



Department of Environment



# Asiatic Cheetah Population Monitoring

Northern Habitats - Iran  
2021 - 2023

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## Abstract

Regrettably, there is a shortage of information concerning the current status of the Asiatic Cheetah (*Acinonyx jubatus venaticus*) population in its northern habitats within the provinces of North Khorasan and Semnan, impeding an accurate assessment of the species situation in Iran. Notably, the Touran Biosphere Reserve in Semnan Province is currently Iran's most vital cheetah habitat. This reserve is the sole protected area where documentation of Asiatic cheetah breeding has occurred over the past five years. Conversely, recent surveys conducted at the Miandasht Wildlife Refuge in North Khorasan Province failed to confirm the presence of cheetahs between 2018 and 2020, underscoring the urgency of understanding the situation in the Touran region. Subsequently, a research endeavor was initiated in 2021 to elucidate the status of cheetahs in both the Touran and Miandasht regions. Following a two-month preparatory period involving the installation of camera traps in the Touran Wildlife Refuge, the research team familiarized itself with the area and identified potential locations indicative of cheetah presence, thus commencing the primary study.

A three-year comprehensive research project, from 2021 to 2023, was undertaken to assess the population status of cheetahs in the Touran and Miandasht regions. Commencing in May 2021, the study involved extensive camera trapping utilizing 90 camera traps. Subsequent monitoring in the following two years involved a reduced number of cameras, approximately 60 in total.

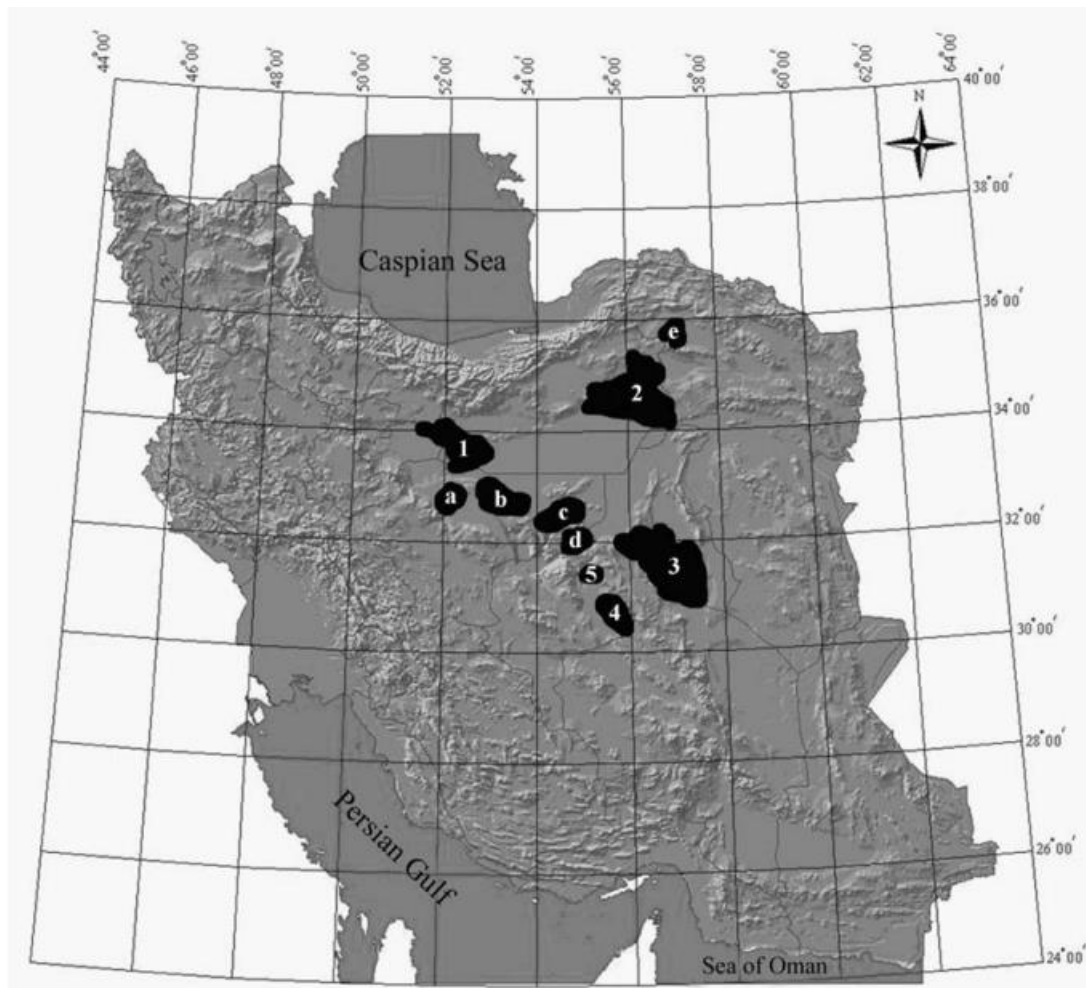
The camera traps were concurrently deployed across three distinct areas: the national park, the wildlife refuge, and the protected area of Touran. Additionally, Miandasht Wildlife Refuge was included in this study. The primary objective was to capture the presence of cheetahs within these regions. This comprehensive effort resulted in the acquisition of 797 images of cheetahs over the three years. Notably, this study documented all new photos of cheetahs within the Touran region. The findings revealed the presence of six female cheetahs, four male cheetahs, and 17 cheetah cubs, highlighting significant insights into the cheetah population within the specified areas.

The absence of documented sightings of new cheetahs and their reproduction in the southern habitats of the cheetah in Iran since 2010 and the diminishing prospect for the survival of the cheetah population in Miandasht Wildlife Refuge underscore the highly delicate situation of the Asiatic Cheetah in Iran. Addressing this situation necessitates prompt and comprehensive action to reinvigorate the population. The stability of the cheetah population and its reproductive success in Touran highlight the critical need to enhance conservation efforts in this ecosystem, underlining the possibility of safeguarding the Asiatic Cheetah in its natural habitat. Sustaining this possibility will hinge on comprehensive conservation measures within and outside the protected areas.

This may involve establishing a semi-captive reserve or continuing captive breeding initiatives. Furthermore, to enhance the efficacy of cheetah monitoring via camera traps, the consideration of installing satellite collars on cheetahs, as well as conducting genetic studies, is crucial.

## Introduction

According to historical records, the Asiatic Cheetah population in Iran has been of critical concern for decades (11, 12). In the mid-1970s, the Asiatic Cheetah inhabited a vast area in eastern and central Iran, with experts estimating its population to be between 200 and 400 (12). However, following the Iranian revolution in 1979 and the Iran-Iraq war, the cheetah faced increased threats while its primary prey species decreased, resulting in its extinction in many regions (11 and 12). By the early 2000s, experts estimated a small population in only five regions, including Bafq Mountain Protected Area, Dare-Anjir Wildlife Refuge, Naybandan Wildlife Refuge, Touran Biosphere Reserve, and Kavir National Park (9), (Map 1). Recent studies and monitoring reveal that the current population size of Asiatic Cheetahs in Iran is estimated to be less than 40 (11 and 19).



