

# Assessment of the Primates, Large Mammals and Birds of the Mathews Range Forest Reserve, Central Kenya



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Cover photo: Left: Elder Lpaasion Lesipih and scout Sinyah Lesowapir. Upper right: pearl-spotted owlet *Glaucidium perlatum*. Lower right: bushbuck *Tragelaphus scriptus*. All photographs taken in the Mathews Range by Yvonne A. de Jong and Thomas M. Butynski.

**CONTENTS**

Summary	4
Introduction	6
Methods	7
Research Area	8
Results, Conclusions and Discussion	10
I. Primates	10
Small-eared greater galago <i>Otolemur garnettii</i>	12
Somali galago <i>Galago gallarum</i>	14
Mt. Uarges Guereza <i>Colobus guereza percivali</i>	17
De Brazza's monkey <i>Cercopithecus neglectus</i>	20
Hilgert's vervet monkey <i>Chlorocebus pygerythrus hilgerti</i>	22
Olive baboon <i>Papio anubis</i>	24
Conclusion and Discussion	27
Primate Conservation in the Mathews Range	28
II. Large Mammals	30
Conclusion and Discussion	33
III. Birds	35
IV. Human impact in the Mathews Range forests	42
Recommendations	43
Recommendations for monitoring primates, large mammals and birds	44
Patrol-based surveys and camera trap surveys	45
Interviews	46
Constraints	47
Acknowledgements	48
Literature	49

## SUMMARY

The Mathews Range Forest Reserve (*ca.* 940 km<sup>2</sup>) lies within the Namunyak Conservancy (*ca.* 3332 km<sup>2</sup>) and is the southern-most of the forest-covered chain of mountains that crosses the semi-arid plains of Samburu District in north-central Kenya. Knowledge of the biodiversity of the Mathews Range is sparse and scattered. From 2 - 14 June 2010, 278 km (128 h) of foot and vehicle surveys were undertaken in the Mathews Range and adjacent parts of Namunyak Conservancy. The principal aims of this survey were to document (1) which species of primates, large mammals and birds were present and obtain an indication of abundance, (2) determine the habitat used and altitude limits for these species, (3) assess intra-specific variation (phenotypic, vocal, habitat-use) between the primate species of the Mathews Range and conspecifics at other sites, (4) establish a baseline against which to monitor change, and (5) assess threats to the biodiversity of the Mathews Range.

Six species of primate are known to occur in the Namunyak Conservancy; small-eared greater galago *Otolemur garnettii*, Somali galago *Galago gallarum*, Mt. Uarges guereza *Colobus guereza percivali*, de Brazza's monkey *Cercopithecus neglectus*, Hilgert's vervet monkey *Chlorocebus pygerythrus hilgerti*, and olive baboon *Papio anubis*. Of these six species, five occur in the Mathews Range Forest Reserve (*O. garnettii*, *C. guereza*, *C. pygerythrus*, *C. neglectus*, and *P. anubis*) and three are 'forest-dependent' species (*O. garnettii*, *C. guereza* and *C. neglectus*). With three forest-dependent primate species, the Mathews Range compares favorably with the other highland forests in Kenya that lie to the east of the Eastern Rift Valley, including those of Mt. Kenya (three species) and the Aberdares Range (three species). Except for *P. anubis*, all species of primate in the Mathews Range/Namunyak Conservancy are at low density relative to many other sites. The Senegal galago *Galago senegalensis* and the Sykes's monkey *Cercopithecus mitis*, two species expected to occur in the Mathews Range, were not recorded. The Sykes's monkey is almost certainly absent from the area. Additionally, the potto *Perodicticus potto* was not encountered in the Mathews Range.

One of the six primates in this region, *C. guereza*, is represented by an endemic, 'Endangered', subspecies (*C. g. percivali*; IUCN 2010). The other five species are listed as 'Least Concern'. Threats to the primates of the Mathews Range are habitat degradation and loss due to human activities (including livestock grazing, harvest of cattle fodder, fire), and the hunting of *C. g. percivali* for its pelt.

This assessment is the first to record (1) *O. garnettii* in the Mathews Range, thereby extending its geographic range *ca.* 80 km to the north; (2) the presence of *C. neglectus* more than 2 km away from a permanent water source; (3) groups of *P. anubis* that spend all of their time within the forests; (4) *G. gallarum* that occupy degraded woodland bordering swamp and bushland; (5) the use of tree holes by *G. gallarum* as resting sites and; (6) and *G. gallarum* as high as 1250 m asl.

Fifty-one species of large- and medium-sized mammals were observed on, or reported for, Namunyak Conservancy. Of these, at least 29 species occur in the Mathews Range. Three of the 51 mammal species are on the Red List (IUCN 2010), as 'Endangered', two as 'Vulnerable', five as 'Near Threatened', and 39 as 'Least Concern'.

A total of 153 species of birds were encountered during this survey, 35 of which are forest-dependent species. None of the 153 species is on the current IUCN Red List as threatened. Significant range extensions were made for red-fronted parrot *Poicephalus gulielmi* and woodland kingfisher *Halcyon senegalensis*.

This report makes several recommendations for the long-term monitoring of the conservation status of the mammals and birds of the Mathews Range, and for conservation actions. Priority conservation actions are: (1) stop poaching, especially of *Colobus guereza*; (2) prevent fires; (3) stop cutting trees for livestock fodder; (4) reintroduce the black rhino; and (5) expand eco-tourism, especially wilderness walks.

## **INTRODUCTION**

The Mathews Range Forest Reserve (*ca.* 940 km<sup>2</sup>) in central Kenya lies within the Namunyak Conservancy (*ca.* 3332 km<sup>2</sup>) and represent the southern extent of the forest-covered chain of mountains that crosses the semi-arid savannah plains of Samburu District. Knowledge of the biodiversity of the Mathews Range is limited and scattered. Two important criteria in the evaluation of conservation areas are biodiversity richness and the conservation status of its taxa (Hacker *et al.* 1998). To be able to set effective conservation measures for the Mathews Range Forest Reserve (hereafter referred to as 'Mathews') it is essential to assess its biodiversity, collect natural history data, and evaluate the relative abundance of the species in the area, particular the threatened (*i.e.*, Red Listed) species.

The principal aims of this biodiversity assessment of the Mathews were to (1) document which species of primates, large mammals and birds are present, (2) assess geographic range and altitude limits for primates and birds, and (3) examine intra-specific variation (phenotypic, vocal, habitat-use, etc.) between the primate taxa of the Mathews and conspecifics elsewhere in East Africa. Additionally, this assessment was designed to provide (1) a rough indication of relative abundance, (2) a baseline against which to monitor change, and (3) an assessment of threats to the biodiversity of this site.

This report (1) presents and discusses the results of this assessment, (2) suggests priority actions for conserving the biodiversity of the Mathews, and (3) makes recommendations for monitoring primates, large mammals and birds in the Mathews.

## METHODS

From 2 - 14 June 2010, 128.0 h were spent on surveys of which 35.6 h were spent listening at night from camps, 61.7 h on diurnal foot surveys, 8.7 h on nocturnal foot surveys, 19.9 h on diurnal vehicle surveys, and 2.3 h on nocturnal vehicle surveys. A total of 277.7 km of trail and dirt road surveys were conducted; 62.0 km of diurnal foot surveys, 8.1 km of nocturnal foot surveys, 178.3 km of diurnal vehicle surveys, and 29.4 km of nocturnal vehicle surveys. Of these surveys, 103.3 h and 86.3 km were in forested areas (including 29.3 h listening at night camps), and 24.7 h and 191.4 km were in semi-arid woodland/bushland (including 6.3 h listening at night camps). Surveys were conducted by TMB and YAdJ, usually accompanied by one scout and one guide except for 2 days when the survey team split into two pairs (TMB with ranger, YAdJ with guide). Foot surveys were conducted along existing trails or along freshly cut trails (for the purpose of this survey) at an average rate of 1.0 km/h. Vehicle surveys were conducted along dirt roads at an average rate of 11.1 km/h. The scout and guide pointed-out tracks, dung, vocalizations, etc., for various species of mammal.

During each day in the field, a new list of bird species seen and/or heard was compiled together with the elevation, location, and primary habitat for each species. Additional notes were made on the least abundant species, the Red Listed species, and those for which the Mathews Range represented an extension of the geographic range.

Data for primates, large mammals and birds were collected with the aid of binoculars, digital camera (Canon 40D with 100-400 mm lens), GPS (Garmin GPSmap 60 Cx), and audio equipment (Marantz Digital PMD660 recorder with Sennheiser Shot-Gun ME-66 microphone). A total of 10 infrared video camera traps were used (six 2010 Bushnell Trophy Cam and four Scoutguard SG550). Camera traps were installed to record 30 second videos. The traps were set at most camps by various members of the survey team.

Information collected during each survey include date, weather, start time, end time, transect location (GPS), walking speed (GPS), and distance moved (GPS). When primate groups or large mammals were encountered, the following data were collected: time, coordinates (GPS), altitude (GPS), species/subspecies, vegetation type, and tree density. The focus during every encounter with primate groups was to obtain a detailed description of as many individuals in the group as time and visibility allowed, as well as taking photos and assessing group size and composition. The track for each survey was saved in a GPS and used to produce a map. With the above data the encounter rates for the primates and the larger mammals of the Mathews were calculated. Evidence of human activities (*e.g.*, tree cutting, hunting, livestock grazing/browsing) within the Mathews was noted during the foot surveys.

Photographs taken of the primates of the Mathews and its vicinity will be uploaded to the Photographic Maps (or PhotoMaps) maintained by YAdJ and TMB (De Jong & Butynski 2010a). The PhotoMaps, at < [www.wildsolutions.nl](http://www.wildsolutions.nl) >, provide a 'living' collection of photographs of the primates of Kenya and Tanzania. These are a practical tool for documenting and discussing primate diversity, taxonomy, biogeography, distribution and conservation status and, therefore, for developing and implementing actions for primate conservation (De Jong & Butynski, 2010b).

## RESEARCH AREA

All surveys took place within an area of 1,100 km<sup>2</sup> (1.25846° – 0.85062°N, 37.22634° – 37.46417°E) on Namunyak Conservancy, Samburu District, central Kenya, with a focus on the Mathews. The Mathews is located roughly in the center of Namunyak Conservancy. Within the Mathews, two areas (one in the south and one in the north) were surveyed from two basecamps (Camp 1, Murat – south Mathews; Camp 3, Kitich – north Mathews; Table 1; Figure 1 & 2). The straight-line distance between the two basecamps is 9.5 km.

