



# Mara Meru Cheetah Project

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## INTRODUCTION

The cheetah *Acinonyx jubatus* once widely distributed across Africa, is now found only in 9% of its historical range. Since the beginning of 20<sup>th</sup> century cheetah population in the wild reduced dramatically from over 100,000 to around 7,000 individuals, and it is rapidly declining due to loss of habitat loss and fragmentation, human encroachment, and reduction in prey base, illegal trade, conflicts with other predators and people (retaliatory killing), poaching, diseases, disturbance, and accidental death on roads and in snares, and tourism-related issues. (Woodroffe, 2000, Durant et al. 2017). Cheetah considered “Vulnerable” by the IUCN and is listed in CITES Appendix I (Nowell & Jackson 1996). Rapid contraction in range supports the reassessment of this species and listing it as “Endangered” by the International Union for the Conservation of Nature (IUCN) Red List (Durant 2022).

Current genetic study revealed that East African cheetahs (*Acinonyx jubatus raineyi*) are genetically distinct from Southern African individuals (*A. j. jubatus*), warranting their recognition as a distinct subspecies (Prost et al. 2022). In East Africa, remaining wild population strongholds occur in Tanzania and Kenya, wherein Maasai Mara Ecosystem holds one of the most viable cheetah populations in the country, with connectivity with Tanzania's population. In Kenya, the cheetah is listed as an Endangered species under the Wildlife and Conservation Management Act, 2013. Since 2018, more conservancies have been formed in the Mara Ecosystem around the MMNR, offering more secure habitats for predators including cheetahs.

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.

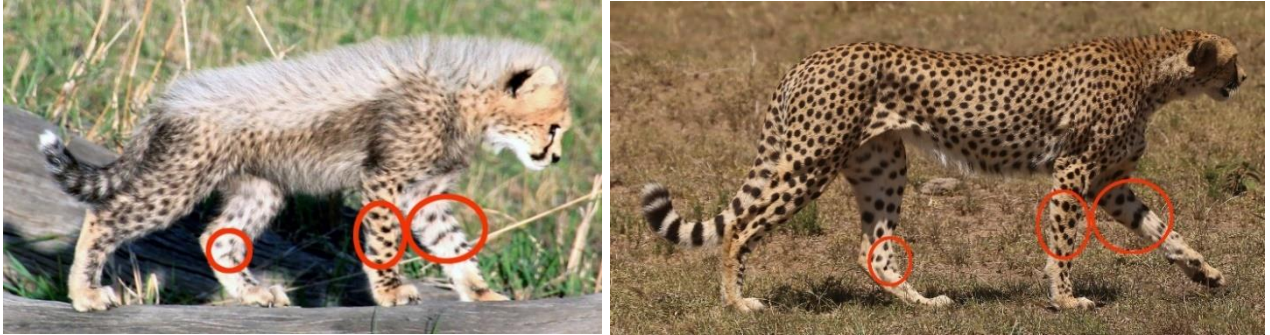
In 2022, our two research teams spent 186 days (1,692 hours) and 143 days (1,117 hours) in the field and covered 10,912 km and 7,438 km respectively. Field work included quantitative (scouting for cheetahs) and qualitative data collection (cheetah behavior observations). We collected behavioral data on 47 adult cheetahs (23 males and 24 females with and without cubs) in the Reserve and surrounding Conservancies. Below we provide data for 2022 on the Mara cheetah population trends, challenges and behavioral adaptations.

## I. CHEETAH POPULATION

**1.1. Individual identification as key to population monitoring.** Identification of individuals allows tracking long-term population trends, generating life-history data, such as habitat use, survival, reproductive success, recruitment, immigration and emigration. This information can then be used to improve of management strategies.

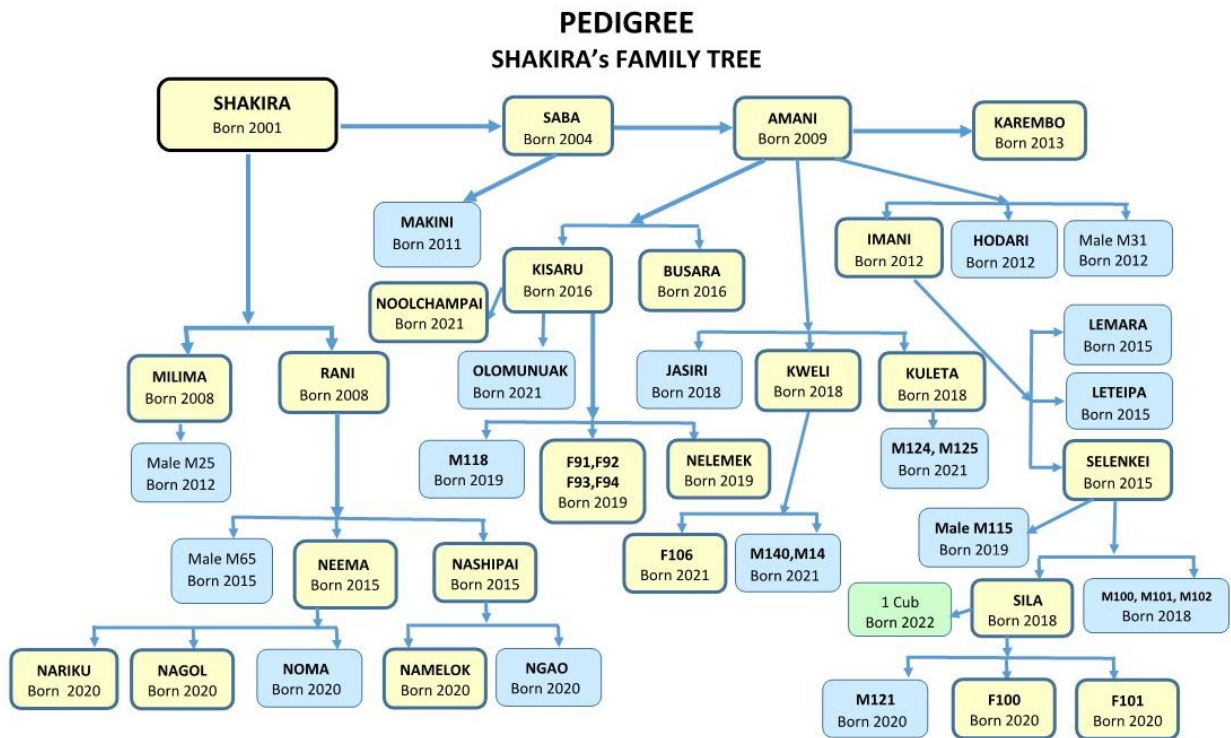
Mara cheetah database has been built on the basis of the original method of cheetah identification, developed by Dr. Elena Chelysheva in 2001 (*Chelysheva, 2004*). The method is based on the visual analysis of the unique spot patterns on front limbs (from toes to shoulder) and hind limbs (from toes to the hip), and spots and rings on the tail. It helps to identify individuals from the age of

one month (Pic.1,2). In the example below, spot patterns (circled in red) of 1 month old cheetah cub match with those of an adult cheetah, revealing their phenotypical identity. Correct identification of cheetahs from collected photos enables building the Mara cheetah Pedigree (Pic. 3), where the year of birth and kinship among cheetahs (parents/grandparents/ littermates) has been revealed. To date, MMCP team processed over 90,000 photographs with dates and time taken, provided by researchers, who had been working in the area in the early 2000-s, professional photographers, guides who have been taking photos since 2000-s to date, and photos taken by Dr. Elena Chelysheva, who was working in the Maasai Mara Cheetah Conservation Project with the Kenya Wildlife Service in the period between 2001-2002.



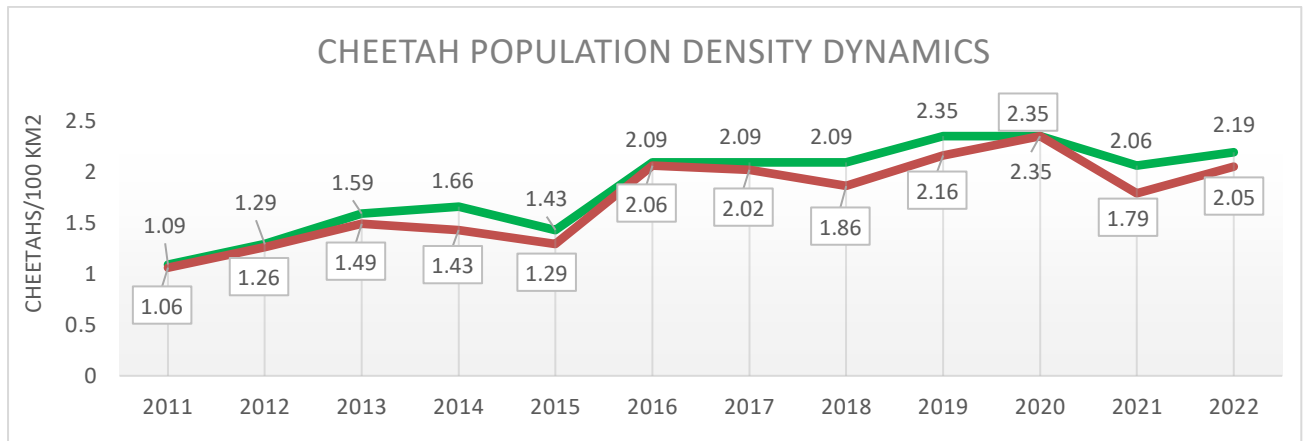
Pic.1-2. Original method developed by Dr. Elena Chelysheva enables to identify individual cheetahs from as early as from one month of age. Female Karemba at the age of 1,5 months (left) and two years (right)

From 2001-to date, 277 adult individuals identified, and some cheetahs we track in 6<sup>th</sup> generation (See Pic.6). To continue the bloodline, females have to produce and successfully raise females in each generation. One of the good examples was Shakira, whose descendants we observe now in the 6<sup>th</sup> generation. Below, there is an updated Shakira’s Family Tree (blue colour box – males, yellow – females, green – cubs).



Pic. 3 Example of Pedigree of Shakira

**1.2. Mara cheetah population trends.** Population monitoring is key to wildlife conservation and management. Our long-term Mara cheetah population monitoring revealed that Maasai Mara National Reserve (MMNR) provides important cheetah habitat in Africa. Using a search-encounter design with multi-session SCR models to collect spatially indexed photographs, we found out that cheetah density between 2005 and 2013–2016 in the Masai Mara National Reserve (MMNR), was ~1.2 cheetahs/100 km<sup>2</sup>. The density fluctuated annually (*Linden et al. 2020*) due to variable movement between the reserve, surrounding areas (e.g., Serengeti National Park, conservancies) and areas outside of protected territories. However, recording throughout a year adult individual who have been utilizing the Mara Ecosystem, which comprises of the Maasai Mara National Reserve (1,510 km<sup>2</sup>) and surrounding conservancies (1,500 km<sup>2</sup>), reveals fluctuation of the cheetah density through 12 years with stability in 2016-2017 and 2019 and 2020.



*Pic.4 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*

Increasing of cheetah density and numbers, was associated with the recruitment rate of adults exceeding the death rate, when:

- 1) New cubs were raised to independence and added to the database.
- 2) New adult cheetahs appeared in the Mara ecosystem.
- 3) Known individuals appear in the Mara after several years of absence.

Decreasing was associated with the death rate of adults exceeding the recruitment rate, when:

- 1) Cheetahs of the reproductive age, including those reached independence in the previous year temporary/permanent disappeared from the Mara (established their home ranges outside the Mara or died)
- 2) Adult cheetahs died to different causes (i.e. disease, interspecific competition, human-wildlife conflict etc.)
- 3) No new individuals from outside the Mara were spotted in the Mara ecosystem.

The reason for increased cheetah density and numbers in 2022 was due to the following factors:

- 5 mothers raised 12 cubs (7 males and 5 females) to independence, and we added them to the database.
- A male M85 born in 2016 in the Mara, reappeared after 4,5 years, which became the longest time of cheetah absence.
- 8 new cheetah males appeared in the Mara (including 4 single males in 4 different conservancies (M126 in the Mara Triangle, M127 in Olderkesi, M128 In Olarro and M132 in Enonkishu) and 2 coalitions of 2 males each (M130,M131 in the Mara Triangle and M133, M134 in the MMNR at Sand river area).

Out of 66 adult individuals observed in the Mara in 2022, 38 were males and 28 females. By the end of 2022, there were 6 coalitions of 2 males each.

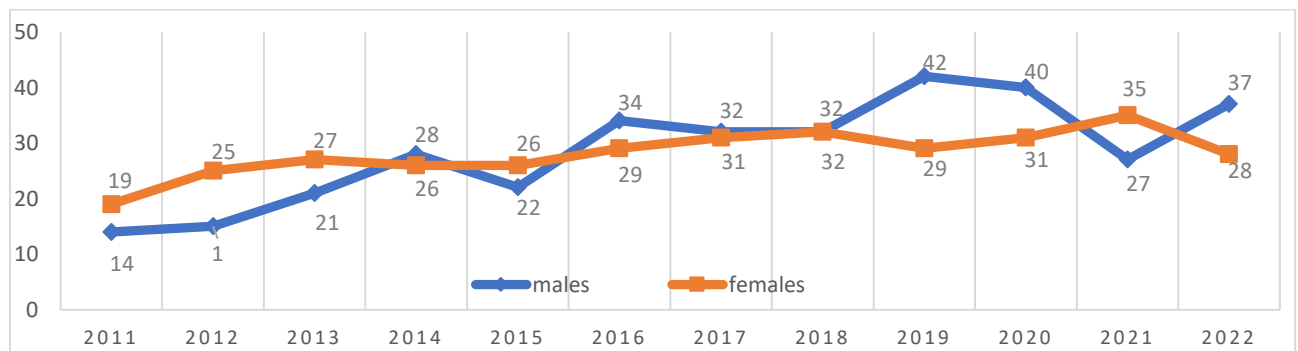
Number of males and females using the Mara ecosystem differed from year to year, with sex ratio deviation more towards females (41.6% out of 12 years). In 25% years, sex ratio was equal, and in 33.3% deviation was towards males (See Table 2).

Lower total number of observed cheetahs in the first two years of our research could be attributed to the limited time of field work (3-5 months per year) but with essential data collected by our field scouts. From 2013 to the present, our research teams have been working in the field throughout the year.

The proportion of females in the population appears to be more stable over the years, in contrast to the proportion of males, whose numbers fluctuated over 11 years of observation (Pic.5). This can be attributed to the shorter average lifespan of males compared to females (2,8 and 6,2 respectively) (Kelly et al 1998), and the intense movement of young individuals and coalitions, which, after reaching the age of independence, may go to the Serengeti or beyond conservation areas.