Map 1: Selected Areas: 1) Kavir NP, 2) Khar Turan NP, 3) Naybandan WR, 4) Bafq&Ariz PA, 5) Daranjir WR Potential Areas: a) Desert FA of Northern Karkas Mountain, b) Ardestan FA, c) Abbas Abad PA, d) Siahkuh PA, e) Miandasht WR. (9)

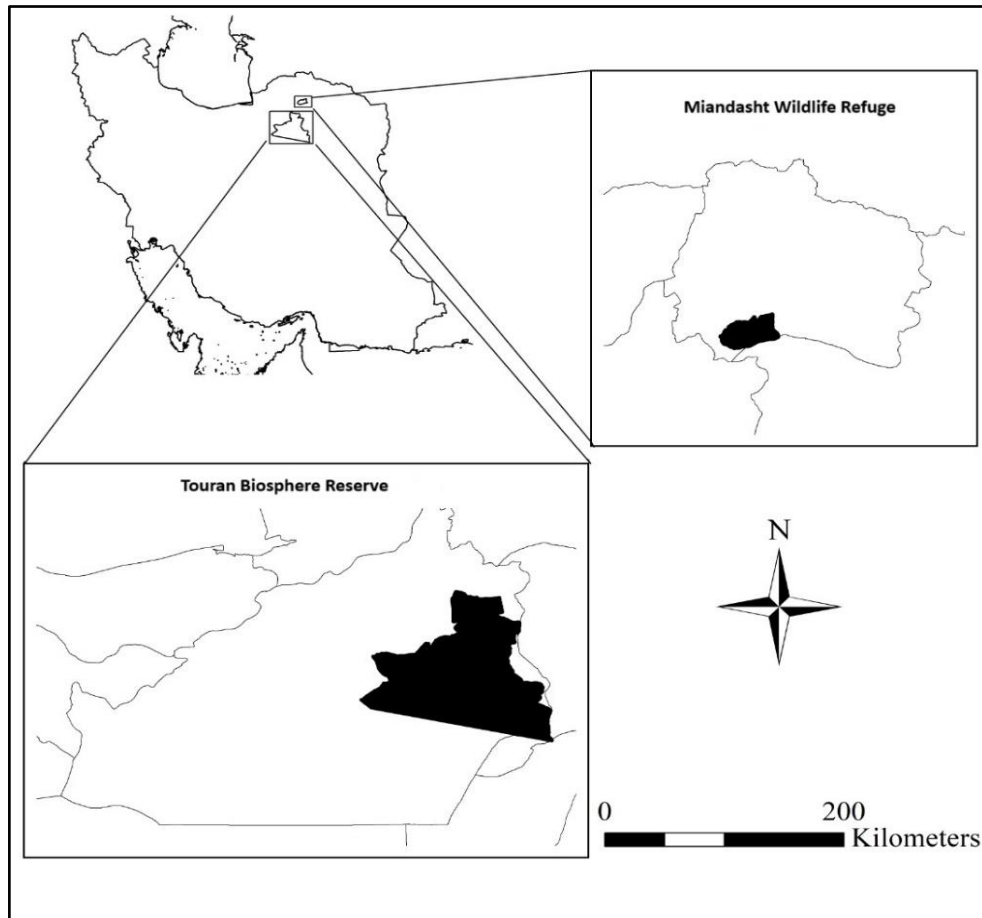
The absence of reliable data regarding the geographic distribution, population size, and population trend of cheetahs in Iran has presented a challenge in evaluating the efficacy of conservation efforts. Moreover, it has led to divergent opinions among experts regarding conservation priorities. In response, the Iranian Cheetah Society (ICS) undertook a comprehensive assessment of the cheetah population at a national level. This initiative was conducted between 2011 and 2016 in three distinct phases through collaboration with the Department of Environment (DoE), the Conservation of Asiatic Cheetah Project (CACP), and various non-governmental organizations in critical cheetah habitats. Notably, 11 designated areas within five arid provinces of Iran - namely Yazd, Kerman, North Khorasan, South Khorasan, and Isfahan - were closely monitored as part of this endeavor.

In the survey, nine target areas were state protected areas, while two were private protected areas. The findings revealed a concerning absence of breeding records in the southern habitats, specifically in Kerman, Yazd, and South Khorasan provinces, with no female cheetah sightings recorded since 2010. Breeding reports were limited to northern habitats, notably in the Semnan province (Touran Biosphere Reserve) and North Khorasan (Miandasht Wildlife Refuge). This underscored the urgency of directing research and conservation efforts towards the northern habitats. The Iranian Cheetah Society focused on the Miandasht Wildlife Refuge following three monitoring phases. Regrettably, subsequent observations from 2016 onwards indicated the loss of the entire known cheetah population in the southern habitat.

Regrettably, no research activities have been conducted for several years to evaluate the status of cheetahs in Touran Biosphere Reserve, which currently serves as the sole breeding-protected area for the species. To address this gap, a comprehensive study involving intensive camera trapping was carried out concurrently in Touran Biosphere Reserve and Miandasht Wildlife Refuge from 2021 to 2023 to ascertain the status of cheetahs in the northern habitats. The findings of this research will be detailed in the forthcoming report.

## Study Areas

This study was conducted in Touran Biosphere Reserve, including sections of the study carried out in Touran Biosphere Reserve, encompassing areas of the National Park, Protected Area, and Wildlife Refuge zones in Semnan Province, as well as Miandasht Wildlife Refuge in North Khorasan Province. The distance between the borders of these two regions is approximately 53 km, measured as the shortest aerial distance (Map 2).



Map 2: Geographical Location of the Touran Biosphere Reserve in Semnan Province and the Miandasht Wildlife Refuge in North Khorasan Province

The Touran Biosphere Reserve, spanning approximately 14,000 square kilometers, is situated in the far eastern part of Semnan Province and southeast of Shahroud County. Positioned within the Iran-Anatolian Plateau region, the reserve experiences an arid and semi-arid climate, with diverse plains and mountains ranging from elevated to level plains. Consequently, the area showcases a varied abundance of flora and fauna. The existence of carnivorous species, such as leopards, cheetahs, caracals, wolves, wild cats, sand cats, three species of foxes, and striped hyenas, as documented by trap cameras, serves as

evidence of the region's rich biodiversity (Figure 1). The main food resources of cheetahs in this locale are gazelles, wild sheep, and chinkara.

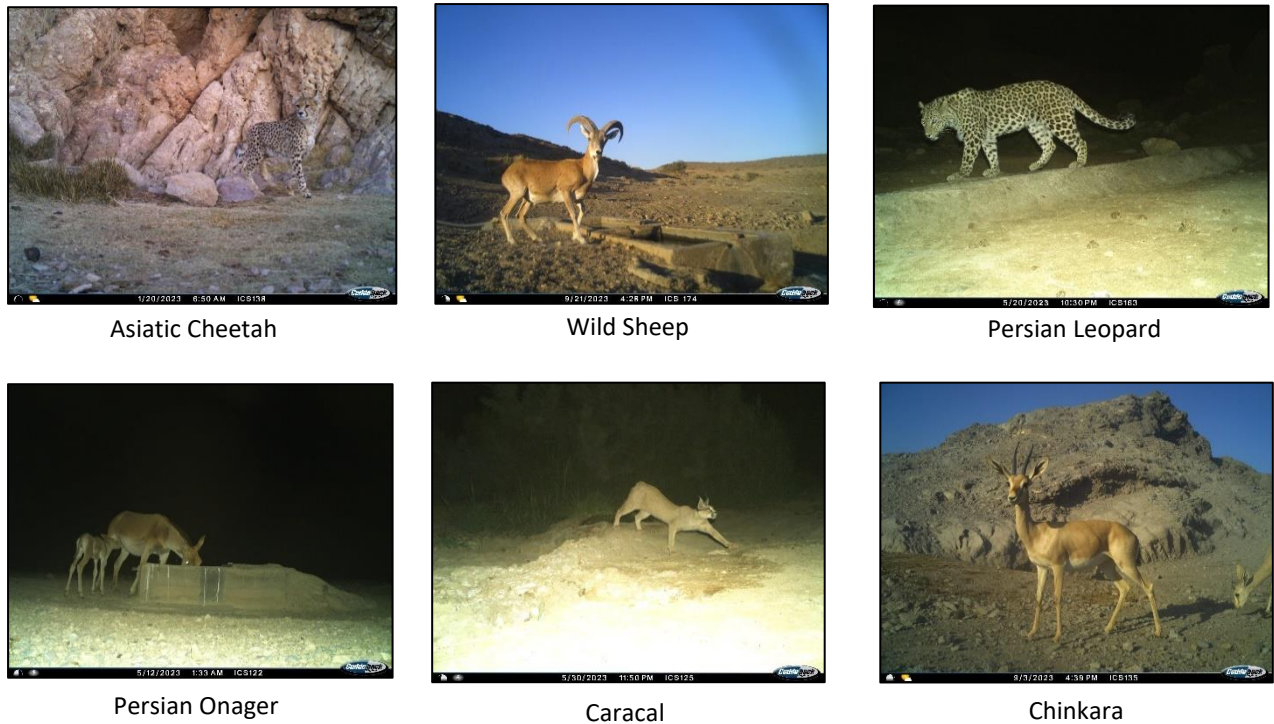


Figure 1: A Segment of the Faunal Diversity of the Touran Biosphere Reserve Captured by Camera Traps

Miandasht Wildlife Refuge spans an area of 844 square kilometers and is situated in the North Khorasan Province. To the south, the refuge is bordered by arid mountain hills interspersed with dry, waterless valleys, while to the north, it is encompassed by a vast plain abundant with saline plants (see Map 2). Notably, the refuge is home to a substantial population of gazelles, serving as the primary prey for cheetahs. Other carnivorous species coexist with the cheetah, including wolves, jackals, wild cats, and caracals (Figure 2).