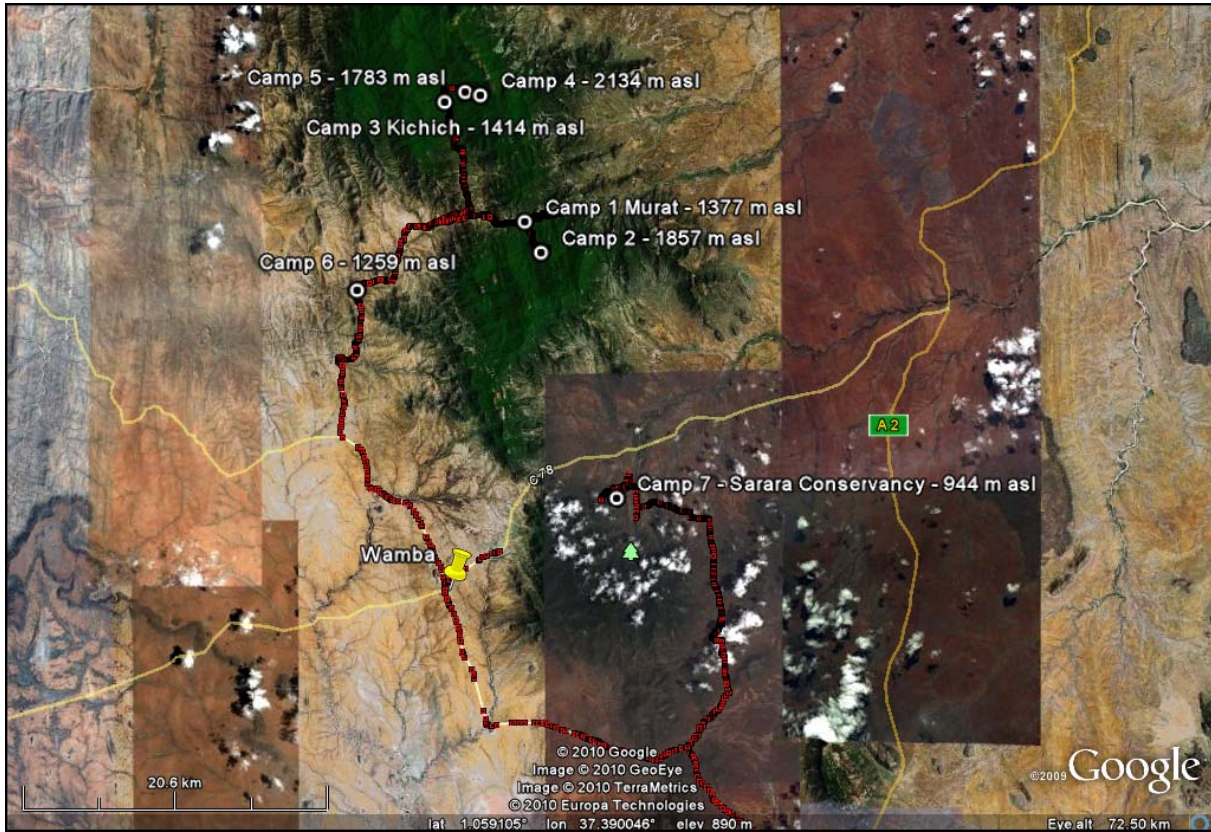


Figure 1. Camps and tracks surveyed on Namunyak Conservancy during 2 -14 June 2010.

Table 1. Camps within Namunyak Conservancy with their localities, altitudes and habitat types.

Camp	Dates	Coordinates	Altitude (m asl)	Habitat type
Camp 1, Murat	2-5 & 7-8 June	N1.17905; E37.34049	1377	Highland swamp surrounded by secondary lower montane forest
Camp 2, Lemsron	5-7 June	N1.15963; E37.35059	1857	Montane forest near small stream
Camp 3, Kitich	8-10 June	N1.24980; E37.29281	1414	Lower montane forest near small river
Camp 4, Roochets	10-11 June	N1.25367; E37.31432	2134	Mixed <i>Podocarpus</i> and <i>C. megalocarpus</i> forest.
Camp 5, Lolpirpir	11-12 June	N1.25563; E37.30523	1783	Mixed <i>Podocarpus</i> and <i>C. megalocarpus</i> forest with tall cycads ( <i>Encephalartos tegulaneus</i> )
Camp 6, W Mathews	12-13 June	N1.13745; E37.23857	1259	<i>Acacia</i> - <i>Commiphora</i> woodland/bushland
Camp 7, E Mathews (Sarara Conservancy)	13-14 June	N1.01109; E37.39626	944	Woodland (including <i>Acacia</i> spp, <i>Newtonia hildebrandtii</i> , <i>Melia volkensii</i> ) bordering swamp and <i>Acacia</i> - <i>Commiphora</i> bushland

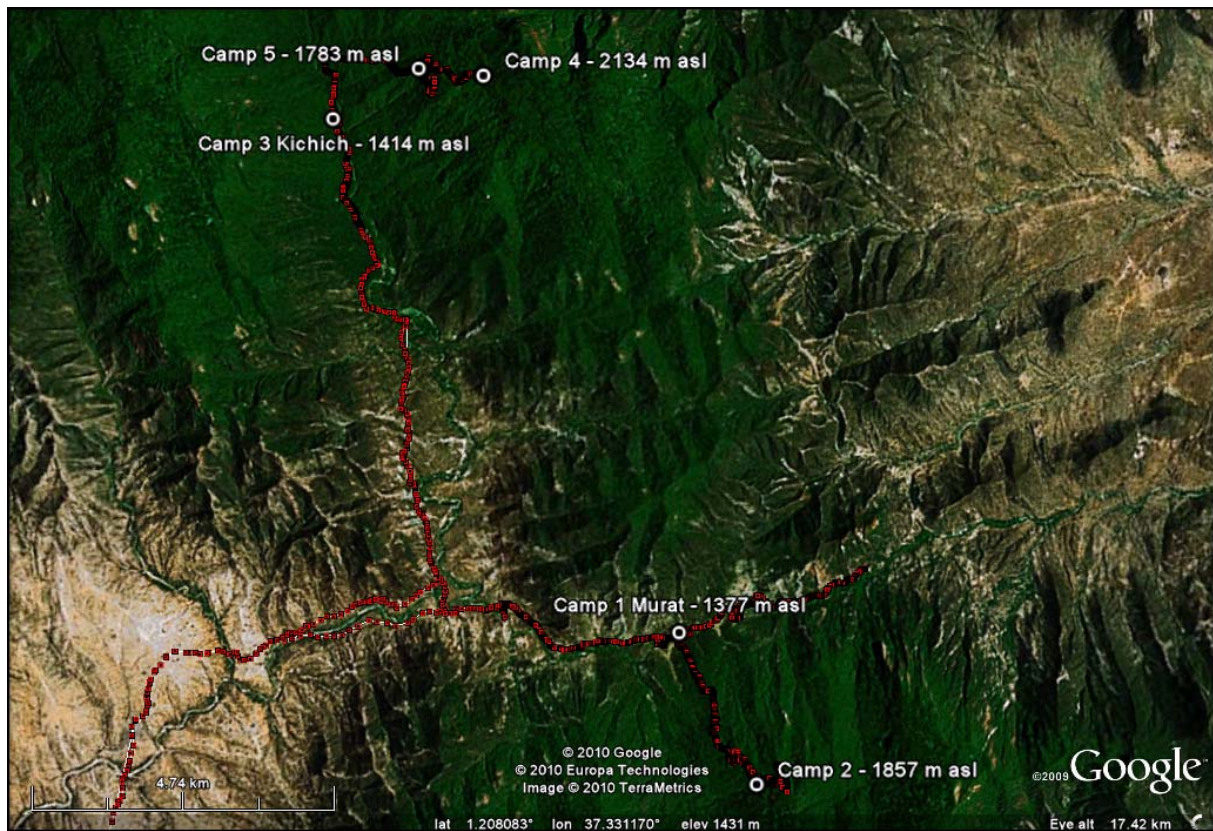


Figure 2. Tracks surveyed in the Mathews Range, Namunyak Conservancy, during 2 - 12 June 2010.

## RESULTS, CONCLUSIONS AND DISCUSSION

During this assessment, 51 species of mammals (of which six species are primates), were observed or reported for Namunyak Conservancy. Of these, at least 29 species (including four primates) occur in the Mathews. According to the Red List (IUCN 2010), three of these mammals are ‘Endangered’, two are ‘Vulnerable’, five are ‘Near Threatened’, and 39 are ‘Least Concern’.

### I. Primates

A total of six primate species were recorded for the Namunyak Conservancy and four of these occur within forests of the Mathews. All six primate species are of ‘Least Concern, although the Mt Uargues guereza *Colobus guereza percivali*, is ‘Endangered’ (IUCN 2010). Table 2 provides the encounter rates, encounter sites, altitude range, degree of threat, and relative abundance for all six species.

Table 2. Primate species and subspecies, rate of encounter, site of encounter, altitude range, IUCN Red List degree of threat category, and relative abundance on Namunyak Conservancy, including the Mathews Range.

Species	Encounter rate	Areas of encounter	Altitude range (m asl)	Degree of threat category (IUCN 2010)*	Abundance
Small-eared greater galago <i>Otolemur garnettii</i>	0.04 loud calls/h (n=2) during foot surveys. None seen during foot surveys. None encountered during vehicle surveys.	S Mathews & N Mathews	985 - 1415	Least Concern	Low. Found only in forest.
Somali galago <i>Galago gallarum</i>	Mathews W 1.11 ind/h and 1.08 ind/km (n=2) during foot surveys. 0.40 loud call/h (n=1).  E Mathews 1.50 ind/h (n=3) 0.12 ind/km (n=3) during vehicle surveys. Calls heard.	W Mathews & E Mathews	888 - 1250	Least Concern	Moderate. Found only in bushland/woodland.
Mt. Uargues guereza <i>Colobus guereza percivali</i>	0.06 groups/h and 0.06 groups/km (n=4) during foot surveys. None encountered during road surveys.	S Mathews, N, Mathews & Ngare Narok	1377 - 2080	Least Concern as a species and Endangered as a subspecies.	Low. Found only in forest.
De Brazza’s monkey <i>Cercopithecus neglectus</i>	0.05 groups/h and 0.05 groups/km (n=3) during foot surveys. None encountered during vehicle surveys.	S Mathews & N Mathews	1289 - 1808	Least Concern	Low. Found only in forest. Probably the least abundant primate in the Mathews forest.
Hilgert’s vervet monkey <i>Chlorocebus pygerythrus</i>	0.14 groups/h and 0.02 groups/km (n=3) during vehicle surveys. None	Central Mathews & E Mathews	945 - 1285	Least Concern	Moderate. Found only in bushland/woodland and riverine

<i>hilgerti</i>	encountered during foot surveys.				forest.
Olive baboon <i>Papio anubis</i>	0.11 troops/h and 0.11 troops/km (n=7) during foot surveys. 0.15 troops/h and 0.02 troops/km (n=3) during vehicle surveys.	Mathews S, Mathews N and E Mathews	980 - 1995	Least Concern	Moderate. Present in all vegetation types. Probably the most abundant primate in the Mathews forest.

\*LC = Least Concern, EN = Endangered (IUCN 2010).

### Small-eared greater galago *Otolemur garnettii* (Samburu: Lkimoongu)

*Otolemur garnettii* is a forest dependent nocturnal primate with a distinctive, loud, advertisement call.

#### Distribution

During this assessment, encountered only in Murat Gap, south Mathews (loud calls heard from two individuals). Records provided for northern Mathews by Juliet King (pers. comm.) and Patrick Reynolds (pers. comm.) and for east Mathews (Sarara Conservancy) by Jeremy Bastard (pers. comm.).

