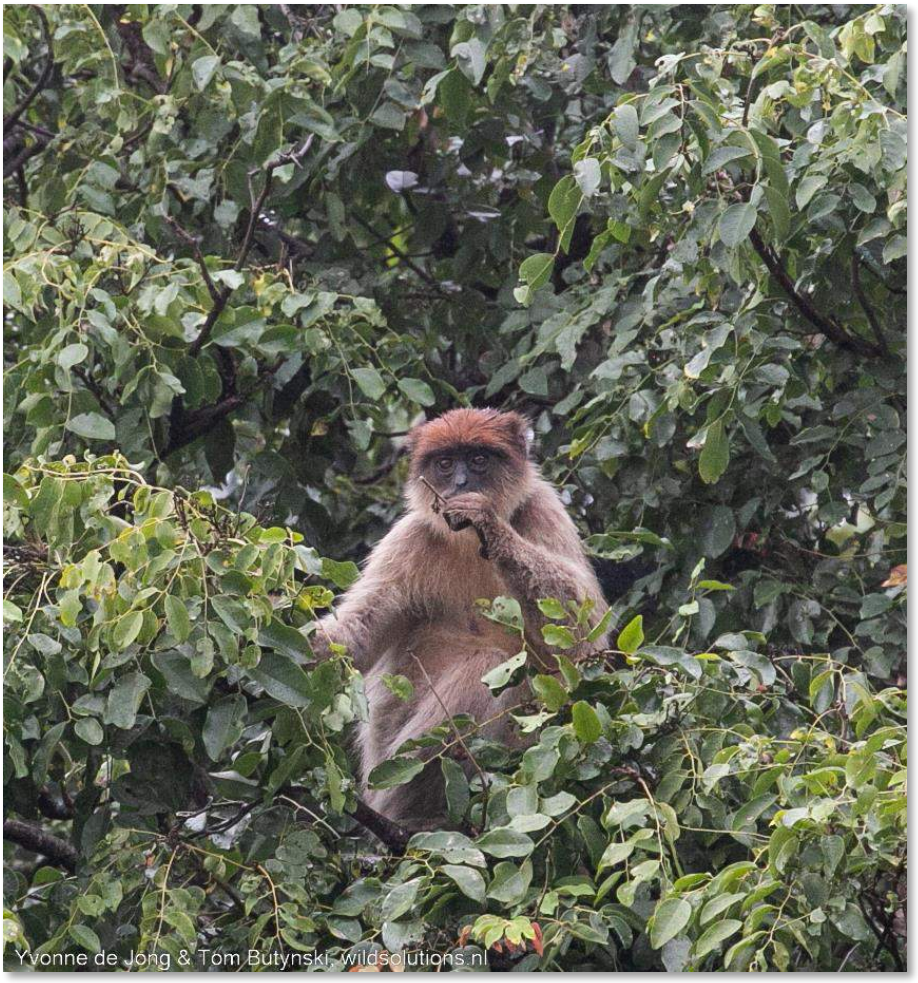
Mahale Mountains National Park: Tourism Development and Ranger and Guide Training in Research Methods



Report to Tanzania National Parks, Nomad Tanzania, and Re:wild

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Cover photograph: Ashy red colobus *Piliocolobus tephrosceles*, Mahale Mountains National Park, Tanzania

Unless otherwise stated, all photographs and maps by Yvonne de Jong and Thomas Butynski.

Content

Summary

In April 2022, an exercise titled, 'Tourism Development and Ranger and Guide Training in Research Methods' was conducted. This exercise was facilitated by Tanzania National Parks (TANAPA) and Nomad's Greystoke Mahale, with additional financial support from Re:wild. During this exercise, which was mostly conducted at the higher altitudes of Mahale NP, we: (1) trained five TANAPA rangers and eight Greystoke Mahale guides and trackers in natural history and field research methods; (2) identified a tourist hiking trail from Lake Tanganyika to the top of Mt. Nkungwe; (3) located four camp sites for tourists; (4) identified the most scenic viewpoints and sites where the more interesting species of mammals and birds (particularly primates and endemics) are most likely to be encountered; (5) updated the list of primates for Mahale NP; and (6) prepare a new edition of '*Primates of Mahale Mountains National Park, Tanzania*' (Butynski and De Jong 2009).

Mahale NP supports a total of 11 species of primate, of which seven are diurnal and four are nocturnal. These include the recently named Mahale Angola colobus *Colobus angolensis mahale*, Thomas's dwarf galago *Galagoides thomasi* (only other site where this galago is known to occur in Tanzania is Minziro Forest, northwestern Tanzania), and an unidentified dwarf galago *Paragalago*. The presence of the Mozambique dwarf galago *Paragalago granti* was not confirmed. The most common diurnal primate observed was the ashy red colobus *Piliocolobus tephrosceles*, followed by Schmidt's red-tailed monkey *Cercopithecus ascanius schmidti*. The Mahale Angola colobus has the most limited altitudinal range and geographic distribution, as well as the smallest population. Twelve camera traps (*ca.* 580 camera trap days) captured eight species of vertebrate between 1,200 m asl and 2,335 m asl. All eight species were previously known to occur in Mahale NP. A selection of images is presented in this report while video footage is provided at: https://www.wildsolutions.nl/mahale/.

This report presents some of the more noteworthy findings for Mahale NP's primates, addresses their biogeography in the Greater Mahale Ecosystem, explains recent taxonomic changes, and provides information of particularly interest to rangers, guides, and tourists.

The two groups of Mahale Angola colobus which were heard during this survey, of which one group was observed, led to the formal describing and naming of this subspecies (De Jong and Butynski 2023a). An article, published in *Primate Conservation* (the open-access journal of the IUCN SSC Primate Specialist Group) presents information on its geographic distribution, abundance, ecology, and threats, and present priorities for research and conservation actions. We hope that this publication brings heightened awareness to the present plight of the African colobines and encourages tourists to visit Mahale NP to view this rare, and endemic, monkey. The abstract of this publication is provided in this report. We assess the Mahale Angola colobus as 'Critically Endangered' on *The IUCN Red List of Threatened Species* (Appendix 4) and accept the suggestion by Dr Anthony Rylands to include this monkey as one of '*The World's 25 most Endangered Primates 2024-2025'*(see http://www.primate-sg.org/special_reports/).

A tourist hiking trail and four tourist camp sites were located in remote parts of Mahale NP. One camp site is at Mfiga and three are along the main trail from Lake Tanganyika to Mt. Nkungwe. A map and details for each camp are provided in this report.

The illustrated '*Primate Checklist'* is in Appendix 1, the illustrated camp brochures are in Appendix 2, the second edition of '*Primates of Mahale Mountains National Park, Tanzania*' is in Appendix 3, and the degree of threat assessment of the Mahale Angola colobus for *The IUCN Red List of Threatened Species* in Appendix 4.

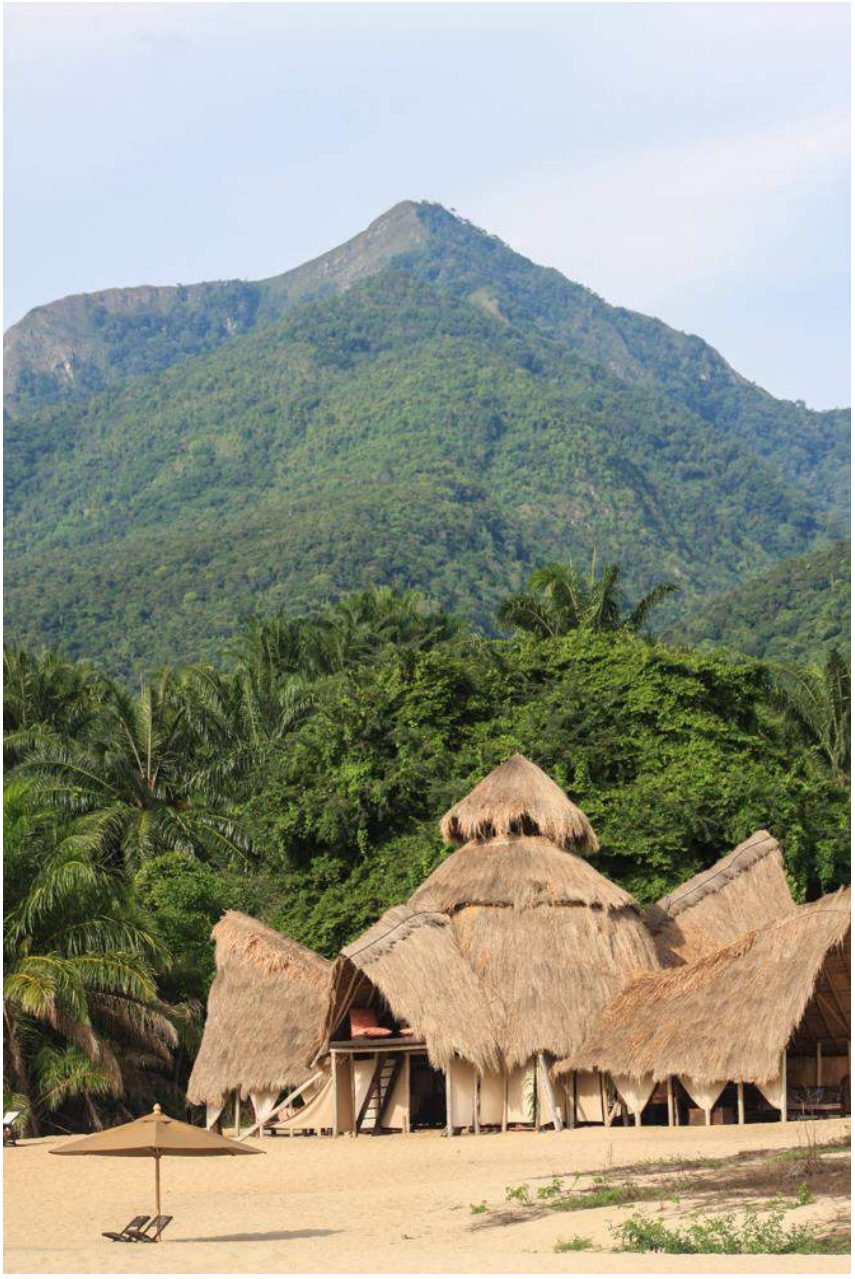

Figure 1. Greystoke Mahale with Mount Nkungwe in the background, Mahale Mountains National Park, central western Tanzania.

1. Mahale Mountains National Park

1.1 Background

Mahale Mountains National Park (1,613 km²; hereafter 'Mahale NP') is located along the Albertine Rift on the eastern shore of Lake Tanganyika, central western Tanzania (Figures 1 and 2). Gazetted in 1985, this park represents the western limit of the 'Greater Mahale Ecosystem/Landscape' (*ca*. 18,200 km²; Kano 1971; Moyer *et al.* 2006; Piel *et al.* 2013; TANAPA 2016; McLester *et al*. 2019; Bonnin *et al*. 2020). The Mahale Mountains are part of the Albertine Rift Biodiversity Hotspot and of particular importance for the conservation of primates. Mahale NP is an 'Important Bird Area' (Fishpool and Evans 2001; Baker and Baker 2002). The vegetation of the park is divided into three major vegetation types: woodland (or miombo woodland), montane forest, and lowland forest (Itoh and Nakamura 2015; De Jong and Butynski 2023a). The least studied vegetation type in Mahale is the montane forest (>1,500 m asl; Itoh and Nakamura 2015). Closed montane forest occurs from *ca*. 1,800 m asl to *ca*. 2,350 m asl (Nishida 1972, 2012; Nishida and Uehara 1981; Nishida *et al.* 1981; Itani 1990; De Jong and Butynski 2023a). The higher altitudes of Mahale are extremely rugged and often shrouded in clouds and mist.

Overviews of the history, geography, vegetation, and biodiversity of the Mahale NP are presented in Moreau (1943), Ulfstrand and Lamprey (1960), Nishida (1968, 1972, 1990, 2012), Kielland (1978), Itani (1990), Anderson and Baker (2003), Moyer (2006), Moyer *et al.* (2006), TANAPA (2006), Itoh and Nakamura (2015), and Nakamua and Itoh (2015). Moyer (2006) and Nakamura *et al.* (2015) review the biodiversity surveys and other studies conducted in Mahale NP. At least 70 species in 11 orders of mammals are listed for the park (Ihobe 2015a, 2015b), a few of which are endemic species.

1.2 Primates

Prior to this exercise, nine species of primate were confirmed present in Mahale NP: miombo silver galago *Otolemur crassicaudatus monteiri* (Bartlett in Gray, 1863), eastern vervet *Chlorocebus pygerythrus centralis* Neumann, 1900, Mahale silver monkey *Cercopithecus mitis* ssp.? Wolf, 1822, Schmidt's red-tailed monkey *Cercopithecus ascanius schmidti* Matschie, 1892, Kinda baboon *Papio kindae* Lönnberg, 1919, Mahale Angola colobus *Colobus angolensis* ssp. nov., ashy red colobus *Piliocolobus tephrosceles* (Elliot, 1907), and eastern robust chimpanzee *Pan troglodytes schweinfurthii* (Nishida 1968, 2012; Kano 1971; Moyer 2006; TANAPA 2006; Butynski and De Jong 2009; Ihobe 2015a, 2015b; De Jong and Butynski 2023a). Nishida (1968, 1990) and TANAPA (2006) also list Tanzania lesser galago *Galago senegalensis sotikae* Hollister, 1920, southern yellow baboon *Papio cynocephalus cynocephalus* (Linnaeus, 1766), and olive baboon *Papio anubis* (Lesson, 1827). While the Tanzania lesser galago is likely present in the lowland woodlands of Mahale NP, the olive baboon is almost certainly absent (Kano 1971; Moyer *et al.* 2006; De Jong and Butynski 2023a). Presence of moholi lesser galago *Galago moholi moholi*

Smith, 1836, is mentioned (Kano 1971; Moyer 2006; Ihobe 2015a, 2015b), but this requires confirmation.

2. The 'Tourism Development and Ranger and Guide Training in Research Methods' Exercise

During 12–23 April 2022 we conducted an exercise titled, 'Tourism Development and Ranger and Guide Training in Research Methods'. In 2008 and 2009 we conducted primate surveys as part of a guide and tracker training exercise in Mahale NP (22 November–22 December 2008 and 5–19 November 2009) for 49 days. The primate surveys were undertaken in the vicinity of Greystoke Mahale, so exclusively at the lower altitudes of the park. The focus of those surveys was to gather natural history and biodiversity information on primates for the guides, trackers, and clients of Greystoke Mahale, and for TANAPA staff. One of the outcomes of those surveys was the field guide, '*Primates of Mahale Mountains National Park, Tanzania*' (Butynski and De Jong 2009).

During 12–23 April 2022 we conducted an exercise titled, 'Tourism Development and Ranger and Guide Training in Research Methods'. This exercise was facilitated by Tanzania National Parks (TANAPA) and Nomad's Greystoke Mahale. Most of this exercise was conducted at the higher altitudes of Mahale NP using existing trails to climb Mt. Pasagulu, Mt. Mhensabantu, Mt. Ihumo, and Mt. Nkungwe (Figure 2). During this exercise we: (1) trained five TANAPA rangers and eight Greystoke Mahale guides and trackers in natural history and field research techniques (Table 1); (2) identified a tourist hiking trail from Lake Tanganyika to the top of Mt. Nkungwe (2,530 m asl); (3) located four camp sites for tourists; (4) identified the most scenic viewpoints and those sites where the more interesting species of mammals and birds (particularly primates and endemics) are most likely to be encountered; (5) updated the list of primates known to occur in Mahale NP; and (6) prepare a new edition of '*Primates of Mahale Mountains National Park, Tanzania*' (Butynski and De Jong 2009). This report presents the outcomes of this exercise.

Table 1. Names of the five TANAPA rangers and eight Greystoke Mahale guides and trackers trained during this exercise.

TANAPA	Greystoke Mahale
1. Michael Omeme	1. Musa Kapaya
2. Ramadhani Florian	2. Mwiga Mambo Kaimbe
3. Stephano Masalu	3. Hassani Rashidi
4. Sinsera Mung'ang'a	4. Mathias Nelson Omary
5. Rashidi Mkesha	5. Godfrey Stephano Luzibila
	6. Baraka Rehani Njenje
	7. Butati Nyundo
	8. Abel Twalib

Mwiga Mambo Kaimbe on Mount Mhensabanthu, Mahale Mountains National Park.

During this exercise we used the established camps at Mahale NP Airstrip, Mahale NP Headquarters, and Greystoke Mahale, and identified four new camp sites (hereafter, 'new camps') (Figure 2; Table 2). Illustrated brochures of the four new camp sites are provided in Appendix 2.

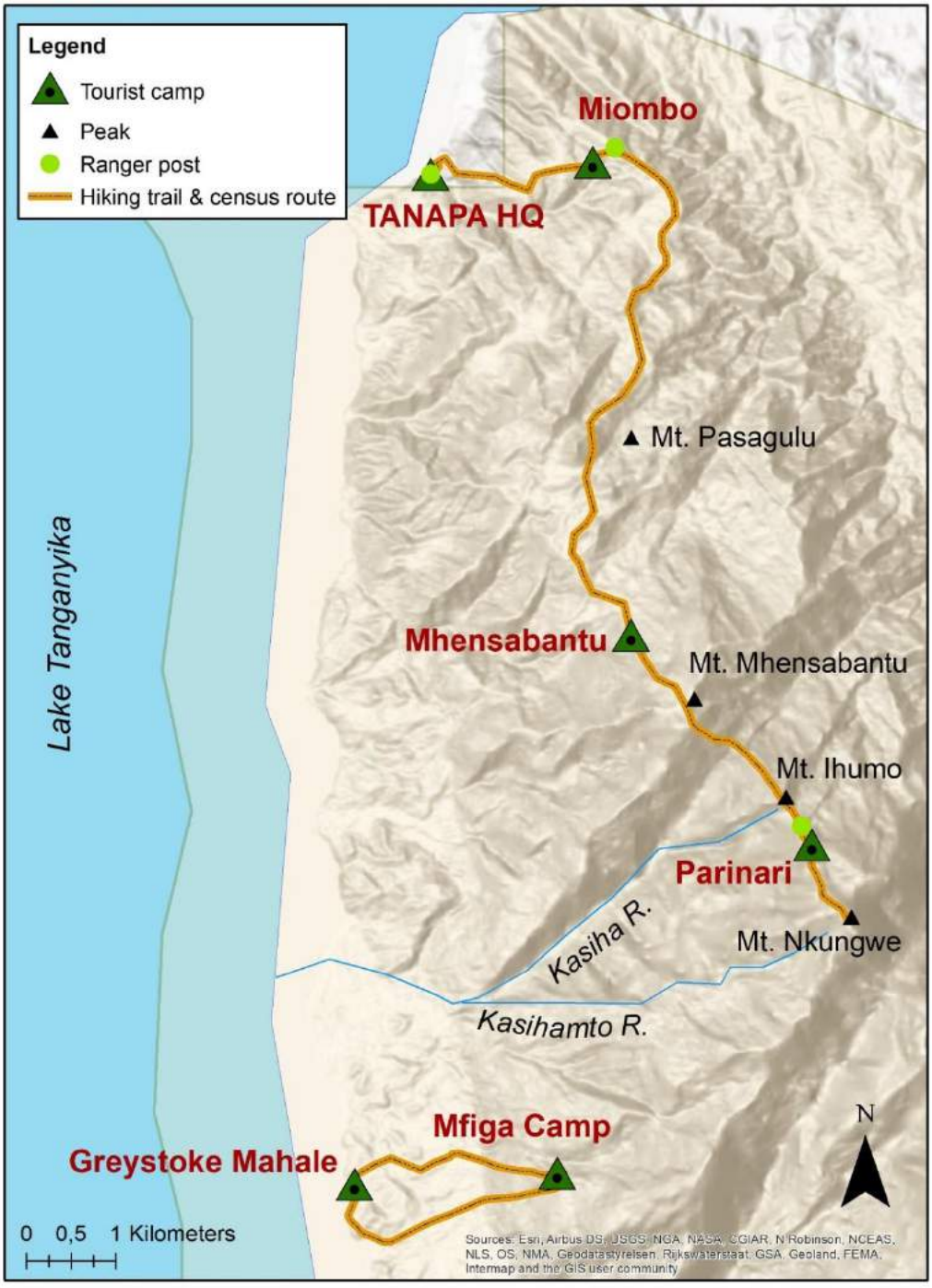

Figure 2. Trails and camps used during this training exercise in Mahale Mountains National Park, Tanzania (12–23 April 2022). Details in Table 2 and Appendix 2.

Table 2. Name, location, altitude, and description of the seven camps used during this training exercise in Mahale Mountains National Park, Tanzania (12–23 April 2022). Further details in Appendix 2.

Camp name	Type	Coordinates	Altitude (m asl)	Description
Mahale NP Airstrip	Established	S6.01171; E29.76487	773	Short grassland on lake shore and edge of miombo woodland.
Greystoke Mahale	Established	S6.13859; E29.73323	773	Closed lowland forest on lake shore. Tourist lodge.
Mfiga*	New	S6.13733; E29.75347	1,238	Mature lowland forest. Perennial stream nearby.
Mahale NP Headquarters	Established	S6.03601; E29.74153	761	Short grassland on edge of lake shore and edge of mature miombo woodland.
Mhensabantu*	New	S6.08314; E29.76098	1,595	Mature mid-altitude forest along ridge on edge of tall grassland. Stream nearby.
Parinari*	New	S6.10549; E29.77882	2,183	Closed mature montane forest along ridge. Stream nearby.
Miombo*	New	S6.03559; E29.75703	1,103	Open mature miombo woodland along ridge. Stream nearby.

* New camp identified during this exercise.

We note that the altitude of Mt. Nkungwe has been variously reported in publications; 2,460 m asl (Nishida 1990), 2,462 m asl (Nishida 1968; Nishida *et al.* 1981; Nakamura and Itoh 2015; TANAPA visitor sign on the peak), 2,473 m asl (Peakery 2023), 2,490 (Itani 1990), 2,500 m asl (Kano 1971; Nishida 1972), 2,515 m asl (Moreau 1943); 2,520 m asl (Itani 1990; PeakVisor 2023), 2,525 m asl (Baker and Baker 2002), 2,576 m asl (Procter 1958), and 2,597 m asl (Grant 1949). During this exercise we recorded *ca*. 2,530 m asl twice on a GPS (Garmin GPSMAP 65) and twice with the Gaia GPS app on an iPhone X., in agreement with Stevens (1958).

