



# Mara Meru Cheetah Project

# ANNUAL REPORT 2024

CHEETAH CONSERVATION FUND  
CARNIVORES, LIVELIHOODS AND LANDSCAPES  
MAASAI MARA 2025

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## I. BACKGROUND

### 1.1. Conservation status and population trends

Historically, the cheetah was widespread across Africa and south-western Asia. At the beginning of the 20th century there were 100,000 cheetahs in the wild (Myers 1975). The species has declined notably throughout their range by 91% and fewer than 7,500 mature individuals remain in the wild. Eastern Africa holds a significant population, second only to the primary stronghold in Southern Africa (Durant et al. 2017). In eastern and southern Africa, resident populations have been recorded in only 11% of their historical range (615,000 km<sup>2</sup>; Durant et al. 2017), and possibly occurring in another 892,658 km<sup>2</sup> (~16%) (IUCN/SSC 2007a). One significant cheetah range occurs in the transboundary areas between northern Tanzania and southern Kenya (Durant 2022). Additionally, almost the entire southern boundary of Ethiopia is recorded as resident cheetah range with connectivity into South Sudan, and likely extending into northern Kenya. Important subpopulations of cheetah survive elsewhere in Kenya, Tanzania and Ethiopia, as well as in South Sudan and northern Uganda but are fragmented across the region. Their status in Eritrea, Djibouti, Somalia and Sudan is largely unknown.

The cheetah is a wide-ranging and cryptic carnivore, making population monitoring challenging (Linden et. al., 2020; Mutoro, 2025). Globally, cheetah populations are declining at 2.1% annually, due to habitat fragmentation, linear development, climate change, human-wildlife conflict, and illegal trafficking (Durant et al. 2017). With an estimated 75% of cheetahs living outside protected areas (IUCN, 2007, KWS, 2010), conservation efforts require a deeper understanding of population connectivity, movement corridors and threats. Monitoring inside and outside of protected areas provides trends in populations or occurrences over time.

In the CITES-CMS/AC12/Inf.10 the eastern Africa cheetah population is estimated at 2,102 mature individuals distributed across 14 subpopulations (Durant et al. 2017). Only one of these subpopulations is estimated to number more than 200 mature individuals: 1,250 mature individuals in the Serengeti/Mara/Tsavo/Laikipia landscape in Kenya and northern Tanzania. It also estimated a smaller transboundary population through southern Ethiopia, eastern south Sudan and northern Kenya to be as few as 175 mature individuals.

In Kenya, cheetahs are listed as endangered in the sixth schedule of the Wildlife Conservation and Management Act (WCMA), 2013 CAP 376, which prohibits hunting, capturing, or trading of the species. The IUCN (International Union for Conservation of Nature) classifies the overall cheetah population as "Vulnerable" due to a declining population size and threats like habitat loss, prey reduction, illegal trade, and human conflict, placing them at a high risk of extinction in the wild.

The cheetah is also listed in Appendix I of the CMS (Conservation of Migratory Species of Wild Animals) and Appendix I of CITES (Convention on International Trade of Endangered Species of Wild Fauna and Flora), meaning without strict protection policies they are at a high risk of extinction. Currently, the Kenyan cheetah population is fragmented with key areas having limited connectivity as a result of increased human activities and linear development.

### 1.2. Cheetah subspecies and importance of cheetah conservation in Kenya

The cheetah is a unique species warranting its own categorization in the cat classification. *Acinonyx jubatus*, meaning "sharp claw" refers to the semi-retractable claw and "maned or crested" referring to the thick mantle that remains from cub to sub-adulthood (Schreber, 1775). The English name is derived from the Sanskrit *cita*, meaning "spotted one". Five genetically distinct cheetah subspecies were originally recognized: *A. j. venaticus* (historically in western and southern Asia, now confined to Iran), *A. j. hecki* (northwest Africa), *A. j. soemmeringii* (northeast Africa), *A. j. raineyi* (east Africa), and *A. j. jubatus* (southern Africa). In 2017, the IUCN Cat Specialist Group revised this classification,

merging *A. j. raineyi* with *A. j. jubatus* due to a lack of distinctive differences (Charruau, 2011; IUCN, 2017; Kitchener et al., 2017). However, a recent genomic study using Single Nucleotide Polymorphisms (SNPs), mitochondrial DNA (mtDNA), and major histocompatibility complex (MHC) class II DRB gene data found that east African cheetahs (*A. j. raineyi*) are genetically distinct from their southern counterparts (*A. j. jubatus*), recommending that they be recognized as a separate subspecies (Prost et al., 2022). Recently, in 2023 the north eastern subspecies *A. j. soemmeringii* was up-listed to “Endangered” by the IUCN Red List after the population was found to be severely threatened by illegal trade (Schmidt-Kuntzel, 2023). The range of *A. j. soemmeringii* extends into the northern regions of Kenya where there is a gap in knowledge on the status. It is likely that Kenya holds three different subspecies, which makes each individual in Kenya critically important for survival of the species.

### 1.3. Cheetah biology, social organization, reproduction and adoption

Cheetahs are habitat generalists, persisting across a wide array of environmental conditions as long as there is a variety of prey (Mutoro, 2022, Watcher 2006, Marker, 2003a). Preferred prey is typically in the 23-56kg range, diet selection varies from hare to sub-adult zebra, sub-adult eland, adult Topi to Wildebeest (Mutoro 2022; MMCP 2020).



Pic. 1. Two males of the Tano Bora coalition

The cheetah is a highly social species, however both males and females can lead solitary lives or form temporary unions (sub-adult litter mates of both sex, unrelated males of different age (MMCP 2017)) and permanent alliances – male coalitions, that may include unrelated males (Caro 1994, Chelysheva 2018). Cubs from a single mother can have multiple fathers which can be attributed to female promiscuity (Gottelli et al., 2007). There is no particular breeding season and cubs are born throughout the year. Although courtship occurs throughout the day, mating usually takes place at night (MMCP 2017). After 90 to 98 days of gestation, females give birth to 1 to 7 cubs during dark hours. (MMCP 2019). Cub mortality ranges from 85-95% with 5 -15% of cubs reaching independence. Most cubs die due to predation by lions and hyenas, as mothers cannot defend offspring from the larger predators (Laurenson 1994).

In the wild, it is difficult to know the number of newborns, therefore data on the number of cubs is based on the sighting of the litters that emerge from the dens (MMCP 2019). The amount of time a female spends raising her litter depends on her age, the number of cubs, and their sex (Chelysheva, *unpublished data*). Mothers leave cubs when they are about 12 - 23 months (average 16,9 months), after which they roam with their litter mates for several weeks - up to 6 months (MMCP 2019).

Typically, sisters leave their litter mates one by one, with the most successful female hunter leaving first (MMCP 2020). In rare cases, sister-litter mates can form short- or long-term unions, as observed in the Mara (MMCP 2017) and Botswana (Vandermeij 2005). There are recorded cases of “adoption” of cubs by females, which increased survival of adopted cubs (Caro 1994, MMCP 2019). Male siblings remain together for life, forming a permanent coalition that may consist of 4-5 males (Caro and Collins 1986). In some cases, siblings can accept an unrelated male or two (Caro 1994, Chelysheva 2018), with the largest long-term coalition observed in Kenya lasting 8.5 years (Chelysheva, *unpublished data*). Long-term observations revealed a positive impact of different social structures on the cheetahs’ survival in their natural habitat (Durant et al., 2004). A group of males have a greater chance of



establishing and maintaining a relatively large territory (Caro and Collins 1986) and hunting large game together, members of coalitions are usually larger than solitary individuals and are heavier by an average of 8 kg (Caro 1989).

#### 1.4. Lifespan of cheetahs in Eastern Africa

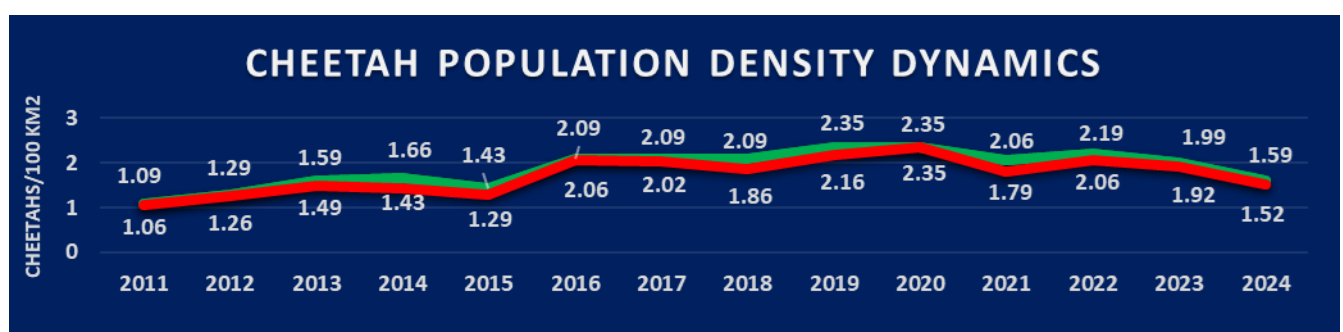
The longest recorded lifespan in Kenya is 13 years for females, and 11 for males (MMCP 2019). To date, females have never been recorded as reproducing beyond 12 years (Durant, *unpublished data*). Males in coalitions typically live longer, although by the age of 8-10.5 years coalitions will have lost at least one member.

## II. MARA CHEETAH POPULATION TRENDS and CHALLENGES

Since 2011, the Mara-Meru Cheetah Project (MMCP) operates in the Mara Ecosystem, mainly focusing on the territory of the Maasai Mara National Reserve (MMNR), where tourism activity is high throughout a year. The Project team works closely with the Narok County Government authorities, Kenya Wildlife Service (KWS) Mara Veterinary Unit, wardens and rangers of the Maasai Mara National Reserve and conservancies, and with other local stakeholders. Since 2012, we involved over 150 guides from different Mara facilities and tour companies into cheetah monitoring. Guides provide us with vital information on cheetah health and sightings. With years, they became strong supporters of cheetah research and wildlife conservation. We regularly update them with important data on particular Mara cheetahs through workshops, meetings in the various tour facilities and in the field, share our findings and information, which help them to better understand behavior and ecology of animals and educate guests. We communicate with rangers of the Reserve and conservancies on the daily basis and assist each other with cheetah monitoring and anti-harassment activities.

In 2024, our two research teams spent 167 days (1,837 hours) and 139 days (1,569 hours) in the field and covered 6,441 km and 6,695 km respectively. Field work included quantitative (scouting for cheetahs) and qualitative data collection (cheetah behavior observations). We collected behavioral data on 34 adult cheetahs (21 males and 13 females with and without cubs) in the Reserve and surrounding Conservancies. Below we provide data for 2023 on the Mara cheetah population trends, challenges and behavioral adaptations.

### 2.1. Mara cheetah population trends



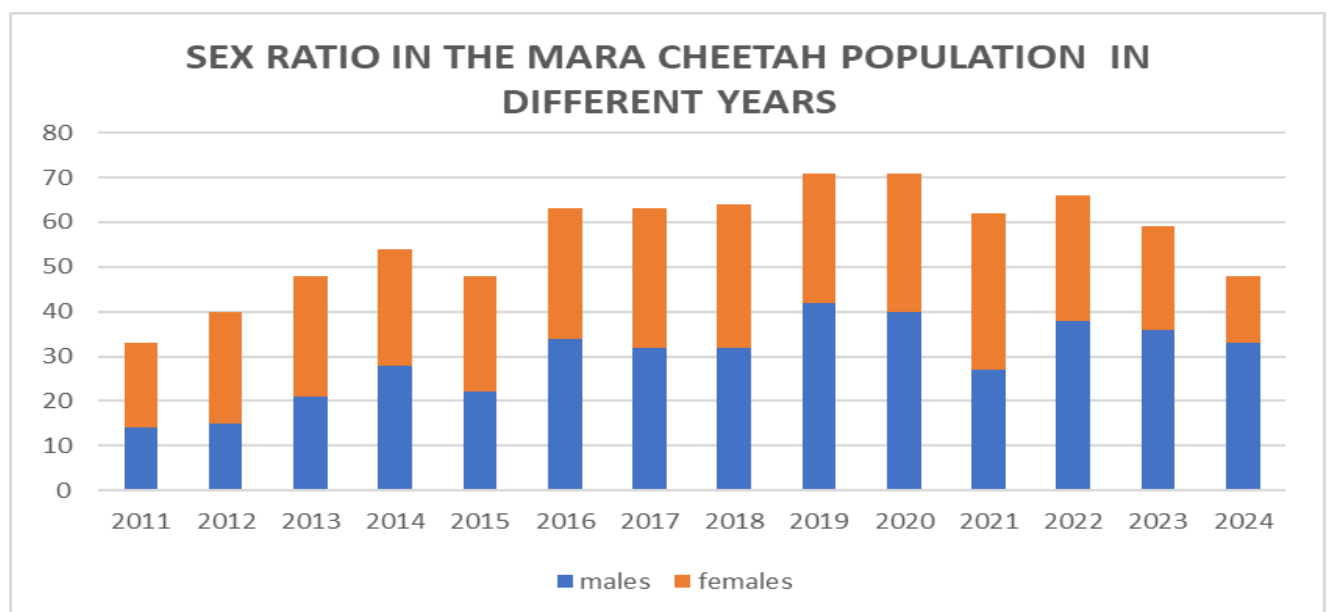
Pic.2 Cheetah population dynamics: **Green** - based on the total number of adult individuals recorded in the Mara ecosystem through the year and **Red** - based on the number of adult individuals by the end of each year (31 December) excluding confirmed dead individuals

In 2019, 71 (42.29) adult cheetahs seen in the Mara, out of which 5(4.1) died  
 In 2020, 71 (40.31) adult cheetahs seen in the Mara, out of which 0 died  
 In 2021, 62 (27.35) adult cheetahs seen in the Mara, out of which 8(3.5) died  
 In 2022, 66 (38.28) adult cheetahs seen in the Mara, out of which 4(3.1) died  
 In 2023, 60 (36.23.1) adult cheetahs seen in the Mara, out of which 6(3.2.1) died  
 In 2024, 48 (33.15) adult cheetahs seen in the Mara, out of which 3(2.1) died

**DISTURBING TREND:** In 2023, 10% less cheetahs observed in the Mara ecosystem than in 2022, and in 2024, 20% less cheetahs observed than in 2023. The observed downward trend in the Mara cheetah population may be caused by a combination of factors, including, but not limited to the following:

- Habitat reduction and fragmentation within the Mara ecosystem (new settlements, fences);
- Increased disturbance from tourists in MMNR, that drives cheetahs to the Serengeti NP and to the adjacent conservancies;
- Human population growth, increased livestock numbers, and expanded grazing areas;
- Reduction in the number of different cheetah prey species and, as a result of the above;
- Increased competition for resources with more powerful predators (lions, hyenas);
- Increased HWC.

The diagram (Pic. 2) shows that the highest number of cheetahs in the Mara – 71 adult individuals was observed in 2019 and 2020. This may have been the maximum carrying capacity of the ecosystem. However, it's also possible that, due to the factors listed above, the ecosystem's carrying capacity is declining, and therefore the number of cheetahs observed in recent years represents the maximum the ecosystem can support.



Pic. 3 Sex ration of the Mara cheetah population

Given the significant decline in female numbers throughout the Mara ecosystem, particularly in the Triangle (See p.14) and the shift towards males, the following negative consequences can be expected:

- reduced breeding and population growth due to a critical decline in the recruitment of cubs;
- increased territorial conflicts between males;
- population ageing and range contraction (local extinction may occur in some areas);
- ecosystem imbalance;
- loss of genetic diversity as a result of inbreeding in the Mara population.

What is disturbing about the decline in female cheetahs and the male-skewed population in the Mara is that it signals a potential population collapse in progress, masked by the continued visibility of many males, a weakening breeding base and a silent population decline. Despite the visible presence of many males, fewer females mean reduced reproduction, increased inbreeding, and growing competition among males. This imbalance not only threatens the long-term viability of the cheetah population but may also reflect deeper issues such as habitat loss, cub predation, or human pressures near denning areas, factors that, if unaddressed, could lead to a rapid local population collapse.

**2.2. New cheetahs.** The absence of fences along the Tanzania border, allows animals to move freely from Serengeti to the Mara ecosystem (see Pic.16). Therefore, every few months we observe new cheetahs in the Mara: mostly males – adults and adolescents, who have reached the age of independence and have begun to explore new areas. Rarely, females with cubs appear at the southern part of the Mara, at the Tanzanian border. However, these females do not travel deep into the MMNR, prefer staying in the areas with low tourism activity. Also, new cheetahs (adolescents and females with sub-adult cubs) come to the northern part of the Mara from the north-eastern conservancies or from outside protected areas.

In 2024, **10 new males** (1 singleton and 4 male coalitions) appeared in the Mara:

- ❖ In the beginning of the year, two males (M161, M162) – in Olarro conservancy.
- ❖ In the beginning of September, two shy males (M154, M155) – in the Triangle at Engai area.
- ❖ In the middle of October, three very shy males (M158, M159, M160) – in Ol Chorro conservancy.
- ❖ In the end of July 2024, single male Sanare (M164) – in Ol Chorro conservancies.
- ❖ In the end of December 2024, two males (M166, M167) – near WRTI research station.

**2.3. Lifespan of cheetahs.** To date, the maximum documented age was 11,5 years for males and 13 years for females. By the end of 2024, the **oldest females** were F42 (12 years 8 months) and F50 (12,5-years old). One female was 10 years old (F63) and two females (F68, F69) – 9 years old. The **oldest males** were two 10-years-old remaining males of the Tano Bora coalition – Winda and Olonyok. The life expectancy of males is much shorter than that of females, and this makes it possible for females to mate with different males during their lifetime even during the same estrus, and thus enriching the genetic diversity by giving birth from different males.

