

*Full Length Research Paper*

# **Status of the cheetah (*Acinonyx jubatus*) in Ethiopia: A review**

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**Cheetah (*Acinonyx jubatus*), one of the wide-ranging scarce carnivores, was widespread some decades back in Ethiopia's wild lands. However, its natural habitats are currently fragmented and shrinking due to anthropogenic factors. Regardless of this general overview, there appears to be a lack of up-to-date information which reveals the past and existing status of cheetahs in Ethiopia since they are relatively understudied compared to other large carnivores. Available published and unpublished reports, manuscripts, and policy-focused documents on the target species were reviewed to explore and document the status of the cheetah in Ethiopia. Based on our review, we concluded that the cheetah population size is extremely small (below 500) while large ranges (65% of projected habitat area) have been identified through field assessments and sightings undertaken since 2015. Besides, the incidence and extent of its threats are increasing and changing over time. It is therefore recommended that there is a need to conduct a countrywide assessment to examine the status of the existing populations and review the developed national action plan based on up-to-date information on the potential threats to the populations of the cheetah.**

**Key words:** Trends, distribution, range, estimates, density, abundance, threats, conservation.

## **INTRODUCTION**

The cheetah (*Acinonyx jubatus*, Schreber, 1775) is one of the most unique and specialized members of the cat family. As predators, cheetahs have evolved the ability to run at speed to capture their prey. Cheetah is the fastest land mammal capable of running with a speed of 100 km per hour for short distance run (Sharp, 1997). Cheetahs, unlike many other African predators, rarely scavenge (Durant et al., 2015). They take a wide variety of prey, depending on habitat and geographic location, but they prefer prey of 15 to 30 kg (Durant, 2000; Durant et al., 2015).

Cheetahs appear to show relatively low habitat selectivity and occur at relatively low densities compared with other carnivores (Durant et al., 2015). Cheetahs are adaptable to various types of habitats ranging from desert through grassland savannahs to thick bush (Myers, 1975; Caro, 1994; Kingdon, 1997; EWCA, 2012). Cheetah males are often social, forming permanent coalitions of two or three animals, usually brothers, which stay together for life while females are solitary or accompanied by dependent young (Caro, 1994; Kingdon, 1997; Durant et al., 2015).

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In areas where prey is migratory, female cheetahs go along with the herds, while male coalitions establish small territories of about 30 km<sup>2</sup> on average (Caro, 1994). However, in areas where prey is non-migratory, both cheetah sexes may have overlapping and very large range (average 1,642 km<sup>2</sup>) (Caro, 1994; Marker 2002; Durant et al., 2015).

About five decades back, cheetah was quite widespread in the wild lands of Ethiopia, and it has been an essential element in the ecosystems that range from open savannah grassland to arid/semiarid lowland and thick bushland (Myers, 1973; EWCA, 2012; Kebede and Gebretensae, 2018). However, the present distribution of the species is limited to some wild habitats of the country. The distribution of the species has contracted noticeably from its historical range and the declines have been largely attributed to habitat loss and fragmentation. These have been the over-arching threats to cheetah populations since cheetahs require much larger areas of land than do other carnivore species (Myers, 1975; EWCA, 2012, Kebede and Gebretensae, 2018).

Despite this general truth, it is evident that there is a lack of up-to-date information which reveal the past and present status of cheetahs in Ethiopia since the species is relatively understudied compared to other large carnivores, and thus little is known about the species in question in most of its ranges (Marker, 2002; Durant et al., 2015; Kebede and Gebretensae, 2018). Therefore, this review aims to examine and document the past and current status of the distribution and population size of cheetahs in Ethiopia.

## METHODOLOGY

### Study area

Ethiopia is located in the Horn of Africa, bordering Eritrea in the North, Djibouti, and Somalia in the East, Kenya in the South, and Sudan and South Sudan in the West. The country stretches from 3°N of the equator to 15°N latitude and from 33°E to 48°E longitude and has an area of 1,127,127 km<sup>2</sup>. Ethiopia has great geographic diversity with high and rugged mountains, flat-topped plateaus, deep gorges, incised river valleys, and rolling plains. The climate pattern of Ethiopia is mainly determined by the alternations of the inter-tropical convergence zone and the influence of the Indian Monsoon throughout the year. The differences in altitude, topography, and climate have created the different ecosystem types of Ethiopia, which range from cool afro-alpine to evergreen montane forests, to dry desert scrubland (Hussein, 2021). Ethiopia is consequently endowed with a diverse suite of biological resources and the isolation of its mountain and desert areas has given rise to numerous endemic species of flora and fauna found nowhere else on Earth (IBC, 2005; Biodiversity Indicators Development National Task Force, 2010).