3. Methods

3.1 Diurnal Primate Survey

A total of about 52 km of trail were walked during this training exercise (Figure 2). The census teams ranged in size from three to eight people. Existing trails were used to climb to Mfiga Camp (1 night), Mt. Pasagulu (1 night), Mt. Mhensabantu (1 night), and Mt. Nkungwe (3 nights) (Figure 2). Each team walked at an average speed of about 1 km/h, scanning and listening regularly for primates and other mammals, and stopping at viewpoints to scan the forest with binoculars. Information collected during each census included date, weather, start time, end time, places surveyed, walking speed, and distance travelled (GPS; *e.g.*, Garmin GPSmap 60Cx). Each encounter with primates was appointed a unique identification code. Information collected during each encounter included date, time, coordinates (GPS), altitude (GPS), vegetation type,

species/subspecies, minimum group size, and group composition. Particular attention was given to obtaining descriptions and photographs of adult males. Observations were made with binoculars (*e.g.*, Zeiss Dialyt 7x42B, Zeiss Victory 10x42). YDJ took photographs with a Canon EOS 5 Mark III digital camera fitted with a Canon 400 mm lens and iPhone X. Census routes were saved by GPS and downloaded into an Asus Latitude notebook using Garmin MapSource and ESRI ArcMap (Version 10.8.1) software. The number of primate groups encountered per kilometre and per hour were the indices used to assess relative abundance (Butynski and Koster 1994; White and Edwards 2000). Locations of all primate groups were plotted on a map using ArcGIS.

3.2 Nocturnal Primate Survey

Presence of galagos was recorded during nocturnal surveys conducted by foot at all seven camps. These surveys were undertaken off and on during 18:45–23:00 h and 04:00–06:30 h. Reflection from the eyes of galagos can be observed at >100 m in suitably open habitats. Torches (EagleTac M3C4 and Petzl Tikka RXP headlamps) were used to scan the vegetation. Walks were conducted slowly (*ca.* 0.5–1.0 km/h) with pauses to scan the vegetation, observe animals, and record vocalisations. The following were recorded: date, weather, moon phase, start time, finish time, localities surveyed (GPS), walking speed (GPS), and distance travelled (GPS). When galagos were encountered, binoculars (Zeiss Victory 10x42 and Zeiss Dialyt 7x42B) were used. The following data were collected when galagos were encountered: date, time, GPS coordinates, altitude, species/subspecies, number of individuals, height above ground, vegetation type, and tree density. In addition, galagos were described and photographs taken using a Canon EOS 5D Mark III digital camera fitted with a Canon 400 mm lens combined with a Canon Speedlite 430EX II flash.

In addition to nocturnal walks, listening surveys were undertaken at each camp, either from camp or from high points near camp, at dusk, dawn, and before and after nocturnal walks. The advertisement call of galagos provides species-specific information that can be used for species identification (Bearder *et al.* 1995; Zimmermann 1995). Audio recordings of galago vocalizations (and other nocturnal mammals and birds), preferably the loud advertisement call, were made during surveys, or opportunistically, using a Marantz Digital PMD661 Solid State recorder with Sennheiser Shot-Gun ME-66 microphone. The time and date of each recording was automatically saved within the audio file.

3.3 Camera Trap Survey

Twelve camera traps (mixed brands and models) were installed along survey routes but mainly in the vicinity of camps. Camera traps were active for a total of *ca.* 580 trap hours, scattered at three locations between 1,200 m asl and 2,335 m asl. The cameras were set to take infrared triggered photographs (time lapse of 1 second) and attached to trees at 20–50 cm above ground. Baits (*e.g.*, sardines, dry cat food, salt) were used to attract mammals. The camera traps were placed by trainees as well as by the trainers.

3.4 Site Names and Maps

In this report we attempt to apply the most used name and spelling for each site. We found that the most useful maps for Mahale NP and for the Greater Mahale Ecosystem are those presented in Kano (1971), Nishida (1972, 1990, 2012), Kielland (1978), Nishida *et al*. (1981), Uehara and Ihobe (1998), Moyer *et al*. (2006), TANAPA (2006), Nakamura and Itoh (2015), Bonnin *et al.* (2020), and De Jong & Butynski (2023a).

Figure 3. View from the hiking trail approaching Mount Nkungwe. Lake Tanganyika is in the distance.

4. Results

4.1 Primate Survey

Eleven species of primate were confirmed present within Mahale NP during this exercise, including one unidentified dwarf galago *Paragalago*. Diurnal censuses lasted 31.8 hours and covered 52 km of transect during 13–22 April 2022. The authors visually encountered 19 primate groups (Table 3).

Seven diurnal species of primate were encountered during this survey (Table 3). The most common primate observed was the ashy red colobus (eight groups), followed by Schmidt's red-tailed monkey (seven groups). In interpreting these results, much consideration needs to be given to the fact that the altitudinal range over which each species occurs differs greatly and that we did not census all altitudes equally. Whereas ashy red colobus, Schmidt's red-tailed monkey, Mahale silver monkey, and eastern robust chimpanzee all occur from 773 m asl up to 2,358 m asl, eastern

vervet is confined to the lakeshore (773 m asl) and Mahale Angola colobus is not known to occur below 1,800 m asl. Overall, it appears that both the ashy red colobus and the Schmidt's red-tailed monkey are the most common and widespread monkeys in Mahale NP, while the latter is the more abundant species below 1,600 m asl. There can be no doubt that, among the monkeys of Mahale NP, the Mahale Angola colobus has the most limited altitudinal range and geographic distribution, as well as the smallest population. Although our census data are limited, they are corroborated by the much more extensive research of others (*e.g*., Kano 1971; Nishida 1972; Nishida *et al*. 1981; Uehara and Ihobe 1998; Uehara 2003; Moyer 2006).

Table 3. Visual encounters by the two authors with groups of diurnal primates during censuses and off censuses in Mahale Mountains National Park, Tanzania (13–22 April 2022). The altitudinal range is based both on visual encounters and on calls heard.

Species	Groups/km (n)	Groups/hour (n)	Visual encounters off census	Altitudinal range (m asl)*
Eastern vervet (LC) *Chlorocebus pygerythrus centralis*	0.00	0.00	2	773 (n=2)
Schmidt's red-tailed monkey (LC) *Cercopithecus ascanius schmidti*	0.13 (7)	0.22 (7)	2	773–1,595 (n=12)
Mahale silver monkey (NA) *Cercopithecus mitis* ssp. unknown	0.00	0.00	1	1,103–2,350* (n=7)
Kinda baboon (LC) *Papio kindae*	0.06 (3)	0.09 (3)	2	773–1,100 (n=9)
Ashy red colobus (EN) *Piliocolobus tephrosceles*	0.15 (8)	0.25 (8)	3	790–2,358* (n=12)
Mahale Angola colobus (DD) *Colobus angolensis mahale*	0.02 (1)	0.03 (1)	0	1,968 (n=1)
Eastern robust chimpanzee (EN) *Pan troglodytes schweinfurthii*	0.00	0.00	0	1,103–2,300* (n=5)

* Known to occur at 773 m asl.

At least three species of nocturnal primate occur in Mahale NP, two of which were confirmed during this survey: Miombo silver galago and Thomas's dwarf galago *Galagoides thomasi* (Elliot, 1907) (Table 4). Thomas's dwarf galago is a new species for Mahale NP. The only other site where this galago is known to occur in Tanzania is Minziro Forest, northwestern Tanzania. Moyer (2006) and Moyer *et al.* (2006) report presence of the Mozambique dwarf galago *Paragalago granti* (Thomas and Wroughton, 1907). We probably encountered this species at two of our camps, but no recordings of its load call or photographs were obtained (Table 4). No evidence of the moholi lesser galago was obtained during this exercise. Listening conditions at night were excellent at all camps except for two of the three nights at Parinari Camp when it was very windy.

A selection of audio recordings of galago calls obtained by the authors during this survey can be accessed at: https://www.wildsolutions.nl/mahale/.

Table 4. Nocturnal primates seen and/or heard at each of seven camps in Mahale Mountains National Park, Tanzania (13–22 April 2022).

Camp	Altitude (m asl)	Taxon	How detected
Mahale Airstrip	773	Miombo silver galago	Heard
Greystoke Mahale	773	Miombo silver galago	Heard
Mfiga	1,238	Miombo silver galago Thomas's dwarf galago	Heard Seen and heard
Mahale NP Headquarters	761	Miombo silver galago Mozambique dwarf galago (probably)	Heard Seen
Mhensabantu	1,595	Miombo silver galago	Heard
Parinari	2,183	Miombo silver galago Thomas's dwarf galago	Heard Seen and heard
Miombo	1,103	Miombo silver galago Mozambique dwarf galago (probably)	Heard Seen and heard

Nishida (1968, 1990) and TANAPA (2006) list Tanzania lesser galago and olive baboon, and Ihobe (2015b) lists yellow baboon as present in Mahale NP. No evidence for these three taxa was obtained during this survey. While the Tanzania lesser galago is likely present in the lowlands of Mahale NP, and yellow baboon is probably present in the lowlands of eastern Mahale NP, olive baboon is almost certainly absent (Kano 1971; Moyer *et al.* 2006; T. Butynski and Y. de Jong pers. obs.). Presence of moholi lesser galago has been reported (Kano 1971; Moyer 2006; Ihobe 2015a, 2015b), but this requires confirmation. If present, this would be a northward extension of the geographic distribution for this species of *ca.* 750 km (De Jong and Butynski 2023c).

Below we present some of the more noteworthy findings for some of Mahale NP's primates, address their biogeography in the Greater Mahale Ecosystem, explain recent taxonomic changes, and provide information of interest to rangers, guides, and tourists. The illustrated '*Primate Checklist'* is in Appendix 1, the illustrated camp brochures are in Appendix 2, the second edition of '*Primates of Mahale Mountains National Park, Tanzania*' is in Appendix 3, and the draft assessment of the Mahale Angola colobus for *The IUCN Red List of Threatened Species* in Appendix 4. This assessment is expected to be published on the Red List website (www.iucnredlist.org) in December 2023.

4.1.1 Eastern vervet *Chlorocebus pygerythrus centralis*

During this exercise, vervet monkeys were only encountered at Greystoke Mahale (773 m asl; Figures 4 and 5). The group here is habituated to humans and, like at many tourist camps, sometimes raids food tables, tents, and kitchens.

Figure 4. Large juvenile eastern vervet *Chlorocebus pygerythrus centralis,* Mahale Mountains National Park, Tanzania.

Figure 5. Adult male eastern vervet *Chlorocebus pygerythrus centralis*, Mahale Mountains National Park, Tanzania.

Based on an extensive review of the literature, viewing of hundreds of individuals in the field and in photographs, and close examination of all specimens of *Chlorocebus* at the Museum für Naturkunde, Berlin, we revised the taxonomic arrangement of *Chlorocebus* in East Africa and recognize four subspecies: northeastern vervet *Chlorocebus pygerythrus arenaria* (Heller, 1913), eastern vervet *Ch. p. centralis* (Elliot, 1910), Pemba vervet *Ch. p. nesiotes* (Schwarz, 1926), and reddish-green vervet *Ch. p. rufoviridis* (I. Geoffroy Saint-Hilaire, 1843) (De Jong and Butynski 2023b, 2023c). Based on photographic material collected during this and earlier surveys in Mahale NP and vicinity, we now recognize *Ch. p. centralis* as the subspecies present in Mahale NP as opposed to *Ch. p. rufoviridis* (*e.g.*, Butynski and De Jong 2009; Isbell and Jaffe 2013; De Jong and Butynski 2018). Figure 6 depicts the current geographic distributions of *Ch. p. centralis* and *Ch. p. rufoviridis* in the region.

Figure 6. Geographic distribution of three subspecies of savanna monkey *Chlorocebus* in southwestern East Africa. Map based on De Jong and Butynski (2023c).

4.1.2 Mahale silver monkey *Cercopithecus mitis* subspecies unknown

The gentle monkey *Cercopithecus mitis* has a complex and debated taxonomy. Despite its eurytopic ecology, arid and semi-arid habitats (*e.g.*, deserts, grasslands, bushlands, and open woodlands) are geographic barriers. This, together with big rivers and big lakes, largely explains the current fragmented geographic distribution of *C. mitis*, as well as the great variation present in the coloration and pattern of the pelage among subspecies (Kingdon 2013; Lawes *et al*. 2013; De Jong and Butynski 2018, 2023c; Butynski and De Jong 2020b). The subspecific status of the Mahale *C. mitis* remains in question (Figure 7). This monkey is patchily distributed and relatively uncommon in Mahale NP and its vicinity (Kano 1971; Ihobe 2015a; De Jong and Butynski pers. obs.). None were seen during this survey although at least seven groups were heard at 1,103–2,475 m asl. During previous surveys in Mahale NP, we found groups near the shore of Lake Tanganyika at 773 m asl (Butynski and De Jong 2009).

Mahale NP forms a peninsula, isolated by water and a vast semi-arid region which is mostly covered by 'Central Zambezian Miombo Woodland' (Olson *et al*. 2001; Foley *et al.* 2014). As a result, *C. mitis*, like all other forest-dependent species in Mahale NP, is geographically isolated. The nearest population of *C. mitis* is the Mweru monkey *C. m. opisthostictus* Sclater, 1894, to the west across Lake Tanganyika. Overland, the nearest is Doggett's silver monkey *C. m. doggetti* Pocock, 1907, *ca.* 160 km to the north in Gombe Stream National Park (Figure 8).

Figure 7. Adult Mahale silver monkey *Cercopithecus mitis* ssp.? Mahale Mountains National Park, Tanzania. Photograph by Mathias Nelson Omary.

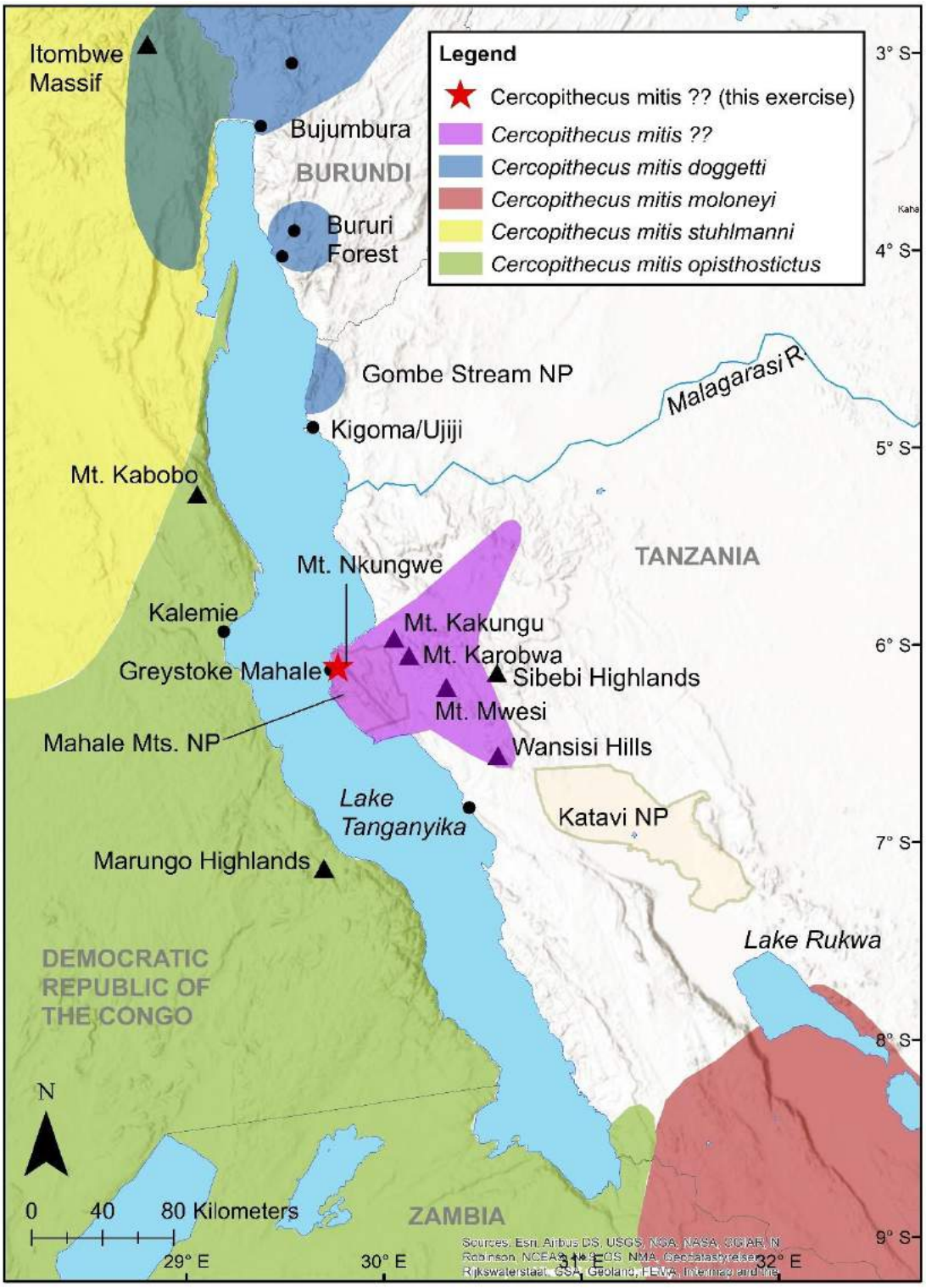

Figure 8. Mahale Mountains National Park and vicinity, with the geographic distributions of the nearest subspecies of gentle monkey *Cercopithecus mitis* depicted. Map based on Kano 1971, Butynski and De Jong (2009, 2020b), McLester *et al.* (2019), and De Jong and Butynski (2023c).

4.1.3 Kinda baboon *Papio kindae*

Kinda baboon, previously considered a subspecies of yellow baboon *P. cynocephalus* (Groves 2001, 2005; Grubb *et al*. 2003; Butynski and De Jong 2009; Altmann *et al*. 2013; De Jong and Butynski 2018, 2023c), is now widely recognized as a species as it is morphologically (Frost *et al*. 2003) and genetically (Burrell 2009; Zinner *et al*. 2009) distinct from the other five species of baboon (Figure 9).

Figure 9. Adult male Kinda baboon *Papio kindae,* Mahale Mountains National Park, Tanzania. The pink skin around the eyes is diagnostic.

Nine Kinda baboon groups were encountered during this exercise, of which five groups were seen and three groups were heard only. The groups observed at Mahale NP Headquarters were photographed and many vocalizations were recorded. A selection of these audio recordings can be accessed at: https://www.wildsolutions.nl/mahale/.

One vocalization of Kinda baboon that is of particular interest is the 'whoop-gobble' that is emitted by adult males (recording 11 on https://www.wildsolutions.nl/mahale/). This call is given by adult males of most species of drill-mangabeys *Cercocebus* spp. and all species of baboon-mangabeys *Lophocebus* spp. for intra-group coordination and inter-group communication (see species profiles in Butynski *et al.* 2013). Our review of the literature revealed no reports of the whoop-gobble for baboons. This call is audible to the human ear at 1–2 km. Interestingly, while

we have visited many sites where baboons are present, we have heard the whoop-gobble at only three other sites; northern yellow baboon *P. c. ibeanus* Thomas, 1893, in Tana River Primate National Reserve, north coast of Kenya, olive baboon x northern yellow baboon in Meru National Park, central Kenya, and olive baboon in Mara National Reserve, extreme southwestern Kenya. This complex and important call in the repertoire of some papionins may be a phylogenetically preserved trait present in the common ancestor of *Papio*, *Cercocebus* and *Lophocebus*---a 5-million-year-old lineage (Jolly 2013).

Kinda baboon newborns and young juveniles typically have a reddish pelage (Altmann *et al.* 2013), whereas the newborn Mahale Kinda baboon is unique in that it has a pink muzzle, pink ears, and white pelage (Figures 10 and 11). Their pelage turns reddish-brown with age. Newborns in Issa Valley, northeast of Mahale NP and south of the Malagarasi River, are white, cream, or light brown (B. Mason pers. comm. 2018). It appears that Issa Valley supports baboons that have a mix of southern yellow baboon, olive baboon, and Kinda baboon traits. In the Uvinza region, north of the Malagarasi River, newborns vary from dark cream to brown (B. Mason pers. comm. 2018). More attention should be given to the coloration of newborn baboons as this might provide insights into the taxonomy and biogeography of baboons in this region.

Figure 10. Adult female Kinda baboon *Papio kindae* with small white juvenile at Mahale Mountains National Park Headquarters.

Figure 11. Adult female Kinda baboon *Papio kindae* with small white juvenile at Mahale Mountains National Park Headquarters.

The geographic distribution of Kinda baboon lies west of Lake Tanganyika and *ca.* 275 km to the south of Mahale NP (Figure 12). Based on their molecular study, Zinner *et al*. (2015) state that it is not known how the Kinda baboon of Mahale NP is related to Kinda baboons on the western and southern shores of Lake Tanganyika. Baboon taxonomy and biogeography in this region is complex, particularly in the Greater Mahale Ecosystem. Kinda baboon, olive baboon, and yellow baboon occur in a phenotypic cline northeast and east of Mahale NP, along the southern limit of the geographic distribution of olive baboon and western limit of yellow baboon. The phenotype of individuals within the cline are variable and typically intermediate. Additional molecular and morphological studies are required to determine the taxonomic status of baboons in the Greater Mahale Ecosystem and its vicinity. Until then, we consider the baboons along the western edge of Mahale NP to be Kinda baboon.

Figure 12. Geographic distribution of baboon *Papio* in the Greater Mahale Ecosystem and beyond. The green star depicts an olive baboon *Papio anubis* record (M. Hogan iNaturalist). Map based on Altmann *et al*. (2013), Zinner *et al*. (2015), De Jong and Butynski (2023c).

4.1.4 Ashy red colobus *Piliocolobus tephrosceles*

The taxonomic arrangement of the red colobus monkeys *Piliocolobus* has been debated for many years. In '*Primates of Mahale Mountains National Park*' (Butynski and De Jong 2009) we followed the taxonomy at that time by referring to the Mahale red colobus monkey as a subspecies (*Procolobus rufomitratus tephrosceles*; Figure 13). Since then, the taxonomic arrangement of red colobus has changed considerably. Here we follow Groves (2007), Struhsaker and Ting (2020), and Linder *et al.* (2021) who treat *tephrosceles* as a species of *Piliocolobus*.