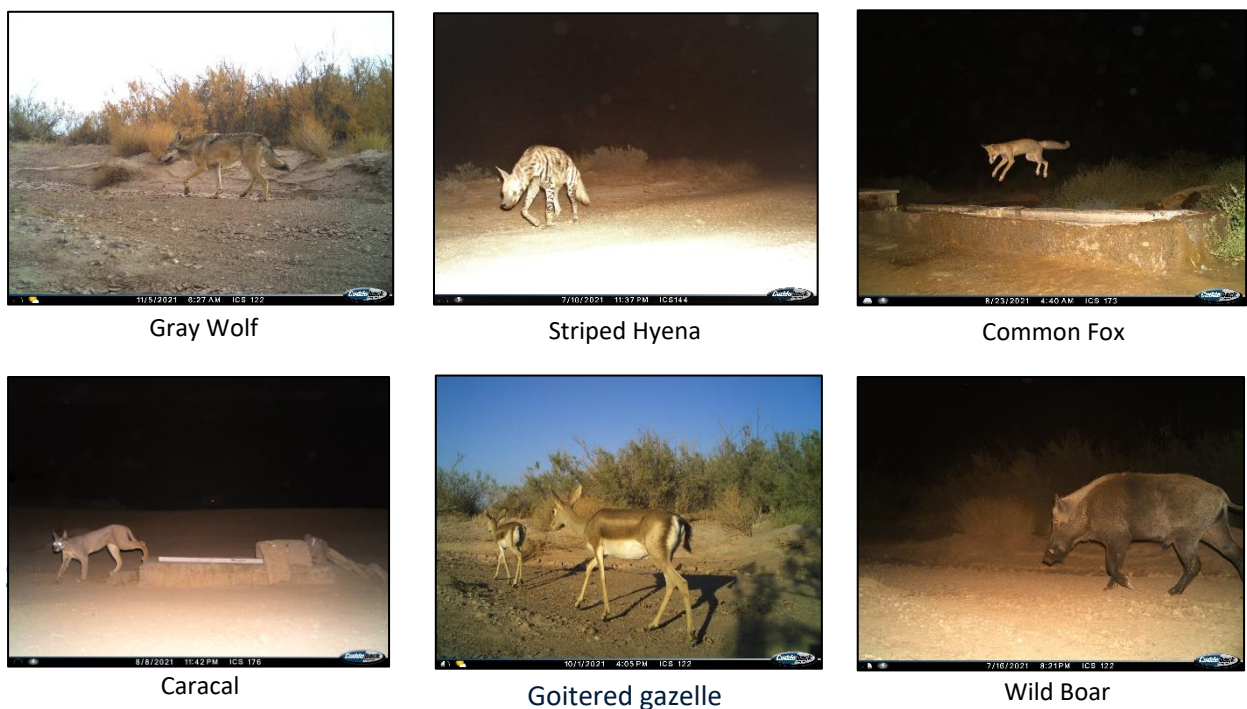


Figure 2: A Segment of the Faunal Diversity of the Miandasht Wildlife Refuge Captured by Camera Traps

Due to the infrequency of direct observations of Asian cheetahs in the wild, this study utilized camera traps as a primary data collection method. Their non-invasive nature makes them particularly effective in studying elusive or rare species, such as cheetahs (1, 5).

Effectively selecting camera trap locations is challenging, especially given the low number of cheetahs in the region. Studies tend to overrepresent males, as cameras often placed near male-marked areas like trees and rocks (19, 2). Additionally, female cheetahs are more elusive and harder to observe compared to males. Given the non-uniform habitat usage of cheetahs (7), we installed cameras across diverse landscapes, including passes, flood paths, plains, and key topographies, using rangers' expertise. We also prioritized placing cameras near water sources, which are highly efficient in arid environments during the warm season. Monitoring water sources with camera traps significantly increases the likelihood of recording female cheetahs during lactation, both alone and with cubs, during the hot season, as their water needs rise (18).

To accurately identify and complete each identity card, capturing images of both sides of the animal's body was necessary. As a result, two cameras were installed on opposite



Figure 3: Camera Traps in plain Areas



Figure 4: Camera Trap in Mountain Pass



Figure 5: Coverage of Key Gorges



Figure 6: Installing Camera Trap Near Water Resources

sides of the track at stations where there was a high likelihood of a cheetah crossing (Figure 7).

Furthermore, the pathway was intentionally lined with rocks and bushes to enhance the probability of obtaining a clear and identifiable image. These barriers effectively guided the animal to the path between the cameras, allowing for capturing high-quality images from both sides of the body (Figure 8).



Figure 7: Installing Camera Traps on Both Sides of a Potential Cheetah Pathway: Optimal Camera Range and Sample Results



Figure 8: Efforts to Guide Cheetahs Between Cameras Using Habitat Elements as Barriers

In Touran National Park, certain locations are recognized as key habitats for cheetahs, where a significant number of both male and female cheetahs, along with their cubs, are frequently sighted and documented. However, accurately determining the sex of cheetahs poses a challenge, as it can be intricate and, at times, infeasible to discern using cameras positioned on both sides. To address this issue and enhance the accuracy of previous identifications, an additional camera was deployed near the crossing points and marking trees to facilitate easier gender identification (refer to Figure 9).



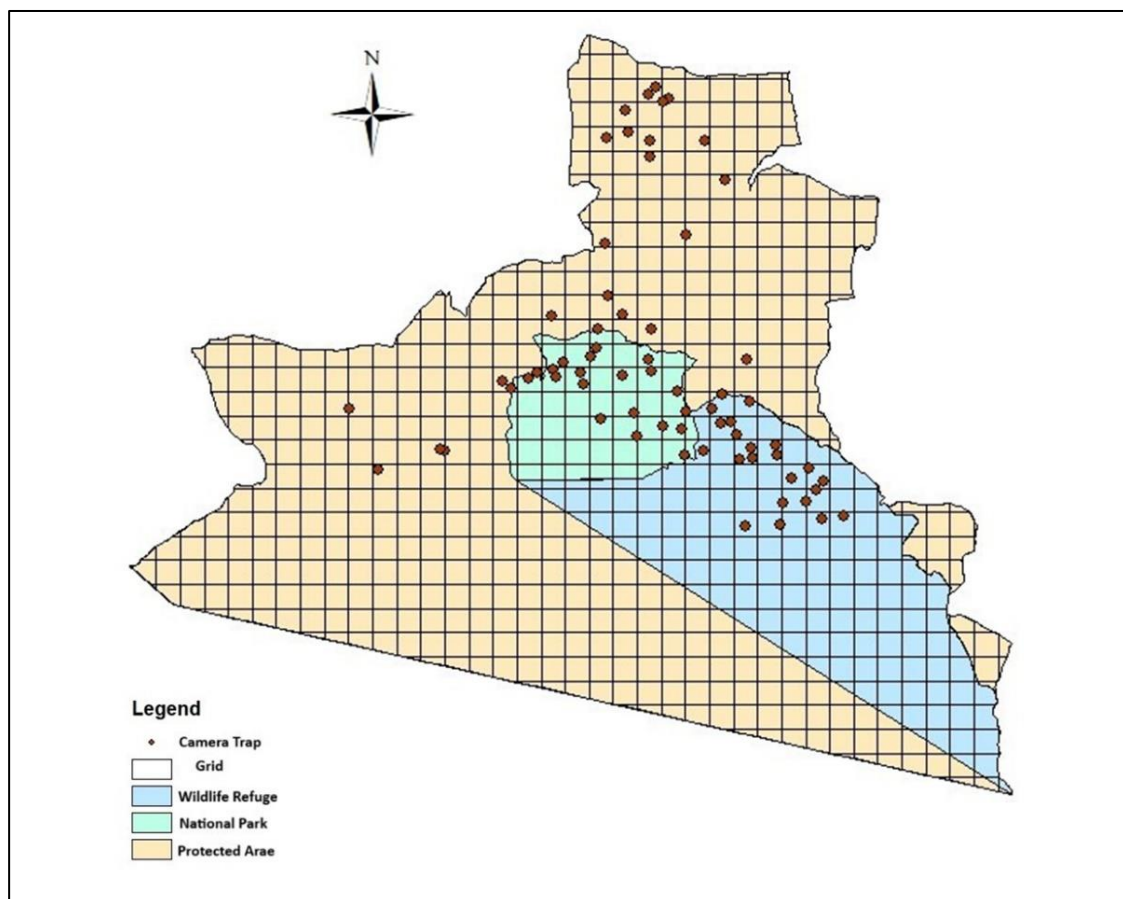
Figure 9: Sample Camera Trap Setup to Enhance Gender Identification of Cheetahs at a Marking Place