### Literature sources

Numerous scholarly sources, published and unpublished reports, and policy and strategy documents related to cheetah are the primary sources for the review. This review used a total of twenty-

four articles and books published in the past fifty years. Moreover, five unpublished reports of wildlife assessment submitted since 2015 to the concerned global and national offices were used as crucial sources for the review. The strategy documents that were considered to undertake this review are the regional and national action plans for the conservation of the cheetah and African wild dog (IUCN SSC, 2007; EWCA, 2012). Google Scholar (<http://scholar.google.com>), Science Gate (<https://www.sciencegate.app>) and Science Direct (<https://www.sciencedirect.com>) were the academic search engines used to get the review material that is not found in local libraries and archives. Conservation status, abundance and distribution of cheetah were the keywords used to search for available information on the target species.

## Extrapolations of trend in distribution and abundance

The trends in distribution and abundance of cheetah in Ethiopia for the past 50 years are presented chronologically from the past to the present. In most cases, density estimates were conservative since expert-based information was not available. Consequently, the population estimates were derived from applying density estimates from comparable areas to resident ranges as mapped during conservation strategy workshops and related studies (IUCN SSC, 2007; Durant et al., 2015; Durant et al., 2017). For this review, the following density estimates were used: (1) for well managed protected areas density was estimated at one individual per 100 km<sup>2</sup> as applied by Durant et al. (2011); and (2) for areas that are largely unprotected or are under threat, density was estimated at 0.25 individuals per 100 km<sup>2</sup> following Marker (2002) and Durant et al. (2017).

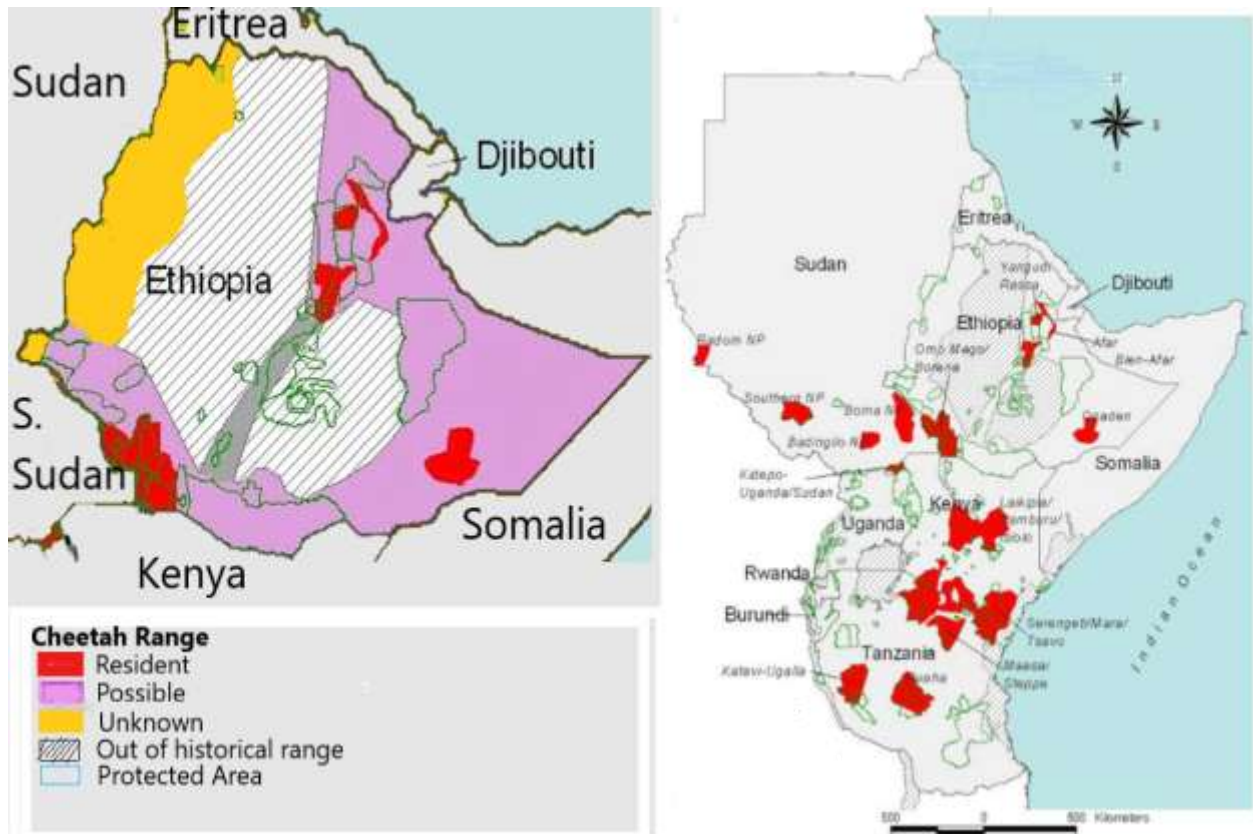
The maps and Global Positioning System (GPS) readings indicated in the published and unpublished reports were used mainly to assess distributions of the species in question.