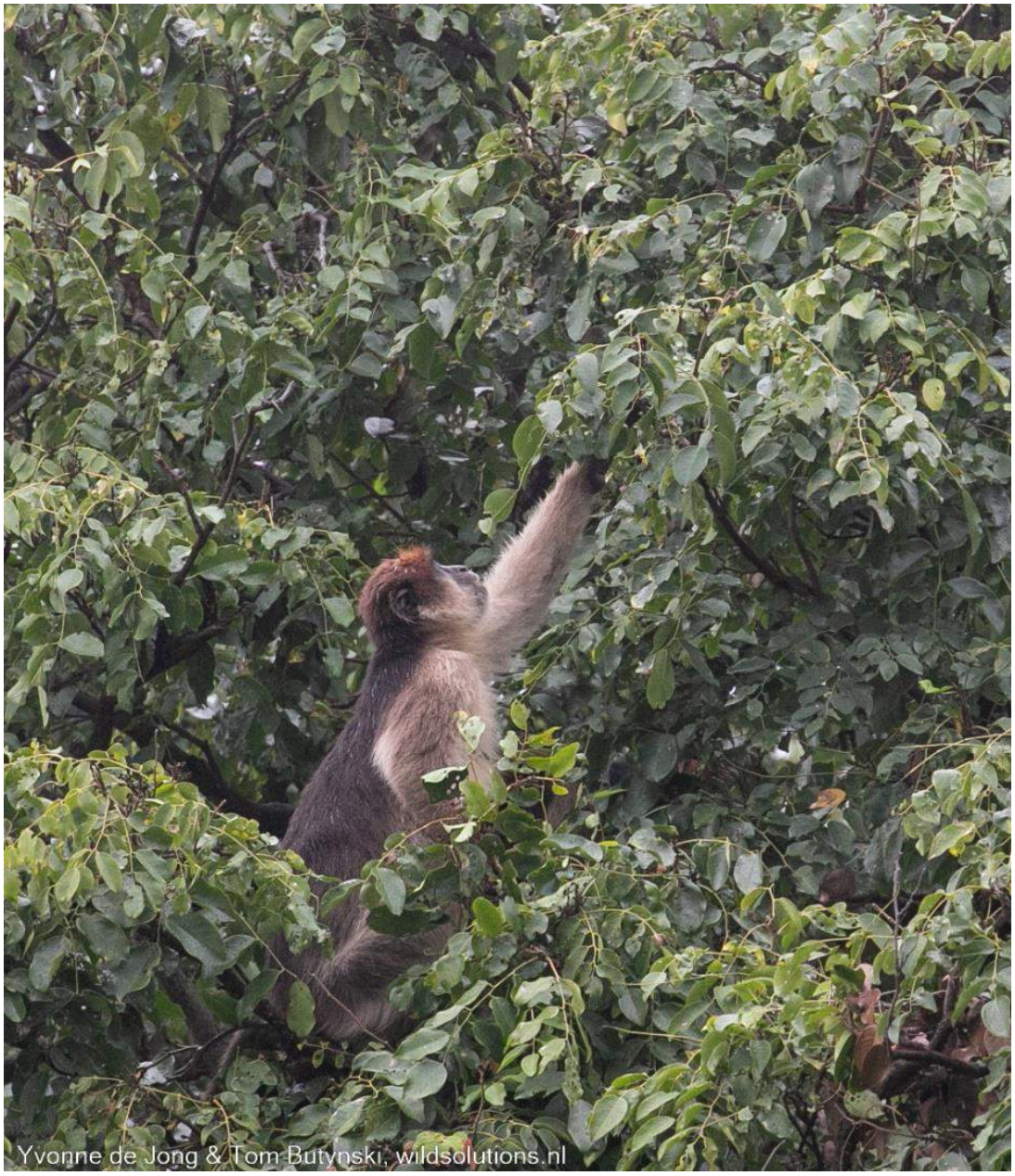

Figure. 13. Adult ashy red colobus *Piliocolobus tephrosceles*, Mahale Mountains National Park, Tanzania.

The colobines represent the most threatened group of primates in Africa, with the species and subspecies within *Piliocolobus* being particularly threatened (Linder *et al.* 2021). All 18 taxa of *Piliocolobus* are threatened, with all but four being 'Endangered' or 'Critically Endangered' (Butynski and De Jong 2022). The ashy red colobus is listed as 'Endangered' on the IUCN Red List of Threatened Species (Struhsaker and Ting 2020). During this exercise, the ashy red colobus was observed 11 times, including eight times during censuses. This was the most common primate observed during this exercise (Table 3). The ashy red colobus occurs over almost the entire altitudinal range of Mahale NP (773–2,358 m asl). The highest altitude record for this species is 2,420 m asl (Mbizi Forest Reserve, southwestern Tanzania; T. Davenport pers. comm. in Butynski and De Jong 2022). No other red colobus is reported at such a high altitude.

Mahale NP is the most important stronghold for the ashy red colobus in Tanzania. About 245 km to the south of Mahale NP lies the Mbuzi Forest Reserve and Mbizi Forest Reserve, the southernmost sites for this species. In 2007, there were about 1,354 ashy red colobus in these two forest reserves (Davenport *et al.* 2022). About 140 km north of Mahale NP there is another isolated population of ashy red colobus in Gombe Stream National Park.

In Mahale NP, ashy red colobus is the preferred prey of chimpanzees, accounting for 78% of 939 observed hunts of primates and ungulates during 1965–2010 (Hosaka *et al*. 2001, 2020). Compared to other parts of the range of red colobus, the annual rate of predation by chimpanzees in Mahale NP is relatively low (1%–4%; Boesch *et al.* 2002; Uehara 2003) and appears to be sustainable (Butynski and De Jong 2022).

4.1.5 Mahale Angola colobus *Colobus angolensis mahale*

Two groups of Mahale Angola colobus were heard during this survey and one group was observed.

1. At about 09:00 h on 18 April 2022, B. Nyundo, M. Nelson, A. Twalib, S. Masalu, and B. Rehani (pers. comms.) heard one bout of three roars at *ca*. 1,800 m asl on Mt. Mhensabantu (*ca*. 6.08ºS; 29.75ºE). The group was only about 100 m away, but reaching it was not practical due to the extremely rugged terrain and absence of a trail.
2. On 21 April 2022, at 07:45 h, we located a group of at least seven Mahale Angola colobus. The group was about 300 m from us across a forested valley on the steep southern slope of Mt. Ihumo (6.100ºS; 29.767ºE) at about 1,970 m asl (Figure 14). We observed this group with binoculars for about 20 minutes before dense clouds moved between us and the group and it began to rain. The group was feeding. One bout of two roars was given.

Figure 14. Adult Mahale Angola colobus *Colobus angolensis mahale* on the southern slope of Mount Ihumo, Mahale Mountains National Park, Tanzania.

Both encounters with Mahale Angola colobus are of scientific and conservation importance. Our encounter was 43 years after the last published observation of this monkey (Nishida *et al.* 1981; Itani 1990). The Mahale Angola colobus is currently listed as 'Data Deficient' on *The IUCN Red List of Threatened Species* due to its poorly known geographic distribution and population size (Butynski and De Jong 2020a). 'Data Deficient' species are of great conservation concern as they are often considered as 'non-threatened' or simply 'over-looked' (Parsons 2016). A higher portion of 'Data Deficient' taxa are, however, threatened by extinction compared to data-sufficient species (Borgelt 2022). Under current *IUCN Red List* degree of threat criteria, the Mahale Angola colobus qualifies as 'Critically Endangered'. Appendix 4 holds the re-assessment that we submitted to the *The IUCN Red List.*

Every 2 years a list of 25 threatened primate taxa is compiled by the IUCN SSC Primate Specialist Group, the International Primatological Society, and Re:wild. This list is published in '*Primates in Peril, The World's 25 Most Endangered Primates'.* We have accepted the invitation by Dr Anthony Rylands to draft a profile for the Mahale Angola colobus to be published in '*The World's 25 most Endangered Primates 2024-2025'.*

De Jong and Butynski (2023a) formally describe and name the Mahale Angola colobus and provide information on its geographic distribution, abundance, ecology, and threats, and present priorities for research and conservation actions. This article was published in *Primate Conservation*, the open-access peer reviewed journal of the IUCN SSC Primate Specialist Group. It is dedicated to the memory of the late Professor Toshisada Nishida (1941–2011) for his many important contributions to primate research and conservation in Mahale NP (Nishida 1990, 2012), including his discovery of the Mahale Angola colobus (Nishida *et al.* 1981). We hope that this publication will bring heightened awareness to the present plight of the African colobines and encourage tourists to visit Mahale NP to view the rare and endemic Mahale Angola colobus. The abstract of this article is below. The full article can be accessed at: https://www.wildsolutions.nl/mahale-angola-colobus/.

Designation of a New Subspecies of Angola Colobus *Colobus angolensis* Sclater, 1860 (Primates: Cercopithecidae) Endemic to the Mahale Mountains of Western Tanzania

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Abstract: The polytypic Angola colobus *Colobus angolensis* is a widespread species that, in eastern Africa, is often restricted to small, highly isolated, areas. In 1966, evidence for an undescribed subspecies of *C. angolensis* was obtained in Mahale Mountains National Park, central west Tanzania. Mahale *C. angolensis* has only been observed twice by scientists (1976 and 1979) and remained unnamed. In April 2022, 43 years after the last published observation, we observed, heard, and photographed a group of Mahale *C. angolensis*. Given the considerable current geographic isolation (~100 km across L. Tanganyika; ~330 km across land) of this monkey from its conspecifics, together with the distinctive coloration and pattern of its pelage, we here designate this as a new subspecies. We also describe the environment in which Mahale *C. angolensis* lives, discuss its paleobiogeography, taxonomic arrangement, and threats, and provide recommendations for conservation and research. Mahale *C. angolensis* is endemic to the montane forests of Mahale Mountains National Park where it has been observed at only two sites, the southern slope of Mt. Ihumo (~1,970 m asl) and on the ridge between Mt. Nkungwe and Mt. Kahoko (~2,350 m asl). In addition, bouts of 'roar' loud calls were heard on nearby Mt. Mhensabantu (~2,050 m asl) on two occasions. The geographic distribution of Mahale *C. angolensis* is likely between 10 km² and 50 km². The size of this population is probably <400 individuals, with <200 adults. This monkey appears to occur wholly within a remote and rugged part of Mahale Mountains National Park where agricultural encroachment and poaching are not major concerns at this time. The primary threats are habitat loss due to fire, and to a warming climate. With its small population and severely restricted geographic distribution, Mahale *C. angolensis* qualifies as a 'Critically Endangered' subspecies under current IUCN Red List degree of threat criteria.

4.1.6 Miombo silver galago *Otolemur crassicaudatus monteiri*

The most common and widespread nocturnal primate in Mahale NP appears to be the miombo silver galago (Figure 15). This species was heard and seen at all seven camps and occupies all major vegetation types and all but the highest altitudes in Mahale NP.

Figure 15. Adult miombo silver galago *Otolemur crassicaudatus monteiri* at Greystoke Mahale, Mahale Mountains National Park, Tanzania.

4.1.7 Thomas's dwarf galago *Galagoides thomasi*

Thomas's dwarf galago was seen and heard on 15 April 2022 at Mfiga Camp and on 21April 2022 at Parinari Camp (Table 4; Figure 16). These are the first records of this species for Mahale NP. The only other record for Thomas's dwarf galago in Tanzania is in Minziro Nature Forest Reserve, *ca*. 580 km to the northeast (Figure 17; Perkin and Bearder 2004; De Jong and Butynski 2018).

Figure 16. Thomas's dwarf galago *Galagoides thomasi*. Illustration by Stephen D. Nash.

Figure 17. Geographic distribution of Thomas's dwarf galago *Galagoides thomasi* in East Africa. Map based on Perkin and Bearder (2004), Svensson and Bearder (2019), and De Jong and Butynski (2023c).

At least three Thomas's dwarf galagos were heard at Mfiga Camp. All were >10 m above ground in pristine mid-altitude (transition) evergreen forest (1,220 m asl). At least three were seen and heard at Paranari Camp, at 3–25 m above ground in pristine montane forest (2,183 m asl). No photographs were obtained during this exercise, but T. Butynski is familiar with this primate in many other forests across tropical Africa, particularly in how it differs from Demidoff's dwarf galago *Galagoides demidoff* (G. Fischer, 1808). In addition, the species-specific crescendo loud

call was heard and recorded many times during our 1-night at Mfiga Camp and heard during one of the three nights that we stayed at Parinari Camp. Located near the top of Mt. Nkungwe, Parinari Camp was extremely windy on two of the nights that we were there, making it difficult to hear or record calls. A spectrogram of a crescendo call is presented in Figure 18. A spectogram of what we believe to be an alarm/threat call of Thomas's dwarf galago *Galagoides thomasi*, recorded 18 April 2022 at Parinari Camp (2,183 m asl), Mount Nkungwe is presented in Figure 19. A selection of recordings obtained at Mfiga Camp can be found here: https://www.wildsolutions.nl/mahale/. More of the vocal repertoire of Thomas's dwarf galago can be accessed here: https://www.wildsolutions.nl/vocal-profiles/galagoides/thomass-dwarf-galago-galagoides-thomasi/.

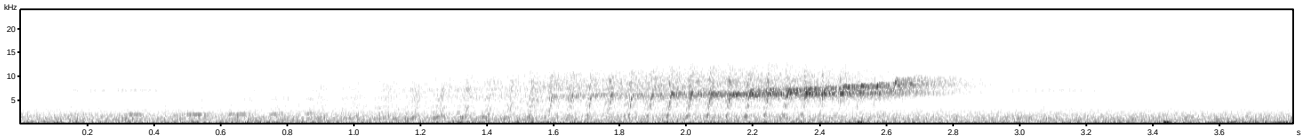


Figure 18. Spectogram of the crescendo loud call of Thomas's dwarf galago *Galagoides thomasi* recorded 15 April 2022 near Mfiga Camp at 1,220 m asl, Mahale Mountains National Park, Tanzania. More recordings by the authors of primate vocalization at Mahale National Park can be found at: https://www.wildsolutions.nl/mahale/.

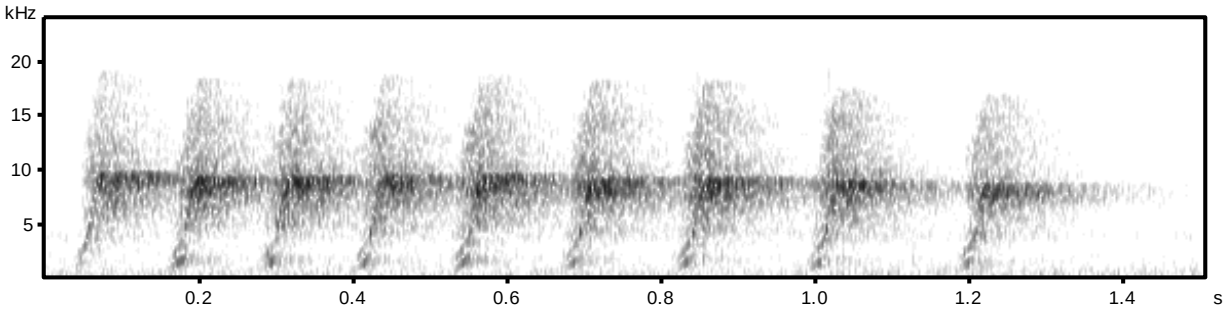


Figure 19. Spectogram of what we believe to be an alarm/threat call of Thomas's dwarf galago *Galagoides thomasi* recorded 18 April 2022 at Parinari Camp (2,183 m asl), Mount Nkungwe, Mahale Mountains National Park, Tanzania. More recordings by the authors can be found at https://www.wildsolutions.nl/mahale/.

4.1.8 Mozambique dwarf galago *Paragalago granti*

Moyer (2006) and Moyer *et al.* (2006) report a dwarf galago, preliminarily identified as Mozambique dwarf galago, from the montane forest of Mt. Mfitwa (2,440 m asl) and mid-altitude forest of Mt. Pasagula (1,490 m asl) in Mahale NP. This galago is also reported to occur in the

Sitebi-Sifuta Mountains 80 km to the east of Mahale NP (Moyer *et at*. 2006). We observed one galago at Mahale NP Headquarters at 800 m asl on 16 April 2023 and three galagos at 1,100–1,130 on Mt. Pasagula near Miombo Camp on 22 April 2023 that appeared to be Mozambique dwarf galagos (Figure 20). No recordings of the calls or photographs were, however, obtained. These records are *ca*. 650 km northwest of the documented range of Mozambique dwarf galago (Figure 21). If this is a *Paragalago,* then Mahale NP is the only site known where it appears that a species of *Paragalago* is parapatric, if not sympatric, with a species of *Galagoides*.

Figure 20. Mozambique dwarf galago *Paragalago granti.* Illustration by Stephen D. Nash.

The vocal profile, including the incremental loud call, of Mozambique dwarf galago can be accessed at: https://www.wildsolutions.nl/vocal-profiles/galagoides/mozambique-dwarf-galago-galagoides-granti/.

Figure 21. Geographic distribution of Mozambique dwarf galago *Paragalago granti* in East Africa. Map based on De Jong *et al*. (2019) and De Jong and Butynski (2023c).

4.1.9 Moholi lesser galago *Galago moholi moholi*

Despite the apparent suitability of some woodland habitats, moholi lesser galago was not encountered during this exercise or during our two earlier surveys (2008 and 2009) in Mahale NP. Moyer (2006), Butynski and De Jong (2009), De Jong and Butynski (2012), Pullen and Bearder (2013), and Ihobe (2015a) include Mahale NP within the geographic distribution of moholi lesser galago (Figure 22) but with the lack of evidence we now question the presence of this species in western Tanzania (De Jong and Butynski 2018, 2023c).

Figure. 22. Moholi lesser galago *Galago moholi moholi*. Illustration by Stephen D. Nash.

Although it seems possible that the moholi lesser galago is present in the lowlands of eastern Mahale NP, it would be a range extension of 750 km to the northwest (Figure 23). Since this species is phenotypically similar to Tanzania lesser galago, and both are repetitive callers dependent on semi-arid habitats, these two species can be confused in the field.

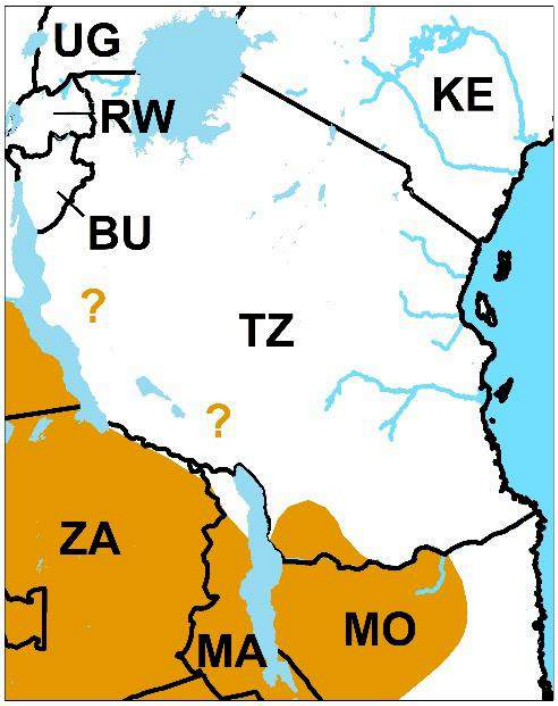


Figure 23. Geographic distribution of the Moholi lesser galago *Galago moholi* in East Africa. Map based on Bearder *et al.* (2021) and De Jong and Butynski (2023c).

The vocal profile of the moholi lesser galago can be accessed at: https://www.wildsolutions.nl/vocal-profiles/galago/moholi/.

4.1.10 Tanzania lesser galago *Galago senegalensis sotikae*

Nishida (1968, 1990), Moyer *et al*. (2006), and TANAPA (2006) list the Tanzania lesser galago (Figure 24) for Mahale NP. According to Ihobe (2015a) this is a misidentification of moholi lesser galago. Despite the apparent suitability of some of the woodland habitats for Tanzania lesser galago, we have yet to obtained evidence for this species. If a lesser galago is present in Mahale NP, it is more likely to be the Tanzania lesser galago than moholi lesser galago. We anticipate that, eventually, the Tanzania lesser galago will be confirmed as present in Mahale NP. Additional nocturnal surveys, particularly in miombo woodlands and in riverine forest to the northern, eastern, and western parts of Mahale NP are required to determine if either of these two species, or both, occur in Mahale NP.

Figure 24. Tanzania lesser galago *Galago senegalensis sotikae*. Illustration by Stephen D. Nash.

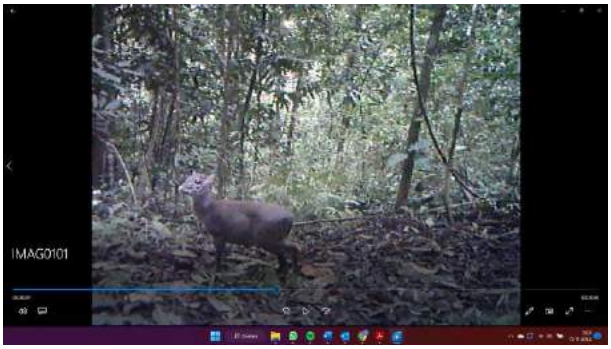
The vocal profile of the Tanzania lesser galago can be accessed at: https://www.wildsolutions.nl/vocal-profiles/galago/senegalensis/.

4.2 Camera Trapping

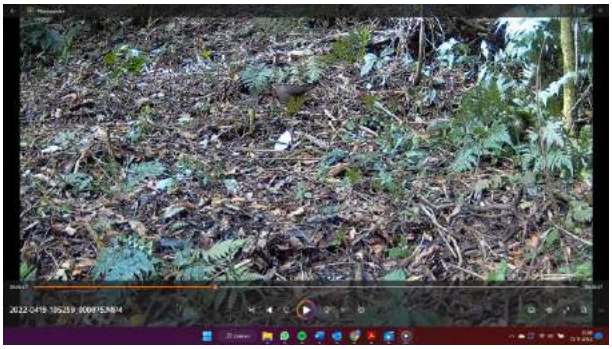
Eight species were captured by photographs and/or videos taken by 12 camera traps which were active for a total of *ca.* 580 trap hours and scattered at three locations between 1,200 m asl and 2,335 m asl. All eight species are known to occur in Mahale NP (Moyer 2006; Moyer *et al*. 2006; Ihobe 2015a, 2015b). Figure 25 includes a selection of photographs and video screenshots obtained by the camera traps. In addition, a selection of camera trap photographs and video can be viewed at: http://www.wildsolutions.nl/mahale/.

