# Assessing Distribution, Population Dynamics, and Conservation Strategies for the Critically Endangered Southern Patas Monkey (*Erythrocebus baumstarki*) in Northern Tanzania's Serengeti Ecosystem

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## Executive Summary

The Southern patas monkey (*Erythrocebus baumstarki*) is critically endangered due to significant habitat loss and degradation throughout its historic range in East Africa. Currently, this species is confined to isolated areas in Tanzania's Serengeti, with fewer than 100 adults remaining. It has already become extinct in Kenya. This rapid decline is primarily driven by agricultural expansion, charcoal production, and competition with livestock, putting the species at risk of extinction. Urgent conservation measures are essential to prevent further decline and ensure the survival of this unique primate. These measures should include habitat protection, regular population monitoring, and securing safe water sources.

## Introduction

The Southern Patas Monkey (*Erythrocebus baumstarki*), a 'Critically Endangered' species of patas monkey, is at risk of becoming the first primate extinction in mainland Africa if urgent conservation measures are not implemented. Southern Patas Monkey is listed as Critically Endangered on the IUCN Red List of Threatened Species and it is listed for the second time as one of the 25 most threatened primate species in the world (see Butynski and de Jong, 2022 and De Jong and Butynski, in prep). Endemic to East Africa, the Southern Patas Monkey was once distributed across southern Kenya and central north Tanzania, a geographic range of approximately 66,000 km². However, its geographic range has diminished by an estimated 85% since the early 20th century due to human-driven habitat degradation, fragmentation, and competition over resources (De Jong et al., 2009; De Jong & Butynski, 2021). This alarming range contraction has confined the species to small, isolated populations in Tanzania's Serengeti ecosystem, with fewer than 100 mature individuals remaining (De Jong & Butynski, 2021).

Historically, the Southern Patas Monkey was found in three main regions in Tanzania: the Serengeti, Mount Kilimanjaro, and Arusha (De Jong et al., 2009). However, populations in the Kilimanjaro and Arusha areas have become increasingly isolated and fragmented due to expanding agriculture, charcoal production, and urbanization, leading to local extinctions in many areas (Loishooki et al., 2016). By around 2015, the species had also become extinct in Kenya (De Jong & Butynski 2021). The remaining population is primarily confined to the western Serengeti and adjacent protected areas, where occasional sightings have been documented in locations such as the Grumeti Game Reserve and Ikona Wildlife Management Area (WMA) (De Jong & Butynski, 2021).

The Patas Monkey occupies a unique ecological niche in semi-arid, open acacia woodlands, where it relies heavily on the Whistling Thorn Acacia (*Acacia drepanolobium*) and *Balanites* tree species for food and shelter (Isbell & Young, 2007). Adapted to these arid habitats, the patas monkey is highly terrestrial and displays remarkable adaptations for (long distance) ground movement, making it one of the fastest-running primates, reaching speeds of up to 55 km/h. This speed and terrestrial behavior are crucial for predator evasion in open landscapes (Hall, 1965; Isbell, 1998). However, as their habitats become increasingly fragmented due to human activities, these adaptations provide less protection against habitat loss and anthropogenic pressures.

Patas need to drink daily, and the location of water sources affects their movements, especially in the dry season (Struhsaker & Gartlan, 1970; Chism & Rowell, 1988). A significant driver of the Southern Patas Monkey's decline is the intense competition with the rapidly growing human population, and their livestock, for perennial water sources. The demand for agricultural land, charcoal, and other resources has led to extensive woodland destruction, reducing the available habitat for this primate (De Jong & Butynski, 2020). In addition, illegal grazing, snaring, and attacks from domestic dogs near human settlements further threaten this species' survival (Loishooki et al., 2016). Although it is not a primary target of hunters, the Southern Patas Monkey often falls victim to snares set for other animals, while domestic dogs pose a particularly high risk during crop raids (De Jong and Butynski, 2021).