**2.4. Birth and death of cubs.** It is important to note, that in the wild it is hard to learn how many cubs have been born in each litter. If the den was accidentally found by the guides, we advise them NOT to post photos of the cubs/dens on social media and NOT to share location. We report to the MMNR authorities, and subsequently, rangers/ wardens close the area with the road signs which we provide to them for this purpose. We rely on the photos taken by the guides/guests and/or rangers of the mother and cubs and record the ID of the female and number of spotted cubs. In some cases, the number of the born cubs remains unknown because they disappear/die before anyone spots the cubs and the female appears without signs of pregnancy (large belly for several continuous days) and nursing cubs (brown fur around the nipples). Therefore, the real number of the cubs born each year in the Mara remains unknown.

**Table 1. Sex ratio trend**

Year	Adult cheetahs (males/females)	Sex ratio (M/F)
2011	33 (14.19)	1:1.35
2012	40 (15.25)	1:1.6
2013	48 (21.27)	1:1.3
2014	54 (28.26)	1:1
2015	48 (22.26)	1:1.2
2016	63 (34.29)	1.2:1
2017	63 (32.31)	1:1
2018	64 (32.32)	1:1
2019	71 (42.29)	1.45:1
2020	71 (40.31)	1.3:1
2021	62 (27.35)	1:1.3
2022	66 (38.28)	1.35:1
2023	60 (36.23.1)	1.56:1
2024	48 (33.15)	2.13:1

In 2024, five females gave birth to 6 known litters. Neema (F68) gave birth to two litters in May and November, Nagol (F99) gave birth in September to one litter of 5 cubs, and Kuleta (F82) gave birth to two litters in May (unknown number of cubs) and in August to 4 cubs. Risasi (F84) gave birth in the Mara Triangle, but due to a secretive nature of the female and inaccessible hilly area, the data on the litter absent. All these females lost their litters.

On 14 November 2024, Nagol (F99) was spotted by the guides walking on the slope of hill at the Rhino ridge area of the MMNR with 5 2-months old cubs. Immediately, Mara Cheetah Unit (MCU) arrived at the area and began monitoring and protecting of the family. The place where Nagol was hiding her offspring was inaccessible by the vehicles, which helped the female to keep her dens undiscovered until the time came to introduce solid food to the cubs. The team was monitoring the family daily despite the rainy weather and difficulties of getting to the area due to mud and flooded



rivers. At the age of two months, cubs were big enough to follow the mother to the kill, however, it was risky to expose them. Therefore, the family was eating fast, and after giving cubs opportunity to eat well, the female consumed maximum from a kill, including the skin and muscle meat of the head to stay until next hunt in 2-3 days.

On 22<sup>nd</sup> November after successful hunt and feeding on Thomson gazelle with the litter, Nagol took the cubs back to the bushes on the slope of the Rhino Ridge. Usually after feeding, females with small cubs do not show up for one to two days. On the morning of 24<sup>th</sup> November, Nagol was spotted at the slope with only one cub and several hyenas were seen in the area of the last den (under the bush visible from the base of the ridge). Nagol managed to keep the only surviving male cub alive for 7 more days, travelling in the open areas trying to avoid encounters with other predators. Unfortunately, on 1<sup>st</sup> December 2024, during the very heavy rain that limited the visibility even at a short distance, a lioness approached the cheetah family and attacked the cub. The cub was still alive for over 45 minutes, and died of fatal injuries.



*Pic. 4. The den of F99 on a slope of the Rhino Ridge*



*Pic. 5 Female and 5 cubs full after feeding on an adult Thomson gazelle*





*Pic.6,7 Female ate all muscle meat and some skin from the carcass, including the head.*



*Pic. 8. Cub killed by a lioness. Photo by MCU*

**Success story.** In the beginning of 2024, Nabaya (F88) gave birth and in the beginning of September, was seen with 2 (1.1) healthy cubs in Olarro conservancy. By the end 2024, she kept both cubs (male and female). (Pic. 9)



*Pic.9. F88 with 2 cubs*

**2.5. Cubs raised to independence.** Within the last four years, 2024 was the least successful by the total number of cubs reached independence.

In 2020, **six females** raised 13 (6 males and 7 females) cubs to independence.  
 In 2021, **five females** raised 13 (7 males and 6 females) cubs to independence.  
 In 2022, **six females** raised 15 (9 males and 6 females) cubs to independence.  
 In 2023, **four females** raised 8 (6 males and 2 females) cubs to independence.  
 In 2024, **one female** raised 3 (1 male and 2 females) cubs to independence.

**2.6. Lifespan of the cheetah families.** In the Masai Mara, mothers spend from 12 to 23 months with their litters. The average age of independence in the Mara is 16.7 months, n=47 litters (See Table 3), which is similar to Serengeti, where it is 17.1 months (Kelly et al., 1998). Although we have been observing many litters, it is not always possible to witness the exact time of dispersal of the family. Therefore, we use below the data, obtained from photographic materials and/or our observations.

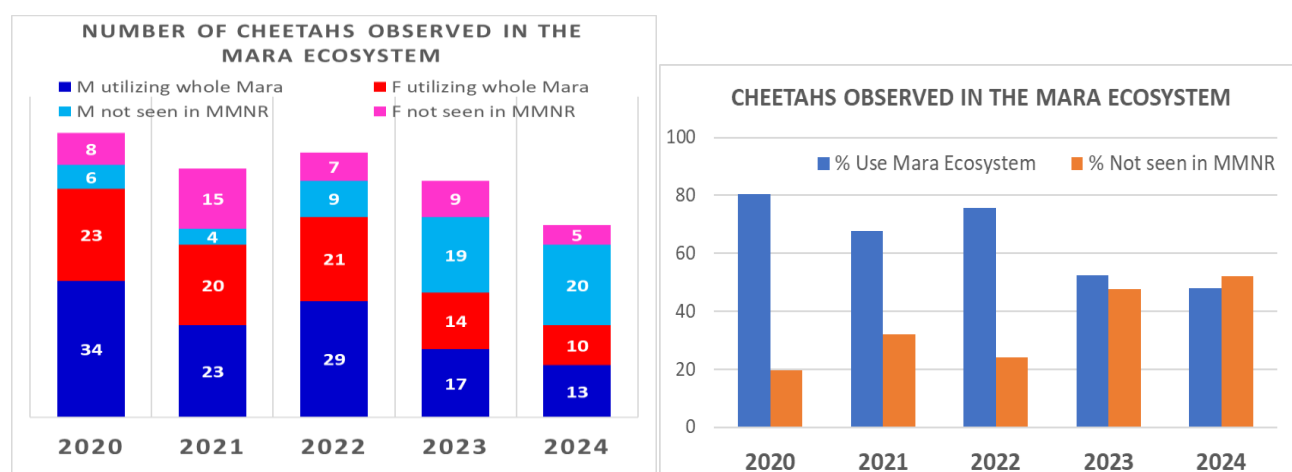
Our long-term observations reveal that, if the female gets pregnant, she leaves her sub-adult cubs from the previous litter one month before delivery. Littermates stay together for up to six months perfecting their hunting skills. When females reach sexual maturity at approximately two years of age, they leave their brothers and start solitary life. The most successful hunter female in the family, can leave her litter-mates, while the other female remains with the brother.

Males-littermates remain together for the rest of their lives in groups called “coalitions”, which may consist of up to 5 individuals. Usually, male cubs move from the mother’s territory while female cubs usually establish territories (home ranges) within their mother’s home range. If females (sisters) raise cubs in the same area, one of them can adopt sister’s cub/cubs (see Annual Report 2020 for details).

**Table 2. Proportion of cheetahs utilized the whole Mara ecosystem And cheetahs not observed in the MMNR**

Year	Cheetahs observed in a year	Utilized the territory of the MMNR, Conservancies and areas at the Tanzanian border		Not seen in the MMNR	
		%	Male.Female. Unknown	%	Male.Female. Unknown
2020	71	80.3	34.23	19.7	6.8
2021	62	67.8	23.20	32.2	4.15
2022	66	75.8	29.21	24.2	9.7
2023	60	52.5	17.14.1	47.5	19.9
2024	48	47.9	13.10	52.1	20.5

In addition, the following trend has been observed – while in 2020, most cheetahs (80.3%) used the entire territory of the Mara ecosystem, by 2024 the proportion had changed and most cheetahs stopped appearing in the Maasai Mara National Reserve (Table 2, Pic.10,11). This could be attributed to the high level of human disturbance in the reserve compared to the conservancies and blockage of corridors connecting the MMNR, conservancies, and community areas.



**Pic.10,11.** The ratio of cheetahs utilizing the entire Mara ecosystem (Maasai Mara National Reserve (MMNR), conservancies, community areas and areas bordering Tanzania) to cheetahs utilizing all parts of the Mara ecosystem except for the MMNR

From 2011 to 2022, 80% to 64% of cheetahs used the whole ecosystem (incl. MMNR), but over the past 2 years, a trend has emerged – in 2023, almost half of the Mara cheetah population did not appear in the reserve, and in 2024, majority of cheetahs did not come to the MMNR (Pic.10,11). It can be attributed to the disturbance of animals in the MMNR (individuals raised in remote areas with no

tourism are especially sensitive) and the increase of fencing at the north-eastern boundary of the MMNR, community areas and conservancies, blocking the routes.

## **2.7. Distribution and territoriality**

In 2024, a trend in spatial distribution of cheetahs was revealed, the MMNR Talek being the most visited of the reserve areas and this trend is supported by data from previous years. The most accustomed to tourism cheetahs are found in the central and northern parts of the reserve, especially in the Talek area, where tourism is active all year round. The Mara Landscape harbors more cheetahs than recorded, but due to disturbance, shy cheetahs prefer to stay in remote/inaccessible/closed areas (hills, bushes, and forests), making it hard to be seen.

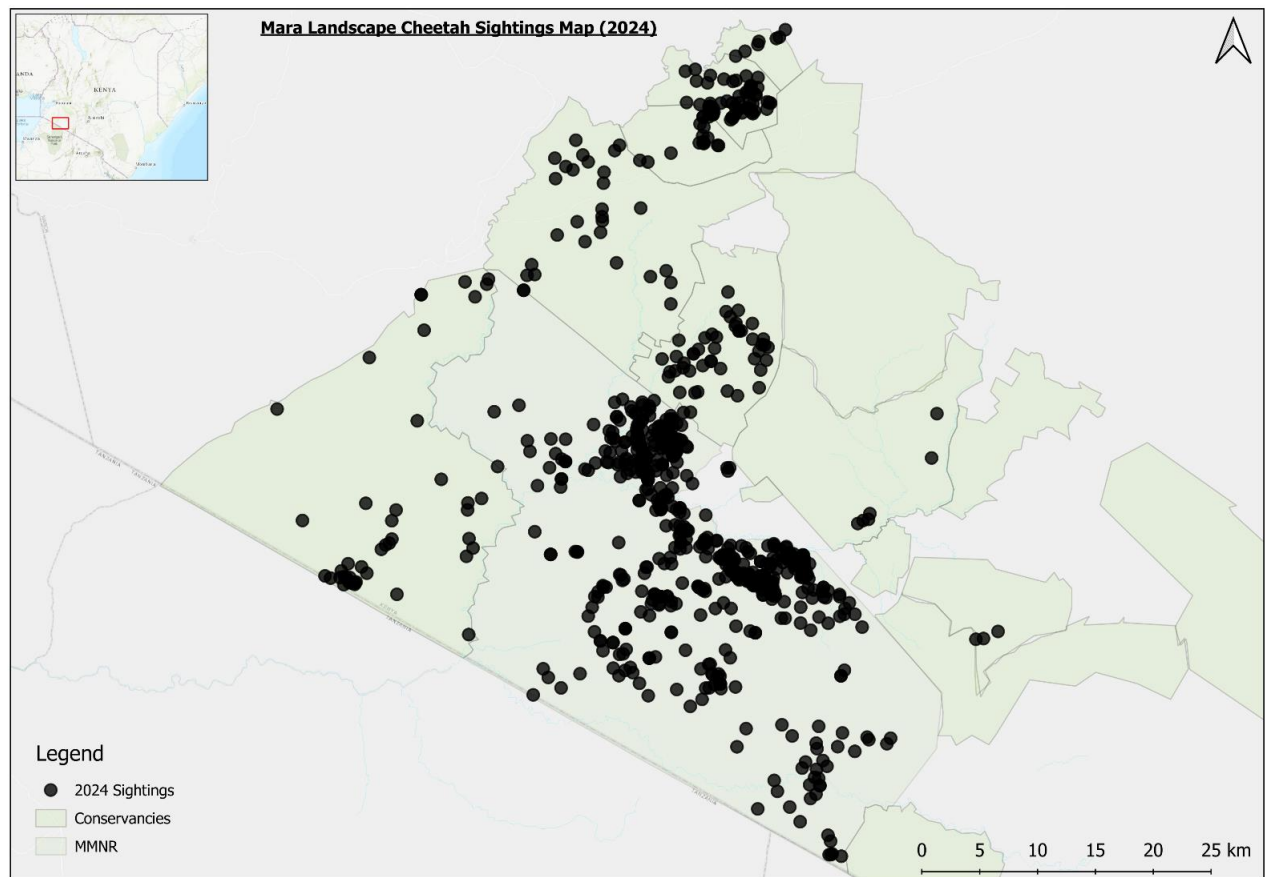
The distribution of cheetahs on the Northern Conservancies, MMNR, and areas of the Mara-Serengeti border is attributed to the largest remaining active corridor connecting these areas. Shrublands coverage in Northern conservancies and along their borders with the MMNR, plays a role of a refugee zone to cheetahs, especially females with cubs or young individuals raised and dispersed from the conservancies.

The Southern areas of the MMNR (Sand River, Osero-Sopia and Sopa) give opportunity to cheetahs to get used to the tourist activity, which is very low at the side of Tanzania border and increases gradually towards the center part of the Reserve. Lack of disturbance, open fields and mosaic dense vegetation patterns of these areas, provide cheetahs opportunity to successfully hunt, rest, mate and raise cubs. The dense vegetation covers as well rocky areas also make it difficult to see cheetahs and hence fewer sightings.

Cheetahs inhabit vast areas throughout the year due to combined factors that impact on their distribution and affect the size of their territories/home ranges. Cheetahs may hold territories or have home ranges. Territory is the sociographical area that traversed by an individual or a group of cheetahs, (e.g. male coalition, female with cubs, group of siblings) in its normal activities of hunting, mating, and caring for offspring. Home range is the area, which is not exclusively held not defended by cheetahs and significantly exceeds the size of the territory. Each home range has a core area, defined as an area of intensive use or most concentrated ranging. Location of the core area within the home range may change with time. Territorial male cheetahs consistently defend their territory from potentially intruding conspecifics and occasionally animals of other species. Other males adopt a "floater" tactic characterized by large home ranges and lack of territorial defense. Overlapping ranges facilitate social interactions, gene flow, and reproduction. Female home ranges encompass several male territories and overlap with the home ranges of floaters, therefore allowing them access to several males.

Unlike males, female cheetahs do not defend their territories and avoid interactions with conspecifics, especially when raising cubs and when not in estrus. Therefore, the areas where females roam, can be defined as home ranges. It is important to note, that in presence of large coalitions, members of smaller coalitions also do not defend their territories and do not mark objects (as indicator of their presence) in the areas where their home ranges overlap. Home ranges vary depending on gender, social groupings and cub survival – females can increase home ranges and can travel greater distances after losing cubs (MMCP, 2019). Our long-term data of distribution and movements of cheetahs in the Mara, collected for several years, reveals no significant trends in sizes and shapes of cheetah home ranges. In different cheetahs they change within a year and through years. Size of annual home range in the Mara Ecosystem in different individuals ranges from 215 km<sup>2</sup> to 889 km<sup>2</sup>, wherein overall home range determined for three years (2017, 2018 and 2019) in different individuals ranges from 485 km<sup>2</sup> to 933 km<sup>2</sup>, with similar mean for males and females - 688 km<sup>2</sup> (n=4) and 644 km<sup>2</sup> (n=5) respectively. Annual home ranges of different cheetahs differ in size from one year to the next on average by 30%.





Pic.12. Cheetah distribution in the Mara ecosystem in 2024

Cheetahs of the Mara have home ranges, that they cover within a year: Single male 372 - 646 km<sup>2</sup>, Male coalition 506-812 km<sup>2</sup>, Single female 335 - 766 km<sup>2</sup>. Within a home range, individuals may stay at the certain area for one-two weeks, and that smaller area can be defined as a temporary territory (See our Annual Report 2019 for the details). Home ranges and territories of male and female cheetahs overlap. Sometimes, females in oestrus cover large distances in search for the partners. By that, they get a chance of meeting with different males for courtship during one cycle. By travelling within their large home ranges, males also get opportunity to encounter different females and enrich genetic diversity by mating with them. Moreover, some individuals of both sexes get to know each other well.