Bushy-tailed mongoose *Bdeogale crassicauda*

Leopard *Panthera pardus*



Blue duiker *Philantomba monticola*



Eastern lemon dove *Aplopelia larvata jacksoni*

Probably red-capped robin-chat *Cossypha natalensis*

Large-spotted genet *Genetta maculate*

Gambian giant pouched rat *Cricetomys gambianus*

African civet *Civettictis civetta*

Figure 25. The eight species captured by camera traps during this training exercise.

4.3 Tourist Camp Sites and Trails

Four tourist camp sites are in remote parts of Mahale NP, three of which are on the main trail from Mahale NP Headquarters to Mount Nkungwe and one is at Mfiga (Figures 26 and 27). Table 5 provides the details of each tourist camp.

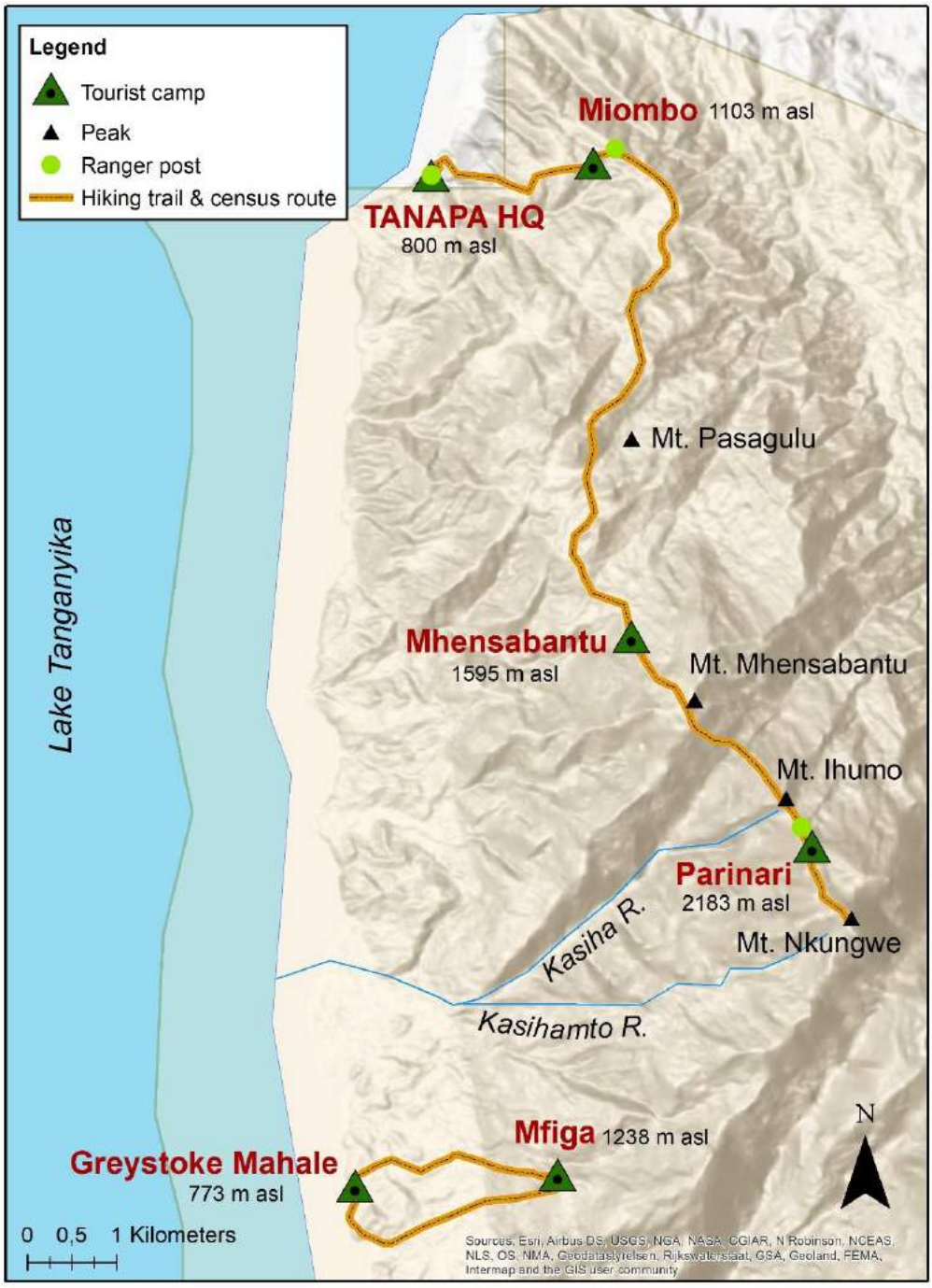


Figure 26. Tourist camp sites and hiking trails in remote parts of Mahale NP identified during this exercise. Table 5 provides the details of each tourist camp.

Table 5. Details of tourist camps. All camps can accommodate up to 14 people (*e.g.*, six tourists, two guides, six porters). All camps should be established so that guides and porters have their own private space and fire, at least 20 m from the tourists tents and fire.

Camp name, coordinates, and altitude	**Distance to camp**	**Distance to water**	**Vegetation type**	**Camp needs**	**Wildlife at/near camp**	**Notes**
Mfiga S6.13733; E29.75347 1,238 m asl	3 km from Greystoke Mahale and L. Tanganyika	*ca.* 2 km	Evergreen, closed canopy, mid-altitude (transitional) forest.	No flat ground. Needs clearing and leveling of 8 tent sites and 2 fire sites. Needs 2 pit-latrines.	Thomas's dwarf galago. Primate diversity good, but densities low. Wood owl, great blue turaco, black-and-white casqued hornbill.	Enclosed by trees, so limited view. Close to Mahale Ring Trail. Trail to and from camp good for seeing mammals, birds, and plants. Primate diversity and density best near L. Tanganyika.
Miombo S6.03559; E29.75703 1,103 m asl	3 km to Mahale NP Headquarters. 7 km to Mhensabantu Camp. 11 km to Parinari Camp.	*ca.* 1 km	Mature, open, miombo woodland. Little understory. Grass to 1 m high.	Guides and porters camp at ranger post/radio tower *ca.* 200 m up-hill. 360° views over the northern hills of Mahale NP. A large gently sloping area for the camp but needs clearing and leveling for 6 tents and 1 fire site. 1 pit-latrine needed. This site can accommodate a large group of campers with but more cutting of grass.	Mahale silver monkey, ashy red colobus, Kinda baboon, Schmidt's red-tailed monkey, miombo silver galago, leopard, Retz's helmetshrike,	Suitable for a day trip and picnic, or camping. Can accommodate large groups. Relatively easy access with some steep sections along the trail. Good site for tourists who have time to camp for only 1–2 nights in Mahale NP and do not want long, steep, hikes.
Mhensabantu S6.08314; E29.76098 1,595 m asl	10 km to Mahale NP Headquarters. 7 km to Miombo Camp. 4 km to Parinari Camp.	At camp	Mid-altitude (transitional) forest on edge of grassland and near stream.	One flat site for 4 tents and 1 fire. Need to clear and level sites for 4 more tents and 1 more fire site. Needs 2 pit-latrines.	Ashy red colobus, Schmidt's red-tailed monkey, miombo silver galago.	Sheltered from wind. Transit camp to Mt. Nkungwe. Excellent views 50 m from camp overlooking Mahale NP, L. Tanganyika, DRC, etc. Excellent for sundowners.
Parinari	14 km to Mahale NP	250 m	Closed primary montane forest	Guides and porters camp at ranger post. Tourist camp at	Angola colobus, ashy red colobus, Mahale silver	Highest camp in Mahale NP. Sheltered from wind.

S6.10549; E29.77882 2,183 m asl	Headquarters. 11 km to Miombo Camp. 4 km to Mhensabantu Camp. 750 m to Mt. Nkungwe peak.		with big trees and stands of bamboo.	flat spot *ca*. 150 m up hill. Now 3 tent sides available. Need to double the flat area to allow for 3 more tent sites and 1 fire. Needs 1 pit-latrine. Ranger posts needs some repairs and cleaning-up to make it presentable to tourists.	monkey, Thomas's dwarf galago, miombo silver galago, scaly spurfowl, crowned eagle, Schalow's turaco, regal sunbird (endemic subspecies *anderseni*), Tacazze sunbird, Kungwe apalis, yellow-bellied wattle-eye (endemic subspecies *kungwensis*).	Spectacular views from ranger post and from top of Mt. Nkungwe. Best chance to see/hear the rare, endemic, Mahale Angola colobus.

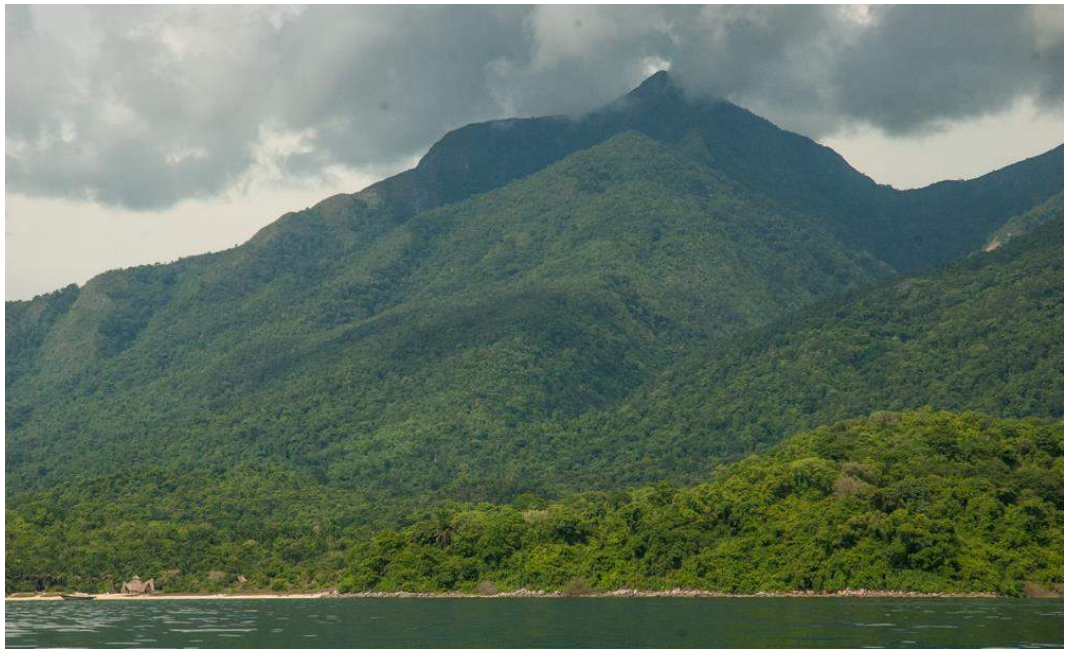


Figure 27. Mount Nkungwe, with Lake Tanganyika and Greystoke Mahale in the foreground, Mahale Mountains National Park, Tanzania.

Acknowledgements

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Appendix 1

Illustrated Checklist of the Primates of Mahale Mountains National Park

Primates of Mahale Mountains National Park

Thomas M. Butynski and Yvonne A. de Jong. Illustrations by Stephen D. Nash

	Thomas's dwarf galago *Galagoides thomasi*	Least Concern	☐
	Mozambique dwarf galago* *Paragalago granti*	Least Concern	☐
	Moholi lesser galago* *Galago moholi moholi*	Least Concern	☐
	Miombo silver galago *Otolemur crassicaudatus monteiri*	Least Concern	☐
	Eastern vervet *Chlorocebus pygerythrus centralis*	Least Concern	☐
	Schmidt's red-tailed monkey *Cercopithecus ascanius schmidti*	Least Concern	☐
	Mahale silver monkey *Cercopithecus mitis* subspecies unknown	Not Assessed	☐
	Kinda baboon *Papio kindae*	Least Concern	☐
	Ashy red colobus *Piliocolobus tephrosceles*	Endangered	☐
	Mahale Angola colobus *Colobus angolensis mahale*	Data Deficient**	☐
	Eastern robust chimpanzee *Pan troglodytes schweinfurthii*	Endangered	☐

***** Confirmation of presence is required. ** Expected to be listed, before 2024, as 'Critically Endangered'

Appendix 2

Brochures for Camps in Mahale Mountains National Park

Illustrated camp brochures for Mahale Mountains National Park visitors. See Table 5 for additional camp information.

MFIGA CAMP
MAHALE MOUNTAINS NATIONAL PARK

1 -2 Days

S6.13733; E29.75347

1,238 m asl

Evergreen, closed canopy, lowland forest.

MFIGA CAMP

MAHALE MOUNTAINS NATIONAL PARK

Highlights

Relatively easy hike in evergreen, closed canopy, lowland forest with all its diversity.

Chance to see Thomas's dwarf galago and many of the other primate species. Bushbuck, blue duiker, leopard, wood owl, great blue turaco, trumpeter hornbill, and many more.

Greystoke Mahale → 3 km → Mfiga Camp

MIOMBO CAMP
MAHALE MOUNTAINS NATIONAL PARK

1 Day

S6.03559; E29.75703

1,100 m asl

Mature, open, miombo woodland. Little understory. Grass up to 1 meter high.

MIOMBO CAMP

MAHALE MOUNTAINS NATIONAL PARK

Highlights

Explore true miombo (Brachystegia) woodland with all its diversity for a picnic or the night.

Relatively easy access with some steep sections along the trail.

Chance to see Mahale silver monkey, ashy red colobus, Kinda baboon, Schmidt's red-tailed monkey, miombo silver galago, leopard, and a great diversity in birds such as grey-headed kingfisher, broad-billed roller, and Retz's helmetshrike.

Mahale Mountains NP Headquarters → 3 km → Miombo Camp

Miombo Camp → 7 km → Mhensabantu Camp

Miombo Camp → 11 km → Parinari Camp

MHENSABANTU CAMP

MAHALE MOUNTAINS NATIONAL PARK

Transit camp

S6.08314; E29.76098

1,595 m asl

Mid-altitude (transitional) forest on edge of grassland and near stream.

MHENSABANTU CAMP

MAHALE MOUNTAINS NATIONAL PARK

Highlights

Transit camp with spectacular views off Lake Tanganyika and DRC.

Fantastic sundowner possibilities to unwind from an interesting but challenging hike.

Chance to see ashy red colobus, Schmidt's red-tailed monkey, miombo silver galago, and a great diversity in birds.

Mahale Mountains NP Headquarters → 10 km → Mhensabantu Camp

Miombo Camp → 7 km → Mhensabantu Camp

Mhensabantu Camp → 4 km → Parinari Camp

PARINARI CAMP
MAHALE MOUNTAINS
NATIONAL PARK

3 Days

S6.10549; E29.77882

2,185 m asl

Closed primary montane forest with big trees and stands of bamboo.

PARINARI CAMP

MOUNT NKUNGWE, MAHALE MOUNTAINS NATIONAL PARK

Highlights

Less than a kilometer from the summit of Mount Nkungwe (2,530 m asl), the highest point of the Mahale Mountains.

Spectacular views over Lake Tanganyika, DRC, and inaccessible parts of the Mahale Mountains

Chance to see the Angola colobus monkey, red colobus monkey, Mahale silver monkey, Thomas's dwarf galago, leopard, regal sunbird, Kungwe apalis, trumpeter hornbill, crowned eagle, malachite sunbird, Schalow's turaco, Fuelleborn's African dusky flycatcher, yellow-bellied wattle-eye, and many more.

Mahale Mountains NP Headquarters → 9 km → Mhensabantu Camp

Mhensabantu Camp → 4 km → Parinari Camp

Parinari Camp → 11 km → Miombo Camp

Miombo Camp → 3 km → Mahale Mountains NP Head Quarters

Appendix 3

Primates of Mahale Mountains National Park, Tanzania

The field guide, '*Primates of Mahale Mountains National Park, Tanzania*' was published by Nomad Tanzania in 2009 (Figure 28). Since 2009, several taxonomic changes have been made to the primates of East Africa and new information concerning the primates of Mahale NP has been obtained, including during this ranger and guide training in research exercise. We have updated the text and added two species of primate. This appendix presents the updated '*Primates of Mahale Mountains National Park, Tanzania*' (Butynski and De Jong 2023). This field guide includes photographs and distribution maps by the authors, illustrations by Stephen Nash, and QR codes to the vocal profiles of the galagos by the Nocturnal Primate Research Group, Oxford Brookes University.

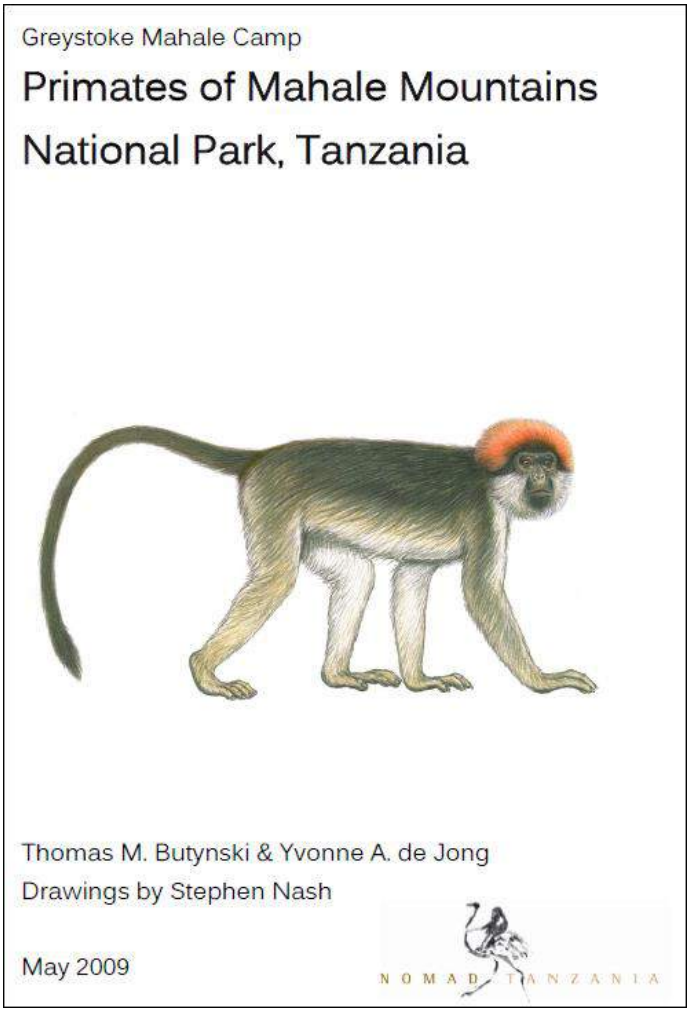

Figure 28. Mahale primates field guide produced in 2009.

Primates of Mahale Mountains National Park, Tanzania

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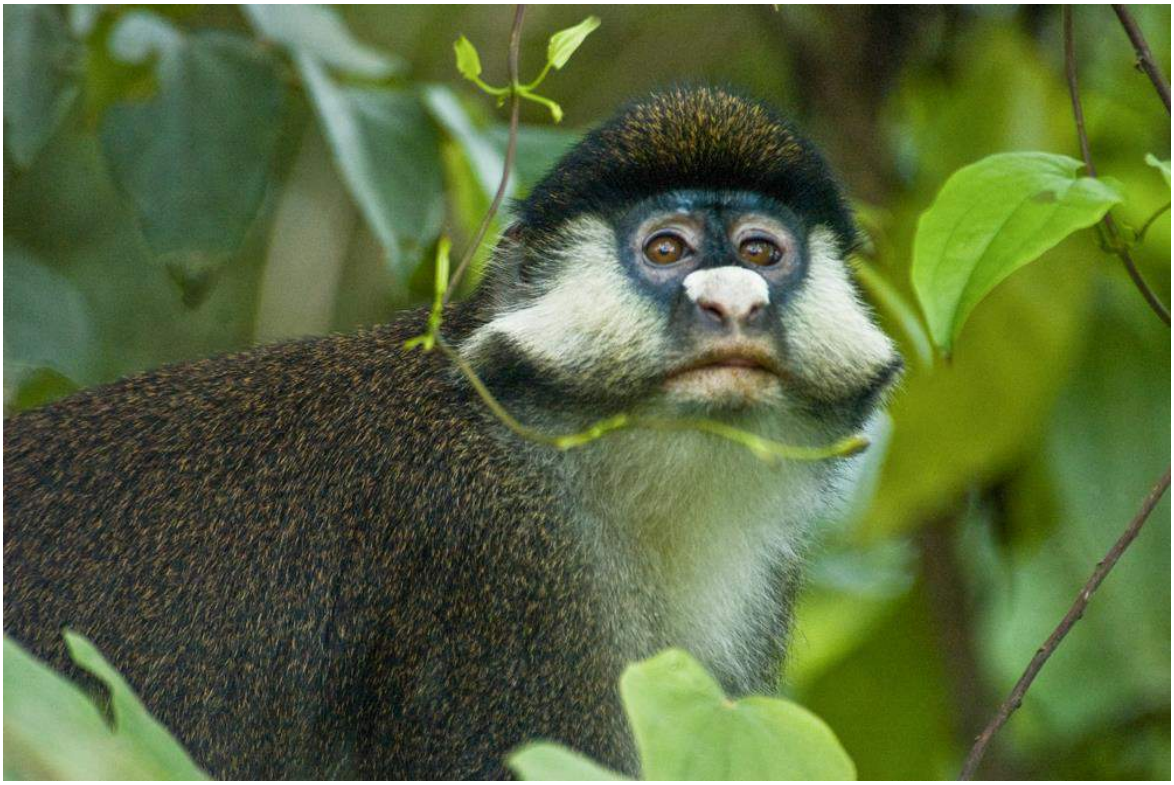


August 2023

Photographs and maps by Yvonne A. de Jong and Thomas M. Butynski, unless stated otherwise. Illustrations by Stephen Nash. QR codes by the Nocturnal Primate Research Group, Oxford Brookes University, Oxford, UK.

