



Mara Meru Cheetah Project

**ANNUAL PROGRESS REPORT**

**2021**

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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 et al. 2017). In Kenya, the cheetah is listed as an Endangered species under the Wildlife and Conservation Management Act, 2013. While much of the current cheetah range exists outside of protected areas the populations within represent important strongholds for cheetah conservation (Durant et al. 2017). In East Africa, remaining wild population strongholds occur in Tanzania and Kenya (Marker 2002), wherein Maasai Mara ecosystem holds one of the most viable cheetah populations in the country, with connectivity with Tanzania's population. 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 2021, our two research teams spent 230 days (2,530 hours) and 153 days (1,683 hours) in the field and covered 11,320 km and 10,158 km respectively. Field work included quantitative (scouting for cheetahs) and qualitative data collection (cheetah behavior observations). We collected behavioral data on 36 adult cheetahs (15 males and 21 females with and without cubs) in the Reserve and surrounding Conservancies. Below we provide data for 2021 on the Mara cheetah population trends, challenges and behavioral adaptations.

## PROJECT TEAM

**Project Founder and Principal Investigator** – Dr. Elena Chelysheva is a biologist with over 36 years of experience of working with cheetahs and studying them in captivity and in the wild. In 2001-2002, Elena was working as an Assistant Researcher at the first governmental Cheetah Conservation Project in Kenya, initiated by the Kenya Wildlife Service (KWS) in the Maasai-Mara region. At that time, Elena developed original method of cheetah identification (published in 2004), which is widely used now by different researchers. In 2008, Elena defended her PhD in cheetah ecology and behavior. Dr. Elena Chelysheva is a member of the IUCN Conservation Planning Specialist Group. Since 2011, Dr. Elena is leading the Mara-Meru Cheetah Project (MMCP).





**Senior Project Advisor** – Salim Mandela Mandere graduated from the University of Nairobi with a Bachelor’s Degree in Wildlife Management and Conservation. Before joining the MMCP, Mandela completed several projects including assessment the contributions of private ranches in wildlife management and conservation; camera trapping and data analysis; game counts; community conservation education and conflict management. He joined the MMCP as a Senior Research Assistant in 2012 and took wide range of responsibilities including field data collection and analysis, community education programs development and implementation, conducting motivation talks to Kenyan students in different Universities and schools. Working in the Project, Mandela gained vast experience and skills, which allowed him to be chosen by the local community for the

position of the Manager of the newly formed Olerai Conservancy in the Mara. At the moment, Mandela is completing his Master’s thesis (based on the data collected while working at the MMCP) at the University of Nairobi and assists our team as the Senior Project Advisor and mentor of our new assistants.

**Senior Research Assistant** – Jackson Morara Otuke holds a Bachelor’s degree in Environmental Planning and Management from Kenyatta University. His professional interests are GIS and Remote Sensing (competent in using different programs- ArcGis, Q-GIS, Snap, Open foris Collect Earth tool, Google Earth, Global mapper), spatial planning and environmental management for sustainable urban, rural and regional development while conducting research, designing and preparing development plans with environmental related programs/projects. In the MMCP, Jackson’s responsibilities include field data collection (wildlife behavior monitoring and recording), spatial analysis using GIS, developing and implementation of conservation outreach programs for the local community, rangers and local tour guides and teaching Research Assistant and attached local students GIS programs and techniques.



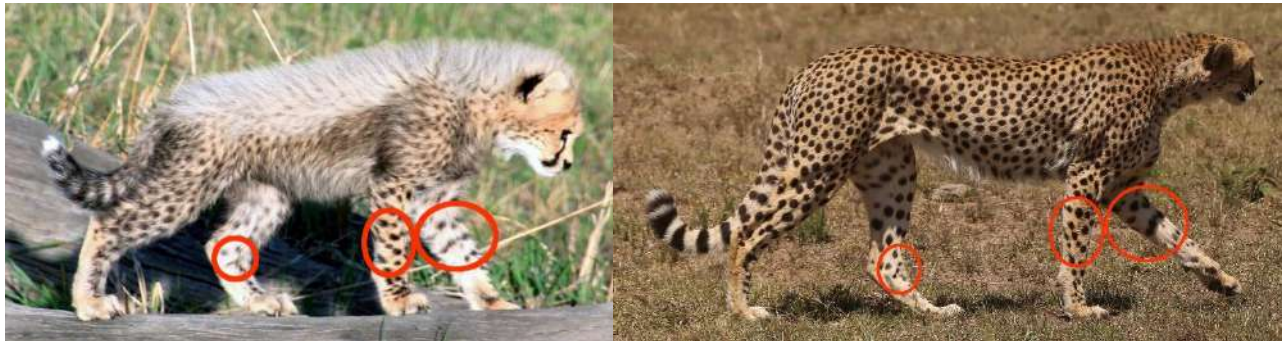
**Research Assistant** – Branson Togom Nalala graduated from the University of Nairobi in 2019 with a bachelor’s degree in the Wildlife Management and Conservation. Coming from a pastoral community, Branson took a course in the University that gave him knowledge to help his community in solving daily conflicts that arise from the close interaction of people and the wildlife. Branson’s responsibilities include field data collection (wildlife behavior monitoring and recording), developing and implementation of conservation outreach programs for the local community, rangers and local tour guides.

## I. CHEETAH POPULATION

**1.1. Database.** The database has been built on the basis of individual identification by 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. 6), where the year of birth and kinship among cheetahs (parents/grandparents/littermates) has been revealed. To date, MMCP team processed over 75,000 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.

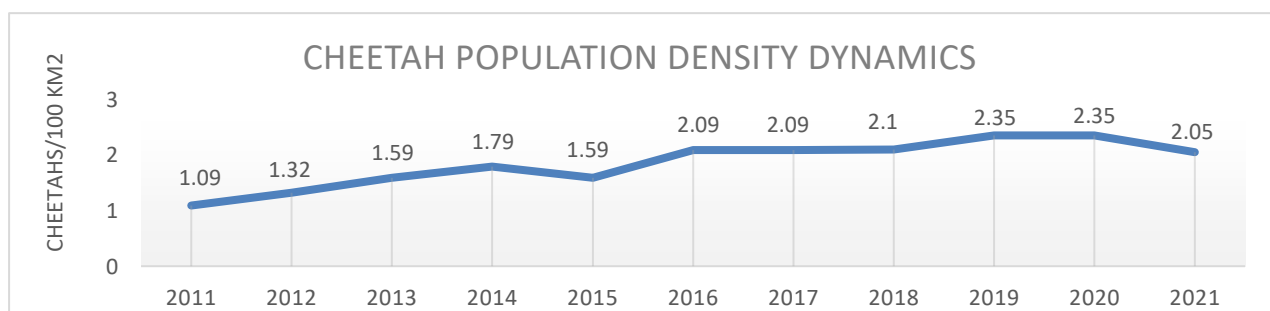
Out of **228 adult** individuals identified from **2001-to date**, **kinship between 90%** revealed (For examples see Pic.6).



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)

**1.2. Mara cheetah population trends.** 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 10 years with stability in 2016-2017 and 2019 and 2020.



Pic.3 Cheetah population dynamics

Increasing 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 of noticeable decrease in 2021 was due to the following factors:

- In 2021, 8(3.5) adults died/disappeared, out of which three oldest females aged 13 years (F7 Miale and F8 Rani) and 12 years (F3 Amani) most probably died due to an old age, and two females of the reproductive age died due to lions' attacks (F56 Kiraposhe and F84 Namelok). Also, three coalitions of two males lost one member each.
- In 2021, we haven't sighted many of the young cheetahs that have reached independence in 2020.

Number of males and females using the Mara ecosystem differed from year to year, with sex ratio deviation more towards females (45.4% out of 11 years). In 27.3% years, sex ratio was equal, and in 27.3% 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.

**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



Pic.4 Nora (F42) – one of the oldest cheetahs

**1.3. Lifespan of cheetahs.** To date, maximum documented age for males was 11 years for females was 13 years. By the last sighting in 2021, out of 29 females of reproductive age, seven females were 6 years old, and 9 females were 3 to 5 years old.

8 females, who had previously raised offspring, considered old:

13 years old: Miale (F7) and Rani (F8)

12 years old: Amani (F3)

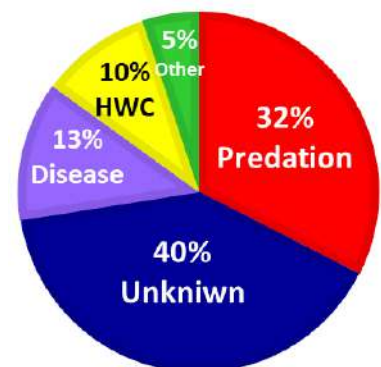
11 years old: Kakenya (F19) and Ropili (F52)

9 years old: Nora (F42), Imani (F50) and Kiraposhe (F56)

Three oldest cheetahs (F3,F7,F8) disappeared by the end of 2021, and one 9-year-old female (F56) was killed by a lion in December 2021.

**1.4. Causes of death.** Since 2011 to date, 40 (22.18) adult cheetahs died of different, mostly unknown causes (Pic.4). 32% of cheetahs lose 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. (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



Pic 5. Causes of cheetah deaths

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.

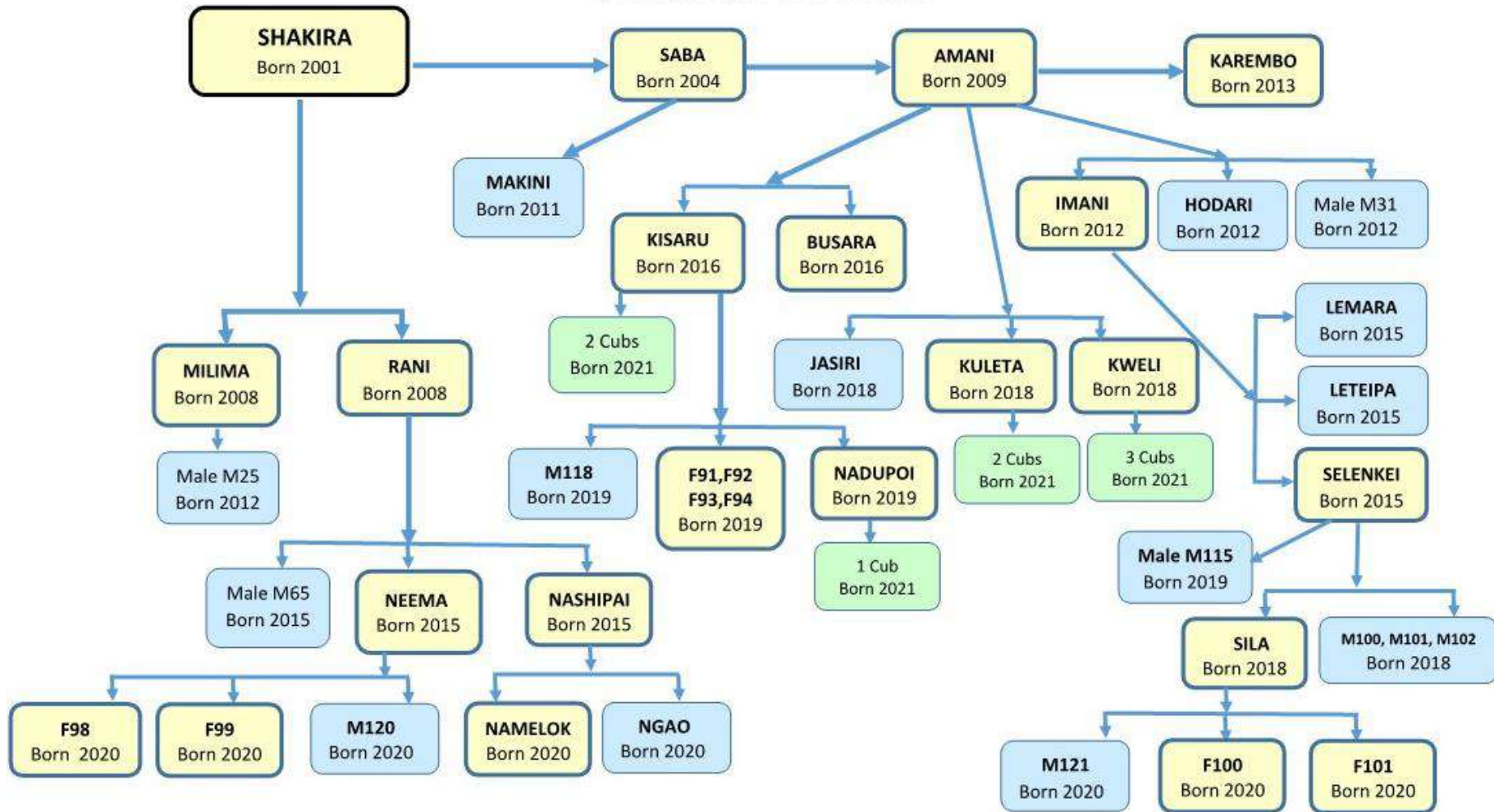
**Table 2.** Death cases documented from 2012 to date

Year	Total number	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	3 (2.1)	M58 Olpadan	Single male	7	Predation (lion)
		M72 Olarishani	One male from a coalition of 4	7	Predation (lion)
		F78 Entito	Female with 2 cubs	6	Unknown
<b>TOTAL</b>	<b>40 (22.18)</b>				

Females Amani was seen last in January 2021 at the age of 12, Miale (F7) was last seen in February 2021 at the age of 13, and Rani (F8) in March 2021 at the age of 13.