**Table 1. Sex ratio changes with years**

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)	1.3:1



*Pic. 5 Number of Males and Females observed in the Mara per year*

**1.3. Lifespan of cheetahs.** To date, maximum documented age was 11 years for males and 13 years for females. By the end of 2022, the **oldest females** were F42 (10 years 8 months) and F50 (10,5-years old). Two females were 8 years old (F59 and F63); four females (F67, F68, F69, F70) – 7 years old, four females – 6 years old; five females – 4 years old, one – 3 years old and six – 2 years old. The **oldest males** were solitary male M30 (10,5-years-old brother of F50), and 5 males of the Tano Bora coalition (8-years-old). In total, out of 38 males observed in 2022, six males were 8 years old, two males were 7 years old, three – 6 years old, two – 5 years old, six – 4 years old, one – 3 years old, three – 1 year old, while 14 males were two years old. 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 fund by giving birth from different males.

**1.4. Causes of death.** Since 2011 to 2022, 41 (23.18) adult cheetahs died of different, mostly unknown causes. 31.7% of cheetahs lost their lives to predators, mostly lions: out of 13 cases lions were responsible for killing cheetahs in 85% (n=11), and leopard in one case. No deaths have been recorded in 2020. In 2022, 4 cheetahs died/disappeared, out of which 3 males of the largest male coalition Tano Bora (M58, M70, M72) died in the Reserve: M58 and M72 were killed by lions and M70 was speared (Pic.70-74). One female (F78) disappeared in Naboisho conservancy, leaving 3 (1.2) cubs of 12 months. (See Table 2 for the details).

The major threat to the Mara cheetah population is interspecific competition with other large predators (lions and hyenas) for the resources and with other species for the space (e.g. baboons, warthogs). Such competition has both a direct and indirect impact on the survival of the cheetah. Direct impact includes but not limited to: losing food for kleptoparasites (lion, hyena, leopard, warthog etc.), predation of cubs (by lion, hyena, leopard, jackal, baboon etc.) and adults (by lion and leopard). Indirect impact includes, but not limited to the events, when lactating mothers, young, weakened or old cheetahs lose their kills to other animals.

**Table 2.** Death cases documented from 2011 to date

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	Heart failure
		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 (previously a member of a coalition of 2)	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	Possibly drowned
		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	Sub-adult cub male with the mother and littermates	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	Accident at hunt
		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
		F78 Entito	Female with 2 cubs	6	Unknown
<b>TOTAL</b>	<b>41 (23.18)</b>				

**1.5. 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. Before delivery, females are looking for secure place and if leave cubs for hunting, use different route on the way back. Cubs are mostly seen when mother takes them out of the den and they start following mothers at the age of 1,5-2 months.

Among other predators, cheetahs are the most vulnerable – majority of the cubs die due to predation by hyenas and lions within the first three months. A large number of cubs in a litter - up to 7, can be a compensation for the high cub mortality. To date, two females (F63 and F90) have been documented in the Mara with 7 cubs.



Pic.6 Neema's family

The first 1.5 months, when the litter is hiding in a "den" - in tall grass, in rocky, bushy areas or in ravines, the young can accidentally be found by various creatures inhabiting the area, especially when the mother goes hunting. In search of suitable prey, the female sometimes walks 5-6 kilometers and returns after feeding to maintain milk production. Our long-term observations revealed that ravines are the safest places for the dens. After the cubs are introduced to solid food, the mother must ensure that she hunts at a distance that either she can carry the carcass (usually of a small prey), or that her cubs can follow her to a hidden carcass. By following the mother, the cubs can encounter all the inhabitants of the area, including baboons and birds of prey.

To prevent disturbance by the tour vehicles, denning areas are usually closed by the rangers both in the conservancies and in the Reserve. 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 park authorities, and subsequently, rangers/wardens close the area with the road signs which we provide to them for this purpose. To date, we delivered to different ranger stations over 270 road signs: "AREA CLOSED", "TRACK CLOSED", "RANGERS ONLY" and "RESTRICTED AREA. DO NOT DRIVE BEYOND THIS POINT" (Pi.18). These road signs served in the MMNR for indicating close areas: temporary for recovering of the grass, for protecting areas where cheetahs keep small cubs, etc.

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. Here we use information documented by photo materials, provided by the rangers, guides and guests and by our own observations of females with the cubs following the mothers when they start exploring the Mara.

In 2022, 11 females gave birth to cubs in 12 litters, out of which in 10 litters of 34 cubs and 2 litters of unknown number of cubs – cubs were born in the conservancies, the dens were not visited to avoid disturbance. Four females gave birth in the MMNR and 7 females in different conservancies.

Out of 12 litters, 5 litters were born in the MMNR, and by mid-January 2023, no cub survived. Out of 34 cubs, 76.5% cubs died. The death rate in the Mara in 2022 was higher, than in Serengeti,



where it was reported 64% (Laurenson,1994). Survival rate varies through years depending on different factors, including but not limited to the mother's age and personal experience. The older females gain more experience, and by the age of 6, some females manage to raise their first litter.

By the end of 2022, only 5 females in the Mara were raising in total 9 cubs (F50 – one cub out of 3 cubs, F67 – one cub male out of 5 cubs, F95 – all 3 cubs out of 3, F80 – one cub male out of 2, and F84 – 3 out of 4 cubs). By the end of January 2023, F50 lost her last cub and F84 lost one cub female. All cubs that survived, were born and raised in different conservancies.

**Cheetah monitoring in the conservancies.** Cheetah is one of the iconic species in the Mara ecosystem and one of the major tourist attractions. Cheetahs perform successfully in presence of tourists: hunt, eat, raise cubs, mate etc. when tourists obey Rules and Regulations: keep appropriate distance and quiet. Disrespectful tourists' behavior directly impacts cheetah welfare (e.g. losing opportunity to hunt when cars surround the prey, move in between cheetah and its prey or behind it, limit the hunting space etc.), indirectly affects cheetah survival (tourists visiting cheetah dens in closed areas force mothers to move cubs more often and therefore expose them to different threats (e.g. predators) and directly affect cheetah cubs survival (e.g. cars off-road blocking the mother with cubs from the other predators, who slip between cars and attack/kill cheetah cubs).

In long-established conservancies, ranger teams perform daily patrols of the areas ensuring animal-friendly viewing of wildlife, including cheetahs. Special attention is dedicated to the families with cubs. Areas where female had given birth, get temporary closed for all types of vehicles, until the time when cubs start following the mother. Such long-term programs include three main activities:

1. Daily anti-harassment monitoring of cheetahs (6:00-19:00 during the time of game drives)
2. Sick, injured, recovering cheetahs monitoring (6:00-19:00 throughout a day or whenever required).
3. Mothers with cubs monitoring of families and protecting them from anthropogenic (tourist misbehavior, human-wildlife conflict) and climate factors (fire, floods etc). (6:00-19:00 throughout a day)

All mentioned above activities have produced excellent results, ensuring the safety and welfare of animals, the satisfaction of tourists and a significant increase in the popularity of the areas through promotion in the media within Kenya and internationally. It is important to point out, all cubs that survived to independence in 2022, were born and raised in different conservancies.

Given the global decline in the cheetah population across Africa, population instability in the Maasai Mara Ecosystem, and the problems that cheetahs face in the Mara, urgent action is needed to create conditions in the Maasai Mara National Reserve that will help maintain a healthy, self-sustaining cheetah population.

Among all the Mara conservancies, the Mara Triangle implemented a unique Cheetah Monitoring Program, where a litter of cheetah cubs have been raised without tourist influence. Several years ago, five conservancy vehicles (Pic.7) have been assigned by the conservancy management to monitor cheetahs 7 days a week ensuring their welfare and limiting influence of tourists on the daily behavior and activities of this vulnerable species. Such monitoring became very successful in 2022. When 3,5-year-old female Risasi (F84) gave birth in the Mara Triangle, all roads and pathways were closed by the rangers, and no vehicles including



Pic.7 Rangers monitoring a cheetah family

Cheetah monitoring vehicles entered the area. When female was leaving the den for hunting once in 2-3 days, rangers followed her at a distance, keeping all four vehicles on roads at a distance, which often exceeded 200 meters. Taking in account, that it was her first litter, Risasi managed to raise 2 out of 4 cubs to the age of 14 months (see Cover photo).

**1.6. Cubs raised to independence.** Within last three years, 2022 was more 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.

All mothers with cubs spent most of the time in the conservancies and or Serengeti NP with brief visits to the MMNR for 2-7 days in different months of 2022, except for F70, who has never been spotted in the MMNR. However, her cubs – two females, have been observed in the Reserve after dispersal with their mother. Three dispersal events took place in different conservancies (F68, F70, F80) and three – in Serengeti (F59, F63, F87).

**1.7. Lifespan of the cheetah families.** In the Masai Mara, mothers spend from 12 to 23 months with their litters. The average age of independence the Mara is 16.7 months, n=43 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. We observed it in the family of F68 with her 3 adolescent cubs – two females and one male.

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 3. Lifespan of cheetah families**

No	Lifespan of a Family (months)	No of Cubs	Sex of Cubs	Cheetah Female ID
1	23	2	1.1	F13
2	23	3	0.3	F74
3	21	2	0.2	F9
4	21	2	2.0	F13
5	20	2	1.1	F16
6	19	1	0.1	F4
7	19	5	1.4	F19
8	19	3	1.2	F3
9	18	3	1.2	F26
10	18	3	1.2	F8
11	18	3	3.0	F63
12	18	1	1.0	F7
13	18	3	1.2	F51
14	18	3	1.2	F3
15	17	3	1.2	F80
16	17	2	0.2	F70
17	17	2	0.2	F3
18	17	3	3.0	F59
19	17	3	2.1	F78
20	17	3	2.1	F53
21	17	2	2.0	F7
22	16	3	2.1	F50
23	16	3	1.2	F68
24	16	2	2.0	F82
25	16	1	1.0	F13
26	16	1	0.1	F3
27	16	4	3.1	F67
28	16	3	1.2	F74
29	15	3	2.1	F78
30	15	2	1.1	F69
31	15	1	1.0	F42
32	15	1	1.0	F67
33	15	1	1.0	F5
34	15	2	2.0	F40
35	15	1	0.1	F3
36	15	2	1.1	F59
37	14	1	1.0	F24
38	14	3	2.1	F56
39	14	1	1.0	F1
40	14	3	2.1	F3
41	14	1	1.0	F76
42	13	1	0.1	F26
43	12	6	4.2	F6
	<b>TOTAL</b>	<b>CUBS</b>	<b>54.46</b>	

**1.8. Sex of the cubs and male versus female cubs’ survival rate.** Sex of the small cubs can be differentiated by the distance of anus and the urinary organs from the tail, which is shorter in females than in males (see Pic.8). It is possible to identify sex when cubs appear from the den and start following the mother and perform different joint activities, e.g. interact at a kill and play.

In the wild, it is impossible to estimate the rate of cub females versus cub males' survival because sex of cubs at the birth is not known, and some families are spotted first when cubs are about 4 months old, and could already had lost littermates, as 3 first months are known to be the most critical for cheetah cub survival, when majority of them die. However, long-term observation in the Mara suggests that cub survival rate of males is higher that of females. Majority of the litters at the first encounter, contained cubs of both sexes. For example, Risasi (F84) was raising 2 male and 2 female cubs, but by the age of 11 months, two female cubs have been killed by reptiles, and 2 males survived. In 2022, out of 6 litters raised to independence, 5 litters contained at least one male, and out of 15 cubs, 9 were males, which is 60%. Out of 43 litters, for which the time of cubs dispersal was known, in 81% litters (n=35) was at least one cub male (Table 3).



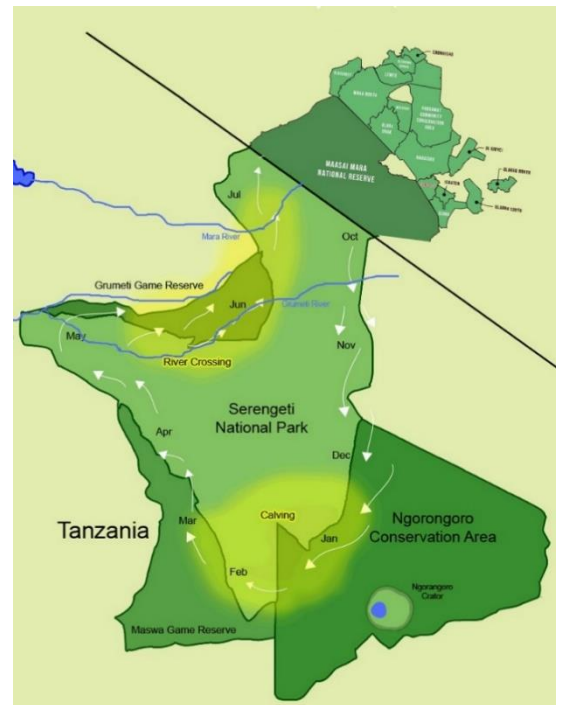
Pic.8 Male cub (left) and female cub (right)

## II. CHEETAH POPULATION CHALLENGES, SURVIVAL STRATEGIES AND ADAPTATIONS

**2.1. Territory utilization.** In order to find secure places, cheetahs move intensively within the Mara-Serengeti Ecosystem.

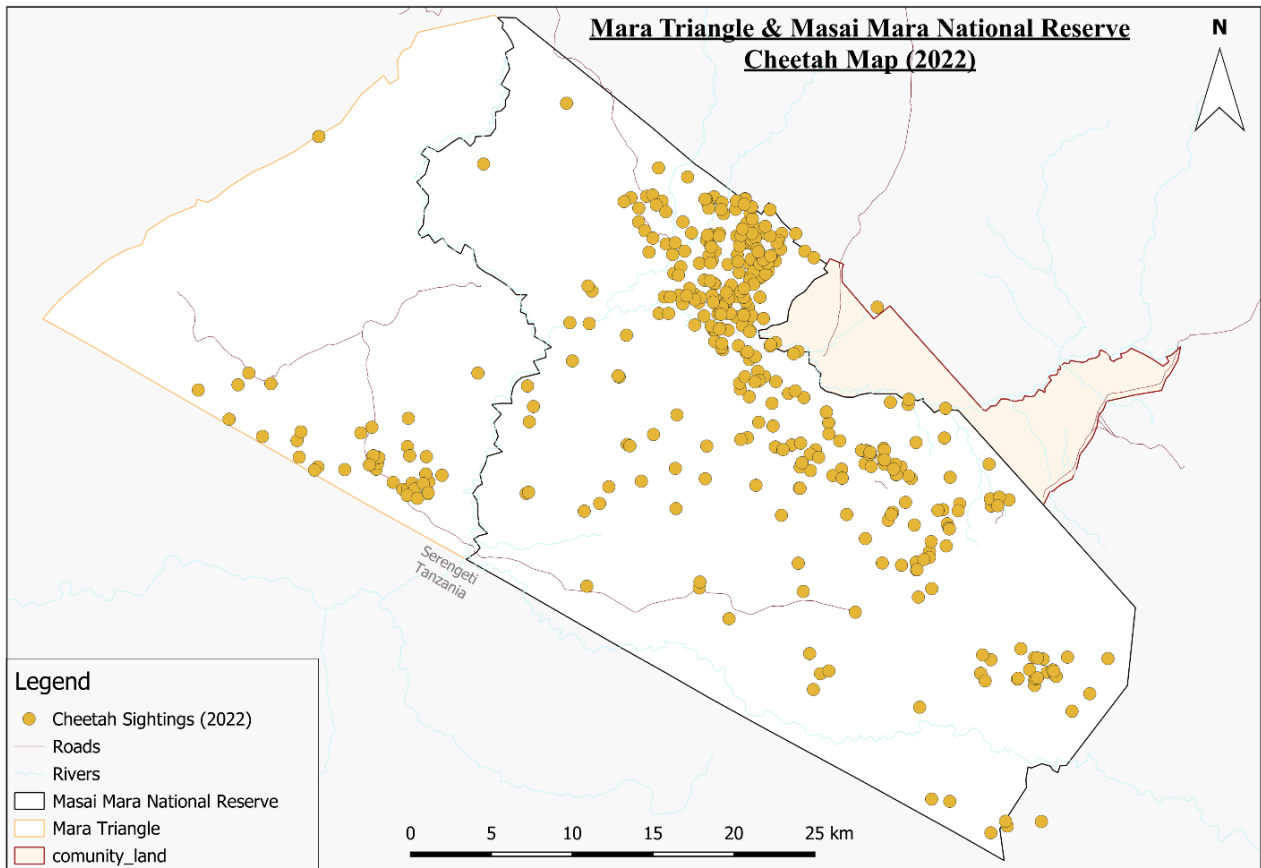
In 2022, out of 66 (38.28) identified adult individuals observed in the Mara Ecosystem, 75,8% utilized the territory of the Reserve and Triangle (1,510 km<sup>2</sup>), surrounding Conservancies (1,500 km<sup>2</sup>), and areas at the Tanzanian border, while 24.2% (n=16, out of which 9 males and 7 females) have not been spotted in the Reserve. In 2020, out of 71 cheetahs, proportion was 80.3% to 19.7% (n=14 (6.8), in 2021, out of 62 cheetahs, 67.8% to 32.2% (n=20 (4.15)).

