Twiga Tracker Status Report

Maputo National Park, Mozambique

South African Giraffe (*Giraffa giraffa giraffa*)

June 2024 – April 2025

In partnership with

PEACE PARKS FOUNDATION

Overview

This document presents a ten-month summary of GPS tracking unit performance and preliminary space-use metrics of South African giraffe (*Giraffa giraffa giraffa*) post tagging in Maputo National Park (NP). This giraffe tracking project is conducted as a partnership between the Giraffe Conservation Foundation (GCF), Peace Parks Foundation (PPF), and the Mozambique Wildlife Alliance (MWA) to better understand the seasonal space use of giraffe in the reserve, and inform effective conservation management strategies in Maputo NP. Specifically, this project seeks to:

- Monitor the movement and adaptation of South African giraffe in Maputo NP.
- Understand the movement, habitat utilisation, and spatial ecology of South African giraffe in Maputo NP.
- Generate recommendations for future conservation management and provide critical insights to inform proactive, long-term monitoring strategies for conservation managers and other stakeholders.

Study Area

Maputo NP is situated in southern Mozambique and encompasses a range of different habitats, including coastal lakes, floodplains, savannas, and sand forests, supporting a myriad of different species (Matimele, 2016) (Figure 1). Established in 1932, mainly for the protection of elephant, this diverse landscape has since become the home of many other large herbivores, including South African giraffe, which play a pivotal role in the ecological processes of the park (De Boer et al., 2005). Supported by the Futi and Maputo Rivers, the various landscapes provide critical freshwater resources which support large grazing and browsing guilds throughout the park.

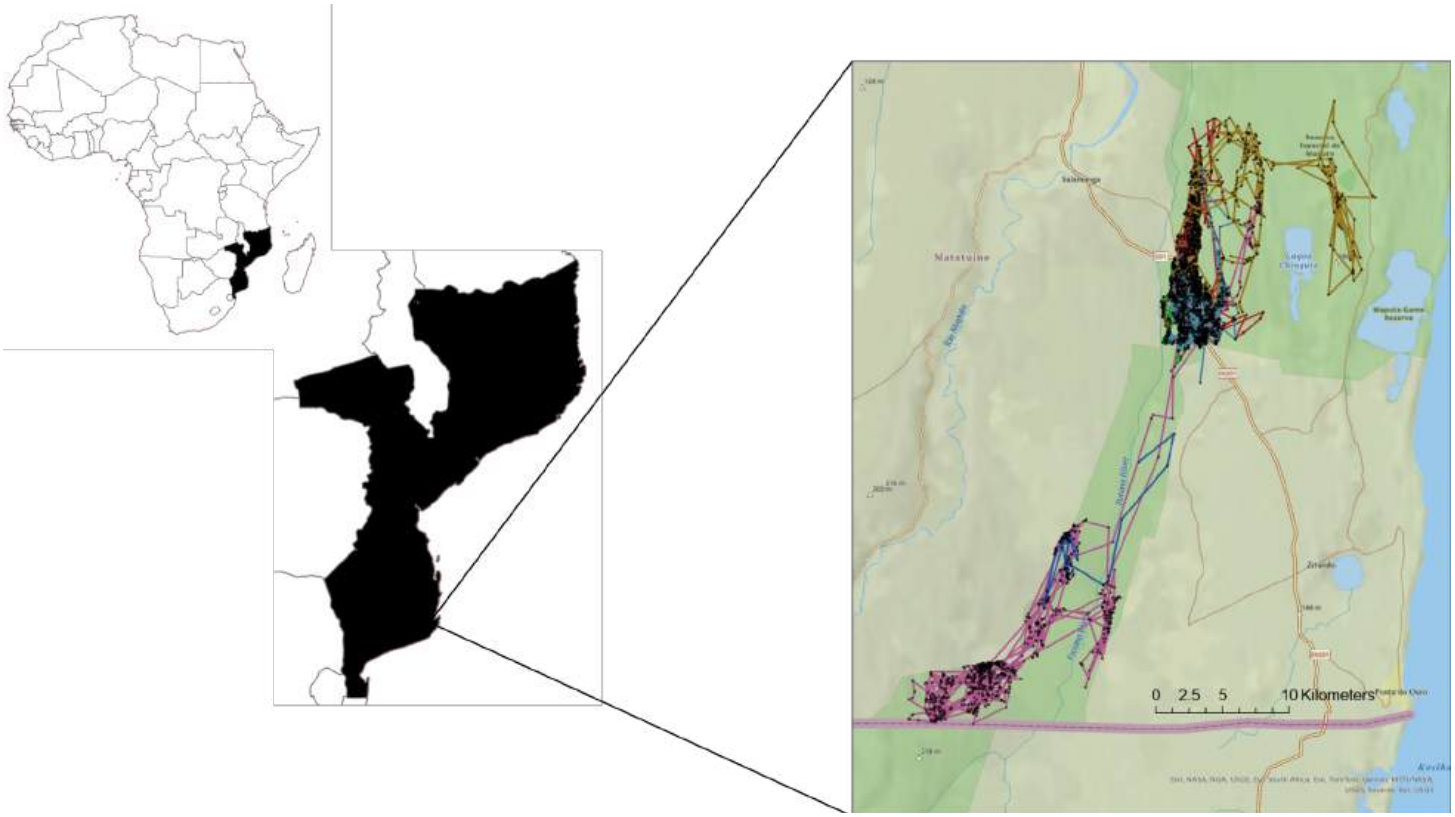


Figure 1. Map of tracked South African giraffe locations in Maputo NP, Mozambique.

Maputo NP experiences a subtropical climate influenced by its coastal location, with a hot, rainy season from November to March and a cooler, dry season from April to October (Ferreira et al., 2023). The average annual rainfall ranges between 800 and 1,100 mm, with most precipitation falling during the summer months. Although not as prone to extreme droughts as interior regions, seasonal variability in rainfall can influence wetland levels and habitat availability for different species. The Futi and Maputo Rivers, along with numerous seasonal and permanent pans, play a crucial role in sustaining these habitats. The Futi Corridor forms an important seasonal migration route for elephant and other large herbivores. Vegetation throughout the park varies and includes sand forest patches, thicket, and woodland, featuring species such as *Strychnos* spp., *Albizia spp.*, *Terminalia sericea*, *Diospyros inhacaensis*, and *Brachystegia spiciformis* (Ferreira et al., 2023). Coastal zones support mangroves and dune vegetation, while grasslands and palm savannas occur in floodplain areas (Ferreira et al., 2023). Maputo NP's topography is relatively flat, especially in the eastern coastal areas, rising slightly toward the inland western sections. Altitude ranges from sea level along the Indian Ocean coastline to approximately 120 m in the inland sandveld regions.

GPS Tracking

To investigate habitat preferences, spatial utilisation, and movement strategies of South African giraffe, we fitted six individuals with Ceres Trace GPS tracking units (Figure 2). These units utilise the GlobalStar satellite network and are default programmed to record four locations per day.

- 5 June 2023 – one female tagged
- 28 May 2024 – four individuals (three females and one male) tagged in the vicinity of the Futi Gate area
- 11 June 2024 – two individuals (one female and one male) tagged near the Futi Corridor

The operation was led by Dr Joao Almeida, wildlife veterinarian and Director of MWA. The giraffe were immobilised using Thianil and reversed with Naltrexone. The GPS units were attached to the ear of the giraffe with a dual-pin secured between the two visible cartilage ridges on the proximal third of the ear. The solar panel was positioned on the inside of the ear (Figure 2).

Figure 2: Example of Ceres Trace ear tag fitted to South African giraffe in Maputo NP.

Occurrence estimation

In this study, we used kernel density estimators (kde) with reference bandwidths as the smoothing parameter to estimate animal occurrence for all individuals. The total utilisation distribution was defined as the 95% probability contour. To quantitatively evaluate areas of concentrated use within the utilisation distributions, core areas were defined as the 50% probability contour.

Results

Tracking Performance Diagnostics

Following the initial deployment of one tracking device in June 2023 and the remaining devices in May/June-2024, the GPS devices have satisfactorily collected data, with reliable collection and data transmission of coordinate fixes (Figure 3). Most Ceres Trace units collected data over the duration of the study period.