The following factors and their combinations contribute to cheetah movements and affect the size of their territories/home ranges:

- \* Availability of suitable habitat (landscape; vegetation; rivers; roads)
- \* Environmental conditions (weather; burning of the area etc.)
- \* Availability of appropriate prey
- \* Cheetah population density
- \* Presence and activity of other predators and conspecifics
- \* Social, health and reproductive status (single or in a group; lone after losing coalition-mate, mothers with cubs, couples/groups in courtship)
- \* Age
- \* Personal experience and success
- \* Human activity in the area, the level of disturbance (tourists following animals during hunting or raising cubs etc.) and tolerance towards humans (tourists, and herders with livestock, locals on foot and on transit)
- \* Conservation status of the area (protected/not protected)



When adolescents start independent life, their home ranges during the first several months are larger than in the next year. However, with time the home range may change due to various factors and shrink or expand temporary. For example, home range of two sisters – Busara (F73) and Kisaru (F74) after separation from the mother in July 2017 was 265 km<sup>2</sup>, but after sisters split in January 2018, Kisaru settled in the remote conservancies, while Busara was roaming in the Reserve, adjacent conservancies and in the Mara Triangle. In 2018 and 2019, Kisaru was raising a litter of six cubs and her home range was much smaller (215 km<sup>2</sup>) than of Busara: 379 km<sup>2</sup> in 2018 and 376 km<sup>2</sup> in 2019. Their mother (Amani) was raising a new litter since April 2017 and left her cubs in October 2019. Her home range in these years was 419 km<sup>2</sup> in 2017 and 350 km<sup>2</sup> in 2018, and increased in 2019 when she was taking cubs around, which possibly contributed to increasing the size of her home range.

Dispersing adolescents, females with cubs, males who lost their coalition-mate, or “floaters” engage in wide-ranging behavior, which may temporarily expand the boundaries of their ranges. For example, when young males formed a coalition (Tano Bora) after they had dispersed from their mothers and started exploring areas, their home range in the first year was larger than in next year - 749 km<sup>2</sup> in 2017 and 432 km<sup>2</sup> in 2018 (Pic.8). Numerous studies have shown that cheetah home ranges can be similar in size for males and females and overlap in areas where prey is non-migratory (Broomhall et al. 2003). In contrast, where ungulate prey is migratory, home ranges are comparatively larger with males forming small territories and females exhibiting roving behaviors (Caro 1994). Although there is a seasonal influx of migrant herbivores into the MMNR each year (Stelfox et al. 1986), resident herbivores are also present year-round in relatively high numbers. In addition, cheetah space use has been shown to be highly concentrated within a small portion of the home range (~14% of the total area), even for individuals that otherwise occupy large areas (Marker et al. 2008).

Serengeti National Park: 833 km<sup>2</sup>  
East-central Namibia: 857 km<sup>2</sup>  
North-central Namibia: 1836 km<sup>2</sup> (Marker et al., 2008)  
Mara: Single male (M5) 90,5 - 455 km<sup>2</sup>  
Male coalition (5M) 506-812 km<sup>2</sup>, core area 232 km<sup>2</sup>  
Single female (F3) 350 - 409 km<sup>2</sup>

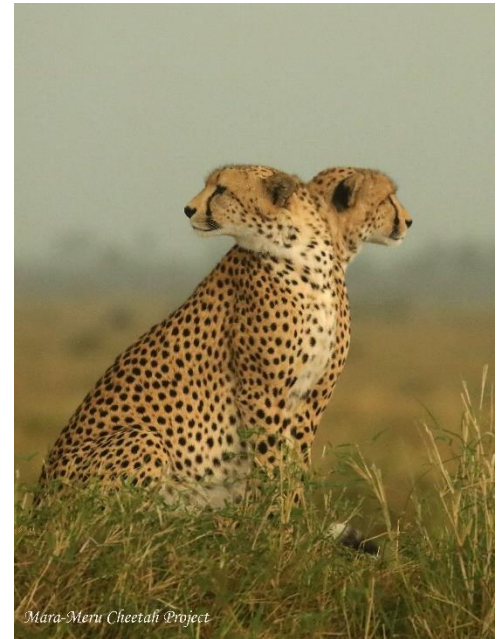
It is important to indicate that sizes of home ranges are approximate because firstly, sizes calculated based on the GPS positions of cheetahs only when animals were available; secondly, cheetahs intensively move within Ecosystem throughout a year, and can temporarily change area of habitat for remote area in the middle of the year. Thus, the territory that the cheetah used during the calendar year would exceed the size of the territory that the animal actually used. For example, when coalition of 5 males (Tano Bora) started using the area in MMNR of a single male Martin (M5), the latter, moved to another area (Mara North Conservancy) and settled there for over 10 months. Martin (M5) moved to the remote conservancy in the middle of October 2017, and returned to his territory in the Reserve in the end of July 2018. Home range of Martin in 2017 was 455 km<sup>2</sup> and in 2018 – 373 km<sup>2</sup>. However, tracking the male since he had left to the Mara North revealed that for 10 months his territory was 90,5 km<sup>2</sup>, but once in 2018 another coalition settled in the Mara North, he started moving towards the Reserve, and his home range increased to 253 km<sup>2</sup>.

In the Mara, home ranges for males and females have similar sizes, increasing and decreasing in different years. For example, home range of the male Martin (M5) in 2018 was 372 km<sup>2</sup> and female Amani (F3) – 350 km<sup>2</sup>; home range of the male Olchorre (M81) in 2018 was 646 km<sup>2</sup>, and home range of female Imani (F50) in 2019 was 766 km<sup>2</sup> (Pic.5). Large home ranges might be a result of low carrying capacity of the area, e.g. high density of other predators (lions and hyenas – major cheetah competitors); increased density of cheetahs; low prey availability; human-wildlife conflict and habitat perturbation, such as bush encroachment etc.). Often, cheetahs will temporarily venture outside their normal home range due to natural or anthropogenic disturbances or for exploratory purposes (Marker 2002), which also contributes to extension of the home range.

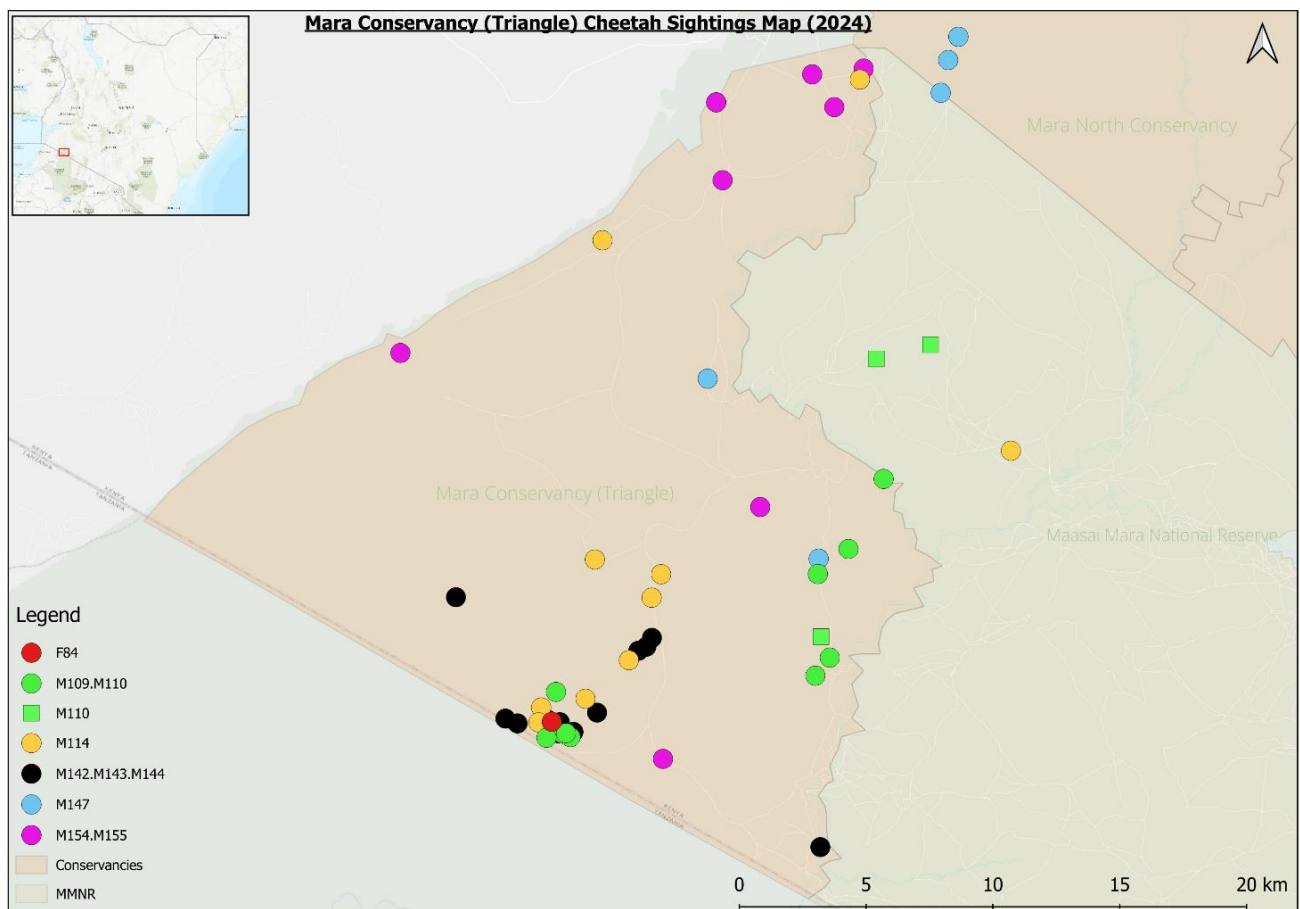
Direct observations provide significant data on cheetah time budget, space use, activity and behavioral patterns, including territoriality. However, in unfenced biotopes, where animals move freely, finding them become challenging. Hence, determination of the home range becomes approximate.

**2.8. Cheetahs in the Mara Triangle.** Our long-term observations in the Mara Triangle showed that its territory is capable of having up to 10 individual cheetahs during the year, including at least one male coalition. Perhaps the reason is the carrying capacity of this Conservancy.

Due to the fact that the Mara-Serengeti ecosystem has no physical barriers to the movement of animals, new cheetahs appear in the Mara every few months - most often males, in the process of exploring new territories. During migration, cheetahs come to the Mara following wildebeest and other ungulates. Cheetahs that come from Serengeti are usually very shy, unlike the cheetahs of the Mara, who are tolerant of the activity of tourist cars. Our long-term observations have shown that to be successful in the Mara (resting, hunting and raising cubs), cheetahs must be tolerant of tourist vehicles. This September, a new coalition of two very shy males appeared in the Mara Triangle. Hopefully, these males will be able to enrich the gene pool of the Mara cheetah population.



Pic. 13. Males M154,155 in the Mara Triangle



Pic. 14. Cheetah sightings in the Mara Triangle in 2024

As seen in the map (Pic.14), the distribution of cheetah sightings appears to have shifted significantly between 2023 and 2024. In 2023, cheetahs were widely dispersed across the Mara Triangle, including areas near the border with the Serengeti to the South-West and a heavy concentration in the Central-East region. However, in 2024, the majority of sightings are tightly clustered in the southernmost tip of the Triangle, with a notable secondary concentration in the North-East, extending into the Northern Conservancies. The shift to the south may be linked to changes in the Great Migration patterns as cheetahs follow their prey's movements.

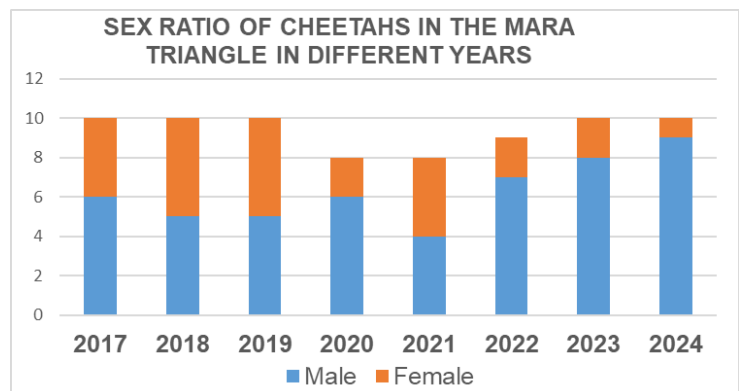
In different years, there were various number of adult cheetahs observed in the Mara Triangle. In 2017-2019, 16 different individuals – 9 males and 7 females have been seen in the Triangle, but up to the end of 2024, the total number per year did not exceed ten, probably due to a limited carrying capacity of the area. In all these years, some individuals born and raised in the MMNR and in the Triangle, have been moving across the Mara River, establishing their territories/expanding their home ranges on the opposite side of the river. One of the recent examples was Ranger (M147), son of Risasi (F84), who was born and raised in the Triangle and Northern Serengeti, but crossed the Mara River to the MMNR side after losing his brother. Since then, he has been actively exploring the Mara ecosystem, reaching northern conservancies. Risasi's brother, Ruka (M110) also crossed the Mara River on 23 May 2024 from the Triangle after losing his brother in Tanzania. In June 2024, he was in OMC, in September in MNC and then in the MMNR.

The sex ratio in most cases, except for three years (2018, 2029 and 2021), was in favor of males, and in 2024 the balance has shifted towards males significantly, (Pic. 15), when only 1 female was seen within a year.

In 2017, **10 (6.4)** have been observed in the Mara Triangle.

In 2018, **10 (5.5)** were in Triangle.

In 2019, **10 (5.5)** were in Triangle.



Pic.15. Cheetah s ratio trend in the Mara Triangle cheetahs

In 2020, **8 cheetahs** were spotted in the Triangle – **6 males** and **2 females**. Out of 6 males, two were singletons and 4 were in coalitions. One single male was approximately 7-years old M59, who has been roaming in the Mara Triangle since 2016 with rare visits to the Reserve. The other single male was 3-years old M99 son of Naserian. In 2020 he started exploring the Greater Mara. There were two male coalitions spotted in the Mara Triangle in 2020. Two 2-year-old sons of Rosetta (M109,M110), who have separated with their sister by July 2020 in the Reserve and started exploring the Mara before set up by the middle of 2020 at the Rhino Ridge area of the Reserve. The other coalition consisted of two Lemai Boys Mgeni (M90) and Mwenzi (M91). They were last spotted together on 23 March 2020, although there were sightings of Lonely Mgeni (M90) at the Tanzanian border in the Mara Triangle in December 2019. Out of two females, one was 12-year-old Rani (F8), who had been born in the Mara Triangle. The other female – Kalenya (F19) spent significant time in Tanzania.

In 2021, **8 cheetahs (4 females and 4 males)** have been seen in the Mara Triangle. Apart from Kakenya (F19), all other cheetahs have been using territories on both sides of the Mara River (Reserve and Triangle). Two families born and raised in the Reserve, moved to the Triangle after separation from the mothers: brothers Ruka (M110) and Rafiki (M109) – cubs of Rosetta, born at the Sand River area of the MMNR, and two littermates Ngao (M117) and Namelok (F89) – cubs of Nashipai (F69). Female Rani (F8) was spotted last in the Mara Triangle in the end of March 2021.

In 2022, **9 cheetahs** have been observed in the Mara Triangle (**7 males** and **2 females**). Out of 7 males, three were singletons: Oloti (M114), Mpaka (M116), Kijana (M126), and 4 were in coalitions:

Rafiki (M109) and Ruka (M110), and two shy males (M130,M131). Two **females** were Risasi (F84) and Imani (F50).

In 2023, *initially*, **12 cheetahs (9 males and 3 females)** have been observed in the Mara Triangle. Out of 9 males, 2 were singletons: Oloti (M114) and Mpaka (M126) and 7 were in coalitions – Rafiki and Ruka (M109, M110), Sons of Siligi (M142.M143.M144), and two sons of Risasi (M146.M147). Risasi (F84) left her sons on 15th of September 2023. Unfortunately, in 12 days, M146 died of a fatal injury, and M147 was named Ranger by the Triangle rangers. Females were Risasi (F84) and Naado (F105). Although Imani F50 was spotted at the bank of the Mara River on Triangle side, she did not move further. Therefore, we can count **8 males** and **2 females**. Thereby, the total number of adult cheetahs did not exceed 10 as in previous years.

In 2024, out of **10 cheetahs (9 males and 1 female)** have been observed in the conservancy. Out of 9 males, two were singletons: Oloti (M114) and Ranger (M147) and 7 were in coalitions: Siligi sons (M142, M143, M144), Rafiki (M109) Ruka (M110), and new shy males (M154,155). The only female was Risasi (F84).

Taking to account the longer lifespan of females (max 13 years), in 2024, Risasi was in her primer age (6 years) in 2024 and could raise another litter to independence. However, she was observed pregnant, then nursing (in the area inaccessible to the vehicles) and then alone without cubs moving towards Tanzanian border. She was last seen at the border in mid-October 2024.

## 2.9. Wildlife corridors

By following different individuals (26 males and 23 females) and groups of cheetahs (19 males in 7 coalitions, 7 mothers with cubs, 6 groups of subadults) we identified the areas and places that cheetahs used as crossing points from one area to another. We used data on cheetah movements from 2021 to date. The most critical points are situated along the NE boundary of the Maasai-Mara National Reserve (MMNR) and adjacent conservancies (Olerai, Naboisho, Nashulai) and community lands (Pic.16,17).

Through the years, we have been observing cheetahs actively using indicated corridors (see Pic.16 and Pic.17). However, increased fencing in the Mara contributed to blocking corridors and restricted movements within the ecosystem.

### Blocked Corridors

- 1) Between Talek and OMC (blocked an access to Olerai and Naboisho conservancies)
- 2) Camps along Talek River (fences)
- 3) Villages between MMRN and Naboisho conservancy (livestock grazing and settlements)
- 4) Villages at Sekenani area (cut access for MMNR-Nashulai conservancy, Siana-Nashulai, Olkinyiei/Naboisho-Eastern Conservancies).

Existing to date 8 corridors, including the western part of the MMNR that connects Mara with Serengeti and Tanzania, are still active. At the same time, two corridors situated between Talek and Sekenani Gates, are narrow and involve high level of human activity, including daily grazing in the bushland.