It should be noted that, despite the different total number of cheetahs observed in the Mara in different years, the number of individuals who did not visit the Reserve maintained within 14-20 individuals. A higher percentage of cheetahs visiting the MMNR in 2022 attributed to the fact that more cubs born and raised in the conservancies, began to come to the Reserve after separating from their mothers in search of new places.



Pic. 9 Mara-Serengeti Ecosystem

**2.2. Cheetah distribution in the MMNR.** Our long-term observations (Linden et.al 2020) revealed a trend in the spatial distribution of cheetahs in the MMNR. In 2005 and since 2012 to date, Talek area has been one of the most visited areas of the Reserve (Linden et al, 2020). The year 2022 has supported this trend (Pic.10).



Pic.10. Cheetah distribution in MMNR in 2022

The following factors and their combinations contribute to cheetah movements, distribution 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
- \* Annual wildebeest migration
- \* 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 transport)
- \* Conservation status of the area (protected/not protected).

**2.3. Areas bordering the MMNR.** The Maasai Mara National Reserve borders the Serengeti National Park in Tanzania to the south, and the adjoining conservancies and pastoralist communities to the north, east, and west (Jacobson *et al.*, 2015; Ogutu *et al.*, 2009). There are no fences between the Maasai Mara National Reserve, the Serengeti National Park, Mara conservancies, and community areas, and wildlife moves freely within the Maasai Mara Ecosystem. The habitat types of the study are represented by dwarf shrubs/short grassland, tall grassland, shrubland, forest, and woody/ shrubby grassland (Oindo *et al.*, 2003).

The most accustomed to tourism cheetahs are found in the central and northern parts of the park, especially in the Talek area, where tourism is active all year round. This trend has continued for more than 15 years. (See *Linden et al 2020*). Individuals born and raised in Tanzania, away from tourist routes, and in conservancies adjacent to the Reserve, are usually very shy. The border areas help them adjust to the high human activity in the Mara. For example, the area represented by shrublands along the border with Olare-Motorogi conservancy on the east, which plays a role of a refugee zone to cheetahs, especially females with cubs, coming from the eastern and northern conservancies, or young individuals raised and dispersed the neighboring conservancies. For example, Nebaati (F70) has never visited the MMNR and was raising her offspring in the conservancies, including Naboisho, OMC and Ol Kinyei. In February 2022, she left her 17-months-old daughters (F96,F97) in Ol Kinyei conservancy, and young females started travelling within the known areas slowly expanding their home range. On 27<sup>th</sup> July 2022, they appeared at the eastern part of the reserve (Pic.11), at the border with Nashulai conservancy, and by the middle of November, have been intensively travelling through the least visited areas of the Reserve and towards Tanzania.

The Sand River, Osero-Sopia and Sopa areas of the MMNR are often used by solitary individuals, male coalitions and females with cubs from the Serengeti. For example, on 6<sup>th</sup> of November 2022, a coalition of two young males (M133, M134) appeared from the Serengeti in Sand River area (Pic.12). It was the same area, where another male coalition (M88,M89) appeared in the reserve on 18<sup>th</sup> of September 2018 and later settled at Sopa.

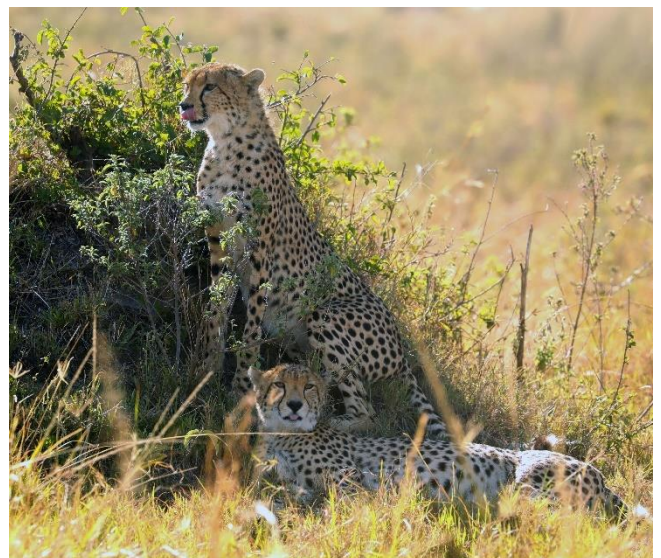


Pic. 11. Daughters of F70 in the Reserve (F96,F97)

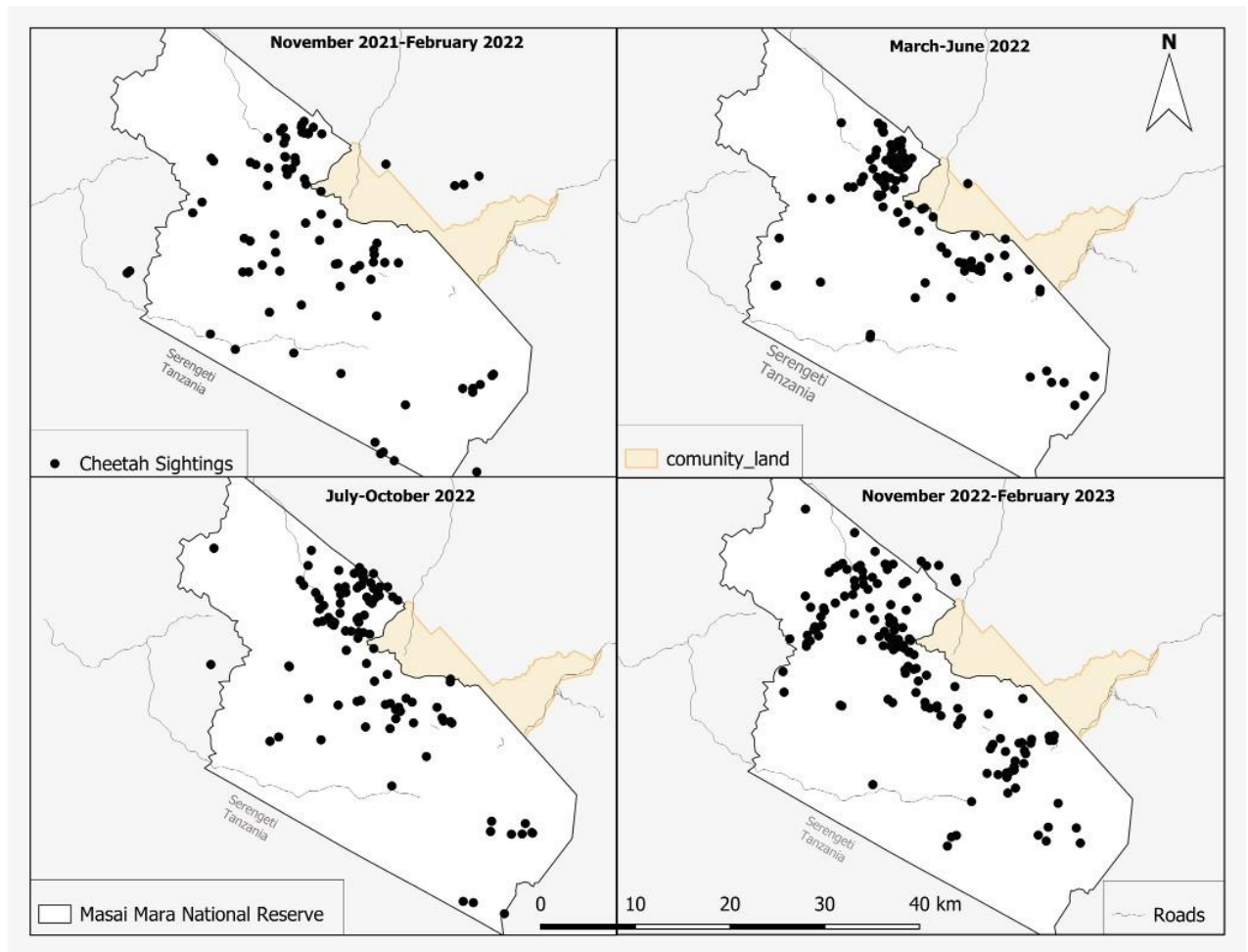
These areas give opportunity to cheetahs to get used to the tourist activity, which is very low at the side of Tanzania border and increases gradually towards the centre part of the Reserve. Lack of disturbance, open fields and mosaic dense vegetation patterns of these areas, provide cheetahs opportunity to successfully hunt, rest, mate and raise cubs.

In order to follow trends in the movement and distribution of cheetahs in the Reserve, we have divided the year into 3 seasons: March to June, July to October, and November to February. The period of March-June 2020 was taken as the basis, when there was a lockdown and there were no tourists in the park. The maps below show cheetah distribution in the Reserve in four different periods of 4 months starting from November 2021 to February 2023.

The Cheetah movement trends between the years 2021 and 2022 are somehow similar. During the period between November 2021 and February 2022, the cheetahs utilized the entire Reserve except for the extreme North-West part. This pattern can be attributed to an even distribution of prey across the Reserve.



Pic.12. New males in the reserve – M133,M134



Pic 13 Cheetah distribution in the MMNR during three periods in 2021-2023

At the beginning of the year, cheetahs were dispersed all over the Reserve. But this would gradually change towards the second quarter, when Talek area seems to be the most visited. Great movement would however begin with the coming of Wildebeests (July-October), and this is the period when cheetahs were utilizing the entire MMNR.

During the months of March-June 2022, Talek area was the most frequented by cheetahs. This can be associated with high concentration of middle-size prey in this area. Zones around Talek are known for short grasses, which are an attraction for most middle-size prey and hence explaining the crowding of Cheetahs here (Pic.13)

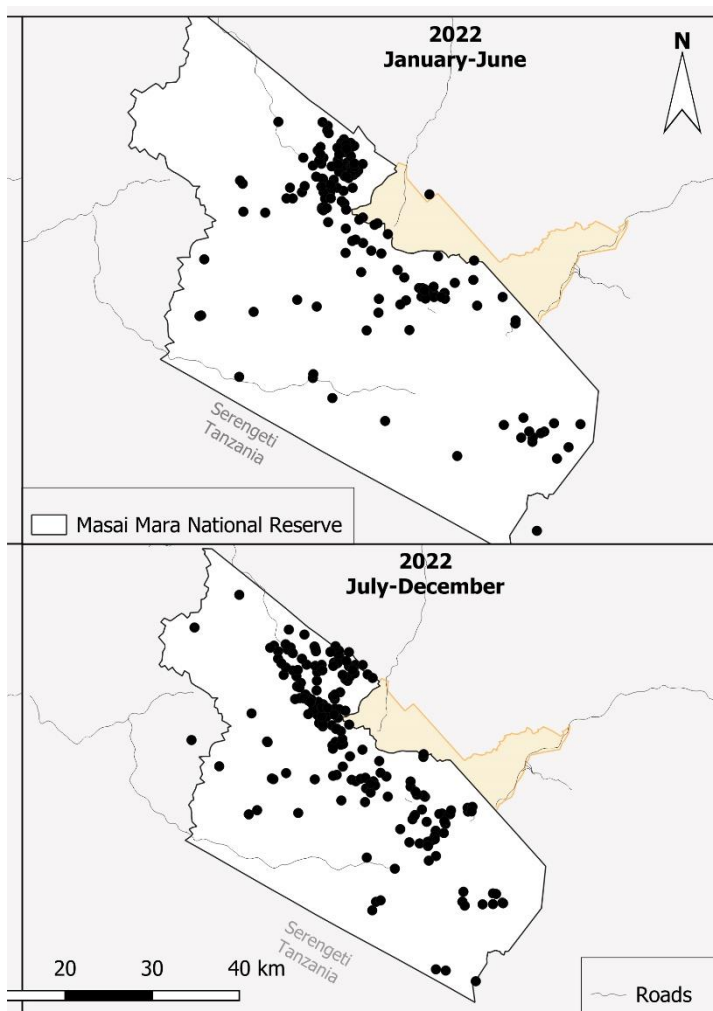
During the period between July and October (Wildebeest Migration), cheetahs utilized the whole of the Reserve because of availability of prey in the entire Reserve and consequently reduced interspecific competition. This trend was similar in different years, which is interesting, as it shows that general distribution of cheetahs in the MMNR is not affected by tourism, but is influenced by other environmental factors.

Female cheetahs such as Nora (F42) have been the most mobile within the Reserve during the year. Despite all these movements, some cheetahs have been observed to have retained their areas all-year round (for example single male Jasiri (M108) of Sopa area and Tano Bora coalition). (Pic.25-27).

It is difficult for a lone male to hold a territory when competing with a coalition. But if the male in the coalition loses partners, he does not hold the territory for long and turns into a floater. And therefore, the same area can be used by two or 3 different males. At the same time, young solitary males travel in search of safe and attractive areas, moving far from their birthplace. For example, Jasiri (M108) was born and raised by Amani (F3) in the northern Mara. At the age of 2 years, he began to regularly appear in the reserve, and from May 2021, began to explore Sopa area. So called Sopa Boys Olaretoni (M88) and Olanyuani (M89) have dominated the area since October 2018. After sudden death of Olaretoni at the end of July 2021, his coalition-mate Olanyuani began to share the territory with Jasiri. From May 2022, Jasiri settled in Sopa, gradually replacing Olanyuani. Olanyuani has been spotted at Sopa in April briefly, and by June 2022, moved towards Tanzanian border close to Olderkesi conservancy.



