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Cheetah Reintroduction in India: Review of Eco-restoration Policy Gaps

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Authors' contributions

This work was carried out in collaboration between both authors. Author HK conceptualized and proof read the paper to approved it while author UG did the data collection and presentation. Both authors read and approved the final manuscript.

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ABSTRACT

Recent Introduction of the African Cheetah in India is more emotion than ecology. These are still kept in the enclosure, and served meat than let them hunt. We find following gap in this inter-continental animal transfer- 1) Cheetah mainly dwell or hunt in the plains savanna habitat and not hill forests of the Kuno National Park (KNP), 2) Cheetah mainly hunt on antelopes (weight< 50 kg) that are rare at Kuno and not on Chital (Spotted deer, weight > 60 kg) prevailing at Kuno, 3) Hares, Pigs and small livestock such as sheep, goat make 30% the Cheetah diet in Africa but ignored/ excluded at Kuno, making it unviable. The imported Cheetah yet await release into the wild due to the risk of prey deficit, pathogens and depredation by Tiger, Leopard, Hyena etc. About 8 i.e. 40% of the 20 Cheetah imported have died, similar to the translocations success rate within Africa. We suggest (1) exploring grassland prevalent sanctuaries in Gujarat-Rajasthan states (2) release Chinkara (Indian Gazelle), pigs, barking deer, wild boars and hares as prey in the wildlife reserve, not just Chital, (3) permit low human disturbance and grasslands in KP & surroundings, including

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livestock, (4) develop Savanna corridors and network management of wildlife reserves adjoining Kuno (Madhav, Gandhisagar, Ranthambor, Kailadevi) or farther (Tal Chhaper WLS, Churu district & Jaroda closed area, Nagaur district) as the later report multiple times antelope density than KNP.

Keywords: Predator; mammal; rehabilitation; grassland; wildlife.

1. INTRODUCTION

Restoration ecology is gaining importance over conservation recently to stem extinction & revive nature's balance to 1-2 century prior state when human intervention started harming the nature substantially. Reintroduction of extinct or near extinction i.e. "threatened" species is key strategy in this eco-restoration movement [1]. Cheetah (*Acinonyx jubatus*) introduction in India in recent years attracted global attention as ray of hope amidst global efforts to reverse biodiversity loss and restore ecosystem [2]. It has important teething problems & lessons globally and for other threatened species so we wish to highlight these in this brief review.

Cheetah is one of the "4 big cats" i.e. predators, in India besides lion, tiger, leopard [3]. It is primarily found in Africa and to marginal extent in Asia- from Iran to India. Indian subspecies extinct by 1952 with last 3 shot in the Koriya district in 1951 in the present Chhattisgarh state [4]. Only handful- about 20 remain in Iranian mountains [5], inhabiting scrub forests unlike savannas in Africa. Others estimated a higher number of 50 to below 100 [6-8] while the government proclaims only 12 [9]. But these are not transferred to India due to Iran's refusal nor cloned [4,5]. The Supreme court had initially prohibited import of African Cheetah in 2013 on the plea of some environmentalist but allowed it on experimental basis in 2020 [5].

2. CHEETAH HISTORY IN INDIA

In India, Cheetah was primarily confined to grasslands/ savanna in western Indian such as deserts in Rajasthan or Gujarat stats, bordering Pakistan and lesser extent in the central Indian, forested states such as Madhya Pradesh or Maharashtra, where its occurrence was recorded from grasslands/ scrub forests. The race "*venaticus* (Griffith)" occurs in India [3]. Prater (1965), the ace British wildlife expert wrote in his treatise of Indian animals (mammals)- "*Like Lion, Cheetah came into India by the way of our north-western pass. It established itself in the plains and lower hills of the northern and central India, struggling southwards as far as Deccan and Mysore. It was not infrequently (i.e. commonly) met with about 50 years ago. It lived most commonly in the low rugged hill, and came down from its lair amidst rocks and boulders to hunt in the neighbouring plains. It hunted gazelle and antelope, and probably smaller animals and birds. Sometimes it attacked goats and sheep. For centuries, Cheetah, tamed and trained, has been kept by man used in hunting. Nothing is known about the Breeding habits of Cheetah in India*" [*ibid.*].