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**).

### PEDIGREE SHAKIRA'S FAMILY TREE



Pic. 6 Example of Pedigree of Shakira



**1.5. Birth and death of cubs.** In 2021, 13 females gave birth to 60 cubs in 15 litters, out of which 3 females gave birth in the MMNR and 10 females in different conservancies.

Out of 60 cubs, **58%** (n=35) died within first 3-5 months. Out of 35 cubs who have died, 26% (n=9) died in the MMNR and 74% (n=26) in the conservancies. The death rate in the Mara is lower, than in Serengeti, where it was reported 64% (Laurenson,1994).

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. To date, it was a very rare case at Lemek conservancy in October 2021, when rangers came across F90 (Nelemek) den with 7 blind cubs. The area was closed for visitors and carefully monitored by the rangers. However, due to different causes, within 4 months, Nelemek lost 6 out of 7 cubs.

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. 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". 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.



Pic.7 Closing the area of a cheetah den (top)

Pic.8 female with cubs (bottom)



Pic.9 Rangers close the area where cheetah gave birth with the road signs provided by our Project (left)



Pic.10 Road sign (right)

**1.6. Cubs raised to independence.**

In 2020, five females raised 12 (6 males and 6 females) cubs to independence. In 2021, five females raised 15 (7 males and 6 females) cubs to independence.

**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 16.8 months, n=38 litters (See Table 5), 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.

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. Males-littermates remain together for the rest of their lives in groups called “coalitions”, which may consist of up to 5 individuals. 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**

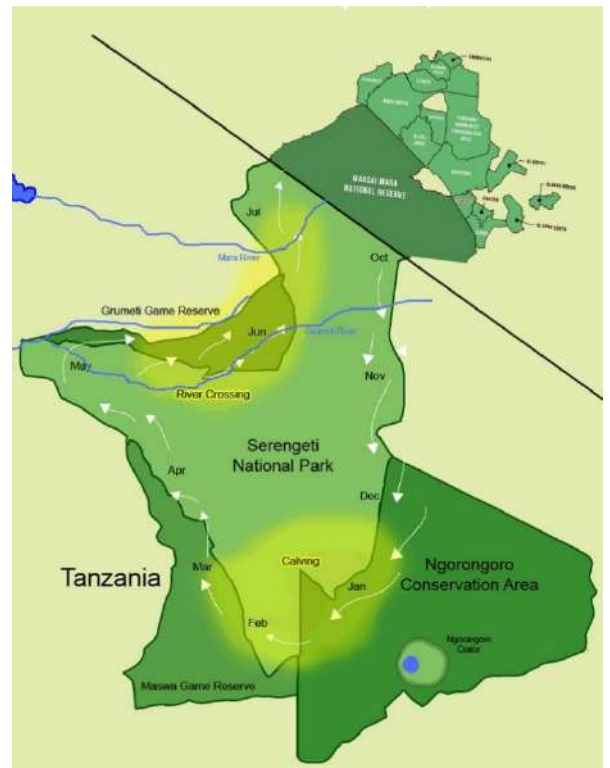
No	Lifespan of a Family (months)	No of Cubs	Sex of Cubs	Cheetah Female ID
1	23	2	1.1	F13
2	23	3	0.3	F74
3	21	2	0.2	F9
4	21	2	2.0	F13
5	20	2	1.1	F16
6	19	1	0.1	F4
7	19	5	1.4	F19
8	19	3	1.2	F3
9	18	3	1.2	F26
10	18	3	1.2	F8
11	18	1	1.0	F7
12	18	3	1.2	F51
13	18	3	1.2	F3
14	17	3	1.2	F80
15	17	2	0.2	F3
16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

Pic.11 Independent cubs of Neema (F68)

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

**2.1. Loss of habitat and fragmentation.** Habitat loss and fragmentation due to human encroachment is the strongest threat to the survival of the species in the rapidly changing conditions of the modern world. The Serengeti-Mara ecosystem which includes the Serengeti National Park and Maasai Mara National Reserve, is one of the largest and most protected ecosystems on Earth, and covers about 30,000 square kilometers.

The Greater Mara ecosystem is key to two wildebeest migrations: the Serengeti migration and the Loita plains migration. The radically expanding fencing in the central and northeastern part of the Greater Mara is already having devastating effects on the Loita plains migration to the far north of the Greater Mara ecosystem, since the fencing there is getting so dense that wildebeest could get completely excluded from this vital migration (Løvschal, Mette et al. 2017). Cheetahs (especially male coalitions and mothers with sub-adult cubs) rely strongly on Wildebeests, who arrive in the Mara with calves. Also, new cheetahs come to the MMNR following migratory antelopes from the Northern Serengeti (See our Project Annual Report 2020). So far, the free movement of cheetahs within the Serengeti-Mara ecosystem allows enriching the gene pool and makes the territory vital for the survival of the species, and its cheetah population one of the strongholds of the species. Since the Mara makes up only 7.5% of the entire ecosystem, every effort must be made to save it and its biodiversity.



Pic.12 Fenced area of the whole Greater Mara in absolute and relative coverage



In the Mara Ecosystem the size of annual home range in different cheetahs' ranges from 215 km<sup>2</sup> to 889 km<sup>2</sup>, wherein overall home range determined for three years in different individuals ranges from 485 km<sup>2</sup> to 933 km<sup>2</sup>, with similar mean for males and females – 688 km<sup>2</sup> and 644 km<sup>2</sup> respectively. Annual home ranges of different cheetahs differ in size from one year to the next on average by 30% (See our Annual Report 2019 for details).

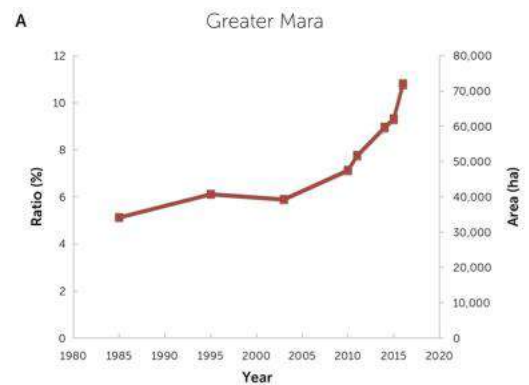
Pic.13. Tano Bora crossing the Talek river (Photo by Anthony tira)

In order to access remote areas, cheetahs cross rivers (Pic.13) and active equally during day and night time, and do not rely on the external source of light in the complete darkness (See our Annual Report 2020 for details). Within one day or night the group of males can cover 22km.

Despite the fact that a huge Serengeti-Mara ecosystem provides conditions for the survival of the species, landscape degradation at the edges as a result of human activity has a negative impact

on protected areas and wildlife. Some boundary areas have seen a 400% increase in human population over the past decade, while larger wildlife species in key areas in Kenya have declined by more than 75% (Veldhuis et al., 2019). Land privatization and fencing of thousands of hectares of communal grazing areas in East Africa became one of the most radical cultural and environmental changes in its history. The severe and costly side effects of fencing include extensive, multi-scalar habitat deterioration and fractioning of the more natural parts of the landscape into smaller, disconnected areas such as privately enclosed land parcels. Maasai Mara refers to a gazetted national reserve managed by the Narok County Government situated within this area. The remaining Greater Mara comprises smaller administrative areas, including wildlife conservancies, conservation areas and settlement areas.

Fencing is rapidly increasing across the Greater Mara, where areal cover of fenced areas has increased with >20% since 2010 threatening to lead to the collapse of the entire ecosystem in the near future. If in 1985 to 2014, fenced plots were concentrated in limited peripheral areas and few in number across the open savannah, after 2014, fences began to concentrate in expansion fronts inside the Greater Mara and filled-in areas between these fronts and peripheral concentrations (Løvschal, Mette et al. 2017). Fencing around MMNR threatens the freedom of movement of wildlife including ungulates and predators. For instance, in Talek area, the fenced areas formed a narrow cases corridor leading from the MMNR to community land located on the other side of the Talek River. In some cases, cheetahs have been seen in the dark running along the fence line in Talek on their way to the conservancies through the community area (See Pic.15).



Pic. 14 Fenced area of the whole Greater Mara in absolute and relative coverage

On 13 June 2021, at 20:00 we received a call from the local tour guide, who had found a cheetah next to Talek town running restlessly along the vegetable fence, first along one side of the road, and then along the other side along the long mesh fence. In the evening, the female crossed the Talek river and headed towards the nearest conservancy. However, once on a busy road coming from Talek, she got lost between the fences situated along the road. We immediately informed the Talek warden and together with rangers arrived at the spot. By that time, several cars were lighting up the frightened cheetah with their headlights. The traffic on the road was busy (motorcycles, trucks, cars, pedestrians). It was a young female Risasi (F84), who 10 days ago had separated from her brothers and began an independent life. We have asked all drivers to move more than 100 meters, turn off lights and engines, and keep quiet. We positioned the cars so that in the dark the cheetah could see the beginning of the corridor between the fences and find its way back to the reserve. It took female 10 minutes to escape safely. The next morning, we found Risasi in the MMNR.

To avoid disturbance by other predators, cheetahs travel at night time, covering long distances. Some cheetahs temporary become nocturnal, sleeping during the day time and become active after the sunset, around 19:00. Although cheetahs can orientate well in the darkness, on the busy roads they might be blinded by the head lights of motorbikes and vehicles, and as a result get into the road accident.