Pic. 14 Three members of the Tano Bora coalition (M70,M71,M73)



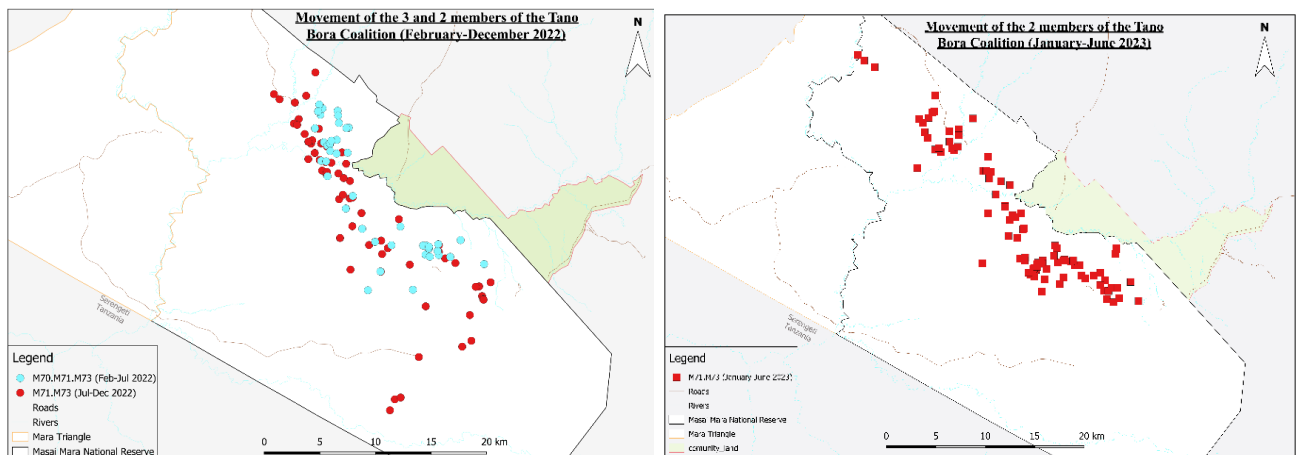
The 6 months periods' comparison portrays a trend similar to the previous years. Between the months of January and June, Talek and Sopa areas are the most utilized by many cheetahs. From July to October, there is plenty of prey due to the Wildebeest migration and thus the utilization of the whole reserve by cheetahs. (Pic.15).

Pic.15 Comparison of cheetah distribution in the MMNR between 6-months periods of 2022

**2.4. Movements of the Tano Bora – 5 males coalition.** The famous five male coalition Tano Bora has been one of the main attractions in the MMNR (Pic.14,16). Their core area was at the Tipilikwani junction, but their home range was covering areas from Simba towards Talek and up north, including Olare Motorogi and Naboisho Conservancies. They have been dominating the same area from 2018 to date despite the fact that by the end of July 2022, they have been down to two: M71 and M73. They expanded their territory deep into the south of the Reserve and were spending more time (especially after successful hunts) in the close area of the MMNR (Pic.17).



Pic.16 The remaining two males of the Tano Bora coalition: Olonyok (top) and Winda (bottom)



Pic.17 Comparison of areas used by 3 (M70,M71,M73) and 2 members (M71,M73) of the Tano Bora coalition in the MMNR in 2022 (left) with areas used by two members (M71,M73) in 2023

In 2017, just after the coalition was formed, its home range was the largest and covered 749 km<sup>2</sup>, and extended from Simba, Tipilikwani, and Talek areas up north of the MMNR towards Rhino Ridge, encompassing the Naboisho and Olare Motorogi Conservancies. Although the size of the home range varied in different years (See Annual Report 2019), the size of the territory, which males have been patrolling, marking regularly and defending, remained within 232 km<sup>2</sup>. It covered the area between the Tipilikwani junction and Talek to the north, and Fig Tree – Olkiombo area up to the Double Cross in the North-West.

Although the coalition's home range has not changed, there have been significant changes in movements of the Winda (M71) and Olonyok (M73) after death of Leboo (M70) in July 2022:

- 1) Unlike the other years, when they were 4 and 3, in 2022, two remaining males have been confined to a rather smaller area (mostly around Talek), with rare visits to the south-western part of the MMNR.
- 2) Two remaining males have been avoiding the Tipilikwani area near community land for several months after losing a coalition-mate.
- 3) Since 2017, the coalition was spending about 30% of time in the close areas of MMNR. In 2023, the two remaining members have frequented closed areas spending about 50% time there.

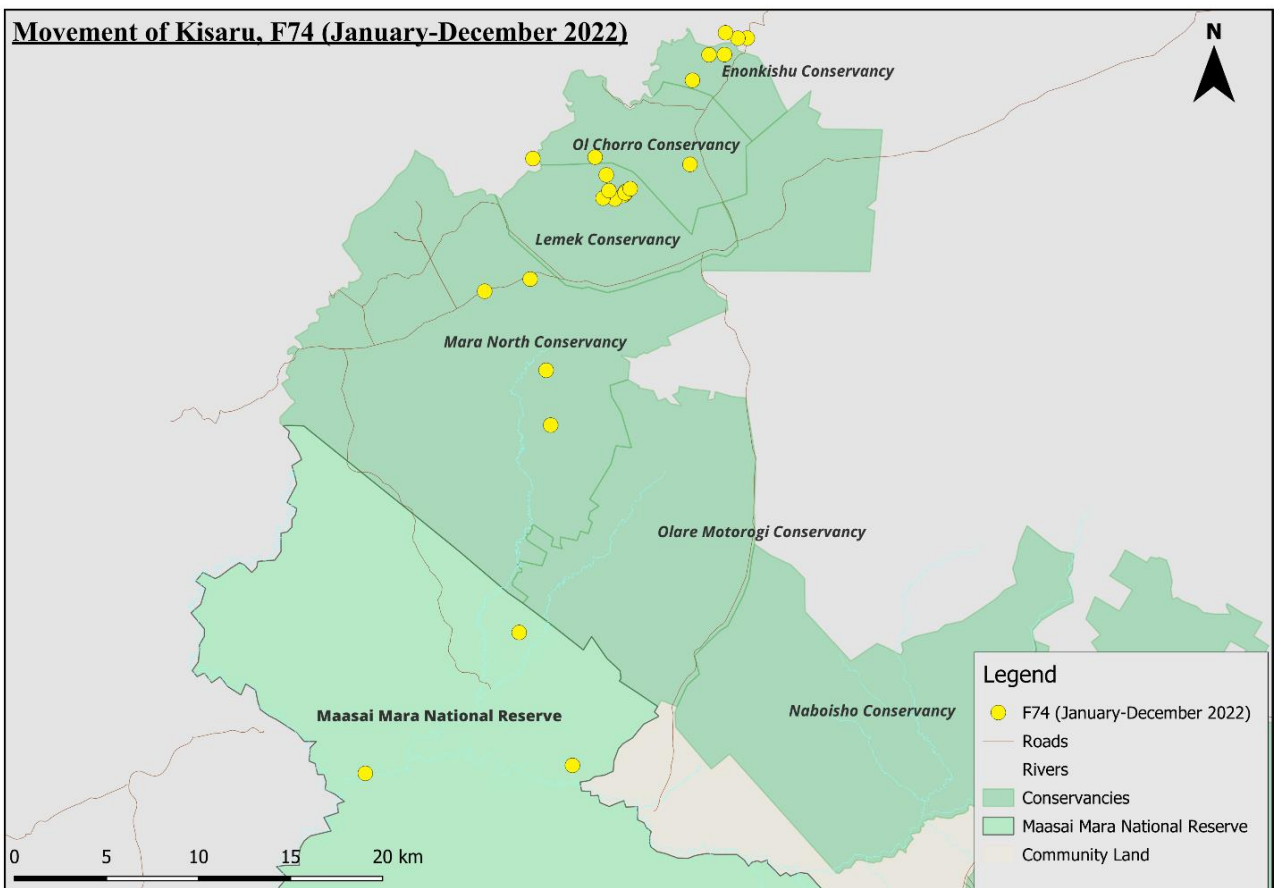


This can be attributed to the high rate of successful hunts within these areas in absence of human disturbance (Pic.18).



Pic.18 One of the new closes area, used by M71 and M73 in 2023

**2.5. Movements through the Mara ecosystem. Kisaru’s family.** Females with cubs such as Kisaru (F74) have made tracks across various conservancies with a number of visitations to the Reserve (Pic.19).

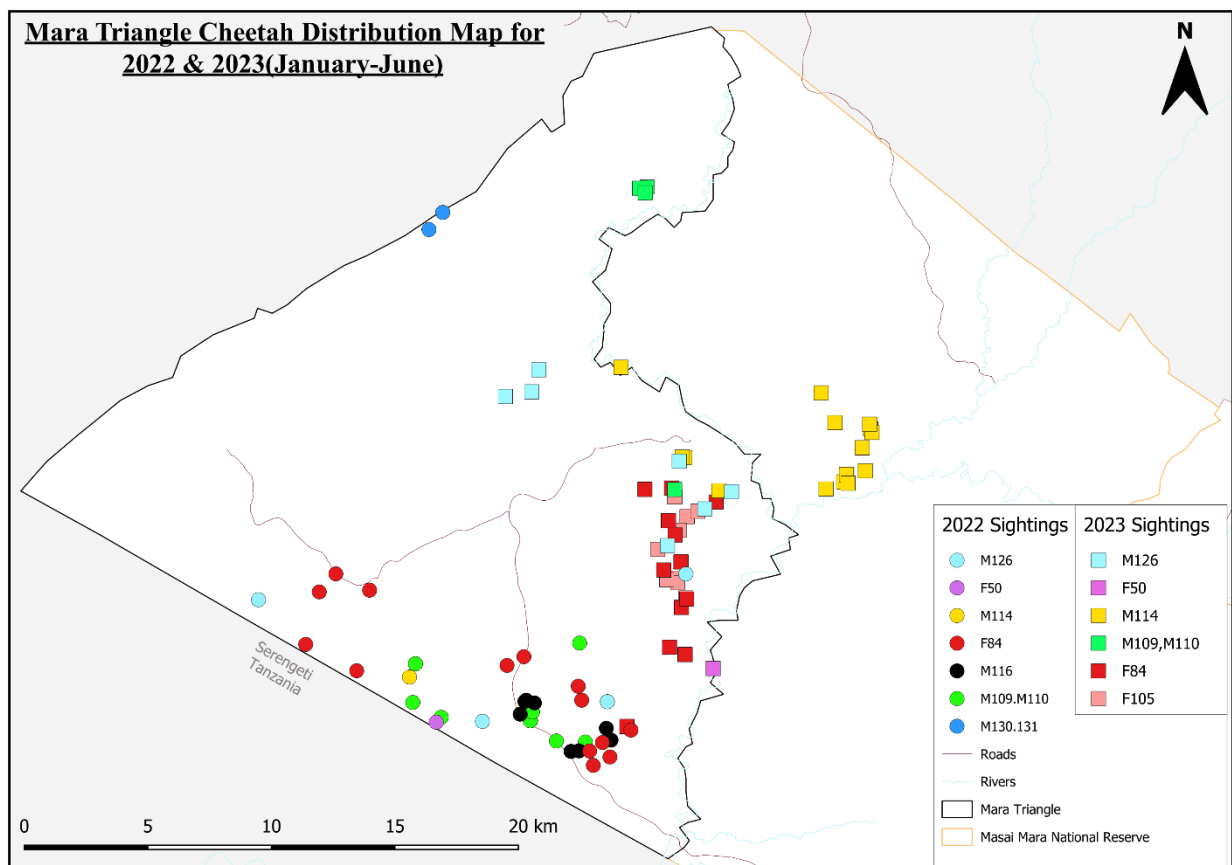


Pic.19 Movements of Kisaru (F74) with cubs in the Mara Ecosystem in 2022

Kisaru (F74) was spotted with four 2-months-old cubs on 11<sup>th</sup> of September 2021, at Enonkishu conservancy. By 26<sup>th</sup> of September, she lost one cub (in/id sex). When cubs reached 3,5 months, Kisaru started travelling with them through Ol Chorro and Lemek Conservancies to the Mara North

and Olare-Motorogi conservancies, where by the mid-November, she lost one male cub. On 18<sup>th</sup> of November, she appeared at the south-western boundary of the MMNR with two remaining cubs – a male and a female. During 2022, the family was extensively travelling through the conservancies and towards the end of July 2022, explored the northern part of the MMNR before heading back to Enonshishu. Kisaru was seen with her cubs all year round until the last week of December, when she separated with them for three days (21-23.12.2022) during which, she was in courtship and mating with Milele (M83) and Mbili (M84) in Lemek Conservancy (Pic.19). However, this female would later reunite with her two cubs on 31<sup>st</sup> December of 2022 at Enonkishu Conservancy.

**2.6. Cheetahs in the Mara Triangle.** Cheetah distribution in the Mara Triangle during the year 2022 was mostly dense along the Tanzanian border. However, sightings from January 2023 through June 2023, show a concentration of cheetahs along the Mara River. Such movement can be contributed to the land use and grass management in the Triangle, which provide for cheetahs the most suitable habitats, which is represented by mosaic distribution of patches of tall grasses, short grasses and shrubs. Each element provides shade to different animals, including cheetah prey (hares, antelopes), and cheetahs, especially those with cubs. Sick/injured cheetahs get opportunity to hunt in the tall grass or in the bushes, as it has been observed in case of F84 with cubs and limping male Oloti (Pic.20).



Pic.20 Comparison of cheetah sightings in the Mara Triangle in 2022 (January-December) with sightings in 2023 (January-June)

In 2022, 9 adult cheetahs (7 males and 2 females) have been observed in the Mara Triangle. Out of 7 males, three were singletons (M114, M116, M126) and 4 were in two coalitions of 2 males each. Two new shy males (M130, M131) were first spotted in the beginning of October 2022 at the slope of the Olololo escarpment. The other coalition was represented by two brothers Ruka (M110) and Rafiki (M109). Two females were Imani (F50) and Risasi (F84). Imani's home range

covers OMC, MMNR, Mara Triangle and northern part of the Serengeti NR. Imani has been regularly visiting Mara Triangle since 2019 (see Annual Report 2019).

The Mara-Serengeti ecosystem stretches over 40,000 sq. km, and since the animals move freely through it, every 3-4 months new cheetahs appear in the Mara. Most often these are young males (singletons or in coalitions) wandering in search of safe and attractive areas, moving far from their birthplace. If the area is controlled by a coalition, the loner (or smaller coalition) has to move away for a while to avoid clashes.

Out of 7 males observed in the Mara Triangle in 2022, one male **M114** was new to the Mara Triangle and three were **new individuals to the Mara ecosystem: M126 and a coalition of M130 and M131**. A coalition of two shy males appeared on the slope of the Oloololo escarpment in the beginning of October and disappeared within 2 weeks. Our long-term observations reveal, that in order to be successful, cheetahs need to be tolerant to the presence of the tour vehicles. If cheetahs settle at the certain area, it takes 2 to 3 months for them to get used to tourist activity and allow cars approach at about 25 meters.