Rangers, scouts and guides at Namunyak Conservancy did not know *O. garnettii*. There appear to be no previous records for *O. garnettii* in the Mathews. As such, this assessment obtained the first records of *O. garnettii* for the Mathews. This record extends the known geographical range of this species *ca.* 80 km to the north (Figure 3; Butynski & De Jong pers. comm.). The subspecies present in the Mathews is assumed to be the Kikuyu small-eared greater galago *O. g. kikuyuensis* which is the only subspecies known from the Kenya highlands to the east of the Eastern Rift Valley (Figure 3).

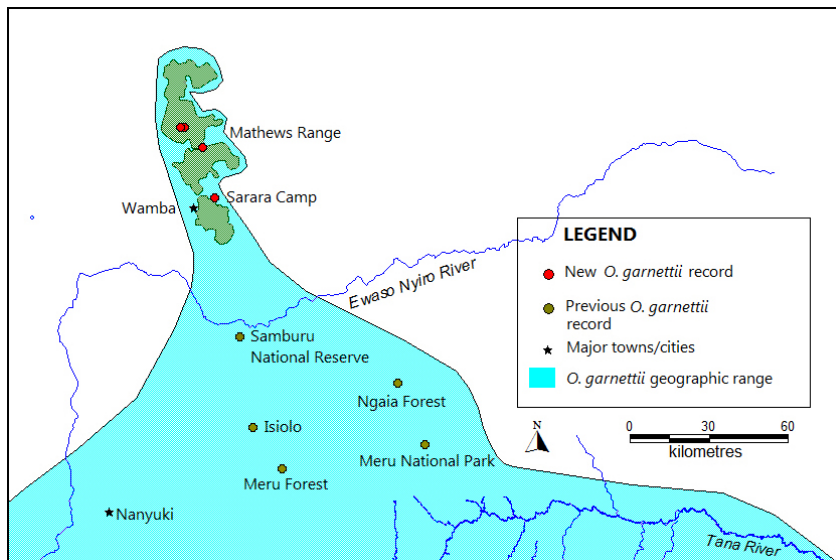


Figure 3. Geographic distribution of *O. garnettii* in the vicinity of Namunyak Conservancy, Kenya, with sites of encounters/evidence and existing records by Butynski & De Jong depicted.

#### Vegetation

Riverine vegetation, including *Ficus sycomorus*, *Croton megalocarpus*, *Acacia* spp, *Trema orientalis*. Mixed *Podocarpus*, *C. megalocarpus* forest with herbaceous understory.

#### Geographic phenotypic variation

The survey team did not observe *O. garnettii*. At Sarara Conservancy (E Mathews) this species is described as having an overall dark appearance (J. Bastard pers comm). Due to the lack of sightings it is uncertain which subspecies of *O. garnettii* is present on Namunyak Conservancy. Closest subspecies to this range is *O. g. kikuyuensis*. Due to the isolated location of the Mathews forest, and the great age of the Mathews range, there is some chance that this population differs phenotypically from *O. g. kikuyuensis*.

**Conservation status**

People at Sarara Camp used to encounter *O. garnettii* often, but there appears to have been a big decline since *ca.* 1995 (J. Bastard pers. comm.). The forest of the Mathews that are below 2,000 m appear to be suitable habitat for *O. garnettii*. Pastoralist harvest cattle fodder during the dry months of the year by cutting down trees for their leave, and they burn of forest and swamp vegetation to control ticks and regenerate young plant growth. It seems unlikely, however, that these activities have much negative impact on *O. garnettii*.

Degree of threat category: Least Concern (IUCN 2010). A widespread and adaptable species with no major threats to its survival other than habitat destruction and disease.

### Somali galago *Galago gallarum* (Samburu: Lkimoongu)

*Galago gallarum* is a poorly known nocturnal primate that lives in drier and ‘thornier’ habitats than any other galago or, indeed, any other African primate.

A total of seven individuals seen. Vocalizations heard in distance at dusk (*ca.* 19.00h) at Camp 6, west of the Mathews, and at dawn (05.41h) at Camp 7, E Mathews.

### Distribution

Absent from the forest of the Mathews Range, occupying only the low altitude, drier parts of Namunyak Conservancy (Figure 4).

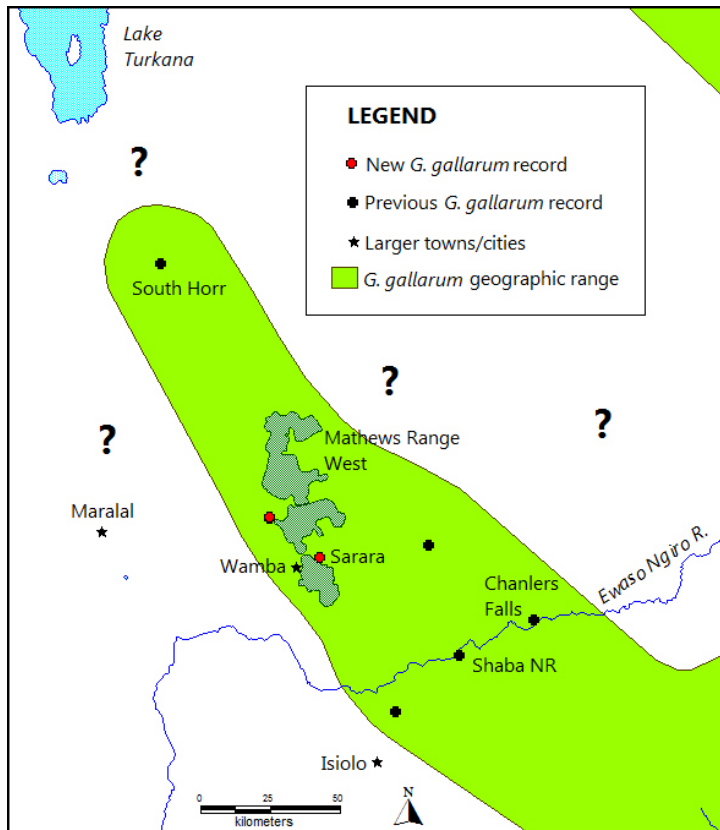


Figure 4. Geographic distribution of *Galago gallarum* in the vicinity of Namunyak Conservancy, Kenya, with previous records by Butynski & De Jong depicted.

### Vegetation

*Acacia -Commiphora* woodland/bushland (n=5) and woodland (including *Acacia* spp, *Newtonia hildebrandtii*, *Melia volkensii*) bordering swamp and *Acacia-Commiphora* bushland (n=2).

Little is known about the habitat preference of this species (Butynski & De Jong 2004). Earlier encounters with the Somali galago were consistently in *Acacia -Commiphora* woodland or bushland. In E Mathews, *G. gallarum* observed (for the first time) to make use of a more moist habitat (*i.e.*, woodland bordering swamp and bushland). Encountered at 1250 m (20 km NW of Wamba in *Acacia -Commiphora* woodland). Previously not known to occur above 1200 m (Butynski & De Jong in press).

### Geographic phenotypic variation

Little geographic variation was observed between *G. gallarum* on Namunyak Conservancy and in Meru National Park, Shaba National Reserve and South Horr (Butynski & De Jong 2004, Butynski & De Jong in press). The main differences detected are a more intense buff, almost orange, on the shoulders and front limbs of the Namunyak animals, and a slightly lighter brown/black over the distal half of the tail (Figure 5).



Figure 5. Somali galago *Galago gallarum* in *Acacia* sp. west of the Mathews Range at 1250 m asl in *Acacia-commiphora* woodland.

Current taxonomy does not recognise any subspecies for *G. gallarum* (Groves 2001, Grubb *et al.* 2003; Butynski & De Jong 2004, in press).

### Group size/composition

Five out of six encounters were with one individual, while one of the encounters was with two individuals.

### Behavioral notes

Most habitats in which *G. gallarum* occurs have few or no trees large enough to provide holes big enough for the Somali galago to enter. This species often sleeps in the open on branches within a barrier of dense *acacia* thorns or *commiphora* spines. No nest building by *G. gallarum* has been observed but they, at least occasionally, sleep in bird or rodent 'grass ball' nests amongst dense thorns (Butynski & De Jong 2004). In E Mathews, two individuals were observed at dusk in a large *N. hildebrandtii* with numerous holes in which they, presumably, slept.

### Conservation status

*G. gallarum* occurs in low densities on Namunyak Conservancy but is probably widespread here. There are no apparent threats to the survival of this species in this region as there appears to be ample habitat.

Throughout its wide geographic range, *G. gallarum* is locally common and able to persist in waterless, degraded, habitats (including sites over-utilized by domestic livestock; Butynski & De Jong 2004). Degree of threat category: Least Concern (IUCN 2010).

### Mt. Uarges Guereza *Colobus guereza percivali* (Samburu: Lkoroi)

Forest dependend species. The subspecies *C. g. percivali* is endemic to the Mathews, Karisa Hills and Ndoto Forest (Mwenja 2008). Reported to be present on Mt. Nyiru but now thought to be extirpated from that site (Mwenja 2009; Butynski & De Jong unpubl data).

### Distribution

The Mt Kenya guereza *Colobus guereza kikuyuensis* at Timau on Mt Kenya, ca. 120 km to the south, is geographically the nearest subspecies to *C. g. percivali* (De Jong & Butynski unpubl. data). This survey appears to be the first to record *C. g. percivali* in the south Mathews since the collection of the holotype for this subspecies on Mt. Uarges in ca. 1913.

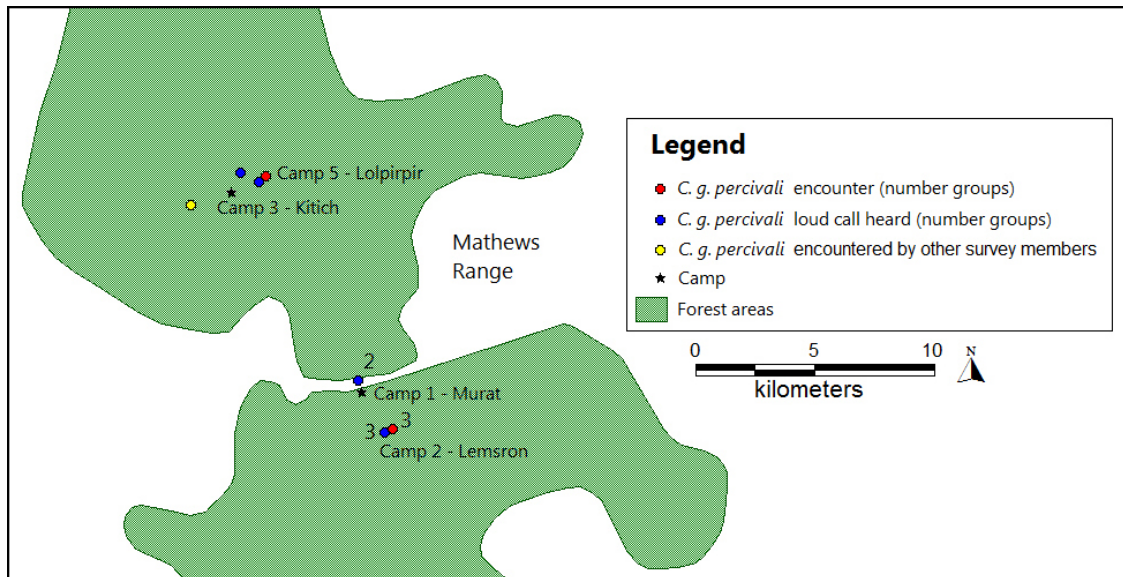


Figure 6. Encounter and vocalization sites of the Mt. Uarges guereza *Colobus guereza percivali* in the Mathews Range, Kenya.