## RESULTS AND DISCUSSION

### Trend in distribution of cheetah in Ethiopia

Historical distribution of cheetah in Ethiopia was probably determined by geographical features more than anything else due to the existence of the high altitude of the central highlands (EWCA, 2012). The first status survey for cheetahs was conducted in the early 1970s (Myers, 1973, 1975). Later surveys of selected countries were conducted in the 1980s (Gros, 1996, 1998, 2002; Gros and Rejmanek, 1999). The summary of the then knowledge of global status was also collated in 1998, although accurate information is complicated to collect for cheetah, which is shy and rarely seen across most of its ranges (Durant et al., 2007; EWCA, 2012).

In the 1960s, cheetahs were quite widespread in the wild lands of Ethiopia. They had been widely seen in the Somali border area of the then Harerghe province (eastern part of Ethiopia), in the then Ghemu Gofa province, and in the Borana area of the then Sidamo province (southern Ethiopia). There were also considerable numbers in the Omo River area, and relict populations in the Ogaden, southern Bale province, and Danakil Depression (Myers, 1973, 1975). However, like the case of other African countries, cheetah in Ethiopia has experienced significant reductions in its range over



**Figure 1.** Range of Cheetah in Ethiopia (R) and distribution of cheetah in range states within eastern Africa in 2007 (L) as mapped by participants at the regional conservation strategy workshop.  
Source: (IUCN SSC, 2007).

the last century (CITES, 2019) in which its historical ranges have been fragmented and shrinking over time due to mainly habitat conversion for different land use types like expansion of cultivation and urbanization (EWCA, 2012).

Before the national workshop, the eastern Africa regional meeting on conservation planning for cheetahs and wild dogs was held in 2007, at Mpala Research Centre in Kenya. Following the regional workshop, some limited areas in the Great Rift Valley (Omo and Awash Valleys) and Ogaden area in the Somali region (Figure 1) were identified as locations for resident populations of cheetah (IUCN SSC, 2007).

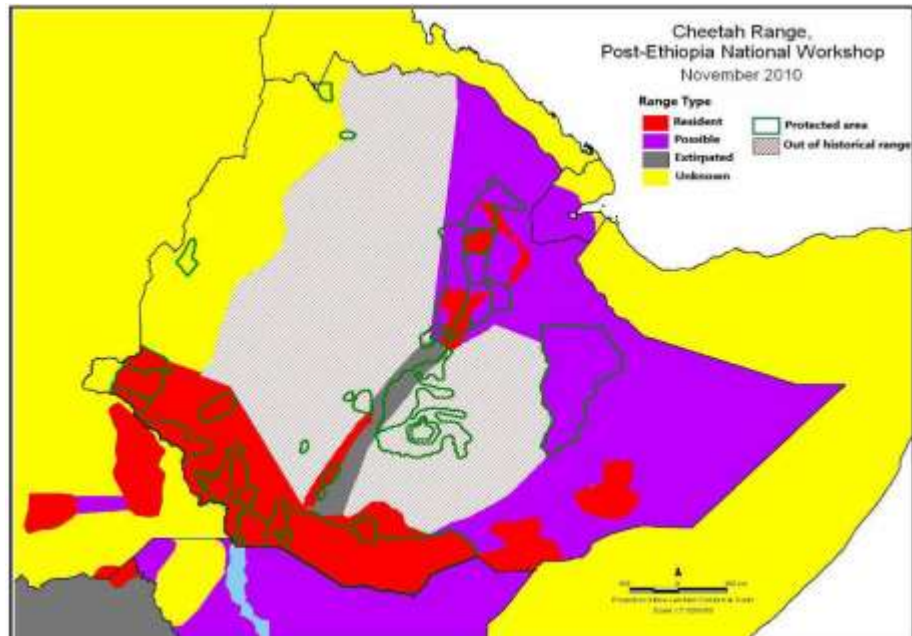
During the 2010 workshop in Addis Ababa to develop a national action plan for the conservation of cheetahs and African wild dogs (EWCA, 2012), additional information about the then status of cheetahs was gathered. Based on this, the following map of distribution for cheetah including additional areas of Gambella, Borena, Geralle, and Afer was developed (Figure 2).

