



Twiga Tracker Status Report

Greater Masai Mara Ecosystem, Kenya

Masai Giraffe (*Giraffa tippelskirchi*)

September 2023 – June 2024

In partnership with:





Overview

The Greater Masai Mara Ecosystem is an important conservation landscape, supporting globally significant wildlife populations including the Masai giraffe (*Giraffa tippelskirchi*). However, the landscape has seen an increase in fragmentation through fencing and other infrastructure development. This fragmentation is a threat to the functional connectivity and ecological viability of the ecosystem at large. Understanding the impacts of fragmentation on giraffe space use in the ecosystem will inform better landscape level management conservation and contribute to the growing understanding of multi-species connectivity and viability of wildlife populations. Twenty-one (21) GPS satellite tail tags were deployed between 16-20 September 2023 to assess giraffe movements within the ecosystem. Here, we provide assessments of the performance of GPS tracking units, preliminary space-use metrics of the tagged Masai giraffe, and recommendations for their conservation and management. This project is a collaborative effort between the Giraffe Conservation Foundation (GCF), the Smithsonian National Zoo and Conservation Biology Institute (SNZCB), the Kenya Wildlife Service (KWS), and the Wildlife Research and Training Institute (WRTI).

The specific objectives of this project are to:

- Assess Masai giraffe behavioural responses to fencing and habitat fragmentation.
- Examine Masai giraffe space use patterns and resource selection in the Masai Mara Ecosystem.
- Evaluate connectivity in an increasingly fragmented landscape.

Study Area

The Greater Masai Mara Ecosystem spans approx. 668,500 ha in the northeastern part of the Mara-Serengeti Ecosystem, located on the Kenya/Tanzania border (Figure 1). This diverse landscape includes the Masai Mara National Reserve (NR), community and private conservancies, the designated Pardamat Conservation Area, and adjacent unprotected lands without formal conservation status. The ecosystem is also home to approximately 3,290 Masai giraffe. In recent years, fencing has become more prevalent, especially within the Pardamat Conservation Area and surrounding community landscapes.

GPS Tracking

We used Kernel Density Estimate (KDE) metrics to analyse the spatial usage patterns of the tagged giraffe. We defined total utilisation distribution by using the 95% probability contour, while the 50% probability contour was used to define each animal's core area.

Tracking Performance Diagnostics

One unit (4515) failed immediately after deployment, and a month later, six other units (4596, 4597, 4600, 4603, 4604, 4706) encountered recharging issues and failed to provide any data of value (Figure 2). Concerns were raised with the manufacturer Savannah Tracking as another set of units used in a subsequent tagging exercise in the Amboseli Ecosystem exhibited similar issues. Battery profiles were shared with an independent battery engineer who determined that some of the units exhibited signs of faulty batteries. The manufacturer hypothesized that partial shading of the solar panels of the tail units by the strap was cause for the unit failures and fast discharging. We have since stopped using these devices. To date, 19 of the 21 units have ceased to collect and transmit data (see Table 1 & Figure 2).