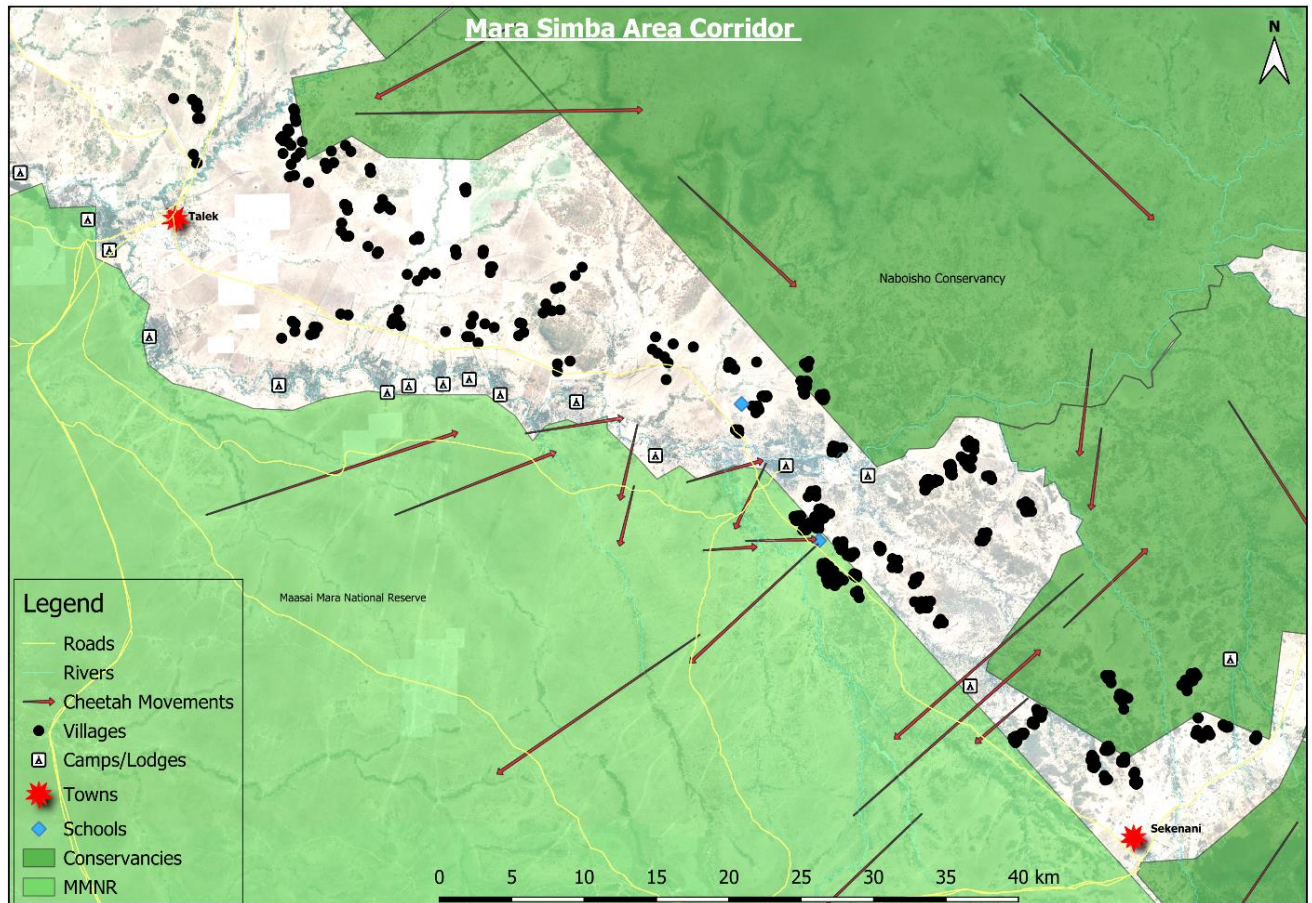
### Active Corridors

- |   |                         |
|---|-------------------------|
| 1) MMNR-OMC-Naboisho  | 5) Ripoi-MMNR-Serengeti |
| 2) Naboisho-Nashulai-MMNR (very narrow with human activity) | 6) Triangle-MMNR        |
| 3) Northern Conservancies - MMNR (large)                    | 7) MMNR-Serengeti       |
| 4) Oloisukut-Triangle (human activity)                      | 8) Triangle-Serengeti   |









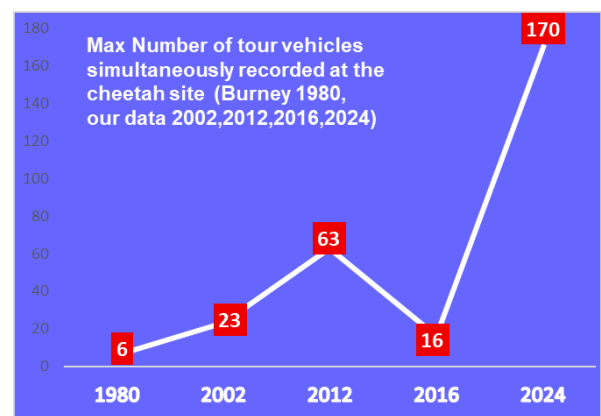
Pic.17. Cheetah movements at the Talek-Sekenani area of the MMNR, adjacent Conservancies via community areas

## 2.10. Human activity and its impact on cheetah behavior

While moving within the ecosystem, cheetahs encounter various levels of human activity: intensive tourism all year long in the MMNR (Pic.18,19,20,21), day and night grazing and normal day activities of the communities, including, but not limited to water and firewood collection, movements across the areas by foot and motorbikes (Pic.32).

### 2.10.1. Tourism

The Mara is characterized by a year-round flow of tourism with significant difference between the Reserve and the conservancies in number of vehicles and time of presence at the cheetah sightings. In the conservancies, safari takes place mainly in the morning (6:00-11:00) and evening (16:30-18:30) hours, and during lunch no one follows the cheetahs. The maximum number of vehicles allowed at a cheetah sighting simultaneously is 5, with other vehicles waiting for their turn at 100m distance. In total, there are 10-20 vehicles visit cheetah sighting during the high season. In MMNR, safari starts before 6:00 and the first vehicles attend cheetah at about 6:00-6:30, cars are following the cheetah all day long



Pic.18. Number of tour cars simultaneously recorded in the MMNR in different years

and leave around 19:00. The total number of the vehicles simultaneously at one cheetah sighting varies from 10 to 170, and at least 2 cars following or staying with the cheetah during lunch hours (Table 3).

Just like 20 years ago, in the course of the day, the largest number of tourist groups close to cheetahs were observed in the early morning and late afternoon. The fewest were observed in the middle of the day. Information spreads quickly between tourists and guides. Within an hour the number a vehicles in the Reserve grows from 2 to over 50. By sharing the location of a cheetah with other drivers, the guides attract an unmanageable number of vehicles, which makes work of the rangers extremely hard. On the next morning, drivers most often check the place where a cheetah had been seen the previous day. Most often as it was shown by Karanja (2003), once tourists spot a cheetah, they violate the rules on practically more than in half of cases, including following moving animals and driving off road. However, presence at the cheetah sighting of rangers in patrol vehicle, minimize the risk of park Rules violation and disturbance of cheetahs. Currently, there are two ranger patrol vehicles, that are assigned by the County Government of Narok for cheetah monitoring and anti-harassment activities, while in the Mara Triangle (500 km<sup>2</sup>), that is 3 times smaller than the Reserve (1,500 km<sup>2</sup>), there are 6 vehicles with the same duties.



*Pic.19. Cheetah surrounded by cars in absence on rangers*

*Pic.20. Cheetahs use tour vehicles as a shade during hottest time*



Our long-term observations of cheetah and tourists' behavior revealed that presence of tour vehicles alone does not affect cheetah behavior, and therefore their welfare. But tourists' activity (driving around, making noise etc.) affects cheetah behavior significantly (Chelysheva et. al, in prep). Driving in front of the prey and stalking cheetah reduces chances of successful hunt (Pic.15). Moreover, cheetahs stop hunting until the prey move to the side with no vehicles and the space for a chase created. However, if all the vehicles are parked at one side and do not move while cheetah is stalking, the hunting success reaches 90%. We observed cheetahs hunting successfully in presence of maximum 65 cars. Moreover, cheetahs use vehicles parked on the roads, as a shield for stalking the prey, and usually hunting success reached 95%.

Overcrowding around feeding cheetah or the mother with cubs during the day hours, and/or taking photos with a flash in the evening hours, attract hyenas to the spot within 20 minutes, and sometimes lions, which results in cheetah losing their kill, cubs and even their lives. However, when the cars are parked at a distance in a line and leave wide open area for observation, cheetahs have time to spot danger and react accordingly. Cheetahs use vehicles to hide from pursuing predators (lions and hyenas), which is critically important especially for females with small cubs.

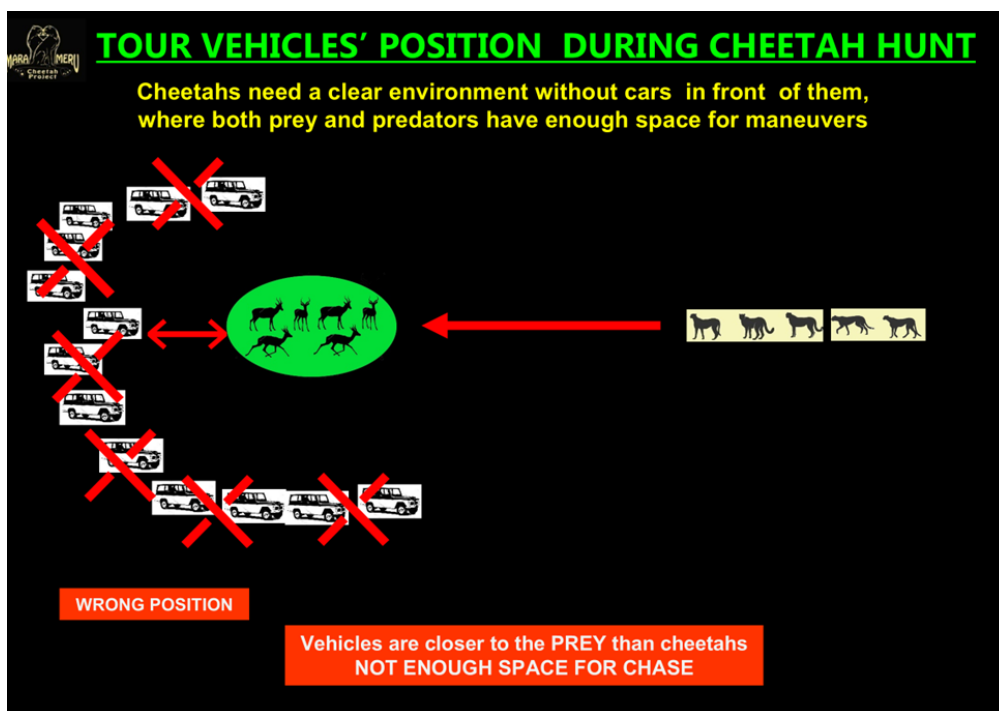




Pic.21. Human activity in front of two cheetahs feeding in 10 meters – driver attaches a tow rope for pooling a vehicle

**Table 3.** The highest number of tour vehicles recorded at the cheetah sightings simultaneously between June 2024 and June 2025 in MMNR

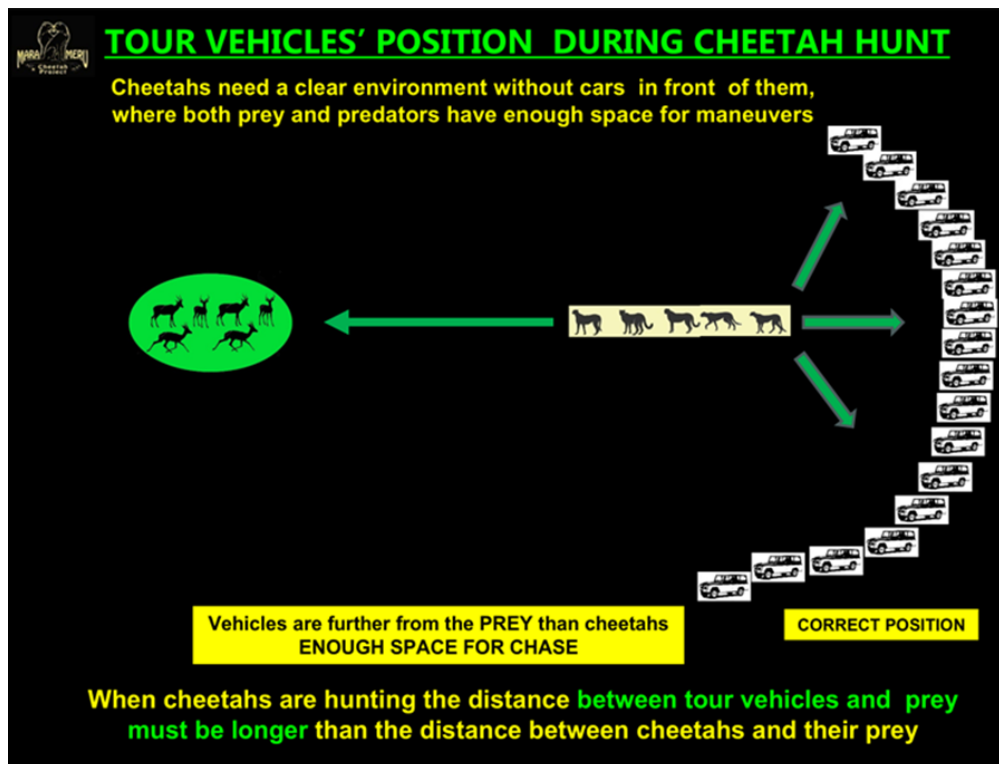
month	June 2024	July	Aug	Sept	Oct	Nov	Dec	Jan 2025	Feb	Mar	Apr	May	June 2025
# cars	32	170	89	50	51	38	38	55	55	31	48	32	105



Pic.22. Wrong position of cars during cheetah hunt



We recommend to the guides the following way of placing vehicles at the hinting cheetah sight (Pic.23).




Pic.23. Correct position of cars during cheetah hunt

Visiting cheetah dens by tour cars, indirectly affects cheetah cubs' mortality, because presence of cars and tire tracks left in the grass, attract predators to the dens. Also, mothers start relocating their offspring as soon as the last car left. By that, cubs get exposed to the predator species (lion, hyena, jackal, leopard, eagle, etc.) and other space competitors dangerous to cheetahs (baboon, buffalo, elephant etc.). We always encourage guides who came across females with small cubs to keep the information confidential, not to share location and not post photos of small cubs to avoid traffic to the denning areas.


It is important to note that behavior of cheetahs inhabiting the Serengeti-Mara ecosystem differs significantly in many behavioral aspects. For example, recent study revealed that in Serengeti, cheetahs did not hunt in presence of tour vehicles. It has been found strong negative relationship between vehicle presence and hunting decisions, with hunting probabilities dropping from 20% in vehicle-free conditions to nearly 0% in the presence of vehicles. Engine noise and the number of running engines further exacerbated these disturbances, prompting cheetahs to adopt passive behaviors such as lying down or sitting up, reminiscent of risk-avoidance strategies employed around dominant predators. Additionally, engine noise was a critical predictor, with hunting probability declining sharply as the number of running engines increased. Behavioral shifts were also evident, with cheetahs displaying passive behaviors, such as lying down or sitting up, in response to vehicles (Minja 2025).

Our long-term observations showed that to be successful in the tourist areas, cheetahs have to be tolerant vehicles' presence. Every 3-5 months, new shy cheetahs appear in the Mara, and most of them come from Tanzania. These individuals are extremely shy and experience difficulties in presence of the tour vehicles: they cannot rest, hunt or mate. It takes about 3-5 months for such individuals to get used to the presence of cars, and some of such cheetahs start using the cars as a shade during the hottest hours of the day (Pic.20) and do not hesitate to mate in close proximity of vehicles (MMCP 2021, P.20, Pic.31).



## NAROK COUNTY GOVERNMENT

The Land of Diversity




<p><small>Since 1900</small></p> <p><b>90%</b></p> <p><i>of cheetah habitat destroyed</i></p>	<p><small>Since 1900</small></p> <p><b>93%</b></p> <p><i>decrease of the wild cheetah population</i></p>	<p><small>Only</small></p> <p><b>7000</b></p> <p><i>free-ranging cheetahs left worldwide</i></p>	<p><small>About</small></p> <p><b>60</b></p> <p><i>adult cheetahs in the Mara Ecosystem</i></p>
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The right behaviour towards cheetahs is essential to ensuring the long term survival of this species

### MAASAI MARA NATIONAL RESERVE

### CHEETAH OBSERVATION RULES



**DO NOT DISTURB:**

- Keep 25m from wild cats (with or without cubs)
- Avoid more than 5 cars at one cheetah sighting
- Stay always on tracks and do not go off-road
- Stay in your car at all time

**GIVE WAY:** Never block any moving cheetah

**RESPECT:** Never separate cheetahs, e.g. mother and cubs, litter-mates, coalition-mates  
... separation is a high risk e.g. for cubs being killed by other predators

**GIVE SIGHT:** Do not surround cheetahs  
... as they need to check the environment for potential dangers

**STOP:** Do not drive whenever cheetahs are hunting or running  
... to avoid accidents with cheetahs (and other cars)

**GIVE TIME:** After a successful hunt do not approach cheetahs before eating has started  
... to allow cheetahs benefiting from their successful hunt

**RESIST:** Cheetahs on/in the vehicle are strictly prohibited

**NEVER FEED** cheetahs

**AVOID NOISE:** Switch off engine and radio when observing cheetahs  
... do not disturb animals or other visitors, to allow cheetahs to hear dangers, to not compromise communication between cheetahs as noise confuses cheetahs and prevents finding each other if lost, e.g. mother and cubs

**PATIENCE:** Never try to attract cheetahs' attention, e.g. by noise, light or starting/accelerating/stopping the engine  
... to avoid stress of animals and to respect their privacy

**LIGHT:** Do not use flashlights, external lights or headlights  
... as it can affect their vision

**STAY GROUNDED:** Do not use drones or remote devices  
... to avoid stress of animals

**FINE FOR VIOLATING THE RULES – 50,000 KES per car**  
**For a repeat violation – ban of a driver/guide**

LET'S SAVE CHEETAHS FOR POSTERITY TOGETHER

**CHIEF PARK WARDEN:** +254 722 857 779 Mr. Stephen Minis

**MAASAI MARA NATIONAL RESERVE • CHEETAH MONITORING AND PROTECTION TEAM**

**Rhino/Cheetah Warden:** +254 721 698 113 Mr. Stephen Kenta

**Cheetah Team Corporal:** +254 729 217 526 Ms. Brenda Naisiae Kantai

**MMCP Project Manager:** +254 111 796 464 Mr. Saitoti Mpooya



Design by  
Dr. Gordon Hoehne

Pic. 24. Cheetah Observation Rules based on our research observations and findings and recommended by the Narok County

In the Mara ecosystem, cheetahs tolerant to presence of vehicles are more successful (in hunting, courtship, etc.) than non-tolerant individuals (from outside protected areas and Tanzania). Wildlife has ability to adapt, but not without limit.