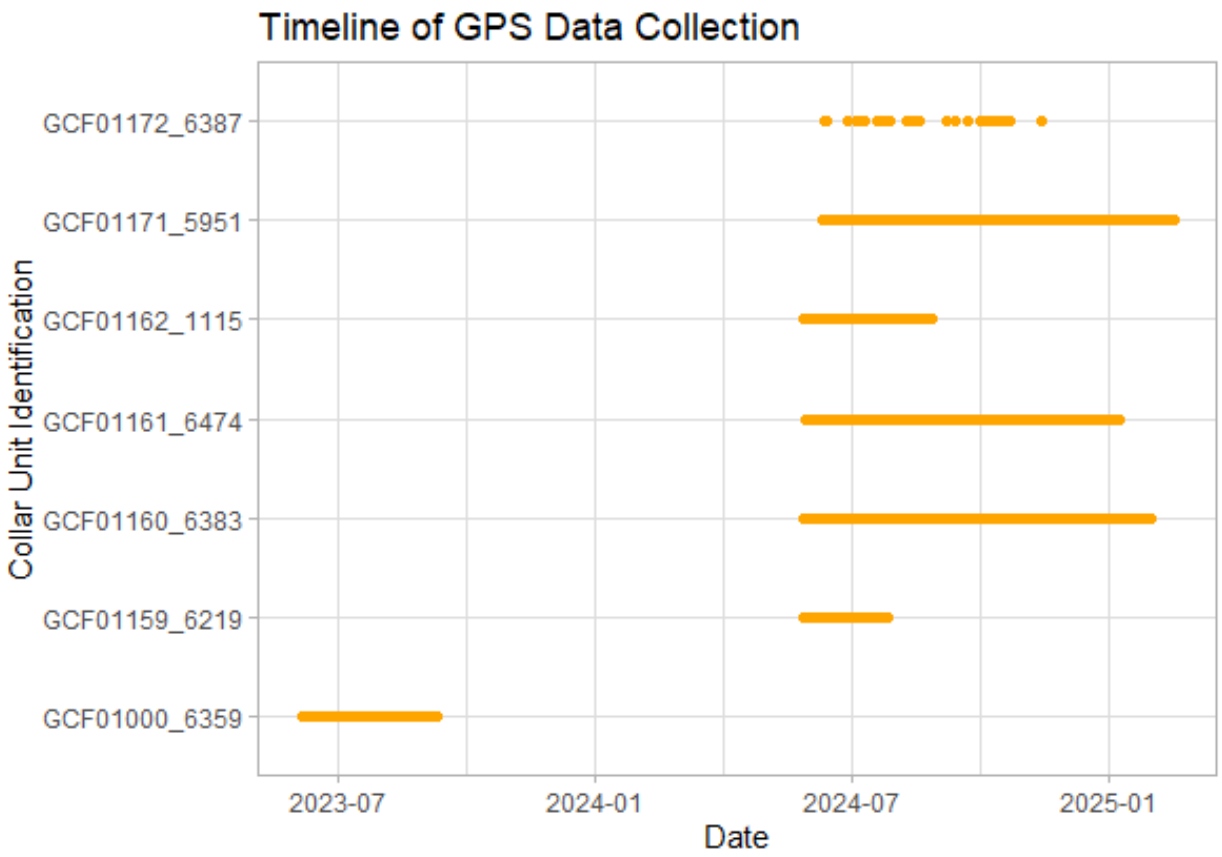


Figure 3: Timeline of GPS data collection for all tracking devices on seven South African giraffe in Maputo NP.

Occurrence Estimation Models

The tagged individuals exhibited varied ranging behaviours during the study period and throughout the landscape. Based on kernel density estimates (KDE), the overall mean 95% KDE was 125.7 km² (SD = 116.4), while the mean 50% KDE was 27.1 km² (SD = 21.6). Female giraffe (n = 5) had a mean 95% KDE of 62.8 km² (SD = 39.1) and a 50% KDE of 13.0 km² (SD = 6.1). Male giraffe (n = 2) ranged more widely, with a mean 95% KDE of 283.0 km² (SD = 79.2) and a 50% KDE of 62.5 km² (SD = 0.7). These results suggest sex-based differences in spatial use, with males exhibiting larger core and total ranges than females over the tracking period (Table 1).

Bibliography

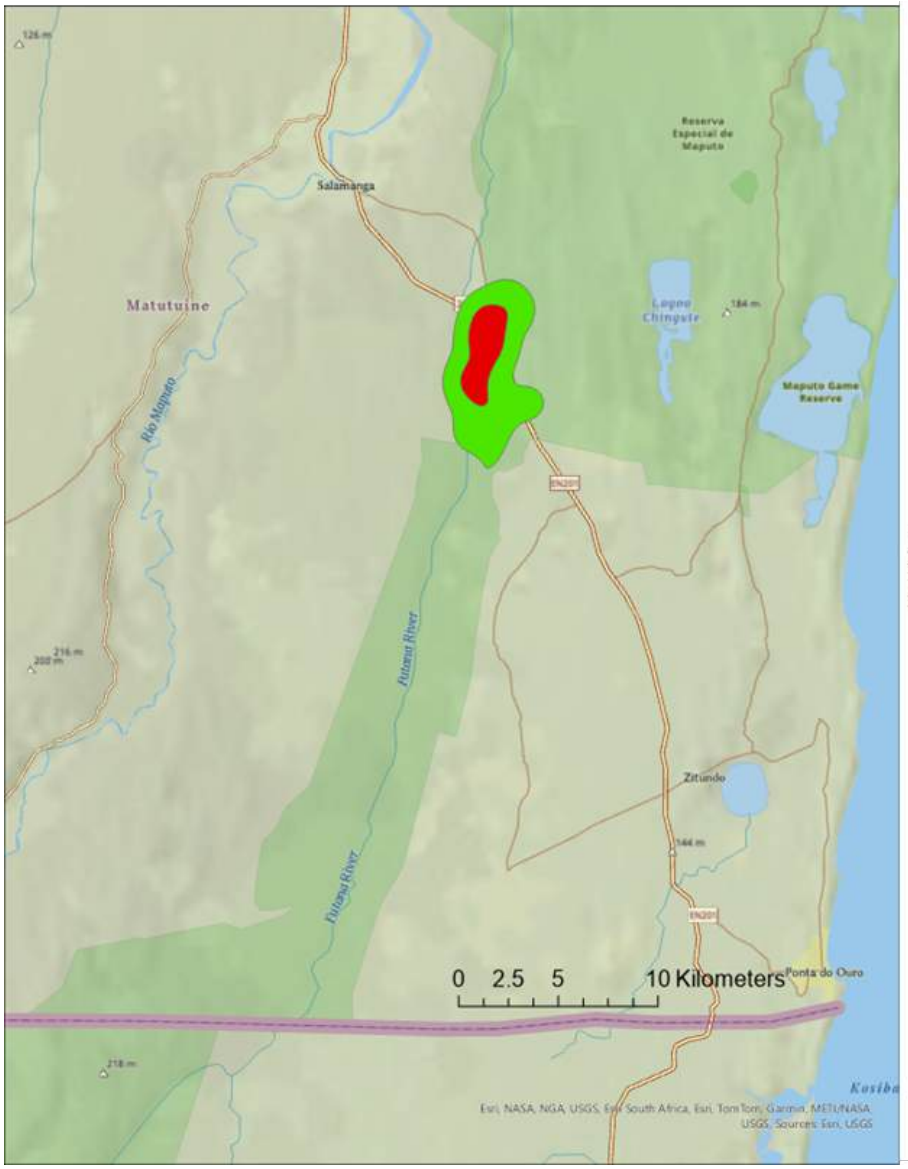
De Boer, W.F., Fairall, N., Van Aarde, R.J. & Ntumi, C.P. 2005. Use of space and habitat by elephants (*Loxodonta africana*) in the Maputo Elephant Reserve, Mozambique. *South African Journal of Wildlife Research* 35(2): 139–146.