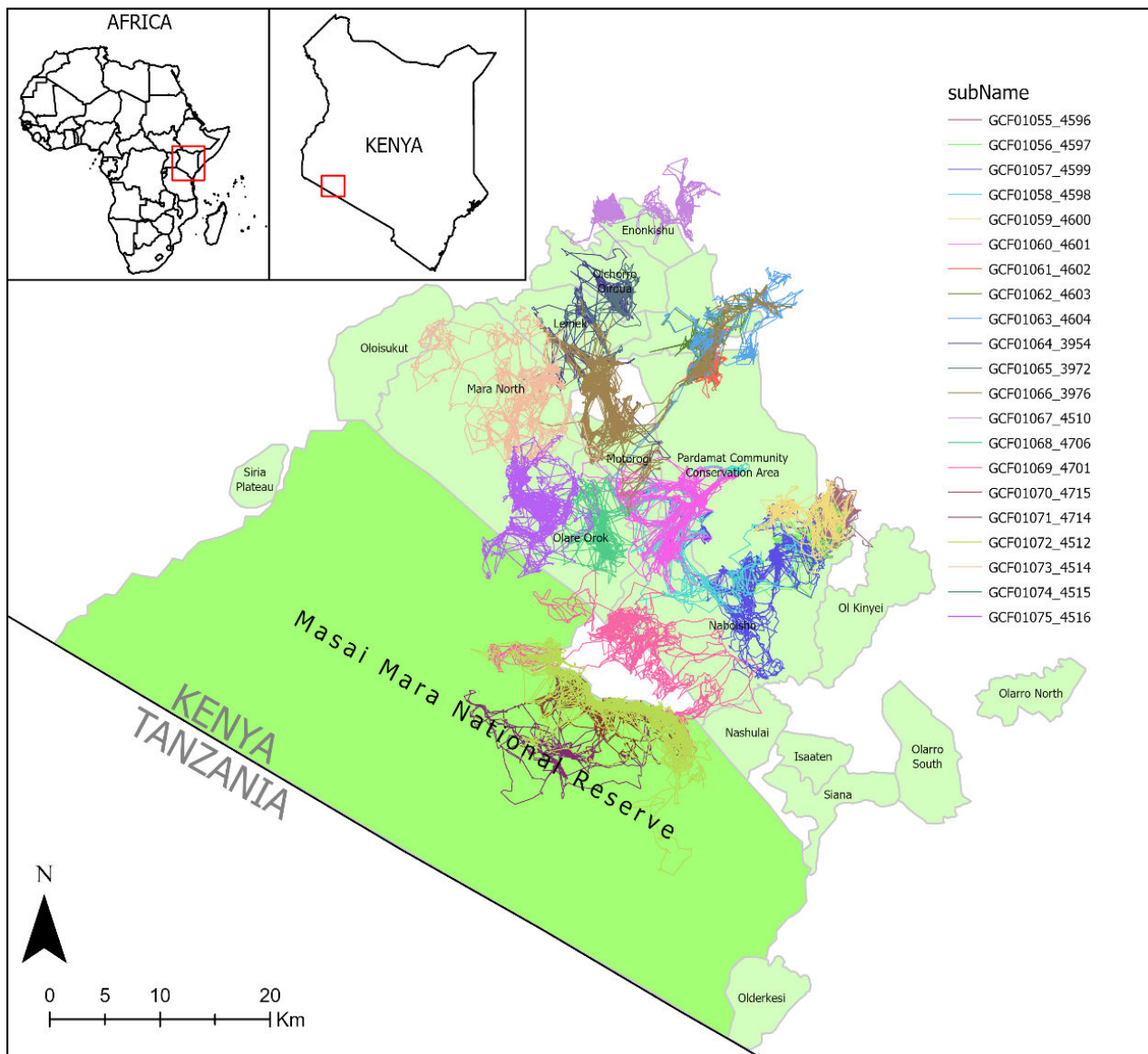


Figure 1: Map of movement patterns of Masai giraffe that were tagged in the Greater Masai Mara Ecosystem in September 2023. Movements are depicted up to 18 June 2024 for units still working.

Giraffe movements

It is not possible to compare the movement data of all tagged Masai giraffe as the data from the tags were inconsistent (see Table 1 & Figure 2). Nonetheless, individuals covered varying distances within the ecosystem since the tagging up to 1,977 km for the farthest-moving individual. The overall average cumulative hourly displacement was 958.4 km (SD = 530.8). Furthermore, we note some interesting movements:

- Unit 3976 (female – tagged in Lemek Conservancy) moved the longest distance (1,977 km).
- Unit 4512 (male – tagged in Masai Mara NR) moved 1,934 km.
- Three giraffe tagged in Masai Mara NR never moved out of the Reserve.
- Unit 4602 (female – tagged in Pardamat) moved the fourth longest distance (1,521 km) but had the smallest 95% KDE at 11.8 km² with a core area 50%KDE of 2.8 km².



Table 1: Summary of Masai giraffe movement data collected in the Greater Masai Mara Ecosystem from September 2023 to June 2024.