Recognizing the Southern Patas Monkey's vulnerable position, recent studies underscore the need for targeted conservation measures. These include habitat protection, the establishment of protected water sources, the prevention of illegal grazing, and community-based conservation initiatives to foster local support (De Jong & Butynski, 2021). The Serengeti ecosystem, home to the only remaining Southern Patas Monkey population, presents a unique opportunity for long-term ecological and behavioral studies to inform conservation strategies. This research proposal addresses knowledge gaps regarding the current distribution, population structure, and primary threats to the Southern Patas Monkey in the Serengeti. The findings will provide crucial data to guide conservation interventions aimed at ensuring the survival of this Critically Endangered primate.

## The current distribution of Southern Patas Monkey

The only remaining population of Southern Patas Monkey. The historic and current geographic range of the Southern Patas Monkey is provided in Figure 1.

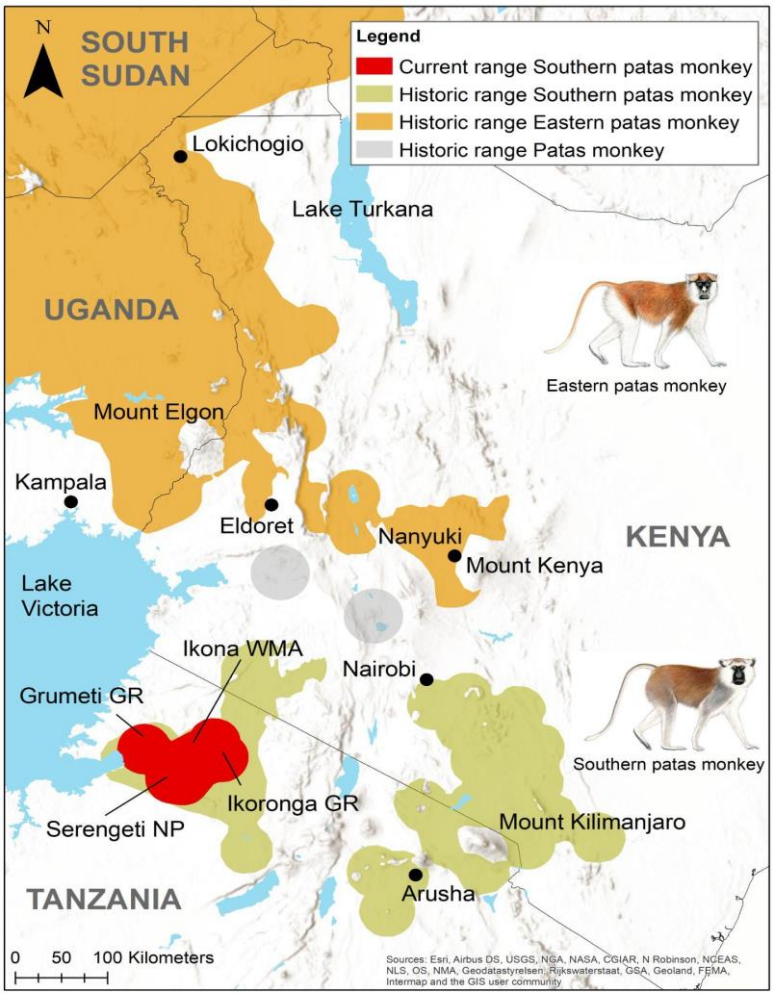


Figure 1. Historic and current geographic range of the Southern Patas Monkey (*Erythrocebus baumstarki*) in Northern Tanzania and Southern Kenya. Map by De Jong and Butynski (2021), used with permission.

## Southern Patas Monkey locality records from De Jong and Butynski (2021) since 2010

In Central Grumeti Game Reserve (GR), a Southern Patas Monkey was observed in 2018 with a single male sighting recorded by G. Tolchard (personal communication). Additional sightings include the Grumeti River area in 2019, as well as Ikorongo GR in various years post-2017, where both individual males and groups were documented. At German Bridge within Ikona Wildlife Management Area (WMA), sightings were reported by Paradise Tented Camp staff in 2020, although group sizes were unspecified. In 2019, multiple observations at Ikona WMA suggested it hosts both solitary males and groups, underscoring its importance as a significant habitat fragment. In Mbalageti and Western Serengeti National Park (NP), groups were observed at Mbalageti Tented Camp in 2020, with sightings ranging from groups of 3 individuals to larger aggregations observed at various sites, including Mbalageti and

Vichakani, from 2012 to 2020. In the Western Corridor and Vichakani areas of Serengeti NP, records between 2010 and 2013 document both group and individual sightings, adding to the distribution data across this ecosystem (Figure 1).