A series of recent reports have indicated that there are more ranges for cheetah. For example, Wendim et al. (2015, 2018) have confirmed the existence of considerable number of cheetahs in the western part of

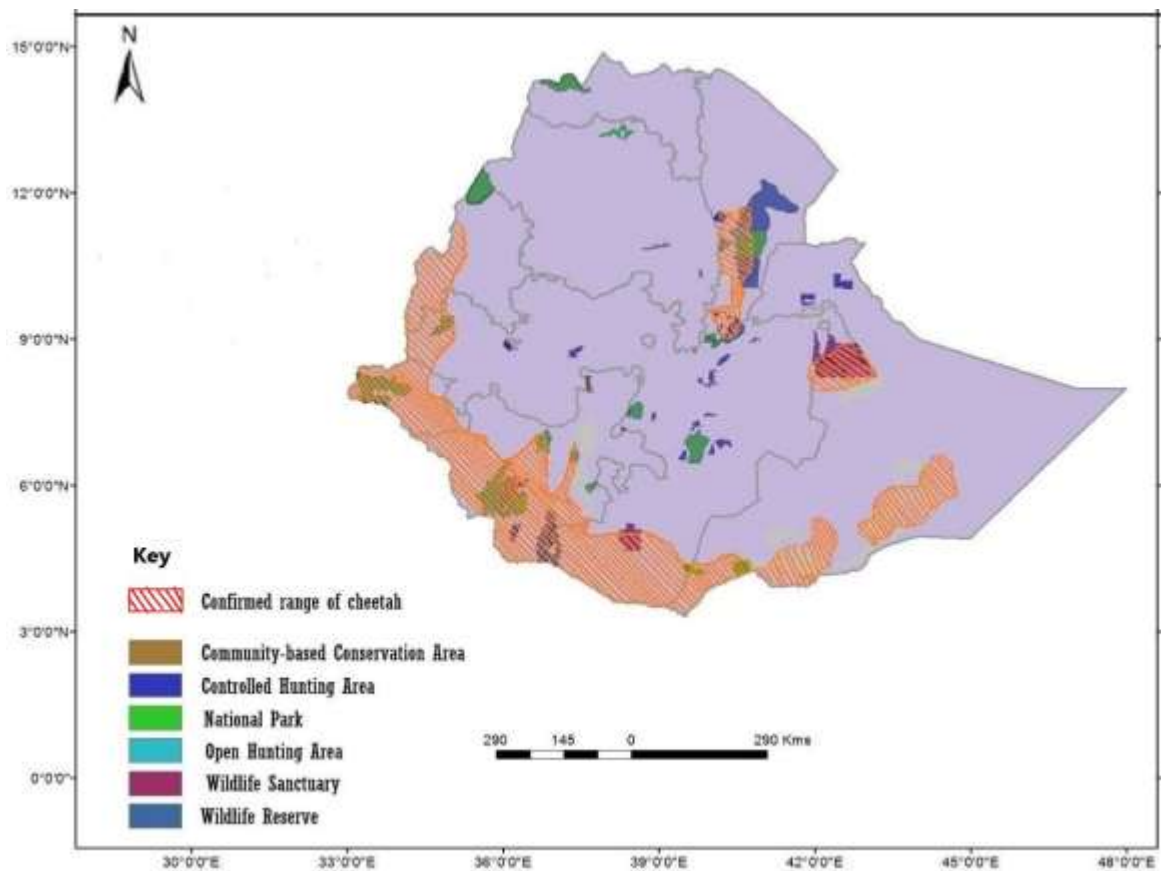
the country, indicating a total of 23 and 6 individuals were directly spotted in the Mao-Komo proposed protected area and Dedessa proposed National Park, respectively. The fact that cheetahs were observed in all transects during the assessment in Moa-Komo shows that the cheetahs are evenly distributed throughout the area. There is also a new sighting in 2022 at Midega-Tolla, south of Babile Elephant Sanctuary (Perscomm). This shows that there are still relict populations of cheetah around Babile, which was also confirmed by previous work (EWCA and WSD, 2010), although this was debated by the results of the recent survey (Bauer et al., 2019). Therefore, considering the aforementioned reports, some areas indicated earlier as unknown and possible ranges (Figure 2) are currently taken as confirmed ranges for the cheetah population in Ethiopia (Figure 3).

### Trend in the abundance of cheetah in Ethiopia

There is lack of data that show the current status of the population of Cheetah. In areas where there are sightings, data on the existing population in the specific habitats



**Figure 2.** Cheetah distribution and ranges in Ethiopia (taken from National Action Plan for the conservation of Cheetah and African Wild Dog in Ethiopia, 2010)  
Source: Authority (2012).