Giraffe ID	Sex	Status	Start Date	Stop Date	Duration (Days)	Fixes	Steps (km)	KDE 50 (km ²)	KDE 95 (km ²)
GCF01055_4596	Female	Inactive	09/16/2023	02/13/2024	149.6	1,494	830.8	7.1	26.2
GCF01056_4597	Female	Active	09/16/2023	06/08/2024	266	1,306	446.5	10.8	54.6
GCF01057_4599	Female	Inactive	09/16/2023	04/22/2024	219	5,178	1,480.9	42.5	172.4
GCF01058_4598	Female	Inactive	09/16/2023	01/01/2024	106.8	2,632	1,028.9	31.4	151.8
GCF01059_4600	Female	Inactive	09/17/2023	01/08/2024	112.5	1,242	504.5	8.3	43.8
GCF01060_4601	Male	Inactive	09/17/2023	04/05/2024	200.6	3,501	1,289.9	11.3	76.8
GCF01061_4602	Female	Inactive	09/17/2023	06/07/2024	263.4	6,310	1,521.4	2.8	11.8
GCF01062_4603	Male	Inactive	09/17/2023	02/03/2024	138.3	1,396	480.7	6.5	31.5
GCF01063_4604	Male	Inactive	09/18/2023	02/25/2024	160.5	1,070	467.0	25	102.1
GCF01064_3954	Female	Inactive	09/18/2023	03/05/2024	168.7	2,991	783.5	25.5	112.9
GCF01065_3972	Female	Inactive	09/18/2023	02/18/2024	153	1,488	339.7	17.6	83.6
GCF01066_3976	Female	Active	09/18/2023	06/18/2024	274.3	6,048	1,976.5	15.6	145.5
GCF01067_4510	Male	Inactive	09/18/2023	04/26/2024	220.2	5,171	1,043.0	5	36.3
GCF01068_4706	Female	Inactive	09/19/2023	02/15/2024	148.6	1,464	583.9	10.7	46
GCF01069_4701	Male	Inactive	09/19/2023	03/25/2024	188.1	4,484	1,329.6	36.5	180.2
GCF01070_4715	Female	Inactive	09/19/2023	02/09/2024	142.5	3,293	1,007.8	14.4	64
GCF01071_4714	Female	Inactive	09/19/2023	11/14/2023	55.7	1,271	412.3	20.7	124.6
GCF01072_4512	Male	Active	09/19/2023	06/18/2024	273.4	6,565	1,934.4	21.4	127.3
GCF01073_4514	Female	Inactive	09/20/2023	04/23/2024	215.6	4,894	1,142.8	23.3	131
GCF01074_4515	Male	Inactive	09/20/2023	09/20/2023	0.1	3	0.2	-	-
GCF01075_4516	Male	Inactive	09/20/2023	06/05/2024	258.7	5,500	1,522.2	15.6	71.2

The tagged Masai giraffe also exhibited diverse ranging behaviours across the ecosystem. The average 95% KDE was calculated at 89.7 km² (SD = 49.9), and the average 50% KDE at 17.6 km² (SD = 10.5). The largest recorded 95% and 50% KDE was 180.2 km² (Unit 4701 – a female tagged in Olare Motorogi Conservancy) and 42.5 km² (Unit 4599 – a female tagged in Mara Naboisho Conservancy) respectively (see Table 1).

Most tagged Masai giraffe in the Greater Mara Ecosystem frequently traversed multiple properties and conservancies (Figure 4). This use of multiple properties highlights the significance of connectivity in the landscape for this globally significant population of Masai giraffe. Figures 5 and 6 below show an example of routes that giraffe seemingly prefer to use while in transit between conservancies.

The movement data gives an indication of the avoidance of heavily fenced areas such as those in Pardamat Conservation Area (Figure 6). It is also important to note that movements appear concentrated along riverine areas indicative of the availability of food sources.



