states that in 2010, the WII prepared a "feasibility report on Cheetah introduction in India" jointly with the Wildlife Trust of India and the report was put in the public domain. Three sites were selected and Kuno NP was chosen for introduction because of two facts; first, the area available was larger than the other two options, and second, the process of relocating villagers from the Kuno NP in the advanced stage. Since the beginning, Kuno NP has been preparing to relocate the Asiatic lions. Initially, it was thought to have relocated 27- 32 cheetahs to a 347 sq. km area, spread from the 3,200 sq. km area of the Kuno NP where they are more likely to travel and expand [3].

4. KUNO NATIONAL PARK

Kuno National Park is extended in the Vindhyan hill series, Kuno National Park is situated in the Sheopur district of Madhya Pradesh within the geographical extent of 76°58'37.45" E to 77°20'7.98" E and 25°30'50.03" N to

26°05'23.19" N. Kuno National Park covers an area of 748.761 km² and is located in the Sheopur district of Madhya Pradesh. The Kuno NP and attached buffer area are part of the Kuno Wildlife Division which covers an area of 1235 km² [4].

The perennial Kuno River flows through the park. The western side of the river is dominated by hills with medium to steep slopes while the eastern side falls towards the valley and therefore has flatter terrain with gentle medium slopes and flat river valleys. The Shivpuri Forest region connects Kuno NP to Panna TR in a patchy manner on the south-easterly side of the boundary, forming a connected forest environment. In order to reach Kuno NP's northern boundary from over the Chambal River, Ranthambhore NP and Kailadevi WLS (both sections of the Ranthambhore TR) must travel through some excellent forest regions. The adjacent habitat patch is approximately 6800 km², with around 3200 km² having a strong potential for cheetah occupancy.

The protected area of 748.761 km² within the NP is almost free of human settlements and domesticated livestock. The 24 villages residing within the NP were relocated outside the boundaries of the Protected Area in 1998. Also, the NP has an approximate population of 500 feral cattle left behind by people when they moved out. The population of feral animals forms part of the prey base for any large carnivore inside the park. There are 169 villages spread over the 3200 km² possible cheetah habitat outside the National Park.

Kuno National Park is a part of the Sheopur-Shivpuri forested landscape, which has an area of 6,800 km². Kuno NP was rated high on the priority list for considering the reintroduction of the cheetah because a lot of restorative investment has already been made here for introducing the Asiatic lions. According to estimates, the Protected Area can currently support 27 cheetahs, but that number could rise to over 32 with the addition of some additional forested areas (120 km²) to the Kuno NP and the regulator of the surrounding 3,000 km² of forest habitat as a buffer to the Kuno NP. As soon as a cheetah population grows within the National Park, dispersers populate the area and might eventually hold over 70 animals.