These distribution records reflect the species' fragmented range, largely confined to Serengeti NP and Grumeti GR with occasional sightings in WMA. This isolated population distribution underscores the need for continued monitoring and habitat protection to support Southern Patas Monkey survival in Tanzania.

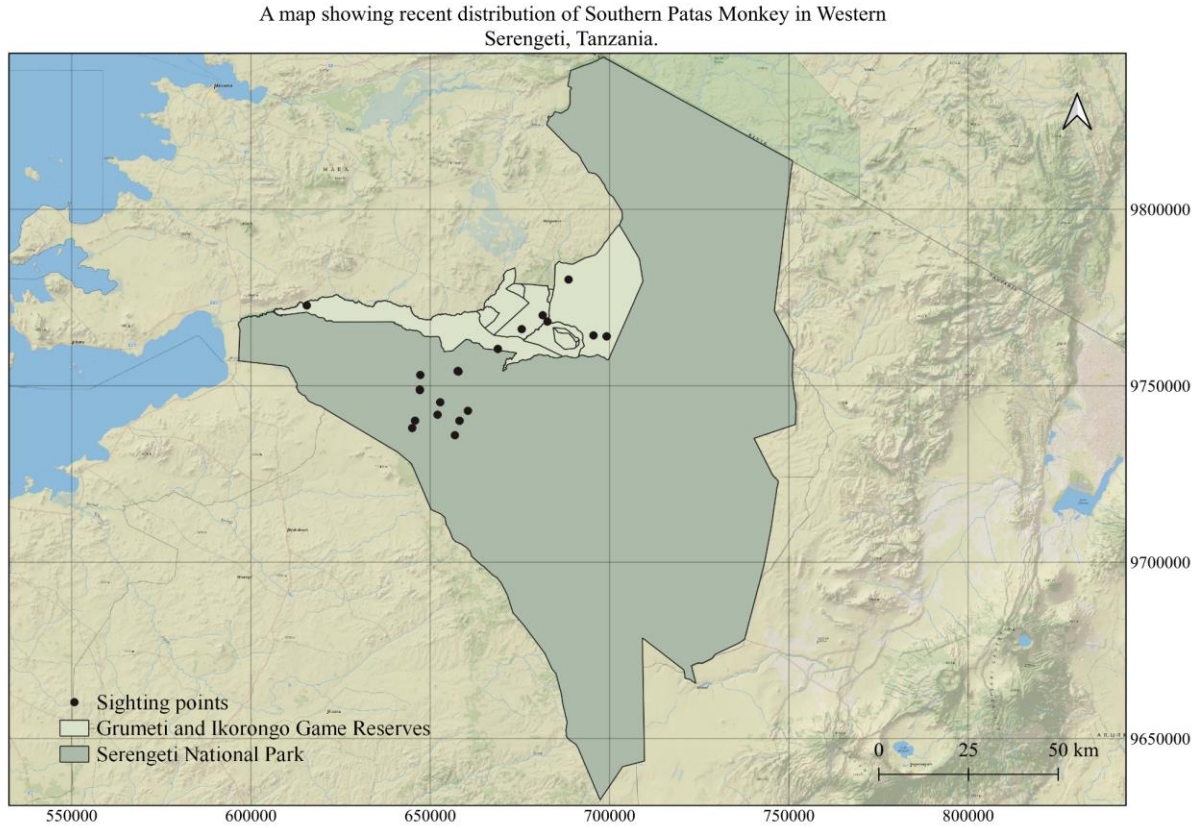


Figure 2. Serengeti Ecosystem with the Southern Patas Monkey sightings since 2010 depicted with black dots (Source: Southern Patasbase, De Jong & Butynski, 2021)