A single young male **Oloti (M114)** appeared in the Mara Triangle in the beginning of July 2020. In early September, he crossed the Mara River and started exploring the Maasai Mara National Reserve, but after 2 months he returned to the Triangle. His appearance in Mara coincided with the emergence of a new coalition – Rosetta's two sons – Ruka and Rafiki, who gained independence in March 2020 and began to travel in the Mara, reaching the Triangle in May 2020. To date, Oloti's movements from the Triangle to the Reserve and back were partly dictated by movements of this coalition and other cheetahs (Pic.20, 48-53).

Another single male **Kijana (M116)** was born in January 2020 and was spotted with his mother Kuahidi (F76) in different conservancies, including Olarro, Naboisho and Olkinyei. After mother had left him at the age of 14 months in Naboisho, he started roaming within the conservancies, including Olerai conservancy. In June 2021, he joined Olpadan (M58), ex-leader of the Tano Bora coalition, and stayed with him for over 3 weeks in the MMNR. In July 2021, after Olpadan had left Kijana in the MMNR, the young male moved back to Olerai and briefly reunited with his mother. By the end of July 2021, he was seen in Naboisho and later in other conservancies, and by the end of June 2022, appeared in the Mara Triangle at the border with Tanzania. He was remaining shy and did not stay for long. Some cheetahs make their route to Tanzania through the Mara conservancies and appear in the Triangle after several weeks/months spent in the Serengeti NP.

**Mpaka (M126)**, appeared in the Mara Triangle in the mid-July 2022, and since then has been regularly seen in the conservancy between the Tanzanian border and the Mara River area (Pic.21).



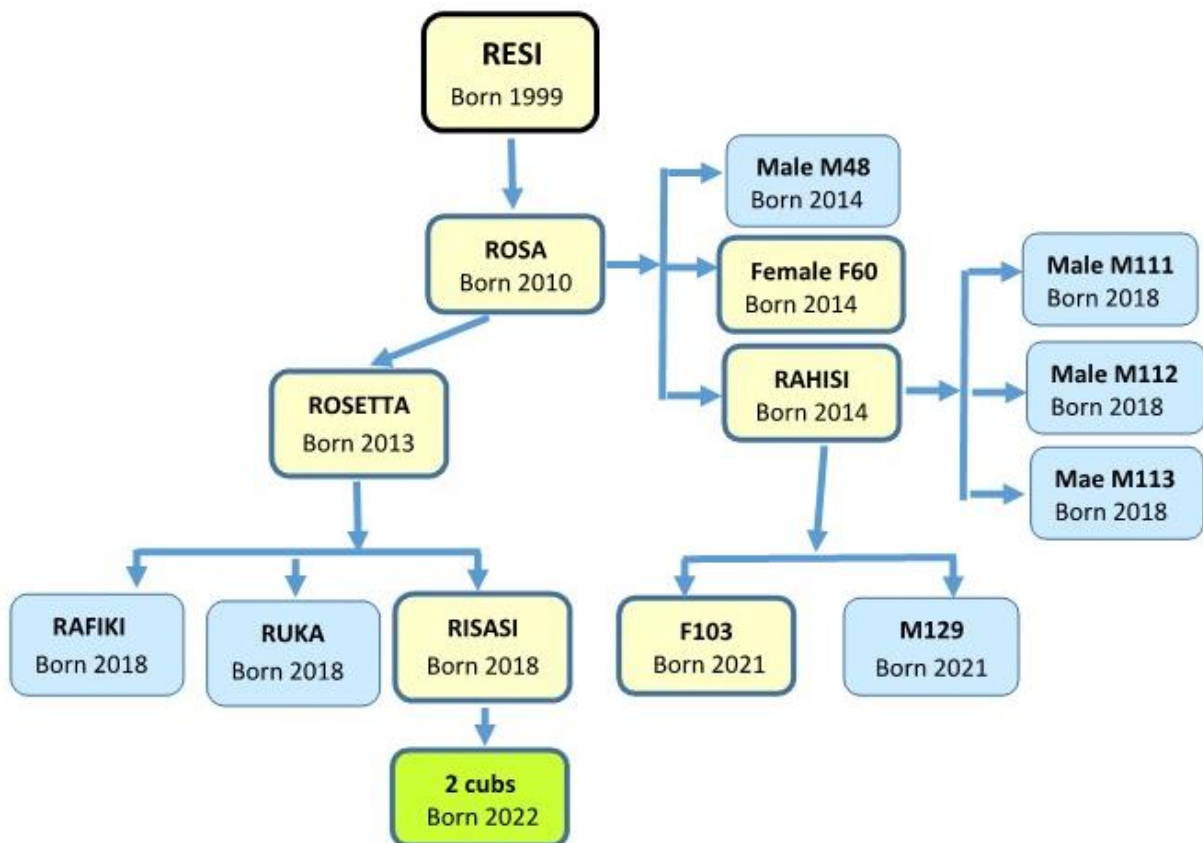
Pic.21 New Male Mpaka (M126) in the Mara Triangle



Pic.22 Risasi with cubs in the Mara Triangle

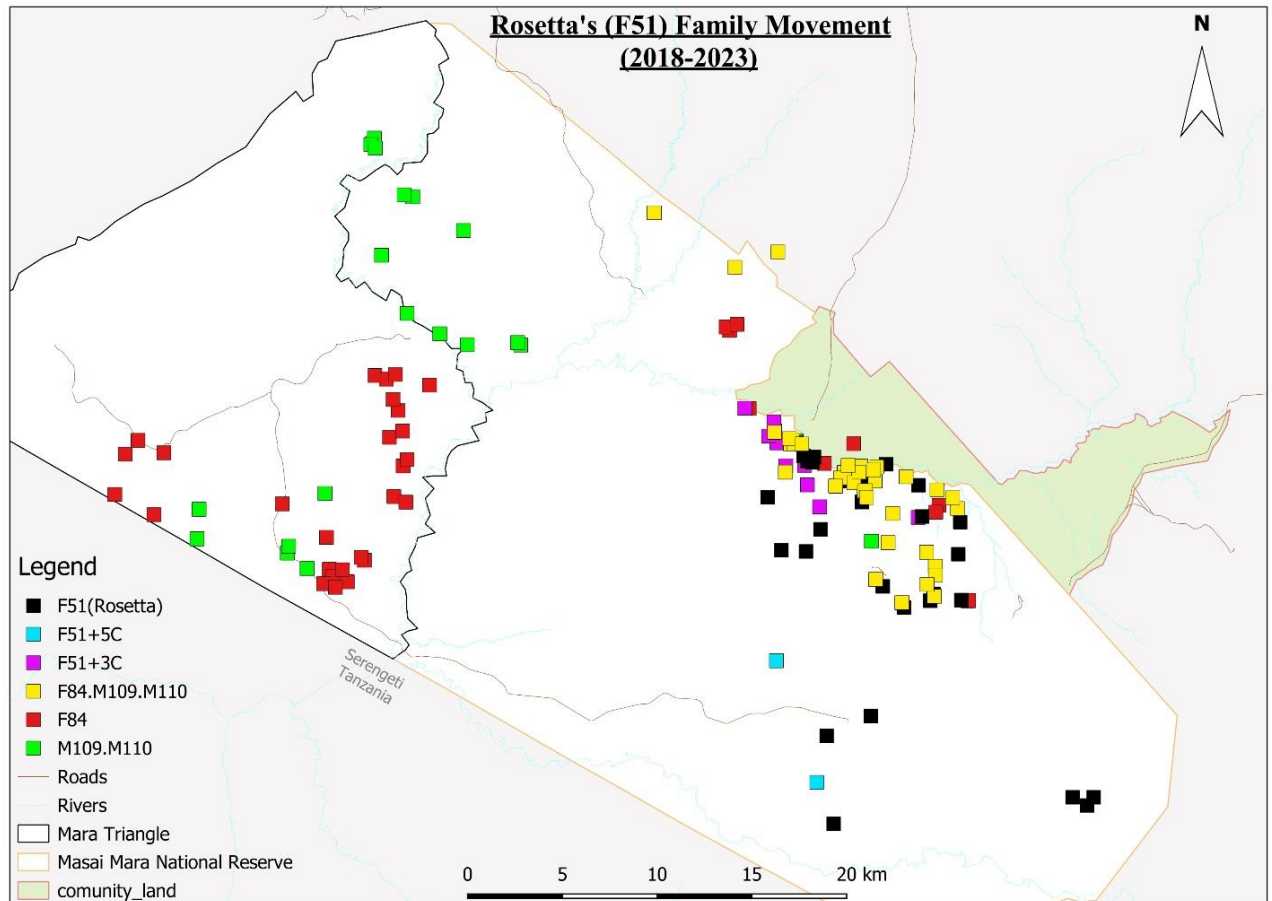
**2.7. Movements of Rosetta’s family.** Rosetta (F51) – daughter of Rosa (F26), granddaughter of Resy (F9) (Pic.22,23), spent majority of time in Serengeti NP, with rare visits to the MMNR. In Kenya, her home range covered the area from Cottars, Sand River, Sopa through Simba, Tipilikwani towards Talek (Pic.24, *black dots*) before and after raising cubs. To date, she raised to independence one litter of 3 cubs (2.1) at the age of 6 years. Rosetta was raising cubs in the Reserve and in Serengeti NP.

In early September 2018, she gave birth to 5 cubs at the Sand River area far from roads and tourists routes (Pic.24, *blue dots*). When cubs started following the mother, Rosetta started moving towards Tanzania, and on 29 of December 2018, lost one cub at Cottars area. On 16 January 2019, she appeared at Simba area of the MMNR (Pic.24, *purple dots*) with 3 cubs: 2 males (M109 and M110) and one female (F84), who she successfully raised to independence and left at Simba area on 5 March 2020. Three adolescents: two brothers Ruka (M110) and Rafiki (M109) and their sister Risasi (F84) starts exploring the MMNR, moving towards Talek and further to the south-west (Pic.24, *yellow dots*). By 13<sup>th</sup> June, 2020 Risasi (F84) (Pic.24, *red dots*) left her brothers (Pic.24, *green dots*), and was observed alone, roaming within the Reserve and community areas bordering the Reserve on the eastern side.



Pic. 23 Pedigree of Rosetta’s lineage

In 2022, all three littermates became resident cheetahs of the Mara Triangle, covering the areas between the Mara River and Tanzanian border, with short-term visits to Serengeti NP. On 3<sup>rd</sup> May 2022, Ruka and Rafiki have been observed in the Mara Triangle, in 1 km from Risasi (F84), who was at the last trimester of pregnancy. In mid-May 2022, Risasi gave birth in the Triangle and by 10 June, was spotted carrying 4 cubs. On 18<sup>th</sup> September 2022, she lost one cub female to a snake bite, and on 18<sup>th</sup> January 2023, another cub female to a crocodile, raising two male cubs. By the time cubs reached 7 months, the family extended their visits to Tanzania from 2-3 days to weeks and months (Pic.24).



Pic.24 Movements of Risasi's family in the Maasai Mara in 2018-2023

### III. CHEETAH BEHAVIOR

**3.1. Courtship events with mating.** Although cheetahs are very secretive animals and most of mating happen with no witness, from 2017 to date, there were 11 cases of cheetahs' mating observed in the Mara during day time:

- M12, M13 with F8 in October 2017
- M72, M70, M71, M73 with F42 in December 2017
- M58 with F8 in March 2018
- M30 with F73 in March 2018
- M73 with F69 in August 2018
- M70 with F7 in October 2019
- M81 with F68 in January 2022
- M81 with F80 in February 2022
- M83, M84 with F74 in December 2022

- M71 with F69 in February 2023
- M71 with F42 in April 2023

Two cases of courtship in 2022, involved violence of males towards females.

**3.2. A case of the courtship of Jasiri (M108) and Siligi (F63) with 3 cubs.** Jasiri – a lonely territorial male, who has settled in Sopa area since May 2022. This area of the MMNR is visited by different females from both the Reserve and Tanzania. One of them is Siligi, who was born in October 2014 in raised in Tanzania together with her sister Maridadi (F63) and brother Olpadan (M58) – a former leader of the famous Tano Bora coalition. Siligi also became famous by being the first female in the Mara documented with seven 1.5-month-old cubs in 2019. From December 2019 to January 2020, Siligi lost 5 cubs, and later moved to Serengeti with one remaining cub female, who she raised to independence in Tanzania. Thus, she raised her first litter at the age of 6, like 5 other cheetah females: Milima (F1), Sidai (F4), Saba (F5), Rosetta (F51) and Nashipai (F69).

Siligi spends most of her time in the Serengeti and the southeastern part of Mara. Her next litter turned out to be more successful: out of 5 cubs, Siligi raised 3 males in 2022 in Tanzania.

On 6<sup>th</sup> of August 2022, Siligi brought her three 16-month-old cub males into the Sopa area of the Reserve, where the family encountered Jasiri. The male trapped the family for two days. He perceived the young males as competitors, periodically pouncing on them, while they tried to be closer to their mother. The female was non-receptive, and on 7<sup>th</sup> August, after pursuing the whole day, in the evening Jasiri lost interest in her, finally attacked her sons and left. The female led the cubs in the opposite direction (Pi.25-27).



*Pic. 25. Three cubs males of Siligi investigating the spot where their mother was sitting*



*Pic.26. Jasiri (right) opposite Siligi and her cubs (female lying in between cubs)*

Apparently, it was not the first meeting of Siligi and Jasiri, since she behaved confidently and relatively calmly in his presence.



Pic. 27. Jasiri attacking Siligi's cubs males

**3.3. A case of Milele (M83) and Mbili (M84) mating with Kizaru (F74).** The home ranges of Kizaru (born in February 2016) and a coalition of 2 males, sons of Kiraposhe (F56) Milele and Mbili (born in July 2016) overlap since 2018 in the areas of OMC, Mara North, Lemek, Ol Chorro, Enonkishu conservancies). By that, animals have been meeting and knowing each other for years. Females come into oestrus when they have large cubs, and if the mating was productive, the female stays with her big cubs for another 2 months, and leaves them a month before giving birth. At the time of mating, females usually leave the offspring behind, disappearing with males in secluded places. This provides not only a peaceful environment for courtship, but also the safety of the cubs, since males often display aggression towards young males. Courtship in cheetahs continues for 3 days, after which the males lose interest in the partner. Cheetahs are very secretive animals, and although courtship can often be observed during daytime, mating often occurs at night. Males in coalitions use different tactics to avoid competition: most often, one male disappears with the female for a day or two, after which he returns to the group. Some pairs of males, mate with the same female in turn. After a successful mating, the female usually is rolling over while the male is watching her. In case of a coalition, when meet a female simultaneously, male compete for the opportunity to mount a female and often display aggression towards each other. In some cases, males display violence towards the female (Pic.27).