Tritsch writes- "*In Punjab, before the thorn forests were cleared for agriculture and human settlement, they were intermixed with open grasslands grazed by large herds of blackbuck; these co-existed with their main natural predator, the Asiatic cheetah. The blackbuck is no longer extant in Punjab. Later, more habitat loss, prey depletion, and trophy hunting were to lead to the extinction of the Asiatic cheetah in other regions of India*" [10].

Various kings or chieftains of various estates harbored and even imported Cheetah into India till from 15th to 20th century for hunting sport by chasing antelopes e.g. King Shahu Maharaj, Kolhapur estate, Maharashtra state [11]. The Cheetah extinction followed by the huge demise in the number of lions and Tigers across India served as a shock signal. Indian Government enacted wildlife conservation act, 1972 to prohibit reckless hunting of the wildlife and create protected area such as national parks and sanctuaries across the country, where forest logging and human, livestock activities were mostly barred to protect the habitat and ensure wildlife recovery [12]. Later wildlife hunting was banned across the country even in the agriculture lands or human habitation, cities and it is said that "profligacy evades prudence". Auditor General observed the irregularities in the Cheetah project management and finance calling for judicious use of the public funds [13].

3. FOREST AND WILDLIFE CONSERVATION HISTORY IN INDIA

Forest logging was highly regulated or stopped in majority of the Indian forests vide the national

forest policy, 1988 and timber was replaced by steel, concrete plastic etc. and massive afforestation effort was made bringing 5 million ha under tree cover in the past 4 decades [14]. India's tree cover grew by 25% from 19% of the land cover to 24% from 1990 to 2020 vide remote sensing based biennial "state of India's forests" reports by the forest survey of India (*ibid.*). Strong conservation efforts led to rapid increase in the population of flagship species such as tiger population that more than doubled from 1,411 in 2010 to 3,167 in 2022 [15]. This caused wildlife spill over to villages and even cities, causing livestock depredation, human causalities and crop loss, causing "human wildlife conflict" (HWC), an issue presenting a huge management challenge in Africa too [16].

Over growth of forests, total stoppage of human activities may have led to excessive forest canopy, loss of grasslands/ shrub growth beneath trees and unsuitable for the herbivores such as deer, leading to their attacking the crop land and subsequently predator animal also who find husbanded livestock such as cattle, goat, sheep, dogs as easier prey than chasing the wild deer or antelope, wild boar etc. Government also started providing decent if not adequate or lucrative compensation for wildlife caused damage to the crops/ animal husbandry or human life in the last decade which was meagre or often non-existent until two decades ago. This can be considered as "payment for ecosystem services" viz. "wildlife/ biodiversity" as environmentalists have argued [17].

The growing wildlife population and its frequent sighting also promoted eco-tourism with famous wildlife reserves such as Kanha, Bandhavgad (Both Madhya Pradesh state), Sariska, Ranthambor (both Rajasthan state), Bandipur-Nagarhole (both Karnataka state), Corbett (Uttar Pradesh state) & Tadoba (Maharashtra state) etc. becoming global attraction centres for wildlife tourists due to high tiger sighting rate there [18]. This has generated local employment, developed the local economy and built forest department/ protected area (PA) revenue and visibility so it is policymaker's popular strategy, despite sustainability issues.

4. CHEETAH REINTRODUCTION PLANNING & CELEBRATION

However, to recover the lost natural ecosystem balance, species recovery and even reintroduction has been attempted worldwide for some charismatic, flagship species albeit with limited success of 40% [19]. Similarly, Cheetah was sought to be reintroduced in India [4]. For, it is a charismatic species known to be the fastest running mammal and amazing sprint. Its rehabilitation in its past habitat could indicate complete ecosystem recovery and add to India's pride and also promote eco-tourism it was proposed. Indian government also may have wanted to project its image as pro-environment, eco-restoration friendly nation. National Tiger Conservation Authority (NTCA) was assigned this task and it commissioned a study to Wildlife Institute of India (WII), the premium wildlife research agency of Indian Government. It surveyed 6 protected areas, comprising 3 each in Madhya Pradesh (Kuno NP, Gandhisagar wildlife sanctuary- WLS, Madhav NP) & Rajasthan states (Mukundara NP, Shergarh WLS, Nauradehi WLS) [20]. It concluded that Kuno NP as the best among PA to enable Cheetah reintroduction, followed by Gandhisagar WLS, based on prey density, low human density and less cost for fencing etc.