Content

Mahale Mountains National Park

In 1985, the Mahale Mountains National Park (hereafter, 'Mahale Mountains NP') became the 11th national park in Tanzania. This park was created for the purpose of protecting a part of the Albertine (Western) Rift Ecosystem and its globally significant biodiversity, in particular the primates, endemic fish, and the rich mosaic of habitat types. Mahale Mountains NP is 1,613 km² and located on the eastern shore of Lake Tanganyika, about 130 km south of the city of Kigoma. The park includes the Mahale Mountains, pristine beaches of Lake Tanganyika, as well as the lake out to 1.6 km from the shoreline. Mahale Mountains NP represents the western limit of the 'Greater Mahale Ecosystem/Landscape' (*c*. 18,200 km²).

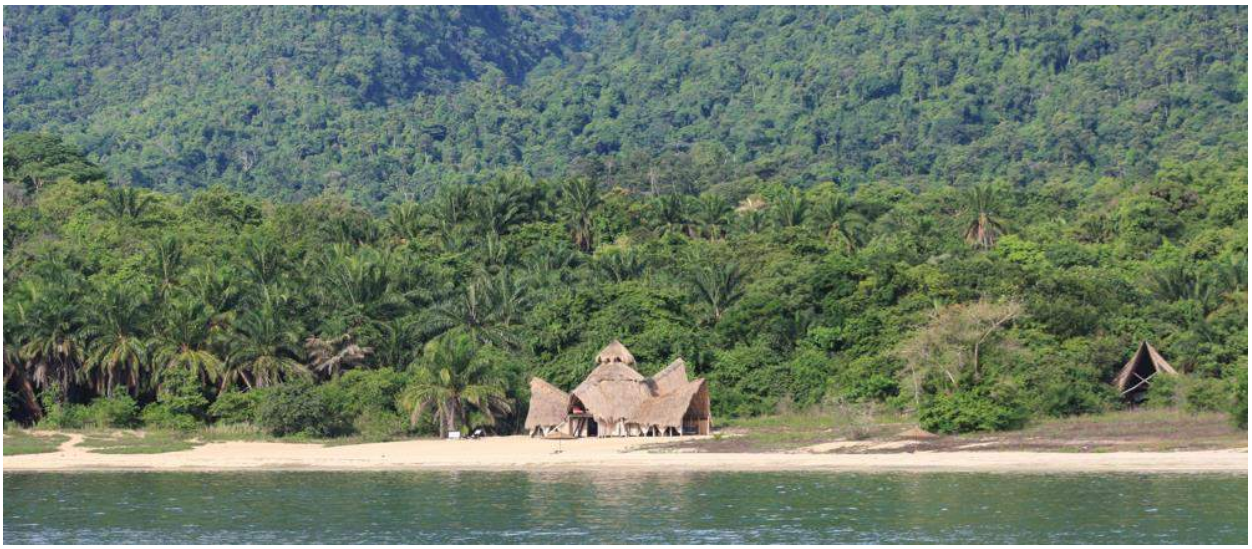
Five main vegetation types are found in the Mahale Mountains NP. About 75% of the park is covered with 'miombo' woodland (which is dominated by *Brachystegia* spp., *Isoberlinia angolensis,* and *Julbernardia* spp.). Lowland evergreen forest covers the flat to hilly area between Lake Tanganyika and the mountains (780–1,300 m above sea level = asl). Rivers and streams throughout the lower, drier, parts of the park hold strips of riverine forest. The slopes of the mountains host a mix of bamboo *Oxytenanthera abyssinica* bushland and, above 1,800 m asl, montane forest. The more common trees in the montane forest include *Paranari excelsa, Podocarpus latifolius*, *Bersama abyssinica, Nuxia congesta, Macaranga kilimandscharica, Harungana madagascariensis, Olea welwitschii, Vepris nobilis, Gambeya gorungosana*, and *Croton megalocarpus*. Alpine bamboo *Oldeania alpina* is also common here. The alpine zone (>2,350 m asl) is covered by grass and low bush.

The terrestrial part of Mahale Mountains NP (*c.* 1,500 km²) ranges in altitude from the shore of Lake Tanganyika at 773 m asl to the top of Mt. Nkungwe at *c.* 2,530 m asl. Lake Tanganyika, formed during the Late Miocene (12–9 million years ago), is the longest (676 km), second deepest (1,471 m; mean depth 570 m), and second oldest major lake in the world. Covering 32,900 km², Lake Tanganyika is the biggest lake in Africa by volume, holding about 17% of the world's fresh water. A total of 128 species of fish are known for Lake Tanganyika. Of these, 96 % are found nowhere else, making Lake Tanganyika of great importance to the conservation of Africa's diversity of fish species.

Although the terrain of Mahale Mountains NP is flat to hilly near the lake, the interior is extremely rugged with many steep slopes and cliffs. Mean annual rainfall at Greystoke Mahale is roughly 1,500 mm. There is one wet season (November–April) and one dry season (May–October). It rarely rains during June, July and August. Temperatures are highest during the wet season. Average monthly maximum daily temperatures range from 25º C to 29º C. Average monthly daily minimum temperatures range from about 18º C to 21º C.

The list of bird species known to occur with the park stands at 355 (see Nomad's Checklist of the Birds of Mahale Mountains National Park), while the list of mammal species totals 82 (see Nomad's Checklist of the Mammals of Mahale Mountains National Park). There are 1,174 species of plants known for the park, but the actual number is thought to be at least twice this. Many of the plant and animal species in

Mahale Mountains NP are globally threatened with extinction. As such, this park is extremely important for their long-term survival.



Greystoke Mahale, Mahale Mountains National Park, western Tanzania.

Primates of Mahale Mountains National Park

The Order Primates is comprised of an interesting, charismatic, diverse, and successful group of species that are, with few exceptions, confined to the tropics and subtropics. Primates occur in a wide variety of habitats, including forests, woodlands, savannas, and even semi-deserts and mangroves. At present, the IUCN's Primate Specialist Group recognizes 107 African primate species, comprising four families and 26 genera. At the species level, 55 of the 107 are considered threatened (*The IUCN Red List of Threatened Species*; www.iucnredlist.org), with 11 listed as Critically Endangered (CR), 24 as Endangered (EN), and 20 as Vulnerable (VU). Tanzania is known to have 14 genera and 46 species and subspecies of primate, making it one of the most important countries in Africa for the conservation of primates.

The main characteristics that make a primate a primate are:

1. Eyes that face forward for binocular vision. This enables depth perception (*i.e.*, three dimensional views).
2. A long period of development before and after birth. The mother invests much time and energy in her (typically one) offspring and there is a long socialization period.
3. Large brain relative to body size.
4. Fingers and toes that have flat nails (as opposed to claws). The skin of the fingers and hands is hairless and has prints.
5. A shortened snout and, therefore, a reduction in the sense of smell.

6. An opposable thumb that enables a precise, firm, grip (although the colobus monkeys do not have thumbs).

Despite of the above 'specialized' features, anatomically, primates are among the least specialized of today's mammals. They play essential roles in the survival of the natural habitats in which they live. For example, they comprise a high proportion of the mammalian biomass in many habitats and are excellent dispersers of seeds. Primates are good indicators of the quality and health of an ecosystem, especially forest ecosystems. If primates were to disappear from the forest, the ecological community would greatly change, and the viability of those forests would be seriously threatened. When forests are degraded or lost, humans lose many crucial benefits such as protection of water catchments and soil, climate regulation, timber, firewood, foods, and medicines.

The diversity of primates in Mahale Mountains NP is high, with at least 10 species of nine genera present (excluding humans). In addition, one dwarf galago/bushbaby (*Galagoides* or *Paragalago*) is present but has yet to be identified as to species. This is more species of primate than for any protected area in Tanzania except for the Udzungwa Mountains National Park (13 species). Mahale Mountains NP has several major habitats, all of which support one or more species of primate. The smallest species of primate in Mahale Mountains NP is the recently (2022) identified Thomas's dwarf galago *Galagoides thomasi*. This species weighs about 100 g, has a body that is about 146 mm long, and a tail that is about 195 mm in length. The largest species of primate Mahale Mountains NP is the chimpanzee; adult males weigh about 42 kg and have a body length of about 82 cm. Chimpanzees, being 'apes', have no tails. More than any other group of animals, it is the primate community that make the Mahale Mountains NP such a special and unique place.

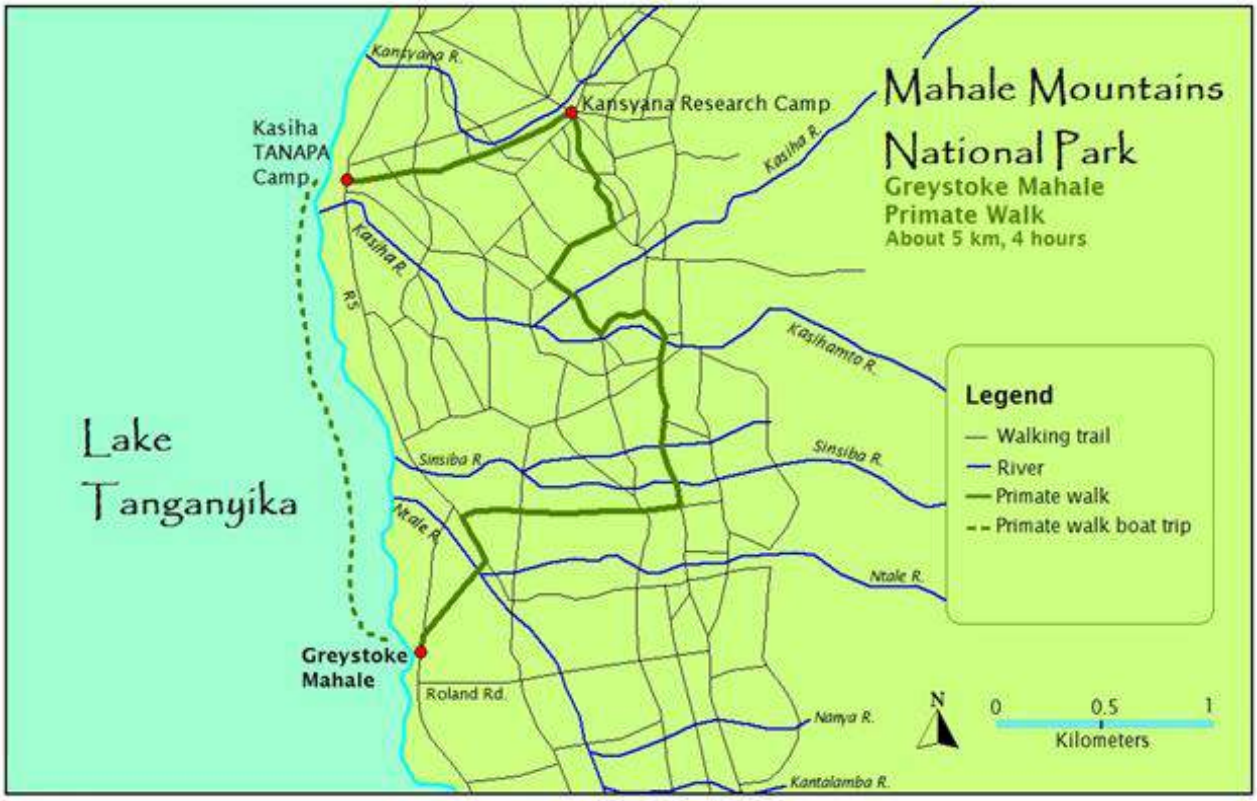
Globally, the biggest threats to primates are habitat loss due to agriculture, logging and human expansion, hunting, climate change, and disease. All threats are directly or indirectly related to rapidly growing human populations. The main threats to the primates of the well protected Mahale Mountains NP are fire, climate change, and the rapidly growing human population around the park. Furthermore, transmission of diseases between humans and non-human primates is a major concern.

Two of the 11 primate species are currently considered by the *IUCN Red List of Threatened Species* to be globally threatened with extinction. These are the chimpanzee (Endangered) and ashy red colobus (Endangered). The recently described (2023) Mahale Angola colobus is expected to soon be listed as 'Critically Endangered'. The montane forests of the Mahale Mountains NP are the only place in the world where you can find the Mahale Angola colobus, the number of which is probably fewer than 400 individuals.

Mount Sibindi (in the distance) as seen from the top of Mount Nkungwe. The patch of montane forest in the middle of this photograph is where the first two observations of Mahale Angola colobus *Colobus angolensis mahale* occurred (Nishida *et al*. 1981; Itani 1990). Note the dense cloud cover, the rugged terrain, the fire-maintained grassland on the left (east) slope of Mount Sibindi, and the closed montane forest on the right (west) slope. This amount of cloud cover is typical for the peaks of the Mahale Mountains and is related to the presence of Lake Tanganyika to the west.

Greystoke Mahale Primate Walk

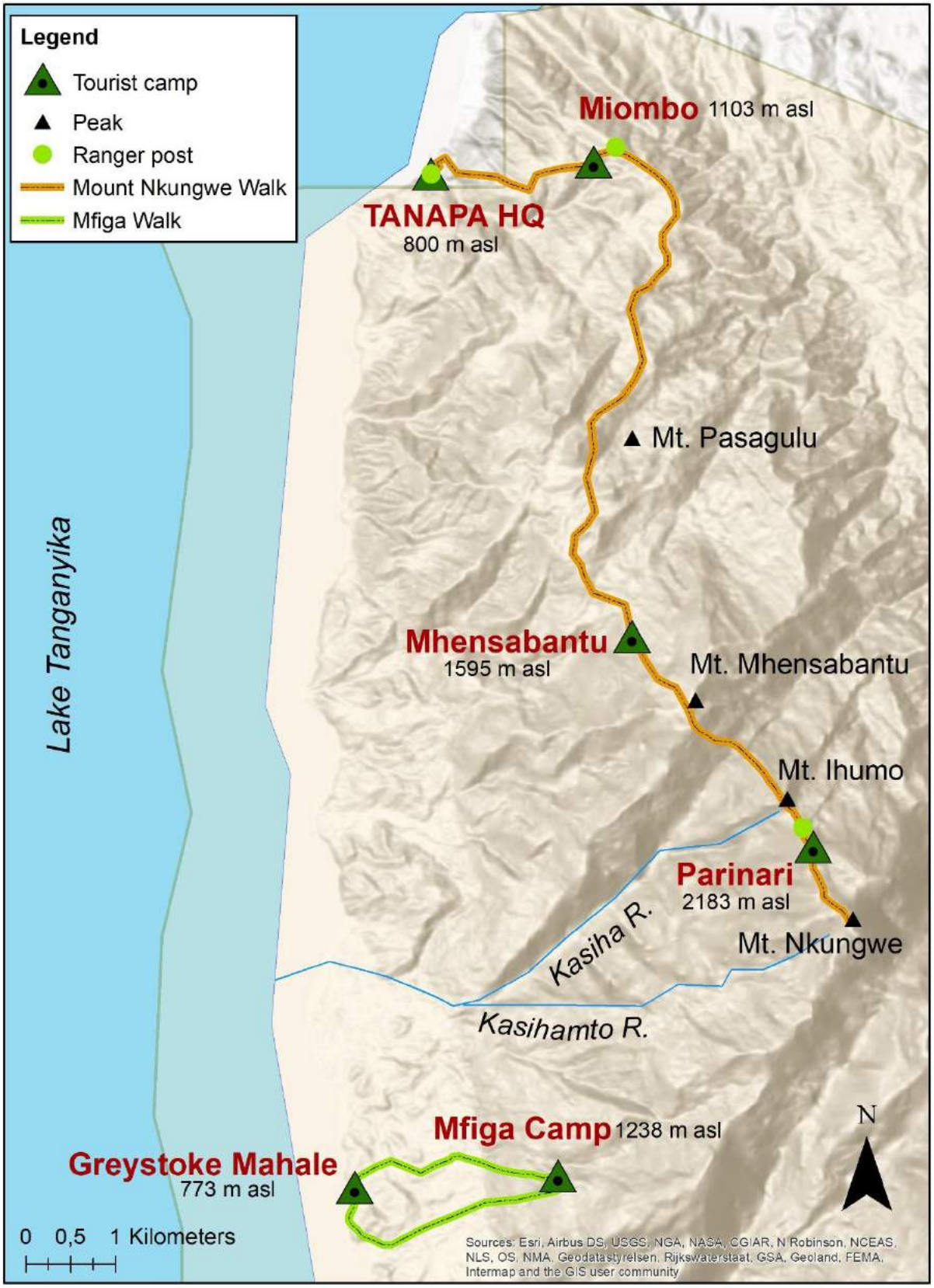
Besides ‘chimpanzee tracking’, Greystoke Mahale offers ‘primate walks’ along trails that pass through the area’s various ‘primate hotspots’. The ‘Primate Walk’ (see map below) was designed primarily to increase the chance of encountering two of the area’s most difficult to find diurnal primates---the Mahale silver monkey and the ashy red colobus monkey---but also to take visitors through a diversity of forest types were a large number of species of birds, butterflies, wildflowers, trees, etc., can also be observed. A boat takes the visitors and their guides from Greystoke Mahale to the Kasiha TANAPA Camp (about a 10-minute boat ride). From there the visitors walk slowly back to Greystoke Mahale. The Primate Walk is about 5 km long and takes most visitors 4 to 5 hours to complete. This walk can be made shorter or longer if necessary.


Mahale Mountains
National Park
Greystoke Mahale
Primate Walk
About 5 km, 4 hours
Kansyana Research Camp
Kasiha
TANAPA
Camp
Kansyana R.
Kasiha R.
Kasiha R.
Kasihamto R.
Sinsiba R.
Sinsiba R.
Ntale R.
Ntale R.
Lake
Tanganyika
Greystoke
Mahale
Roland Rd.
Namya R.
Kantalamba R.
Legend
Walking trail
River
Primate walk
Primate walk boat trip
N
0
0.5
1
Kilometers

Mount Nkungwe Primate Walk

The challenging, but stunning, 'Mount Nkungwe Primate Walk' starts at Mahale TANAPA Headquarters (about a 10 minute boat ride from Greystoke Mahale) and leads along an established trail that passes through the parks major vegetation types [from lake level (773 m) to 2,530 m asl] into montane forest at about 1,800 m asl. The tail provides breath-taking views of Mahale Mountains NP, Lake Tanganyika, Democratic Republic of Congo (DRC), and parts of the 'Greater Mahale Ecosystem/Landscape'. The walk, often through rough terrain, leads to Mt. Pasagulu (*c*. 1,600 m asl), Mt. Mhensabantu (*c*. 2,050 m asl), Mt. Ihumo and, finally, to the highest point of Mahale Mountains NP, the peak of Mt. Nkungwe (2,530 m).

The walk (map below) was designed primarily to access Mt. Nkungwe. It provides the chance to encounter all 11 primate species, including the Mahale Angola colobus and Thomas's dwarf galago, as well as many species of birds, butterflies, wildflowers, trees, etc.


Legend
Tourist camp
Peak
Ranger post
Mount Nkungwe Walk
Mfiga Walk
Miombo 1103 m asl
TANAPA HQ
800 m asl
Mt. Pasagulu
Lake Tanganyika
Mhensabantu
1595 m asl
Mt. Mhensabantu
Mt. Ihumo
Parinari
2183 m asl
Mt. Nkungwe
Kasiha R.
Kasihamto R.
Mfiga Camp 1238 m asl
Greystoke Mahale
773 m asl
N
0 0,5 1 Kilometers
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

Mfiga Primate Walk

'Mfiga Walk' starts at Greystoke Mahale, leads to Mfiga Camp and loops back to Greystoke Mahale. The trail is slightly challenging due to steep sections which can be slippery when wet. The trail goes through evergreen, closed canopy, lowland forest from lake level (773 m) to 1,238 m asl. The tail provides views of parts of Mahale Mountains NP and Lake Tanganyika but is mostly within the closed forest.

Mfiga Walk (map below) was designed primarily to view primates and other wildlife, including blue duiker, bushbuck, great blue turaco, and black-and-white casqued hornbill, but also many other species of birds as well as butterflies, wildflowers, etc. From the camp there is a good chance to see and hear Thomas's dwarf galago, miombo silver galago, and wood owl.

Mfiga Walk is about 6 km long (coming and going) and takes most visitors 5–6 hours to complete. A night camping at Mfiga Camp is an option but is not required. This walk can be made shorter or longer if necessary.

Thomas's dwarf galago

Galagoides thomasi

Kiswahili: Komba
Kitongwe: Mung'anya

Notes: First reported to occur in Mahale in April 2022. Known in Tanzania from only one other site (near Lake Victoria).

Description: Smallest galago in Mahale Mountains NP. Overall brown galago with long muzzle, pale nose stripe, and off-white underparts and throat. Diagnostic 'crescendo' loud call. Often high above the ground making long leaps among branches.

Body weight:
Adult males: 82 (74–88) g.

Adult females: 75 (60–85) g.

Distribution: From Nigeria to Côte d'Ivoire southward to northern Angola and eastward to eastern DRC, western Uganda, Rwanda and Burundi, extreme northwestern Tanzania (Minziro Forest), and Mahale Mountains NP. Distribution depicted by the green area on the below map.

Altitude range: 0–2,690 m asl.

Habitat: Upper canopy of primary and secondary lowland and montane forest. Can persist in natural forest fragments.

Food: Omnivorous. Relies mostly on insects, but also eats gums, fruits and seeds.

Abundance: Patchily distributed. Can be common in montane forest and in secondary forest.

Activity pattern: Nocturnal and arboreal. Sleeps in self-made leaf nests and in tree-holes lined with fresh leaves.

Group size and social organization: Mostly solitary while foraging but in vocal contact with conspecifics. Sleeps in groups of up to five individuals. Social groups of up to 12 individuals.

Gestation: *c*. 110 days.

Birthweight: *c*. 25 g.

Vocalization: Distinct vocal profile with unique loud call. Vocalizations are important for communication as in all galagos. The loud call gives information about location, sex, age, physical condition, behavioral intentions, etc. Scan the QR code (or go to: https://www.wildsolutions.nl/vocal-profiles/galagoides/thomass-dwarf-galago-galagoides-thomasi/) for the vocal profile.

Predators: Poorly known but most likely genets, palm civets, monkeys, chimpanzees, hawks, owls, and snakes.

Longevity: >10 years in captivity.

Conservation status: 'Least Concern' on the IUCN Red List of Threatened Species.

Threats: Threatened in Mahale Mountains NP by loss of montane forest do to fire and climate change.

Best places to view in Mahale Mountains NP: Near Parinari Camp on Mt. Nkungwe and Mfiga Camp.