On 21<sup>st</sup> of December 2022, 7-year-old Kizaru with her two 17-month-old cubs (Pic.33), met two 6.5-year-old males Milele and Mbili. Two males ran towards the family, and cubs scattered in fear and lost contact with each other and their mother. Kizaru disappeared in the thick forest, followed by two active males. The three cheetahs spent 2.5 continuous days in the forest, and mating was observed on 22<sup>nd</sup> December. After some hours of resting next to the female, both males were alternately mounting her with copulation. While the first one was copulating, his brother was either pushing competitor by the body side, or trying to mount on top of a mating male (Pic.28). By the time when the first male released the scruff of a female, the other one grabbed it (Pic. 29). As soon as the second mating male would complete copulation and release the female's scruff, she would quickly run deeper into the forest. After resting for some hours, the mating resumed, and female was running away. Kizaru did not have a moment to roll over, and several times, tried to walk away from the males, provoking them to growl at her and approach.

While Kisaru's daughter was searching for the mother and the brother around the thickets desperately calling for them. When she finally re-united with her brother, they both returned to the place where they had last seen their mother last time. They repeatedly went deep into the thicket, but could not find the mother. Only on the third day, in the early morning, they saw the mother with two males, who were vigilantly watching her, not letting her leave the spot at the edge of the forest.



*Pic. 28. Mbili is mounting Kisaru*

They repeatedly went deep into the thicket, but could not find the mother. Only on the third day, in the early morning, they saw the mother with two males, who were vigilantly watching her, not letting her leave the spot at the edge of the forest. After seeing their mother at a distance followed by the males, the cubs went hunting and successfully captured an adult male Thomson's gazelle. Having lost sight of the cubs, the hungry Kisaru made repeated attempts to elude the males. Eventually, on 23<sup>rd</sup> of December, at 13:20, the males left the female for hunting.

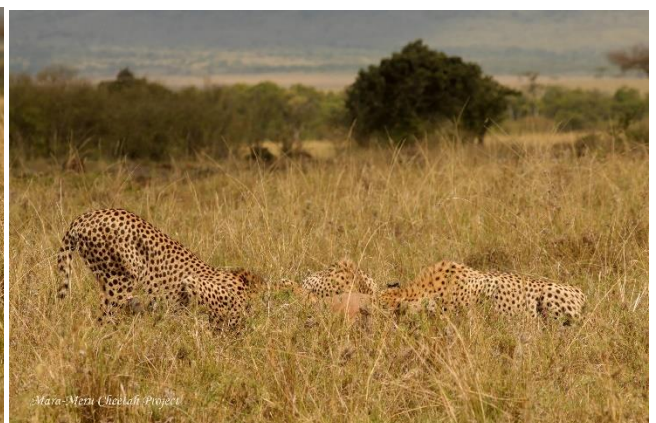
Kisaru was watching them motionless, and when they caught the adult Topi, she ran towards them. Kisaru approached the males, who had begun to eat, and poked her head towards the carcass rather confidently, but cautiously. Mbili hit her, but still let her in, and for several minutes the trio ate together (Pic.30,31), after which the males left the carcass one by one and lay down under a bush 20 meters away, leaving Kisaru to eat alone. After 35 minutes, they returned to the kill and, after several mutual growls (Pic.32), began to eat together. Having had her fill, Kisaru took advantage of the heavy downpour and ran into the field, calling her cubs. The males kept eating for 3 more hours. Kisaru found the cubs only after 7 days, on December 31st. During these days, the cubs got used to hunting, and the female got food for herself.



*Pic. 29. Milele is mating with Kisaru while Mbili is trying to pull him off the female*



*Pic. 30. Kisaru (left) approached feeding males*



*Pic. 31. Kisaru (left) joined males for feeding*





Pic. 32. Males Milele and Mbili (right) over their kill growling to Kisaru (left)

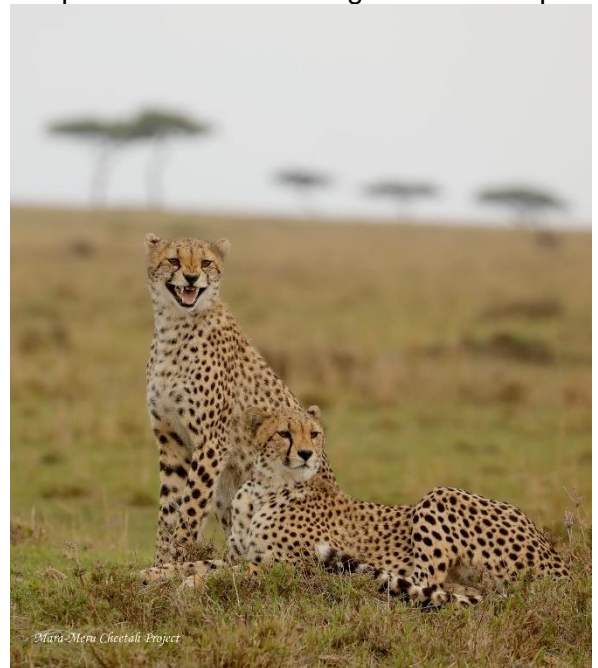
**3.4. Cheetah communications.** Acoustic signaling represents one of the most important communication channels among animals. Knowledge of how species transmit information relating to individual identity is important for understanding species communication mechanisms. In some cases, vocal individuality can also be exploited by researchers and conservationists to monitor and survey species populations using individually distinct vocal features as a non-invasive marking method.

Previously, social regulation based on individual and sex recognition by distance calls was reported for free-ranging lions (*Panthera leo*). Vocal correlates of caller identity were found in the long-distance calls of tigers (*Panthera tigris*) and male Eurasian lynxes (*Lynx lynx*) (Rutovskaya et al., 2009). Previously, all research on cheetah vocal communication has been done in captivity. Thus, the function of sounds produced by cheetahs in the wild and the information encoded in them remained unknown until our recent study. Previously, all vocalizations of cheetahs including the chirps were only investigated in captivity. We conducted the first study of acoustic communication of cheetahs in their natural habitats. Studying cheetah acoustic communication is a part of the long-term behavioral monitoring of the free-ranging cheetah population in the Mara ecosystem. The first objective was estimation of individual and sex-related acoustic variation of the long-distance chirps of mature cheetahs. All calls were produced spontaneously by the cheetahs; we did not provoke any animal to vocalize. Together with audio, we were recording video of the situations, and in between cheetah vocalizations, we commented on the distance changes and briefly described the ongoing events that caused the vocalizations. All recorded vocalizations were produced by individually identified callers. Life histories of cheetahs were known, because some of them we have been observing in 7<sup>th</sup> generation, and some individuals we have been following for over 10 years (Pic.3).

Cheetahs display a unique social organization: both females and males can live alone or form unions. In the wild, sisters-littermates can form short-term alliances. Brothers-littermates stay in life-long coalitions, which can include unrelated males. Also, unrelated males form either short-term alliances or life-long coalitions.

Conveying information about individual identity by acoustic communication is a fundamental feature for species that need to maintain social contact among group members. Encoding individual identity within acoustic signals allows animals to communicate such information and find each other, especially in low-visibility habitats. For many species, a key component of the information conveyed to conspecifics through the use of long-distance calls is individual identity. Detection and decoding of this information are crucial for influencing the response of the receiver.

For all age categories of cheetahs, a common context for production of their long-distance chirps is loss of contact with conspecifics and advertising own location to resume spatial proximity or to establish a novel contact. Male-male context was identified when a male lost visual contact with coalition members and produced repetitive chirps towards them. Male-female context was identified when male caller produced chirps when searching a potential sexual mate (the animal that found an olfactory mark started the chirping when looking for a mate of opposite sex). Occasionally, a male or female continued the chirping in the context of courtship, when the partner was in spatial proximity. Mother-cub context was identified when a mother produced the chirps towards cubs, who delayed following her, or who were out of sight (e.g., lost in the bush or left far behind from the spot of successful hunt), thus provoking them to approach for restoring spatial proximity. Contexts for producing the chirps were therefore not the same for both sexes: female chirps lack in male-male context and male chirps lack in mother-cub context.



Pic. 33. Kisaru's daughter is calling her mother, brother is lying next to her

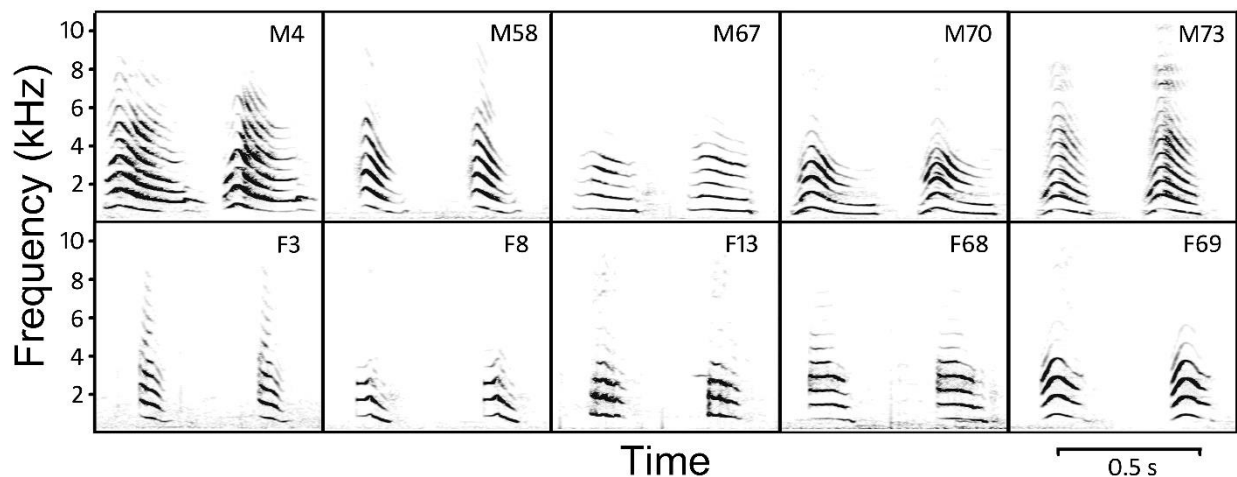
From 2790 hours of recordings of a total of 40 individually identified mature cheetahs (20 males and 20 females), we selected for acoustic analysis audio files from 20 (eight males and 12 females) individuals, which provided sufficient call samples for analysis. For estimating the effects of sex and individuality on the acoustic variables of chirps, we selected 15–20 calls per individual from all the 20 individuals, 390 chirps in total.

Studying contextual use of long-distance chirps and recording sounds in the wild is complicated in the Maasai Mara because on the number of reasons:

- 1) It was not easy to locate cheetahs in the wild, some of them were shy and kept far distance from the vehicles, which did not allow recording clear sounds;
- 2) All listed situations occur rare;
- 3) During observations, we prioritized the welfare of animals, maintaining a distance, recommended by the local rules, trying to minimize disturbance;
- 4) Extraneous sounds (e.g. wind, water stream, airplane, car engine, birds, crickets, other animals' sounds, human-related sounds etc.) act as obstacles and adversely affect the quality of the recording;
- 5) It was difficult to encounter the same adult individual after more than 2 years due to the short lifespan in the wild: on average 6.2 years for females and 2.8 years for males (*Kelly et al. 1998*).

For acoustic analyses, we selected only high-quality chirps with high signal-to-noise ratios, not disrupted by wind or overlapped with extraneous noises (e.g., from water stream, airplane, car engine, birds, crickets, other animals, or human voices). We took the best quality calls regardless of distance, in which all necessary acoustic parameters could be measured. Male chirps were longer in duration and lower in the peak frequency and all fundamental frequency variables than female chirps. The average value for assignment of the chirps to correct sex with Discriminant Function Analysis (DFA) of 93.8% was significantly higher than by-chance level of 52.9%. The average value of correct assignment of the chirps to individual with DFA was 79.5%, which was significantly higher than the level by chance of 14.8%. For 10 cheetahs recorded twice with time space of one or 2 years, DFA showed high values of correct assignment of the chirps to individual for both years (91.4% in the first year and 83.9% in the second year of recording), but cross-validation of the chirps recorded in the second year by discriminant functions created for the chirps of the first year showed a dramatic decrease of correct assignment to the level expected by chance (27.2%). Long-distance chirps of wild mature cheetahs provide reliable cues to sex and may also encode caller individuality, although this is not stable over time.

We have discovered that the long-distant calls of cheetahs – chirps – carry information about the sex, age and individuality (Pic.34). These calls are used for communication between members of the male coalitions, between potential sexual partners, and between mothers and cubs. Wild cheetahs from different social units may benefit from communication by their intense chirps from a distance. Potentially, recognition of caller sex and individuality by voice may help avoiding undesirable conflicts between competing social units of cheetahs, or, otherwise, to help searching mating partners. The results of our study have been published in *Ethology* (Chelysheva et.al 2023).



Pic.34. Spectrogram illustrating individual and sex differences in the far-distance high-frequency chirps of adult cheetahs over 4 years of age. Top: chirps of five males, two calls per individual. Bottom: chirps of five females, two calls per individual.

#### IV. HEALTH MONITORING

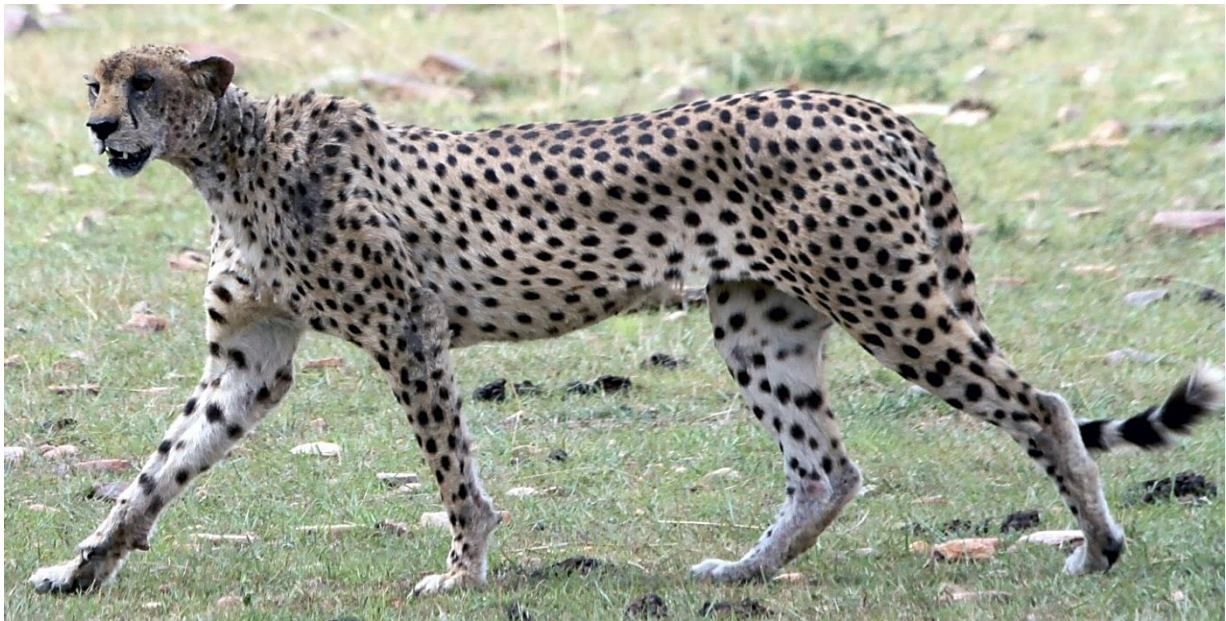
Following one of the Project objectives (i.e. *Identification of major threats to the cheetah population including health problems*) the research team performs cheetah health monitoring by direct observations and collecting photographic materials from the rangers and guides. In case of any health issues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

**4.1. 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 (Pic.36,43) 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 (Pic.36,43). Once the number of healthy gazelles increased, number of infected cheetahs decreased.