NTCA crafted a plan for Cheetah reintroduction in India led by WII & with other expert inputs for Cheetah [21]. Talks were held with foreign authorities of which Namibia agreed to translocate its Cheetah to India, and later South Africa also agreed similarly. African wildlife experts also visited India to assess the habitat suitability and prey adequacy of Kuno and expressed satisfaction [22]. 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 (Spotted Deer, *Axis axis*) is the most abundant prey with a density estimate of 38.48/ km2 ± 8.7 [23]. The density estimates of Sambar, Nilgai (Blue bull), Wild pig, and Chinkara (Indian Gazelle) are 7.63/ km2 ± 1.4, 9.68/ km2 ± 1.8, 12.3/ km2 ± 3.1 and 2.3/ km2 ± 0.64 respectively. Population density is 51.58 animals per km² on average is estimated for all potential Cheetah prey species [24].

MoU with Namibia was signed and accordingly the Cheetah were brought in India in 2 batches- 1st batch of 8 on 17th September 2022 and the 2nd batch of 12 from south Africa in February 2023 [25]. Both herds are kept in fenced enclose called "boma" to acclimatize and it was said that they may be released free in the wild once prey population build up was adequate- 35 animals/ sq km [21,25].

This import was hugely celebrated as conservation success story to build pro-nature image of India. Breeding and birth of cubs in India was also observed but later significant mortality was also observed with 8 of the 20 imported Cheetah dying, including by "septicaemia", bacterial infection of the blood [26]. This raised debate and led to their confinement to the fenced enclose. However, high mortality (60%) is also observed in translocation within Africa or even in Namibia, in a pack of 23 adults and 10 offspring [19]. They report quarantine period as high as 450 days-1.5 years even in translocations within Namibia. High mortality may be natural phenomenon making Cheetah a rare species. Cheetah are thus not yet become wild in India since 2 years of imports, but are fed on livestock meat, compromising their hunting instinct & skill [27].

5. ECOLOGICAL DIFFERENCE IN AFRICAN AND INDIAN HABITAT

We compare the African and Indian habitats on 2 parameters- a) Geography, c) Prey availability. Fig. 1 shows the location of Namibia and south Africa in the continent relative to other neighbouring countries. Table 1 shows that Indian location has nearly 1.5 to 2 times the rainfall (760 mm/ year) than in Africa (550 mm/ year). Kuno has forest, hill ecosystem, while in Africa is mostly plain, savanna. Maximum and minimum temperatures in India are bit higher- reaching 42 ^{0}C while it is often up to 35 ^{0}C and rarely 40 ^{0}C in Africa. Humans exist in and around the Cheetah reserves in Africa, but are relocated in India. So the question if the Cheetah is really at home in India [28]. Habitat differences and prey limitations are barriers to Cheetah release in the wild it is said [29]. Cheetahs in Africa initiated more hunts and had a higher success rate in the open woodland savanna of the KNP compared to other available habitats with thicker bush, as shrubby/ woody vegetation obstructs their chase [30].

It is evident that majority of the Cheetah habitats in Africa are plains, grasslands/ Savanna and with low rainfall, high altitude and low temperatures. Indian habitat at Kuno however has higher temperature and rainfall and is hilly, with forest prevalent. This may not be very suitable for Cheetah.

6. PREY SPECIES DIFFERENCE

Table 2 depicts the African prey weight and relative frequency in Cheetah scats, indicating its diet preference. It also depicts similar Indian species and their density per unit sq. km. Livestock- Goat (18% of samples)-Sheep (11% of samples) comprising 1/3rd of scats, is missing in India and even the hare (36 i.e. 14% of 262 scat samples) in Kenya, Africa [31] is not considered or counted in India [32]. This represents a major gap- comprising 43% of scats and/or diet as above!