In order to remain vigilant at night, the cheetah must get enough sleep during the day. Older animals spend more time sleeping, especially after a heavy meal. A good daytime sleep without disturbance is important for survival in the face of fierce competition with other predators in the ecosystem. Therefore, we encourage the guides and tourists when they find a sleeping cheetah, not to wake it up, especially if it is a mother with cubs or an old animal.

**Conclusions:** Maintaining correct behavior and keeping reasonable distance from cheetahs, are critically important, both for the wellbeing of cheetahs, and for the benefit of visitors. Continuous monitoring cheetah population throughout the year provides accurate data on the population density, trends and threats, and ability to perform necessary actions.



Pic.25-29. Cheetah Observation Rules placed at the MMNR gates (Olololo gate, , Sekenani and Talek gates)(above) Purungat river gate, Mpuai post (below)



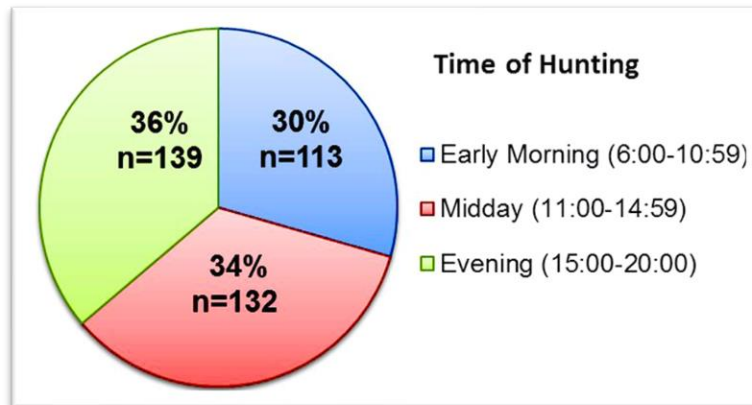
#### 2.10.1.1. Cheetah adaptations

As a resilient species, forced to cope with the pressures of tourism, cheetahs modify their behavior to achieve optimal results, including:

- ✓ Hunting at any time of the day, including the hottest and night hours, or early morning hours before dawn (before safari begin in the MMNR)
- ✓ Hiding (resting, feeding) during safari hours deep inside bushes, remaining undetected by tourists



- ✓ Staying (rest, hunt, feed, mate, give birth and raise offsprings) in places hard to reach for tourists (hills, thick bushes, forests, closed areas (MMNR)
- ✓ Using tour vehicles as a shelter for hunting and hiding from approaching predators (lions)
- ✓ Hunting in presence of over 50 vehicles (if all are on the same side not moving)
- ✓ Mating at any time of the day
- ✓ Crossing rivers at the most convenient points, including spots situated inside tour facilities.



Pic. 30. Time of cheetah hunting during the day time



Pic.31. Two males – Olonyok and Winda walking through Julia's camp territory to the bank of Talek river for crossing

### 2.10.2. Cheetahs in the community lands

In the community areas at the edge of the Reserve and in the conservancies, in presence of walking people cheetahs hide in the tall grass or in the bushes. Cheetahs may stay motionless for over 40 minutes waiting for livestock with herders or walking residents to pass by the bush even in 2 meters. Mothers who raise cubs in the conservancies, teach their cubs behavioral strategies contributing to their survival in the future. Cheetahs normally hide when livestock is approaching and hunt wild game species. Some females guide their cubs towards the bomas for human shield.

We have observed that in the areas where certain cheetahs become temporary residents, the local community becomes tolerant to their presence and even to accidental attacks to the small stock. For

example, Amani (F3) and Kisaru (F74) who have been raising their several litters in MNC, Lemek, Ol Chorro and Enonkishu conservancies, were always tolerated by the local communities. Young cheetahs explore different hunting opportunities and sometimes chase livestock. Once such cheetahs move to the areas, where they are not known, they may become victims of human-carnivore conflict.

Interviews conducted by our team in 2015 in the villages around MMNR, revealed that 89% respondents confused cheetah for a leopard, and 60% out of all respondents who blamed cheetahs for their livestock losses (spotted cat took the shoat up a tree), confused cheetah for a leopard. Such confusion put cheetahs in high risk of persecution



*Pic. 32. Cheetah family (Kisaru with 6 cubs) resting at the roadside*

### 2.10.3. Cheetahs and livestock

Healthy cheetahs ignore livestock and hunt natural prey. (Example Pic. 33-35)



*Pic. 33. Nelemek (F90) is hunting wildlife next to livestock*





*Pic. 34. Nelemek (F90) is hunting wildlife next to livestock*



*Pic.35. Nelemek hunted Thomson gazelle next to the village ignoring calves and walking people*

**Only in extreme cases cheetahs take domestic stock – sheep and goats. This happens to:**

- sub-adults when they explore new species to hunt or hone their hunting skills
- females with cubs in the areas where wild prey is temporarily absent (Pic.36)
- sick and injured cheetahs unable to run with full speed (Pic.35)
- old cheetahs (Pic.37-38)
- cheetahs of any sex, age and experience, who failed hunting wild game due to tourists interfering with the hunting process (when cars drive by or stop in front of the cheetah and the prey, expecting the cheetah to run towards the tourist with the camera, i.e. for the frontal shot).



*Pic.36. **Young cheetah** – M124, 16 Months old son of F82 Kuleta eating sheep at the border of the MMNR during day time (August 2022)*

*Pic. 35. **Sick (limping) cheetah** F69 female unable to hunt fast-running gazelles, hunted a sheep in a herd that was herded by a small boy, border of MMNR (April 2024)*







Pic.37-38. 11 years old Amani, MNC (January 2021) hunted a young goat



Pic.39-40. Herder persecuting Amani

In 2023-2024, while Nashipae (F69) was raising her 4 cubs, and Kisaru (F74) was raising one cub, these families were staying in the grazing areas along the reserve boundaries for weeks several times. Daily monitoring of the families and actively protecting the livestock from young cheetahs and injured adult cheetahs, helped prevent HWC in these areas. Our two teams with rangers or alone performed the following activities:

- 1) diverting young cheetahs from the small stock, and
- 2) explaining to the herders safe herding methods and diverting the livestock from the predators.

As it has been pointed out in the numerous recent meetings, HWC and its impacts on people and wildlife continue to grow, but there are different solutions available for mitigating conflicts.

#### 2.10.3.1. Cheetah adaptations

- ❖ cheetahs stay in the forests, bushes and hunt in the fields when opportunity arises;
- ❖ females bring cubs for overnight closer to bomas.

## 2.11. MMCP activities

- ✓ Working with local communities, sharing with herders safe livestock husbandry and grazing
- ✓ Assisting cheetahs at multiple locations (boundaries of the MMNR and community areas, conservancies), preventing HWC: saving livestock from cheetah attacks by diverting cheetahs from livestock, diverting herds away from cheetahs with cubs
- ✓ Connecting livestock owners with «Lights for Life» and funding installation of predator-deterrent lights

**Conclusion:** Continuous monitoring cheetah families and individuals throughout the year enables partaking of necessary actions aimed at protecting cheetahs and livestock. Awareness, environmental education and introducing safe livestock herding and keeping strategies are critically important for survival of the species and welfare of the local communities.

## 2.12. RECOMMENDATIONS

- Strengthened protection and connectivity of cheetah habitats through securing wildlife corridors, promoting ecofriendly land use, and minimizing land fragmentation.
- Integrate cheetah monitoring data into national wildlife management systems to guide adaptive policy and conservation planning.
- Increase funding and logistical support for community-based scouts and conservation programs to enhance ground surveillance and response.
- Promote coexistence initiatives, including community education, compensation schemes, and predator-friendly livestock management.
- Regulate tourism and vehicle pressure around cheetahs to reduce behavioral disturbance, especially for females with cubs.
- Enhance cross-border collaboration between Kenya and Tanzania for coordinated monitoring of trans-boundary movements of cheetahs.
- Support continued research and veterinary intervention programs to address emerging cheetah health, genetic, and ecological challenges.

## III. CHEETAH BEHAVIOR

**3.1. Courtship events with mating.** Cheetahs are very secretive animals and whereas most of courtship activities happen during the daytime, mating occurs usually at night or at any other time with no witness. However, from 2017 to the end of 2024, 14 cases of cheetahs' mating were observed in the Mara during day time:

- |  |                                      |
|--|--------------------------------------|
| • M12, M13 with F8 in October 2017         | • M81 with F80 in February 2022      |
| • M72, M70, M71, M73 with F42 in Dec. 2017 | • M83, M84 with F74 in December 2022 |
| • M58 with F8 in March 2018                | • M71 with F69 in February 2023      |
| • M30 with F73 in March 2018               | • M71 with F42 in April 2023         |
| • M73 with F69 in August 2018              | • M132 with F68 in February 2024     |
| • M70 with F7 in October 2019              | • M83 with F100 in June 2024         |
| • M81 with F68 in January 2022             | • M71 with F68 in August 2024        |

**Olbarikoi and Neema.** Home ranges of male and female cheetahs overlap, and, on the one hand, different males encounter each other, but on the other hand, males have the opportunity to meet different females. Meetings between males often result in fights, in which some cheetahs may get injured.



On January 26, Mpaka (M126), who is roaming mainly in the Triangle and Serengeti, encountered two males from the Tano Bora coalition in their territory in the Reserve. Both Winda (M71) and Olonyok (M73) attacked the intruder, but eventually Mpaka was the only male who wasn't hurt! Both coalition-mates, were limping after the brawl, and Olonyok's ear was seriously damaged.

In conditions of fierce competition, especially with coalitions, some lonely males not only manage to survive, but also to reproduce. One of these males was Olchorre (M81), who, having lost his littermate, Once created a temporary alliance with the son

of Miale (F7), and who at the age of 7 years, managed to mate with two different females in the territory of two male coalitions within 2 weeks! In early February, 2024 another single male, approximately 4-year-old Olbarrikoi (*"light color"* in Maa), (M132) came from conservancies to the territory of the Reserve and also managed to successfully mate with an 8.5-year-old female Neema (F68, daughter of Rani (F8), granddaughter of Shakira). Neema also had the opportunity at different times to meet with coalitions (Milele and Mbili (M83, M84), 5 males of the Tano Bora) and different floaters including mating with both coalition males and singletons – Olchorre and Olbarrikoi. With productive mating, different males have a chance to enrich the genetic pool of the cheetah population. And in some cases, it is even easier for a single male to mate, since he is not disturbed by his coalition partner. The mating was successful, but unfortunately, Neema lost that litter.



Pic.41 Mating of Olbarrikoi (M132) and Neema (F68)



Pic.42 .Olbarrikoni following Neema



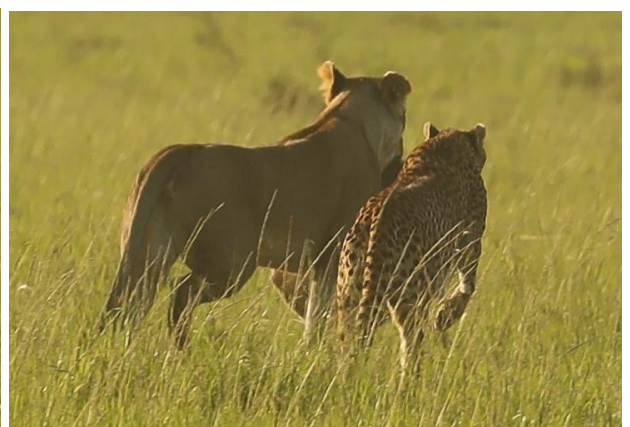
Pic.43 Neema is rolling in estrus in front of a male

### 3.2. Antipredator behavior

**Kisaru and her cub Lekisaru.** In the wild, it is impossible to estimate the rate of survival of cub females versus cub males' because the sex of the cubs at birth is unknown. Some families are spotted first when cubs are about 4 months old, and could already have lost littermates, as the first three months are known to be the most critical for cheetah cub survival. Our long-term observations in the Mara suggest that cub survival rate of males is higher than that of females. Majority of the litters at the first encounter, contained cubs of both sexes. Out of 43 litters, for which the time of cubs' dispersal was known, in 81% litters (n=35) was at least one cub male. In 2022, out of 6 litters raised to independence, 5 litters contained at least one male, and out of 15 cubs, 60% were males (n=9). With age, cub become more active, and spend more time playing with each other. For the single cub, the only partner is the mother. In the beginning of July 2023, Kisaru gave birth to four cubs at the Mbokishi Conservancy. Within 1,5 months, she lost half of a litter, and started travelling through the conservancies with two remaining cubs – a male and a female. In the last week of November, she appeared on the eastern border of the Reserve with a single cub – a male. For a week, she was trying to proceed deeper into the reserve, but did not manage to cross the high and rough waters of the Talek river.



Lions and hyenas are known to be the major enemies of cheetahs, and mothers do their best to protect their offspring and teach survival strategies. By seeing approaching hyena or a lion, cheetah mother would rush towards it and lead away from her cubs. In one occasion, we observed how Kirsu ran towards a big lioness who had spotted cheetahs from far and was running towards them. Fortunately, on the way to the cheetah family, the lioness saw a family of Warthogs, caught one and lost interest in cheetahs. However, Kirsu had reached the lioness, followed and slapped her from the back. Her cub was watching the scene from over 200 meters and ran towards the mother after the action. The lioness focused on protecting her prey from the hyenas, and the cheetah family escaped safely.



*Pic.44-47 Kirsu is following a lioness who hunted a warthog piglet and slapping her*

On another occasion, we observed Kirsu battling a hyena trying to attack her resting cub. Being fearless, at some point, she might have miscalculated her strength or find herself in a situation where the forces were unequal.





*Pic. 48-51 Kisaru is protecting her cub by attacking a hyena and driving it away*







Pic.52 Kisaru is biting a hyena

### 3.3. Adaptation behaviour of the cheetah males

Interspecific territorial competition with successful and stronger predators forces cheetahs to employ different survival strategies. For example, do not hunt if a lion, leopard or hyena is spotted at a distance, kill two antelopes at the same time so that if one prey is taken away by kleptoparasites, the other will be eaten by the hunters. Or share a meal with a hyena, saving energy for the fight, in which, in any case the hyena will emerge victorious. Having noticed resting adult cheetahs, hyenas approach to check if there is anything to profit from, and usually leave for good after a while. However, some



Pic. 53 Olonyok is hiding up a tree from hyenas

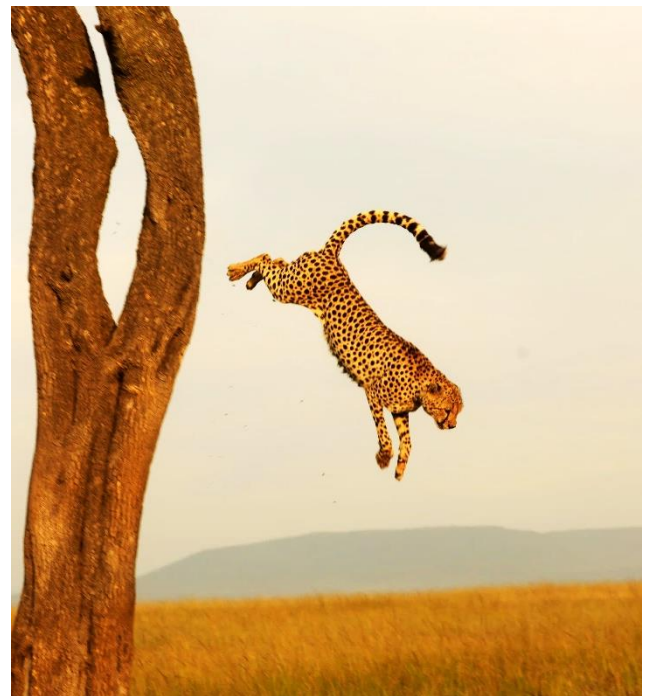
individuals attack adult cheetahs, driving them away from their resting place. A hyena's display of aggressive behavior ends in the hyena's victory, increasing its self-confidence. Although such phenomena are rarely observed, such events occur frequently in nature. A year ago in the evening, we watched two hyenas persistently chase Nashipai, and on March 16, a hyena chased two males - Winda and Olonyok. With age, cheetahs' hearing weakens. Perhaps the January injury to one ear (despite treatment) could also be the reason why





Olonyok did not hear the approach of the hyena and the pre-emptive hiss of his coalition-mate in time. In search of salvation, some cheetahs climb trees and spend hours there, not deciding to come down even when the hyenas have left the place. This was the case with the female Miale, who was fleeing from a group of hyenas, and Kisaru's son, Lekisaru, who waited out the night after the death of his mother, sitting high in a tree. And it appears that Olonyok didn't just climb the tree on March 16 to mark or inspect the area. He looked anxious, and only came down at 18:15 to join Winda, with whom he finished the fawn of Thomson gazelle. When the hyena reappeared on the spot, the cheetahs had already finished eating and were resting nearby. Having finished eating the rest, the hyena drove the cheetahs away from the resting place and immediately left, thus showing its superiority. These two males from the Tano Bora coalition are now 9.5 years old, and every day they find it more difficult to survive. Living as a couple helps them share vigilance and food. Considering that the average lifespan of male cheetahs is about 3 years, Winda and Olonyok are doing well.