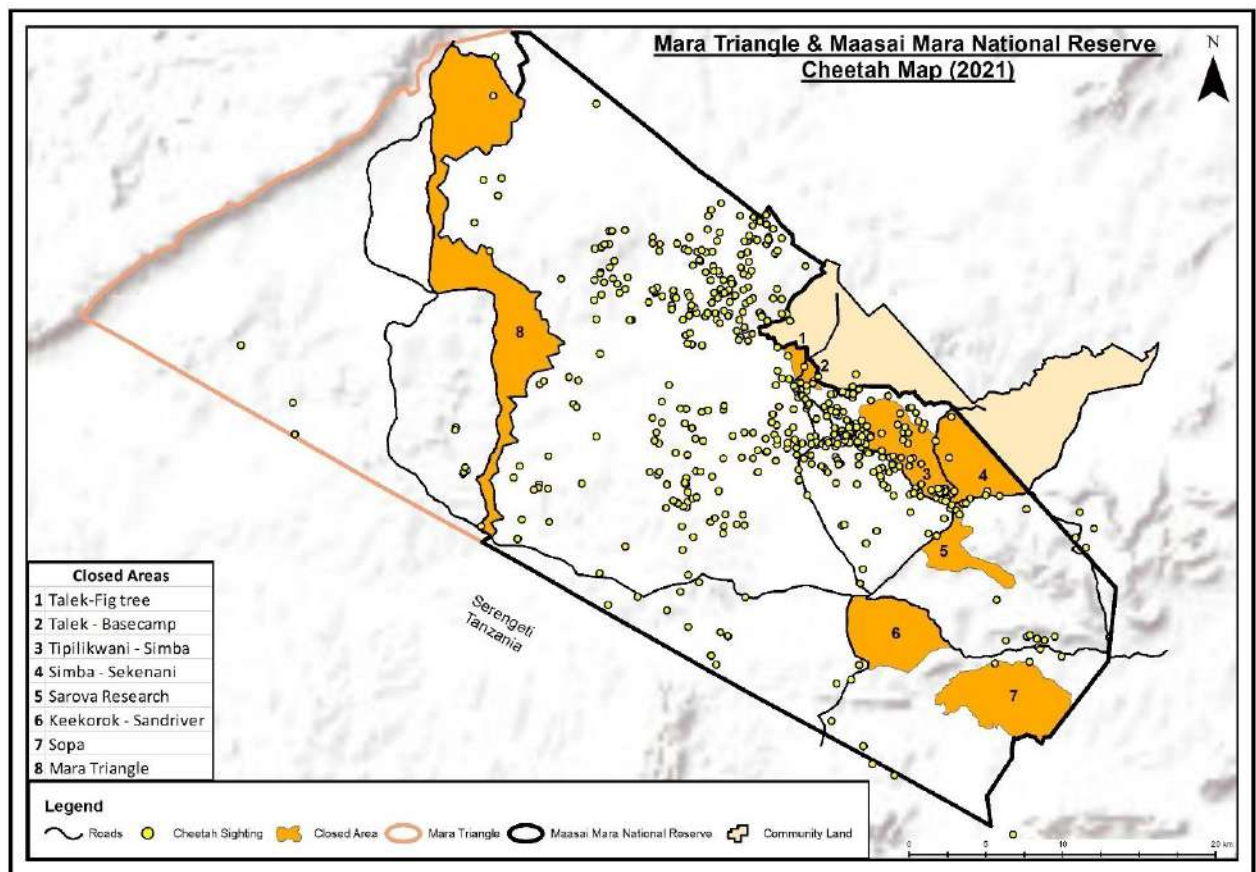


Pic.15 Risasi in Talek fenced area at 20:30 (13 June 2021)

**2.2. Territory utilization.** In order to find secure places, cheetahs move intensively. From 2012 to date, out of 203 (120.83) identified adult individuals observed in the Mara Ecosystem, 75% 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 25% (n=50, out of which 19 males and 31 females) have not been spotted in the Reserve. It should be noted that, despite the different total number of cheetahs in the Mara in different years, the percentage of individuals who did not visit the Reserve maintained within 27-28%. A higher percentage of cheetahs visiting the MMNR in 2021 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.

**2.2.1. Cheetah distribution in the MMNR.** Population monitoring is key to wildlife conservation and management. 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 (Zones 1,2,3) has been one of the most visited areas of the Reserve (Linden et al, 2020). The year 2020 has supported this trend (Pic.16-18).

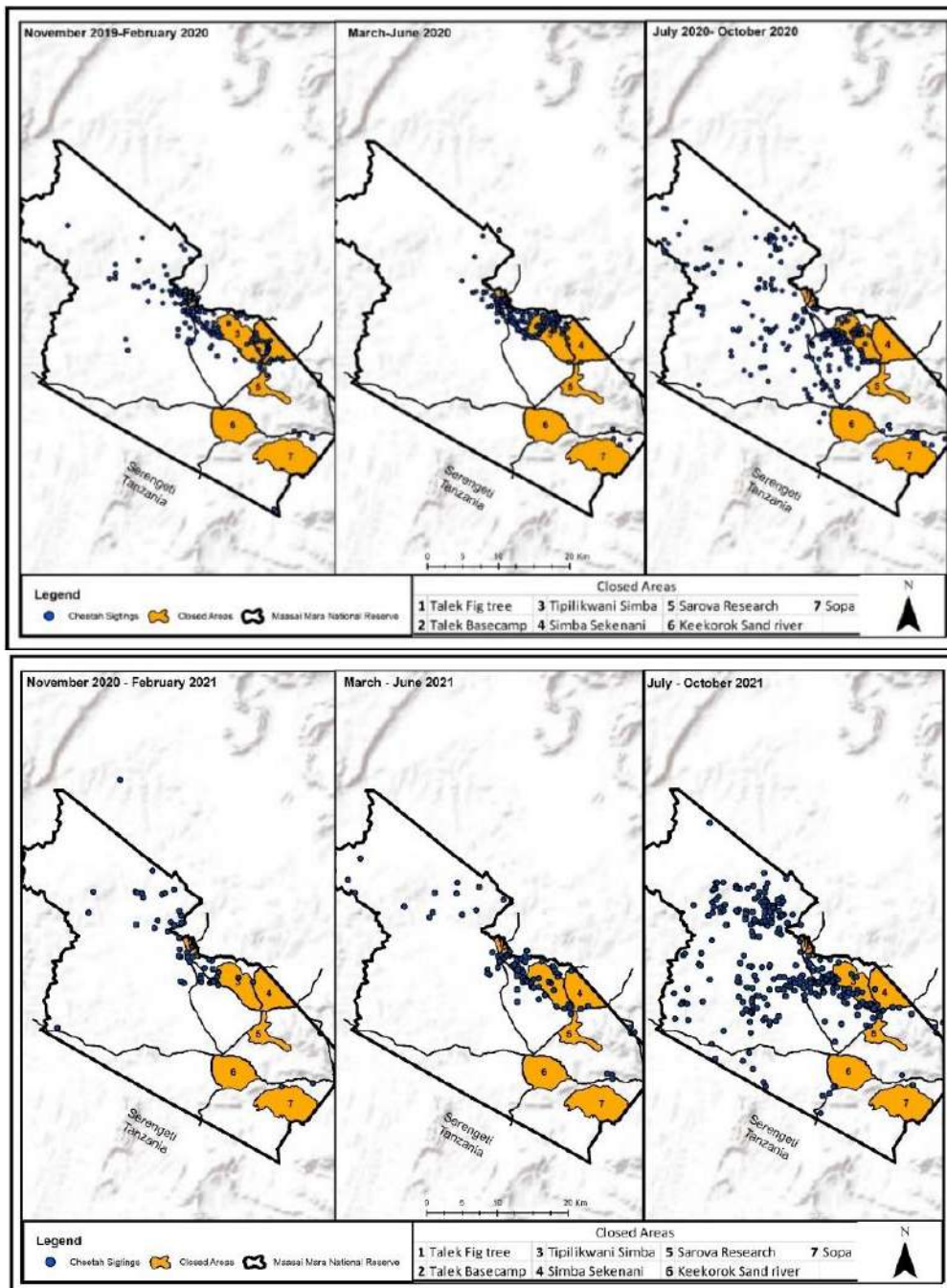


Pic.16. Cheetah distribution in MMNR in 2021

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).



Pic 17-18 Cheetah distribution in the MMNR during three periods in 2019-2022

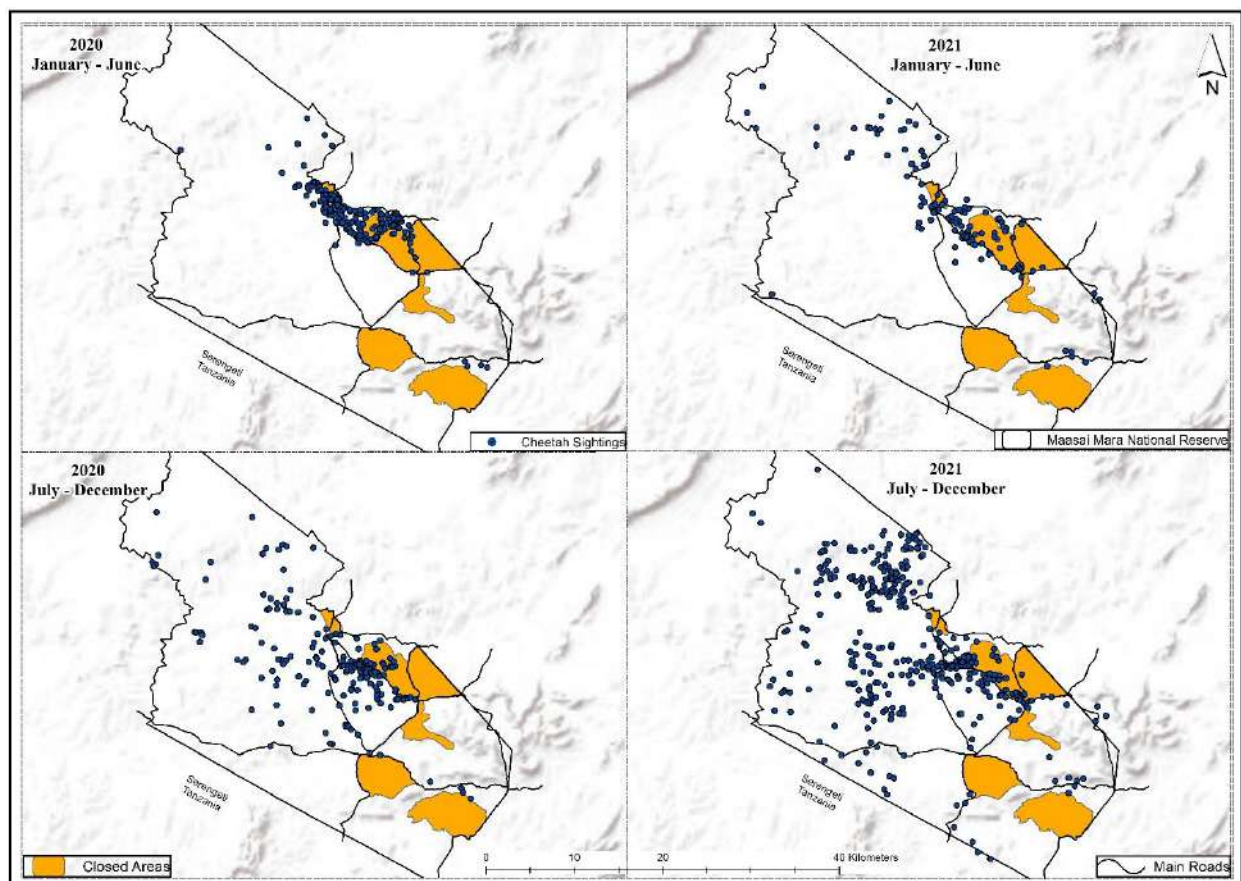
In order to follow trends in the movement and distribution of cheetahs in the reserve, we have divided the year into 3 seasons: March to June, July to October, and November to February. The period of March-June 2020 was taken as the basis, when there was a lockdown and there were no tourists in the park. Comparison of three years: 2019, 2020 and 2021 revealed a similar trend in the distribution of cheetahs in all three years. During two periods (November-February and March-June) cheetahs were concentrated in the northern part of the reserve: from Talek up towards the adjacent Conservancies and also in the southern part of the MMNR (Sopa area). Cheetahs moved to the northern part of the Reserve where grass was short and small and middle-size prey was available. 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 the distribution of cheetahs in the MMNR is not affected by tourism, but is influenced by other environmental factors.