*C. guereza* was encountered once by another survey team in the northern Mathews (1.09844N, 37.16100E) at 2,078 m asl in *Podocarpus* and *C. megalocarpus* – dominated forest with thick herbaceous undergrowth (Juliet King pers. comm.; Figure 6).

*C. guereza* was, apparently, present on Mt. Nyiru, ca. 130 km northwest of the Mathews and south of Lake Turkana. It is unknown which subspecies occupied Mt. Nyiru, however, as there are no known photographs or specimens. This population is reported to have been extirpated (Mwenja 2009; Butynski & De Jong unpubl data).

### Vegetation

High stature forest on rocky hilltops with tall *Podocarpus* and *Ficus thonningi* (with ripe fruits at the time), poorly developed middle-story and no understory (n=3 groups). Mixed *Podocarpus* and *C. megalocarpus* forest with tall cycads (*Encephalartos tegulaneus*) and dense herbaceous understory (n=1 group).

Mixed *Podocarpus* and *C. megalocarpus* forest with herbaceous understory (n=1 group; Juliet King pers. comm.). Four of the groups were in the canopy of tall *Podocarpus* trees when first encountered.

### Group size/composition

Minimum group size for five groups was obtained:

- (1) 7 individuals, including one adult male, one adult female with clinging white infant (>17 weeks old), three adults, and one juvenile.
- (2) 6 individuals
- (3) 4 individuals, including one adult female with clinging white infant
- (4) 6 individuals, including one adult male
- (5) 10 individuals (Juliet King, pers. comm.)

### Geographic phenotypic variation

*C. g. percivali* (Figure 7) differs from *C. g. kikuyuensis* as follows: (1) White tail tuft is 63% of the tail, on average, in *percivali* and 73% in the *kikuyuensis*; (2) White flank veil reaches the base of the tail in *percivali* and covers the base of the tail in *kikuyuensis*; (3) Tail is longer than head + body in *percivali* and about same length as head + body in *kikuyuensis*; (4) White sprinkling on thighs and shoulders below the veil is absent in *percivali* and present in *kikuyuensis* (Groves 2001, Fashing & Oates in press).



Figure 7. Adult male Mt. Uarges guereza *Colobus guereza percivali* in southern Mathews Range.

### Behavioural note

Probably as a result of hunting by humans, *C. g. percivali* is very shy of people. When encountered by people, they typically flee through the canopy for at least 30 m and then quietly hide.

One *C. g. percivali* group was <50 m from a group of *P. anubis*, one was <20 m from a group of *C. neglectus*, and a third group gave alarm calls from near the sleeping site of a group of *P. anubis*.

### Conservation status

*C. g. percivali* has a very limited extent of occurrence in three population (150 km<sup>2</sup>; Mwenja 2009). Traditionally, the Samburu hunt *C. g. percivali* for its pelt which they use as ornaments during ceremonies. Today this form of hunting is illegal. However, hunting is still a major threat to this small population. Other *Colobus* taxa have traditionally been hunted for ceremonial purposes by other tribes in Kenya (including the Chagga, Kikuyu, and Luhya) and some populations have been extirpated as a result.

*C. guereza* responds relatively well to light habitat disturbance (*e.g.*, selective logging), occurring in higher densities in selectively logged than in undisturbed forest Kibale National Park and Budongo Forest Reserve, Uganda (Fashing & Oates in press).

Degree of threat category: Endangered as *C. g. percivali*, Least Concern as *C. guereza* (IUCN 2010).

### De Brazza's monkey *Cercopithecus neglectus* (Samburu: Lmwaki)

Medium sized, robust monkey with wide distribution across tropical Africa. Discovered in the Mathews in 2000 (Douglas-Dufresne, 2005). This is the only population of *C. neglectus* known east of the Eastern Rift Valley.

#### Distribution

The population of *C. neglectus* in the Mathews represents the eastern and south-eastern limits of this species' geographic range. Three groups of *C. neglectus* were encountered in the Mathews during this assessment, one in the centre and two in the north (Figure 8). No groups were encountered in the south Mathews but scout elder Lpaasion Lesipih, who has spent his life in the Mathews, stated that this species is in the south Mathews.

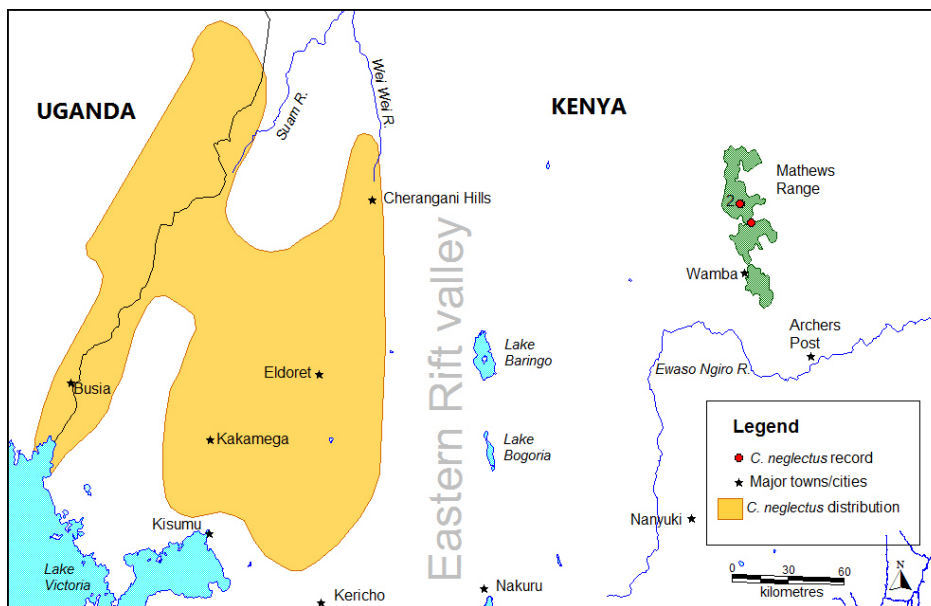


Figure 8. Geographic distribution of de Brazza's monkey *Cercopithecus neglectus* in Kenya (Mwenja 2007; IUCN 2010).

The population of *C. neglectus* that is nearest the Mathews is in the Cherangani Hills, ca. 195 km to the west. The nearest population to the north is in southwest Ethiopia (close to the border with Kenya), ca. 430 km to the northwest.

#### Vegetation

Riverine forest including tall *Ficus sycamoros* (n=1 group); Mixed *Podocarpus* and *C. megalocarpus* dominated forest with tall cycads and a dense herbacious understory (n=1 group); Low stature, mixed *Podocarpus* and *C. megalocarpus* dominated forest with cycads and a well developed herbacious understory (n=1).

#### Group size/composition

Minimum group size of all three groups of *C. neglectus* encountered were obtained:

- (1) 2 individuals
- (2) 4 individuals
- (3) 3 individuals

#### Geographic phenotypic variation

None reported and none observed during this assessment. All observations were brief and generally poor. All individuals were shy and no photographs were obtained.

### **Behavioural notes**

*C. neglectus* was encountered in the canopy of a large, fruiting, *Ficus sycomorosa* at a river (1289 m asl). As soon as the animals noticed the survey team they silently disappeared into the dense foliage. This monkey is mainly dependent on riverine forests and swamps, avoiding primary forest with open understory and is said to typically be within 400 m of water (Gautier-Hion in press). The second and third encounters with *C. neglectus* were at elevations of 1808 and 1600 m asl, and both were > 2 km away from a perennial source of water.

### **Conservation**

The population of *C. neglectus* in the Mathews is small (200-300 individuals; Mwenja 2007) and, therefore, potentially at high risk of extinction. Major threats here are human activities in the forest including (1) the harvest of cattle fodder during the dry months [e.g., leave of *Olea capensis* ssp. *hochstetteri*, *Olea europaea* ssp. *cuspidata*, *Chionanthus battiscombei* and *Craibia laurentii* (Q. Luke pers. comm)] (2) intensive livestock grazing within the forest and along rivers, and (3) burning of forest, riverine and swamp vegetation by pastoralists (see also Mwenja 2007).

Degree of threat category: Least Concern (IUCN 2010). In Kenya, however, this is one of the three rarest species of primate with all populations small and under threat.

**Hilgert's vervet monkey *Chlorocebus pygerythrus hilgerti* (Samburu: Ldere)**

Medium sized, slender woodland primate that is typically patchily distributed and has an extensive geographic range.

**Distribution**

Occupies the woodlands and riverine forests of Namunyak Conservancy and is absent from forested areas. One group was encountered in the western part of the Mathews, two groups were observed east of the Mathews.

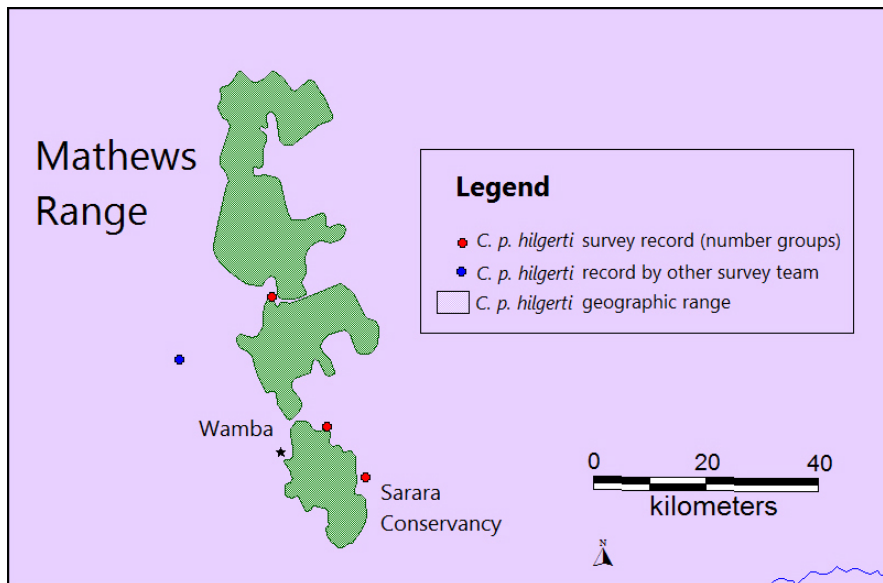


Figure 9. Geographic distribution of the Hilgert's vervet monkey *Chlorocebus pygerythrus hilgerti* in Namunyak Conservancy with sites of encounters depicted.

Hilgert's vervet monkey *Chlorocebus pygerythrus hilgerti* was encountered once by another survey team at Ngilai (N1.09844; E37.16100) at an elevation of 1256 m asl (Judith Syombua pers. comm.; Figure 9).