Timeline of GPS Data Collection

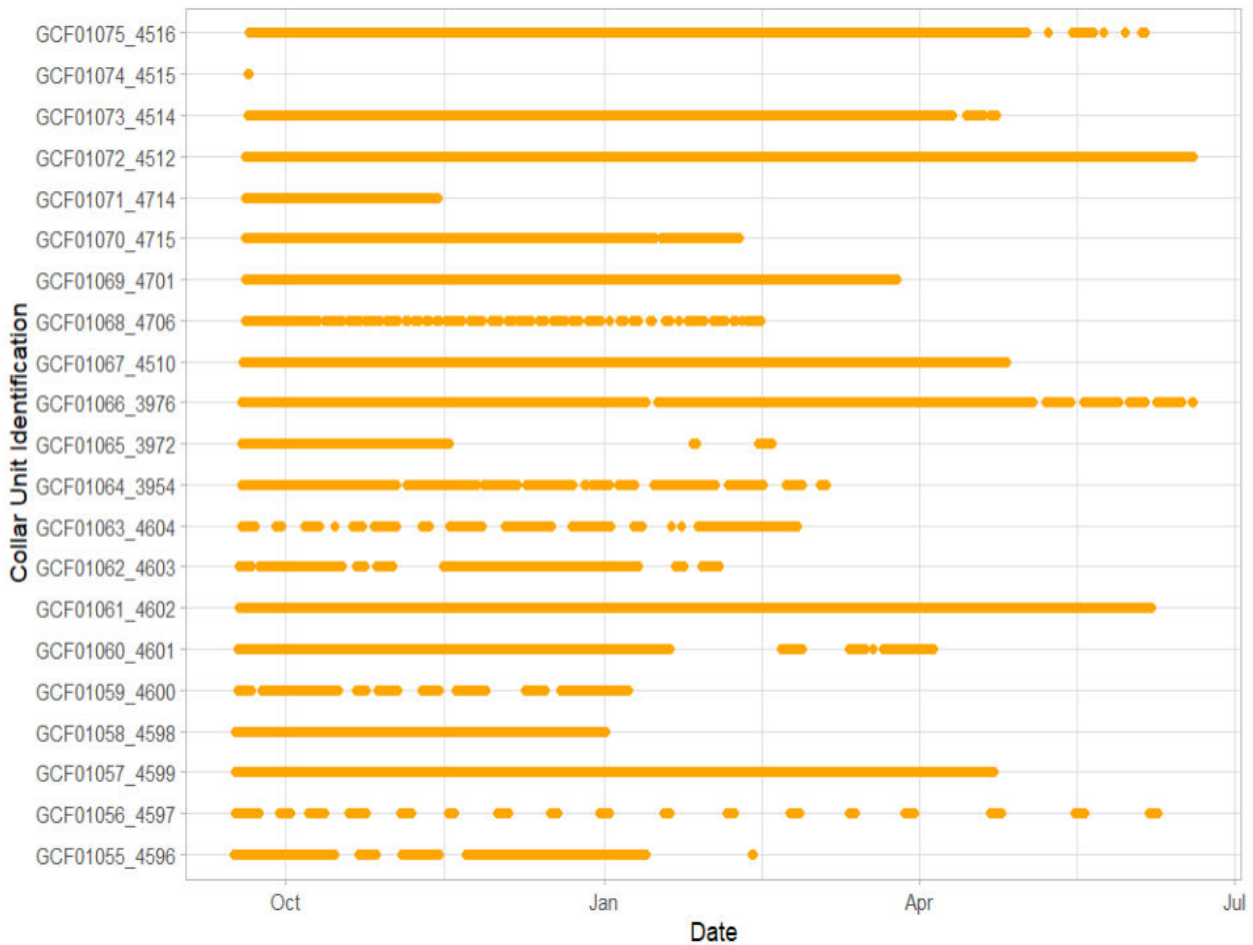


Figure 2: GPS tracking devices used on Masai giraffe in the Greater Masai Mara Ecosystem from September 2023 to June 2024.