Ferreira, E.S.A., Zorzanelli, J.P.F. & Dias, H.M. 2023. Contributions to the floristic and vegetation knowledge of Maputo National Park, Mozambique. *Brazilian Journal of Botany* 46(4): 1027–1040. https://doi.org/10.1007/s40415-023-00928-2

Matimele, H.A. 2016. An assessment of the distribution and conservation status of endemic and near endemic plant species in Maputaland. M.Sc. Thesis, University of Cape Town. https://open.uct.ac.za/bitstreams/89bde481-e677-40ba-9a87-2f38d0114e2c/download

Supplemental Table 1: Summary of GPS tracking deployment of South African giraffe in Maputo NP, Mozambique.

Giraffe ID	Sex	Date Start	Date End	Fixes	Duration (days)	Step Distance (km)	KDE 50 (km^2)	KDE 95 (km^2)
GCF01000_6359	Female	6/5/2023	9/9/2023	235	96	115	7	31
GCF01159_6219	Female	5/28/2024	7/27/2024	200	60	99	7	32
GCF01160_6383	Female	5/28/2024	1/30/2025	882	247	647	21	79
GCF01161_6474	Female	5/28/2024	1/8/2025	773	225	523	11	49
GCF01162_1115	Male	5/28/2024	8/27/2024	294	91	361	62	227
GCF01171_5951	Male	6/10/2024	2/15/2025	827	250	808	63	339
GCF01172_6387	Female	6/11/2024	11/13/2024	30	155	50	19	123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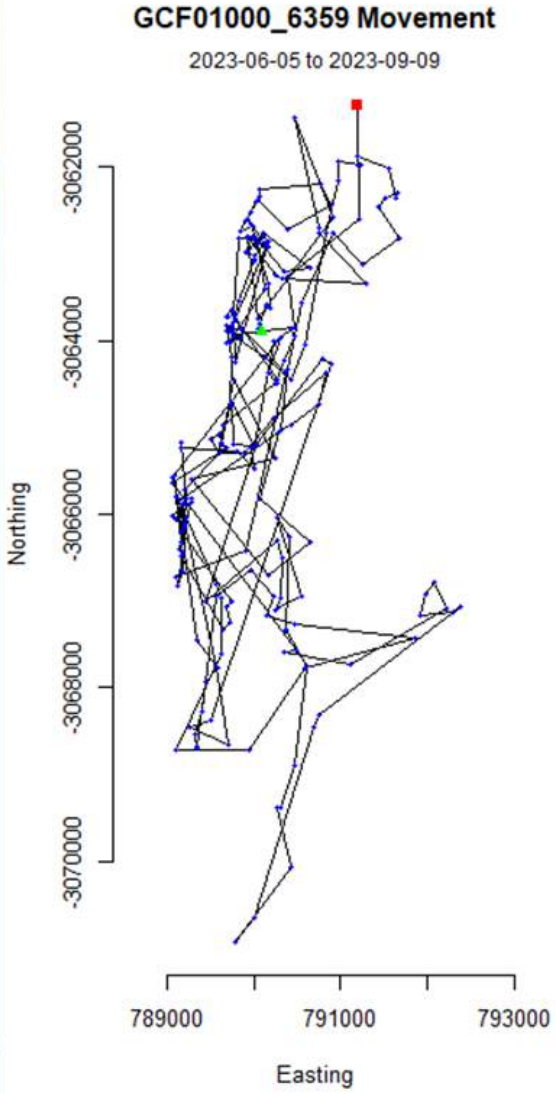
Salamanga
Matutuine
Lagoa Chingute
Maputo Game Reserve
Rio Maputo
Futuzi River
Zitundo
Ponta do Ouro
0 2.5 5 10 Kilometers
Esri, NASA, NGA, USGS, Esri South Africa, Esri, TomTom, Garmin, METI/NASA, USGS, Sources: Esri, USGS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2023-06-05 to 2023-09-09
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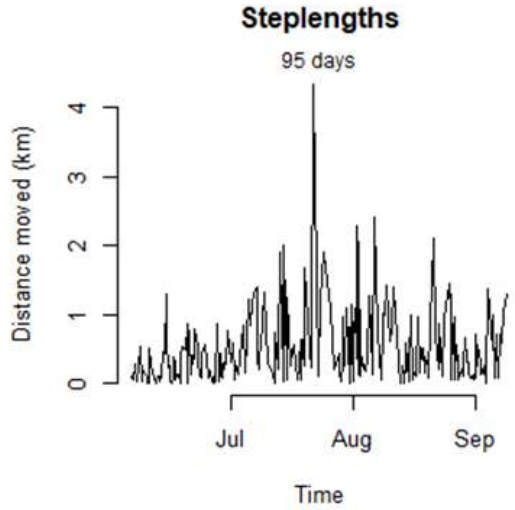
793000
Easting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Distance moved (km)
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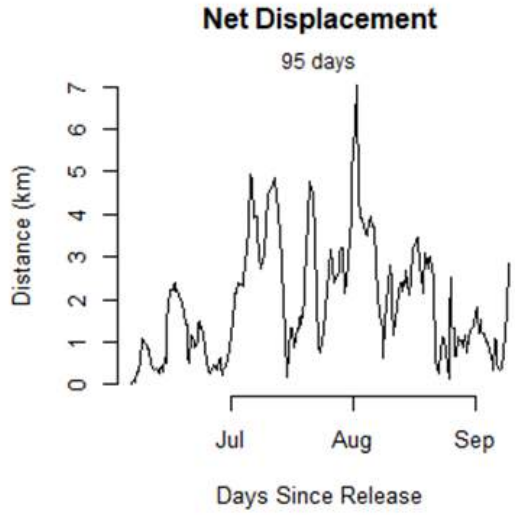
Jul
Aug
Sep
Time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Distance (km)
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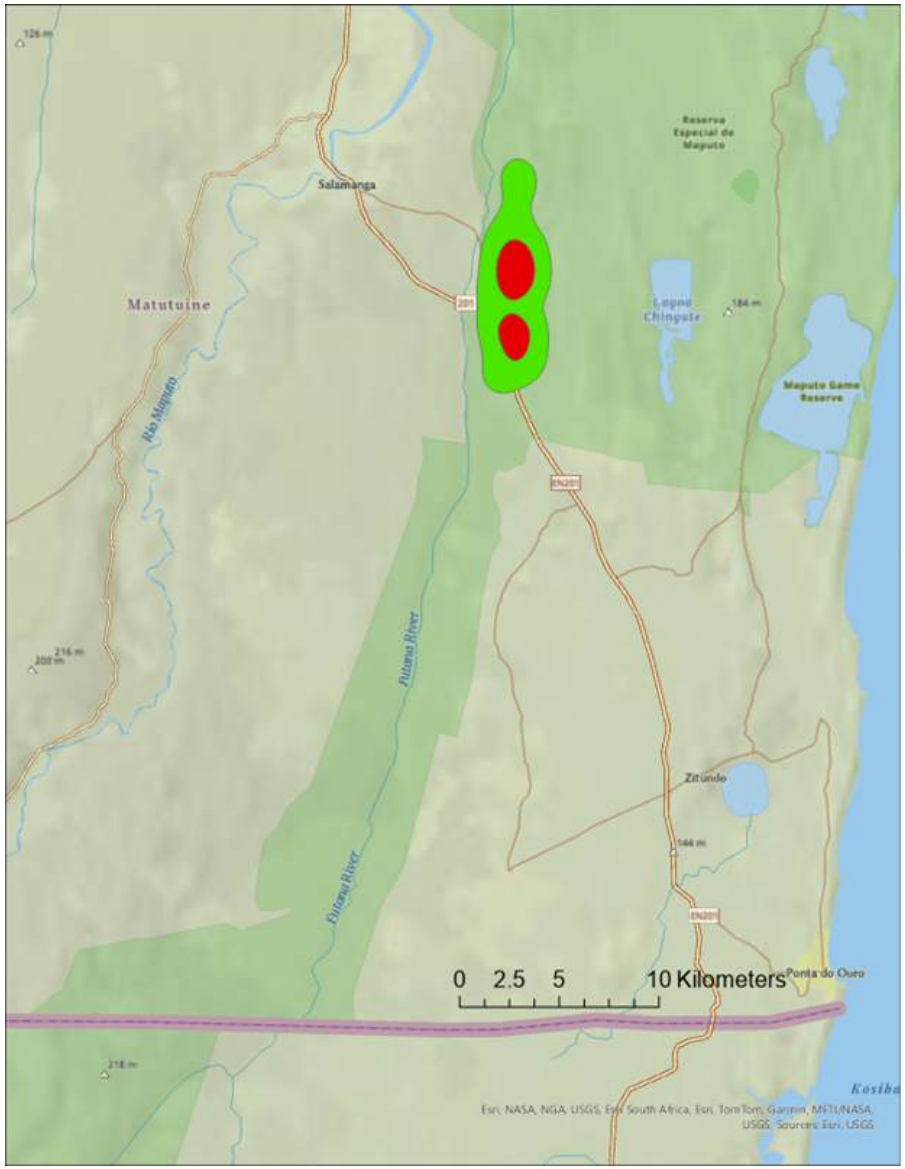
Jul
Aug
Sep
Days Since Release