**Figure 3.** Present conformed distribution of Africa Cheetah in Ethiopia (based on the result of this review).  
Source: Authors

**Table 1.** Previously known cheetah areas, habitat size and population estimate in Ethiopia (IUCN SSC, 2007).

| Area name                 | Total area of habitat (km <sup>2</sup> ) | Estimated population |
|---------------------------|--|----------------------|
| Afar                      | 4,702                                    | 40                   |
| Bilen-Afar                | 7,342                                    | 70                   |
| Ogaden                    | 11,095                                   | 110                  |
| Omo-Mago/Borena           | 25,010                                   | 250                  |
| Yangudi-Rasa              | 2,768                                    | 30                   |
| Total population estimate | -  | 500                  |

Source: (IUCN SSC, 2007).

are not available, and in most cases, the population estimates, including the expert-based ones, need to be treated with extreme caution and are provided as an indication only (Myers, 1973; Marker, 2002; IUCN SSC, 2007; Durant et al., 2015).

The regional conservation strategy for the cheetah and African wild dog in Eastern Africa (IUCN SSC, 2007) suggested five locations for cheetah populations in Ethiopia and estimated the population was 500 (Table 1).

The estimate was made from the size of the polygon using a conservative density of 1 adult per 100 km<sup>2</sup> as adopted by Durant et al. (2011) which is derived from applying density estimates from comparable ranges of well managed protected areas. However, the estimate considers a conservative density of 1 adult per 100 km<sup>2</sup> which is proposed for ranges of well managed protected areas (Durant et al., 2011, 2015), nevertheless most of the areas are unprotected and under threat (Kebede and Gebretensae, 2018). Moreover, this estimate of population sizes does not take into account the Gambella, Mao-komo and Dedessa areas which were recently reported as the significant ranges in the western part of Ethiopia (Wendim et al., 2015, 2018).

The latest study and report on range states (Durant et al., 2017; CITES, 2019) argue that the previous conservative way of estimating density at 1 adult per 100 km<sup>2</sup> in unprotected areas needs to be revised to address the scarce distribution of cheetah across its ranges. Consequently, the recent study by Durant et al. (2017) considers 0.25 adults/100 km<sup>2</sup> as well as one individual per 1,000 km<sup>2</sup>, and estimated 11, 20, 32, 8, and 191 adult cheetahs for Afar, Bilen-Afar, Ogaden, Yangudi-Rassa, and Kenya/Ethiopia/South Sudan, border areas, respectively. This study also appears to have some gaps since it estimated the density of cheetah in the border ranges (Omo and Gambella) at 1 individual per 1,000 km<sup>2</sup>. Because it seems unjustifiable to use this density estimation for populations of relatively intact areas of Ethiopia as it was proposed earlier for areas under elevated pressures and direct threat (Durant et al., 2015). Moreover, the report does not consider Babile and the newly explored stronghold sites of Mao-komo and

Dedessa areas.

Therefore, there is a need to take into account the gaps encountered in the previous estimations and consequently, the current population estimate of cheetahs in Ethiopia has been extrapolated (Table 2).

Considering the result of the previous assessments (Wendim et al., 2015, 2018) and the intactness of the areas, the current estimate based on the result of this review assumes a conservative density of 1 individual per 100 km<sup>2</sup> for Moa-Komo and Dedessa, as adopted by Durant et al. (2011). For the other ranges largely under threat, density is estimated at 0.25 individuals per 100 km<sup>2</sup>, following Marker (2002).

Based on the results presented by various studies, especially the recent surveys and sightings indicated in this review, it is possible to recognize that there is an increase in habitat, and this indicates that cheetahs are still found in a wide range of habitats in Ethiopia but in low population densities. This has also been explored by prior reports (Durant et al., 2015, 2017; Belbachir et al., 2015) which also indicated that cheetahs' low density throughout their range means that their populations require much larger areas of land to survive than do those of other carnivore species.

There is a decline in population size compared to 2007 even though contrasting the population estimates undertaken by the researchers has its own pitfalls since the assessments used different assumptions for estimating the density of cheetah. For example, the 2007 extrapolation (IUCN SSC, 2007) estimated the density at 1 individual per 100 km<sup>2</sup> and this is much larger as compared to 0.25 individuals per 100 km<sup>2</sup> used by Durant et al. (2017) and this study. As a result, a sizable cheetah population was estimated in 2007 even though the projected habitat area was 35% of the current estimate (Figure 4).