7. LION TO CHEETAH GOAL CHANGE

It appears that the prey base here is inadequate and adding Chital (Spotted deer) alone may not suffice as it is heavier (85 kg- male adults) than the antelopes that Cheetah preferentially hunts. This makes its hunting difficult especially for the female Cheetah and cubs, who prefer young deer, but those are also proportionately heavier. Grants' gazelle- population density is estimated at 10.5 ± 3.2 km-2 in Ethiopia at Nechisar National Park [33]. An estimated 0.25 million Thomson's gazelle occupying 14,763 sq. km of Serengeti National Park, implying 16 animals/ sq. km [34,35]. But number of antelopes observed in India are just 1-3 per sq. m [36]. It is only 20% of the African values, so it is highly inadequate. This anomaly can be explained the fact that Kuno NP was initially prepared a decade ago (2013) for Lion relocation [32]. This was not conducted despite Supreme court order in 2013 as ungulate density was dropped to 30/ sq. km in 2018 from a peak of 45/ sq. km in 2014 [5].

The focus was then changed to Cheetah considering the Government investment in shifting 20 villages outside the forest earlier. So the habitat was selected first and its suitability study was initiated later i.e. "putting the cart before the horse"! But this approach needs revision as "square plugs do not fit the round holes". The current impasse is because of the fact that "two wrongs cannot make 1 right thing". Even large animals traces such as Zebra and Giraffe were found in Cheetah scat but marginally [31]. So it is hoped it can adapt to hunt Chital. Cheetah did hunt Chital few times at Kuno, raising hope.

8. NO REWILDING YET- PANDORA'S BOX

It is 2 years now since the 1st arrival of the Cheetah and of the original 20 imported 12 still survive indicating 60% survival [37]. In all, 17 cubs were born in India and 12 of them survive.

Fig. 1. Map of Africa showing Nambia & South Africa location & Kuno in India

Ref.- Africa- https://cdn.britannica.com/16/183716-050-F6B903BE/World-Data-Locator-Map-Namibia.jpg, India- https://images.app.goo.gl/w58wACXjoSBvxu8J8

Table 1. Cheetah habitat in Africa & India compared

COUNTRY	SOURCE SITE (no. of Animals)	Type	Province	Latitude, Longitude	Terrain	Area sq km	Elevation m ASL	Vegetation	Temperature deg. C	Rainfall mm/year
SOUTH AFRICA	1. Phinda* (3)	Private	KwaZulu-Natal	27°46.657' S; 32°20.942 E	Plain, hills	286	*48-112*	Sand forest, marsh	10-35	1,000
	2. Tswalu Kalahari *(3)	Private	Northern Cape	27°15’ S; 22°20’ E	Plain	1,020	160	Arid savanna	0-40	160
	3. Waterberg #, Thaba Meetse (3)	Govt.	Limpopo	24°4′30″ S 28°8′30″ E	Plain (plateau)	6,540	600-2,000	Forest/ savanna	14-25	713
	4. Kwandwe* (2)	Private	Eastern Cape	33° 7' 49" S, 26° 32' 14" E	Plain, hills	220	400 – 550	Scrub forest	10-30	600
	5. Mapesu* (1)	Private	Limpopo	25.356958 S, 29.065119 E	Plain, hills	120	560- 1,900	Scrub, savanna	20-30	300
	AVERAGE	Private	-	-	Plain	1,650	700	Savanna	05-35	550
NAMIBIA	6. Waterberg*# (8)	Govt.	Central	20°25′S 17°13′E	Plateau	405	1,450	Grassland	(0) 09-35 (40)**	400-529
INDIA	7. Kuno NP	Govt.	Madhya Pradesh	25°40' N, 77°20' E	Hilly	748	343	Forest	06-42	760

NOTE- The elevation of African sites of Cheetah is generally high- 700 m ASL, 2 times Kuno & its rainfall is 25% higher than African avg.
**- private game reserve, #- Govt. managed national park, *#-separate from site no. 3, **- values in the parenthesis are rare/ uncommon.*
REF.- 1. https://www.krugernationalpark.org.za/reserves/phinda-game-reserve/, https://www.africaodyssey.com/south-africa/phinda 2. https://tswalu.com/experience-tswalu/understanding-the-kalahari/, 3. https://journeysbydesign.com/destinations/south-africa/waterberg-savannah-biosphere-reserve/when-to-go#:, https://www.dffe.gov.za/waterberg-biosphere-reserve#:, 4. https://classic-portfolio.com/wp-content/uploads/FACT-SHEET-Kwandwe-Private-Game-Reserve.pdf, 5. https://mapesu.com/about-mapesu/, https://www.latlong.net/place/mabusa-nature-reserve-south-africa-27554.html, https://www.mopanebushlodge.com/about-us/useful-information/ 6. https://web.archive.org/web/20051215005249/http://www.biologie.uni-hamburg.de/b-online/afrika/wcmc/waterberg.htm, https://www.info-namibia.com/activities-and-places-of-interest/waterberg/otjiwarongo, 7. https:// www.kunonationalpark.org/