Salamanga
Matutuine
Reserva Especial de Maputo
Lagoa Chingute
Maputo Game Reserve
Rio Momdo
Futuna River
Zitundo
Ponta do Ouro
0 2.5 5 10 Kilometers
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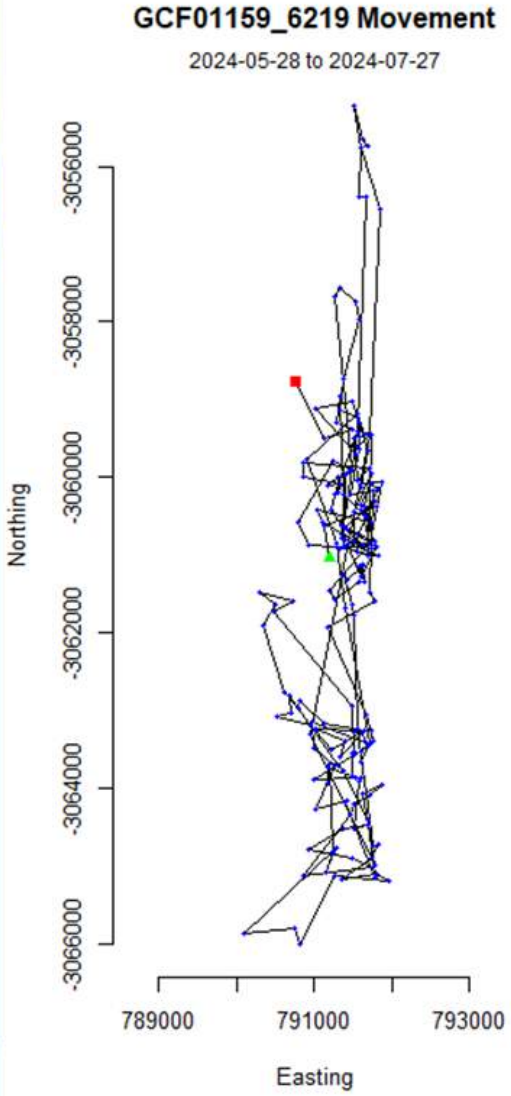
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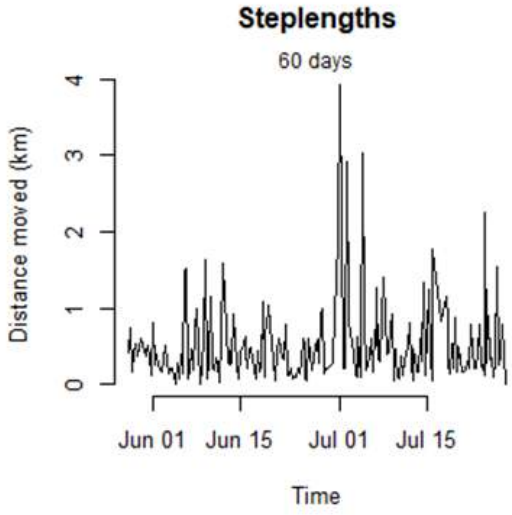
Easting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Distance moved (km)
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2
3
4
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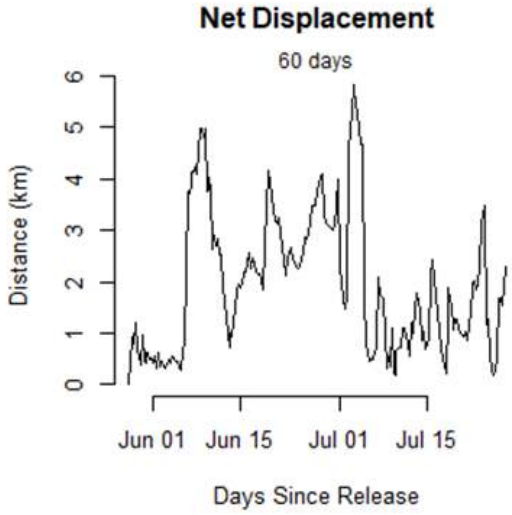
Jun 15
Jul 01
Jul 15
Time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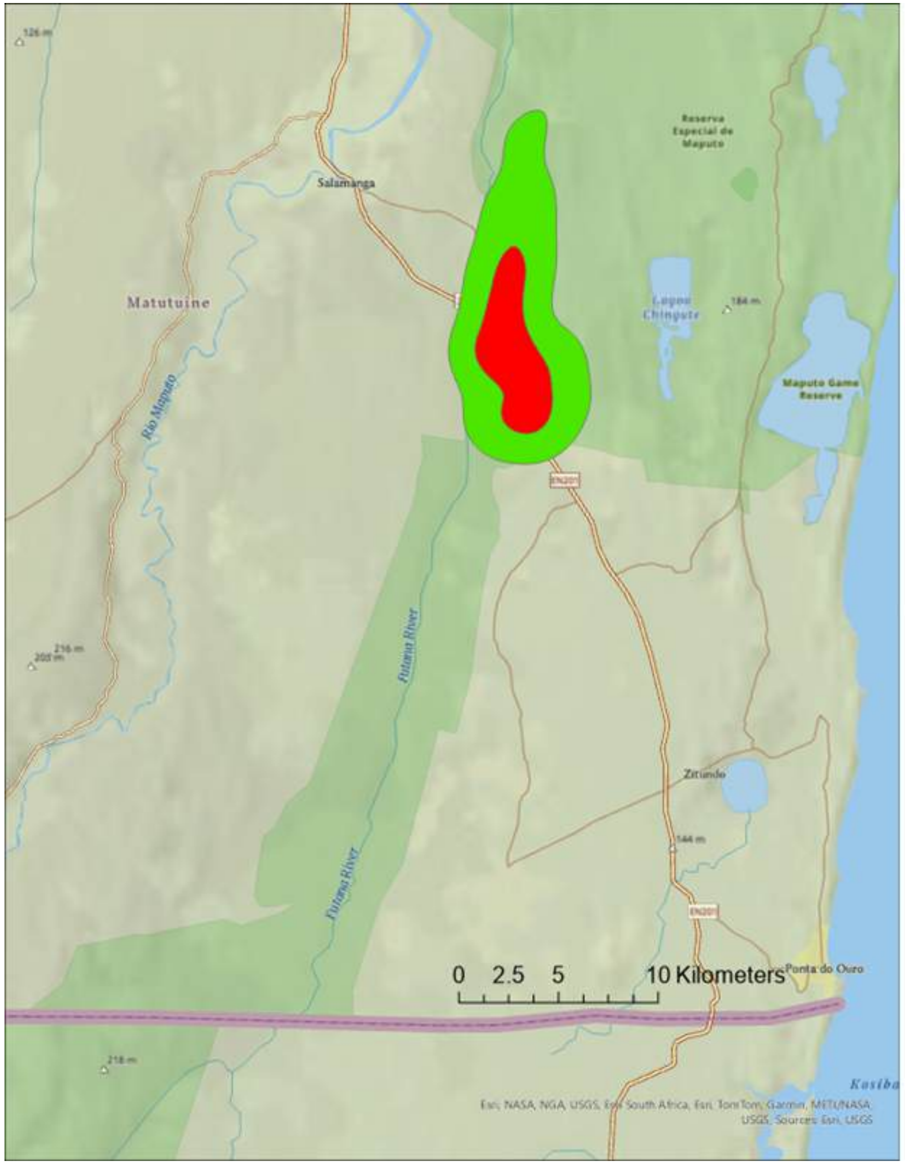