*Pic. 54-56. Olonyok jumping off a tree*



After hunting, cheetahs usually drag a kill into the nearest bushes and by that, keep it safe for hours. Depending on the number and age of the cubs, the family can feed on the adult Thomson gazelle or Impala from one to 6 hours. When hunting in the open area, cheetahs risk losing to kleptoparasites. Flying vultures attract jackals and hyenas. By following cheetahs, jackals sometimes distract their hunts. Single cheetahs and male coalitions sometimes share the part of a kill with jackals, and on very rare occasions – with the single hyena.



Tano Bora coalition males adopted the strategy of sharing kills with single hyenas mostly due to the tolerance of Olonyok (M73) – one of the 5 males. The males kept the same strategy when only two of them (Winda (M71) and Olonyok (M73) survived by 2023 (Pic. 57,58).



*Pic. 57. Two males of the Tano Bora coalition Winda and Olonyok sharing a kill with a hyena*



*Pic. 58. Two males of the Tano Bora coalition Winda and Olonyok waiting for their turn at a kill*



While both males were observed feeding large kills (adult Topi, Wildebeest, Zebra) with the single hyena simultaneously, in presence of two hyenas, they adopted another strategy – feeding with hyenas in turns. In September 2023 we observed such behavior, when males killed an adult zebra. After the first hyena arrived in 20 minutes after males had started feeding, cheetahs stopped feeding, but did not leave the spot. They were growling and hissing to hyena, but did not try to interfere with its feeding. In a few minutes another hyena arrived and joined the first one at a kill. While two hyenas were eating for 22 minutes, cheetahs were patiently waiting. Once they walked away and laid in 50 meters, cheetahs resumed feeding. In 11 minutes however, both hyenas returned, and cheetahs let them eat again. During the next 2 hours, two couples of predators alternated several times. By that, cheetahs got enough food and saved their health by avoiding fights.

### 3.4. Living in the bushland and forest

Cheetahs are remarkably adaptable to life in a wide variety of habitats, and are able to hunt and raise their young successfully, not only in the open fields, but also in hard-to-reach places, such as hills covered with dense vegetation. Such a habitat helps the female and her cubs to hide for a long time from disturbance by predators and humans. With a rich natural food base and the tolerant attitude of the local population towards predators, a female cheetah with cubs can spend considerable time in close proximity to human settlements, feeling completely safe, watching people and livestock, while hunting wild animals in the forest.



Pic. 59. Siankiki hunting and feeding in a dense bush

Such adaptations are important for cubs, who after reaching independence, have to look for suitable habitats. Each generation of ancestors contributes to the development of survival skills. The great-great-grandmother of 4-year-old Siankiki – Amani, was the most successful female in the Mara – she raised 9 cubs in 4 litters to independence. Siankiki's mother, Sila, had a unique skill - she successfully hunted Impalas in the rocky hills. While raising three cubs of her own in 2020, Sila accepted into the



family her younger brother, after his mother Selenkei had raised him to independence. Siankiki (F100) developed interesting strategy for raising her litter – she spent the day in an open area, often near a village, and then hunted in the forest, in the hills, and stayed there for one or two days after feeding. This secretive forest lifestyle most likely explains the fact that female began to be seen regularly only after the cubs grew up and became able to escape from the lions and hyenas. Since early 2024, we have been receiving reports from rangers that they have occasionally encountered a female with very shy cubs in the mountains

Pic. 60. Siankiki with three cubs



of Ol Chorro Conservancy, and it was not possible to approach them for a good photo, which would help us to identify the mother. In March 2024, both rangers and guides began encountering a female with 7–8-month-old cubs in the open areas. The rangers of the conservancies, who have been following the family since its appearance, named the female Siankiki (Young Lady Who Married Recently, in Maa), following the tradition of naming by the first letter of the mother's name (Sila). Now that the cubs have started their independent life, the rangers have given them names in the Maa language following the same tradition: the male was named Serian (Safety), and his sisters - Sainapei (Successful woman) and Silantoi (God's Gift). We hope that the skills learnt from their mother will help three young cheetahs settle in the Mara and continue the lineage of Amani and their distant ancestor in the 7th generation - Shakira.

### Three males in Ol Chorro Oiroua Conservancy.

September and October saw the arrival of five new shy males in the Mara – two in the southwestern part of the Mara (Mara Triangle) and three in the northern part of the Mara ecosystem (Ol Chorro Oiroua Conservancy). In the first half of October, three young males, approximately 2 years old, appeared in the dense forest on the hill slopes near the Rhino Sanctuary. Rangers discovered this coalition in the same area where they first found Siankiki with her three cubs in December 2023. By now, three shy males are gradually expanding into new territories and have already been spotted in the Enonkishu, Lemek and Mara North

Conservancies. Like the female and her cubs, these males demonstrate remarkable adaptations for thriving in dense forest. Although they roam in open areas, they prefer to rest and hunt in the hills, which reduces the risk of cheetahs being disturbed by predators and humans. In open areas, cheetahs are quickly spotted by rival predators.



Pic. 61. Three shy males in the forest



Pic. 62. Three shy males at Ol Chorro Oiroua Conservancy near the Rhino sanctuary

For example, hyenas can follow cheetahs for hours to take away their prey if they are hunting. This encourages the cheetahs to move to escape their pursuers. For now, these males remain shy, but over time they will get used to the presence of cars (as they have already gotten used to the rangers). Then they will feel more comfortable in open spaces and become more accessible for observation.

#### IV. CHEETAH ACOUSTIC COMMUNICATION STUDY

Studying acoustic communication in animals is crucial for understanding their behaviour, social structures, and the evolution of communication systems. Analysing animal vocalizations can reveal insights into their social interactions, emotional states, and even their awareness of environmental changes. Furthermore, this research is valuable for conservation efforts, as it can help monitor animal populations and assess the impact of human activities on their communication and behaviour.

Cheetahs are highly social species and have rich vocal repertoire. They use vocalizations in a range of social contexts such as defence of territories, intraspecific aggression, joint feeding, courtship and mating, and especially mother–cubs communications. Previously, cheetah vocal repertoire was only described in captivity. This is the first study of vocal repertoire of cheetahs in the wild.

**Table 4. Contexts of cheetah calls in the wild**

Call type	MALE	FEMALE	CUBS
<b>Chirp</b>	Looking for the lost coalition-mates Calling coalition-mate to follow/to a kill Searching for/following a female in courtship In fear of approaching male/males during territorial conflicts In fear of the approaching male who is willing to join a coalition Defending a kill from coalition-mates	Calling for the lost male during courtship In response to chirping close up cubs Calling lost cubs To cubs to follow/to stop following To cubs to approach the mother/food To cubs to start/stop playing Signalling the cubs to stay still In fear of the approaching male during courtship In fear of males approaching her small cubs In response to attacking male After losing cubs (inactive, not looking for them)	Fighting for nipples Calling mother when lost Calling lost /left behind/ went far littermates To the family to walk away/to follow To the family to go back to the cub that left behind When difficult to open a kill Fighting at a kill In fear of a male, following their mother, or vehicles at a close distance, or approaching kleptoparasites In fear of unrelated cub trying to play In fear of approaching male coalition In response to unrelated mother, who is calling for her lost cub Calling the mother surrounded by vehicles at a distance
<b>Meow</b>	Courting a female (alternates with chirrs) Calling for the lost/left behind coalition-mate (alternates with chirrs) Calling coalition-mates to follow	Calling cubs to follow from short distance (alternates with chirrs) Looking for the lost cubs (alternates with chirrs) Calling playing cubs at a short distance (alternates with chirrs)	Playing non-aggressively with littermates
<b>Chirr</b>	Looking for the lost coalition-mate (alternates with chirps) Looking for a female after sniffing her scent marks (alternates with chirps) Courting female (alternates with chirps) Approaching a male intruder (alternates with growling) Fearing approaching unrelated male Approaching a coalition trying to join it and response of the coalition (alternates with chirps) After mutual sniffing with a coalition-mate, who returned after mating (alternates with chirps)	Calling a cub to join others suckling Calling a lost/left behind cub (alternates with chirps and meow) Notifying cubs of her returning Calling close up cubs to follow Calling close up cubs to approach to her, to a kill (alternates with chirps and meow) Calming down cubs, who are noisy playing, fighting or chirping in fear Signalling cubs to start playing Signalling cubs to stop following (they sit calm or walk away and hide) To cubs disturbing her by playing on her Fearing a male coalition approaching her cubs	Calling for the lost littermates (alternates with chirps) Playing with mother/littermates Quarrelling at a kill Calling for family being lost (alternates with chirps) Fearing a male/coalition approaching a cub/mother Dominant mounting a littermate, the mounted is growling After a mother bit (competition at a kill) calling a littermate to approach



<b>Squeal</b>	Fighting/protecting a kill from coalition-mates In fear of approaching unrelated male/males Fighting with coalition-mates over a female during courtship Responding to a sudden attack of another predator (hyena) at a kill	In fear of approaching male /males cheetahs (i.e. courtship) In response to the male/males approaching her cubs Play/fight with the mother/littermates Fighting over a kill Responding to cubs disturbing her	Competing for nipples Playing aggressively with the mother/littermates Quarrelling over a kill in fear of attacking unrelated cub
<b>Hoot</b>	Monopolizing and holding a part of a kill protecting from the group members or kleptoparasites (jackal); often followed by growl, squeal, fuff and howl)	Protecting a kill from cubs at the end of feeding	Protecting food from the mother and littermates
<b>Howl</b>	Defending territory from conspecifics Defending food from kleptoparasites (lion, hyena, leopard) Towards potential danger (walking humans, motorbikes) Attacking a female at the end of courtship after mating Following not receptive female (lonely female or mother with cubs) Self-defending from coalition-mates attacking him Towards approaching territory competitors (lion, hyena, warthog) Quarrelling with coalition-mates over a kill Quarrelling with coalition-mates over receptive female	In response to approaching courting male Mother warning the cubs looking at the predator passing by at a distance (lion, hyena, leopard)	Towards approaching male in self-defence Towards potential danger at a distance (lion, hyena) Warthog approaching cheetah kill, and towards jackal following walking cheetah family (accompanied by hiss and growl) Quarrelling with the mother over a kill
<b>Growl</b>	Courting the female, occurs in between and after mating (alternates with hiss) Courting a female in response to every movement of a female or to the cubs approaching the mother Towards potential danger: competitors (lion, hyena), approaching or visible at a distance humans (walking herder, tourist near vehicle etc.) In territorial conflicts towards alien intruder male (alternates with howl) Aggressive interactions within a coalition while competing for female during courtship, for a shade during rest, or for food Defending a kill from conspecifics: from coalition-mates (following fuff), from a mate partner (alternates with hiss, spit, squeal) or while eating close to each other, or one pulling with growl and another on holding with fuff Re-uniting with coalition-mates (alternates with chirps) Displaying dominance towards low-rank coalition-mate while walking, resting or feeding together, or approaching unrelated males	Towards approaching or visible at a distance humans (walking herder, tourist near vehicle etc.) and livestock Towards approaching an unrelated conspecifics and grown-up cub male Towards approaching/ following courting male and while rolling over before/after mating Towards approaching kleptoparasites (hyena, baboon, lion) Sick in pain Resting and disturbed by playing cubs Towards the cubs trying to suckle (when does not have milk)	In fear of potential danger (elephants, hyena, baboons, lion, vultures, zebras, jackals) Towards distant human activities (moving motorbike, tourist car, people walking near the car, herder walking with livestock) Defending food from littermates, or being worrying during the eating by vultures, zebras, elephants, jackals
<b>Purr</b>	Decreasing aggression of coalition-mates in order to get an access to a kill; to re-join a coalition after absence for days; to join a new coalition or defend themselves from approaching intruder who it trying to join them Displaying affiliative behavior within coalition: greeting lost coalition member after calling and looking for him; approaching a leader and initiating grooming or purring ad walking away Grooming coalition-mates	Decreasing aggression in mating partners in order to get an access to their kill Displaying affiliative behaviour: grooming with cubs, play Reducing stress and providing comfortable state to hungry/scared cubs by nursing them	Decreasing aggression in the mother: preventing her attack, getting an access to the food, nipples Displaying affiliative behaviour: greeting and social grooming with mother and littermates, playing with mother and littermates

<b>Hiss</b>	To a female, often right after mating with her (alternates with growling), and towards coalition-mate during courtship (alternates with spits) Intraspecific conflicts: towards intruder (alternates with spit) and in response to the attacker Defending a kill from kleptoparasites (lion, hyena, baboon, jackal etc.) or unrelated conspecifics (alternates with spit, growl and squeal) Towards unreceptive female with cubs To the water before crossing the river	Towards courting male (alternates with growling) To the water before crossing the river To suspicious sounds/ unknown objects at close distance in dense vegetation Towards a male approaching her cubs Defending a kill from approaching hyena	Towards approaching predator (hyena) At a kill to unrelated cub To littermates, suspicious objects while playing and to a kill while exploring it
<b>Spit</b>	Intraspecific territorial conflicts Protecting a kill from kleptoparasites (hyena, lion, baboons etc.) and conspecifics (alternates with growling, hissing and squeal) Within coalitions over a kill and females Towards potential danger (i.e. approaching baboons, warthogs etc.)	Towards courting male Protecting cubs from conspecifics (males) Active playing with cubs Protecting a kill from kleptoparasites (hyena, jackal, vultures etc.)	At a kill towards approaching kleptoparasites (jackal, hyena, unidentified object, ect.) Playing with littermates, or with objects (towards taft of grass, elephant dung etc.) Towards potential danger (i.e. approaching warthog, cheetah male etc.), suspicious objects (i.e. water puddle, etc.)
<b>Fuff</b>	Protecting a kill from approaching coalition-mate; in response to a male, pulling a kill with growling (often follows by squeal, growl, howl)	Protecting a kill from cubs at the end of feeding (often follows by biting a cub)	Protecting a kill from littermates and mother
<b>Grit</b>	Continuous failing hunting for days Looking for the lot coalition-mate (alternates with chirps and chirrs) Limping and unable to follow coalition-mate Courting males after a fight over a female	Watching potential danger to her cubs at far distance (lions, hyenas etc.) After losing a kill to kleptoparasites (hyena, lion) Continuous failing hunting for days Injured, weak and hungry, failed hunting Watching her grown-up cubs leaving to remote distance, refusing to follow calling mother With/without cubs disturbed by tourists (close and noisy, cars followed at a close distance) Unreceptive female surrounded/trapped by a male coalition Looking for the lost cub (alternates with chirps)	Trying to remove something stuck in the mouth Badly limping after unsuccessful hunt

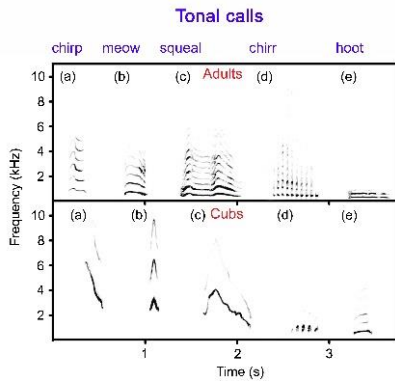
Wild-living cheetahs vocalize in mother-young groups, in male coalitions, during courtship behaviour and during aggressive interactions with conspecifics and other animals, including kleptoparasites.

The structure and behavioural context of 12 call types: 7 tonal (chirp, meow, squeal, chirr, hoot, howl and growl) and 5 non-tonal (purr, hiss, spit, fuff and grit) were investigated in adults older 4 years and cubs under 6 months of age. We discovered a new call type – grit, and discuss its parameters and context in details. In adults, all the 12 call types were present; in cubs, grit was not found. For classifying calls of adult and cub cheetahs, we used acoustic parameters: call duration, peak frequency and fundamental frequency, and also binary acoustic parameters with only two possible values (present/absent) of the fundamental frequency or rhythmic pulsation in the calls.