In previous studies, we partitioned the region into grids of 5 km<sup>2</sup>, to install at least one camera within each grid. This grid size selection was based on the smallest known cheetah habitat range in Africa (14, 2) (Map 3 and 4). All cameras were activated simultaneously over three years, from June to November.

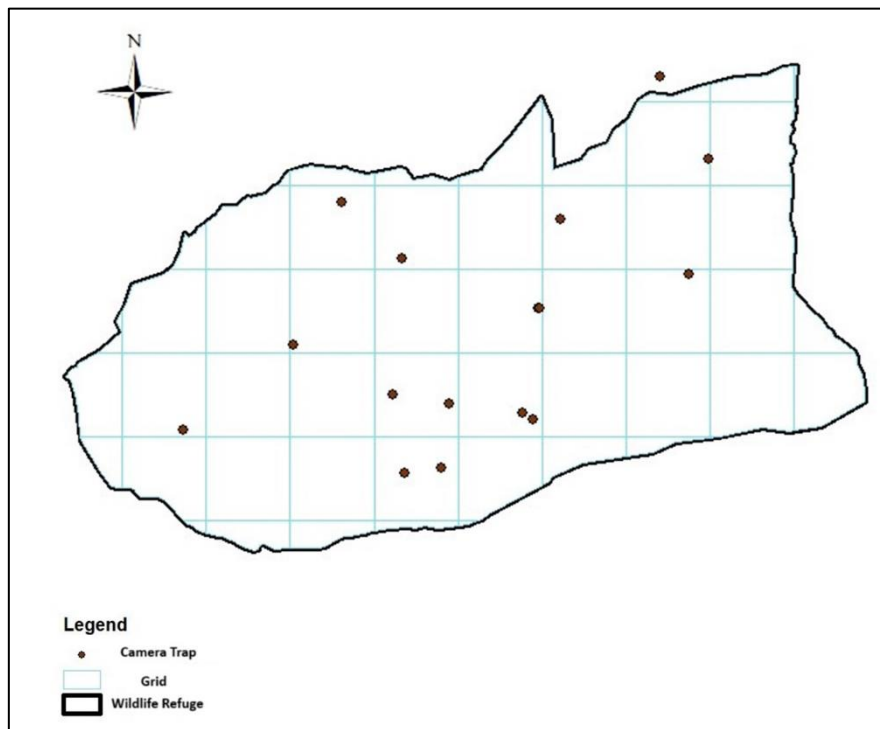
Certain spots proved unsuitable for the camera due to various reasons. For instance, extensive playas rendered camera implementation unfeasible within Touran Biosphere Reserve. During the 2022 and 2023 studies, cameras were positioned in areas where cheetahs were likely to traverse, according to experts and rangers. Consequently, the grid method was conducted in 2021, and two years later, a diverse range of camera placement sites was adopted to maximize the likelihood of capturing cheetah footage.



Figure 10: Expert Team Installing Camera Trap



Map 3: Location of camera traps in the Touran Biosphere Reserve.



Map 4: Location of camera traps in Miandasht Wildlife Refuge

## Obstacles and problems

➤ **Lack of Sufficient and Necessary Information from Previous Studies in the Region:** The research team encountered a significant obstacle in the Touran Biosphere Reserve due to the unavailability of data from previous studies. The utilization of knowledge derived from prior research is critical in determining optimal camera placement for more accurate population estimates (19). The absence of historical data necessitated a more experimental approach during the study phase. To address this issue, cameras were positioned throughout the park area, with a high concentration in the wildlife sanctuary zone, nearly nine months before the research commencement, to enhance the precision of location estimates.

➤ **Damage to Cameras by Camels and Persian Onagers:** The research team encountered challenges related to camera damage and displacement caused by Persian onagers, and camels, in Touran region. To mitigate this issue, a variety of methods were implemented, including obstructing camel access to the cameras and securing the camera bases by cementing them into the ground (refer to image 11).

➤ **Inaccessibility to Suitable and High-Quality Batteries Due to Sanctions and Import Restrictions on Essential Goods.**

➤ **Cameras Theft**



Figure 11: Camera Damage by Camel

## Result

### A: Field Efforts

Throughout three years, comprehensive field initiatives were undertaken to evaluate the status of the Asiatic cheetah in Touran and Miandasht. A total of 208 camera traps were positioned in four designated cheetah habitat areas, resulting in the capture of approximately 355,000 wildlife images (refer to Table 1). Among these images, 797 were conclusively identified as of the Asiatic cheetah. A forthcoming report will furnish a concise overview detailing the count of individual cheetahs and their respective genders documented in these images.

Table 1: The number of images obtained for the Asiatic cheetah, categorized by habitat area- 2021 to 2023

Study area	No. Cheetahs Pics	No. Known Cheetahs	Known Cheetahs ID
Touran National Park	697	5 Adults, 9 Cubs	23, 25, 26, 30, 34
Touran Wildlife refuge	33	3 Adults, 4 Cubs	25, 26, 30
Touran Protected Area	67	4 Adults, 6 Cubs	24, 27, 28, 32
Miandasht Wildlife refuge	0	0	0

### B: Identified Cheetahs and Their History in the Area

Throughout the study period, no cheetahs were captured by the camera traps within the Miandasht Wildlife Refuge. Although the cameras in the area were active, the local ranger managed to capture some images of cheetahs near the sanctuary's boundary. Additionally, residents in the vicinity reported numerous sightings of cheetahs. Nevertheless, it's worth noting that all documented individuals mentioned below have been observed solely within the Touran Protected Area.

An ID card has been designed for each recorded adult and independent individual, with a sample displayed in Figure 12.



Figure12: Identification Card Designed for Faraz, the Dominant Male of the National Park

### 1. Female Cheetah (ID: 25), AKA "Harb."

In 2016, a ranger initially recorded the presence of Harb within the confines of the Touran Biosphere Reserve (Figure 13). As of the conclusion of 2023, she is anticipated to have reached a minimum age of 9 years, potentially establishing her as the oldest known female cheetah within Touran. Her initial verified litter, composed of three cubs, was delivered in 2019. Subsequently, camera traps, in 2021, captured her in the company of two cubs (Figure 14). An assessment of her mating conduct during the winter of 2022 suggested the possibility of another litter in 2023.