Salamanga
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Reserva Especial de Maputo
Maputo Game Reserve
Zitundo
Ponta do Ouro
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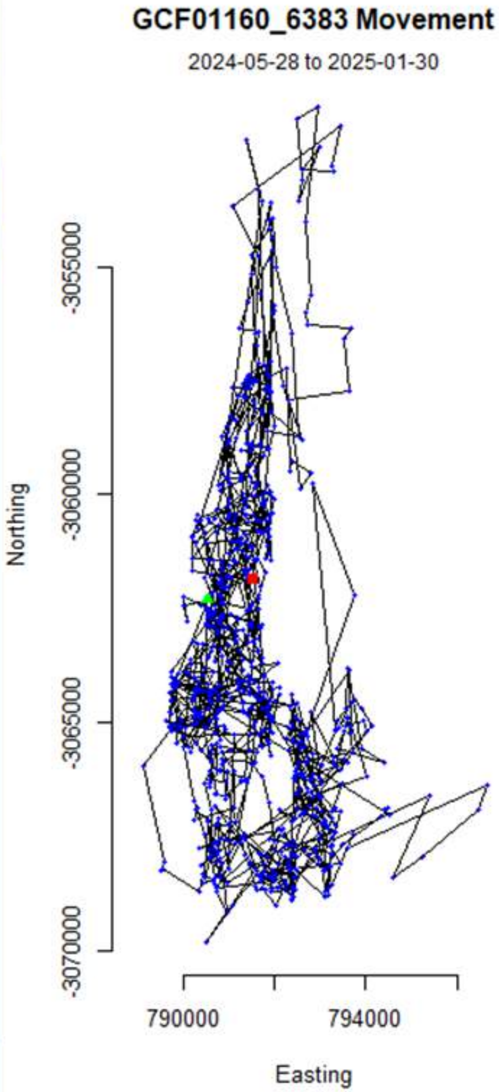

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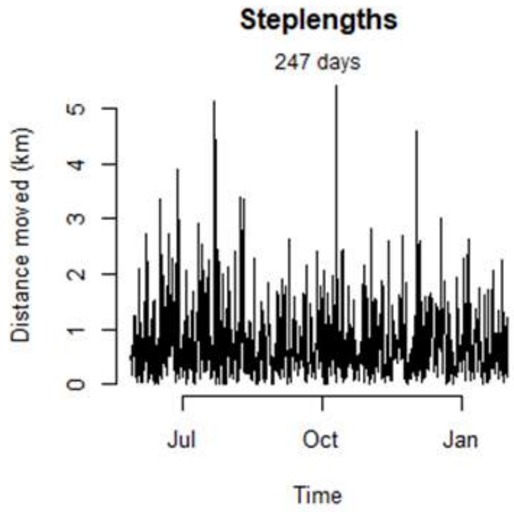
Easting



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3
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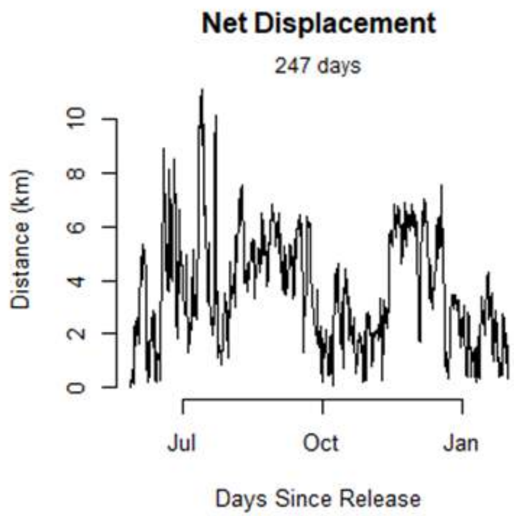
Jul
Oct
Jan
Time