Our study revealed that prevalence of *Sarcoptes* mite in cheetah population was not associated with the studied geographical blocks, animal sex or the presence of affected domestic animals. Cheetah infection with *S. scabiei* was associated with the climatic conditions (dry more than wet season) and the balancing between the total number of Thomson's gazelles and the prevalence of infected individuals. Apparently the high prevalence of mangy gazelles has a negative effect on cheetah; this negative effect was reduced when the.

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 (Pic.37).



*Pic. 35. Son of Milele (M85) appeared from Tanzania with mange after 4,5 years of absence*

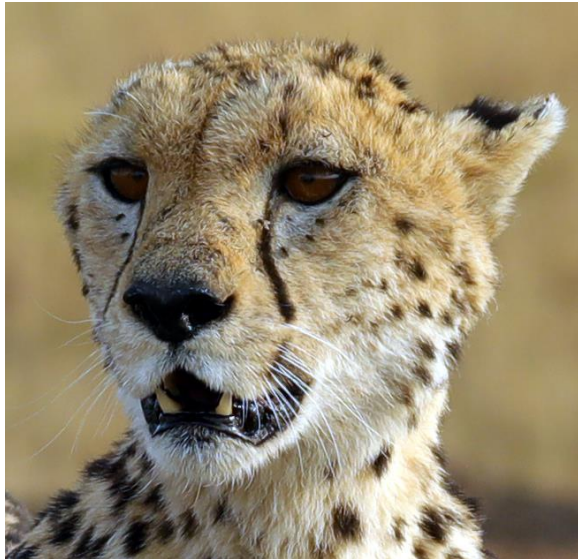


At this time, lesions of the skin on the limbs are not yet visible, but the animal often and for a long time licks the same part of the body (usually the front leg or stomach), quenching the itching. Soon, scabies affects the auricles (Pic.38), and their edges become uneven and hard, sometimes with blood clots.

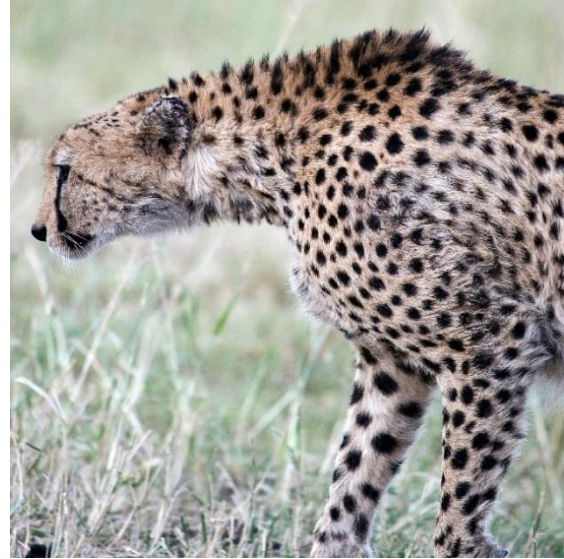
At the latest stages, the skin becomes extensively thickened, greyish in colour, there is a marked eosinophilia throughout the epidermis and dermis (the skin becomes red in colour) (Pic.39), and often almost complete alopecia. The skin cracks, dries and exfoliates exposing the unprotected tissues (Pic.40,41,42) .

*Pic.36. Thomson gazelle with mange in the Reserve*

Treatment of infected individuals in the field has been successful, although cases of self-recovery of cheetahs without intervention were observed in the Mara.



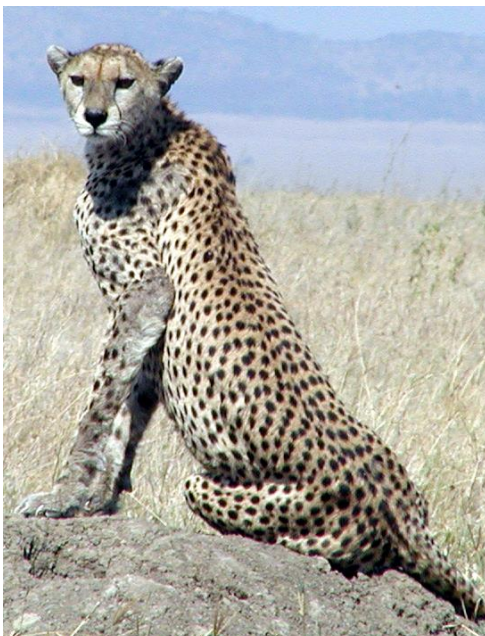
Pic. 37. First stage of mange: grey spots on the face, and ears affected



Pic.38. Second stage: head and legs affected (Pic.by D.Maatanu)



Pic. 39. Third stage of mange: red skin in the abdominal area



Pic. 40, 41. Forth stage of mange: face and large areas of the body affected. Alopecia, grey dry skin



*Pic. 42. Fifth stage of mange: skin on the dead and entire body is dry, grey, sometimes with cracks in tissues*

From 2012 to 2022, **48 (23.23.2)** 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 (Pic.35,41).



*Pic. 43. Female (F7) is feeding on Thomson gazelle affected by mange*

In all years, when cheetahs were seen with mange, Thomson gazelles have also been observed with different stages of mange in the Reserve. 2020-2022, there were Thomson gazelles spotted with mange in the Mara ecosystem. Although, we observed several zebras in one herd affected by mange in October 2022, 200m from the Tanzania border of the Reserve.

**4.2. Temporary lameness.** Regular monitoring of the physical condition of animals and their behavior helps to identify deviations and problems in a timely manner and, if necessary, provide prompt assistance. Good network built by our team with the local stakeholders (including rangers and guides) from the MMNR and the conservancies, and guides outside the Mara, gives us opportunity to respond immediately and check the status of the reported sick/injured individual and report to the authorities.

In the wild, it is difficult to detect exact event, which caused lameness in cheetahs. It can be caused by an injury of a pad by a thorn or a rock during hunting, or by dislocation of the joints due to fight or other events. Some cheetahs recover within days, some – within months. The time of full recovery depends on the stage and a cause of lameness, general physical condition of the individual, its social status, intensity of movements within the home range/territory and personal hunting experience.

For example, **Milele** (M83), who started limping in December 2022, fully recovered only in 5 months. His brother Mbili (M84) was hunting and sharing meals with his brother, which facilitated the process of recovery. Although, males have been moving intensively within 4 conservancies: from the OMC through the MNC, Lemek and OI Chorro to the Enonkishu

For a solitary cheetah with the same initial stage of lameness, it may take longer to recover. If cheetah cannot hunt on its own, supplementary feeding and treatment give positive results. For example, it took young female **Nagol** (F99) about one week to start hunting successfully after one treatment and single supplementary feeding.

Two-year-old Nagol is daughter of Neema (F68), granddaughter of Rani (F8) and great granddaughter of Shakira (Pic.3).



Pic. 44, 45. Female Nagol (F99) is limping on left hind leg (left) and on right hind leg (right)

On 17<sup>th</sup> of January 2023, we received information from the tour guides about a female who was walking with great difficulty. We found her sleeping in the bush, and within 2 hours she got up only once (by that we identified her as Nagol), and from the manner of her movement (limping on the left front and both back legs) it was suspected that she might had a problem with the spine of unknown etiology (44,45). We immediately reported to the MMNR authorities and KWS veterinarians, and the necessary assistance was provided to the female. On 18<sup>th</sup> of January, the KWS veterinarian team operating on the DSWT SKY Vet program, administered anti-inflammatory medicine with the help of a dart (without immobilization of the animal), which had a beneficial effect. (Pic.46,47). After 3-hour rest, the female moved noticeably more freely. On 19<sup>th</sup> January, the female got supplementary feeding by the MMNR rangers, and that day, walked for over 2 km. Over the course of several days of close monitoring, we watched the stiffness of her limbs disappearing, allowing Nagol travelling over 10 km and in 7 days, and hunting successfully on her own.



Pic. 46. Limping female Nagol (F99) receiving assistance from the Mara Mobile Veterinary Unit



Pic. 47. Treatment of Nagol through darting



Pic. 48. Oloti limping

In some cases, repetitive treatment and feeding is required.

On 19<sup>th</sup> of February 2023, we received information from one of the tour guides about badly limping cheetah. The guides helped us locate him near the thick bushes. The cheetah was **Oloti** (M114), he was thin, limping on his right hind leg and with several wounds on his body, apparently from a collision with a predator. He was emaciated and from his locomotion, it was clear that he could not hunt any sufficient prey and survived on hairs, which he could find in the thickets (Pic.46, 53). We reported to the park authorities and the KWS vets, and the male was assisted first with the fresh kill and next day, treated distantly by the vets from the KWS DSWT Mara Veterinary Unit (Pic.49,50). Since there were no positive changes in the male's condition, full examination was performed by the vet on 26<sup>th</sup> of February (Pic.50,51), and dislocation of the joints of his right hind limb was found. Since the male was extremely shy and preferred to spend much of his time in thick bushes and forests, he was difficult to monitor.



In the first ten days of March, Oloti crossed the river and settled in the Mara Triangle, where he was assisted and constantly monitored by the Rangers of the Mara Conservancy. By the time he crossed, he was fed and treated twice in the Reserve. In the Mara Triangle, Oloti gradually recovered, and started independently hunting variety of game (hares, young and adult gazelles) and gradually getting used to the presence of tourist cars. By 31<sup>st</sup> of March 2023, when Ruka and Rafiki (M109,M110) returned to the Mara Triangle from the Serengeti, Oloti again moved to the Reserve (See Pic.20). Despite the fact that in 5 months, he was still limping, he adapted to hunt relatively large prey – adult Impalas, in dense bush at any time of the day, including dusk hours.



Pic. 49. Oloti darted



Pic.50. Vet team at the spot



Pic.51. Examination of Oloti



Pic. 52. Oloti after second treatment



Pic. 53. Oloti is hiding in the grass

**4.3. Dental condition affiliated with age.** Adult cheetahs have 30 teeth: 16 in their upper jaw and 14 in the lower. They have 12 incisors (6 on each jaw), four canine (2 on each jaw), four molars (2 on each jaw), and ten premolars (6 on the upper jaw and 4 on the lower).

Cheetah uses incisors during grooming, hunting, feeding and rarely in fighting (biting the conspecific). Incisors and canine teeth experience significant stress when the cheetah grasps the prey (Pic.56), clings to it while taking the hunted animal down (Pic.55), strangulates it (Pic.57,58), pulls or drags it into the safe place, turns the carcass for better access to the flesh, tears it during feeding or pulls the carcass in different directions with the partner (Pic.59,60). Strong premolar and molar teeth are used for shearing and cutting up solid food (skin, muscle meat) and for crushing

bones. The molars on the top and the lower jaws, together makes up the “carnassial teeth”, which cut food (flesh and bone) in a scissor or shear-like way, into pieces before swallowing.

Physiological wearing of dental hard tissues subsequently leads to the exposure of the pulp. Gradual wear occurs during lateral excursion, the movement of the mandible from side to side as it chews through hard substances such as skin or bone. Therefore, teeth get noticeably affected with age: the amount of wear (i.e. loss of enamel and dentine) on the cusps of the teeth increases, some teeth get broken or lost. Although teeth condition can be used as an indicator of the cheetah age, in some cases this method is not reliable. For example, two coalition-mates of the same age (8,5 years) – Winda (M71) and Olonyok (M73) have different teeth condition (Pic.61-64).



*Pic. 54. Winda is catching zebra*



*Pic.56. Winda is grasping the skin on the belly of Topi*



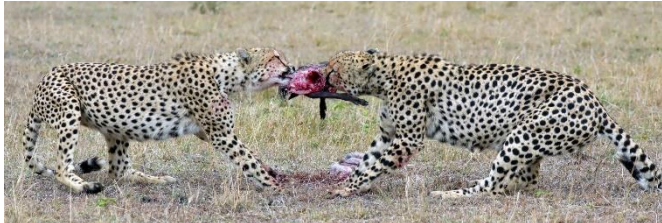
*Pic. 55. Winda an Olonyok holding Topi*



*Pic.57. Winda and Olonyok strangulating zebra*



Pic.58. Winda and Olonyok strangulating adult Topi



Pic.59,60 Winda and Olonyok pulling a kill at the end of feeding



**In Leboo** (M70) 3 mandibular incisors (301,303,403) and 5 maxillary incisors (101,201,102,202,203) are missing, while all canines are in a good condition (Pic.64).

**In Winda** (M71) 4 incisors (402, 301, 302, 303) of the lower jaw are missing, cusp of the mandibular premolar (407) is broken with the pulp exposed, both mandibular canines (304, 404) worn out by 10%, the crowns of incisors (401, 403) are worn out (Pic.61).

**In Olonyok** (M73) 3 incisors (303, 403, 402) of the lower jaw are missing, both mandibular canines (304, 404) worn out by 50%, the crowns of the canines (304, 404) are broken, and the pulp is exposed. The crowns of incisors (301, 302, 303) are worn out (Pic.62).

In 11-year-old **Hodari** (M30), the oldest male cheetah in the Mara, the crowns of incisors (301,401) of the lower jaw are worn out by 50%, and the crown of the mandibular canine (304) worn out/broken, and the pulp is exposed (Pic.63).

Such difference in teeth condition can be attributed to the type of prey, hunting and feeding strategies of different cheetahs. Usually, single cheetah (who had never been a member of a coalition) hunts middle-size antelopes with thinner skin (Thomson and Grant gazelles, Impala etc.), whereas coalition of cheetahs takes down larger prey (Wildebeest, Zebra, Eland, Topi) – animals with thicker and harder skin. Among coalition-mates, some cheetahs more often catch and hold prey, and cut the skin, while others prefer eating soft tissues whenever possible. Among 4 males (M70, M71, M72 and M73), Winda (M73) and Olonyok (M71) made more captures of large ungulates, than M70 and M72. Also, we observe Olonyok starting strangulating the prey before other males, and keep holding the neck of a prey longer than others. Broken cusp of the mandibular premolar in Winda possibly resulted from grasping the skin of fast running Topi (Pic.56) or similar case (Pic.55).

Complicated crown fractures, extending through enamel, dentine and pulp, might cause discomfort and possibly chronic pain. Although both males (M71,M73) are in good physical condition, regularly hunt and participate in courtship with different females, special attention shall be given to ensure their proper rest during day hours, and absence of disturbance during hunting and feeding time.