This subspecies has a wide geographical range (Kenya, eastern Uganda, southern Ethiopia, southern Somalia and northern Tanzania) but there are large areas of unsuitable habitat from which it is absent. Dependent on sources of permanent water and tall trees in which to sleep. The Namunyak Conservancy is located well within the geographical range.

**Vegetation**

Degraded bushland (due to grazing and fire) with scattered tall *Acacia* spp. close to a river (central Mathews, n=1 group); degraded woodland bordering swamp and *Acacia-Commiphora* bushland, including *Acacia* spp, *N. hildebrandtii*, *Melia volkensii* (n=1 group); medium dense woodland, including tall *Acacia* spp and *Balanites aegyptiaca* (n=1 group).

**Group size/composition**

Minimum group sizes were obtained for all three groups of *C. pygerythrus* encountered during this assessment:

- (1) 4 individuals, all young animals (in very dense bush).
- (2) 2 individuals, including one adult male and one unsexed adult.
- (3) 4 individuals, including two adult males, one adult female, and one unsexed subadult.

### Geographic phenotypic variation

The *C. pygerythrus* in Namunyak Conservancy (Figure 10) appeared to belong to the subspecies *hilgerti*. Adult males are characterized by long off-white upward and backward cheek whiskers, jet black hands, feet and tail tips (distal *ca.* 10%), and overall longish fur, heavily grizzled on the dorsum, head and outer arms. The whitish lateral stripe, which is present in some groups in Kenya, was not observed in Namunyak Conservancy.



Figure 10. Adult male Hilgert's vervet monkey *Chlorocebus pygerythrus hilgerti* east of the Mathews.

### Behavioural notes

Groups encountered on Namunyak Conservancy appeared to be atypically small and difficult to observe, being afraid of people.

### Conservation

Although this subspecies is widespread, it is patchily distributed and only locally common. The need for *C. pygerythrus* to drink daily and to have access to tall trees for sleeping are limiting factors. Habitat change (in particular human encroachment, tree die-offs and cutting of tall trees, and water depletion) can cause populations to contract and decline (see also Isbell & Enstam Jaffe in press). This species sometimes raids crops and this brings them into conflict with humans.

Degree of threat category: Least Concern (IUCN 2010)

### Olive baboon *Papio anubis* (Samburu: Lotim)

Large, semi-terrestrial and widespread primate. Occupying a wide range of habitats.

#### Distribution

*P. anubis* was encountered both deep into primary forested as well as in savannah woodlands of Namunyak Conservancy. This is the only primate encountered at all altitudes that were surveyed (1980-1995 m asl).

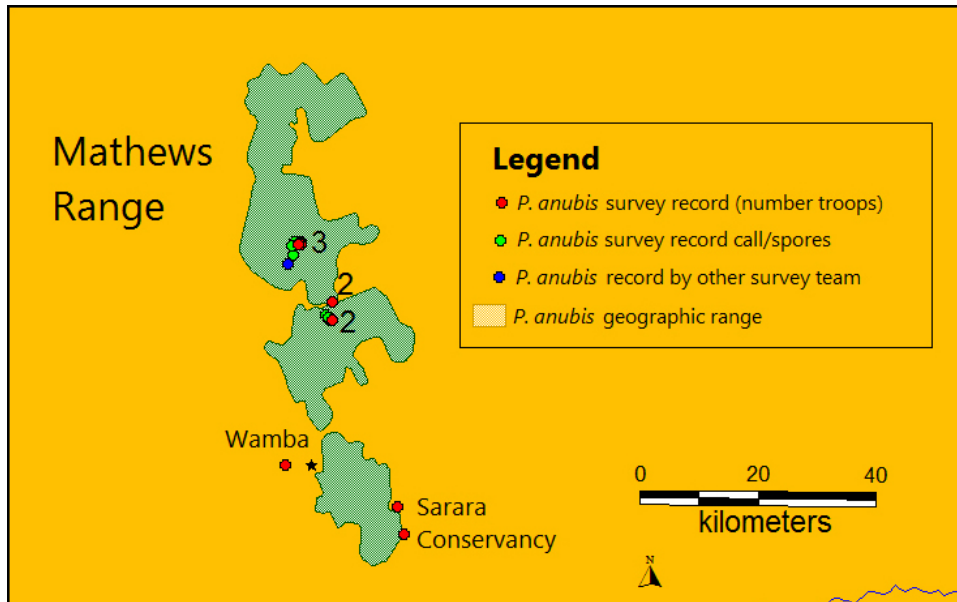


Figure 11. Geographic distribution of the olive baboon *Papio anubis* in Namunyak Conservancy.

During this assessment, *P. anubis* was encountered on 10 occasions by YAdJ and TMB, and once by another survey team. This last encounter was at Matakwan Rocks (01.22875N, 37.28654E, 1383 m asl) in *Acacia* spp bushland (Judith Syombua pers. comm.; Figure 11).

*P. anubis* has the most extensively distributed of any species of baboon, ranging throughout the Sahelian woodland and forest-mosaic habitats from southern Mauritania and Mali eastwards to Eritrea and Ethiopia and southwards through eastern Democratic Republic of Congo and north-western Tanzania (IUCN 2010).

#### Vegetation

Occurs in forest, savannah bushland and woodland, riverine vegetation and degraded land. In Namunyak Conservancy, sleeping sites include large rock cliffs and tall trees (*e.g. Podocarpus*). Habitat selection is limited by the availability of a perennial source of water and secure sleeping sites.

#### Group size/composition

Approximate group size was assessed for all six of the *P. anubis* groups that were encountered during this survey:

- (1) > 50 individuals (at sleeping cliff on large granite rock formation)
- (2) 40-50 individuals on the forest floor in tall *Podocarpus* forest with very open understory
- (3) 50-60 individuals on the forest floor of mixed *Podocarpus* and *C. megalocarpus* dominant forest with tall cycads and dense herbaceous understory

- (4) 30-40 individuals travelling on the ground of degraded *Acacia* – *Commiphora* woodland
- (5) 10-20 individuals travelling on the ground in open savannah woodland close to a dam with water
- (6) 15-20 individuals travelling on the ground in medium dense woodland including *Acacia tortilis* and *Balanites aegyptiaca*.

### Geographic phenotypic variation

The baboons in Namyunyak Conservancy met the phenotypic description for *P. anubis* (Figure 12). Males are robust, olive-gray, with large shoulder capes (mantles) and relatively long arched (not kinked) tails. Here they lack the darker lower limbs that are present on some individuals in Meru Forest Reserve and western Mt Kenya, as well as the pale grey cheeks of baboons in Samburu National Reserve, Ol Pejeta Conservancy, and western Mt Kenya.



Figure 12. Olive baboons *Papio anubis* on forest floor at 1995 m asl in S Mathews Range.

### Behavioural note

Two groups of *P. anubis* were encountered deep within primary forest. Nowhere in their geographical range is this species reported to spend 100% of the time in closed-canopy forest and seldom is this species found >2 km into forest. That *P. anubis* in the Mathews is an exception may be related to the fact that this is a relatively dry forest in which there are gaps (mostly small but some large) that have been created by shallow soils on rock, emerging rocks, very steep slopes, and frequent fire). These gaps probably help to create the habitat heterogeneity that *P. anubis* requires. It may also be that *P. anubis* is able to utilize the forests of the Mathews as a result of ‘competitive’ release from the other species of monkeys which inhabit most other forests in the range of *P. anubis*---perhaps particularly Sykes’s monkey *Cercopithecus mitis* which is, surprisingly, absent from the Mathews. All baboons encountered were shy and difficult to observe.

### Conservation

*P. anubis* is common over much of its extensive range. Comparative research on the ecology and behavior of the ‘mountain forest baboons’ of the Mathews would be of considerable interest as it would likely yield new insights, further demonstrating the ecological and behavioral flexibility of this species.

*P. anubis* needs to drink water at least once every 2 days. This probably means that there are large areas of bushland on Namunyak Conservancy which this species cannot utilize, particularly during the dryer months.

This species often raids crops and, as such, frequently comes into conflict with people. There can be cross infections of disease and parasites between *P. anubis* and humans. It is important, therefore, that groups are not encouraged to come close to people. Tourist lodges and settlements should keep garbage dumps closed and refrain from feeding baboons and other primates in order avoid/minimize human wildlife conflicts and the risks of disease/parasite transmission.

Degree of threat category: Least Concern (IUCN 2010).

## Conclusion and Discussion

One primate species not encountered during this survey is the Senegal galago *Galago senegalensis*. This was surprising as this medium-sized, nocturnal primate is widespread and often common in the woodlands and bushlands of East Africa. Namunyak Conservancy appears to provide habitat suitable for this species. A more intensive survey is likely to find *G. senegalensis* on Namunyak Conservancy. This species is reported from Ngare Narok, west of the Mathews (Mwenja 2008) and has been observed *ca.* 40 km to the southeast of the Mathews (Shaba NR; De Jong & Butynski unpubl. data) and *ca.* 75 km to the north of the Mathews at South Horr (Mwenja 2008).

Four species of primate occur in the forests of the Mathews and at least two (probably three) other species occur in the bushlands/woodlands of Namunyak Conservancy. *C. negelectus* and *O. garnettii* occur in riverine vegetation and in the mid-altitude and montane forest of the Mathews; *C. guereza* is in the mid-altitude and montane forest; *P. anubis* occurs at all altitudes and in all habitats of Namunyak Conservancy; *C. pygerythrus* and *G. gallarum* occur in the bushlands and woodlands of Namunyak Conservancy. *G. senegalensis* was not observed during this assessment but is likely to be present somewhere in the bushlands and woodlands of Namunyak Conservancy and might even be present in some of the forested sites. With four primate species in its forests, the Mathews is similar to other forests east of the Eastern Rift Valley (*e.g.*, Mt. Kenya, Aberdares Range) in terms of its primate diversity. The two to three species present in the drier habitats (*i.e.*, bushlands and woodlands) around the Mathews is also similar to the number found in the drier habitats around Mt. Kenya and the Aberdares). Compared to the mid-altitude and montane forest of central Africa, however, the primate diversity of the forests of the Mathews is low. In central Africa primate communities in forests typically comprise of at least four cercopithecine species, two colobine species, and three prosimians, whereas in the forests of the Mathews there is but one cercopithecine species (*C. neglectus*), one colobine (*C. guereza*), and one prosimian (*O. garnettii*)---and all three occur at low density. The Mathews represents the eastern and northeastern limit of the range for all three of these species.

*C. mitis* appears to be absent from the Mathews. No evidence of this relatively vocal species was collected during this survey or during surveys conducted by Mwenja (2008). Luca Borghesio (pers. comm.) did not see or hear *C. mitis* during 5 years of bird research in the Ngeng Valley of the central Mathews. The forests of Mathews are isolated from other forested areas by a 'barrier' of semi-arid country that is, at its minimum, *ca.* 50 km wide. The nearest population of *C. mitis* is in Ngaia Forest, *ca.* 90 km to the southeast of the Mathews (De Jong & Butynski 2004). The absence of *C. mitis* from the Mathews is surprising, especially since other forest-dependent primate species (*i.e.*, *C. neglectus* and *C. guereza*) are present. It is possible that *C. mitis* once occurred in the area but that this species is less well-adapted to surviving the conditions that probably existed in the Mathews during particular arid periods when the forests of the Mathews may have been restricted to small fragments in the deeper valleys.