## Threats facing the Southern Patas Monkey

The Southern Patas Monkey (*Erythrocebus baumstarki*) faces significant conservation challenges that have escalated its risk of extinction. Habitat loss and fragmentation are among the most pressing threats, driven largely by agricultural expansion, charcoal production, and infrastructure development. Land conversion for agriculture encroaches on the monkey's natural habitats in the Serengeti and surrounding regions, leaving them with increasingly limited spaces to survive and reproduce (De Jong et al., 2009; De Jong & Butynski, 2020, 2021). Charcoal production, which continues to deforest large swathes of woodland, has compounded this issue, removing critical habitat and further fragmenting the species' range (Loishooki et al., 2016). Additionally, infrastructure development, such as roads and urban expansion, disrupts monkey populations by dividing habitat areas and isolating groups, heightening their vulnerability to extinction (De Jong & Butynski, 2021).

Competition with people and their livestock over drinking water also threatens the Southern Patas Monkey, especially during the dry season when livestock graze on the same limited water resources, depriving the monkeys of essential sustenance (De Jong & Butynski, 2020, 2021). Unregulated grazing within protected areas worsens this scarcity, degrading habitat quality and reducing water availability (De Jong & Butynski, 2021). In addition to resource competition, indirect poaching and snaring pose serious risks. Although not the primary targets of hunters, Southern Patas Monkeys are often caught in snares intended for other animals, resulting in injuries and fatalities (Holt, 2021; Loishooki et al., 2016). As these monkeys venture closer to human settlements in search of resources, they are increasingly at risk from snares and traps set by farmers and hunters, escalating human-wildlife conflicts (De Jong & Butynski, 2020). Domestic dogs add to these predation pressures, as they frequently attack and kill monkeys (Loishooki et al., 2016; De Jong and Butynski, 2021).

Water scarcity further jeopardizes the survival of the Southern Patas Monkey. Natural water sources within their habitat are limited, a situation worsened by human activity and climate change. With restricted access to water, monkey populations become even more isolated, reducing their chances of survival and reproduction (De Jong & Butynski, 2021). Compounding these threats is the lack of local and international awareness regarding the monkey's critically endangered status. This species has received limited conservation attention, leading to an absence of dedicated resources and protective measures ( De Jong & Butynski, 2020, 2021, Butynski and De Jong, 2024). The Southern Patas Monkey remains unstudied. The lack of close monitoring hinders effective conservation planning, as inadequate data on population trends, habitat use, and threats limits the development of conservation action (De Jong et al., 2009; De Jong & Butynski, 2020, 2021). Immediate actions are essential to mitigate these threats, including habitat protection, resource management, and community awareness, to secure the future of this Critically Endangered primate.

## Research Objectives

1. To map the current distribution and estimate the population size of the Southern Patas Monkey in northern Tanzania.
2. To identify and analyze key environmental and anthropogenic factors contributing to the decline of the Southern Patas Monkey.
3. To develop and propose a comprehensive conservation action plan for the Southern Patas Monkey in collaboration with Tanzania National Parks Authority (TANAPA), Tanzania Wildife Research Institute (TAWIRI), Tanzania Wildlife Authority (TAWA) and other stakeholders.
4. To support local academic training by involving a Master's student in field research, data analysis, and conservation planning.

## Research Questions

1. What is the current distribution and population size of the Southern Patas Monkey in Tanzania?
2. What are the main environmental and human-induced factors contributing to the decline of the Southern Patas Monkey population?
    - How have changes in land cover, such as deforestation and reduction in wooded vegetation, affected the monkey's habitat?
    - What roles do soil composition, rainfall patterns, and availability of water sources play in influencing habitat suitability for the Southern Patas Monkey?
    - To what extent do resource competition with livestock, poaching, and predation by domestic dogs impact the species' survival?
3. How can a targeted conservation action plan address identified threats and support population recovery for the Southern Patas Monkey?
4. How can local communities and stakeholders be engaged to promote conservation practices for the Southern Patas Monkey in the Serengeti Ecosystem?

## Methodology

To assess the current distribution, population structure, and conservation threats facing the Southern Patas Monkey in the Serengeti ecosystem, we will employ a multi-method approach. This will allow us to gather comprehensive data from both human and non-human sources to inform effective conservation strategies. The methodologies include surveys through questionnaires, camera trapping, geographic information system (GIS) analysis, and regular field surveys in areas historically known as home ranges for the Southern Patas Monkey.