Uganda
L. Victoria
Kenya
Rwanda
Segengeti NP
Ngorongoro CA
Kilimanjaro NP
Burundi
Arusha
L. Manyara NP
Mkomazi NP
Gombe NP
Tanzania
Pangani R.
Mahale
Mountains NP
Dodoma
Saadani NP
Dar es Salaam
Katavi NP
Rufiji R.
L. Tanganyika
Ruaha NP
L. Rukwa
Indian
Ocean
Selous GR
N
Zambia
L. Malawi
Ruvuma R.
Mozambique

Mozambique dwarf galago

Paragalago granti

Kiswahili: Komba
Kitongwe: Mung'anya

Notes: Although this species was first reported to occur in Mahale Mountains NP in 2005, its presence requires confirmation.

Description: Small galago with relatively long rounded ears that are black on the backside. Tail black becoming wider distally ('bottle-brush shape'). Diagnostic 'incremental' loud call.

Body weight: 165 (139–178) g.

Distribution: From northeastern South Africa northward through eastern Zimbabwe, southern Malawi to southeastern Tanzania. Distribution depicted by the dark tan areas on the below map.

Altitude range: 0–1,800 m asl.

Habitat: Dry coastal forest, scrub and thickets, lowland evergreen and semi-evergreen forest, and plant species-rich woodlands, including miombo woodlands.

Food: Omnivorous. Relies mostly on insects, gums, fruits, and flowers.

Abundance: Widespread over southeastern Africa and locally common. Most abundant in coastal evergreen and semi-evergreen forest and thicket. Locally common.

Activity pattern: Nocturnal and arboreal. Sleeps in tree-holes and green leafy nests.

Group size and social organization: Mostly solitaire while foraging. Shares nests with up to five conspecifics of either sexes but also with other galago species.

Vocalization: Distinct vocal profile. Diagnostic loud call. Vocalizations are important for communication, as for other galagos. The loud call gives information about location, sex, age, physical condition, behavioral intentions, etc. Scan the QR code (or go to: https://www.wildsolutions.nl/vocal-profiles/galagoides/mozambique-dwarf-galago-galagoides-granti/) for the vocal profile.

Predators: Poorly known but most likely snakes, owls, genets, palm civets, monkeys, and chimpanzees.

Conservation status: 'Least Concern' on the IUCN Red List of Threatened Species.

Threats: Habitat loss through deforestation and intensive agriculture related to fast-growing human populations. Able to occupy habitats marginally affected by humans. Threatened in Mahale Mountains NP by habitat degradation, loss, and fragmentation due to fire and climate change.

Best places to view in Mahale Mountains NP: The dwarf galago at Miombo Camp may be Grant's dwarf galago.


Uganda
L. Victoria
Kenya
Rwanda
Segengeti NP
Ngorongoro CA
Kilimanjaro NP
Burundi
Arusha
L. Manyara NP
Mkomazi NP
Gombe NP
Tanzania
Pangani R.
Mahale
Mountains NP
Dodoma
Saadani NP
Dar es Salaam
Katavi NP
Rufiji R.
L. Tanganyika
Ruaha NP
L. Rukwa
Indian
Ocean
Selous GR
N
Zambia
L. Malawi
Ruvuma R.
Mozambique

Moholi lesser galago

Galago moholi moholi

Kiswahili: Komba
Kitongwe: Mung'anya

Notes: Reported to occur in Mahale Mountains NP but presence requires confirmation.

Description: Medium sized galago with white nose stripe, greyish body, yellowish-orange limbs, and grey, bushy tail. Diagnostic 'repetitive' loud call.

Body weight:
Adult females: 155 (126–176) g.
Adult males: 177 (145–212) g.

Distribution: From southwestern Tanzania southward through eastern Zambia, Mozambique, and Zimbabwe, to eastern Botswana. Reported to occur in Mahale Mountains NP. Nearest confirmed records are *c.* 700 km to the southeast. Distribution depicted by the red area on the below map.

Altitude range: 0–1,500 m asl.

Habitat: Mainly semi-arid habitats, including woodland, riverine bush, scrub, and forest fringe.

Food: Omnivorous/gumnivorous. Mostly insects and gums. Visit favorite forage trees by following specific routes and mark those with their scent. Locate food with the help of their mobile ears, large eyes, and good sense of smell.

Abundance: Locally common (13–31 individuals/km²).

Activity pattern: Nocturnal and arboreal. Sleeps in tree-holes, nests, on branches, and tree forks.

Distance moved per night: About 2 km.

Size of area used (home range): Females: 4–12 ha. Males: 9–23 ha.

Group size and social organization: Mostly solitary. Sleep alone or in small groups.

Gestation: *c*. 125–130 days.

Birthweight: *c*. 12 g. Gives birth to twins twice per year.

Vocalization: Distinct vocal profile. Unique loud call. Vocalizations are an important means of communication as in other galagos. Has at least 19 different calls. The loud call ('honk') gives information about location, sex, age, physical condition, behavioral intentions, etc. Series of loud calls can last for more than 1 hour and heard at more than 200 m. Scan the QR code (or go to: https://www.wildsolutions.nl/vocal-profiles/otolemur/crassicaudatus/) for the vocal profile.

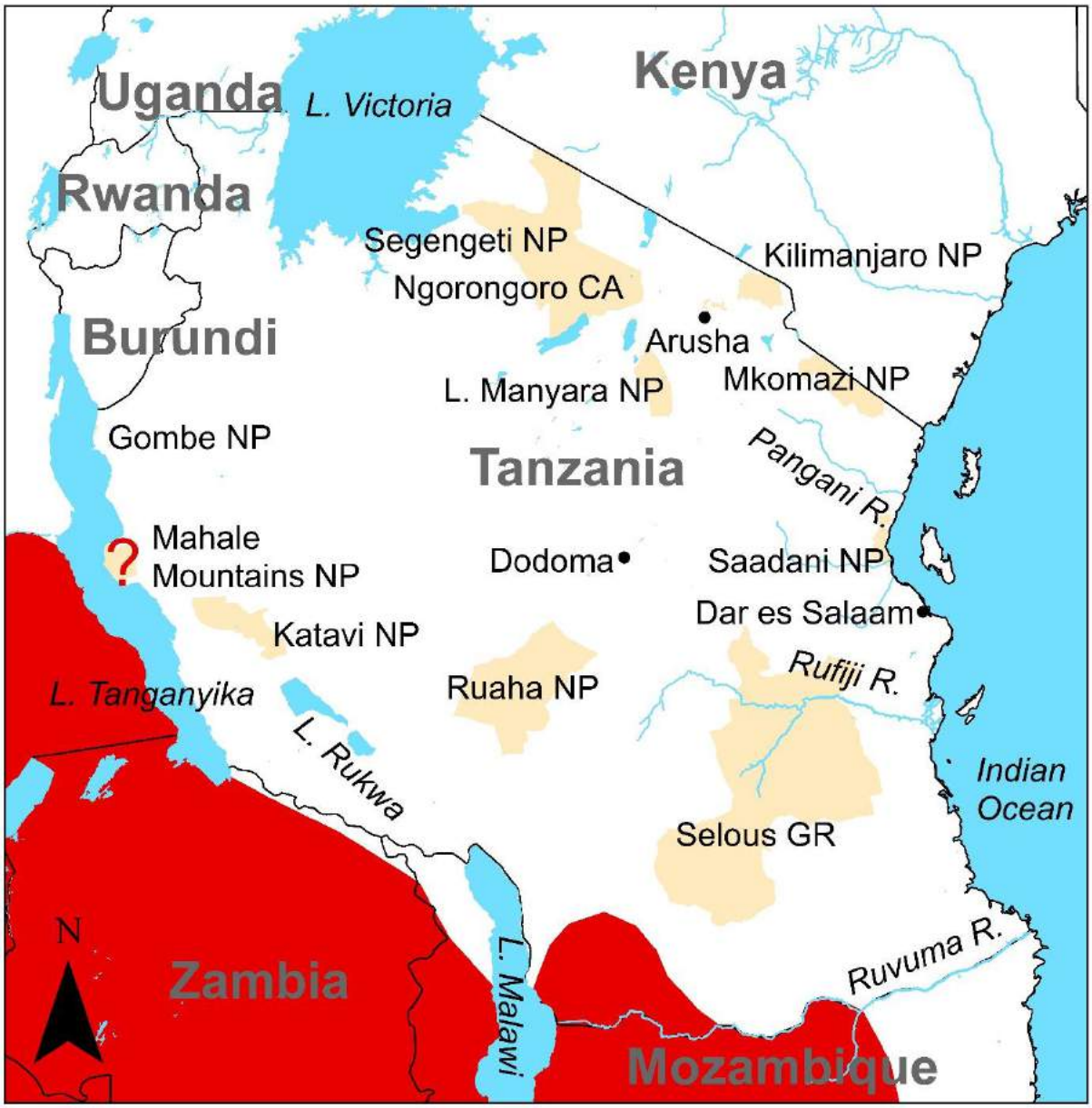
Predators: Small mammalian carnivores, owls, and snakes.

Longevity: *c*. 16 years.

Conservation status: 'Least Concern' on the IUCN Red List of Threatened Species.

Threats: Habitat loss through fire, climate change, deforestation, and intensive agriculture related to fast-growing human populations.

Best places to view in Mahale Mountains NP: If present, expected to be found in miombo woodland.



Miombo silver galago

Otolemur crassicaudatus monteiri

Kiswahili: Komba
Kitongwe: Mung'anya

Notes: Largest and most common galago in Mahale Mountains NP.

Description: Large galago with robust muzzle. Silvery-grey above and off-white to grey below. Ears large, pinkish inside. Tail silvery-grey, long, full, and fluffy. Diagnostic 'trailing' loud call.

Body weight:
Adult females: 1.1 (0.9–1.6) kg.
Adult males: 1.3 (1.0–1.5) kg.

Distribution: From Angola in the west, to Zambia, Malawi, and northern Mozambique in the east, northward to Rwanda and southern Uganda, through most of Tanzania to southeastern Kenya. Distribution depicted by the orange area on the below map.

Altitude range: 0–2,200 m asl.

Habitat: Open woodland, especially miombo woodland. Also in forests, thickets, and well- developed woodland of higher rainfall areas.

Food: Omnivorous. Feeds mostly on insects, fruit, and gum. Individuals follow pathways to known food sources.

Abundance: Locally common but many populations are fragmented and isolated due to habitat loss.

Activity pattern: Nocturnal and arboreal. Most active during the first hours after dusk and the last hours before dawn. Sleeps in dense tangles of creepers and branches 5–12 m above ground.

Size of area used (home range): About 7 ha.

Group size and social organization: Mostly solitary but sometimes in small, dispersed, groups of two or three individuals. Mother with offspring sometimes joined by an adult male at the sleeping site.

Gestation: *c*. 133 days.

Birthweight: *c*. 40 g. Gives birth to twins more often than to singletons.

Vocalization: Galagos are nocturnal and have limited vision. Vocalizations are, therefore, important for communication. Calls give information about location, sex, age, physical condition, behavioral intentions, etc. This species has a large vocal repertoire. The 'loud call' is as a series of complex, well-spaced, drawn-out cries given at a constant rate. This diagnostic call can be heard to at least 300 m. Scan the QR code (or go to: https://www.wildsolutions.nl/vocal-profiles/otolemur/crassicaudatus/) for the vocal profile.

Predators: Leopards, genets, chimpanzees, owls, snakes, and humans.

Longevity: up to 15 years in captivity.

Conservation status: 'Least Concern' on the IUCN Red List of Threatened Species.

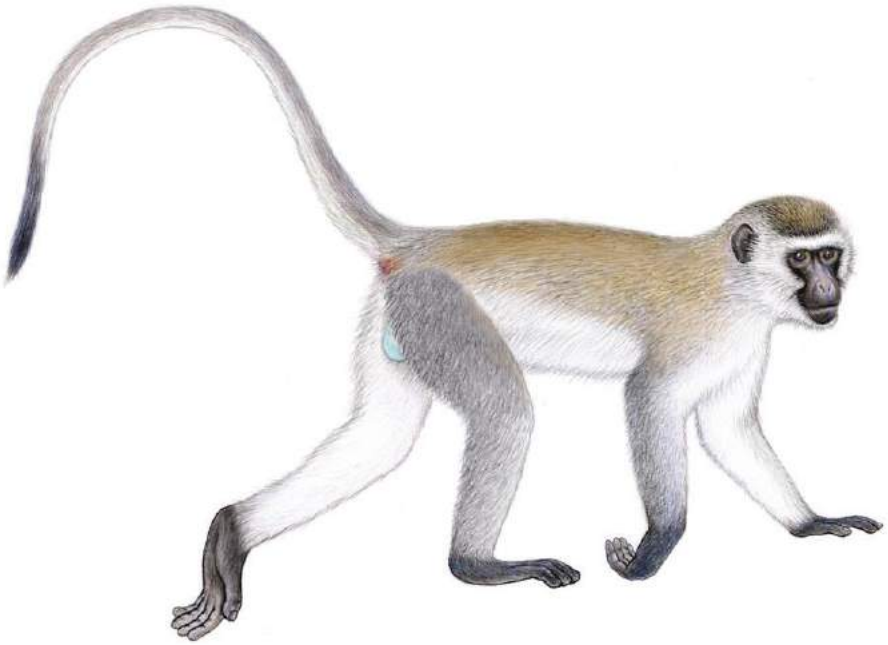
Threats: Habitat degradation, loss and fragmentation mainly due to agricultural expansion and fire.

Best places to view in Mahale Mountains NP: Often heard and seen in the oil palms behind rooms 1, 2 and 3 at Greystoke Mahale, but common throughout Mahale Mountains NP and present at all camps.


Uganda
L. Victoria
Kenya
Rwanda
Segengeti NP
Ngorongoro CA
Kilimanjaro NP
Burundi
Arusha
Mkomazi NP
L. Manyara NP
Gombe NP
Tanzania
Pangani R.
Mahale
Mountains NP
Dodoma
Saadani NP
Dar es Salaam
Katavi NP
Rufiji R.
L. Tanganyika
Ruaha NP
L. Rukwa
Indian
Ocean
Selous GR
N
Zambia
L. Malawi
Ruvuma R.
Mozambique

Eastern vervet

Chlorocebus pygerythrus centralis



Kiswahili: Tumbili
Kitongwe: Ijanda

Notes: The vervet in Mahale Mountains NP was previously considered to be the russet-green vervet *Chlorocebus pygerythrus rufoviridis* but is now recognized as *C. p. centralis*.

Description: Medium sized semi-terrestrial monkey. Grizzled greyish-yellow above, white below. Face, hands, feet, and tail tip blackish. Testicles turquoise.

Body weight:
Adult females: 4.1 (3.4–5.3) kg.
Adult males: 5.5 (3.9–8.0) kg.

Distribution: From south coast of Somalia and coast of Kenya westward through southern Kenya, southern Uganda, and Tanzania south to the Rufiji River and southern end of Lake Tanganyika, then westward to eastern Democratic Republic of the Congo.

Altitude range: 0–2,140 m asl.

Habitat: Savanna-woodland and forest edge. Always close to sources of water (rivers, swamps, lakes). Needs drinking water and tall trees in which to sleep. Not found deep inside forest.

Food: Omnivorous. Diet includes invertebrates, fruit, leaves, flowers, seeds, gums, and, rarely, small vertebrates and eggs. Vervets forage on the ground and in trees. Sometimes raid crops.

Abundance: Locally common but absent from vast areas where drinking water and tall trees are absent.

Activity pattern: Diurnal. Most active during the first few hours after dawn and during the last few hours before dusk. The hottest hours of the day are usually spent resting. About 30–40 % of the time is spent feeding and about 15–20 % of the time is spent moving.

Distance moved per day: 135–1,558 m.

Size of area used (home range): 5–103 ha.

Group size and social organization: Multi-male and multi-female groups of 6–47 individuals. Males leave the natal group once sexually mature at about 5–6 years of age, while females stay in their natal group. Both sexes maintain dominance hierarchies. Daughters tend to occupy a rank near to their mother's rank.

Gestation: About 156–161 days.

Birthweight: 300–400 g.

Vocalization: Produce at least 33 vocalizations. Different alarm calls are used to identify different species of predators. The loud threat-alarm bark is given by adult and subadult males and can be heard to at least 400 m.

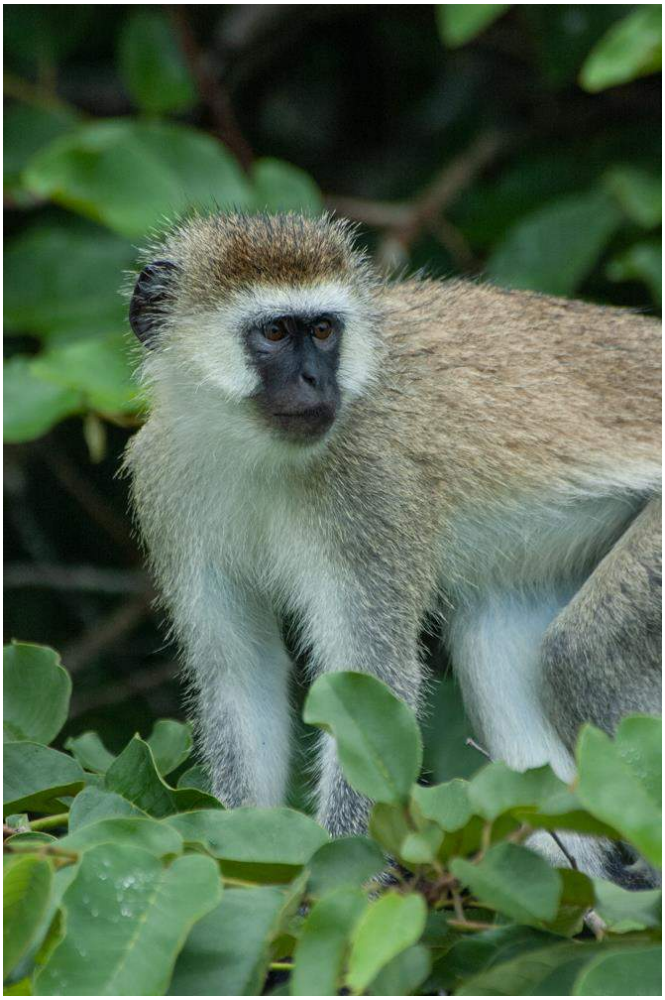
Predators: Crowned eagles, martial eagles, pythons, leopards, baboons, chimpanzees, and humans.

Longevity: At least 18 years in the wild.

Conservation status: 'Least Concern' on the IUCN Red List of Threatened Species.

Threats: Locally threatened. Populations are declining in many regions, particularly where habitat degradation and loss are taking place due to agriculture, settlements, and fire. No direct threats observed in Mahale Mountains NP. Treated as vermin in some areas.

Best places to view in Mahale Mountains NP: Greystoke Mahale and Mahale Mountains NP airstrip. At least one group visits Greystoke Mahale daily and sleeps in the oil palms behind camp. Often seen and heard foraging in the oil palms on the forest-beach edge. Occasionally enter Greystoke Mahale buildings.



Legend

- Northeastern vervet
- Reddish-green vervet
- Pemba vervet
- Eastern vervet

Schmidt's red-tailed monkey

Cercopithecus ascanius schmidti

Kiswahili: Nyani mwenye mkia mwekundu
Kitongwe: Ndugulugu

Description: Medium-sized arboreal monkey with a heart-shaped, white nose spot. Upper parts brown, underparts off-white to pale cream. Tail mostly reddish.

Body weight:
Adult females: 2.8 (2.1–3.8) kg.
Adult males: 3.7 (3.0–4.8) kg.

Distribution: Across equatorial Africa from the Atlantic Ocean to western Kenya and western Tanzania. Mahale Mountains NP is on the southeastern extreme of the range. Distribution depicted by the red area on the below map.

Altitude range: 770–2,500 m asl.

Habitat: In moist lowland, mid-altitude and montane forest, as well as in swamp, gallery, and lakeshore forest. Able to live in secondary forest.

Food: Fruit (35–61 % of diet) and insects (14–31 % of diet), but also feeds on leaves, flowers, gum, and small vertebrates. Raids crops in some areas.

Abundance: 10–184 individuals/km². In Mahale Mountains NP, about 116 individuals/km² in forest and about 63 individuals/km² in woodland.

Activity pattern: Diurnal and arboreal. Forages and feeds 26–69 % of the day (feeding peaks in early morning and late afternoon), rests 9–59 %, and in social behaviors 1–8 % of the day.

Distance moved per day: 1–2 km.

Size of area used (home range): 15–67 ha.

Group size and social organization: Single adult-male, multi-female groups of typically 25–35 individuals (range 3–50). Females remain in their natal group. Subadult males leave their natal group when >4 years of age.

Gestation: About 5 months.

Birthweight: About 260 g.

Vocalization: Vocal repertoire comprises at least eight calls. Adult males have three loud calls; the 'pop', given during disturbances or in response to other loud noises; the 'ka', a low-pitched call given singly or in a rapid sequence of 2–7 calls; and the 'ka-train', a response to predators, especially crowned eagles.

Predators: Crowned eagles, leopards, chimpanzees, and humans.

Longevity: At least 20 years.

Conservation status: 'Least Concern' on the IUCN Red List of Threatened Species.