In central Africa, where primate communities in forests typically comprise of at least four cercopithecine species, *C. neglectus* is an animal of lowland swamps and riverine forests (*i.e.* habitats with few cercopithecine species). In east Uganda and west Kenya, in the eastern part of their geographic range, there are but one or two cercopithecine species in the forests and here *C. neglectus* appears to be less strongly associated with water and also occupies mid-altitude and dry montane forest (*e.g.* Mt Elgon to 2100 m asl; Kingdon 1971). In the Mathews, the eastern extreme of their geographical range, there is no other forest

cercopithecine species. Here, *C. neglectus* is found >2 km from their normally preferred riverine vegetation and to an altitude of at least 2200 m asl in dry montane forest. These observations suggest that competition with other cercopithecine species (perhaps particularly *C. mitis*) is a major factor in not only determining whether *C. neglectus* occurs, but also the habitats and altitudinal range occupied by this species. The only site east of the Eastern Rift Valley where *C. neglectus* occurs, the Mathews, is one of the few forested sites east of the Eastern Rift Valley in Kenya where *C. mitis* is absent.

Two groups of *P. anubis* were observed >2 km within the forests of the Mathews and at least five other groups were heard calling from deep within forest. It is likely that these groups live entirely within the forests and in the gaps within the forest. They are probably too deep within the forest to have access to any bushland, woodland, savannah or riverine forest. Nowhere else in their geographical range is this species reported to spend 100% of the time in forest. *P. anubis* may be able to occupy the forest of the Mathews because (1) forest-dependent cercopithecine competitors are at low density (*C. neglectus*) or absent (*C. mitis*), (2) the forested areas contain some open areas due to fires as well as steep treeless slopes and granitic domes and out-crops, and (3) there are permanent water sources and sleeping sites (tall *Podocarpus* and large rock formations) within the forest.

Butynski and De Jong (2007) described a new subspecies of potto *Perodicticus potto stockleyi* (Figure 13). The *P. potto* is a silent, forest-dependent species which occurs at low densities or is highly local in its distribution, or both. The forests of Mt. Kenya are ca. 100 km south of the Mathews. Although it is likely that the forests of the Mathews are too dry for *P. potto*, there is a chance this species is present. In East Africa, *P. potto* lives in lower montane forest, swamp forest, secondary forest and forest edge. No evidence of the presence of *P. potto* in the Mathews was found during this survey. Future surveys should be on the look-out for this species, particularly in the wettest forest at 1050 - 2000 m asl.



Figure 13. Mt Kenya potto *Perodicticus potto stockleyi*, a nocturnal primate searched for but not found in the Mathews Range.

### **Primate Conservation in the Mathews Range**

Primates play an essential role in the ecosystems they are found. They are of particular importance and interest because (1) they are essential components (often “keystone species”) of the ecosystems in which they occur, affecting the composition of the vegetation and accounting for a significant portion of the mammalian biomass; (2) they are vital to our understanding of human evolution and human diseases; (3) they are among the best indicators of the health of ecosystems, and (4) being charismatic species, they are among the most important “flagship species” for those sites in which they are found, boosting conservation actions for the flora and fauna of the ecosystem they occur in (De Jong & Butynski 2009).

Primate diversity and density (biomass) in the Mathews are low. However, according to elder Lpaasion Lesipih, the abundance of primates in the Mathews is higher today than 40 years ago. All primate groups encountered were afraid of humans, suggesting that the hunting of primates continues to be practiced.

Threats to the primates of the Mathews are habitat degradation due to human activities, including livestock grazing within the forest and along rivers, harvest of cattle fodder (by the cutting of trees and tree limbs) during the dry months, burning of forest and swamp vegetation, and hunting (especially of *C. guereza*). Other threats include excessive drought and diseases.

## II. Large mammals

The large mammal (>5 kg) fauna of the Mathews was assessed. During surveys sightings of a number of medium-sized mammals (< 5 kg) were additionally recorded. Table 3 presents a list of large- and medium-sized mammals encountered or reported in the Mathews and other parts of Namunyak Conservancy.

Fifty-one mammal species were encountered during this assessment or reported to occur on Namunyak Conservancy. A total of 31 species of large and medium sized mammals occur in the forests of the Mathews (Table 3). Of the 51 mammal species recorded for Namunyak Conservancy, two are Red Listed as 'Endangered', two 'Vulnerable', five 'Near Threatened', and 34 'Least Concern' (IUCN 2010).

Table 3. Large- and medium-sized mammal species of Namunyak Conservancy including area of encounter, means of detection, IUCN Red List degree of threat category, and relative abundance on Namunyak Conservancy, including the Mathews Range. Taxonomy adapted from IUCN (2010).

Species Vernacular and scientific name	Areas of encounter*	Means of detection**	Degree of threat category (IUCN 2010)***	Abundance
Mt. Uarges Guereza <i>Colobus guereza percivali</i>	SM, NM	O, V	EN	Uncommon
Olive baboon <i>Papio anubis</i>	SM, NM, WM, EM	O, V, T, D	LC	Common
Hilgert's vervet monkey <i>Chlorocebus pygerythrus hilgerti</i>	M central, EM	O, V	LC	Uncommon
De Brazza's monkey <i>Cercopithecus neglectus</i>	SM, NM	O, V, T	LC	Uncommon
Small-eared greater galago <i>Otolemur garnettii</i>	SM, NM	V	LC	Rare
Somali galago <i>Galago gallarum</i>	WM, EM	O, V	LC	Uncommon
Fruit bats Megachiroptera, Pteropodidae	SM, NM	O, V	?	Common in MN
Unstriped ground squirrel <i>Xerus rutilus</i>	SM, EM	O	LC	Common in ME
Ochre bush squirrel <i>Paraxerus ochraceus</i>	SM, NM, EM	O	LC	Common in MN, SM
Crested porcupine <i>Hystrix cristata</i>	SM, NM	T, D, C	LC	Common
Black backed Jackal <i>Canis mesomelas</i>		R	LC	?
Bat eared fox <i>Otocyon megalotis</i>		R	LC	?
Wild dog <i>Lycan pictus</i>		R	Endangered C2a(i)	Rare
Zorilla <i>Ictonyx striatus</i>		R	LC	?
Striped weasel <i>Poecilogale albinucha</i>		R	LC	?
Honey badger <i>Mellivora capensis</i>	NM	O	LC	?
Otter Lutrinae		D	?	?
Ichneumon mongoose <i>Herpestes ichneumon</i>		R	LC	?
Slender mongoose	SM	O	LC	?

<i>Herpestes sanguinea</i>				
Dwarf mongoose <i>Helogale parvula</i>	SM, NM, WM	O, V	LC	Common
White-tailed mongoose <i>Ichneumia albicauda</i>	SM, EM	O, D, C	LC	Common
Striped hyena <i>Hyaena hyaena</i>	SM	V	NT	Common
Spotted hyena <i>Crocuta crocuta</i>	SM, WM, EM	V, D, C	LC	Common
Aardwolf <i>Proteles cristata</i>	EM	O	LC	Common (Bastard pers. comm.)
Common genet <i>Genetta genetta</i>	NM	O, C	LC	?
African palm civet <i>Nandinia binotata</i>	NM	T, C	LC	?
Caracal <i>Caracal caracal</i>	SM	T	LC	?
Leopard <i>Panthera pardus</i>	SM, NM, EM	T, C	NT	Common
Lion <i>Panthera leo</i>	NM, EM	D, C	V	Uncommon
Aardvark <i>Orycteropus afer</i>	SM	T	LC	
Yellow spotted bush hyrax <i>Heterohyrax brucei</i>	SM, EM	O, V	LC	Common
African elephant <i>Loxodonta africana</i>	SM, NM, EM	O, V, T, D, C	V	Common
Common zebra <i>Equus quagga</i>	Lerata		LC	Rare (Juliet King pers. comm.)
Grevy's zebra <i>Equus grevyi</i>	Ndonyo Wasin (WN Mathews), Lerata, WM		Endangered A2ac; C2a(i)	Rare (Juliet King pers. comm.)
Bush pig <i>Potamochoerus larvatus</i>	SM, NM	O, T, D, skull	LC	Common
Desert warthog <i>Phacochoerus aethiopicus</i>	EM	Skulls	LC	Uncommon
Giraffe <i>Giraffa camelopardalis</i>	EM	O	LC	Uncommon
African buffalo <i>Syncerus caffer</i>	SM, NM	T, D	LC	Uncommon
Bushbuck <i>Tragelaphus scriptus</i>	SM, NM	O, V, T, D, C	LC	Common
Lesser kudu <i>Tragelaphus imberbis</i>	EM	O	NT	Rare
Greater kudu <i>Tragelaphus strepsiceros</i>		R	LC	Rare
Common eland <i>Taurotragus oryx</i>		R	LC	Rare
Bush duiker <i>Sylvicapra grimmia</i>		D	LC	Uncommon
Klipspringer <i>Oreotragus oreotragus</i>		R	LC	Uncommon
Kirk's dikdik <i>Madoqua kirkii</i>	Lower area of NM, EM	O, V, T, D	LC	Common
Guenther's dikdik <i>Madoqua guentheri</i>		R	LC	?
Waterbuck <i>Kobus ellipsiprymnus</i>		R	LC	Uncommon

Grant's gazelle <i>Gazella granti</i>		R	LC	Uncommon
Generuk <i>Litocranius walleri</i>	EM	O	NT	Uncommon
Impala <i>Aepyceros melampus</i>	EM	O	LC	Uncommon
Beisa/fringe-eared Oryx <i>Oryx beisa</i>		R	NT	Rare

\*Areas of encounter codes: SM = South Mathews, NM = North Mathews, WM = West Mathews, EM = East Mathews

\*\*Means of detection codes: O = Observed, V = Vocalizations heard, T = Tracks, D = Dung, C = Camera trapped, R = Reported by 15 scouts/rangers

\*\*\*LC = Least Concern, NT = Near threatened, V = Vulnerable, EN = Endangered.  
All members of the survey team contributed to this list.

Elephant *Loxodonta africana* groups were encountered or heard from 1275 - 1403 m asl in the forested areas of the Mathews (0.12 groups/km; 010 groups/h, n=10). Elephant dung was common to abundant at all elevations of the Mathews, although no fresh dung (<4 days old) was encountered >1400 m asl. In E Mathews, one group and two adult male solitary elephant were encountered (>1000 m asl). Elephants make use of the high elevations of the Mathews during the dry season and during droughts (Thouless 1993). This survey took place at the end of the wet season. Thouless (1993) reports that some of the forest elephants move to lower areas during the wet season with a major movement through the Murit area into the low elevations in E Mathews. This might explain the lack of fresh dung and encounters above 1400 m asl.