Figure 13: Harb's First record in 2016 by Ranger

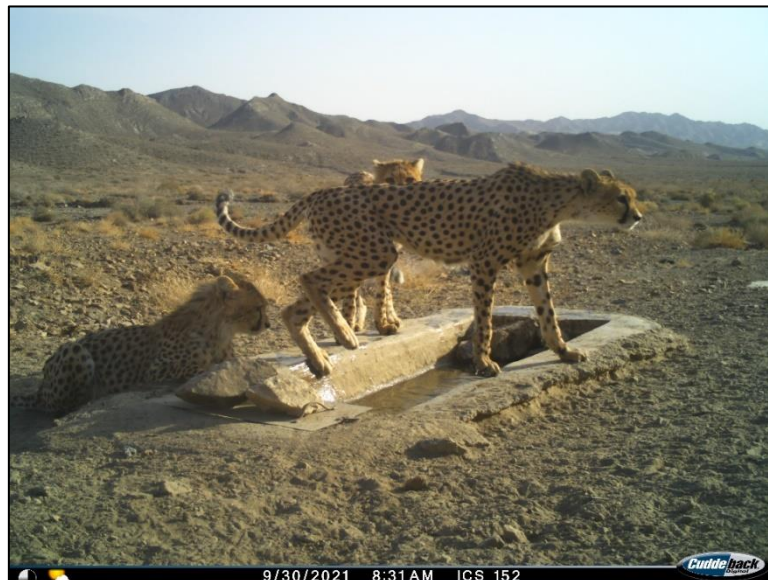


Figure 14: One of Harb Breeding with Two Cubs- 2021

## 2. Female Cheetah (ID 26) - AKA "Khorshid"

Khorshid, a seven-year-old female cheetah, has been monitored in Touran National Park alongside her mother, Parieh, and her brother, Faraz, since her early years. In 2019, she entered her reproductive cycle and successfully gave birth to three cubs, followed by two more in 2021. Khorshid disappeared from records between September 2021 and December 2022. In 2023, Khorshid achieved a significant milestone in Iran's history by becoming the first female Asiatic cheetah to complete three reproductive cycles successfully in over 20 years of Asiatic cheetah research. Previously, no camera traps had recorded more than two successful female reproductive periods. During her third cycle, Khorshid gave birth to four cubs, all observed alongside her until December.



Figure 15: Khorshid's First Breeding in 2020- Recorded by DoE Camera Trap



Figure 16: Second Breeding in 2021



Figure 17: Third Breeding in 2023

### 3. Male Cheetah (ID: 30) - AKA "Faraz"

A male cheetah, Faraz, asserts dominance over the territory of Touran National Park. He was born in 2016, the same year as his sister Khorshid (code 26). Over the past three years, Faraz has extensively traversed Touran Biosphere Reserve, establishing a substantial home range.



Figure 18: Faraz in 2022

### 4. Male Cheetah (ID: 24) - AKA "Feqeh"

Feqeh, an adult male cheetah, is one of only three known individuals observed in recent years. He consistently marks his territory within the protected area, and there is no evidence of his presence elsewhere in the reserve. Since 2020, this male cheetah has been identified as he diligently continues to establish and uphold his territory independently of Faraz.



Figure 19: The last Picture of Feqeh that was taken by Camera Trap

## 5. Female Cheetah (ID: 28) - AKA "Helia"

In 2019, the birth of a female cheetah named Helia was documented. Initially, she was captured by camera traps in 2020 alongside her mother, Harb. In 2021, she was observed autonomously in front of the cameras, signifying her emancipation and self-sufficiency from her mother. Subsequently, in July 2022, Helia was sighted in the open expanse north of the Tehran-Mashhad highway with four cubs. Later, she was observed in the Touran region with two cubs. Regrettably, in 2023, one of cub met with a fatal accident on the road.

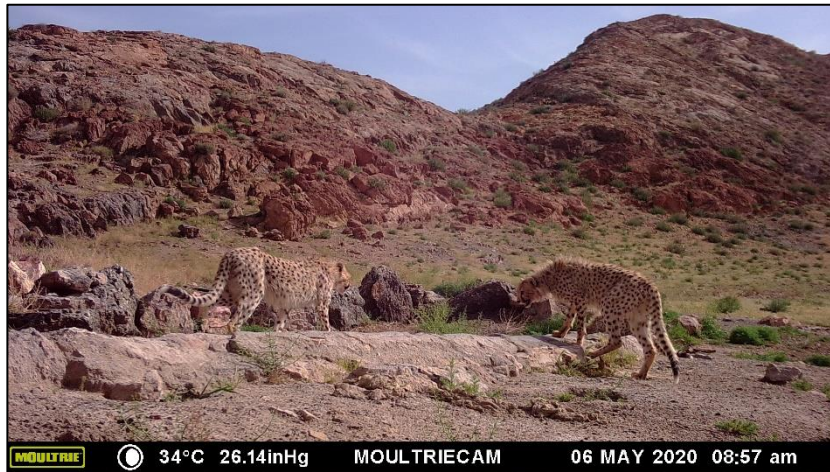


Figure 20: Helia When Was a cub in 2020- Taken by DoE Camera Trap



Figure 21: Helia whit First Cubs in 2022

## 6. Female Cheetah (ID: 27) - AKA "Telma"

Telma, akin to Helia, was born in 2019. Her mother, Khorshid, nurtured her until she attained autonomy in 2020. Documentation from 2021 confirms Telma's presence within the designated protected area, accompanied by her four offspring.



Figure 22: Telma after Independence from Mother in 2020



Figure 23: Her First Breeding with Four Cubs in 2022

## 7. Female Cheetah (ID: 23)- AKA "Majerad"

Majerad was documented once in Touran National Park in 2019, and she did not reappear until September 2023, when she emerged on the periphery of the park accompanied by a male cub. Regrettably, she met with a fatal road accident in March 2023.



Figure 24: Last Majerad camera trap picture before her accident in 2022

## 8. Female Cheetah (ID: 34)- AKA "Mahshad"

Mahshad, the offspring of Harb, was born in 2021 and acquired territorial knowledge from her mother. She reached adulthood in the winter of 2022. Camera traps in the protected area and Touran National Park have shown that she was alone until the end of 2023. If she successfully mates, she will likely start breeding next year.



Figure 25: Mahshad with her mother in 2022



Figure 26: Mahshad after her independence from her mother in 2023

## 9. Male cheetah was known as "Khorshid's Son" (ID: 26)

2019 a male cheetah known as "26" was born. He was one of Khorshid's sons and a sibling of Telma's. Unfortunately, he passed away in 2023 due to injuries sustained outside the protected area. Before his death, his image was captured by camera traps within the Touran protected area.



Figure 27: Last camera trap picture before he died in 2023

## Summary of the recorded Asiatic Cheetah in the Northern Habitat 2021- 2023

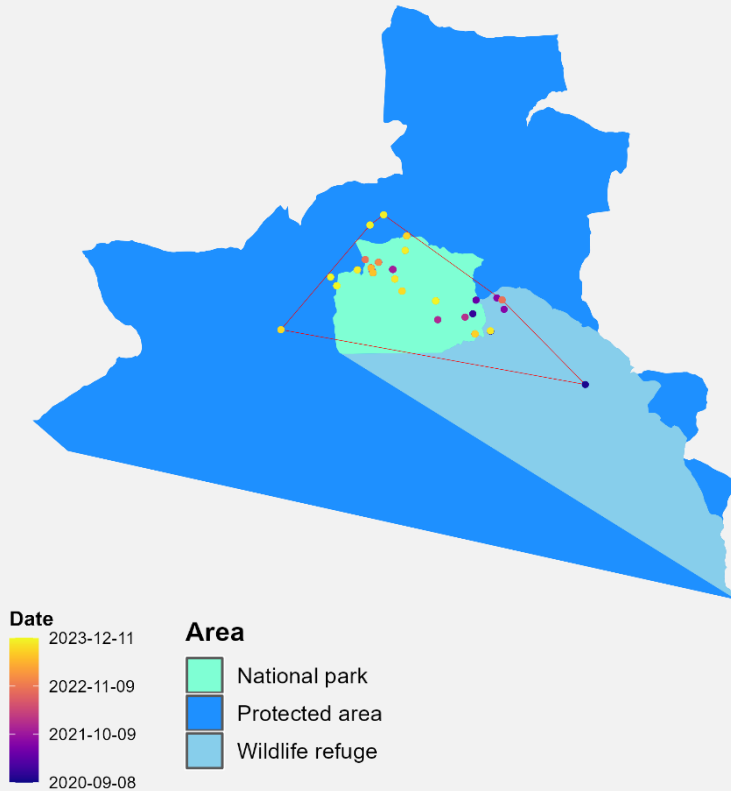
Year	Female	Male	Cub	Total
2021	3	2	4	9
2022	6	2	9	17
2023	3	3	4	10

### C: Movement Routes of Cheetahs in Touran Biosphere Reserve

Capturing the cheetahs' movement patterns in Iran presents a considerable challenge, primarily stemming from the unavailability of satellite collars. While camera traps can document specific points of the cheetahs' presence and movements, it is feasible to estimate the minimum range of their movement within a given timeframe. It is crucial to acknowledge that the lack of cheetah recordings at a particular location does not definitively indicate their absence in that area. Various factors account for cheetahs not being captured on camera, thereby leading to their undocumented presence despite their actual appearances.