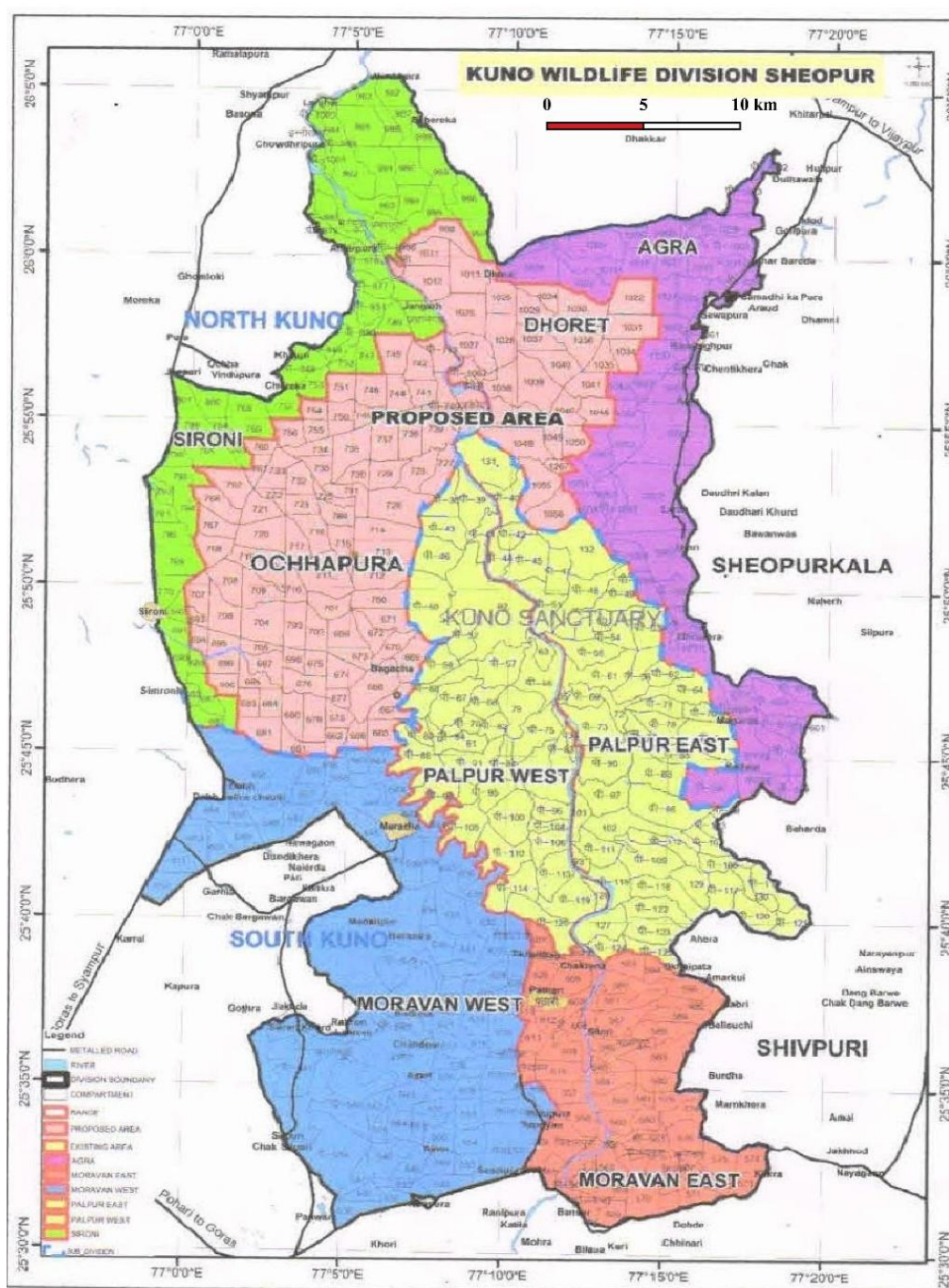


Fig. 2. Kuno wildlife division

5. ECOLOGY OF KUNO NATIONAL PARK

“The Madhya Pradesh forestry is broadly divided into three biogeographic provinces viz., Gujarat-Rajputana (4B), Central Highlands (6A), and Central Plateau (6D)” [5]. “The Central Indian Highlands are a distinct province within the Deccan Peninsula zone, these highlands

comprise two parallel chains of hills i.e., the Satpura and the Vindhya ranges, which run almost east to west and are separated by the river Narmada all along their course. Tropical dry and moist deciduous forests are primarily found in the Central Highlands. While teak (*Tectona grandis*) dominates the forest in the western and central parts of the region, an abundance of sal (*Shorea robusta*) forms the moist deciduous

forests in the eastern ranges. The Northeastern part of Madhya Pradesh has forests dominated by stunted *Shorea robusta*, *Anogesius spp.*, and *Acacia spp.* interspersed with several miscellaneous species. The southern half of the state has a *Tectona grandis*-dominated drier forest association. Some of the natural grasslands, mostly those along river valleys, have now become agricultural lands while some other areas are of anthropogenic origin grasslands (e.g., old village sites or wastelands) being arrested by fire, tree cutting, and livestock pressure" [6].

Kuno National Park falls under the northern tropical dry deciduous forest as per India's latest classification of forest types. The leading trees in this landscape are *Anogeissus pendula* and *Boswellia serrata*, while the middle part is dominated by *Acacia catechu*, *Acacia leucopholea*, and *Diospyros melanoxylon*. *Zizyphus sp.* makes the lowest part of the canopy cover in Kuno National Park. Shrub species encompasses of *Grewia flavescens*, *Helicteres isora*, *Vitex negundo*. Grass species include *Heteropogon contortus*, *Apluda mutica*, *Aristida hystrix*, *Themeda quadrivalvis*, *Cenchrus ciliaris*, *Dicanthium annulatum* and *Desmostachya bipinnata*. In Kuno wildlife sites there has been a complete relocation of villages from the park. These village sites and their agricultural fields inside the National Park have now been taken over by grasses and managed as savannah habitats.

6. PREY BASE OF KUNO NATIONAL PARK

There are plenty of studies on the preferred prey base of the African Cheetahs when they are proposed to be translocated to Kuno NP because of the prey available here. According to several reports, the Indian Cheetah mainly preys on blackbuck (*Antelope cervicapra*) and chinkara (*Gazella bennettii*), while it sometimes kills chital. Chinkara was found in good numbers in Kuno NP and the population of Chinkaras is 0.9/ km².

In 2016, Based on the prey base study by the Wildlife Institute of India (WII) and the World Wildlife Fund (WWF) in Kuno NP, chital is the most abundant prey with a density estimate of 64.9/ km² ± 8.7. The density estimates of sambar, nilgai, wild pig, and chinkara are 7.63/ km² ± 1.4, 9.68/ km² ± 1.8, 12.3/ km² ± 3.1 and 2.3/ km² ± 0.64 respectively. National Tiger Conservation Authority (NTCA) another report

says, chital is the most abundant wild prey in Kuno NP with a population density of 38.48 individuals per km² and 51.58 animals per km² for all potential Cheetah prey species [7]. Using 3/4 of the adult body weight and density estimates of prey species, the biomass in Kuno NP for the year 2016 was estimated as 4,991.1 kg /km² ± 867.18 (Table 1).