Table 2. Prey population, size and diet share

Africa [31]			India [32]		
SPECIES*	**Weight kg**	**Frequency#$**	**SPECIES**	**Weight kg [3]**	**Density no/ sq km**
Gazelle- Thomson’s	23-56	4	Chinkara##	23	1
Gazelle- Grants		26	Blackbuck	40	-
Bush buck		19	Choushinga**	-“-	1
Warthog		18	Chital*#	85	70
Goat		18	Sambar	225-300	5
Impala		7	Neelgai*#*	-“-	4
Zebra	>56	11	Wildboar	230	3
Kudu		4	Langur	20	40
Sheep	23-56	11	Peafowl	5	13
Hare- Cape/ Spring	< 10	36	Hare	2	
			Cattle	> 100	2.5

*Note- #$- Frequency In Cheetah Scat (N= 262), ##- Indian Gazelle. **- Four-Horned Antelope, *#- Spotted Deer, *#*- Blue Bull*

All are held captive in enclosures at Kuno, none of them is ranging free in the wild. About 20 cheetahs will be introduced annually for the next 8-10 years, estimating at least 160 animals to be brought into the country [27]. The Cheetah Action Plan states that the project success lies in Cheetah population reaching 21, the maximum carrying capacity of Kuno, with 748 sq km. area, that can currently accommodate only about 10-15 cheetahs [4]. If 3,300 sq km more is restored, the cheetah numbers can reach a maximum of 21 in 15 years and 36 by 30 to 40 more years the action plan says [28]. Few Cheetah released in the wild experimentally were captured and brought into captivity for treatment and monitoring after dying repeatedly during the 2023 monsoon due to septicaemia [25]. Despite the Indian government's praise for the project, issues like lack of prey and habitat suitability remain. According to recent reports, Kuno National Park's (KNP) capacity to host cheetahs has been exceeded and the 'excess cheetahs' must be relocated to newly created fenced habitats in Madhya Pradesh's Gandhi Sagar National Park [24]. Reports say that KNP has witnessed a reduction in the population of chital, dropping from 8,000 in 2021 to about 6,500 within a year. This is despite the Cheetah not hunting in the wild still at KNP! Yet, since the introduction of cheetahs to the park, approximately 1,500 more chital have been introduced [29].

9. CARRYING CAPACITY WOES

The carrying capacity of Kuno NP for Cheetah is estimated at 20 so it is full now [37]. Even in the relocation within African project, Cheetah release density was <2 per 100 sq. km. [1]. So the Kuno NP area of 748 sq. km can only support 15 Cheetah maximum at this rate, if the habitat was suitable, which it is not, unfortunately. So it is argued if India overestimated Cheetah carrying capacity at Kuno [38]. Some experts opined that Kuno is unsuitable habitat for Cheetah, including late Mr AJT Johnsingh an ex Dean, WII [39]. Other experts also said Cheetah project has turned into "glorified safari" [23, 37]. Expert panel of Govt. of India headed by Mr Rajesh Gopal, ex chief, Project Tiger said the Cheetah cannot be released into the wild unless prey population builds up adequately- say 50 ungulates/ sq. km [25]. Importing *Cheetahs* to India from Namibia is a decision taken in haste without considering its guild ecology, some argued [40]. African experts too questioned the hasty shift [41,42]. However, some were in its favour [43]. Some had found Kuno habitat as suitable prior to translocation [44]. This was based on their impressive experience of Cheetah translocation within Namibia [1] where 17 cheetahs achieved independence (68%) but eight were returned to captivity, among the captive-raised orphaned adult cheetahs ($n = 25$) that were released into the wild across 3 private reserves in Namibia. The preferred prey was Steenbok, although avoided by artificially formed female cheetah coalitions, which primarily killed juvenile eland, a type of Oryx. Cheetahs hunted across diverse vegetation for hunting, although coalition males appeared to use somewhat denser areas. African-Indian joint expert team replied the African critique [44]. But more criticism is pouring from the world over [45]!