This report presents an analysis of raw data obtained from camera traps to evaluate the presence of cheetahs. It encompasses data collected up to 2023. The study has delineated the movement ranges of cheetahs based on a substantial volume of data points. Detailed explanations of each cheetah's movement range have been furnished for Faraz, Khorshid, Harb, Feqeh, Helia, Telma, and Mahshad. Additionally, figure No.34 provides a visual representation of the extent of overlap in the movement ranges of all seven cheetahs.

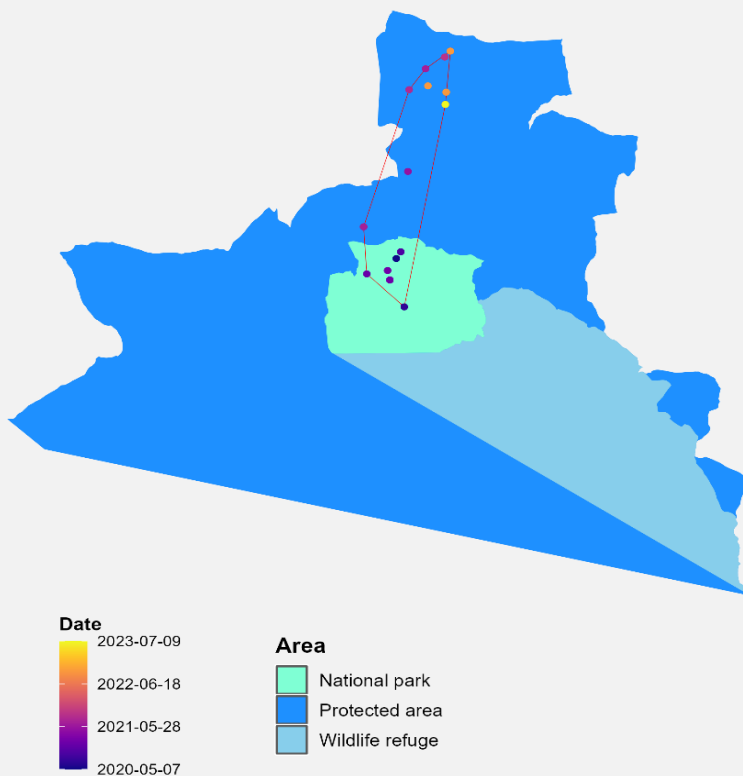
Faraz (Figure 28)



Faraz became the territorial male in the national park after the previous dominant male was captured for a captive breeding program. Before this, Faraz primarily roamed as a floater male in more secluded areas outside the sanctuary (21).

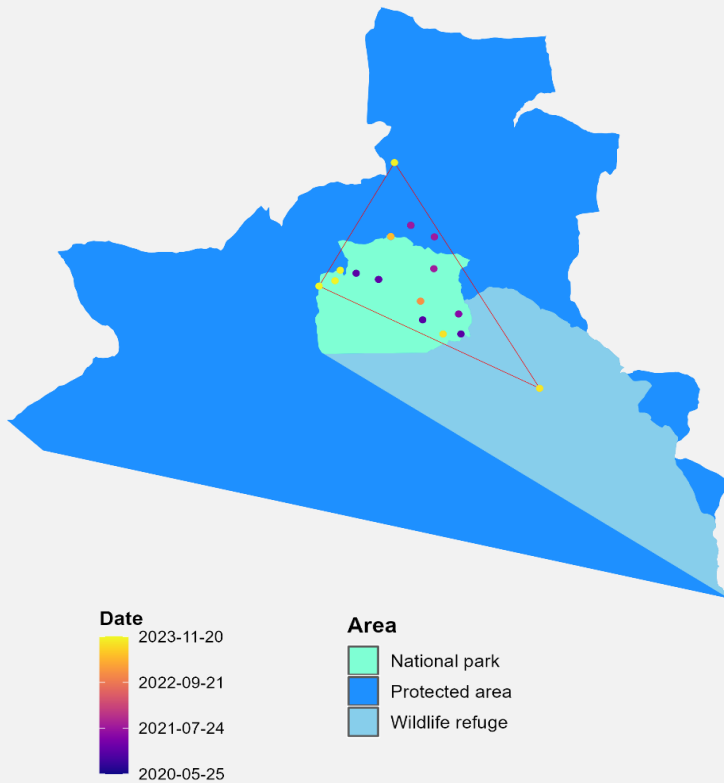
Over the past three years, he has demonstrated territorial behavior, dedicating the majority of his time to patrolling the boundaries of the national park, and intermittently surveying sections of the wildlife refuge and protected areas before re-entering the national park.

Feqeh (Figure 29)



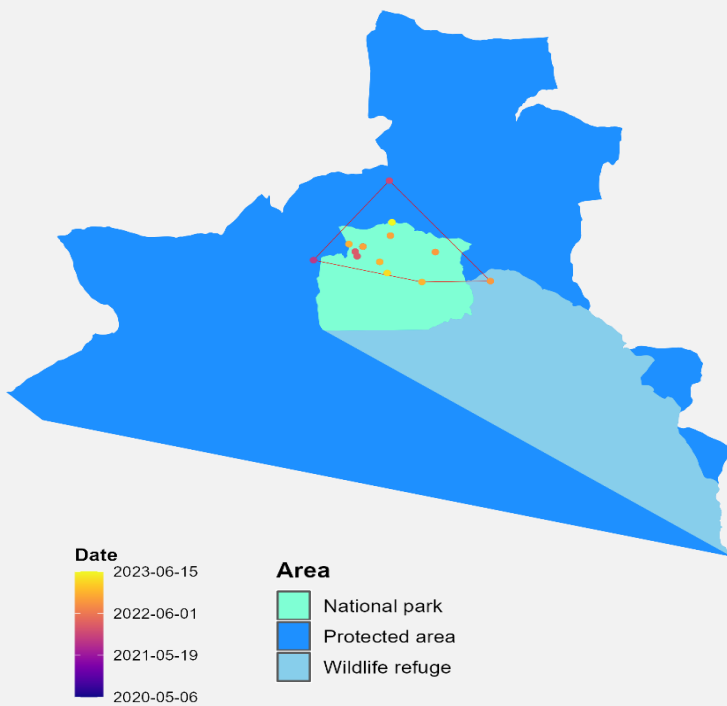
Following the presence of Firouz (the previous dominant male), Feqeh's frequent appearances were noted across various sections of the national park. However, upon Firouz's capture, Feqeh's sightings became confined to the protected area, with the surveillance cameras no longer detecting his presence. Observations suggest that over the past three years, Feqeh has exclusively inhabited a specific part of the protected area. This behavior indicates Feqeh's territorial claim and deliberate avoidance of conflicts with Faraz.