### Potential threats

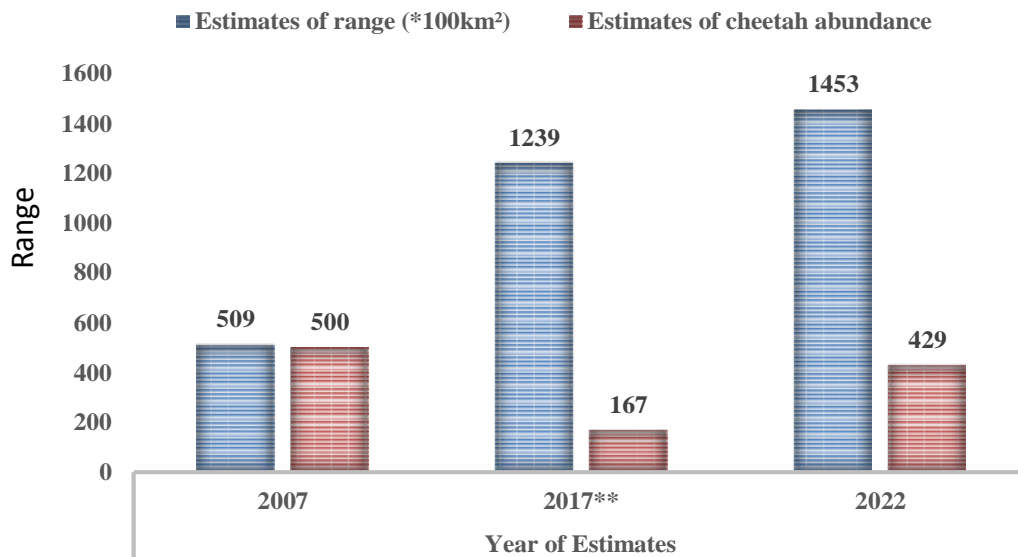
Globally, the cheetah is classified as 'Vulnerable' by the IUCN (Durant et al., 2015), having disappeared

**Table 2.** The present areas, habitat size, and population estimate of cheetahs in Ethiopia.

| Area name                                       | Total area of habitat (km <sup>2</sup> ) | Estimated population |
|---|--|----------------------|
| Mao-Komo and Dedessa Areas & their surroundings | 9,000                                    | 90*                  |
| Gambella  | 18,061                                   | 45**                 |
| Omo Valley, Borena and Geralle                  | 72,245                                   | 180**                |
| Middle and Lower Awash Valley                   | 14,812                                   | 37**                 |
| Afder and Ogaden                                | 22,190                                   | 55**                 |
| Babile and its surroundings                     | 8,982                                    | 22**                 |
| Total population estimate                       |  | 429                  |

\*Density estimated at 1 individual per 100km<sup>2</sup> as applied by Durant et al. (2011); \*\*Density estimated at 0.25 individuals per 100km<sup>2</sup> following Marker (2002) and Durant et al. (2017).

Source: (Durant et al. (2011); Marker (2002) and Durant et al. (2017))



**Figure 4.** Estimates of cheetah range and abundance by IUCN SSC (2007), Durant et al. (2017), and the current estimate.

\*\*For 2017, only 50% of the estimated population and habitat were considered in the case of Ethiopia/Kenya/South Sudan ranges

Source: IUCN SSC (2007); Durant et al. (2017) and authors.

from 20 countries and confined to 9% of its historical distributional range (Durant et al., 2017). According to the global assessment on threats to cheetah populations, the type and extent of the threats vary between regions (Woodroffe et al., 2007; EWCA, 2012).

Evaluation of threats conducted during the development of the national conservation action plan shows that habitat loss and fragmentation together represent the over-arching threat to cheetah populations in Ethiopia, which contribute to several of the other proximate threats (IUCN SSC, 2007; EWCA, 2012; Durant et al., 2015). Cheetahs are also threatened by conflict with livestock herders, reduced prey scarcity, and illegal live trade (EWCA, 2012; Nowell, 2014; Durant et al., 2017; CITES, 2019). Moreover, cheetahs are killed to

use their skins for traditional ceremonies, especially in the southern part of Ethiopia where dozens of skins were counted across two years ceremonies of the Daasanach community (Torrents-Ticó et al., 2022).

Overall, the incidence and extent of the threats to cheetahs in Ethiopia are increasing and changing over time. For example, since the recent past, illegal trade in cheetahs, which is mainly driven by the demand for exotic pets in the Middle East, has been identified as a potential threat to cheetah populations in Ethiopia, and this threat is increasing over time (Nowell, 2014; CITES, 2019; Tricorache and Stiles, 2021; Tessema et al., 2021). The data collected by Tessema (2017) and Tricorache and Stiles (2021) clearly show that Somaliland and Ethiopia are the primary sources and transit areas for

smuggling cheetahs to the Arabian Peninsula. According to Tricorache and Stiles (2021), the number of illegally trafficked live cheetahs in Ethiopia for ten years (2005-2015) was 103 while Tessema (2017) reported that an estimated 98 cheetah cubs were smuggled from Ethiopia to the Middle East in 2016. This trend is also supported by the recent report of a top officer from EWCA who addressed the media mentioning that every month, at least four cheetahs were smuggled to the Gulf nations (BBC, 2020).