Pic.61. Teeth condition of Winda (M71)



Pic.62 Olonyok (M73)



Pic.63. Hodari (M30) bottom left, Pic.64. Leboo (M70) – bottom right

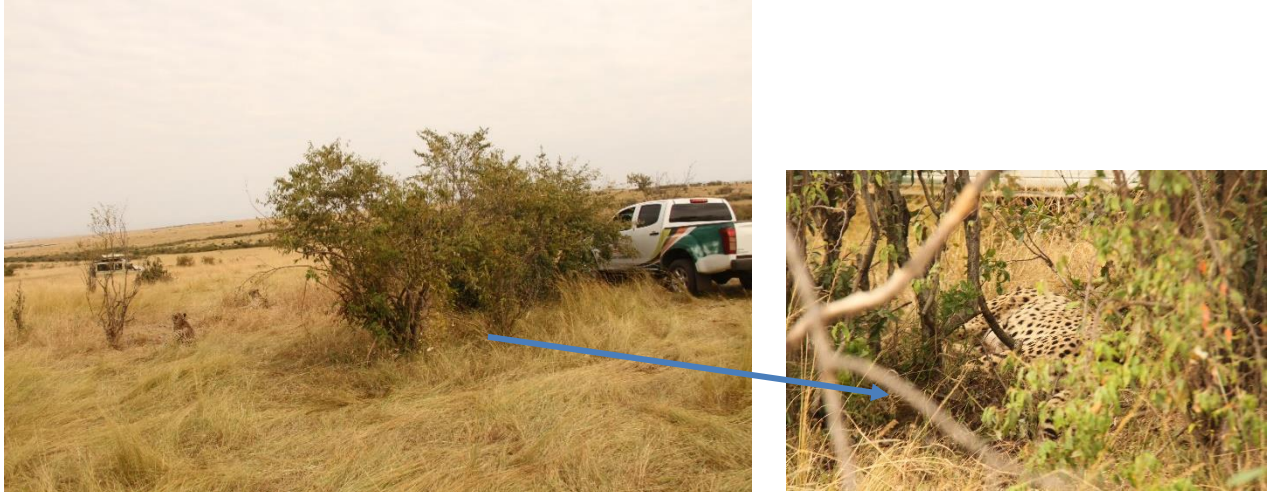


**4.4. Cases of cheetah death.** In 2022, three adult cheetah males were documented dead and one female missing. Three males (M58, M70, M72) from the famous 5-male Tano Bora coalition died: Olpadan (M58) on 26<sup>th</sup> of January, Olarishani (M72) on 13<sup>th</sup> of February, and Leboo on 28<sup>th</sup> of July. Two males have been killed at night in the same place by lions, which were found in the close proximity in both cases, although there was no witness of any of the accident. In case of Olpadan, there were lion footprints found at the spot, and deep deadly wounds on the body indicated that the cheetah was bitten by a large predator, like a lion. In case of Olarishani, his coalition-mates were found resting under the nearest bushes, and when leaving the place, were calling for Olarishani – typical behavior of the group members, who are calling others to follow. Olarishani was a male with a high hierarchical status. After separation of their ex-coalition-mate Olpadan (M58) in the end of June 2021, relationship between the 4 males became more balanced – all males began to share leadership among themselves. In the absence of Olpadan, the males acted harmoniously during hunting and bringing down the prey, and showed mild aggression only at the end of the meal, which is typical for coalition members. They also met with Nora (F42) and Nashipai (F69) twice in 2022, and they were not fighting over the females.



Pic.65. Leboo, Winda and Olonyok marking territory

**Leboo (M70)** was found by the MMNR rangers in the morning on 28<sup>th</sup> July 2022 in the bush dead, with his coalition-mates – Winda (M71) and Olonyok (M73) resting in close proximity to him (Pic. 66,67). The case was immediately reported to the MMNR authorities. KWS Mara Mobile Veterinary

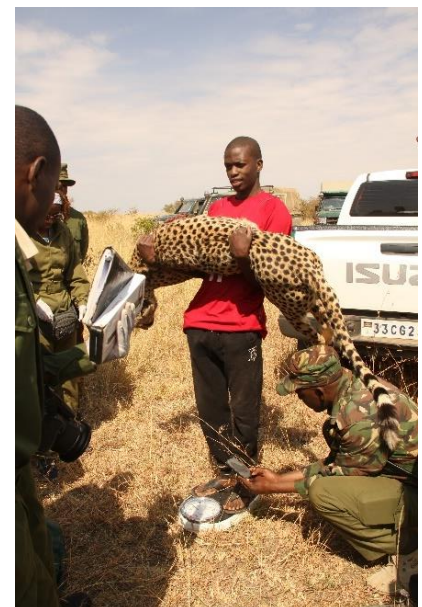


Pic.66. Winda and Olonyok resting next to the bush, where Leboo was found dead. Pic.67 Dead Leboo in the bush

Unit arrived on the scene shortly and performed full necropsy. Unlike all other cheetahs, who were attacked by the predators and therefore had multiple wounds of different size, Leboo had only two puncture wounds on both sides of the rib cage, which could be inflicted by a spear as depicted by the shape of the wounds' edges outline. Lungs were popping out through a puncture wound on the right side of the chest, and right ventral lung lobe was found punctured. The cause of death was identified as hypovolemic shock secondary to internal bleeding. It was suggested that the spear went directly perpendicular to the thoracic cage, as location of the puncture wounds were on both sides of the chest (Pic.71-74).



Pic.68. Mara authorities, KWS Mara Vet team during autopsy



Pic.69. Weighing Leboo

Whenever possible, it is important to provide family/coalition members with opportunity to check the dead individual before removing a carcass. If the dead cheetah picked up without other cheetahs noticing it, they start looking for the escaped member, repeatedly coming back to the spot where they had been together and continuously calling.

Leboo was blocked by the vehicle from his coalition-mates, and his body was safely relocated to another place for the autopsy. Neither Winda, nor Olonyok witnessed the event, and by the time of necropsy was completed, both males started looking for Leboo and calling. They were roaming in the same area 4 more days checking the spot where Leboo died, and late in the evening on 1<sup>st</sup> of August 2022, left the area.



Pic.70. A wound on the left side



Pic.71. Lungs exposed from the wound on the right side of the rib cage



Pic.72. A view to the wound on the right side of the rib cage



Pic.73. A puncture on the left side of the body



Pic.74. Close view of the puncture

## V. WORKING WITH THE MARA STAKEHOLDERS

**5.1. 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, provides rangers monitoring equipment: binoculars and rugged NIKON digital ranged photo cameras with built-in GPS (Pic.75-78) and conducts conservation workshops for them at the ranger stations and tourist facilities (Pic.79-82). 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. In 2022, MMCP team conducted 8 workshops, including several at the research base for rangers and wardens from all Mara conservancies, including newly formed. Photos taken by the

rangers with the photo cameras which we give to different rangers patrolling teams, help following cheetah movements in the Mara ecosystem.



Pic.75. Digital rugged NIKON photo camera With built-in GPS for rare species monitoring Issued to the Reserve and conservancies teams



Pic.76. Cheetah Protecting and Monitoring team (Mara Triangle)



Pic.77. Binoculars to the Mara Conservancy patrolling team



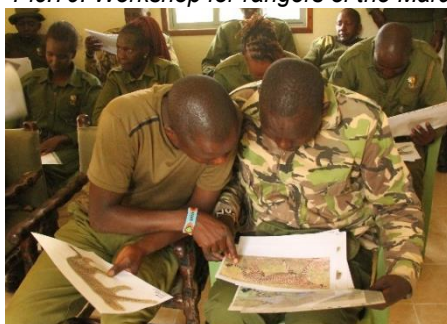
Pic.78. Binoculars to the MMNR patrolling team



Pic.79. Workshop for rangers of the Mara ecosystem



Pic.80. Workshop for rangers at Pardamat conservancy



Pic.81. Workshop at Seana conservancy



Pic.82. Workshop at Ripoi conservancy

**5.2. Greater Maasai Mara Ecosystem Management Plan and Maasai Mara National Reserve Management Plan Meeting.** By the invitation of the Narok County and MMNR authorities, the project team participated in the meeting with stakeholders and partners held at the Mara Keekorok lodge on 17<sup>th</sup> February 2023. The meeting was dedicated to updating the Greater Masai Mara Ecosystem Management (GMME) Plan and Maasai Mara Management Plan 2022-2032. It brought together all stakeholders of the Greater Masai Mara Ecosystem, including representatives of the Government of Narok, KWS, MMCA, WWF and the Mara Conservancies. The plans provide a policy framework that will guide development in all sectors of Narok County for the next ten years. MMCP team suggested several edits, including:

- Reforestation in several areas of the MMNR, including planting Croton bushes in the open areas, such as along the main road Talek-Keekorok and Talek-Naibor camp area. Bushes planted in 10-15 meters from the main roads, provide good shade to various wildlife, including ungulates, carnivores and rodents.
- Creating artificial waterhole on the side of the main road Talek-Keekorok. Such waterhole made in appr. 30 meters from the main road, will attract various wildlife and by that, provide spectacular game viewing from the main road, especially during dry months.
- Closing the side roads, which are passing by the lonely trees and small bushes in the area, and extending the distance to these bushes and trees, taking in account movement of the shade around the trees from the sunrise till the sunset. The pathway for cars shall be created in 20 meters from the shade of the tree crown at any time of the day. Such trees are often used by different animals, including cheetahs with cubs. Viewing from 20-meter distance will provide visitors with opportunity to observe animals without disturbing them.
- Promote animal-friendly guiding in the MMNR by free of charge education/training programs for the local guides.
- Improve Park Rules by adding and reinforcing the following rules:
  - \* This Reserve is a no music zone. Switch off your music while in the park
  - \* Do not make a circle around the animal, it needs to check environment for a potential danger
  - \* Turn off the engine and radio when stopped to observe animals. Keep quiet while watching animals - noise disturbs the wildlife and may irritate your fellow visitors
  - \* Do not make any noise, accelerate or start/stop an engine to attract animal's attention, respect privacy of the animals
  - \* Do not use flash/external light/headlights while photographing/filming animals, it can affect their vision
  - \* Do not separate any baby animal from the mother by driving. If you hear group members (mother/baby/coalition-mates etc.) calling being separated, immediately stop driving and switch off the engine and radio. Noise confuses animals and prevents finding each other if lost
  - \* Do not drive whenever animals are hunting. Perpetration will be equated to the animal harassment
  - \* Animals have a right of way and right to eat. Blocking any walking wild predator and approaching it before it has started eating after successful hunt is harassment and punishable
  - \* Wild cats (cheetah, leopard etc.) on/in the vehicle are strictly prohibited. Keep a distance from the cats (with cubs or without) of 25 meters, and under no circumstances do not approach cats moving towards your car, as it may encourage them climbing a vehicle.
  - \* Do not smoke near animals, leave for 100 m
  - \* Do not use drones and remote recording devices

**5.3. Regional Conservation Strategy for the Cheetah and African Wild Dog in Eastern Africa Workshop.** On 27-30 September 2022, Dr. Elena Chelysheva participated in the Eastern African Strategy for Cheetah and African Wild Dog update workshop, held at the Mpala Research Centre in Laikipia. This international seminar was organized by the IUCN and Range Wide Conservation Program for Cheetah and African Wild Dog (RWCP) and brought together more than 40 representatives of 26 international conservation and governmental organizations, and research and conservation projects from 13 countries, including: Kenya, Tanzania, Uganda, Ethiopia, Djibouti, Somaliland, South Sudan, Namibia, South Africa, Zambia, Mexico, UK and USA (Pic.88)..



The previous Strategy was published in 2007 (Pic.83), and updating has become an urgent need. Different topics have been discussed, including illegal cheetah trade to conservation challenges and measures. Several working groups were working on different parts of the Strategy, which includes:

1. Develop and implement strategies to promote coexistence of cheetah and wild dogs with people and domestic animals.
2. Provide relevant stakeholders and managers with scientific and timely information on the status of and threats to cheetah and wild dog populations.
3. Strengthen human, financial and information resources for conserving cheetah and wild dogs in collaboration with stakeholders.
4. Policy and legislation.
5. Mainstream Cheetah and Wild Dog conservation in land use planning and its implementation.
6. Promote the development and implementation of national conservation programmes for cheetah and wild dogs, by government and other stakeholders.



Pic.83. Dr. Mitchell, Coordinator of Cheetah and Wild Dog Conservation Strategy in East Africa at Wildlife Conservation Society opens the Workshop

As cheetah and African wild dog populations continue to decline in numbers and range, translocations and rewilding initiatives have been considered as conservation measures. Cheetah translocations have been conducted for over 50-years in different countries (*Chelysheva, 2011; Boast et al, 2018*), and a vast experience has been gained. However, until now there was no guidelines for conservation translocation and/or rehabilitation of cheetahs and wild dogs.



Pic.84. International teams working on updates of the Strategy



Pic.85. Discussing Objectives of the Strategy

Pic.86. Mapping cheetah and wild dogs sighting (bottom left)



Pic.87. Cosmas Wambua is presenting new Objective 4.5 for the Strategy "Conservation Translocations of Cheetahs and African Wild Dogs"

One of the great achievements of the workshop, was collaborative work of different teams, sharing ideas and experience and contribution of each member to the Regional Strategy (Pic.84-86). Cosmas Wambua, Action for Cheetahs in Kenya (ACK) Assistant Director (Pic.87), and Dr. Elena Chelysheva advised, formulated and presented to the members of the workshop additional Strategy Objective 4.5 on development of the **Guidelines for conservation translocations of cheetah and wild dog**, which was met with enthusiasm and accepted as a part of the updated Regional Strategy for Cheetah and African Wild Dog 2023-2033.

**Objective 4.** Review and harmonise existing policy and legislation, and where necessary, develop new policy and legislation, for conservation across cheetah and wild dog range at national, regional and international levels.

**4.5. Guidelines are developed and adopted for the conservation translocations of cheetah and wild dog** within three years.

**4.5.1** Create a regional group (species experts, IUCN representatives, local authorities) for advising, planning and implementing conservation translocation and/or rehabilitation and release of cheetahs/wild dogs within two years.

**4.5.2** Develop regional guidelines for conservation translocation/rehabilitation and release of cheetahs/wild dogs in line with the IUCN recommendations taking into account multiple factors (including genetics, health, welfare and chances of survival) within two years.

**4.5.3** Develop or adapt MoU in line with guidelines to support transboundary translocations.



*Pic.88. International team of the Eastern African Strategy for Cheetah and African Wild Dog update workshop at Mpala Research Center 26-30 September 2022.*

This international workshop created a strong team of species experts, governmental authorities from East African countries and international conservation organizations, who have jointly created a new document that will guide the conservation of these rare and charismatic African species for the next 10 years. It also provided great opportunity to meet colleagues, establish new contacts, share challenges in the conservation field, including illegal trade of cheetahs, and discuss ways forward and collaboration in Cheetah and African Wild Dog research and conservation.

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