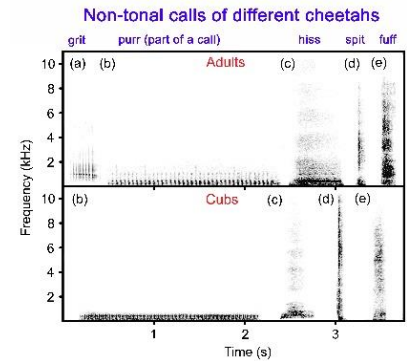
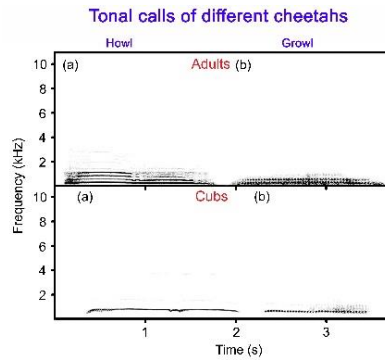
Along ontogeny from cubs to adults the fundamental and peak frequencies of 7 tonal call types decreased, duration of 7 tonal and 3 non-tonal call types either did not change or increased. Pulse rate of chirrs, growls and purrs did not change with age. Structure of calls in adult cheetahs slightly differed between males and females. Only in 3 high-frequency tonal call types (chirp, meow and squeal), fundamental and peak frequencies of males were lower than in females. Call duration did not differ between sexes in all call types. A distinctive trait of cheetah vocalizations in comparison with other species of felids is an unusually high fundamental frequency of some tonal call types in both



cubs and adults. Along ontogeny from birth to 4 years of age, chirps are becoming gradually lower-frequency and reach their low-frequency plateau at 4 years of age. Results from our study revealed that long-distance chirps of wild mature cheetahs encode sex, age and individuality, and can be used by conservationists as a non-invasive tool for estimating cheetah age in the wild, particularly at ages younger than 4 years.

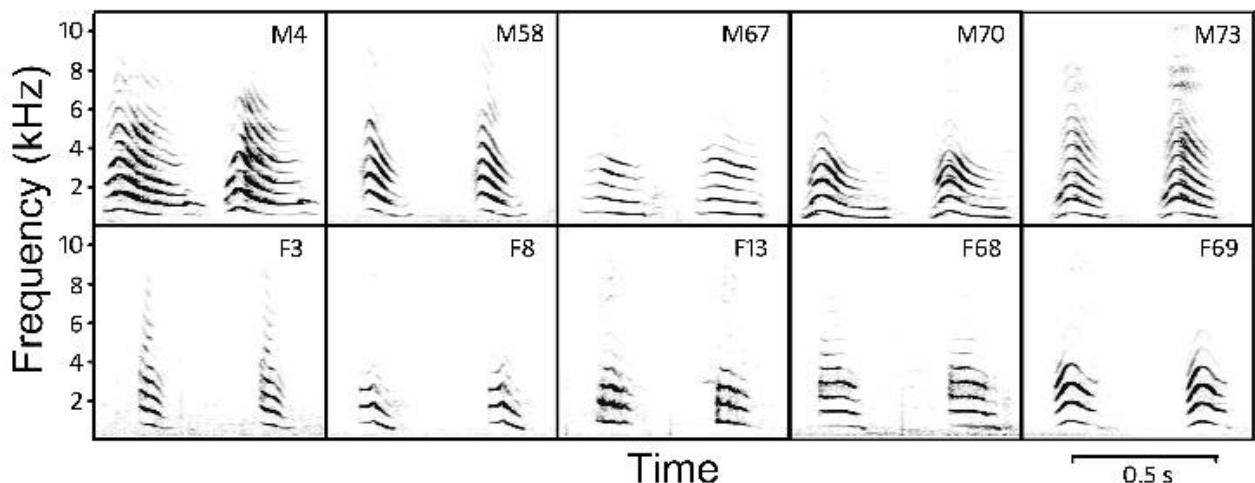


Pic. 63-64. Spectrograms of tonal calls



Pic. 65. Spectrograms of non-tonal calls

### Individual and sex-related differences of mature cheetah chirps



Pic. 66. Spectrograms of chirp calls of different adult cheetah Males (top row) and Females (bottom row)

### Implications for Conservation:

- Use **chirps** measurements as a non-invasive method for estimating cheetah age in the wild, particularly at ages younger than 4 years
- Use **gritting** to detect discomfort in cheetah. Importance of keeping quiet (engine and radio off) in presence of cheetahs

## V. BELLY SIZE

The size of the belly can be used as a reliable indicator of the physical condition and physiological status of the cheetah. For example, it helps to indicate sickness and inability to hunt and help to differentiate the full cheetah from the pregnant one, and even to identify the stage of pregnancy.

Initially normal belly size depends on different factors:

- ✓ Physical constitution of cheetahs – some cheetahs are initially slim while others are heavily built.
- ✓ Sex – males, especially in coalitions, generally are heavier and bigger than solitary males and females. However, some females inherit a strong build from their mothers.
- ✓ Environmental factors, including climate – in cold climate fur on the abdominal side of the body is usually thicker and fluffier, that makes belly look bigger; abundance and availability of prey, and therefore chances to hunt regularly.

We use the following 13 sizes. The scale is approximate, where:

- 8** – is a healthy cheetah in normal physical condition,
- 7** – is skinny cheetah who has been starving for over a week, and
- 13** – is a cheetah with heavy hanging belly that looks like the cheetah has a ball inside.

**9** – belly slightly bigger, usually after small kill (hare, small fawn)

**10** – bigger belly (after eating big fawn, next day after having the belly 14 or 13)

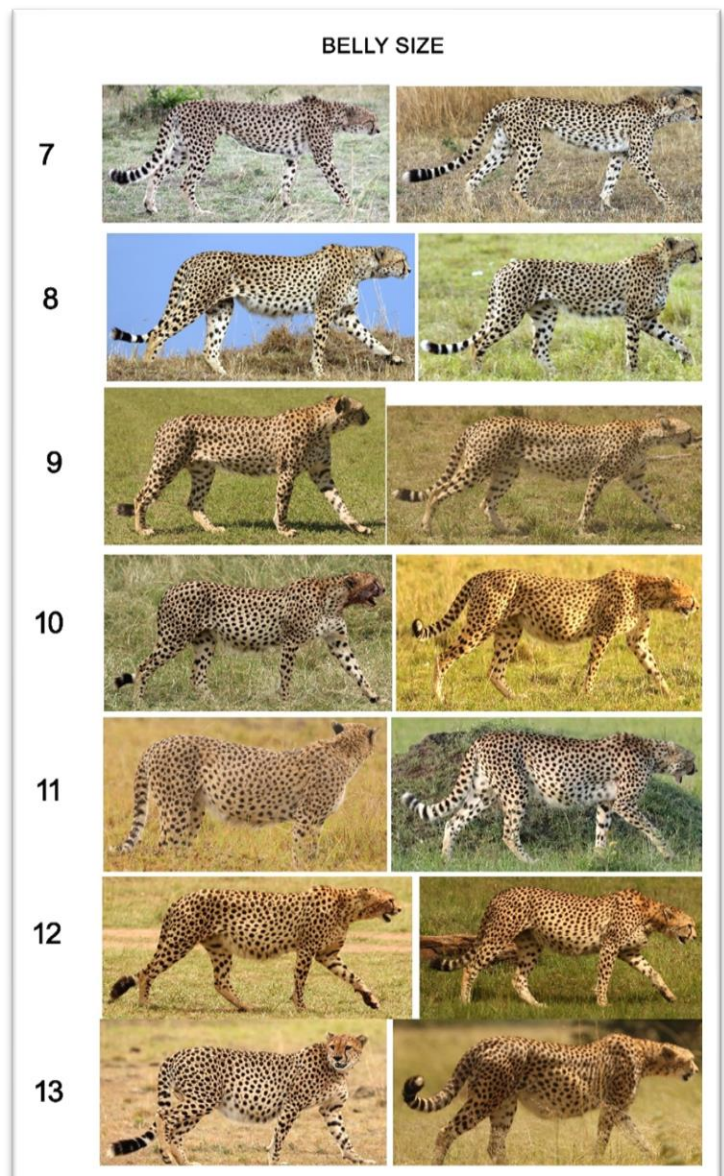
**12-13** – after eating large prey (Wildebeest, Topi, sub-adult Elands or Zebra etc.)

Some cheetahs of both sexes are slim while some are bulky and therefore even after several days of starving visually have a belly size 8 or 9. This scale is relevant to cheetahs of the Mara ecosystem, where cheetahs get access to rich variety of prey.

**Pregnant cheetah.** There are two ways to identify a pregnant cheetah:

- 1) Female remains with the same big size of the body for 3 and more days
- 2) Female with big belly is hunting (Pic. 68)

Pic.68. Pregnant cheetah is hunting



Pc.67. Different categories of the belly size





## VI. HEALTH MONITORING

Following one of the Project objectives (i.e. *Identification of major threats to the cheetah population including health problems*) the research team performs cheetah health monitoring by direct observations and collecting photographic materials from the rangers and guides. In case of any health issues observed, we report to Reserve/conservancies authorities and the KWS Mara Mobile Veterinary Unit and assist them in locating these individuals for treatment.

**6.1. Sarcoptic mange.** Sarcoptic mange is a highly contagious mite infection caused by *Sarcoptes scabiei* burrowing under the skin of domestic and wild mammals. It has been reported from 10 orders, 27 families and 104 species of domestic, free-ranging and wild mammals, including cheetahs. Cheetahs acquire it via direct contact with infected prey species or conspecifics. Study in the Mara (Gakuya *et al* 2012) has shown that cheetah infection with *S. scabiei* was associated with the climatic conditions (dry more than wet season) and the prevalence of infected Thomson's gazelles. Once the number of healthy gazelles increased, number of infected cheetahs decreased.



Pic.69.MMCP donated med equipment to the KWS Mara Mobile Vet Unit

Clinical symptoms of mange depend on the immune status of the respective host. The initial stages of scabies can be identified by the appearance and behavior of the animal. The first signs appear on the muzzle in the form of gray areas under the eyes and on the bridge of the nose. At this time, lesions of the skin on the limbs are not yet visible, but the animal often and for a long time licks the same part of the body (usually the front leg or stomach), quenching the itching. Soon, scabies affects the auricles, and their edges become uneven and hard, sometimes with blood clots. At the latest stage, the skin becomes extensively thickened, greyish in colour, there is a marked eosinophilia throughout the epidermis and dermis (the skin becomes red in colour), and often almost complete alopecia. The skin cracks, dries and exfoliates exposing the unprotected tissues. Treatment of infected individuals in the field has been successful, although cases of self-recovery of cheetahs without intervention were observed in the Mara.

From 2012 to 2024, **52 (26.24.2)** cheetahs were spotted with different stages of mange, of which 9 (4.3.2) were treated by the Veterinary Units, and 5 (1.4) recovered on their own. We documented two sources of mange in cheetahs: prey (feeding on infected Thompson's gazelle) and another cheetah (contact with infected individual during courtship). In general, cheetahs with mange majorly come from Tanzania.

In **2012**, 22 (10.10.2) cheetahs (**29%**) were spotted with different stages of mange, of which 8 (3.3.2) were treated by the Veterinary Units, and 3 (1.2) recovered on their own.

In **2014-2015** there were 10(3.6) adult cheetahs spotted with mange, or **13%** of the Mara cheetah population;

In **2016**, 5(3.2), which was **8.5%**;

In **2017**, 4 (2.2) with mange, i.e. **5.4%**;

In **2018**, 2(1.1) – **3.5%**, both spent most time in Serengeti;

In **2019** – 5(3.2) or **7%** adult cheetahs, out of which 2 males spent most time in Serengeti. In 2019, two young cheetahs (1.1) have been treated by the KWS Vet Unit and one female (F61), recovered on her own;

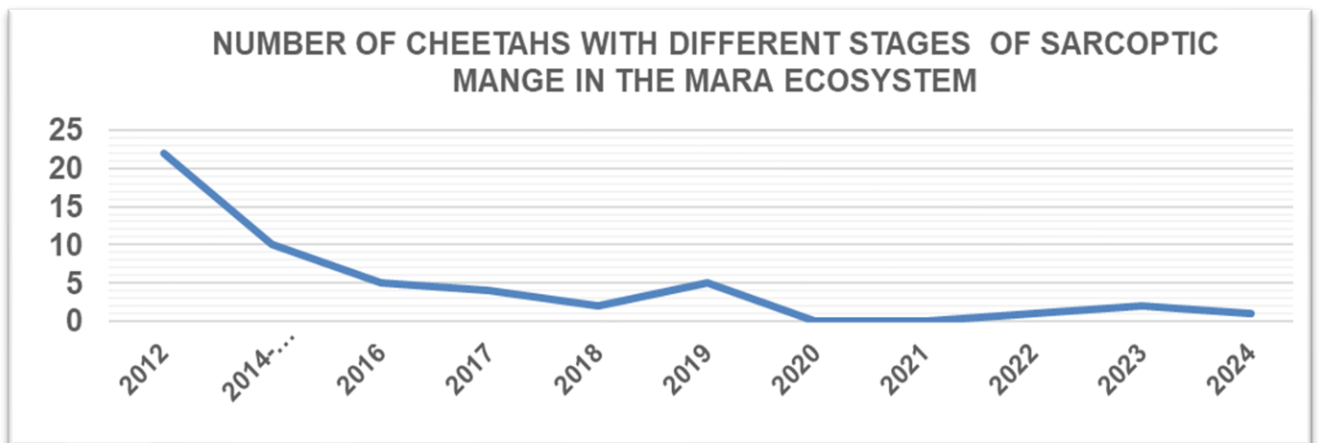
In **2020** and **2021**, no cheetahs were spotted with mange;

In **2022**, 1 (1.0), M85 came from Tanzania with mange of 5 stage;

In **2023**, 2(1.1) or 3,4% - both recovered by themselves;

In **2024**, 1(1.0) or 2% of the Mara population, was spotted with 2<sup>nd</sup> stage of mange.





*Pic.70. Dynamics of appearance of cheetahs with mange in the Mara from 2012 to 2024*

The only cheetah that was seen with mange in the Mara, was Noma (M120), who arrived from Tanzania in the beginning of July 2024 with signs of mange: bold front right limb elbow and poor quality of fur on the face (Pic.71-74).



*Pic. 71-74. Noma (M120) with the signs of mange (right front limb elbow)*



## 6.2. Intraspecific competition – territorial fight

While travelling, single males get opportunity to meet and mate with females, and some of them succeed, like Olchorre, who managed to mate with three different females (F74, F68 and F80). In the MMNR and in the conservancies. However, if intruder encounters any coalition and does not escape the fight, he might be injured. In case of the Tano Bora five males, we witnessed more than 9 encounters of them with other coalitions and single males, and apart from one case when 4 males fought with their ex-coalition-mate and ex-leader Olpadan (M58), no male was ever injured.

Single male Mpaka (F126) arrived from Serengeti to the Mara Triangle in July 2022, and within a year established in the Triangle. In a year, new coalition of 3 healthy males – Siligi's Sons arrived from Serengeti, that forced a solitary male to look for other safe areas. In the beginning of 2024, he crossed the Mara River from the Triangle to the MMNR, and on 26 January 2024, collided with two remaining males of the Tano Bora coalition Winda (M71) and Olonyok (M73) (Pic.75). The fight was not long, Tano Bora males left Mpaka without any injury (Pic.76). Only one male got an injury – Olonyok. The injury of his left ear did not look serious, but close monitoring revealed the inflammation of the head below the ear, exudate secretion (Pic.77) and visible changes in behavior. Olonyok was walking with his head tilted to the left and down, was less active than Winda, and displayed general discomfort and weakness. We reported to the KWS and MMNR authorities, and decision was made to assist Olonyok. On 10<sup>th</sup> February Dr. A. Takita (Triangle Veterinarian) carried out successful immobilization and treatment of the male (Pic.78-79). Olonyok was additionally treated remotely on 24<sup>th</sup> March by darting antibiotics and anti-inflammatory medicine, and completely recovered.



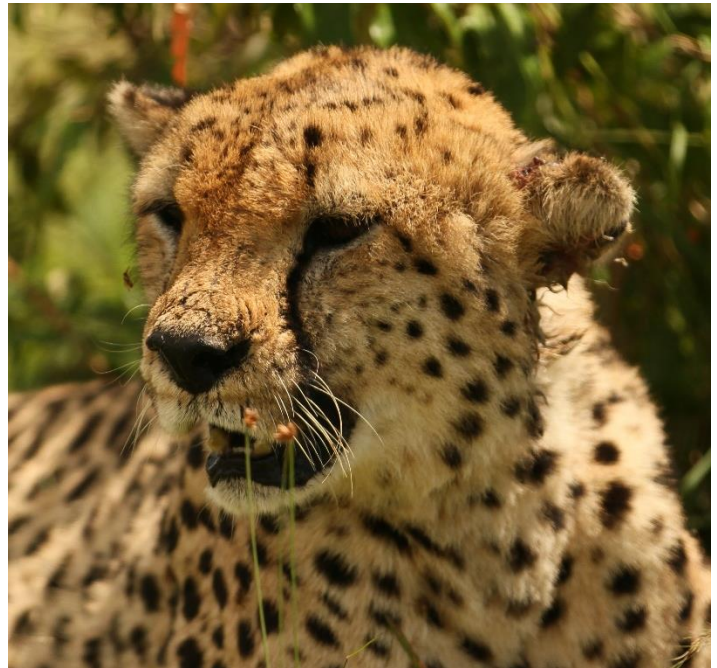
Pic. 75. Winda and Olonyok surrounded Mpaka.



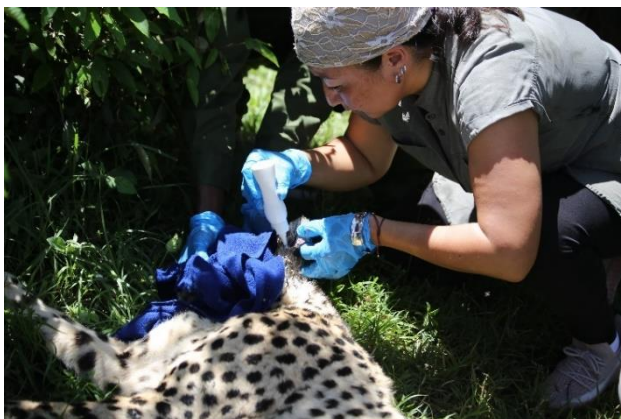
Pic.76. Mpaka after fight



Pic. 77. Olonyok with an injured ear



Pic.78. Darting Olonyok



Pic.79. Dr. A. Takita is treating the ear of M73.