Cheetah reintroduction backlash is contrasted with the success Indian lion project where a population of 611 Asian lions currently co-exists with people in a mixed landscape, about 25% more than the 2005 estimate [46]. The statements by project scientific advisory members that it is actually an "experimental reintroduction of cheetahs into India", suggesting that the outcome is uncertain, raises additional ethical concerns, some argue [47]. They write "1*. The Asiatic cheetah, A. j. venaticus, is extinct in India and should not be replaced, without appropriate scientific consideration, by the African cheetah. 2. The relict population of the Asiatic cheetah in Iran holds the only extant members of the subspecies with an estimate of 50 mature individuals. 3. Genetic evidence points to historical translocations of African cheetahs to India and others even suggest that the cheetah was never indigenous to India. 4. The Indian plan has No clear exit strategy, as required by the IUCN Guidelines for Reintroductions, has been defined should the project not succeed or cause unpredicted harm to other wildlife or humans*" [*ibid.*].

10. FUTURE EXTENSION PLAN

Thus, the Government intends to import next batch pf Cheetah other reserves such as Gandhisagar or Banni area in Kutch, Gujarat as it has more grassland habitat [48]. At the occasion of the 2 years completion of the Project Cheetah on 17th September 2024, NTCA announced to extend the project Cheetah in the next 25 years to total 8 districts in the 3 states, including Shopur, Shivpuri & Muraina of M. P. state [49]. The new 5 districts nearby proposed for extension are Bhind and Datia districts in Madhya Pradesh, Dholpur in Rajasthan, and

Lalitpur and Jhansi in Uttar Pradesh. But we suggest prey population survey needs to be done afresh there to avoid repeating the above error. Habitat suitability is more important than geographic proximity or convenience.

10.1 Western Indian Grasslands and Community Conservation

Grassland are abundant in the western Indian plains in the Rajasthan and Gujarat states and support large populations of antelopes vide the census - Blackbuck (25,298), Chinkara (42,590), Neelgai (77,737) besides wild pig (16,933) [50]. Further, conserving nature especially wildlife such as antelopes and tree called “Khejdi” in vernacular (*Prosopis cineraria*) is traditional culture of the ethnic community “Bishnoi” here [51,52]. So this provides scope for further conservation efforts also such as including Cheetah in its ambit, we suggest. The antelope density in western Indian Rajasthan state is much higher than Kuno NP, for instance 38 and 13 per sq km at Tal Chhaper WLS (Churu district) and Jaroda closed area (Nagaur district) respectively [53]. This can help as Cheetah is being largely, if not exclusively a gazelle hunter [54]. Grasslands can thus suit it better [55].

Human habitations are often considered wildlife enemy but to the contrary, considerable wildlife exists around human settlements than the protected areas as the census above shows [50]. Further, ecologists note that low to moderate human biodiversity enhances biodiversity [56,57]. In fact, there are many private Cheetah conservation parks operating in Africa who earn from tourism. For instance, Namibia’s wildlife industry grew from an estimated N$ 25.3 million contribution in 1993 to N$ 154 million in 2000, representing a real growth of 20.7% per annum [58]. The conservation area community needs to be rewarded for such conservation support through payment for ecosystem services (PES) as Indian Government has increased and sped up the compensation or the wildlife caused damage of livestock or crops [17]. Such changes may make the Cheetah revival project successful and answer the global experts who doubted it, for strong reasons [41,42] and others who question it logically [59,60]. Some call it only “introduction”.

11. CONCLUSIONS

We argue that (a) Cheetah is basically grassland or savanna-woodland animal but shifted to hilly, ravines forest in India at a higher temperature and rainfall tract, (b) Cheetah prey consists of mainly small to medium sized mammals weighing about or below 50 kg but the chief prey speculated in Kuno national Park in India where it is introduced is Chital- with adult males weighing 85 kg, making its hunting difficult especially for the female Cheetah, (c) western Indian grasslands from the states of Rajasthan & Gujarat, including the deserts may form more suitable habitat for the Cheetah as in Africa and needs to be explored, (d) small mammals need to be bred and introduced in the Cheetah habitat as pre viz. Hare, mouse deer, barking deer etc. besides antelopes- Chinkara (Indian Gazelle) & Choushinga- Four horned antelope.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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