The map above shows cheetah distribution in the Reserve in four different periods of 4 months each starting from November 2020 to February 2022. Cheetah movement on the top 2 maps is similar then increased and didn't change, remained the same from July 2021 to February 2022. In 2021 we had different females raising cubs and they were moving a lot exploring different areas of the reserve with their young ones. Wildebeest migration also affect the distribution of cheetahs because in the period from July 2021, cheetah movement spread deep to the southern part of the Reserve.

After cheetah cubs separate from the mother, they move a lot exploring different areas looking for new territories. This also led to an increase in cheetah distribution in the Reserve.

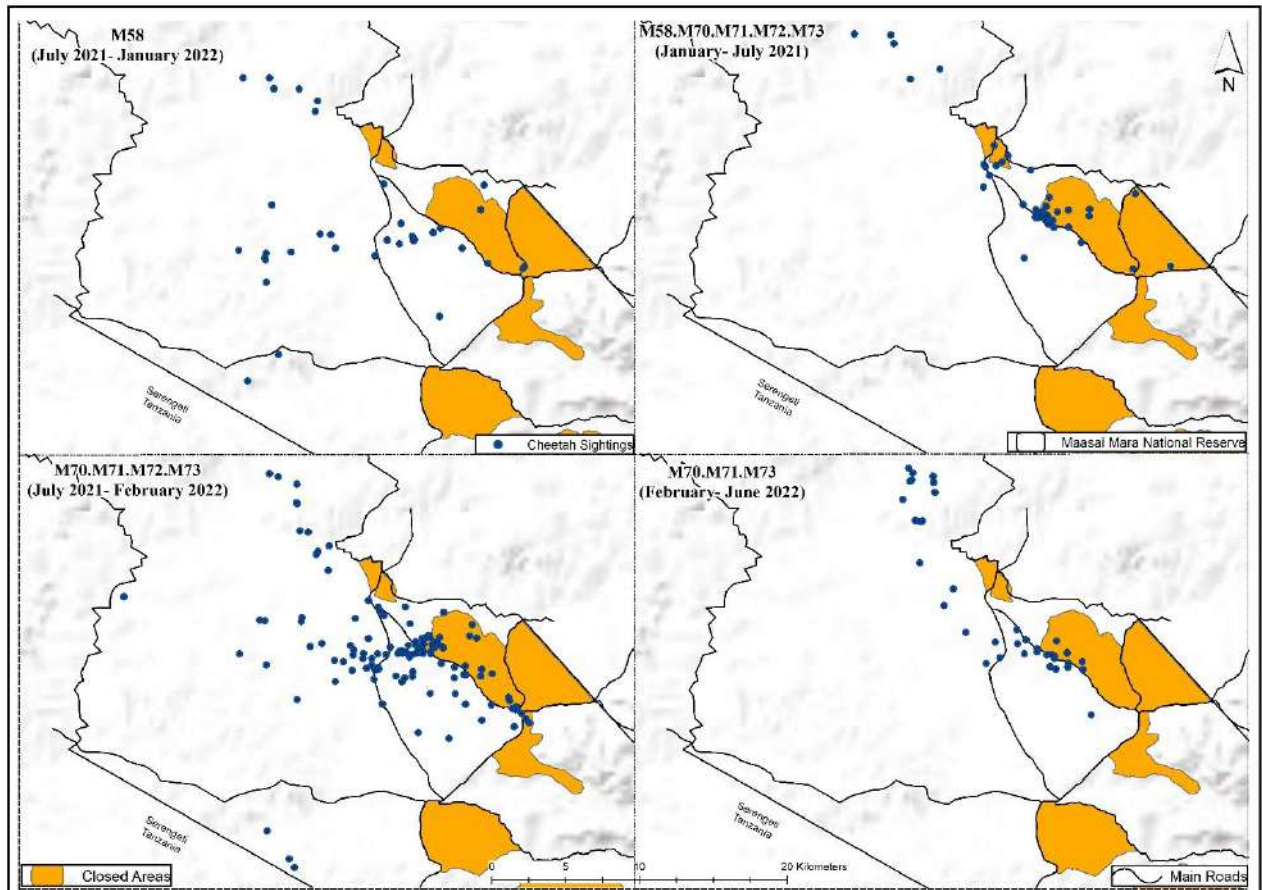
Also, in 2021, in July-October, three females with sub-adult cubs (Nashipai with 2 cubs, Neema with 3 cubs and Nashula with 3 cubs) were moving in the reserve intensively, familiarizing the cubs with different areas, so that after dispersing, young would be able to establish their territories. After Nashipai left her cubs (Ngao and Namelok) in August 2021, they were moving intensively exploring different parts of the reserve: from Maji ya Fisi towards Olkiombo and Rhino Ridge areas and later, crossed the Mara River to the Triangle side.



Pic.19 Comparison of cheetah distribution in the MMNR in 2020 and 2021 (6-months periods)

Cheetah trend and distribution within years are similar but change within a year. Between the months of January and June cheetahs are mostly concentrated in the northern part of the Reserve and Sopa area (Pic.19). From July to December, their distribution spreads towards the southern part of the MMNR, cheetahs utilize the whole Reserve. This is because of the Wildebeest migration that starts from the months of July to October.

**2.2.2. Movements of the Tano Bora – 5 males coalition.** The famous five male coalition Tano Bora are one of the main attractions in the MMNR. 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 February 2022, they have been down to three. After separation of Olpadan (M58) in June 2021, the group of 4 and the lonely male Olpadan were using the same area with the single male avoiding his ex-coalition-mates. In several occasions, they were spotted 100m away from each other. Both the 4 brothers and Olpadan would expand their territory deep into the south of the Reserve only during migration period (July to October) when Wildebeests became their major prey.



Pic.20 Comparison of movements of 5, 4 and 3 members of the Tano Bora coalition, and ex-member Olpadan (M58)

**2.2.3. Importance of the tall grass and bushes for cheetah survival.** Various types of vegetation are extremely important for all wildlife species, including cheetahs. Although cheetahs inhabit all types of terrains (desert, riverine forest, thick forests, rocky hills, bushland, shrubland, open savanna etc.) (Novel, Jackson 1996), mosaic of bushes and open plains is ideal habitat for cheetahs (Caro, 1994). Our long-term observations revealed that in the Mara, cheetahs actively use tall grass fields. Different groups (male coalition, female with cubs) and individuals of both sexes use areas with tall grass:

- To escape from disturbance by the other predators, tourist etc.(e.g. cheetah walks on the road but once gets disturbed, walks into the tall grass and disappears from the followers).
- To hunt hares, fawns hidden in the grass and adult ungulates if getting weak due to an old age, injury, lack of experience (e.g. limping cheetah sneaking closer to the antelope being not seen by an ungulate, and ambushes from a short distance).
- To hide the kill from the raptors keeping it in the tall grass helps to secure the food (although cheetah males normally do not drag a kill to a shade). Cheetahs can feed on the carcass for over 6 hours with breaks, while lying down next to it or at a distance.



- To leave the cubs in the tall grass in the middle of the field far from the roads while going hunting. In the low-used tourist areas of the MMNR and in the conservancies, cheetahs leave cubs in the tall grass while leaving for hunting for 3-6 hours
- To escape from disturbance during courtship.

It is very important to emphasize the role of savannah areas with tall grass and islands of bushes. Islands of bushes attract various animals with their shade, including hares, small and medium-sized ungulates, which can become prey for a cheetah. Cheetahs also hide their cubs and kills in the bushes from various kleptoparasites. Cheetahs prefer to rest under the bushes of the first line on the border of the forest/bushland and the clearing/field, where they have a good overview of the area. Some timid individuals and females with cubs prefer to rest in the depths of the bushes, where they cannot be seen. The shyest females spend the whole next day in the bush after a successful hunt. Their cubs play in the bushes completely silently, which is important for their safety.



Pic.21 Tall grass covers cheetahs from predators

Dense vegetation and tall grass do not prevent observations of cheetahs by the guests. In tourist areas, where cars go on safari twice a day, females bring offspring to open areas in the early morning hours (8:00-9:30) and in the evening (16:00) for 30-45 minutes, when about 4 to 6 cars arrive. In order to get the best observation / photos of a cheetah family, the following rules must be observed: not to drive around the cheetahs, keep the distance prescribed by the Rules, keep the engine and radio turned off, not make any noise or attract the attention of cheetahs.

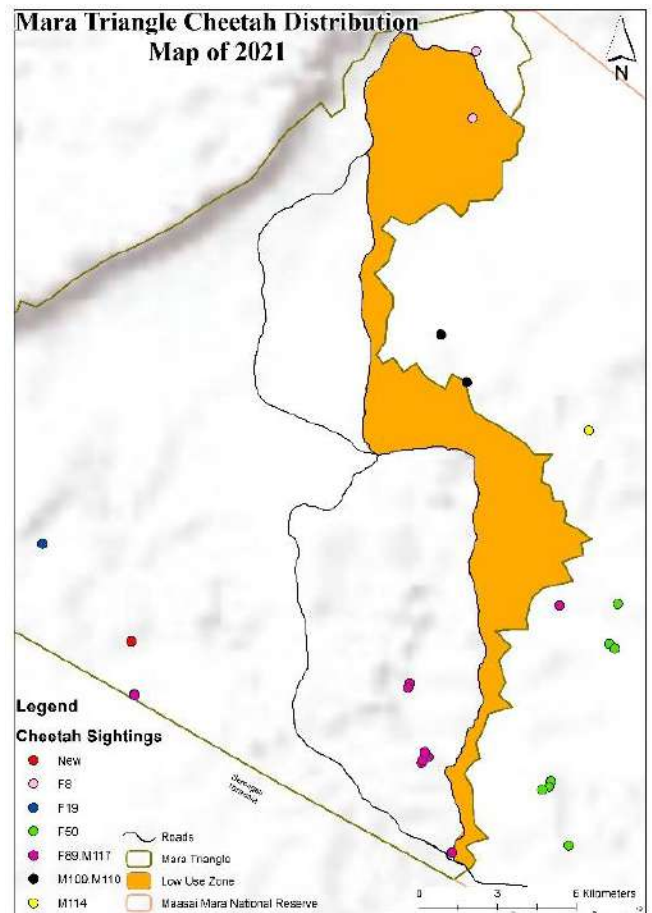
Open vast fields with short grass with no bushes are dangerous for vulnerable cheetah, because they do not provide the shade for travelling and the shelter for hunting cheetahs, exposing them to other predators. Mothers cannot leave the cubs for long hours of hunting, or bigger cubs to watch and learn mother's hunting techniques.

It is important to point out that all Closed areas of the MMNR have mosaic of savanna and bushes, therefore providing for years habitats appropriate for different wildlife species including cheetahs. However, there are certain areas of the MMNR that would benefit from having bushes in the middle of open fields. As reforestation programs continue in some areas of the Mara ecosystem, we propose that this program be extended to the MMNR.

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

Female Imani (F50) was spotted at the river side of the reserve, but not in the Mara Triangle, although in 2020 and 2022, she used both territories: MMNR and the Triangle. However, in the beginning and in the mid 2021 she was raising two litters in the MMNR, and after losing the second one, went to Olare Motorogi Conservancy.

Also, there were a few sightings of unidentified cheetahs (referred as New, see Pic.22) in the Mara Triangle, close to the Tanzanian border.