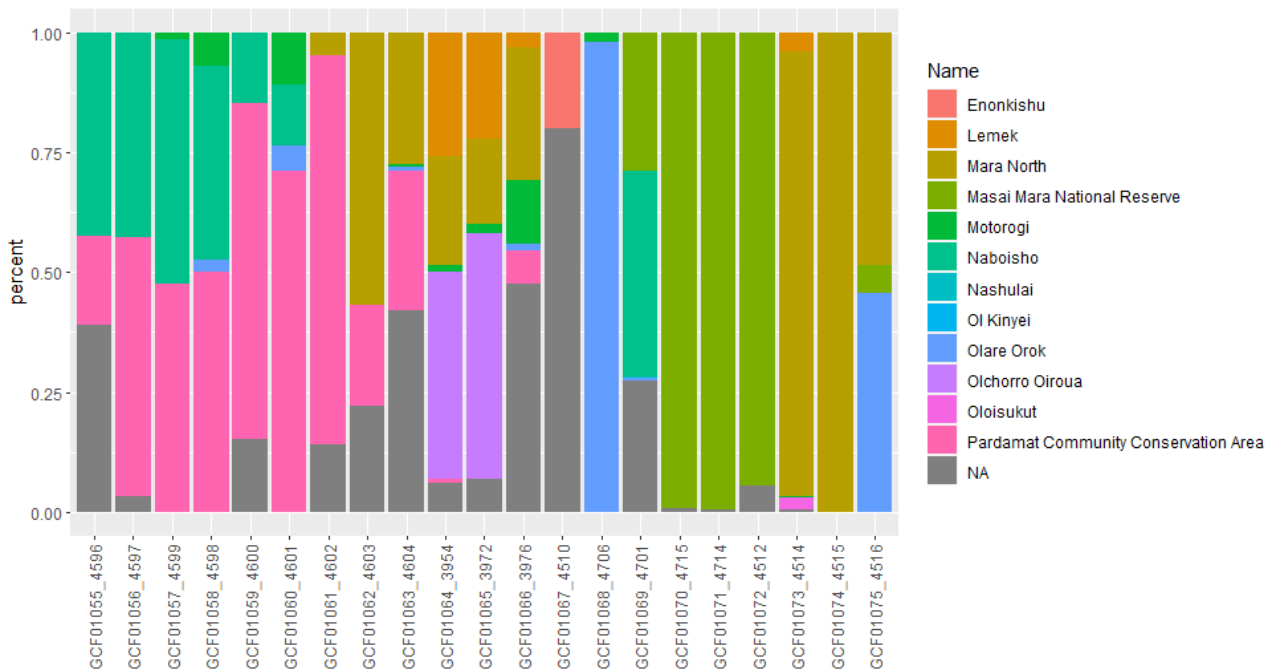


Figure 3: Land-use of Masai giraffe in the Greater Masai Mara Ecosystem from September 2023 to June 2024. Stacked barplots represent the percentage of total coordinate fixes in each property for each giraffe.

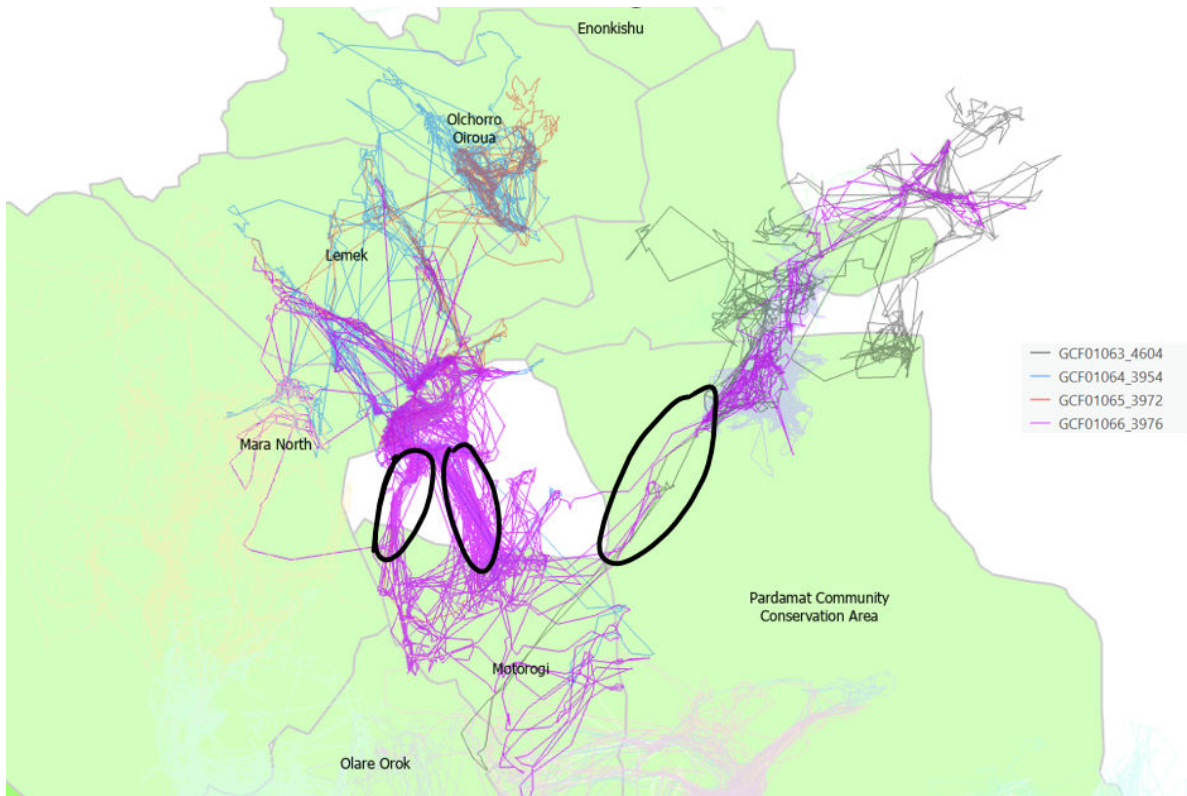


Figure 4: Masai giraffe units 3954, 3972, 3976 (tagged in Lemek Conservancy) and unit 4604 (tagged in Mara North Conservancy) exhibiting routine movements (circled in black) through specific areas in Aitong township and another connecting northwest of Mara North Conservancy with Motorogi through Pardamat Conservation Area.