### Conservation action

Cheetahs are protected by national law and even licensed hunting of this species is not allowed in Ethiopia. It is evident that legal protection of the species alone is not sufficient, if the ever-increasing threats to cheetah are not taken into consideration. To this end, a national action plan for the conservation of cheetahs and African wild dogs was endorsed in 2012 and this strategic plan was developed using participatory process involving as many stakeholders as was practicable (EWCA, 2012).

Like the case of other species-specific action plans, there have been considerable limitations in delivering the outputs to meet the objectives of the action plan. One of the reasons for this is that the main conservation approach in Ethiopia is ecosystem-based, which focuses on safeguarding key biodiversity areas using the limited resources (Kebede and Gebretensae, 2018). As a result, few components of the cheetah and wild dog conservation strategy (e.g. management of human-cheetah conflict and establishing networking and collaboration) were partially addressed. Moreover, this species-specific conservation action plan was developed using logical framework methodology, based on the information on potential threats and associated problems by then and thus there is a need to review the plan based on the existing conditions on the ground as the severity of threats to cheetah is increasing and changing over time.

### CONCLUSION AND RECOMMENDATIONS

It is noticeable that there is a lack of data on the status of cheetah, particularly in Ethiopia. However, the information gathered from the field assessment, literature, and supporting policy documents presented over the last five decades indicate that cheetahs are still found in a wide range of habitats in Ethiopia but in low population densities. In spite of the wider range and increase in area of the projected habitat, the population size of the cheetah is still extremely small and the incidence and extent of its threats is increasing and changing over time. It is therefore recommended that there is a need to: (1) conduct a countrywide assessment to examine the status of the existing populations; (2) review the developed

national action plan based on up-to-date information on the potential threats to the populations of cheetahs; and (3) strengthen partnerships to curb the ever-increasing illegal trade of cheetahs.

### CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

### REFERENCES

- Authority EWC (2012). National action plan for the conservation of cheetah and African wild dog in Ethiopia. [https://bigcatswildcats.com/download/cheetah-research/Cheetah\\_Wilddog\\_Ethiopia\\_NAP.pdf](https://bigcatswildcats.com/download/cheetah-research/Cheetah_Wilddog_Ethiopia_NAP.pdf)
- Bauer H, Kenchington P, Adula M, Sillero-Zubiri C (2019). Rapid carnivore survey in Babile Elephant Sanctuary. Report Published in Oxford.
- Belbachir F, Pettorelli N, Wacher T, Belbachir-Bazi A, Durant SM (2015). Monitoring rarity: The critically endangered Saharan cheetah as a flagship species for a threatened ecosystem. *PLoS One* 10:e0115136.
- BBC (2020). Cheetah smuggling out of Ethiopia fueled by exotic pets' demand. BBC news. <https://www.bbc.com/news/world-africa-51124487>
- Biodiversity Indicators Development National Task Force (2010). Ethiopia: Overview of Selected Biodiversity Indicators. Addis Ababa P 48.
- Caro TM (1994). Cheetahs of the Serengeti Plains: Group living in an asocial species. University of Chicago Press, Chicago, USA and London, UK.
- CITES (2019). Supplemental information on illegal trade in cheetah (*Acinonyx jubatus*). Submitted by Kenya and Ethiopia to the 18th meeting of the Conference of the Parties. Geneva, Switzerland.
- Durant SM (2000). Predator avoidance, breeding experience and reproductive success in endangered cheetahs (*Acinonyx jubatus*). *Animal Behaviour* 60(1):121-130.
- Durant S (2007). Range-wide conservation planning for cheetah and wild dog. *Cat News* 46:13.
- Durant SM, Craft ME, Hilborn R, Bashir S, Hando J, Thomas L (2011). Long-term trends carnivore abundance using distance sampling in Serengeti National Park, Tanzania. *Journal of Applied Ecology* 48(6):1490-1500.
- Durant S, Mitchell N, Ipavec A, Groom R (2015). "*Acinonyx jubatus*". IUCN Red List of Threatened Species.
- Durant SM, Mitchella N, Grooma R, Pettorelli N, Ipavec A, Jacobsona AP, Woodroffe R, Böhma M, Hunter LTB, Becker MS, Broekhuis F, Bashir S, Andresen L, Aschenborn O, Young-Overton K (2017). The global decline of cheetah, *Acinonyx jubatus* and what it means for conservation. *PNAS* 14(3):528-533.
- Ethiopian Wildlife Conservation Authority: EWCA and WSD (2010). Management Plan of Babile Elephant Sanctuary. Addis Ababa P 216.
- Ethiopian Wildlife Conservation Authority (EWCA) (2012). National Action Plan for the Conservation of Cheetahs and African Wild Dogs in Ethiopia. Addis Ababa, Ethiopia.
- Gros PM (1996). Status of the Cheetah in Malawi. *Nyala* 19:33-36.
- Gros PM (1998). Status of the Cheetah *Acinonyx jubatus* in Kenya: a field-interview assessment. *Biological Conservation* 85(1-2):137-149.
- Gros PM, Rejmanek M (1999). Status and habitat preferences of Uganda Cheetahs: an attempt to predict carnivore occurrence based on vegetation structure. *Biodiversity and Conservation* 8(11):1561-1583.
- Gros PM (2002). The status and conservation of the Cheetah *Acinonyx jubatus* in Tanzania. *Biological Conservation* 106(2):177-185.
- Hussein A (2021). The Major Factors Biodiversity Loss and Conservation Measures in Ethiopia: Systematic Review. *Journal of Earth Science and Climatic Change* 12:593.