Pic.22 Cheetah distribution in the Mara Triangle



Pic.23-24 Cheetahs in the Mara Triangle

### III. CHEETAH BEHAVIOR

**3.1. Courtship.** From August 2021 to April 2022, we observed 5 events of cheetahs' courtship, including one with mating:

- 1) Mkali (M66) and Mwanga (M67) with Nora (F42) on 26<sup>th</sup> and 27<sup>th</sup> June 2021
- 2) Tano Bora males (M70, M71, M72, M73) with Nora (F42) on 29<sup>th</sup> June, 1<sup>st</sup> and 2<sup>nd</sup> July, 2021
- 3) Tano Bora males (M70, M71, M72, M73) with Nashipai (F69) on 11<sup>th</sup> and 12<sup>th</sup> August 2021
- 4) Tano Bora males (M70, M71, M72, M73) with Nashipai (F69) on 23<sup>rd</sup> April 2022
- 5) Olchorre (M81) with Neema (F68) on 28<sup>th</sup>, 29<sup>th</sup> January 2022.

In the first four cases females (F42, F69) were not receptive, no mating was observed and males lost interest in females on the second or third day of courtship. During interactions with females, the latter displayed aggression towards the males, while males were aggressive towards each

other, except for Mkali (M66) and Mwanga (M67) when they were with Nora (F42). Four males of the Tano Bora coalition were fighting with each other for 4-6 times a day, while the female was displaying defensive behavior: she lay on her side or on her back and fought off the approaching males with hissing and loud vocalizations. It is important to note that no cheetah got injured during these aggressive interactions.



*Pic. 25 Mkali and Mwanga with Nora (in front, upper photo)*

*Pic.26 Nora sitting on the left behind Mkali (left photo)*



*Pic.27-28. Tano Bora males fight over Nashipai*



Pic.29 Two males of the Tano Bora coalition with Nora (right)



Pic. 30 Four Tano Bora coalition with Nashipai (in the middle)

**3.1.1. Mating of cheetahs: Neema and Olchorre.** Females with adolescent cubs come into estrus and can mate with one or more males. Since the territories and home ranges of males and females overlap, they have opportunity to meet numerous partners. Some single males are more successful than others and manage to mate with different partners. For example, Olchorre (M81) mated with Neema (F68) and Sila (F80) in the beginning of 2022.

On 28<sup>th</sup> and 29<sup>th</sup> January 2022, 6-year-old Olchorre encountered 7-year-old Neema, who was accompanied by her three 14-months-old cubs. Neema was in estrus and early in the morning on 28<sup>th</sup> January was seen calling, although her cubs were with her. Most probably, the female was aware of the male presence in the area. This couple was in courtship in August 2018, when she was 3 years old. Partners know each other and quite possibly can show preference of the partners in the wild, like they do in captivity. Short after Olchorre appeared in the area, the couple mated. In total, from 7:30 to 18:30 they mated three times (last time at 14:45). Behavior of the female after copulation (intensive



Pic.31. Neema with cubs and a male Olchorre

rolling) revealed successful mating. During the period of active courtship, partners do not hunt: females do not hunt because males hold them, and males do not leave the female, apparently so as not to lose the opportunity to mate with her. However, in case of female with cubs, maternity instinct makes the female hunt for them. Whilst Olchorre was following Neema untiringly, she successfully hunted subadult Impala and brought it to her cubs. While all family was feeding, Olchorre was trying to mount the female (Pic.32), but eventually joined the family, which shared a meal with him. This turned out to be beneficial for the male as well. In 1.5 hours after feeding, the couple successfully mated.



Next day, at 9:44 female left the cubs under the bush close to the previous day place, and led the male to the rocky area in 1km from the cubs. The couple came back in 5.5 hours. Till evening, the male was following the female close. On the third day, the male was found in 4 km from the family, which also moved from the area of courtship.

*Pic.32 Olchorre mating with Neema*

Although cheetahs are very secretive animals and most of mating happens with no witness, from 2017 to date, there were 9 cases of the day time mating observed in the Mara:

- 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



*Pic.33-25. Leboo mating with Miale*

### 3.2. Cheetah interactions with other predators.

As territories of predators overlap with territories of cheetahs, different species interact on the regular basis. By observing mother's reaction onto any creature appearing at any distance or approaching the cheetah, cubs learn the degree of danger and correct reaction, which will contribute to their survival: hide, crawl/run away, attack, etc. That is why it is vitally important to provide cheetah mothers with cubs appropriate space to observe surrounding areas to be able to notice the danger and act accordingly.

**3.2.1. Cheetahs and jackals.** It is not known if jackals in the Mara directly affect cheetah survival by killing small cheetah cubs, but they indirectly affect cheetah welfare by attracting attention of other kleptoparasites to cheetah' kills. Jackals often disturb resting cheetahs, or follow the walking cheetah with barking as long as felines are still in the jackal's territory. Adult cheetahs usually do not pay attention to them while eating, and may begin to drive them away if they themselves are already full. Some jackals Olchorre act in teams trying to distract cheetah from a kill and by that to get an access to the food.



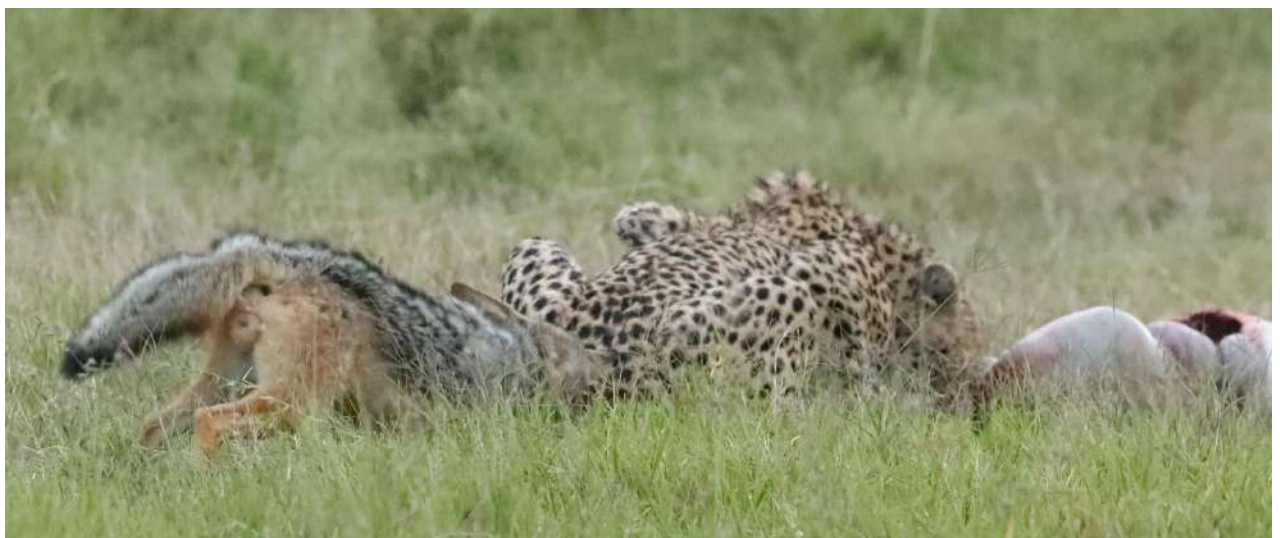
*Pic.36 Jackals distracting Neema's feeding*

For example, we observed a jackal constantly attacking Neema (F68) from behind, and biting the tip of her tail, while other 3 jackals were trying to bite from a kill. Neema turned out to be patient and experienced – she only slightly scares away the annoying jackal, not moving away from the carcass. This helped the female save the food.

One of the challenges of hunting in the evening for a cheetah is the encounter with predators that can take over the prey. Often jackals are the first to discover the cheetah feeding and by loud barking attract attention of the hyenas, who immediately ran to the carcass from afar.



*Pic.37-39. One jackal is biting Neema's tail while the other one is trying to approach her kill*



In some cases, cheetahs let jackals feeding from the same carcass close to (opposite) the cheetah. By that, cheetah reduces chances to be discovered by hyenas attracted by barking jackals. Jackal following a potential hunter gets opportunity for scavenging from a cheetah kill as cheetahs

hunt in presence of jackals. Therefore, for both species, sharing a kill is one of the survival strategies.



Pic.40-43. Cheetahs tolerate jackals, but leave when hyenas approach



**3.2.2. Cheetah female with cubs and hyena.** Of all predators, lions and hyenas pose the greatest threat to cheetah cubs in the wild. It is especially difficult for cheetah families during feeding time, because kleptoparasites, for example, hyenas, can appear at the spot at any time of the day. Being successful hunters, spotted hyenas do not miss the opportunity to take cheetah's prey, they also kill and eat cheetah cubs. Therefore, female cheetahs use different strategies to survive. They drag a kill sometimes for over 100 meters to the thick bush. In the open area, they hide a kill in tall grass or in a shallow depression in the soil, and open abdomen last. If a female with a kill notices a hyena in an open area, she prefers to draw the predator's attention to her food and sacrifice it in order to save the life of her offspring. Hearing mother's growling, cheetah cubs usually crawl or run away to a safe distance while the mother deals with the intruder. For example, when Selenkei (F67) with 5-months-old cub had almost finished eating Thomson's gazelle, she spotted a hyena in about 300 meters. She sat down and began to howl along with the cub, and then made loud calls, which quickly attracted the attention of a hyena at the other end of the field. When hyena began to approach, the cub ran away, crouching and remaining unnoticed, while the mother continued to sit, drawing attention to herself and food. At some point while hyena was still far away, Selenkei raised the kill and dropped it, clearly exposing it to the hyena. Only after the hyena grabbed the carcass and carried it away, Selenkei rushed to her cub. While the hyena was busy eating prey, a family of



Pic.44. Selenkei attracts attention of a hyena to the kill

cheetahs walked safely across the field. Even at the age of 5-6 months, cheetah cubs are vulnerable to hyenas, and if cheetah mother was walking in the field, it had high chances to be spotted by a hyena. By attracting hyena's attention to the kill, cheetah mother saved her cub's life.

**3.2.3. Cheetah female with cubs and lion.** If the lion has not noticed an adult cheetah, the cheetah tries to hide and wait until the predator leaves, or carefully crawls away, trying to remain unnoticed. However, if the female has cubs, she may head towards the lion in advance to draw attention to herself and move away from the cubs. Unless cubs are disturbed (for example, by moving cars or by started engine), they will stay still and wait for their mother's call to follow her. Olchorre Any disturbance can force cubs to run from the place they were secure, and by scattering over the place, get noticed by a lion. Once the lion had spotted the cheetah cub, it will make every effort to catch and kill it. In this case, the little cubs have no chance of survival.



Pic.45. Siligi noticed a lioness while feeding with cubs

When 6-year-old Siligi (F63) was sitting under a bush next to a kill with her 5 two-month-old very shy cubs. The cubs had already eaten and were playing next to the carcass when the female noticed the lionesses from afar (Pic.45). She began to eat greedily. Soon the lioness appeared 100 meters away, attracted by a group of vultures waiting for the Siligi family to finish their meal. Siligi rushed to the lioness and chased her away. At that time, cars switch on engines, and all cubs rushed down to the bushes. However, there were several more lions in the area – 3 adult females and their cubs. According to one of the guides, one of the lionesses grabbed Siligi's cub and carried it into the bush. Siligi did not see what happened, and loudly called the cubs, and then began to lead them away from the lions. The next day, she twice returned to the scene, surveyed the area from the elevated points calling for the lost cub.



Pic.46. Siligi is running towards lioness





*Pic.47-48. Siligi is approaching the lioness to lead her away from the cubs*



*Pic.49-51 Siligi is hiding and runs to the lioness*



*Pic.52. Siligi is leading her cubs away*

**3.3. Male coalition split, separation of members.** If there are several males in a litter, after reaching independence, they remain together for life. Sometimes the coalition accepts unrelated members, towards whom the brothers show both affiliation (friendly) and aggressive behavior. Such a voluntary union lasts as long as it is beneficial to each member of the group. However, in the wild, certain circumstances can lead to the collapse of the union, for example: territorial dispersal of members attacked by other predators (including conspecifics), the desire of an unrelated member to form a coalition with another male, or competition for a female, as a result of which the male leaves the group, following for the object of courting. Unions made up of unrelated individuals are temporary and can quickly disintegrate.