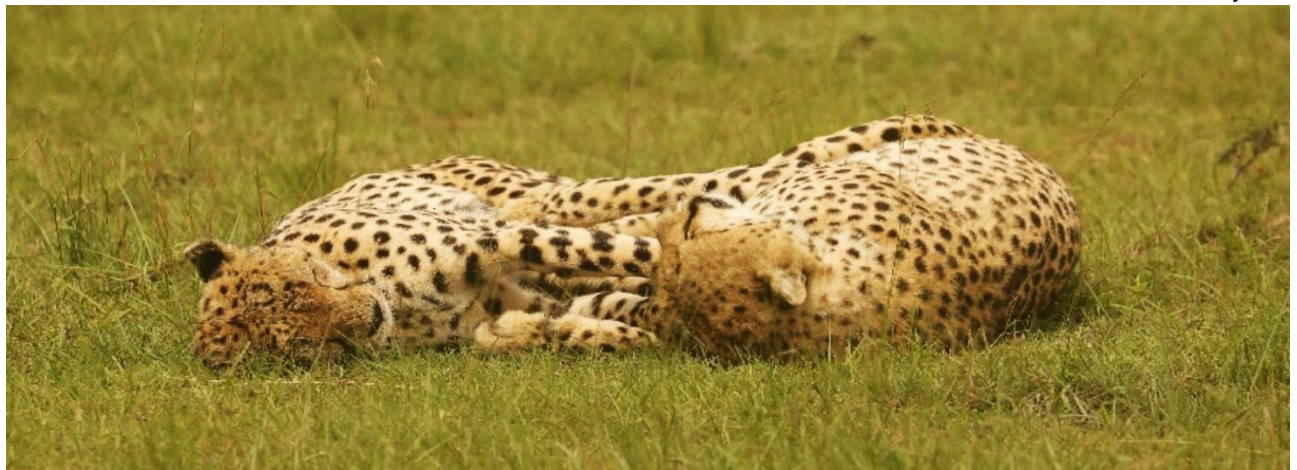
Pic.80. Dr. Chelysheva is explaining to the Chief Park Warden Mr. Minis the signs of genetic uniformity in cheetahs - hooked tail tip, common in Namibian and South African cheetah subspecies – *Acinonyx jubatus jubatus*. \ Tails of East African cheetahs are straight







*Pic.81. Olonyok and Winda eating after treatment of Olonyok*



*Pic.82. Winda and Olonyok reunited after treatment of Olonyok*

**Oloti (M114)** was limping from February 2023, but completely recovered by the beginning of March 24 and successfully hunted adult Thomson's gazelles and sub-adult warthogs (Pic.81-82).



*Pic.83. Oloti recovered*



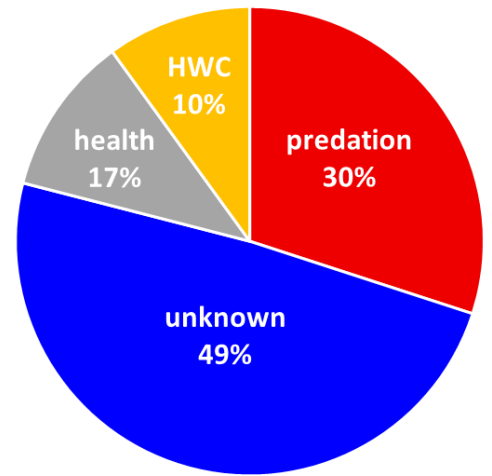
*Pic.84. Oloti successfully hunted sub-adult warthog*



### 6.3. Causes of death

From 2011 through 2024, 50 (27.22.1) adult cheetahs died, out of them, 5 (3.2) confirmed to die in HWC (Pic. 85).

**6.3.1. Case of Kisaru and Lekisaru' rescue.** During heavy rains, on 2<sup>nd</sup> December 2023, Kisaru came from Olare-Motorogi Conservancy with her remaining male cub. Flooded rivers restricted her movement back to the conservancy, and the family resigned at the Double Cross area for a month. That area is known for a lion pride, but Kisaru successfully managed hunting and resting in the area, although she came across lions several times. MCU and our teams were assisting Kisaru making sure she was not disturbed during the rest and hunts. On 20<sup>th</sup> January 2024, she hunted and ate with her son, a sub-adult Thomson gazelle and was left by the monitoring teams sleeping in between rivers at the Double Cross with her cub. At 7:00 next morning, she was found by tour guides dead. Her carcass was carried by a hyena, (Pic.86, 87) and scared cub was hiding in the bushes nearby.



Pic. 85. Causes of death



Pic.86. Hyena with Kisaru's body (by B.Freeman)



Pic.87. Kisaru's carcass (by Jaymowildlife)

The Kenya Wildlife Service (KWS) and the Narok County Government advised rescuing the cub. It was recommended to capture him and place him in an enclosure in the Mara Triangle to raise him and release back into the wild. All the necessary prerequisites were in place: the male was already hunting independently, was wary of people (important for preventing imprinting), the structured and secure enclosure was ready in a location away from tourist routes, and the Conservancy staff had the



necessary experience. The rescue operation was successfully completed by the dedicated team of MCU, Chief Park Wander Mr. S. Minis, rangers and the Veterinarian (Dr. A. Takita) of the Mara Triangle and our team.



Pic.88. Dr. A.Takita is ready to dart the cub, who has been hiding from hyenas up a tree

It is worth noting that the young male demonstrated excellent survival skills. In the morning on 22<sup>nd</sup> January, we found him perched high in a tree where he had spent the night, escaping from the hyenas that continued to circle the ground beneath him. (Pic.88). Rangers named him Lekisaru (*Son of Kisaru* in Maa). He was safely transported by helicopter to the Triangle, where dedicated and experienced team led by the Conservancy CEO Mr. Brian Heath took care of him. For a year, Lekisaru maintained avoidance behavior towards people and was observed by the rangers through CC-TV cameras installed around the perimeter of the enclosure.



Pic. 90. Rescue team, Dr.Takita and Chief Park Warden



Pic. 89. Kisaru's cub Lekisaru in the enclosure Mr.Minis taking Lekisaru to helicopter



Table 5. Causes of death in 2011-2024

Year	Total number (M/F)	ID	Details	Age (years)	Cause of death
2011	1 (1.0)	M2 Honey Boy	One male from a coalition of 3	5	Predation (lion)
2012	1 (0.1)	F9 Resy	Single female	13	Unknown
2013	3 (2.1)	M1 Honey Boy	One male from a coalition of 2	7	Predation (lion)
		M3 Honey Boy	Single male	7	Unknown
		F2 Hanna	Female with cubs	5	Predation (lion)
2014	7 (5.2)	M26, M27 Kisiri's Sons	Two males in a coalition of 2	3	Infectious disease
		M4 Oloololo Brother	One male from a coalition of 2	5	Infectious disease
		M14	One male from a coalition of 3	4	Unknown
		M34	One male from a coalition of 2	3	Predation
		F4 Sidai	Single female	10	Predation (leopard)
		F5 Saba	Single female	10	Unknown
2015	1 (0.1)	F16 Narasha	Single female	12	Predation (lion)
2016	1 (0.1)	F39 Nabiki	Single female	6	Unknown
2017	2 (1.1)	M38 Chiko	Single male	4	Predation (lion)
		F57 Malkia	Last trimester of pregnancy	3	HWC road accident
2018	7 (4.3)	M5 Martin (Oloololo Brother)	Single male	10	Predation
		M12,M13	Two males in a coalition of 2	8	Unknown
		M47	Single male	Appr.4	Predation (lion)
		F64 Naretoi	Single female	4	Disease
		F13 Malaika	Single female	10,3	Unknown
		F40 Kisiri	Single female	Appr.9	Unknown
2019	6 (4.2)	M16 Siriwua	Single male	11	Predation (lion)
		M91 Mwenzi	One male from a coalition of 2	Appr.5	Unknown
		M68, F79	Littermates	2	HWC in Tanzania
		F26 Rosa	Single female	9	Unknown
		Cub Male of F85	Adolescent with family	1	HWC road accident
2020	0	-	-	-	-
2021	8 (3.5)	M63 Lemara	One male from a coalition of 2	6	Unknown
		M66 Mkali	One male from a coalition of 2	Appr.4	Unknown
		M88 Olaretoni	One male from a coalition of 2	Appr.5	Unknown
		F3 Amani	Single female	12	Unknown
		F7 Miale	Single female	13	Unknown
		F8 Rani	Single female	13	Unknown
		F56 Kiraposhe	Female with 3 cubs	Appr.9	Predation (lion)
		F89 Namelok	Single female	2	Predation (lion)
2022	4 (3.1)	M58 Olpadan	Single male	7,5	Predation (lion)
		M72 Olarishani	One male from a coalition of 4	7,5	Predation (lion)
		M70 Leboo	One male from a coalition of 4	7,5	HWC (speared)
		F78 Entito	Female with 2 cubs	6	Unknown
2023	6 (3.2.1)	M84 Mbili	One male of a coalition of 2	8	Unknown
		M134	One male from a coalition of 2	Appr.2,5	Unknown
		M146	One male from a coalition of 2	1y4m	Unknown
		F67 Selenkei	Female with sub-adult cub	8	Unknown
		F76 Kuahidi	Single female	7	Unknown
		Unk sex adult	Carcass, eaten hindquarters	Over 3	Unknown
2024	3 (1.2)	M109	One male from a coalition of 2	5,5	Unknown
		F50	Single female	12	Unknown
		F74	Female with a cub	8	Predation (lion)
TOTAL	50 (27.22.1)				

## VII. WORKING WITH LOCAL AND INTERNATIONAL STAKEHOLDERS

**7.1. Workshops for the rangers and tour guides in the Mara.** The project research team works closely with the teams of rangers of the MMNR and conservancies, providing monitoring equipment: binoculars and rugged NIKON digital ranged photo cameras with built-in GPS and conducts conservation workshops for them at the ranger stations and tourist facilities. Photos taken by the rangers with the photo cameras help in following cheetah movements in the Mara ecosystem.

In 2024, MMCP team conducted 4 workshops for Mara Cheetah Unit (MCU) in MMNR and in conservancies. At the workshop, participants receive updated information about cheetah ecology and behavior, based on new data obtained by our research, as well as training in cheetah identification methodology.



*Pic.91. MMCP team training MCU team*



*Pic. 92 Mara Cheetah Unit Team*



*Pic.93-94. Training conservancies' rangers*

## 7.2. Community education program. Nexus Dicey Game

The future of nature, the future of the cheetah is in the hands of the young generation and children. Preserving animals in their natural habitat is an important and responsible task, and one of its parts is environmental education. For a number of years, our Project team has been conducting educational lessons in schools. The program began with the production and publication of the coloring book “Let’s Go Wild” together with The Laikipian – Art For Conservation team (<https://thelaikipian.co.ke/>). Our new joint project was the development and presentation of the game Nexus Dicey. Nexus Dicey is a fun-filled game that’s all about climate change and environmental awareness. In a world faced with an existential threat of extinction from climate change and environmental damage, players take the role of green warriors and experience the real-world effects of climate change. They get the opportunity to undertake activities that contribute to the health of the planet in a fun-filled way.

In July 2024, we hosted the main members of the team – James Ndungu, the team lead and Martin Ngugi – illustrator, a wonderful artist and an inspiration to everyone who meets him (Pic.96). Together we proudly introduced the game to several Mara schools. In some schools, we were all very pleased to see the very first “Let’s Go Wild” books that we donated 9 years ago. (Pic.95). Not only are they perfectly preserved, but they are still actively used! We presented the game as a floor



version and at the same time offered children to play the tabletop version. Both children and teachers played with pleasure, animatedly discussing victories and failures. After all, according to the rules of the game, if a player landed on a square where he/she "threw garbage into the river or cut down a tree", he/she returned several points back, and if "planted a tree", moved forward several points.

During the game, children and adults learn how important it is to preserve nature, what is good and what is wrong, and how everything in nature is interconnected. If the player landed on a square with an animal, the presenter would talk about it, using information from the booklet. Children are always open to new knowledge, which they absorb perfectly in the process of interactive learning. Safari trips to the park are also part of such learning. Some kids showed us their wonderful artworks with cheetahs, inspired by a visit to the reserve, when they were lucky enough to observe the Tano Bora cheetah male coalition. In the coming year, we plan to continue donating the Nexus Dicey game to pupils in more schools. We are also working on a new ambitious educational project, which we will be happy to present in the near future.



Pic.95 The Laikipian' team led by James Ndungu and MMCP team introduce the Game to the Mara school (left)

Pic. 96. Great artist Martin Ngugi (right top)



Pic. 97. Human version of the Nexus Dicey Game – kids enjoy playing

Pic. 98. Desk version of the Game donated to schools





Pic. 99,100 Young artists inspired by the safari in the MMNR



Pic. 101. Nexus Dicey Game donated to the Mara schools



### 7.3. 14th Carnivore Conference

On 24 and 25 October 2024, Kenya Wildlife Service (KWS) held its 14th Carnivore Conference, bringing together stakeholders from all over the country to discuss “CARNIVORE CONSERVATION IN CHANGING LANDSCAPES”. The conference was attended by representatives of the KWS, WRTI, Counties, Projects, conservancies, WWF, Nature Kenya, Kenya Wildlife Association and many others. This conference is an excellent platform for exchanging experiences, proposing practical solutions and creating a wide-ranging productive network for information exchange and mutual assistance in various fields of nature conservation. This conference became the 10th in which our project takes part since its foundation in 2011. Dr. Elena, Director of the Mara-Meru Cheetah Project, gave a presentation in which she discussed the problems faced by cheetahs in Maasai Mara, their adaptations in rapidly changing landscapes, and the project's activities that help solve problems. We shared with our colleagues various aspects and results of our work - scientific (Mara cheetah population trend over 13 years; cheetah behavioral adaptations under anthropogenic influence; communication of cheetahs; genetic diversity in the Mara cheetah population, etc.); monitoring the health of cheetahs and assistance to the KWS veterinarians; conservation activities (assistance rangers in anti-harassment activities, conducting workshops for rangers and guides, deepening their knowledge about animals for more effective protection), work with local communities (nature conservation lessons at schools, donations of environmental education books and board games created in collaboration with “The Laikipian – Art for Conservation”). Our efforts are aimed at preserving this unique predator and increasing awareness for future generations!

*Pic. 102. Dr. Chelysheva resenting the MMCP findings at the KWS Conference*

*Pic. 103. KWS Carnivore Conference provides opportunity to the researchers to share findings and experience with colleagues and conservation stakeholders*



**7.4. The first Global Cheetah Summit**, which took place in Addis Ababa, Ethiopia, from 28th to 31st January 2024. This event marked a significant step forward in cheetah conservation, gathering over 130 experts from various fields including science, conservation, academia, community leadership, government, and non-governmental organizations. Participants represented more than 80 institutions from across Africa, the Middle East, India, Europe, the United Kingdom, and the United States all committed to the course of conserving the cheetah (CCF 2024).

The summit, under the theme “Conservation Through Collaboration, A Call to Action” successfully culminated in the signing of the Addis Ababa Declaration for Global Cheetah Conservation. The Declaration, ratified by summit participants, emphasizes the urgent need for enhanced conservation efforts to protect the cheetah, which is at risk of extinction with fewer than 7,500 mature individuals remaining in the wild (CCF 2024).



Pic. 104. Global cheetah Summit 2024 (left)

## VIII. MMCP ACHIVEMENTS

- ✓ **Influenced Conservation strategies** including formulation of Cheetah Observation Rules.
- ✓ **Training and equipping** ranger teams of the MMNR and conservancies.
- ✓ **Successfully monitored**, in partnership with Narok County ranger teams (MCU), cheetahs with cubs: in 2025, F69 raised 4 cubs to independence first since 2020.
- ✓ **Community engagement and conservation education** within the ecosystem (recruitment, training and equipping of community scouts, conservation education programs etc.).
- ✓ **Real-time monitoring of cheetahs** within grazing areas to prevent HWC.
- ✓ **Health monitoring and Veterinary collaboration** – identifying cheetahs that need treatment and monitoring recovering individuals – saved over 20 cheetahs.
- ✓ **Conducted first cheetah acoustic communication study in the wild.**
- ✓ **Participation in cheetah genetic study in Kenya**; revealing kinship and parentship of the families through generations.
- ✓ **Conducted first leopard study in the Mara ecosystem** using camera traps and published results, **created first Leopard Database** of the Mara ecosystem.
- ✓ **Created Mara Cheetah Database** of the Mara ecosystem (2001-to date).



## IX. OUR RECOMMENDATIONS:

- ❖ Strengthened protection and connectivity of cheetah habitats through securing wildlife corridors, promoting ecofriendly land use, and minimizing land fragmentation.
- ❖ Integrate cheetah monitoring data into national wildlife management systems to guide adaptive policy and conservation planning.
- ❖ Increase funding and logistical support for community-based scouts and conservation programs to enhance ground surveillance and response.
- ❖ Promote coexistence initiatives, including community education, compensation schemes, and predator-friendly livestock management.
- ❖ Regulate tourism and vehicle pressure around cheetahs to reduce behavioral disturbance, especially for females with cubs.
- ❖ Enhance cross-border collaboration between Kenya and Tanzania for coordinated monitoring of trans-boundary movements of cheetahs.
- ❖ Support continued research and veterinary intervention programs to address emerging cheetah health, genetic, and ecological challenges.

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