7. RESULTS AND DISCUSSION

The proposal for introducing Cheetahs in Kuno National Park was initially put forth in 2009. The court's observations indicated that the decision to introduce African Cheetahs into the same habitat designated for the reintroduction of Asiatic lions had not been presented before the Standing Committee of the National Board for Wild Life, nor was there a consistent decision in this regard. It was also emphasized that KNP did not have a historical habitat for African Cheetahs, and no evidence was provided to support such a claim. The court highlighted that protecting the endangered Asiatic lions and providing them with a second home was of paramount importance. The success of the cheetah introduction program would depend on human-cheetah relationships, prey base availability, and climate suitability. Actual instances of cheetah occurrence near human habitations would be quantified through data from radio-telemetered cheetahs. Now, the density of leopards is 9 individuals per 100 km² in Kuno NP. Sometimes, cheetahs and leopards would fight each other for prey, causing harm and perhaps even death. However, that would be a normal process, and these would be managed by providing the correct supplements and recruiting from the new population. During the first 4-5 years of cheetah reintroduction in Kuno National Park, the leopard population must be controlled to prevent interspecific conflict and allow the cheetah population to settle. In order to study the relationships between these two animals, it would be ideal to radio-collar (GPS/satellite) at least eight to ten leopards in Kuno. Prior to the release of the cheetah, radio collars were placed on leopards and other predators (such as hyenas, jackals, foxes, jungle cats, etc.) in Kuno. These animals were then monitored throughout the same time period. This would produce useful data on resource division amongst carnivore communities in Kuno and be extremely helpful in developing future management plans. Based on this research, management strategies to permit and promote coexistence or manage these

Table 1. Estimates of prey base, population density, and biomass in Kuno National Park-2016

Species	3/4 of Body Weight(kg)	Population Density/km ² ±Standard Error	Biomass (kg/km ²)
Chital	30	64.9 ± 8.7	1,947±261
Sambar	120	7.63 ± 1.4	915.6±168
Nilgai	120	9.68 ± 1.8	1,161.6±216
Wild pig	27	12.3 ± 3.1	332.1±83.7
Chinkara	12	2.3± 0.64	27.6±7.68
Feral cattle	40	15.18±3.27	607.2±130.8
Total			4,991.1±867.18

carnivore populations must be decided for the future. Kuno National Park is currently fit for the reintroduction of cheetahs with minimal actions required (above). Introduction is to be processed in a phased manner with a few individuals after the construction of the soft-release enclosure and augmentation of protection, while other actions are underway. The action plan prepared in 2012 for the reintroduction of cheetahs in Kuno NP remains valid [8]. The first batches of 8 cheetahs [9] and the second batch of 12 cheetahs were released in the enclosure with GPS/GSM or GPS/Satellite transmitters. Males and females are released simultaneously within the enclosure. objectives or potential for reintroducing the Asiatic lions. Once cheetahs have been established, they are known to be able to evade lion predation effectively [10]. The Indian Wildlife Institute in Dehradun has deemed the Gandhi Sagar Sanctuary in Mandsaur and the Nauradehi Wildlife Sanctuary in Sagar suitable for the second phase of cheetah reintroduction, as the population of cheetahs in Kuno has reached 20 after the arrival of cheetahs from Namibia and South Africa. The caring capacity of Kuno National Park is 25 cheetahs. Therefore, the selection of another sanctuary or national park is being considered. The cheetah project will open up tourism opportunities in Sheopur, and both Kuno and Sheopur will be featured on the world tourism map. Kuno will be an important part of the country's major tourism corridors, and with the arrival of cheetahs in Kuno National Park, the entire Gwalior-Chambal region, including Sheopur, will become a new tourism hub. After the African cheetahs arrive, the indirect corridor that will be created in the country will extend from Delhi to Gwalior, where tourists will have the opportunity to visit a dozen or so reserves and national parks, including the country's largest reserves for cheetahs, tigers, crocodiles, and birds. Madhya Pradesh Govt releases public awareness drives for the local communities with a local mascot named "Chintu Cheetah". Further, ensure that local communities are aware that

there is no threat to humans from cheetahs and that any livestock depredation would be immediately and effectively compensated. Kuno NP is on its way to becoming glorified fenced safari parks rather than wildlife landscapes with self-sustaining populations [11].

8. CONCLUSION

Relocation of cheetah populations is considered by India to have vital and far-reaching conservation consequences, and to achieve a number of ecological objectives i.e., improving the enhancing the livelihood options and economies of the local communities and re-establishing the function role of cheetahs within their historical range in India.

COMPETING INTERESTS

The authors have declared that no competing interests exist.

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