**3.3.1. A case of Chai Boys.** It is not yet known if the Chai Boys (M105, M106, M107) were relatives, but since their emergence in the MMNR in October 2019, the three shy males have spent 11 months together actively exploring the Mara. On September 20, 2020, we met only one of them - the male M107, who was trapped by a coalition of two males - Mkali and Mwanga (see our Project Annual report 2020). Since then, we have not seen any of the Chai Boys.



In June 2021, in the MMNR we observed only one member of the Chai Boys group – a male M105. He was still shy, but successfully hunted in the presence of four vehicles. The recent sighting of M107 gives hope that all three males are alive. Further research will help to understand whether the Chai Boys are relatives or whether the young males have united only for a short time.

*Pic.53-54 Chai Boys M105 leading (March 2020, above) and M105 alone (17 June 2021, left)*



Our long-term observations reveal that males in coalitions split when in courtship – one member leave a group searching for a female/following the one. After two-three days of absence, he starts looking for his coalition and rejoins it or his coalition-mate.

**3.3.2. A case of Mkali and Mwanga.** Young males were first sighted in the Mara Triangle in June 2019. Since the males were not similar to each other (very likely not siblings or had different fathers), we named them accordingly: the male with large bright spots was called Mkali (bright),



Pic.55. Mkali (behind) and Mwanga

and the other with small spots Mwanga (light). By the end of the year, the brothers wandered along the far side of the Reserve – in the Tipilikwani-Talek area, and later explored the Olkiombo - Rhino Ridge areas, where they shared the territory with the sons of Rosetta Ruka and Rafiki. Like some coalitions Like some coalitions in the Mara, sometimes Mkali and Mwanga would split up while courting the females, and then reunited again. On April 28, 2021 Mkali (M66) was spotted alone at Ilkeliani area of the MMNR, calling for his coalition-mate, and very next day together with Mwanga (M67).

On September 25, 2021 Mwanga was found alone at the Rhino Ridge area of the MMNR, he had big injuries (Pic.62-63). It was not clear when he had lost his coalition-mate, but since then Mkali has never been met again. Mwanga was treated and recovered.

**3.4. Social interactions of different males – temporary unions.** The cheetah is a highly adaptive and social species: as long-term observations in nature have shown, males are able to form not only permanent, but also temporary alliances with unrelated males. Such unions last as long as it is beneficial for each member. In the Mara, we observed three cases of such temporary unions (Pic.56-58):

- 1) in 2016 between coeval 1.5-year-old two sons of Imani (M62, M63) and the son of Nora (M64);
- 2) in 2018 between 1.5-year-old son of Miale (M85) and 2-year-old Olchorro (M81);
- 3) in 2021 between 1.5-year-old Kijana (M116) and 6-year-old Olpadan (M58).

In all cases, the union lasted no longer than a month.



Pic.56. Son of Miale with Olchorro



Pic.57 Olpadan with Kijana



Pic.58 Son of Nora with two sons of Imani

**3. Social interactions within male coalitions. A case of Olpadan and Kijana.** In December 2016, four males accepted unrelated male Olpadan (M58), who soon became a leader of the group named Tano Bora (Magnificent Five). Since that time to date, we have been observing development and changes in relationship between the members of this unusual union. In most cases, the dominance hierarchy in the male coalitions is relatively stable, and members usually step aside when confronted by the leader. However, if the leader is weakened by injury, disease, or senility, the shift in ranking may occur and the individual with the highest rank will move downward to the lowest position. During intraspecific fights, cheetah males target inguinal area of rivals and there have even been cases where males have bitten and cut off the testicles of intruders in the wild, there are known cases of coalition-mates killing and feeding on the carcass of the intruder, as, for example, in Phinda Resource Reserve in South Africa (Hunter & Skinner 1995).

Olpadan was keeping leadership for 4.5 years, often fighting with the other members. His dominant status began to waver around the beginning of 2019, when two members of the coalition, Winda and Leboo, began to attack him on a regular basis. In two cases, the fight happened during the courtship with different females. One fight in mid-March 2019 resulted in a serious injury to one of Olpadan's testicles. Orchiectomy was performed by the KWS veterinarian Dr. Limo on 18 March, 2019, when one testicle was removed. From the decision maker and leader of the group, he became the last in the chain and the last one to join the meal. Since that time, leadership has been shared mostly by Olarishani, Winda and Olonyok. Being the lowest-ranking male in the group, Olpadan often followed the group at the end of the chain and was the last to start eating. Interestingly, Olonyok, whom Olpadan had attacked before, demonstrating reverse aggression, was the one who allowed Olpadan to eat next to him and who was engaged with ex-leader in mutual grooming after eating. In 2020, he tried to join the Mwanga and Mkali coalition, but the males did not accept him.



Pic.59-60 Olpadan with Kijana



In mid-June 2021, Olpadan finally separated from his coalition in Naboisho, where the Tano Bora coalition had formed, and began a lonely life. The four members of his ex-coalition waited for Olpadan for over 3 weeks, and eventually began to travel again. While Olpadan was limping, he created a temporary union in Naboisho with 1,5-year-old male Kijana, the son of Kuahidi. Kijana was the only cub in the litter who survived to independence. Mother left him in February 2021, and he began traveling alone through the conservancies. In June 2021, he was seen in Naboisho, then in Olerai conservancy, and on 30 June in the reserve with Olpadan. Males behaved like long-term partners from the same coalition, displaying affiliative behaviors: joint feeding and rest, social grooming, following etc.

From Serengeti cheetah study it is known, that for the formation of unions of males, two conditions must be met: the males had to be previously members of coalitions and have lost partners, and their age should not exceed 20 months – adult males see each other as competitors (Caro, 1994). Olpadan was over 6 years old and was able to form mutually beneficial alliance with unrelated male. For young Kijana, an alliance with an experienced partner was also beneficial: Kijana was exploring the reserve. For some time, we observed Olpadan limping, and having a partner who was hunting and sharing food with Olpadan, was beneficial for the adult male. By the end of July 2021, Olpadan's alliance with Kijana fell apart, lasting around one month. Olpadan was not limping anymore. Kijana returned to Naboisho alone, and on July 23, 2021 met his mother Kuahidi in the adjacent Olerai conservancy. She was not very friendly towards her son when he got too close, but they shared a kill next day.



After separating from Kijana, Olpadan began solitary life, avoiding meetings with 4 males. He briefly settled in the Survey area of the Reserve, successfully hunting wildebeest calves. Apparently, he avoided encounters with other cheetahs, as he made no attempts to approach either females or 4 males when saw them from a distance. On July 23, 2021 he was chased by Nashipai (F69) as soon as she noticed the male.

Pic.61 Olpadan after leaving Kijana

#### 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.

In 2021, two males were injured (M67 by a predator and M58 by his ex-coalition-mates), both were treated by the KWS Mara Vet Unit. Within 4 months (mid-December 2021 to mid-February 2022) four cheetahs (2 males and 2 females) of the reproductive age died due to predators' attacks. Below, we describe several cases which took place in 2021 and in the beginning of 2022.



##### 4.1. Injuries: Mwanga (M67)

On September 25, 2021, we found 5-year-old Mwanga injured. The deep wound on Mwanga's thigh was not fresh, and was located in a place where the cheetah could hardly reach to get rid of necrotic tissue. To avoid infection of the wound, the KWS Mara Vet Unit Dr. Limo provided assistance. Over time, the injured muscle tissues recovered, the wound healed, and a barely noticeable scar remains in its place.

Pic.61 Mwanga injured

From the very beginning of recovery, the male hunted independently. With only about 7,000 cheetahs left in the wild, the life of this male of reproductive age is extremely important for both the Mara population and the species as a whole. Having lost a partner, Mwanga successfully hunts and still patrols the areas where he was with a partner, and where he has a high chance of meeting different females and contributing to the genetic diversity of the cheetah population.



Pic.62 Treating Mwanga



Pic.63. Mwanga with wound and fully recovered

#### 4.2. M58 encounter with ex-coalition-mates.

It is known that cheetah males in coalitions kill lonely intruders. During our 10-year behavioral observations, we have witnessed encounters of single males and coalitions in 11 cases, with short and long fights, and only in one case males caused serious damage to a lonely male – it was the ex-leader of the Tano Bora coalition – Olpadan (Pic.64-70). On 25<sup>th</sup> July 2021, when he appeared in the territory that the Tano Bora coalition regularly patrolled, four his ex-coalition-mates attacked him and seriously injured his right eye and tail. Dr. Limo (KWS Maa Mobile Vet Unit) performed emergency



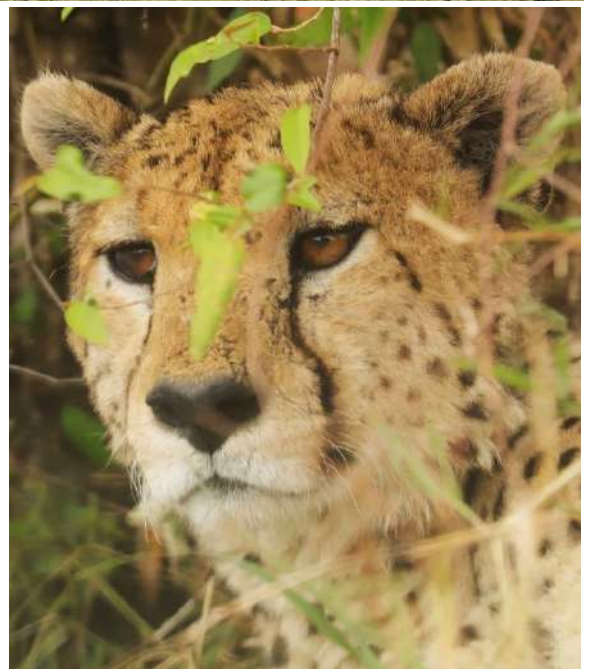
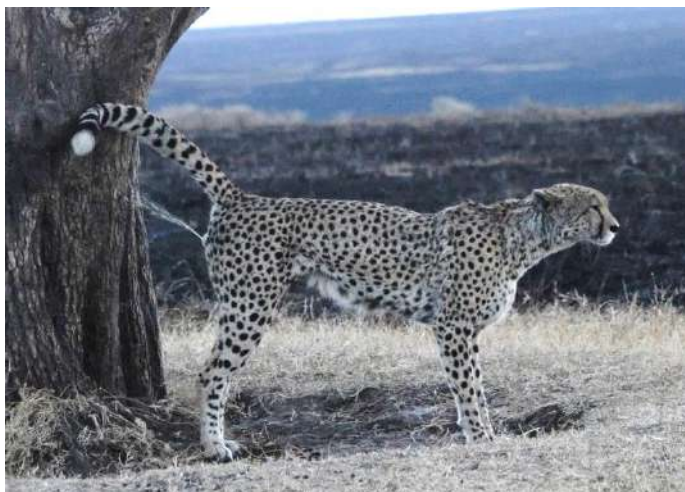
Pic.64. Olpadan after attacked by his ex-coalition-mates

treatment and the male recovered quickly. His tail initially moving only at the lower quarter, in a week was fully functioning, and the male could lift it up while marking objects (Pic. 69) According to Dr. Limo's forecasts, Olpadan's vision could restore at best by 35%, that is, the male would be able to distinguish the movement of the shadow, but would not be able to see clearly. After KWS Vet Unit assistance on the same day, we have been closely monitoring Olpadan for 2 months. Being a successful hunter, he supported himself, but avoided meetings not only with males, but

also with females. On November 11, 2021, he was chased by Neema (F68), who had 3 sub-adult cubs.