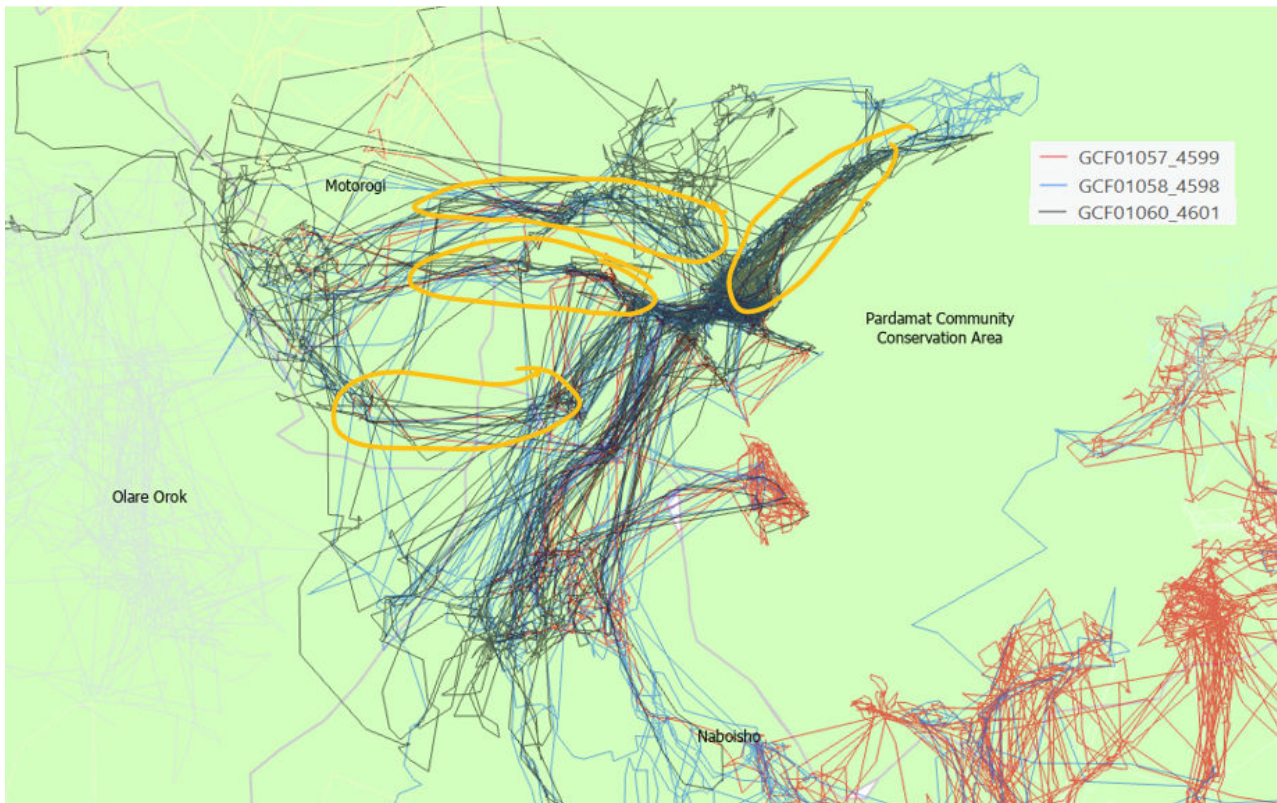


Figure 5: Masai giraffe unit 4599 (tagged in Mara Naboisho Conservancy) and units 4598, 4601 (tagged in Pardamat Conservation Area) exhibited routine movements (circled in yellow) through specific areas connecting the Conservancies.