Net Displacement
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Distance (km)
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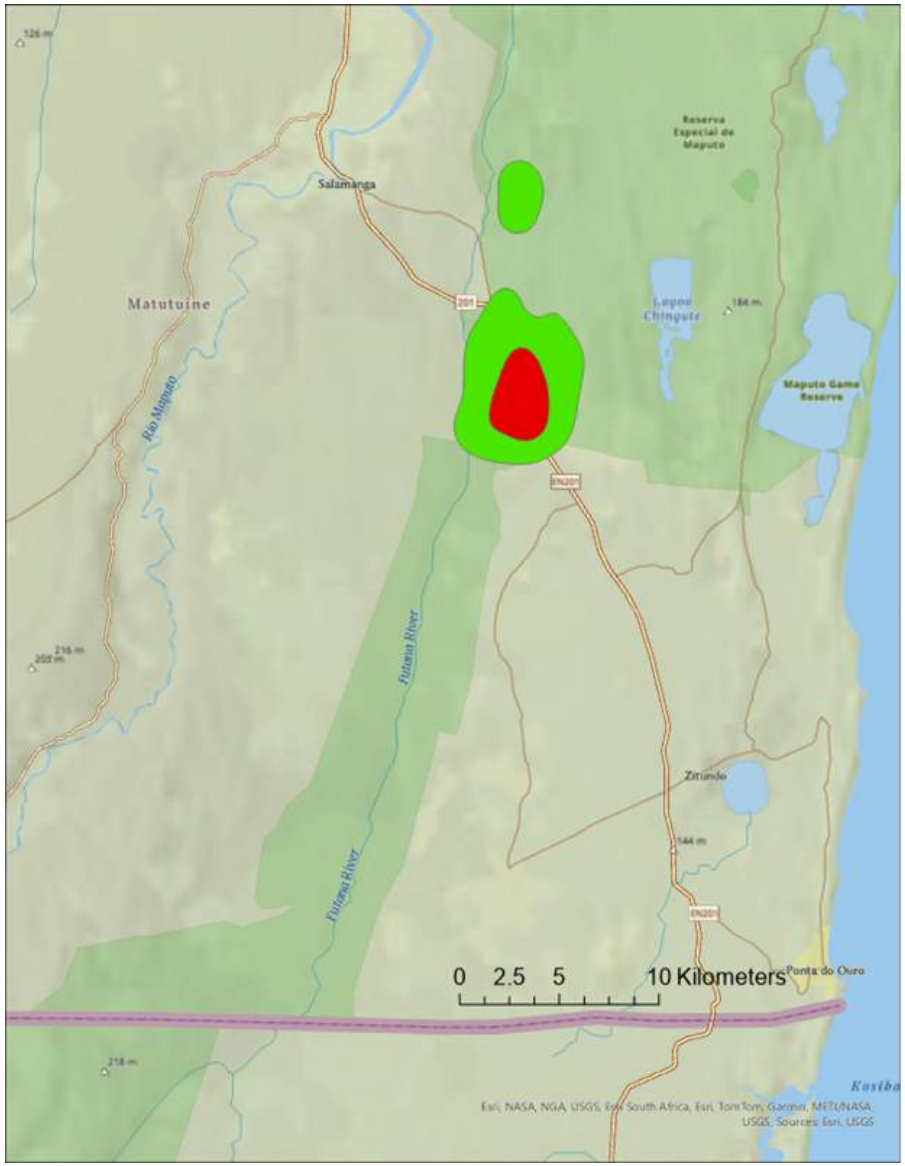
Days Since Release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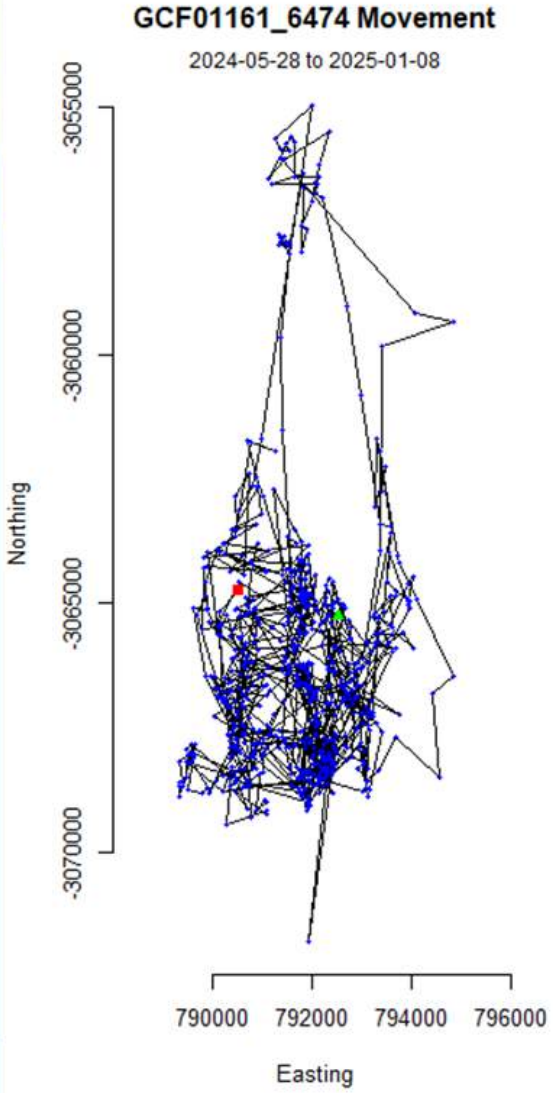
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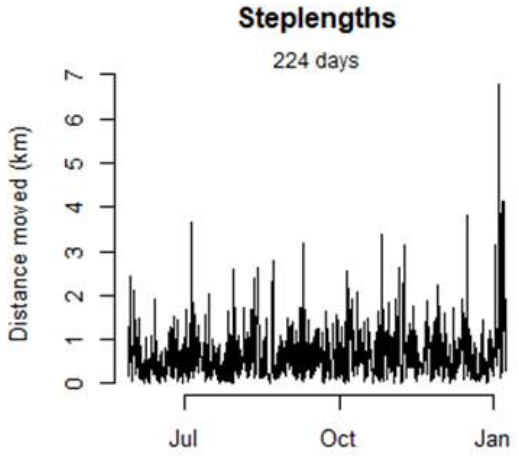
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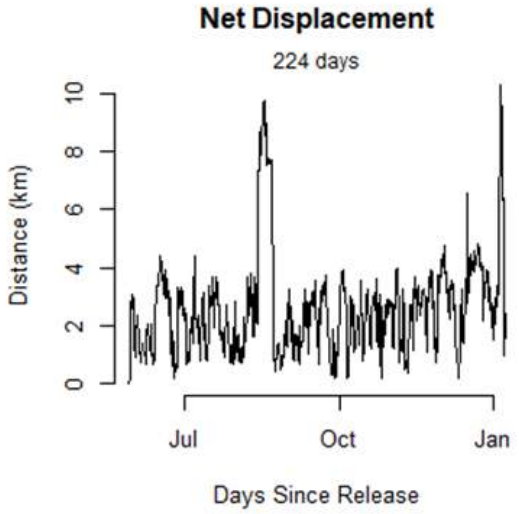
Time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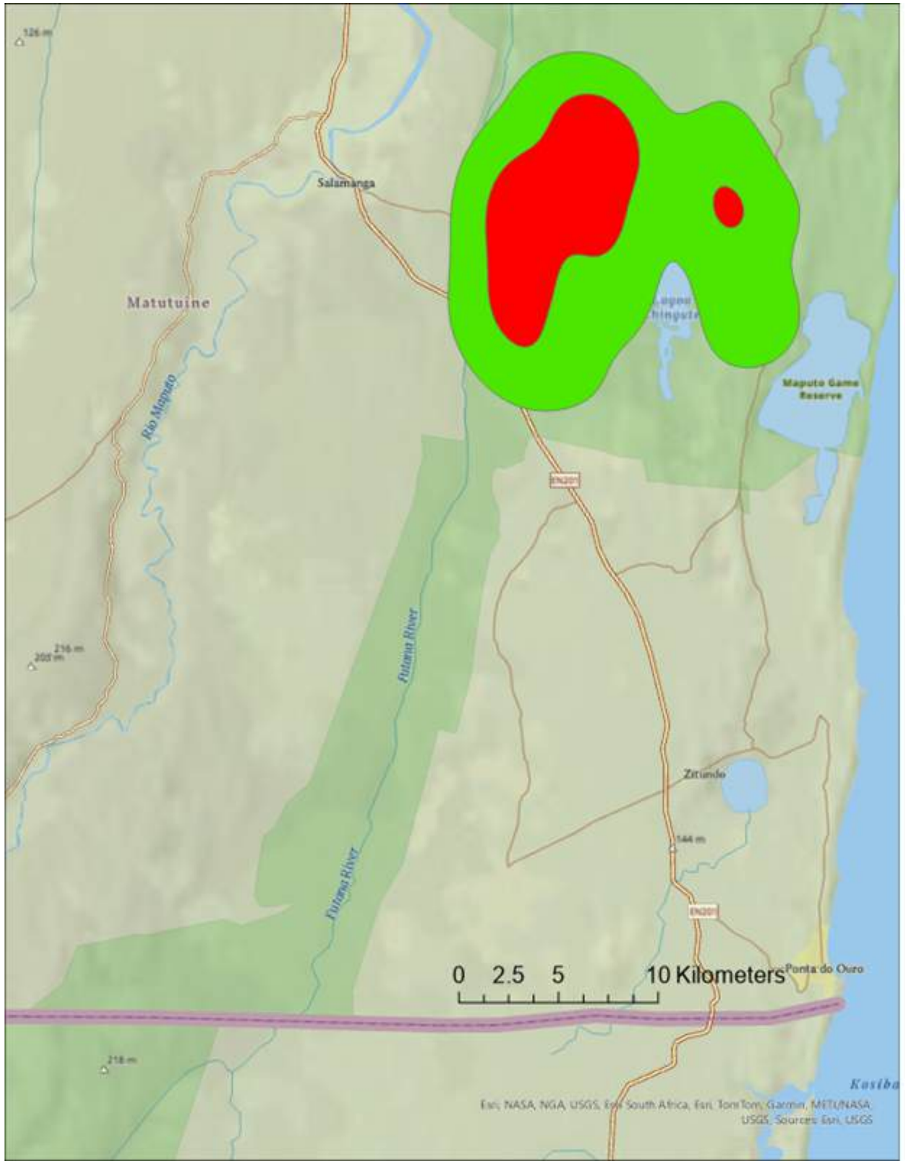
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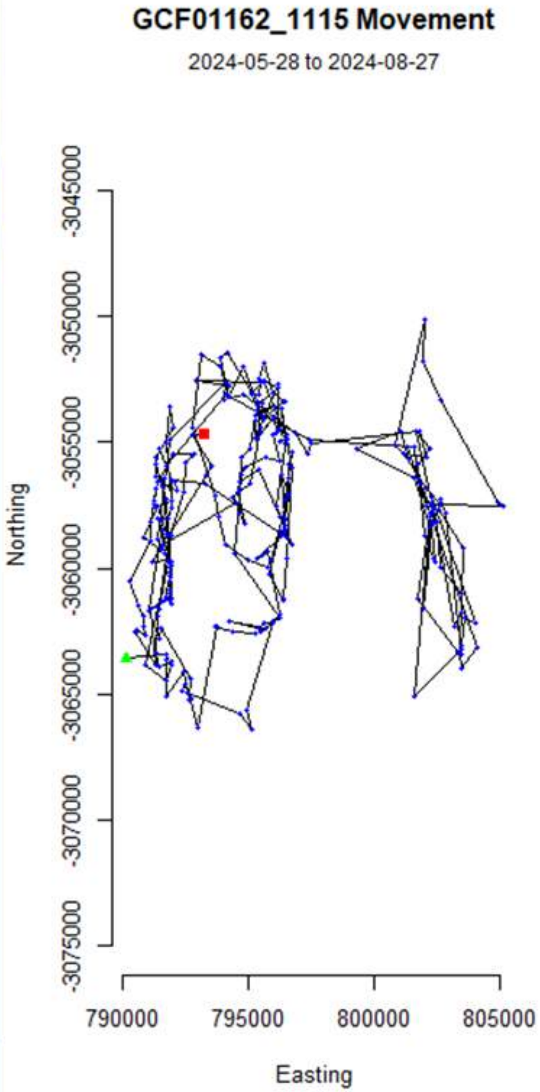
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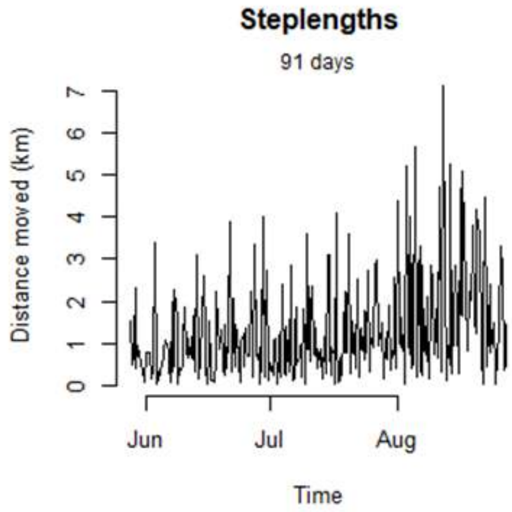