**1. Questionnaire Surveys**

We will conduct questionnaire surveys targeting individuals with significant insight into the Southern Patas Monkey's habitat, behavior, and the threats they face. Specifically, we will focus on:

- **Tour Guides**: Engaging tour guides who operate regularly within the Serengeti National Park and surrounding areas. Their frequent observations and knowledge of animal movements and behaviors can provide valuable insights into the current status of the Southern Patas Monkey.
- **Tanzania National Parks Authority (TANAPA) Staff**: We will survey TANAPA personnel across various roles, particularly focusing on ecologists, park rangers, and managers, as they are

closely involved with conservation efforts and are likely to have detailed knowledge of wildlife trends and specific conservation challenges.

- **Lodge Employees**: Lodge staff working within and around areas where Southern Patas Monkeys have been sighted will be surveyed to document recent observations and collect anecdotal evidence. Staff members in proximity to known habitats are often aware of sightings and activity patterns.
- **Local Communities**: In villages adjacent to Ikorongo-Grumeti and Serengeti National Park, we will interview local residents to gather information on sightings and potential human-wildlife conflict. Understanding community perspectives and knowledge is essential, as these areas face significant anthropogenic pressure that could impact monkey populations (De Jong et al., 2009; De Jong & Butynski, 2021; Holt, 2021).

**2. Camera Trapping and Regular Field Surveys**

Camera traps are a well-established tool for monitoring elusive species and have been used effectively in previous wildlife studies (O'Brien, et al., 2003). We will employ camera trapping through two primary collaborations:

- **Snapshot Serengeti Project**: We will analyze multi-year camera trap data from the Snapshot Serengeti project to assess long-term trends in the presence and movement patterns of the Southern Patas Monkey within the Serengeti. This data will help establish baseline activity levels, distribution, and potential habitat changes over time.
- **Grumeti Fund (2017 Camera Trap Data)**: Additionally, we will access camera trap data from the Grumeti Fund collected in 2017, which may contain valuable observations of Southern Patas Monkeys within the Grumeti Reserve. Analyzing this data will allow us to identify both spatial and temporal patterns in the population.
- **New Camera Traps in Key Locations**: Where recent sightings have been reported, we will set up new camera traps to capture real-time data on the presence and behavior of the Southern Patas Monkey. This targeted approach will help monitor previously recorded areas, particularly those with significant habitat fragmentation, to determine the persistence of these monkeys within their historical ranges.
- **Regular Field Surveys in Known Home Ranges**: To maximize the chances of observing the remaining population, we will conduct regular field surveys in areas that were historically known as home ranges for the Southern Patas Monkey. These surveys will be conducted on foot and by vehicle, allowing for opportunistic sightings and real-time data collection in locations with past population presence.

**3. Geographic Information System (GIS) Analysis**

To understand habitat changes and environmental factors contributing to the decline of the Southern Patas Monkey, we will conduct GIS analysis. This spatial analysis will help identify covariates affecting monkey populations, with a particular focus on:

- **Land Cover Changes**: Assessing the extent of deforestation and reduction in wooded vegetation, which may impact the monkeys' preferred habitats (Isbell & Young, 2007).

- **Soil Composition and Rainfall Patterns**: Investigating the soil types and rainfall variations to determine how these factors might influence vegetation and water availability, affecting habitat suitability (De Jong & Butynski, 2020).
- **Poaching Trends and Human Activity**: Using GIS to overlay poaching and encroachment data will help identify high-risk zones where human pressures may be most impactful.
- **Topographical Factors**: Examining elevation data and proximity to water sources to determine if these variables correlate with observed population declines.

This GIS approach will allow us to produce detailed maps to visualize habitat changes and potential stressors within the Southern Patas Monkey's range, providing valuable insights for targeted conservation interventions (e.g., Herold, et al., 2008).