Spotted hyena *Crocuta crocuta* were heard, tracks were found, and this species was caught on camera trap at 1380 m asl. Spotted hyena was also heard west of the Mathews and in E Mathews. Tracks of striped hyena *Hyaena hyaena* were found in S Mathews at 1214 m asl.

Two lions *Panthera leo* were caught on camera trap and dung was encountered in the N Mathews. No vocalizations were heard and no signs were found >1415 m asl.

Leopard *Panthera pardus* are present in good numbers in the both N Mathews and S Mathews. Tracks were found and camera traps recorded leopard at Camp 2 in S Mathews (1860 m asl) and Camp 3 in N Mathews. The olive baboon and guereza were heard alarm calling jointly during the night in the N Mathews (1785 m asl), likely in response of leopard.

Bushbuck *Tragelaphus scriptus* (Figure 14) were seen several times in S Mathews, and heard and caught by camera trap throughout the area. This species seems to be present in good numbers.



Figure 14. Male bushbuck *Tragelaphus scriptus* caught on camera trap in N Mathews Range.

Duikers *Cephalophus* spp. appear to be absent from the Mathews.

The southern tree hyrax *Dendrohyrax arboreus* and black-necked rock hyrax *Procavia johnstoni* seems to be (surprisingly) absent from the Mathews although more extensive surveys might record one or both of these species.

Yellow spotted bush hyrax *Heterohyrax brucei* were encountered in the central Mathews (N1.17775, E37.33081, 1344 m asl) in a tall *Ficus sycamorous* with many holes, as well as in E Mathews. Photographs of bush hyrax taken during this assessment have been uploaded to the 'Hyrax Photographic Map' <[www.wildsolutions.nl](http://www.wildsolutions.nl)> for the purpose of phenotypic comparisons with other hyrax taxa.

Three dwarf mongoose *Helogale parvula* were observed and photographed in mixed *Podocarpus* and *C. megalocarpus* dominant forests with tall cycads and moderate herbacious understory at 1785 m asl in N Mathews (Figure 15). Dwarf mongoose were heard in S Mathews at 1860 m asl by Quentin Luke (pers. comm.). The dwarf mongoose typically avoids altitudes and forests, inhabiting savannahs, tickets and woodlands (Kingdon 1997). Tim Davenport (pers. comm.), however, reports this species at other montane foreste sites.



Figure 15. Dwarf mongoose *Helogale parvula* in N Mathews Range.

One honeybadger *Melivora capensis* was observed at 20:20 h in mixed *Podocarpus* and *C. megalocarpus* dominant forests with tall cycads and light herbacious understory (1.25563N, 37.30523E, 1785 m asl).

The black rhinoceros *Diceros bicornis* was present in the Mathews but was extirpated from this site by poachers in 2000 (NRT 2010). This is the only species known to have been extirpated from Namunyak Conservancy.

### Discussion and Conclusions

In total, this survey reports 51 species of mammals for Namunyak Conservancy, of which 29 are known to be, or reported to be, present in the forests of the Mathews. Biodiversity within the forests of the Mathews is low relative to central Africa's forest. Some expected species were not recorded (*e.g.*, southern tree hyrax *Dendrohyrax arboreus* and Sykes's monkey *Cercopithecus mitis*).

Although this survey did not assess species densities, the impression is that wildlife densities in the Mathews are generally relatively low (Table 3).

### III. Birds

From 2-14 June 2010, 153 species of birds were encountered in the Namyunyak Conservancy by T. Butynski, Y. de Jong, T. Boucher and D. Martins. In addition, Stuart Keith (Department of Ornithology, American Museum of Natural History) observed nine species of birds during 15-19 November 1962 that were not encountered during the June 2010 survey (Table 4). Of these 162 species, five are migratory species (all observed by S. Keith), 83 are non-forest species, 35 are forest / non-forest (often edge) species, and 35 are forest-dependent species.

One species that might have been heard calling (at 1,900 m asl in montane forest) during this survey is Shelley's francolin *Francolinus shelleyi*, but the presence of this species requires confirmation before it can be added to the list of bird species for Namyunyak Conservancy.

It is surprising that no herons, ibises, ducks, geese, vultures, rails, cranes, plovers, rollers, larks, sparrows, or canaries were encountered during this survey, although all of these groups must be present on Namyunyak Conservancy.

One species (golden-winged sunbird *Nectarinia reichenowi*) is represented by a subspecies (*N. r. lathburyi*) that is endemic to the Mathews Range and Mt. Nyiru (Britton 1980).

Given the small area of forest in Samburu District, and the degradation and rapid loss of forest in East Africa, it is the 35 forest-dependent species that are of greatest conservation concern within Namyunyak Conservancy as these species have rapidly declining and increasingly fragmented geographic ranges. None-the-less, of these 35 species, none is currently under threat with extinction (according to the Red List; IUCN 2010). Indeed, none of the 162 species listed in Table 4 is threatened.

There is no montane forest in Kenya, Ethiopia or Somalia to the east and north-east of the Mathews. As such, the forests of the Mathews support the most eastern and most north-eastern populations of some bird species.

This survey provides significant range extensions for at least two species; red-fronted parrot *Poicephalus gularis* and woodland kingfisher *Halcyon senegalensis*.

Several species of forest edge species (*i.e.*, 'F/N' species) were found deep within the forest (*e.g.*, emerald-spotted wood dove *Turtur chalcospilos*, Abyssinian white-eye *Zosterops abyssinicus*). This might be related to the fact that the dry montane forest of the Mathews is less diverse and more open than are most other montane forests in Kenya.

A good number of birds that are common in many other montane forests in Kenya were either uncommon (*e.g.*, tambourine dove *Turtur typanistris*, African wood owl *Strix woodfordii*, cardinal woodpecker *Dendropicos fuscescens*, montane nightjar *Caprimulgus poliocephalus*, mountain greenbul *Andropadus nigriceps*) or not encountered (*e.g.*, African green pigeon *Treron calva*, crowned hornbill *Tockus alboterminatus*, Cabanis's greenbul *Phyllastrephus cabanisi*, cinnamon bracken warbler *Bradypterus cinnamomeus*, twany-flanked prinia *Prinia subflava*, eastern double-collared sunbird *Nectarinia mediocris*, and olive sunbird *Nectarinia olivacea*, Abyssinian crimsonwing *Cryptospiza salvadorii*). Some of these species are expected to be found in the Mathews Range as additional surveys are undertaken.

This survey was conducted during June when migrants were in Europe, Asia or the Middle-East. Given the considerable range of habitats within Namyunyak Conservancy, and the fact

that the Mathews Range offers the first wooded sites that many migrants will encounter after crossing fast arid areas to the north and north-east, suggest that the number of migrants using the Mathews is likely to be considerable. Indeed, the woodlands and forests of the Mathews may be important habitats for a number of migrants.

Table 4. Species of birds encountered in the Namyunyak Conservancy, central Kenya, from 2-14 June 2010.

Species' Number <sup>1</sup>	Family / Species	Scientific Name	Altitude Range (x 100 m)	Abundance (4)	Primary Habitat (5)
	<b>STRUTHIONIDAE</b>				
1	Common Ostrich	<i>Struthio camelus</i>	11	U	N
	<b>SCOPIDAE</b>				
52	Hamerkop	<i>Scopus umbretta</i>	12-14	F	F/N
	<b>CICONIDAE</b>				
56	Woolly-necked Stork	<i>Ciconia episcopus</i>	13-14	U	N
	<b>ACCIPITRIDAE</b>				
98	Eurasian Honey Buzzard <sup>2</sup>	<i>Pernis apivorus</i>	14	?	M
115	Bateleur	<i>Terathopius ecaudatus</i>	10	U	N
117	African Harrier Hawk	<i>Polyboroides typus</i>	13-14	F	F/N
124	Eastern Pale Chanting Goshawk	<i>Melierax poliopterus</i>	14	U	N
125	African Goshawk	<i>Accipiter tachiro</i>	17-18	U	F
134	Great Sparrowhawk	<i>Accipiter melanoleucus</i>	13-14	U	F
139	Mountain Buzzard	<i>Buteo oreophilus</i>	18-23	C	F
142	Augur Buzzard	<i>Buteo augur</i>	9-14	C	N
143	African Fish Eagle	<i>Haliaeetus vocifer</i>	13-14	C	N
147	Tawny Eagle <sup>2</sup>	<i>Aquila rapax</i>	14	R	N
155	Long-crested Eagle	<i>Lophaelus occipitalis</i>	14	U	N
157	African Crowned Eagle	<i>Stephanoaetus coronatus</i>	13-21	C	F
158	Martial Eagle	<i>Polemaetus bellicosus</i>	11-14	U	N
	<b>FALCONIDAE</b>				
159	Pygmy Falcon	<i>Polihierax semitorquatus</i>	12	U	N
	<b>PHASIANIDAE</b>				
190	Crested Francolin	<i>Francolinus sephaena</i>	9-14	C	N
194	Hildebrandt's Francolin	<i>Francolinus hildebrandti</i>	14	U	N
195	Scaly Francolin	<i>Francolinus squamatus</i>	13-19	C	F
199	Yellow-necked Spurfowl	<i>Francolinus leucoscepus</i>	11	C	N
	<b>NUMIDIDAE</b>				
203	Vulturine Guineafowl	<i>Acryllium vulturinum</i>	10	U	N
204	Helmeted Guineafowl	<i>Numida meleagris</i>	14	U	N
	<b>OTIDIDAE</b>				
237	Crested Bustard	<i>Eupodotis ruficrista</i>	10	U	N
	<b>SCOLOPACIDAE</b>				
312	Green Sandpiper <sup>2</sup>	<i>Tringa ochropus</i>	14	?	M
	<b>COLUMBIDAE</b>				
357	Tambourine Dove	<i>Turtur tympanistria</i>	14	U	F
359	Emerald-spotted Wood Dove	<i>Turtur chalcospilos</i>	9-22	C	F/N