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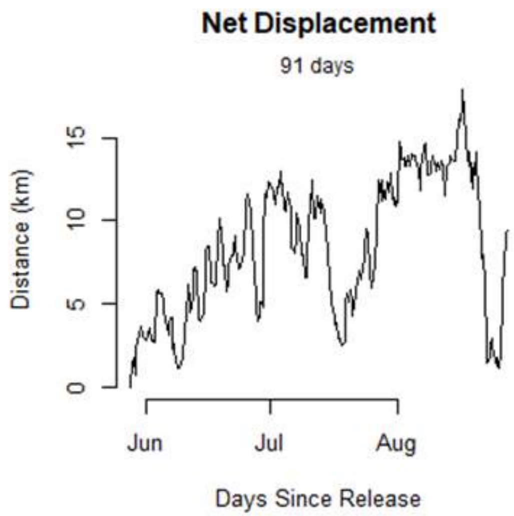
Jun
Jul
Aug
Time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Distance (km)
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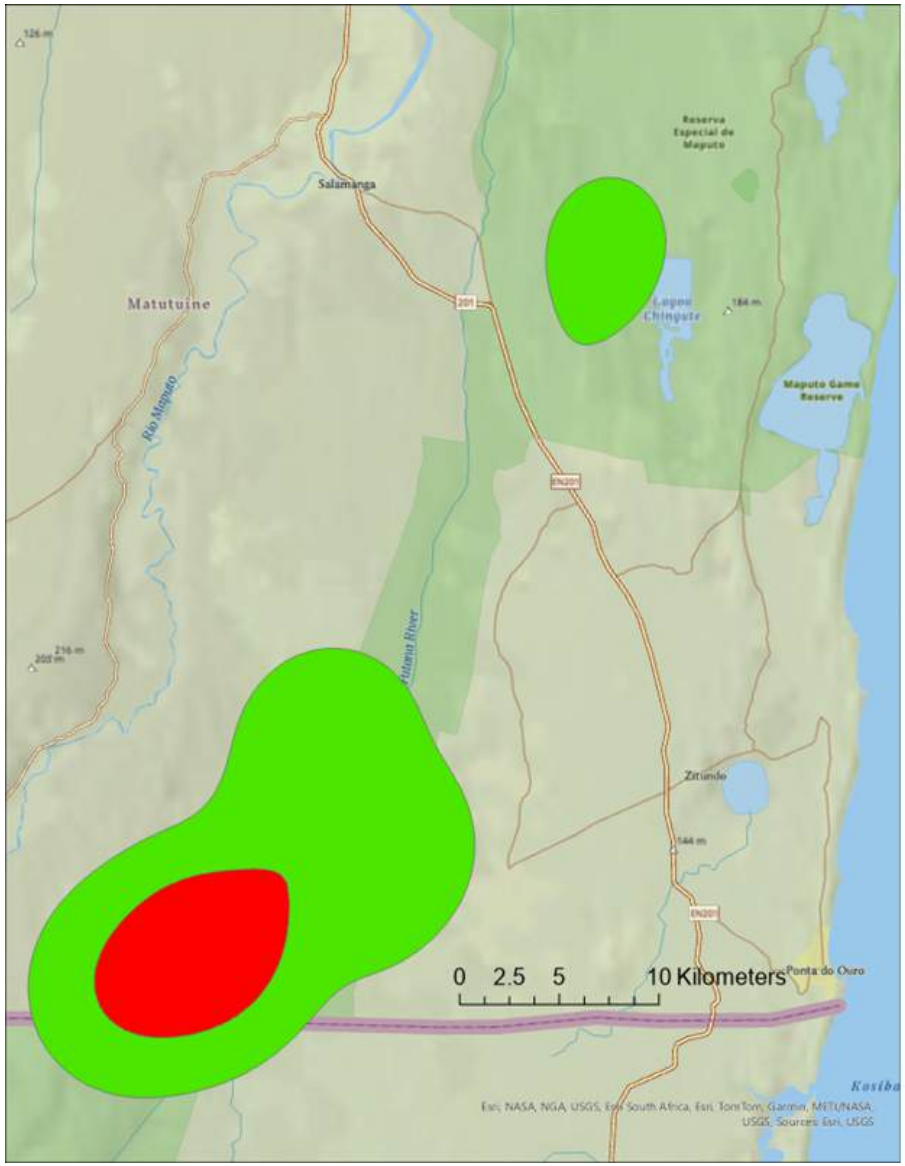
Jun
Jul
Aug
Days Since Release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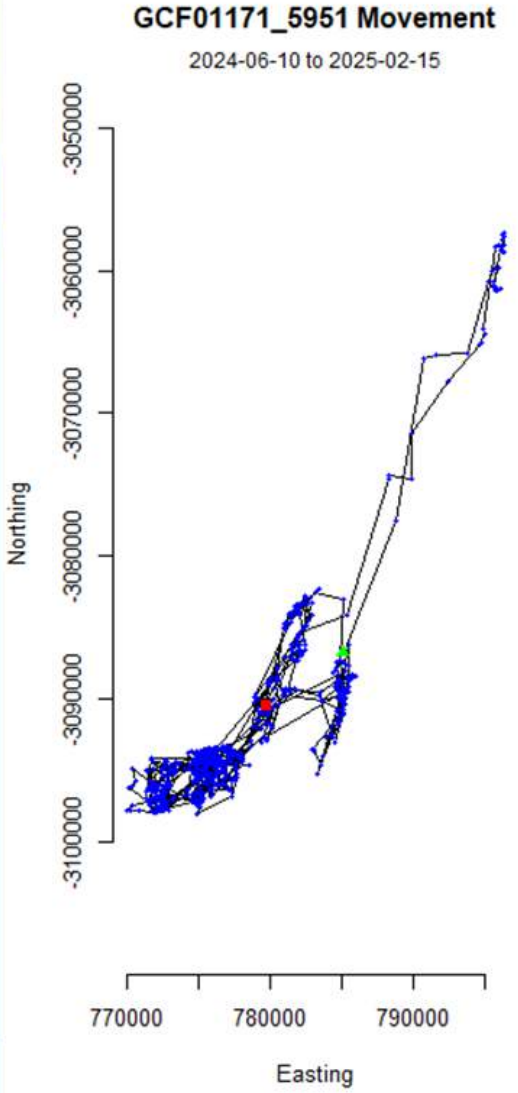
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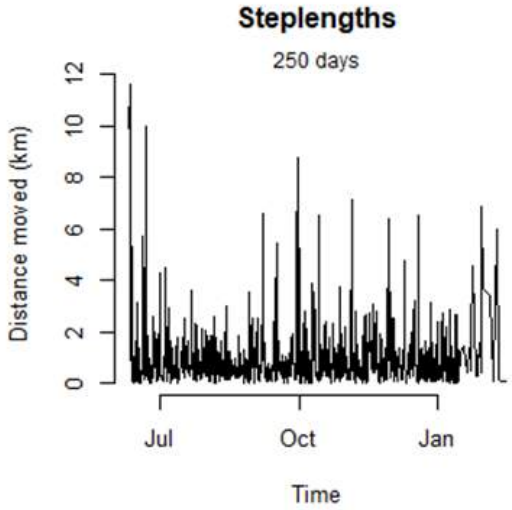
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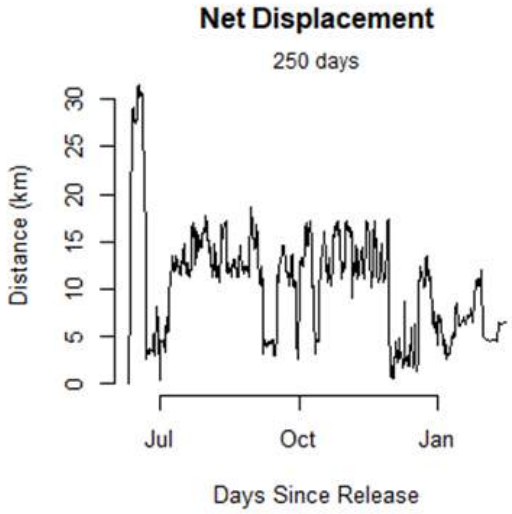
Jul
Oct
Jan
Time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Distance (km)
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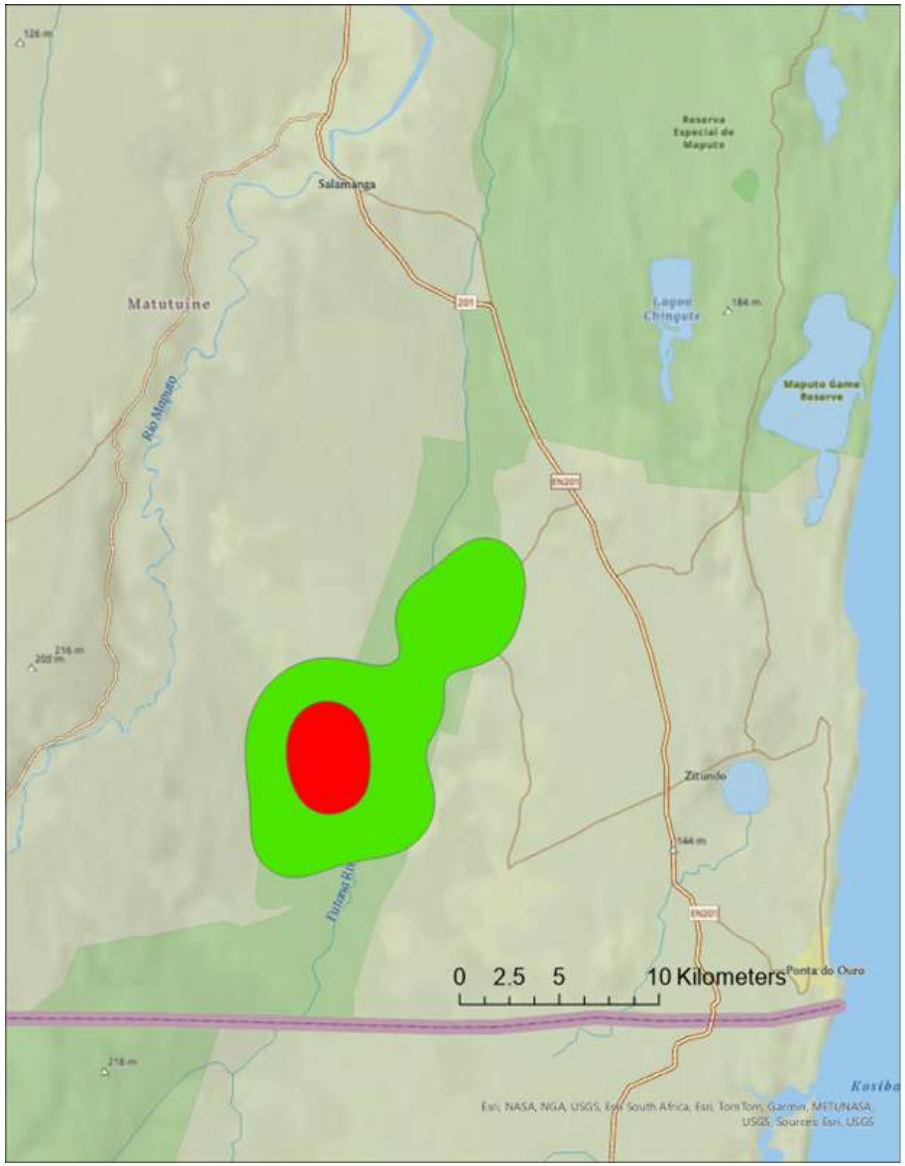
Jul
Oct
Jan
Days Since Release