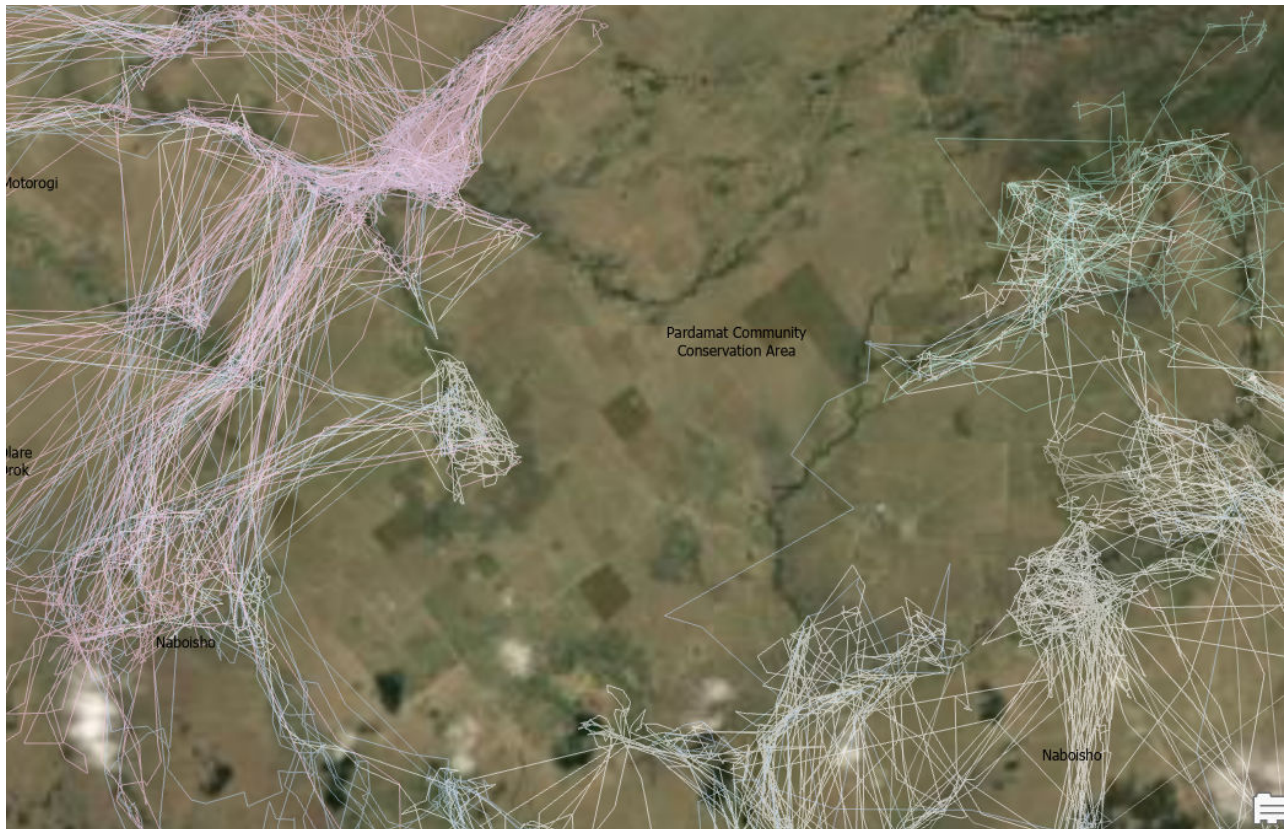


Figure 6: Masai giraffe movements superimposed on Satellite Imagery giving a glimpse of their avoidance of fenced areas within Pardamat Conservation Area, and their movements along riverine areas.

Way forward

The relatively limited data obtained due to the unit failures impacted our ability to provide a detailed understanding of Masai giraffe spatial movements in the Greater Masai Mara Ecosystem. Ongoing discussions with KWS and local authorities, coupled with the preliminary data, highlight that there is a need for continued monitoring and documentation of the proliferation of fences and other human activities.

As the use of technology is essential to contribute to this endeavour, the GCF has been working with other engineers to develop and test alternative tracking units that can generate robust fine scale data for monitoring giraffe movement. Once these technologies have been tested sufficiently, another deployment exercise targeting the same areas should be undertaken, and additionally Isaaten, Siana, Olarro North, and Olarro South added. The Greater Masai Mara ecosystem is key for Masai giraffe but is under threat from anthropogenic impacts. With increased data and analysis, management recommendations can be made to safeguard movement corridors and key data for maintaining viable habitats of Masai giraffe.

As part of the State of Giraffe assessment, GCF also plans to conduct road-based surveys of Masai giraffe in the ecosystem in the last quarter of 2024.