Pic.65-67 Injured eye and treatment of Olpadan  
Pic.68 Olpadan after treatment  
Pic.69,70 Olpadan recovered





**4.3. Male Olpadan (M58) death.** On January 26, 2022 at 6.45 a local guide informed us that he had found a dead male cheetah at the Fig Tree murrum and 4 other males walking away from the site. Due to lack of light in the early morning before sunrise, no pictures were taken within the first minutes. The first photo was taken by a guide at 6:30 am. Based on the photo, we identified the dead male as Olpadan (Pic.1). We arrived at the spot at 7.20 and immediately informed the Wardens from Talek and Olkiombo areas. Wardens with their teams arrived at the scene promptly and together with them, we examined the site of the incident and the body of a cheetah.

The body of 7-year-old male was found in the open area of the murrum, in the short grass. Examination of the site revealed that the body had been dragged for about 3.5 meters from the spot of blood (about 25 cm in diameter) to the spot where it was found. As the tourist cars pulled into place, all animal tracks in the sand were obliterated by tire tracks. However, we found one cheetah front paw print on one side of the cheetah body and a tuft of lion hair 2.5 meters from the bloodstain on the grass (Pic.72,73). The body weight was 48 kg, cheetah was in a good physical condition, with full belly.

Rigor mortis stage: The cheetah body was warm and all rigid, jaws limbs and tail were stiff (Pic.81). It was not possible to open the mouth even with efforts. This suggests that death occurred about 2-6 hours prior to discovery of the carcass.

Note: the body was stiff by the time it was discovered by tour guides.

External parasites: Cheetahs usually carry blood-sucking parasites on their bodies, including *Hippobosca longipennis* commonly known as 'the cheetah fly'. By the time of examination of the body (7:20), all the flies had left the carcass and only one was found on the head. This may be an indicator that death had occurred about 2-3 hours before examination started.



Pic.71 Deed wounds on the lower neck and behind the scapula

Several small ticks were found in the fur. However, at 8:33 a large number of small ticks appeared on the surface of the coat, leaving the carcass. Usually, external parasites begin to leave the body a few minutes after death, but since ticks are slower, it probably took them longer than flies to get to the surface. Even at 9:27, that is 3 hours after the discovery of the dead cheetah, we found large ticks firmly attached to the inner side of the thigh. Perhaps external parasites, in particular ticks, cannot be reliable indicators of the time of death in wild animals (at least cheetahs).

Injuries: total number of wounds – 9; deep large wounds (3.5-7.0 cm in diameter) on the spine, neck, shoulder, lower abdomen-inguinal area (Pic. 75-81). The neck was broken and soft tissue edema

was observed. The nature of the wounds on the neck and the location of the carcass suggest that it is likely that a large predator dragged the cheetah's body by the head, which could lead to a fracture of the spine in the cervical region before or after cheetah's death.



*Pic. 72. Place of the incident (top)*

*Pic.73 - (2) Lion's hair (bottom)*

*Pic.74 – (1) Spot of blood*

All of the wounds in the cervical and thoracic spine areas were large and deep, suggesting a large predator had attacked the cheetah. It is important to mention that during the attack, cheetahs hit the conspecific with their paws, and also inflict bites, damaging soft tissues but leaving smaller wounds on the body. When strangling an intruder, no marks are left on the neck, since the cheetah does not kill the victim with a bite, but by squeezing the trachea, leading to suffocation. Damage to the thoracic and/or cervical spine (spine fracture) could have caused death.



Pic.75-77  
Wound in  
the  
thoracic  
area of  
the spine



Pic.78. Rangers examining the carcass



Pic.79. A deep bite mark indicates a long canine



Pic.80. Stiffness of the body including the tail. Broken neck allows the head fall, thoracic spine swollen



Pic.81. Deep wound from a large canine tooth

**Measurements:**

#	Point of measurements	Cm	
1	Tip of nose – base of neck	33	
2	Base of neck – base of tail (notch of the sacrum)	92	
3	Tail length (base of tail (sacrum) to end of caudal vertebra)	69	
4	Neck girth	37	
5	Chest girth	79	
6	Abdomen girth	98	
7	Waist girth	64	
8	Front leg (height in shoulders) point of shoulder - heel	67	
9	Back leg: point of hip – heel	79	
10	Head girth	46	
<b>Paws</b>			
<b>Front Left Paw (mm)</b>		<b>Back Left Paw (mm)</b>	
Length	75	Length	91
Width	55	Width	53
<b>Front Right Paw (mm)</b>		<b>Back Right Paw (mm)</b>	
Length	80	Length	95
Width	58	Width	54.3

Claws			
Front Left Paw Claws (mm)		Front Right Paw Claws (mm)	
From inner to outer finger		From inner to outer finger	
Dew claw	36	Dew claw	39
First finger claw	35	First finger claw	34
Second finger claw	37	Second finger claw	39
Third finger claw	35	Third finger claw	38
Fourth finger claw	36	Fourth finger claw	33
Back Left Paw Claws (mm)		Back Right Paw Claws (mm)	
First finger claw	28	First finger claw	33
Second finger claw	37	Second finger claw	33
Third finger claw	33	Third finger claw	32
Fourth finger claw	33	Fourth finger claw	25

**Teeth**

#	Canines	Size (mm)
1	Upper right canine	19.26
2	Lower right	17.36
3	Upper right	23.08
4	Lower left	15.17

**4.4. Olarishani (M72).** Olarishani (*Judge* in Maa) was a member of the Tano Bora coalition. He was a male with a high hierarchical status. After separation of their ex-coalition-mate Olpadan (M58) in the end of June 2021, four males continued to travel along the Mara – crossed the Sand River and briefly settled near the Tanzanian border, successfully hunting wildebeests twice a day, and in 5 days reappeared in their usual place – Tipilikwani junction. 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 groups of cheetahs. Moreover, the relationship between the 4 males became more balanced – all males began to share leadership among themselves. They also met with Nora (F42) and Nashipai (F69) twice. We have been observing the coalition for 3 days (6-8 February 2022) following Nora.



Pic.82. Three of the Tano Bora males



Pic.83 Olarishani. Photo by M.Mayers (left)



Pic 84 Photo by Cheetahenthusiast FB (right)

All 4 males were on the Talek river bank on the evening of February 11, 2022. Next morning, at 6:30, only three were spotted resting. Winda (M71) and Leboo (M70) together and Olarishani (M72) in 4 meters under another bush. Olonyok (M73) was absent. From the photo materials provided by the visitor Mrs. Christine Butterworth it was clear that coalition-mates were concerned about Olarishani's condition and were waiting for him to follow them. At 9:45 it was discovered that Olarishani had injuries on his spine. When at 9:45 Olarishani stood up, he could walk only four steps at a time. At 9:50, Leboo and Winda walked to a new location in a few meters, but kept looking back at Olarishani, calling and waiting for him. Olarishani was walking slowly. At 10:10, Leboo and Winda started walking towards the nearest tree and called Olarishani, who started walking a little better and faster following the males, who were scent marking the tree. Despite treatment by Dr. Limo (KWS Mara Mobile Vet Unit), the next day at 17:30 the male died. An autopsy was not performed; therefore, it is difficult to reveal the cause of the death. The nature of the movement and the effort that the male made, as well as numerous photographs of the affected areas of the spine, indicate that most likely the cheetah was attacked by a large predator, and damage to the spine and internal organs led to his subsequent death.

#### 4.5. Olaretoni (M88) – one of the Sopa males.

Two young males Olaretoni (M88) (*The One Who is willing to help* in Maa) and Olanyuani (M89) – (*Hardworking* in Maa) were first spotted in mid-September 2018 close to Tanzanian border. They have been regularly spotted at Sopa and Keekorok areas. According to the Mara Sopa area ranger Stanley Ketuiyi, on 20 July, 2021 two males in a coalition hunted Kongoni, which fell onto Olaretoni. That day the male did not eat, spent the day lying down, and died the next day. Since there was no examination of the body and autopsy, it is difficult to find out the cause of death. However, as there were no internal injuries, it is possible that the male died from internal injuries and internal bleeding.



Pic.85 Olaretoni dead (Photo by S.Ketuiyi)

**4.6. Female Namelok (F89).** Namelok was born in the Reserve and became the first and the only cub female raised together with her brother Ngao (M117) to independence by Nashipai (F69). We have been observing the family during lockdown where there was no disturbance. After Nashipai had left her 15-months old cubs, they started exploring the Mara. Although their mother had never taken them to the Mara Conservancy, on 7<sup>th</sup> December 2021, siblings have been spotted across the Mara River in the Mara Triangle near Serena lodge. They then crossed back to the Reserve and again crossed the Mara River on 16<sup>th</sup> December to the Triangle side.

On December 19, 2021 at 9:20, we received information from the Mara Conservancy Warden A. Bett that the cheetah female Namelok was found dead and her brother Ngao close to her calling. We arrived to the spot and together with two rangers teams examined the site of the incident and the body of the cheetah. We contacted the KWS veterinarian Dr. Limo immediately. Since Dr. Limo was not in the Mara, Dr. Chelysheva performed the post-mortem examination and documented activities (photos and video). The detailed Report was given to the Mara Triangle authorities and to the KWS Mara Veterinary Unit. The body of 19-months-old cheetah was found in the open area of the savanna with some Croton bushes. The body weight was 34kg, cheetah was in a good physical condition, with full belly.



Pic.86. Namelok killed

**Rigor mortis stage:** The cheetah body was cold and rigid (Pics.86,87), jaws limbs and tail were stiff. It was not possible to open the mouth even with efforts. This suggests that death occurred more than 6 hours prior to discovery of the carcass. The body was stiff by the time it was discovered by the rangers.

The total number of injuries was 9, including 5 deep wounds on the spine (Pic.90). It is important to note that some small external wounds were hidden under thick fur, which made them difficult to be detected, while separation of the skin revealed deep punctures in the muscle tissues, apparently from claws. Wounds on the spine could have been from the teeth. The nature of the wounds and cheetah posture suggested that the cheetah had been attacked by a powerful predator (lion or leopard) possibly at some distance from the location of the body detection and died short after that from fatal injuries. Intestine was empty, but stomach contained approximately 3.5 kg of fresh meat, indicating that the cheetah was attacked during or immediately after eating.



Pic.87-90. Namelok was found lying on the left side of the body with numerous injuries of the spine

Observation of Namelok's brother Ngao (M117) behavior the next day supports it: right after making a kill of an adult Impala female at 15:39, he started eating immediately and regularly was looking around anxiously. Lonely lioness appeared at 16:10 from the slope in 300m from the eating cheetah. According to the information from the Triangle rangers, in the evening of 18<sup>th</sup> December 2021, they had observed a shy leopard trying to hunt Reedbuck antelope in the bushes over the place where Namelok' carcass was found. Cheetahs must have hunted later in the evening on 18<sup>th</sup> or at night in that area. In the Mara, single cheetahs and groups (male coalitions and females with sub-adult cubs) have been hunting in complete darkness. A leopard was not spotted on 19<sup>th</sup> and 20<sup>th</sup> December, but we observed lioness on 20<sup>th</sup> December the next day after the accident) in one kilometer from the place of the incident.

#### Teeth

#	Canines	Size (mm)
1	Upper right	1.8
2	Lower right	1.5
3	Upper left	1.9
4	Lower left	1.5

## Measurements:

#	Point of measurements	Cm	
1	Tip of nose – base of neck	34.0	
2	Base of neck – base of tail (notch of the sacrum)	68.0	
3	Tail length (base of tail (sacrum) to end of caudal vertebra)	71.0	
4	Neck girth	30.0	
5	Chest girth	63.0	
6	Neck girth	30.0	
7	Waist girth	57.0	
8	Front leg (height in shoulders) point of shoulder - heel	63.0	
9	Back leg: point of hip – heel	67.0	
Paws			
Front Left Paw (mm)		Back Left Paw (mm)	
Length	8.3	Length	9.0
Width	5.7	Width	5.3
Front Right Paw (mm)		Back Right Paw (mm)	
Length	7.7	Length	9.5
Width	5.7	Width	5.1

## Inner organs

Dimensions (mm)			
Length	mm	Width	mm
Heart	10.2	Heart	7.5
Right kidney	7.0	Right kidney	4.9
Left kidney	7.0	Left kidney	5.2
Heart length	10.2	Heart width	7.5



Pic.91 Four cheetahs with the same injuries: deep wounds on the spine are characteristic of a lion attacking a cheetah, and lead to the death of the latter.