- IBC, Institute of Biodiversity Conservation (2005). National Biodiversity Strategy and Action Plan. Government of the Federal Democratic Republic of Ethiopia. Addis Ababa. Ethiopia.
- IUCN SSC (2007). Regional Conservation Strategy for the Cheetah and African Wild Dog in Eastern Africa. IUCN Species Survival Commission. Gland, Switzerland.
- Kebede F, Gebretensae K (2018). Report on status assessment of seven selected CITES appendix medium/large wild mammal species in Ethiopia. EWCA P 113.
- Kingdon J (1997). Kingdon Field Guide to Mammals of Africa. Academic Press, London.
- Marker LL (2002). Aspects of Cheetah (*Acinonyx jubatus*) Biology, Ecology and Conservation Strategies on Namibian Farmlands. Thesis, Lady Margaret Hall. University of Oxford.
- Myers N (1973). Leopard and Cheetah in Ethiopia. <https://www.cambridge.org/core>
- Myers N (1975). The Cheetah *Acinonyx jubatus* in Africa. IUCN Monograph 4. IUCN, Morges, Switzerland.
- Nowell K (2014). An assessment of the conservation impacts of legal and illegal trade in Cheetahs *Acinonyx jubatus*. IUCN SSC Cat Specialist Group report prepared for the CITES Secretariat, 65th meeting of the CITES Standing Committee. Geneva.
- Schreber JCD (1775). Die Säugethiere in Abbildungen nach der Natur mit Beschreibungen. Erster Theil. Der Mensch. Der Affe. Der Maki. Die Fledermaus. - pp. [1-5], 1-190, Tab. I-LXII [= 1-62]. Erlangen. (Walther).
- Sharp NCC (1997). Timed running speed of a Cheetah (*Acinonyx jubatus*). Journal of Zoology (London) 241(3):493-494.
- Somers M, Szykman M (2007). Rates and causes of mortality in endangered African wild dogs (*Lycaon pictus*): lessons for management and monitoring. Oryx 41(2):215-223.
- Tessema ME (2017). Wildlife Crime Assessment in Ethiopia. <https://www.researchgate.net/publication/323259525>
- Tessema M, Wakjira K, Paulos D, Mekonnen W, Mekonnen A, Asefa A (2021). Trend, Challenges and Opportunities of Illegal Wildlife Trafficking and Trade Activities within and through Ethiopia. Ethiopian Journal of Science and Technology 44(1):47-61.
- Torrents - Ticó M, Fernández-Illamazares Á, Burgas D, Nasak JG, Cabeza M (2022). Biocultural conflicts: understanding complex interconnections between a traditional ceremony and threatened carnivores in north Kenya. Cambridge University Press P 10.
- Tricorache P, Stiles D (2021). Wildlife trafficking black market brief - live cheetahs. Global Initiative against Transnational Organized Crime. Geneva, Switzerland.
- Wendim E, Abyu Sh, Admasu E, Gedamu G, Tadesse L (2015). Report on Ecosystem Assessment for the Establishment of Mao-Komo Nature Conservation Area. EWCA.
- Wendim E (2018). Report on Ecosystem Assessment for the Establishment of Dedessa National Park. EWCA.
- Woodroffe R, Davies-Mostert H, Ginsberg JR, Graf JA, Leigh K, McCreery EK, Mills, MGL, Pole A, Rasmussen GSA, Robbins R, Somers M, Szykman M (2007). Rates and causes of mortality in endangered African wild dogs (*Lycaon pictus*): lessons for management and monitoring. Oryx 41:1-9.