Reserva Especial de Maputo
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Lagoa Chingute
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Rio Mamedo
Zitlundo
Ponta do Ouro
0 2.5 5 10 Kilometers
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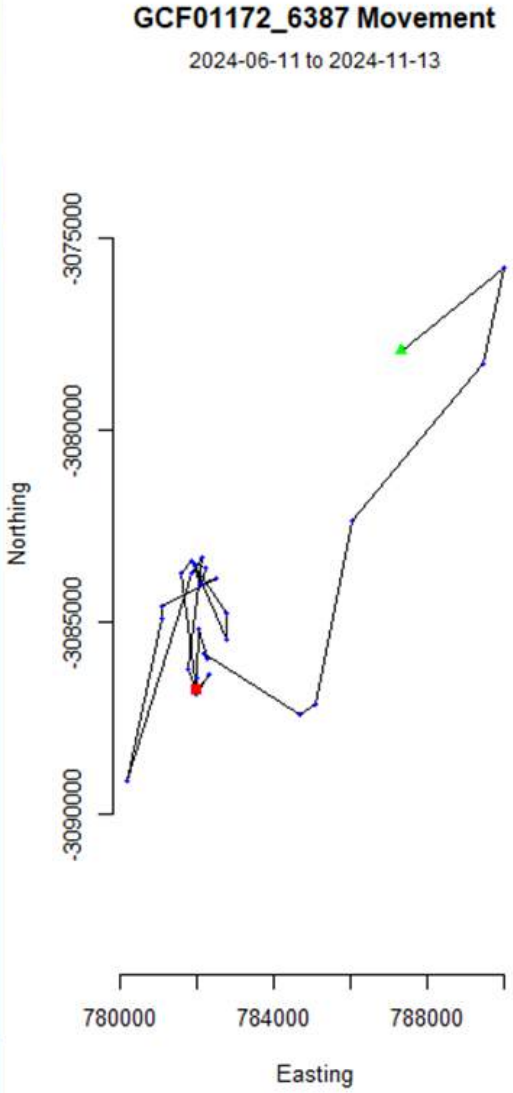
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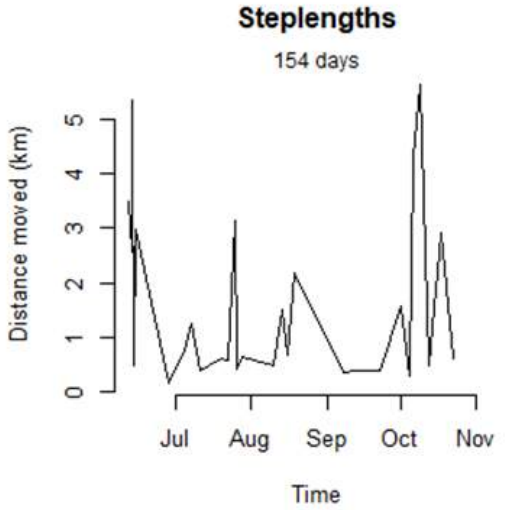
Easting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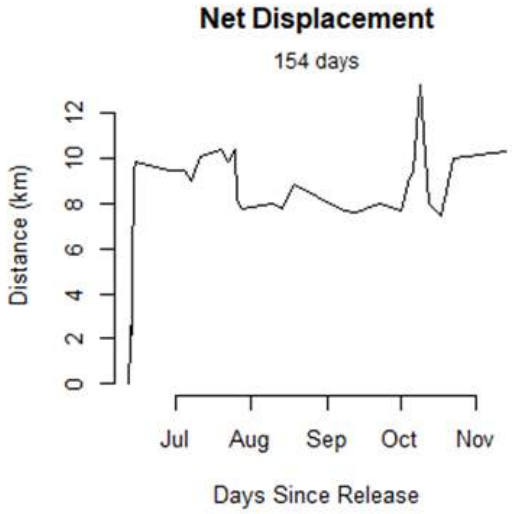
Jul Aug Sep Oct Nov
Time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Jul Aug Sep Oct Nov
Days Since Release