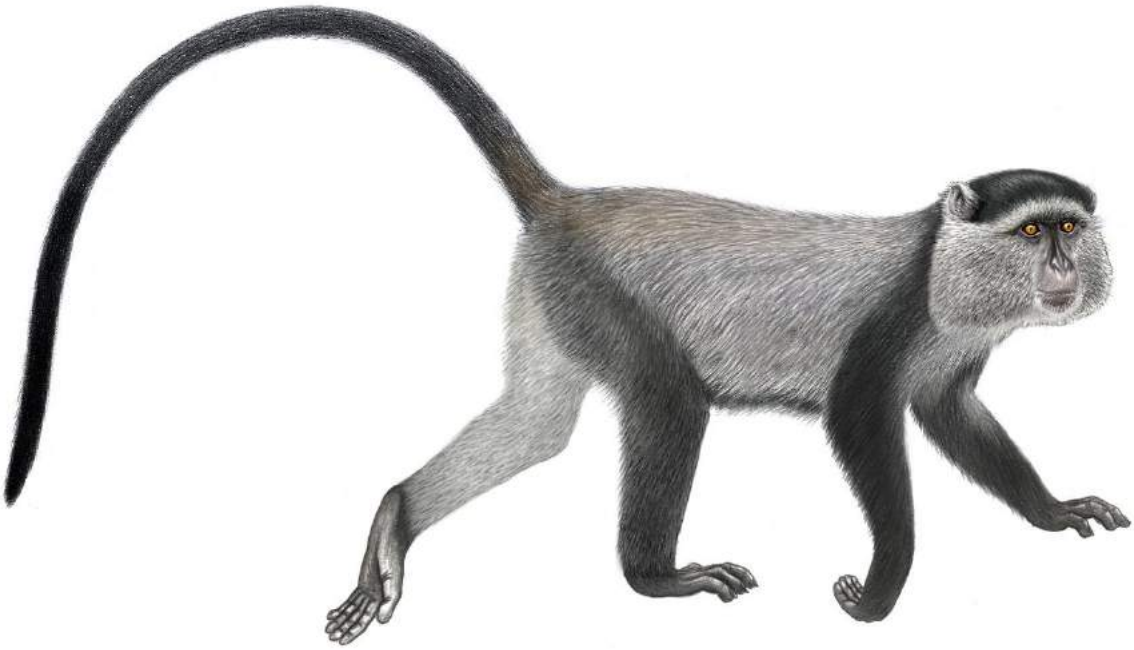
Threats: Locally threatened by habitat degradation, loss, and fragmentation due to agricultural expansion, tree-cutting, and fire. No direct threats observed in Mahale Mountains NP.

Best places to view in Mahale Mountains NP: Near Greystoke Mahale. Frequently encountered during chimpanzee viewing walks.


Uganda
L. Victoria
Kenya
Rwanda
Segengeti NP
Ngorongoro CA
Kilimanjaro NP
Burundi
Arusha
L. Manyara NP
Mkomazi NP
Gombe NP
Tanzania
Pangani R.
Mahale
Mountains NP
Dodoma
Saadani NP
Dar es Salaam
Katavi NP
Rufiji R.
L. Tanganyika
Ruaha NP
L. Rukwa
Indian
Ocean
Selous GR
N
Zambia
L. Malawi
Ruvuma R.
Mozambique

Mahale silver monkey

Cercopithecus mitis subspecies unknown



Kiswahili: Kima
Kitongwe: Nkima

Notes: The taxonomy of the gentle monkey (a species also referred to as blue monkeys or Sykes's monkeys) is under debate. The subspecies found in Mahale Mountains NP has yet to be determined.

Description: Medium-sized arboreal monkey. Back, sides, face, and throat silver-grey. Top of head, outer limbs, and tail black. Grey below.

Body weight:
Adult females: 3.9 (2.3–5.3) kg.
Adult males: 5.8 (3.7–7.8) kg**.**

Distribution: Mahale Mountains NP and the contiguous region east of Mahale Mountains NP, perhaps as far north as the Malagarasi River.

Altitude range: 770–1,970 m asl.

Photograph by Mathias Nelson Omary.

Habitat: In primary and secondary moist lowland, mid-altitude, and montane forest, as well as riverine and lake-side forest.

Food: Omnivore. Main foods are fruit (*c.* 40 %) and invertebrates, but also eats leaves, flowers and, occasionally, eggs and small vertebrates. Foods are fermented in both the foregut and the hindgut which gives this monkey dietary flexibility.

Abundance: 7–153 individuals/km². At 'surprisingly' low abundance and patchily distributed in the Greater Mahale Ecosystem/Landscape'.

Activity pattern: Diurnal and arboreal. Most active during the first few hours after dawn and during the last few hours before dusk. Tends to rest during the middle hours of the day.

Distance moved per day: 1,100 (500–1,900) m.

Size of area used (home range): Typically, 15–50 ha (range 8–253 ha). Ranges overlap with neighboring groups. Home range overlap up to 98 % in high-density populations.

Group size and social organization: Single-male, multi-female groups of typically 10–25 individuals (range 3–65). Females remain in their natal group. Sexually mature males leave their natal group. Avoid baboons and chimpanzees but frequently associate with red colobus and red-tailed monkeys.

Gestation: About 176 (162–190) days.

Birthweight: 400–700 g.

Vocalization: Vocal repertoire comprised of at least 10 calls. The adult male gives three loud calls: the resonant 'boom', given in response to disturbances and for intra-group contact; the 'pyow', given in 3–7+ call sequences for intergroup spacing and during intergroup encounters; and the 'ka-train', given most often in alarm and threat to predators, especially crowned eagles. The 'pyow' is the loudest call and can be heard farther than 1 km.

Predators: Crowned eagles, pythons, leopards, domestic dogs, chimpanzees, and humans.

Longevity: About 20 years.

Conservation status: This subspecies is not assessed, but the species is 'Least Concern' on the IUCN Red List of Threatened Species. Not threatened in Mahale Mountains NP.

Threats: Threatened outside Mahale Mountains NP due to habitat degradation, destruction, and fragmentation. No direct threats within Mahale Mountains NP.

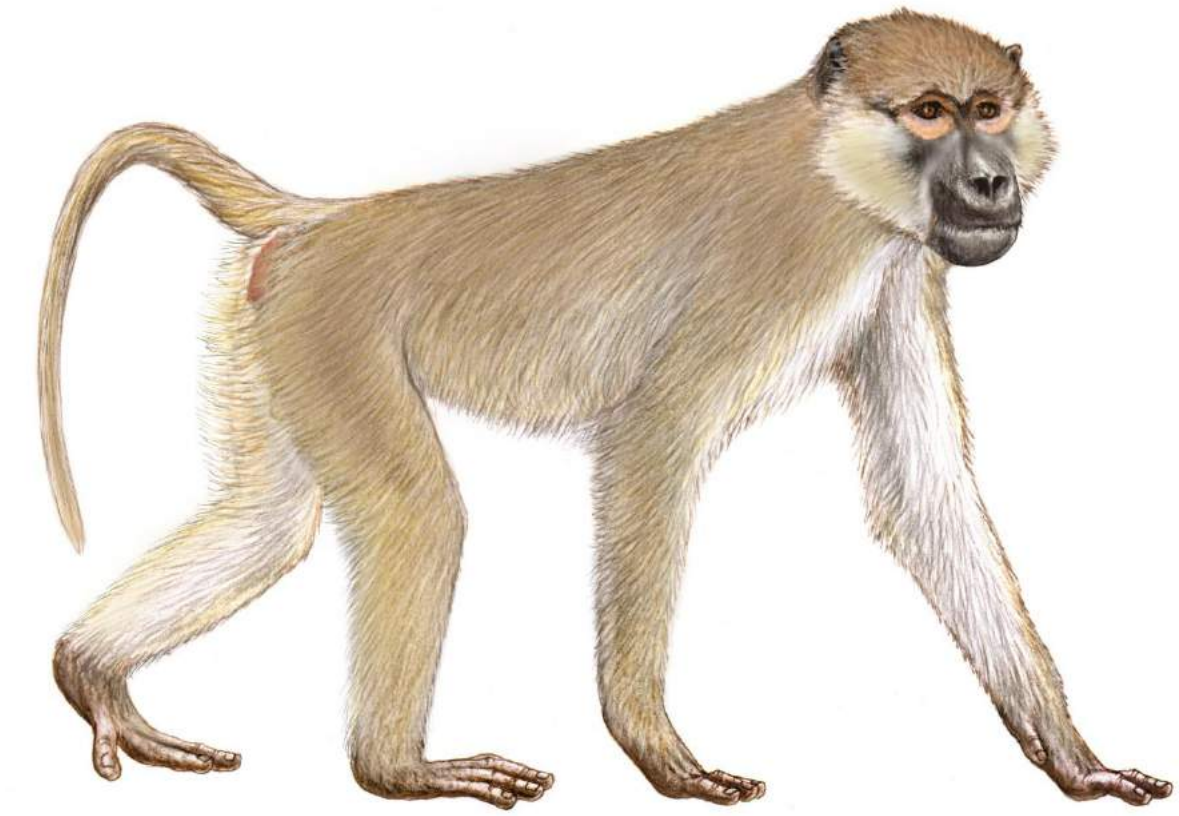
Best places to view in Mahale Mountains NP: Typically, shy and difficult to observe in the Mahale Mountains NP. Far more often heard then seen. Not present at Greystoke Mahale. Occurs over much of the evergreen forest, including Mt. Nkungwe, but most readily observed near Kansyana Research Camp.


Uganda
L. Victoria
Kenya
Rwanda
Segengeti NP
Ngorongoro CA
Kilimanjaro NP
Burundi
Arusha
Mkomazi NP
L. Manyara NP
Gombe NP
Tanzania
Pangani R.
Mahale
Mountains NP
Dodoma
Saadani NP
Dar es Salaam
Katavi NP
Rufiji R.
L. Tanganyika
Ruaha NP
L. Rukwa
Indian
Ocean
Selous GR
Zambia
N
L. Malawi
Ruvuma R.
Mozambique
Sources: Esri, USGS, NOAA


Legend
Manyara monkey
Mahale silver monkey
Tanzania Sykes's monkey
Moloney's monkey
Mozambique
Stuhlmann's blue monkey
Kolb's monkey
Golden monkey
Doggett's silver monkey
Pousargues's monkey
Zanzibar Sykes's monkey
Mweru monkey

Kinda baboon

Papio kindae



Kiswahili: Nyani
Kitongwe: Nguje

Notes: Previously considered a subspecies of the yellow baboon *Papio cynocephalus*. Today it is widely recognized as a full species, *Papio kindae,* as it is morphologically and genetically distinctive from the other five baboon species.

Description: Large, semi-terrestrial, monkey. Yellowish-brown above and off-white below. Bare pink skin around eyes. Newborns typically have an orange pelage but at Mahale they are unique in that they are whitish with pink muzzle and ears. The pelage turns reddish-brown with age.

Body weight:
Adult females: 13 (11–15) kg.
Adult males: 25 (22–30) kg.

Distribution: Southwestern Tanzania as far north as Mahale Mountains NP, then southward through Zambia (except southwest) and westward through southern Democratic Republic of the Congo to central and northern Angola. Distribution depicted by the red areas on the below map.

Altitude range: 0–1,500 m asl.

Habitat: Miombo woodland, dry bushland, ticket, and edges of evergreen forest. Seldom found more than 1 km within forest. Persists in secondary and fragmented habitats. Requires drinking water and tall trees or cliffs on which to sleep.

Food: Omnivorous. Eats fruits, grasses, seeds, flowers, invertebrates, bird eggs, and small vertebrates (including birds, infant antelope, and galagos). Probably the most eaten food at Mahale Mountains NP is oil palm fruit---a common tree left over from the days when people lived in the area. Baboons take food from twice as many plant species as do chimpanzees and, unlike chimpanzees, can digest unripe fruits.

Abundance: In Mahale Mountains NP, 10 individuals/km² in forest and 80 individuals/km² in woodland.

Activity pattern: Diurnal and semi-terrestrial. Most active during the first few hours after dawn and during the last few hours before dusk. Spends much time foraging on the ground but climbs well. Sleeps in the tallest available trees and on cliffs.

Distance moved per day: 8–10 km.

Size of area used (home range): About 24 km².

Group size and social organization: Multi-male, multi-female groups of 30–80 individuals. Females remain in their natal group. Sexually mature males leave their natal group. Females and males both maintain dominance hierarchies. Mating success of the male is related to his dominance rank.

Gestation: About 6 months.

Birthweight: About 900–1,000 g.

Vocalization: The vocal repertoire of adult Kinda baboons includes grunts, 'wahoo' contact calls, threat barks, screams, alarm barks, calls associated with copulations, and 'whoop-gobbles'. Of these, grunts (tonal, low-amplitude, harmonically rich vocalizations) are most common and typically given during foraging. 'Wahoos' can be heard at more than 1 km away.

Predators: Crocodiles, pythons, eagles, leopards, lions, spotted hyenas, chimpanzees, and humans. Chimpanzees hunt and eat Kinda baboons in Mahale Mountains NP.

Longevity: About 27 years.

Conservation status: 'Least Concern' on the IUCN Red List of Threatened Species.

Threats: Crop-raid and forage in areas populated by humans. Therefore, treated as vermin in some areas and have become locally extinct. Their habitat has been destroyed by intensive agriculture and settlements in many places.

Best places to view in Mahale Mountains NP: At least one group visits Greystoke Mahale daily and regularly sleeps in the oil palms behind the buildings. Often seen and heard foraging on the beach and in the vegetation around the buildings. Often present at Mahale Mountains NP Headquarters.


Uganda
L. Victoria
Kenya
Rwanda
Segengeti NP
Ngorongoro CA
Kilimanjaro NP
Burundi
Arusha
Mkomazi NP
L. Manyara NP
Gombe NP
Tanzania
Pangani R.
Mahale
Mountains NP
Dodoma
Saadani NP
Dar es Salaam
Katavi NP
Rufiji R.
L. Tanganyika
Ruaha NP
L. Rukwa
Indian
Ocean
Selous GR
Zambia
N
L. Malawi
Ruvuma R.
Mozambique
Sources: Esri, USGS, NOAA

Ashy red colobus

Piliocolobus tephrosceles

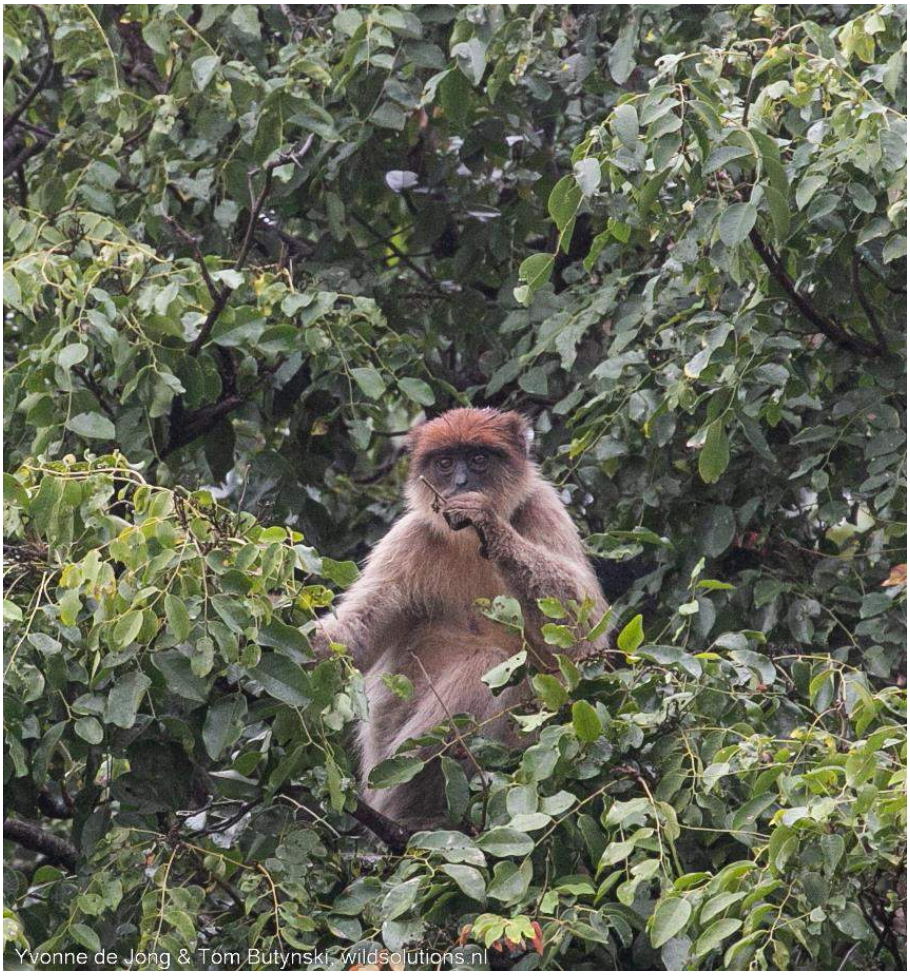
Kiswahili: Mbega

Kitongwe: Ndugurugu

Notes: Previously considered a subspecies of *Piliocolobus rufomitratus.* Now accepted as a species *Piliocolobus tephrosceles*.

Description: Medium size arboreal monkey. Top of head rusty-red. Upper parts blackish. Underside light grey to off-white.

Body weight:
Adult females: 6 kg.
Adult males: 11 kg.



Distribution: Several populations occur along the eastern edge of the Albertine Rift Valley in western Uganda and western Tanzania (including Kibale NP in Uganda, and Biharamulo FR, Gombe Stream NP, Mahale Mountains NP, and Mbuzi Forest [Ufipa Plateau] in Tanzania). Distribution depicted by the red areas on the below map.

Altitude range: 775–2,360 m asl.

Habitat: In many forest types, including miombo woodland mosaic, and riverine, gallery, lowland, mid-altitude, and montane forest. Also, in secondary forests. In almost all major habitat types in Mahale Mountains NP.

Food: Folivorous (leaf-eater). Young leaves dominate the diet. Also leaf stems (= petioles), unripe fruits and flowers.

Abundance: 25–300 individuals/km². 80–105 individuals/km² in the evergreen forest of Mahale Mountains NP and 27 individuals/km² in the miombo woodlands.

Activity pattern: Diurnal. Feeds throughout the day, but mostly early and late in the day. About 45% time spent feeding, alternating with periods of rest and travel.

Distance moved per day: 180–1,185 m.

Size of area used (home range): 40–60 ha in Mahale Mountains NP, and 35–100 ha elsewhere.

Group size and social organization: Multi-male, multi-female groups of 8–82 individuals. Most groups in Mahale Mountains NP comprise of 30–50 individuals. Males remain in their natal group while sexually mature females transfer from their natal group. Males maintain a dominance hierarchy and form coalitions.

Gestation: 6–7 months.

Birthweight: Probably 400–500 g.

Vocalization: Vocal repertoire is complex and may contain more than 25 calls. Unlike other monkeys in Mahale Mountains NP, red colobus are generally quiet and lack a loud call.

Predators: Crowned eagles, leopards, chimpanzees, and humans. Chimpanzee predation on red colobus varies greatly among sites and over time, with 1–40 % of the population killed per year. Immature individuals are the target prey of chimpanzees in Mahale Mountains NP with an annual kill rate of 1–4 %. This rate is similar to the annual replacement rate within this population of red colobus.

Longevity: At least 20 years of age.

Conservation status: 'Endangered' on the IUCN Red List of Threatened Species. Common in some areas, including Mahale Mountains NP, but rare at some sites and inexplicitly absent from many of East Africa's forests. Sensitive to habitat degradation and hunting which makes them particularly prone to local extinction. All but four of the 18 species of red colobus are either 'Critically Endangered' or 'Endangered'. Healthy populations of red colobus, therefore, generally indicate healthy forest ecosystems.

Threats: Main threats are poaching and habitat loss through logging, conversion to agriculture, charcoal production, and fires. Atypically high levels of hunting by chimpanzees have decimated one subpopulation of red colobus in Kibale NP.

Best places to view in Mahale Mountains NP: Groups can be seen throughout the national park, but most readily seen in the vicinity of the Kansyana Research Station and Mahale Mountains NP headquarters.


Uganda
L. Victoria
Kenya
Rwanda
Segengeti NP
Ngorongoro CA
Kilimanjaro NP
Burundi
Arusha
Mkomazi NP
L. Manyara NP
Gombe NP
Tanzania
Pangani R.
Mahale
Mountains NP
Dodoma
Saadani NP
Dar es Salaam
Katavi NP
Rufiji R.
L. Tanganyika
Ruaha NP
L. Rukwa
Indian
Ocean
Selous GR
N
Zambia
L. Malawi
Ruvuma R.
Mozambique
Sources: Esri, USGS, NOAA

Mahale Angola colobus

Colobus angolensis mahale

Kiswahili: Mbega

Kitongwe: Nkamba or Kamba

Notes: In April 2022, 43 years after the last published observation, this monkey was observed by scientists for only the third time and the first photographed were obtained. Given a scientific name in 2023. Unless otherwise stated, the information presented below is for the species, as the Mahale Angola colobus remains an unstudied subspecies.

Description: Medium size black-and-white arboreal monkey with long white hair on the cheeks and shoulders (‘epaulettes’).

Body weight:
Adult females: 7 kg (5–8) kg.
Adult male: 9 kg (6–12) kg.

Distribution: From southeastern Kenya and eastern Tanzania westward through much of the Democratic Republic of Cong and northeastern Angola. This subspecies appears to be restricted to the *c.* 50 km² of montane forests of Mahale Mountains NP. Known from Mt. Mhensabantu, Mt. Ihumo, and Mt. Nkungwe.

Altitude range: 1,800–2,350 m asl.

Habitat: Riverine, lowland, mid-altitude, and montane forest. Restricted to montane forest in Mahale Mountains NP.

Food: Primarily leaves, but also seeds, fruits, flowers, and lichens.

Abundance: This subspecies probably numbers fewer than 400 individuals.

Activity pattern: Diurnal and arboreal. Active at sunrise and continues until mid-morning, followed by a period of rest and then another bout of feeding in the late afternoon until dusk.

Distance moved per day: 300–1,900 m.

Size of area used (home range): 20–>400 ha.

Group size and social organization: Multi-male, multi female groups that vary greatly in size, from 3 to >300 individuals. Groups of 7–30 individuals on Mt. Nkungwe.

Gestation: About 24 weeks.

Vocalization: Adult males produce a 'roar' loud call as part of a display and during agonistic encounters among males. The 'roar' can be heard to about 1 km.

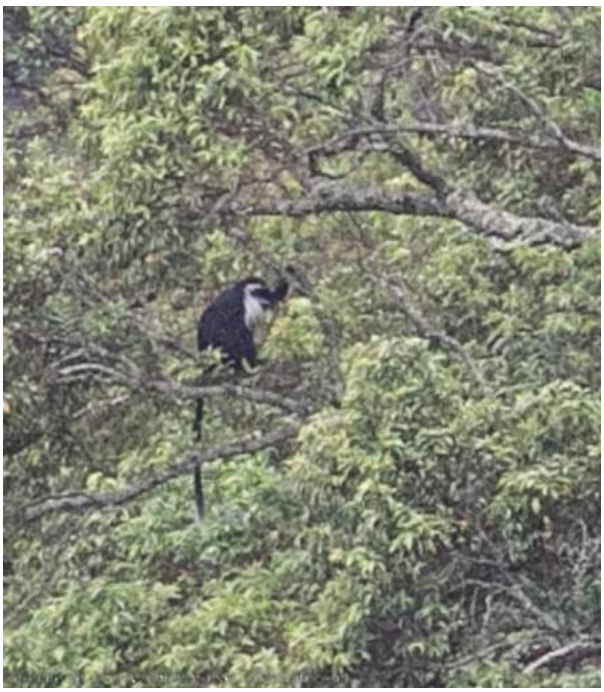
Predators: For the species, known predators are crowned eagles, leopards, chimpanzees, and humans.