**4.7. A case of two cheetah cubs eaten by a lion and a cheetah.** On September 1<sup>st</sup>, 2021, we received information from the guides, that both 2-months old cubs (female and male) of 8-year-old Imani (F50) were killed by a pair of lions. Imani has successfully raised 3 cubs in 2016: two sons and one daughter (Selenkei). Since then, Imani has been constantly losing litters both in the MMNR and in the conservancies. At the age of 8-10 years, females can successfully conceive, but it becomes more difficult to raise offspring.



Pic.92,93 Lion carrying a cheetah cub he killed (top) and eating a cub Pic. 94 (bottom left)

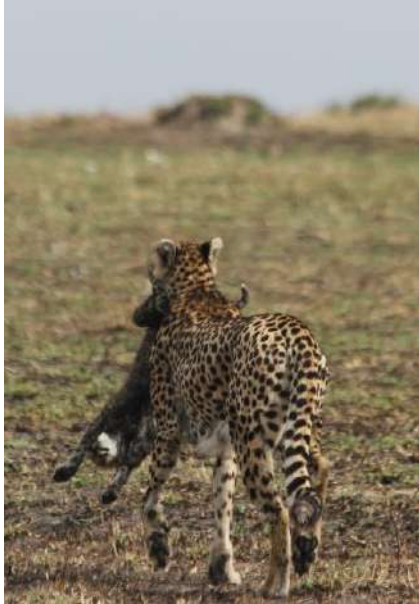


When we arrived at the site, Imani was looking at the male lion, who was carrying a dead cub, and was calling for her lost cubs; apparently, she did not see what had happened to them. The other cub was killed several hundred meters away and left in the grass by a lioness who moved away from the spot. Both dead cubs had intestine exposed from the belly. Usually, lions do not eat killed cheetah cubs, but that day we observed for the first time the male lion feeding on the cheetah cub's carcass for 40 minutes (9:10-09:50).

When at 9:42 Imani found in the grass the body of her cub killed by a lioness, she tried to revive it for some time. Both in captivity and in the wild, in the process of licking a dead cub, the female encounters fresh blood and from that moment begins to eat the carcass. After a minute of licking the cub's body, she picked it up and carried it for 100m before eating. At 9:44 Imani started eating the cub and in 30 minutes (at 10:14) left the spot.



Pic. 95 Imani located the cub killed by a lioness



Imani never saw the second cub, therefore she returned the next day and called. At 7:20, she approached the place where her cub was eaten by a lion, called and finally left the area. While walking, she displayed discomfort: restlessly whipped her tail on the sides, sometimes lay down for a few seconds and got up, continuing to walk. Within the next 3 hours, she killed two fawns of Thomson gazelles (at 9:08 and 10:15). Imani usually strangled her prey before eating, even if it took over 10 minutes. That day, she started eating the first fawn alive immediately after hunting from the back. She was eating the belly while the fawn was still alive making loud sounds. In 24 minutes, she left the fawn only two-thirds eaten and moved towards another heard. Four kilometers away, after observing gazelles from the top of a hill, she hunted another fawn (at 10:15). This time she took it into the bush, suffocated and ate all within the next 45 minutes, and walked away in 44 minutes (12:05), moving further and further away from the place where she was raising and lost both cubs. Within next weeks, Imani hunted adult and subadult gazelles.



Pic. 96. Imani is carrying the cub killed by a lioness (top left); Pic.97 Imani is reviving the dead cub (bottom left)  
Pic. 98 Imani is eating her dead cub (bottom right)

**4.8. A case of the mother killed by a lion and the cheetah cub rescued.** On December 13, 2021 we received information from the rangers, that 10-year-old female Kiraposhe (F56) was found dead (killed by a lion) in South Olarro Conservancy. Her two 5-month-old cubs were roaming around. Kiraposhe was last seen with her 3 cubs on December 10. There were a few unsuccessful attempts made to catch two remaining cubs. On December 18, KWS asked us to assist teams on the spot in capturing the cubs. No cubs were seen on 19. On December 20, Dr. Chelysheva arrived in South Olarro conservancy and discussed the plan of action with the KWS authorities, and advised to use a trap cage with a bate (fresh meat). Four teams (KWS, Olarro rangers, Elephant Aware rangers and our field team) started searching for the cubs, and around 15.00 single cub was located next to the ranger station.



Pic. 99 Kiraposhe with cubs (Photo by G. Cowell)

Rangers set up a trap with several pieces of meat (fresh beef) placed in the way which supposed to lead the cub to the pedal in the far end of a trap. Since the cub was planned to be kept in captivity, we offered him beef. If the cub were planned to be released into the wild in the future, it would have to be fed only on the game meat.



*Pic. 100, 101 Kiraposhe (left) and her cubs (right) on 14<sup>th</sup> of December 2021 (Photos by G. Cowell)*



*Pic. 102-104 Hungry cub is approaching the trap cage attracted by the smell a fresh meat*

The cub was captured in a trap at 15:45, and to reduce stress of capturing, the trap was immediately covered with the canvas, which completely excluded visibility of people. Silence was observed around the trap. At such age, cub behave like wild adults, and in stress (seeing humans approaching him) could run into the fence and break a neck/limb. Therefore, covering the cage was one of the vitally important elements of successful capture. The cub was offered several pieces of meet in the bowl with fresh water, which he took together with meat. it helped to avoid dehydration. The cub spent night in the trap and next day was transported towards the Kisumu Sanctuary. For successful rehabilitation of wild cubs of such age, it is critically important to provide quiet place with no access of public and with all sides of the enclosure covered to avoid visibility. The hide (small cage/box) with closed walls and roof must be provided in the enclosure to assure comfortable adaptation to captivity. On December 23, the cub was safely delivered to the Kisumu Sanctuary, where he is recovering.



*Pic. 105-108 KWS team preparing the trap cage with the captured cub for transportation to the Sanctuary*

## V. WORKING WITH THE MARA STAKEHOLDERS

**5.1. Workshops for the rangers and tour guides in the Mara.** In addition to continued work with the teams of rangers of the MMNR and conservancies, the project team conducts conservation workshops for them at the ranger posts and tourist facilities. At the workshop, participants receive updated information about cheetah ecology and behavior, based on new data obtained by our research team, as well as learning the technique of cheetah identification.



*Pic. 109,110 Equipment donated to the rangers of the conservancy (left) and MMNR (binoculars and waterproof photo camera, center, right)*

We provide teams with Cheetah Catalogues with the profiles of the Mara cheetahs and the most important information on the individuals. We also provide ranger teams with the binoculars and rugged photo cameras, which help them monitoring wildlife and in particular cheetahs, and with the road signs to close the areas where cheetahs raise small cubs. Close daily working with rangers and guides help our team to stay updated and respond quickly when cheetahs need special assistance.



*Pic. 111. Workshop for the rangers of the MNC and Lemek conservancies at the conservancies' headquarters*



Pic. 112, 113 Lecture about cheetahs and the lesson of identification for the rangers of the MNC and Lemek conservancies at the conservancies' headquarters



Pic. 114, 115. Cheetah identification lesson after a lecture for rangers in the Ol Chorro (right) conservancy



Pic. 116 Workshop for the Nashulai conservancy's rangers

Pic. 117 Cheetah identification lesson (Ol Chorro)

**5.2. Education Conservation talks for the local and international students.** By the invitation of the Mara Dopoi Center, on 25 April 2022 Dr. Elena Chelysheva conducted a Cheetah workshop as a part of a special environmental training program initiated by professors of the Prescott College and Maasai-Mara University for the Maasai students from different institutions and students from the college.



Pic. 118, 119. Cheetah identification lesson for Kenyan students – future tour guides

The program aims to teach both local and international students different aspects of animal ecology, behavior and conservation, and to exchange knowledge between two teams. Every year new students attend the classes, and each year the organizers invite our research team to the Center to meet with the whole team. The leader of the MMCP gave a talk with the PowerPoint presentation on cheetah challenges and adaptations, followed by the Q&A session and cheetah identification lesson, attended by all participants and the staff of the Center.

**5.3. Annual Carnivore Conference 2021.** Together with the KWS Mara and WRTI representatives, MMNR and Narok County authorities and various research projects working in the region, the MMCP team participated in the annual CRCA CARNIVORE SITE MEETING held at the Wildlife Research and Training Institute Headquarters in Naivasha on 15-19<sup>th</sup> of December 2021. Following other research organizations, the MMCP presented updates on the cheetah research and conservation activities, which was met with great interest and appreciation. Presentations on the results of ongoing research clearly showed the importance of each of the existing projects through different approaches: both global ecosystem and deep study of a particular species of carnivores.

Over the next two days, all participants were collaboratively and fruitfully working on the strategic objectives of the lion, spotted hyena and partially cheetah and wild dog conservation. Three teams with the representatives of the regional conservation authorities and researchers, worked on the Carnivore Emerging Issues and Gaps Matrix 2021, identified Targets, Activities, Achievements, Gaps and Actions on each of the following categories:

1. Establish and enhance collaborative landscape-level lion and spotted Hyena conservation.
2. Enhance human-lion and human-spotted Hyena coexistence.
3. Improve education and awareness of lion and spotted Hyena conservation status and ecology.
4. Facilitate evidence-based decision making for lion and spotted Hyena conservation.
5. Build integrated and sustainable structures to facilitate lion and spotted Hyena conservation.

In terms of cheetah conservation, important issues were discussed, including possibility of rewilding of captive-held cheetahs, creating a cheetah rehabilitation facility for orphan cubs, development cheetah rehabilitation program and incorporating this program into the new Cheetah and Wild Dog Strategy.



Pic. 120. Participants of the Annual Carnivore Meeting in Naivasha.

**5.4. Mara Management Plan Meeting.** By the invitation of the Maasai-Mara Conservancies Association (MMCA) the leader of the MMCP participated in the meeting hosted by the Basecamp in the MMNR on 3<sup>rd</sup> and 4<sup>th</sup> of July 2021. The meeting was dedicated to creating the Greater Masai Mara Ecosystem Management (GMME) Plan 2022-2032. It brought together all stakeholders of the Greater Masai Mara Ecosystem, including representatives of the Government of Narok, KWS, MMCA, WWF, Mara Conservancies and different research projects. The meeting was held under the auspices: “To secure habitats for the biodiversity conservation for sustainable use of natural resources to improve community livelihood and maintain ecosystem viability for posterity.” Six teams represented by the authorities and researchers discussed and presented results of the joint work on identification of problems, opportunities and management actions/activities on the following 5 categories: Natural resource management, Community partnership and livelihoods, Institutions & governance & operations, Research and monitoring, and Tourism development and management.

MMNR provides important cheetah habitat in Africa. Cheetah is one of the iconic species in the Mara ecosystem and one of the major tourist attractions. Our long-term cheetah population monitoring revealed that cheetahs perform successfully in presence of tourists: hunt, eat, raise cubs, mate etc. when tourists obey Rules and Regulations. 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.), and 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).

To improve tourism in the Mara, we suggested the following measures:

1. Promote tourism during low season
2. Improve guiding in the MMNR by free of charge education/training programs for the local guides
3. Reinforce Park Rules in the MMNR
4. Improve Park Rules by adding 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

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