Khorshid (Figure 30)



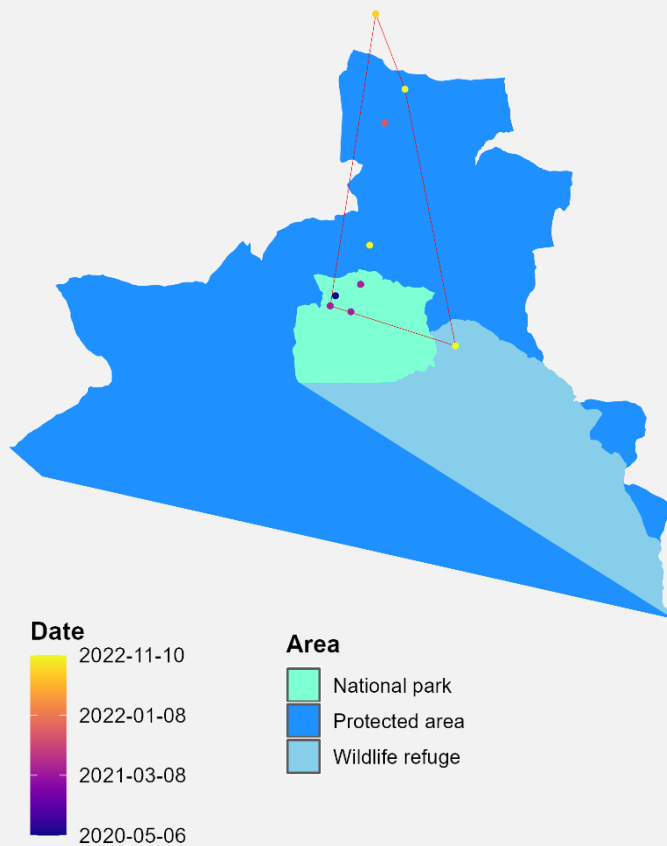
Most Khorshid sightings have occurred within the confines of the national park, occurring both in her solitary state and in the company of her offspring. Notably, in the three documented instances outside the park, her cubs consistently accompanied her. In the last three years, she has given birth within the park twice and only departed the area once when her offspring were grown to some extent.

Harb (Figure 31)



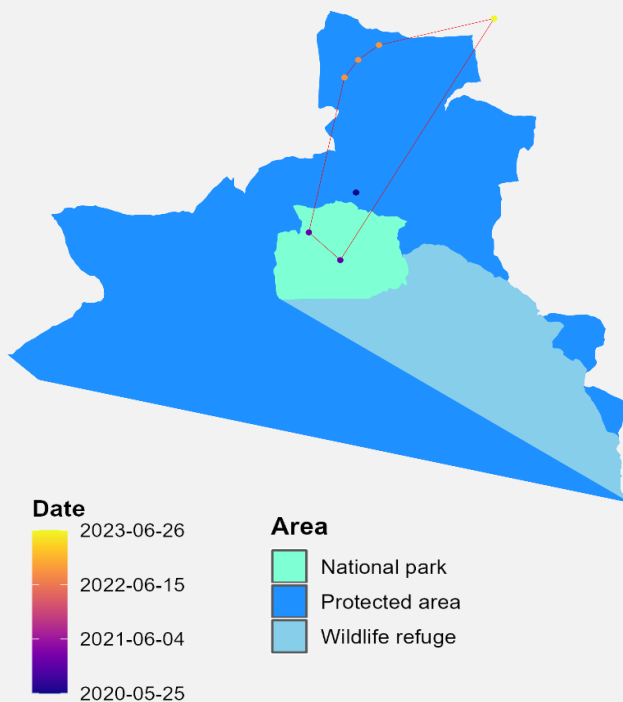
In recent times, Harb has been frequently observed within the confines of the park, prompting the assumption that she breeds her cubs outside the park and subsequently relocates them once they reach a certain age. She has been sighted both singly and with her offspring outside the mating season, actively seeking a mate during the mating season. In the year 2020, research and observations concentrated on the initial phases of Helia's life, during which she lived with her mother.

Helia (Figure 32)



Helia was observed in 2021, and by 2022, documented sightings included her presence with her offspring. The majority of sightings of Helia and her offsprings have transpired within the demarcated protected zone and the Touran Wildlife Refuge. It is of significance to note that instances of her giving birth have also been reported in regions exterior to the protected zone.

Telma (Figure 33)



In 2021, Telma, Khorshid's cub, was observed in the company of her mother at two distinct locations and subsequently alone at a different site. In 2022, she was documented within the borders of the protected area with her four offspring. It is suspected that she may have given birth outside the park, potentially within the northern expanse of the reserve.

## Overlapping Movement Maps of Cheetahs

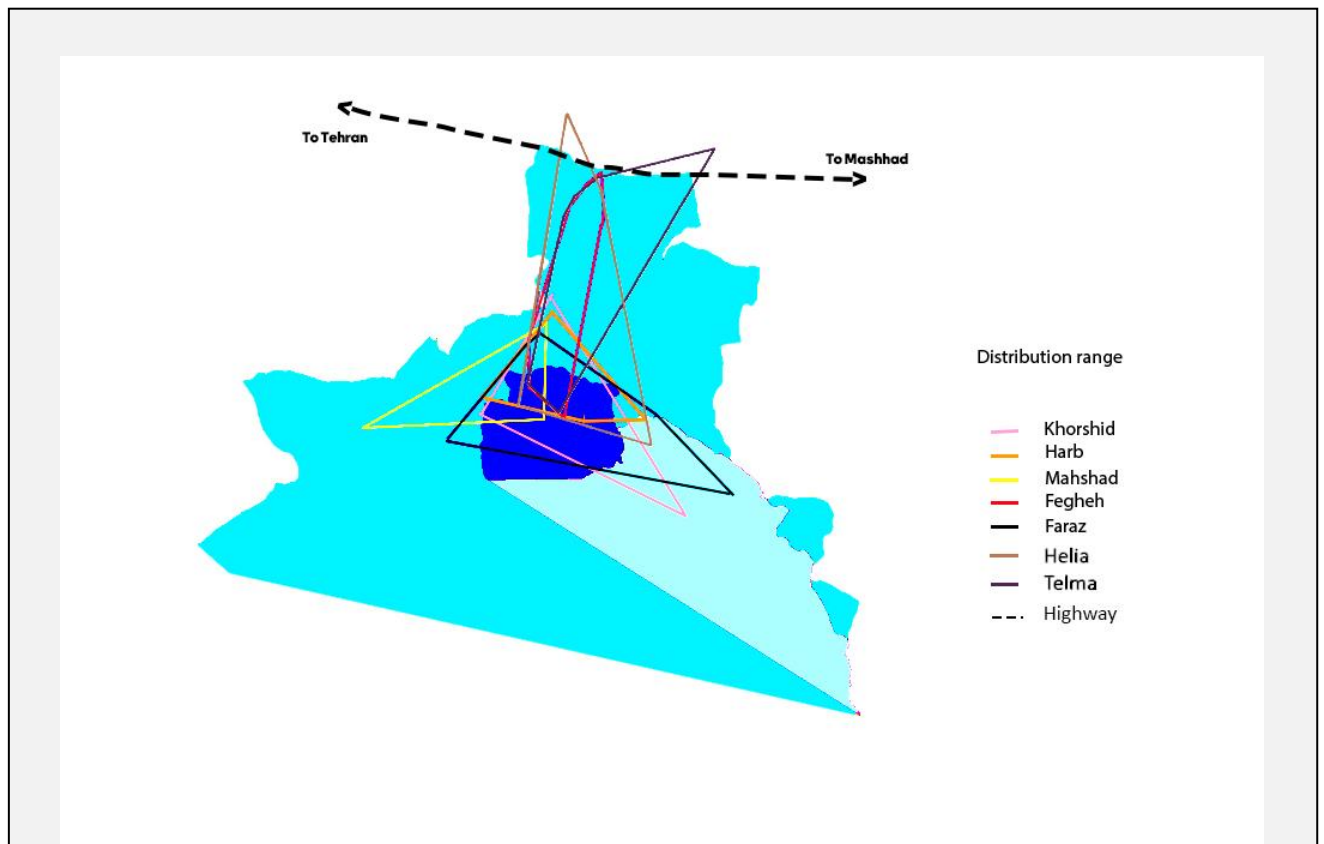


Figure 34: Overlapping Movement Maps of Cheetahs

The provided map shows the roaming range of cheetahs in a specific area. It's important to note that due to incomplete data, the exact ranges and territories of the cheetahs cannot be definitively determined. The map depicts the overlapping roaming areas of male and female cheetahs, based on camera trap findings over three years.