## Study Areas

Protected areas: Serengeti National Park especially the western corridor, Grumeti Game Reserve, Ikorongo Game Reserve, and Ikona WMA (Figure 2)

Open Areas: This study will be conducted in two regions: **Mara** (Serengeti, Bunda) and **Simiyu** (Meatu and Bariadi Districts)

## Expected output

This proposed research project aims to produce several critical outputs that will contribute significantly to the conservation of the Southern Patas Monkey in northern Tanzania. The key expected outputs include:

1. **Updated Distribution Maps and Population Estimates**
   This project aims to produce updated and detailed distribution maps of the Southern Patas Monkey in northern Tanzania, particularly in the Serengeti and surrounding areas. By integrating data from camera traps, field surveys, and GIS analysis, we will create precise maps that depict current habitat use and population distribution. Additionally, this project will estimate the population size, providing crucial information for understanding the status of this critically endangered species.
2. **Identification of Underlying Factors for Decline**
   This project will analyze ecological and human-related factors, including changes in land cover, water availability, soil composition, rainfall patterns, and poaching trends, to identify the main reasons behind the decline of the Southern Patas Monkey. By understanding the habitat needs of this species and the challenges it faces, we can develop targeted conservation strategies to help ensure its survival.
3. **Development of a Conservation Action Plan**
   In partnership with the Tanzania National Parks Authority (TANAPA), the Tanzania Wildlife Authority (TAWA), the Tanzania Wildlife Research Institute (TAWIRI), and other local stakeholders, this project aims to develop a comprehensive action plan for the protection and recovery of the Southern Patas Monkey. The plan will outline practical steps to tackle habitat loss, reduce human-wildlife conflict, and improve local awareness and community involvement.

This conservation strategy will serve as a framework for ongoing efforts to ensure a viable future for this endangered primate.

4. **Support for Academic Training and Capacity Building**
   Through this project, we aim to support at least one Master's student from the College of African Wildlife Management (Mweka), fostering academic training and capacity building in conservation science. The student will gain practical experience in field research, data analysis, and conservation planning, contributing to a new generation of conservationists ready to tackle challenges in wildlife conservation.

Together, these outputs will provide a robust foundation for both immediate and long-term conservation efforts, contributing to the survival and recovery of the Southern Patas Monkey in Tanzania

## Timeline

This research is planned over a three-year period (2025–2028), with specific phases for data collection, analysis, and conservation planning. Depending on data availability and progress, an extension may be requested to ensure comprehensive results.

- **Year 1 (2025): Project Setup and Initial Data Collection**
  - **Q1-Q2**: Recruit and onboard research assistants and establish collaboration with Snapshot Serengeti and Grumeti Fund for camera trap data.
  - **Q3-Q4**: Begin field surveys, including distribution mapping and population estimates in historically known home ranges. Deploy new camera traps in targeted locations, particularly around Grumeti and Serengeti National Park. Start questionnaire surveys with local communities, TANAPA staff, tour guides, and lodge employees.
- **Year 2 (2026): Comprehensive Data Collection and Initial Analysis**
  - **Q1-Q2**: Continue camera trapping and field surveys across northern Tanzania. Gather and analyze camera trap data from Snapshot Serengeti and Grumeti Fund. Conduct follow-up questionnaires in additional locations if required.
  - **Q3**: Begin GIS analysis to map habitat changes, land cover, and environmental factors affecting the monkey population, incorporating covariates such as soil, rainfall, elevation, and proximity to water sources.
  - **Q4**: Conduct preliminary analysis to identify potential factors behind population decline and summarize initial findings. Begin drafting preliminary sections of the conservation action plan based on data collected.
- **Year 3 (2027): Final Data Collection, Analysis, and Conservation Action Plan Development**
  - **Q1-Q2**: Complete final rounds of field surveys and camera trapping. Finalize questionnaire surveys, gathering any remaining qualitative data from key informants.
  - **Q3**: Complete full data analysis, finalizing distribution maps, population estimates, and factors impacting population health. Conduct a workshop with stakeholders, including TANAPA, to discuss findings.
  - **Q4**: Develop a detailed Conservation Action Plan with TANAPA and local stakeholders. Prepare academic publications, reports, and presentations to disseminate findings.
- **Q1 (2028): Project Reporting and Potential Extension Assessment**

- Submit final reports to relevant authorities and stakeholders. Assess data gaps or additional questions that may require an extension of the research phase to continue monitoring or address new findings.

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