Longevity: To a least 20 years of age.

Conservation status: 'Data Deficient' on the IUCN Red List of Threatened Species. Distribution and abundance are poorly-known but isolated in the montane forest of Mahale Mountains NP. Expected to be listed as 'Critically Endangered' on the IUCN Red List before the end of 2023.

Threats: Fire and climate change threaten the area of montane forest on which this monkey depends in Mahale Mountains NP. Although well protected within Mahale Mountains NP, the population is very small and localized and, therefore, prone to extinction.

Best places to view in Mahale Mountains NP: Only chance of seeing the Mahale Angola colobus is by making the long hike along the ridges of Mt. Mhensabantu, Mt. Ihumo, and Mt. Nkungwe, and staying at Paranari Camp.

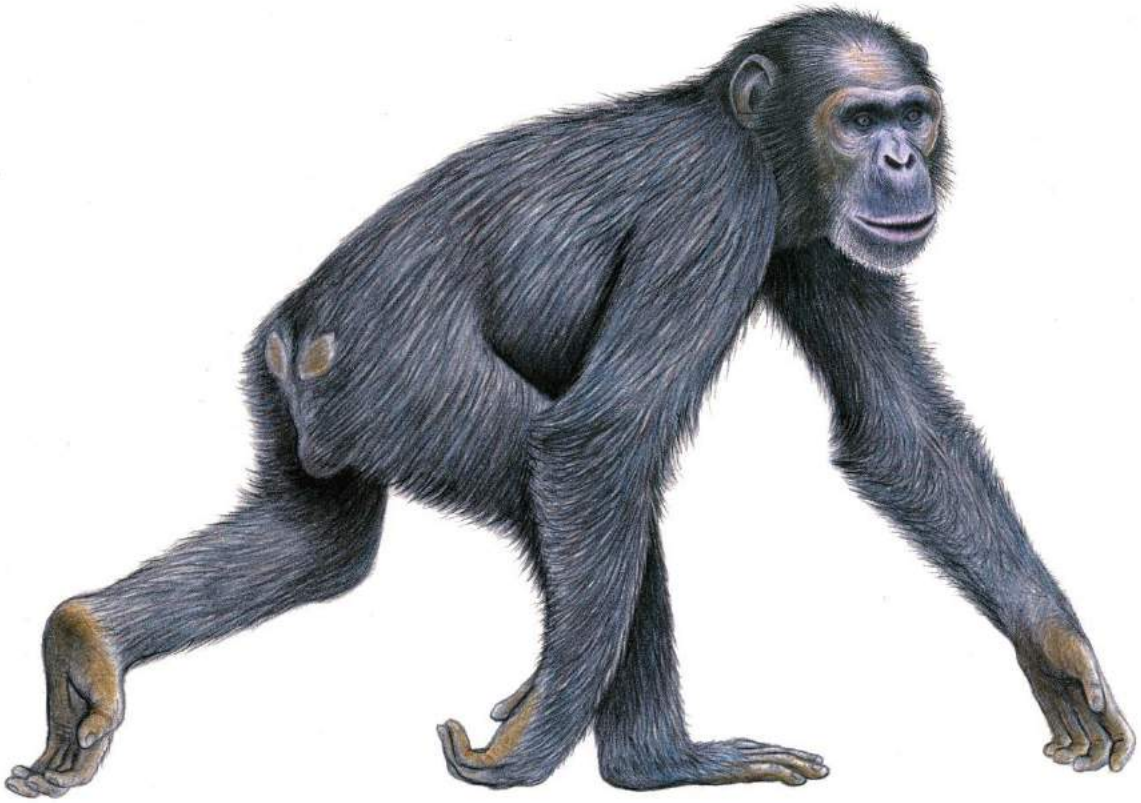


Legend

- Mahale Angola colobus
- Prigogine's Angola colobus
- Rwenzori Angola colobus
- Peter's Angola colobus
- Sharpe's Angola colobus
- Powell-Cotton's Angola colobus

Eastern robust chimpanzee

Pan troglodytes schweinfurthii



Kiswahili: Sokwe
Kitongwe: Ikuku

Notes: The chimpanzees of Mahale Mountains NP have been studied since 1965.

Description: Large, robust, ape. Ears and face hairless. Facial skin ranges from pale brownish-pink to brown to grayish-black. Body covered with medium-long grey, blackish, or black hair. Tail absent. Walks on knuckles.

Body weight:
Adult females: 34 (20–6) kg.
Adult males: 42 (28–56) kg.

Distribution: From the Ubangi River/Congo River in southeastern Central African Republic and Democratic Republic of Congo, eastward to Burundi, Rwanda, western Uganda, and western Tanzania. Distribution depicted by the orange areas on the below map.

Altitude range: 300–2,950 m asl.

Habitat: Primary and secondary forest are the most common habitats, but also swamp forest, riverine forest, and woodlands.

Food: Omnivorous. About 60 % of the diet is ripe fruit. Leaves and piths are major supplemental foods, particularly when fruit is scarce. Other food items include unripe fruit, seeds, flowers, invertebrates, bird eggs, and vertebrates. Red colobus is the most often hunted prey but many other mammals area eaten, including black–and-white colobus, silver monkey, red-tailed monkey, baboon, vervet, galago, small antelopes, and birds. Hunting of the larger mammals is undertaken almost exclusively by parties of adult males.

In Mahale Mountains NP, chimpanzees eat at least 198 species of plants. About 20 % of their feeding time is spent eating saba fruits.

Chimpanzees use tools to give them access to some foods. Termites are 'fished' with twigs. Hard-shelled nuts are smashed with a stone or log.

'Self-medication' frequently occurs. For example, in Mahale Mountains NP, chimpanzees swallow folded leaves of *Aspilia mossambicensis*. These are covered with minute spines that hook and remove intestinal worms. Chimpanzees also chew the bitter pith of *Vernonia amygdalina* to control gut pathogens.

Abundance: <1–-8 individuals/km². Density varies positively with density of large trees bearing fleshy-fruit, most notably figs. With about 700 chimpanzees, Mahale Mountains NP has the largest populations of chimpanzees in Tanzania and is of world-wide importance for the long-term conservation and study of this species.

Activity pattern: Diurnal and semi-terrestrial. Chimpanzees are active 10–13 hours per day. They forage about 55 % of the day, mainly in trees, but travel mostly on the ground. Traveling takes up about 14 % of the day. Grooming (6 %) and resting (25 %) often occur on the ground. Adults construct nests in trees for day and night resting. Males often nest at lower heights than females, perhaps due to their heavier weight.

Distance moved per day: Average varies from 1.0 to 4.8 km/day, depending on the site. At Mahale, the average day range is 4.8 km. Males range farther than females.

Size of area used (home range): 6–32 km². Larger home ranges and lower population densities in woodland than in forest.

Group size and social organization: Most communities contain 20–60 individuals, but some reach 140 individuals. Size of parties varies with food availability, number of cycling females with sexual swellings, and social affinities. Communities in Mahale Mountains NP have 45–101 individuals.

Chimpanzees have a fission-fusion social organization. Members of a community break-up to form temporary parties. Average party size in Mahale Mountains NP is six individuals. Females typically move out of their natal communities when about 11 years of age in Mahale Mountains NP. Males form linear dominance hierarchies. High-ranking males are more aggressive than low-ranking males. To maintain their rank in a community, adult males often form alliances with one or more other adult males.

Gestation: About 230 days (range 202–261 days).

Birthweight: About 1.7 kg (range 0.9–2.4 kg).

Vocalization: Broad vocal repertoire. The most impressive vocalization is the ‘pant-hoot’ (a loud, low, boom that builds-up and is followed by high-pitched hoots). This call, given when excited, and can be heard at >1 km. During ‘pant-hoot’ displays, males often ‘drum’ on a tree with their hands and feet. The ‘pant-grunt’ is given when a higher-ranking individual approaches or threatens. High pitched ‘screams’ are given against an aggressor. ‘Hoos’ given when curious or in mild distress. ‘Wraah’ barks indicate alarm.

Predators: Crocodiles, leopards, lions, and humans. Lethal aggression of males towards individuals in neighboring communities occurs and is linked to improve access to food and females.

Longevity: About 60 years.

Conservation status: ‘Endangered’ on the IUCN Red List of Threatened Species. The number of eastern robust chimpanzees continues to decline as its habitat is reduced, degraded, and fragmented. Populations in well-managed national parks, such as Mahale Mountains NP, appear to be stable but the rapid human population

growth (doubling every 25–30 years) requires roads, settlements, and conversion of forest and woodland to farmland.

Threats: Habitat degradation, loss and fragmentation due to agricultural expansion, logging, mining, fire, and climate change. A major threat in Central Africa and West Africa is hunting for bush meat. Although the consumption of primates is rare in East Africa, chimpanzees are killed while crop-raiding and, increasingly, by immigrant hunters who have moved eastward into Tanzania and Uganda from countries where primates are hunted and eaten. Many chimpanzees are incidentally maimed or killed by traps intended to capture other species. Another treat is disease transmitted by humans. The most common cause of death in Mahale is disease, accounting for 48% of all deaths. At Mahale, 50% of infants die before they are weaned at 3.5–4.5 years of age.

Best places to view in Mahale Mountains NP: Greystoke Mahale is located within the home range of M-community (about 55 individuals). The guides and trackers of Greystoke Mahale will brief you on the chimpanzee viewing protocols and take you to the closest party of M-community. Occasionally, members of M-community visit Greystoke Mahale. Chimpanzee loud calls might be heard while hiking to Mt Nkungwe.


Uganda
L. Victoria
Kenya
Rwanda
Segengeti NP
Ngorongoro CA
Kilimanjaro NP
Burundi
Arusha
Mkomazi NP
L. Manyara NP
Gombe NP
Tanzania
Pangani R.
Mahale
Mountains NP
Dodoma
Saadani NP
Dar es Salaam
Katavi NP
Rufiji R.
L. Tanganyika
Ruaha NP
L. Rukwa
Indian
Ocean
Selous GR
N
Zambia
L. Malawi
Ruvuma R.
Mozambique
Sources: Esri, USGS, NOAA

Primates of Mahale Mountains National Park

Thomas M. Butynski and Yvonne A. de Jong. Illustrations by Stephen D. Nash

Thomas's dwarf galago
Galagoides thomasi

Least Concern ☐

Mozambique dwarf galago*
Paragalago granti

Least Concern ☐

Moholi lesser galago*
Galago moholi moholi

Least Concern ☐

Miombo silver galago
Otolemur crassicaudatus monteiri

Least Concern ☐

Eastern vervet
Chlorocebus pygerythrus centralis

Least Concern ☐

Schmidt's red-tailed monkey
Cercopithecus ascanius schmidti

Least Concern ☐

Mahale silver monkey
Cercopithecus mitis subspecies unknown

Not Assessed ☐

Kinda baboon
Papio kindae

Least Concern ☐

Ashy red colobus
Piliocolobus tephrosceles

Endangered ☐

Mahale Angola colobus
Colobus angolensis mahale

Data Deficient** ☐

Eastern robust chimpanzee
Pan troglodytes schweinfurthii

Endangered ☐

***** Confirmation of presence is required. ** Expected to be listed, before 2024, as 'Critically Endangered'

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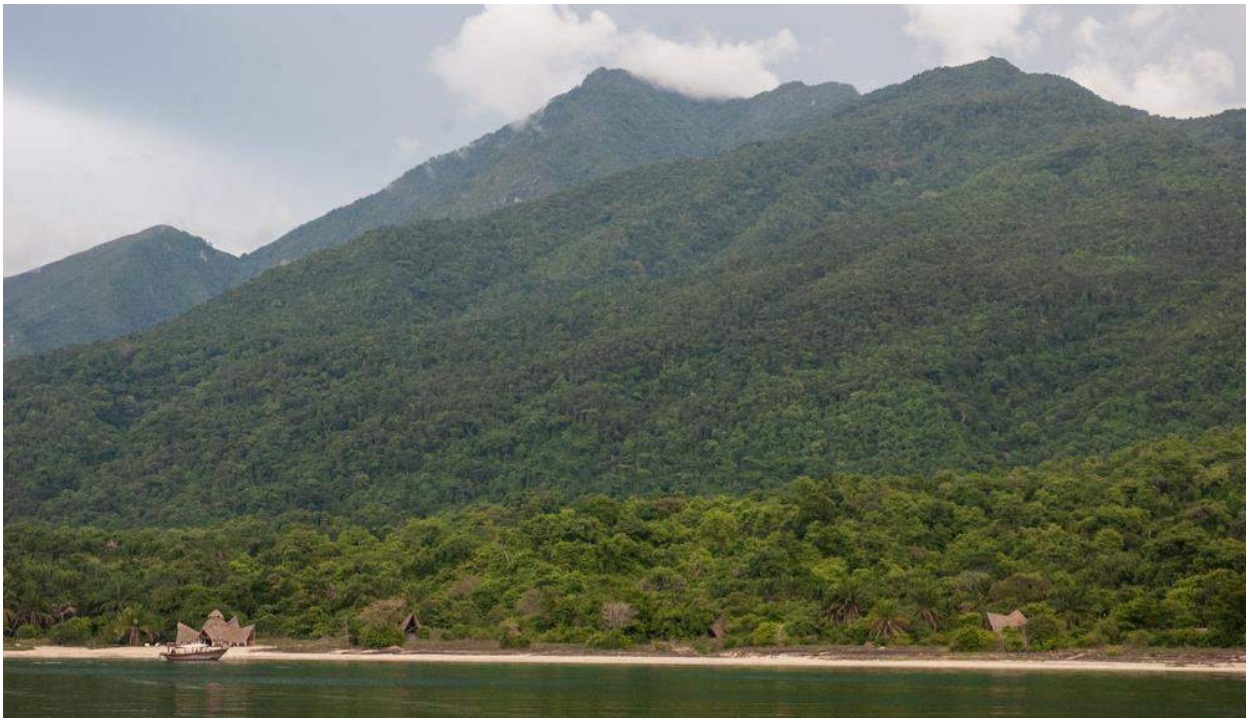

Appendix 4

Draft IUCN Red List Assessment for *Colobus angolensis mahale*

The Mahale Angola colobus *Colobus angolensis* ssp. nov. is currently listed as 'Data Deficient' on *The IUCN Red List of Threatened Species* (Butynski and De Jong 2020). During the April 2022 training exercise, we obtained the information needed to re-assessment this subspecies. Below is the draft of this re-assessment. We have submitted this re-assessment to IUCN. *Colobus angolensis mahale* meets the IUCN criteria for 'Critically Endangered'.

We hope this re-assessment will bring much more conservation attention to the Mahale Angola colobus and to Mahale Mountains National Park, and that it will generate interest from tourists.

Draft

Colobus angolensis mahale

ANIMALIA - CHORDATA - MAMMALIA - PRIMATES - CERCOPITHECIDAE - Colobus - angolensis mahale

Common Names: Mahale Angola Colobus (English), Mahale Mountains Angola Colobus (English), Nkwunge Angolan Colobus (English)
Synonyms: None

Taxonomic Note:
Colobus angolensis mahale was, until 2023, referred to as "*Colobus angolensis* ssp. nov." (Groves 2001, 2007; Grubb *et al.* 2003; Bocian and Anderson 2013; De Jong and Butynski 2018; De Jong *et al.* 2020; Butynski and De Jong 2009, 2020, 2022). This monkey, first encountered by scientists in 1966 (Nishida 1968; Nishida *et al.* 1981; Itani 1990), has been observed only three times by scientists (1976, 1979, 2022; Nishida *et al.* 1981, De Jong and Butynski 2023a). Based on its considerable geographic isolation from other subspecies of *C. angolensis* (*c.* 100 across Lake Tanganyika; *c.* 330 km across land), together with the distinctive coloration and pattern of its pelage, the Mahale Angola colobus was formally named in 2023 (De Jong and Butynski 2023a).

Red List Status
CR – Critically Endangered, B1a,b(i,ii,iii,v); B2a,b(i,ii,iii,v) (IUCN version 3.1)

Red List Assessment

Assessment Information

Assessor(s): Butynski, T.M and De Jong, Y.A.

Regions: Global

Assessment Rationale

Critically Endangered. Endemic to the small area (between 10 km² and 50 km²) covered by the montane forest of Mahale Mountains National Park, central western Tanzania. Population size probably <400 individuals, with <200 adults. Extent of Occurrence <100 km² (*c.* 7 km²); Area of Occupancy <10 km² (*c.* 3 km²). Only known from three encounters by scientists. Primary threat is habitat loss due to fire and climate change, and demographic and genetic stochastic events.

Distribution

Geographic Range

Endemic to the montane forest of Mahale Mountains National Park, central western Tanzania. Known only on Mt. Mhensabantu, Mt. Ihumo, and the ridge between Mt. Nkungwe and Mt. Kahoko (Nishida *et al.* 1981; Itani 1990; De Jong and Butynski 2023a). Confirmed to occur between north 6.088°S, east 29.782°E, south 6.113°S, and west 29.765°E, an area <7 km². Limits, however, poorly understood. Known altitudinal range is 1,800–2,350 m asl. Since *C. a. mahale* appears to be dependent on montane forest, it is unlikely to have a geographic distribution greater than 50 km² or an altitudinal range greater than 1,800–2,350 m asl (De Jong and Butynski 2023a).

'Area of Occupancy': ~3 km² (De Jong and Butynski 2023a)

'Extent of Occurrence': ~7 km² (De Jong and Butynski 2023a)

Lower elevation limit: 1,800 m asl (De Jong and Butynski 2023a)

Upper elevation limit: 2,350 m asl (De Jong and Butynski 2023a)

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Tanzania, United Republic of	Extant	Native	-	-

Population

Poorly known. Only known from three visual encounters by scientists (1976, 1979, 2022; Nishida *et al.* 1981; Itani 1990; De Jong and Butynski 2023a). The groups encountered in 1976 and 1979 were estimated to comprise about 30 individuals (Nishida *et al.* 1981). De Jong and Butynski (2023a) estimate a population of <400 individuals, with <200 adults. The density of *C. a. mahale* in the northern montane forest of Mahale Mountains National Park is low, perhaps in the range of 5–10 individuals/km² (De Jong and Butynski 2023a).

Habitats and Ecology

Diurnal, arboreal, group-living folivore. Restricted to montane forest in the most rugged, coolest, and wettest, part of Mahale Mountains National Park, between 1,800 and 2,350 m asl (Nishida *et al.* 1981; De Jong and Butynski 2023a). Information about the ecology of the montane forests of the Mahale Mountains National Park is provided in Nishida and Uehara (1981), Nishida *et al.* (1981), Itani (1990), Itoh (2015), and De Jong and Butynski (2023a). Sympatric with Thomas's dwarf galago *Galagoides thomasi*, Miombo silver galago *Otolemur crassicaudatus monteiri*, ashy red colobus *Piliocolobus tephrosceles,* gentle monkey *Cercopithecus mitis,* and eastern robust chimpanzee *Pan troglodytes schweinfurthii* (De Jong and Butynski 2023a, 2023b). Sometimes, perhaps often, *C. a. mahale* is in polyspecific association with *P. tephrosceles* (Nishida *et al.* 1981). It likely also forms polyspecific associations with *C. mitis* (De Jong and Butynski 2023a).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	-		Yes, restricted to montane forest

Systems

System: Terrestrial

Threats

The main threats to *C. a. mahale* are fire and climate change through their negative impacts on the extent of montane forest. Also, demographic and genetic stochastic events related to its one small population.

Pan troglodytes preys both on *Piliocolobus* and *Colobus* (Takahata *et al.* 1984; Uehara and Ihobe 1998; Newton-Fisher *et al.* 2002; Uehara 2003; Nishida 2012; Watts and Mitani 2015; Bugir *et al.* 2021; Butynski and De Jong 2022). Since *C. a. mahale* is sympatric with *P. troglodytes,* this ape is considered a threat to this small population.

Other major predators of colobines in Africa are humans, leopards *Panthera pardus,* and crowned eagles *Stephanoaetus coronatus* (Struhsaker and Leakey 1990; Mitani *et al.* 2001; McGraw *et al.* 2006; Zuberbühler and Jenny 2007; Struhsaker 2010; Butynski and De Jong 2022). Leopard and crowned eagles both occur in in the montane forest of Mahale, and both are known to hunt *P. tephrosceles* there (Nishida 1968, 1972, 2012; Nishida *et al.* 1981; Seike 2022; De Jong and Butynski 2023a). Although all four of these predators are expected to prey on *C. a. mahale,* De Jong and Butynski (2023a) suspect crowned eagles are the most important predator for *C. a. mahale* given its ability to hunt arboreal monkeys over large areas of extremely rugged terrain.

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
7.1.3. Natural system modifications -> Fire & fire suppression -> Trend Unknown/Unrecorded	Ongoing	-	-	-

Conservation

The entire geographic distribution of *C. a. mahale* lies within the remote, rugged, montane forests of the well-protected Mahale Mountains National Park (De Jong and Butynski 2023a). There is currently no conservation or research program that focuses on *C. a. mahale*.

Important Conservation Actions Needed

Conservation Actions	
2.1. Land/water management -> Site/area management	None
100.11. OLD 4.4 Habitat and site-based actions->Protected areas	Migration note: Reallocate to 1.1-Land/water protection->Site/area protection or 2.1-Land/water management-> Site/area management

Research Needed

Research priorities for *C. a. mahale* are to determine its geographic distribution and abundance in order to establish a baseline by which to monitor this population. Nishida *et al.* (1981) pointed-out that the forest around and between Mt. Sisaga and Mt. Mfitwa is a priority for a survey. In addition, models should be developed that assess and predict habitat suitability, as well as the impacts of climate change and fire, on the distribution of montane forest in Mahale Mountains NP. Comparative morphological and molecular research throughout the geographic distribution of *C. angolensis* is needed to further refine the taxonomy of this species (De Jong and Butynski 2023a).

Research	Note
3.1. Monitoring -> Population trends Assess distribution, abundance, and threats.	None

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