The movement of female cheetahs to areas outside the protected region and their subsequent birthing in these areas underscores the importance of safeguarding such areas for the conservation of cheetah cubs. The death of a four-year-old male cheetah in the free areas further emphasizes the significance of these regions. Additionally, the concentration of all cheetahs in the northern and northwestern sectors of the national park indicates the security and importance of this area.

## Conclusions

The population decline in Asiatic cheetahs is believed to have commenced a century ago, resulting in their present confinement to the central plateau of Iran (9 and 15). Previously, the cheetah habitat in Iran was segregated into three distinct areas. These three areas encompassed the northern and southern habitats and the Kavir National Park. Up until approximately ten years ago, it was likely feasible for cheetahs to traverse between regions within each area (11 and 20). Regrettably, Kavir National Park has completely lost its cheetah population.

The absence of breeding in the southern habitats for over a decade contrasts with the breeding recorded in the northern habitats over the past five years. The observed increase in the number of females—and consequently, offspring—during this period represents a positive development. However, the precarious cheetah population in Iran serves as a cautionary example that this positive trend is susceptible to reversal due to one or two adverse events, potentially leading to a rapid decline in the breeding population. This vulnerability is reminiscent of the situation in Miandasht Wildlife Refuge, where the entire cheetah population was lost within two to three years. Furthermore, the surveillance and documentation of recently separated young cheetahs in peripheral areas and regions beyond protected zones pose significant threats to their survival.

Figure 35 displays the recorded population data from the past decade in Touran Biosphere Reserve. This data includes information about fatalities, the number of cubs born each year, and the number of males and females, categorized into adults and those with cubs. The chart highlights the relatively small fluctuation in population growth or decline since 2017. Accurate population records were not kept until 2017 due to various reasons. According to experts and observations, the status of the cheetah population in Touran was not much different before and after 2017. The highest recorded population was in 2022, with 20 adults and cubs. The higher number was due to an increase in cub births, but the number of adults did not differ significantly from previous years, fluctuating between five and ten individuals over the past decade.

The lack of significant population changes and the absence of notable growth indicate that the conservation efforts over the past decade to protect the Asiatic cheetah, even in Iran's most important breeding habitat, have been insufficient or ineffective. Furthermore, the population's lack of growth has made it extremely fragile, and the loss of just a few key adult cheetahs involved in reproduction could result in the complete disappearance of the cheetah population in Iran.

\* The data was obtained by the Iranian Cheetah Society, DoE, PWHF, and independent individuals

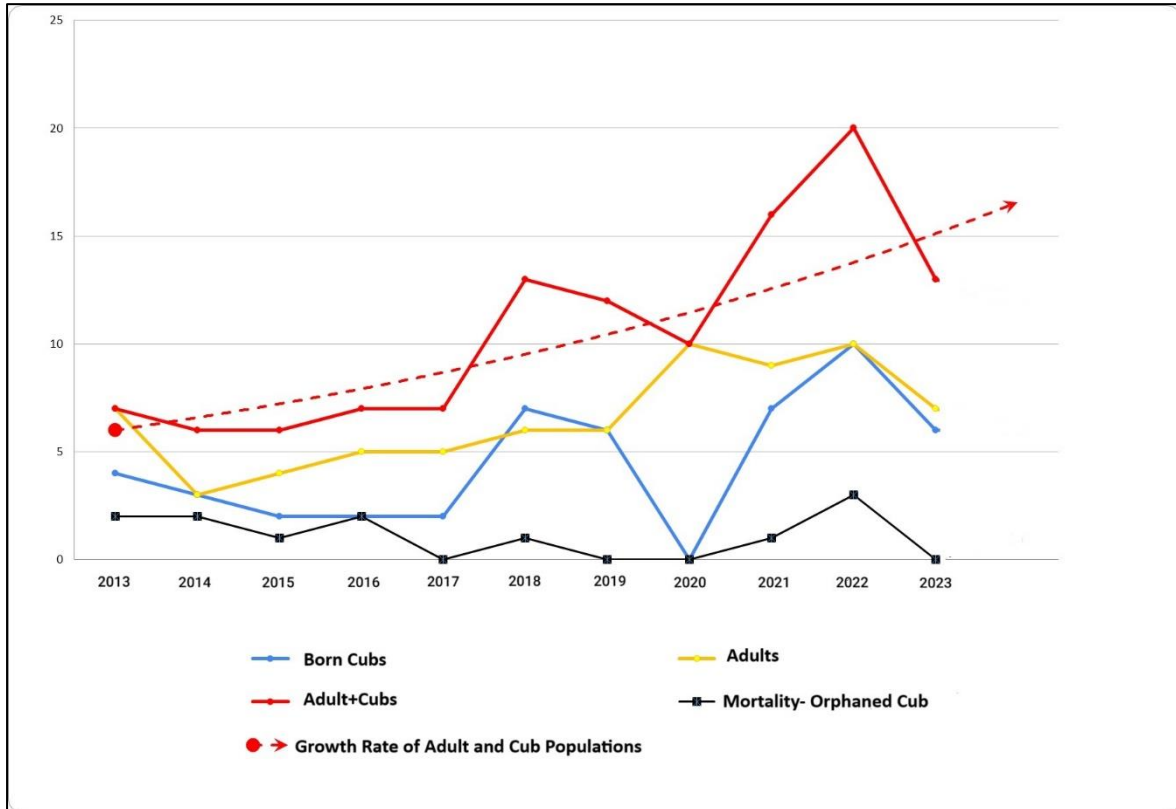


Figure 35: Population Rate of Asiatic Cheetahs in Touran Biosphere Reserve (2013–2023)

Extensive camera trapping has been implemented in these regions for over a decade, leading experts and managers to acknowledge that cheetah conservation in Iran demands more than repetitive camera trapping. While the identified number of adult cheetahs may not comprehensively represent the remaining adult population in Iran, the substantial efforts, extensive time allocation, and the recorded local extinctions, despite ongoing monitoring, substantiate the current estimate of the minimum adult cheetah population in Iran as the anticipated figure. This indication does not signal an abandonment of cheetah habitat conservation but rather underscores the necessity for intensified conservation endeavors to safeguard Iran's last remaining cheetah population.

- ✓ To gain an accurate understanding of cheetah movement paths, the installation of satellite collars on these animals is imperative. This knowledge is essential for the effective implementation of conservation efforts. Access to information regarding

their movement ranges is likely to necessitate updates and modifications to conservation protocols.

- ✓ Water scarcity in the regions has become a significant issue, exacerbated by camels competing with native wildlife over limited water resources. It is imperative to bolster protection within these habitats by upgrading equipment, resolving issues of water resource management—notably the camel problem—increasing the number of protective personnel, and implementing similar measures to effectively safeguard the reserve as the principal breeding habitat in Iran. These initiatives are pivotal in ensuring the secure preservation of the reserve.
- ✓ The areas previously designated as cheetah corridors have evolved into habitats where cheetahs are consistently observed, reproduce, and establish territories. Consequently, safeguarding these areas is paramount to sustaining the resident population. Given the critical endangerment of Asiatic cheetahs, the protection of every individual is of utmost importance.
- ✓ It is imperative to sustain captive and semi-captive breeding initiatives under established international protocols, as this will significantly contribute to the conservation of the genetic diversity inherent in this invaluable species.
- ✓ Given the prevailing genetic concerns within cheetah populations and the pronounced risk of inbreeding among the existing cohort, the prospect of conserving this invaluable species, notwithstanding intensified conservation endeavors, is profoundly improbable. Consequently, it is imperative to initiate requisite research for genetic augmentation and establish requisite provisions in anticipation of this eventuality before the potential loss of the extant population.

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