364	Eastern Bronze-naped Pigeon	<i>Columba delegorguei</i>	14-19	U	F
365	Olive Pigeon	<i>Columba arquatrix</i>	18-19	C	FF/N
369	Lemon Dove	<i>Aplopelia larvata</i>	20	U	F
370	Red-eyed Dove	<i>Streptopelia semitorquata</i>	12-19	C	F/N
373	Ring-necked Dove	<i>Streptopelia capicola</i>	11	C	N
376	Dusky Turtle Dove	<i>Streptopelia lugens</i>	14	U	F/N
377	Laughing Dove	<i>Streptopelia senegalensis</i>	11-14	C	N
	<b>PSITTACIDAE</b>				
380	Red-fronted Parrot <sup>3</sup>	<i>Poicephalus gulielmi</i>	17-21	F	F
383	African Orange-bellied Parrot	<i>Poicephalus rufiventris</i>	??	U	N
	<b>MUSOPHAGIDAE</b>				
398	Hartlaub's Turaco	<i>Turaco hartlaubi</i>	14-21	C	F
401	White-bellied Go-away-bird	<i>Corythaixoides leucogaster</i>	12-13	C	N
	<b>CUCULIDAE</b>				
404	Black-and-white Cuckoo	<i>Oxylophus jacobinus</i>	14	U	N
408	Black Cuckoo	<i>Cuculus clamosus</i>	13-14	C	F/N
409	Red-chested Cuckoo	<i>Cuculus solitarius</i>	14	F	F/N
417	African Emerald Cuckoo	<i>Chrysococcyx cupreus</i>	14-20	C	F/N
419	Klaas's Cuckoo	<i>Chrysococcyx klaas</i>	14	F	F/N
420	Diederik Cuckoo	<i>Chrysococcyx caprius</i>	14	U	N
421	Yellowbill	<i>Ceuthmochares aereus</i>	14	U	F/N
422	White-browed Coucal	<i>Centropus superciliosus</i>	14	F	N
	<b>STRIGIDAE</b>				
432	African Scops Owl	<i>Otus senegalensis</i>	9-14	F	N
439	Verreaux's Eagle-owl	<i>Bubo lacteus</i>	9-10	F	N
441	Pearl-spotted Owlet	<i>Glaucidium perlatum</i>	9-10	U	N
444	African Wood Owl	<i>Strix woodfordii</i>	14-21	F	F
	<b>CAPRIMULGIDAE</b>				
449	Montane Nightjar	<i>Caprimulgus poliocephalus</i>	21	R	F/N
450	Donaldson-Smith's Nightjar <sup>3</sup>	<i>Caprimulgus donaldsoni</i>	12-13	U	N
452	Freckled Nightjar	<i>Caprimulgus tristigma</i>	19	R	F/N
	<b>APODIDAE</b>				
470	Eurasian Swift <sup>2</sup>	<i>Apus apus</i>	14	?	M
471	African Black Swift	<i>Apus barbatus</i>	10	U	N
477	White-rumped Swift	<i>Apus caffer</i>	10	U	N
	<b>COLIIDAE</b>				
480	Speckled Mousebird	<i>Colius striatus</i>	13-14	C	N
	<b>TROGONIDAE</b>				
484	Narina Trogon	<i>Apaloderma narina</i>	14-19	R	F
	<b>ALCEDINIDAE</b>				
486	Grey-headed Kingfisher	<i>Halcyon leucocephala</i>	14	U	N
488	Woodland Kingfisher <sup>3</sup>	<i>Halcyon senegalensis</i>	14	R	N
499	Giant Kingfisher	<i>Megaceryle maxima</i>	14	R	N
500	Pied Kingfisher	<i>Ceryle rudis</i>	13	U	N
	<b>MEROPIDAE</b>				
512	Little Bee-eater	<i>Merops pusillus</i>	11-13	C	N
514	Cinnamon-chested Bee-eater	<i>Merops oreobates</i>	14-20	C	F

	<b>UPUPIDAE</b>				
524	Hoopoe	<i>Upupa epops</i>	13	U	N
	<b>PHOENICULIDAE</b>				
530	Common Scimitarbill	<i>Rhinopomastus cyanomelas</i>	18	U	N
532	Abyssinian Scimitarbill	<i>Rhinopomastus minor</i>	11	U	N
	<b>BUCEROTIDAE</b>				
538	Red-billed Hornbill	<i>Tockus erythrorhynchus</i>	9-11	C	N
539	Eastern Yellow-billed Hornbill	<i>Tockus flavirostris</i>	10-13	C	N
540	Von der Decken's Hornbill	<i>Tockus deckeni</i>	13	C	N
545	African Grey Hornbill	<i>Tockus nasutus</i>	11	C	N
549	Silvery-cheeked Hornbill	<i>Bycanistes brevis</i>	15-21	C	F
	<b>CAPITONIDAE</b>				
560	Moustached Green Tinkerbird	<i>Pogoniulus leucomystax</i>	21	R	F
568	Red-fronted Barbet	<i>Tricholaema didemata</i>	12-13	C	N
570	Spot-flanked Barbet	<i>Tricholaema lacrymosa</i>	14	C	F/N
571	Black-throated Barbet	<i>Tricholaema melanocephala</i>	12-13	C	N
582	Red-and-yellow Barbet	<i>Trachyphonus erythrocephalus</i>	12-13	C	N
583	D'Arnaud's Barbet	<i>Trachylaemus darnaudii</i>	11-14	C	N
	<b>INDICATORIDAE</b>				
586	Scaly-throated Honeyguide <sup>2</sup>	<i>Indicator variegates</i>	14	R	F/N
587	Greater Honeyguide	<i>Indicator indicator</i>	14	U	N
588	Lesser Honeyguide <sup>2</sup>	<i>Indicator minor</i>	14	U	F/N
	<b>PICIDAE</b>				
601	Nubian Woodpecker	<i>Campethera nubica</i>	13	U	N
610	Cardinal Woodpecker	<i>Dendropicos fuscescens</i>	14	U	F/N
616	Grey Woodpecker	<i>Dendropicos goertae</i>	13	U	F/N
	<b>HIRUNDINIDAE</b>				
667	Lesser Striped Swallow	<i>Hirundo abyssinica</i>	13	C	N
668	Rock Martin	<i>Hirundo fuligula</i>	18	U	N
672	Black Saw-wing	<i>Psalidoprocne holomelas</i>	13-20	C	F/N
	<b>MOTACILLIDAE</b>				
673	African Pied Wagtail	<i>Motacilla aguimp</i>	13	C	N
675	Grey Wagtail <sup>2</sup>	<i>Motacilla cinerea</i>	14	?	M
676	Mountain Wagtail	<i>Motacilla clara</i>	13-14	F	F/N
689	Tree Pipit <sup>2</sup>	<i>Anthus trivialis</i>	14	?	M
	<b>PYCNONOTIDAE</b>				
702	Yellow-whiskered Greenbul	<i>Andropadus latirostris</i>	14-23	C	F
703	Slender-billed Greenbul	<i>Andropadus gracilirostris</i>	19-22	F	F
705	Mountain Greenbul	<i>Andropadus nigriceps</i>	18-19	R	F
729	Common Bulbul	<i>Pycnonotus barbatus</i>	9-14	C	F/N
735	Eastern Nicator	<i>Nicator gularis</i>	14	R	F
	<b>TIMALIIDAE</b>				
737	African Hill Babbler	<i>Pseudoalcippe abyssinica</i>	14-20	F	F

746	Rufous Chatterer	<i>Turdoides rubiginosus</i>	9-13	C	N
	<b>TURDIDAE</b>				
756	White-starred Robin	<i>Pogonocichla stellata</i>	14-21	F	F
770	Red-capped Robin-chat	<i>Cossypha natalensis</i>	14-20	F	F
772	White-browed Robin-chat	<i>Cossypha heuglini</i>	14	F	N
814	Little Rock Thrush	<i>Monticola rufocinereus</i>	18	R	N
816	Olive Thrush	<i>Turdus olivaceus</i>	14-23	C	F/N
820	Bare-eyed Thrush	<i>Turdus tephronotus</i>	12-13	R	N
826	Abyssinian Ground Thrush	<i>Zoothera piaggiae</i>	14	R	F
	<b>MUSCICAPIDAE</b>				
831	African Dusky Flycatcher	<i>Muscicapa adusta</i>	14-23	F	F
840	White-eyed Slaty Flycatcher	<i>Melaenornis fischeri</i>	14-23	C	F
	<b>SYLVIIDAE</b>				
873	Willow Warbler	<i>Phylloscopus trochilus</i>	14	-	M
876	Brown Woodland Warbler	<i>Phylloscopus umbrovirens</i>	13-22	F	F
909	Stout Cisticola	<i>Cisticola robustus</i>	14	F	N
912	Rattling Cisticola	<i>Cisticola chiniana</i>	13-14	C	N
933	Grey-backed Camaroptera	<i>Camaroptera brachyuran</i>	12-21	C	F/N
936	Yellow-breasted Apalis	<i>Apalis flavida</i>	12-13	C	N
945	Grey Apalis	<i>Apalis cinerea</i>	14-20	F	F
	<b>ZOSTEROPIDAE</b>				
981	Abyssinian White-eye	<i>Zosterops abyssinicus</i>	11-21	F	F/N
	<b>PARIDAE</b>				
985	Northern Grey Tit	<i>Parus thruppi</i>	12-13	F	N
990	White-bellied Tit	<i>Parus albiventris</i>	14-20	F	F/N
	<b>MONARCHIDAE</b>				
1004	Blue-mantled Crested Flycatcher	<i>Trochocercus cyanomelas</i>	14-16	C	F
1007	African Paradise Flycatcher	<i>Terpsiphone viridis</i>	14-20	F	F/N
	<b>PLATYSTEIRIDAE</b>				
1013	Chin-spot Batis	<i>Batis molitor</i>	12-20	C	F/N
	<b>PRIONOPIDAE</b>				
1029	Northern White-crowned Shrike	<i>Eurocephalus rueppelli</i>	12-13	F	N
	<b>LANIIDAE</b>				
1043	Common Fiscal	<i>Lanius collaris</i>	14	F	N
	<b>MALACONOTIDAE</b>				
1048	Brown-crowned Tshagra <sup>2</sup>	<i>Tchagra australis</i>	14	R	N
1053	Black-fronted Bush-shrike <sup>2</sup>	<i>Malaconotus nigrifrons</i>	14	R	F
1061	Rosy-patched Bush-shrike	<i>Rhodophoneus cruentus</i>	9-10	F	N
1064	Tropical Boubou	<i>Laniarius aethiopicus</i>	12-23	C	F/N
1070	Slate-coloured Boubou	<i>Laniarius funebris</i>	12-19	C	F/N
1071	Northern Puffback	<i>Dryoscopus gambensis</i>	13-20	C	F/N
	<b>CAMPEPHAGIDAE</b>				
1076	Black Cuckoo-shrike	<i>Campephaga flava</i>	13	F	F/N
1080	Grey Cuckoo-shrike	<i>Coracina caesia</i>	14-21	F	F

	<b>DICRURIDAE</b>				
1082	Common Drongo	<i>Dicrurus adsimilis</i>	9-14	C	N
	<b>ORIOLIDAE</b>				
1087	Black-headed Oriole	<i>Oriolus larvatus</i>	14-19?	C	F/N
	<b>CORVIDAE</b>				
1097	Fan-tailed Raven	<i>Corvus rhipidurus</i>	11-14	C	N
	<b>STURNIDAE</b>				
1102	Waller's Starling	<i>Onychognathus walleri</i>	11-18	C	F
1103	Red-winged Starling	<i>Onychognathus morio</i>	9-19	F	F/N
1111	Greater Blue-eared Starling	<i>Lamprotornis chalybaeus</i>	13-14	F	N
1116	Hildebrandt's Starling	<i>Lamprotornis hildebrandti</i>	9-10	F	N
1118	Superb Starling	<i>Lamprotornis superbus</i>	9-13	C	N
1119	Golden-breasted Starling	<i>Cosmopsarus regius</i>	11	F	N
1123	Sharpe's Starling	<i>Cinnyricinclus sharpie</i>	19-20	F	F
	<b>NECTARINIIDAE</b>				
1140	Collared Sunbird	<i>Anthreptes collaris</i>	14-21	F	F/N
1149	Amethyst Sunbird	<i>Nectarinia amethystine</i>	14-19	F	F/N
1152	Variable Sunbird	<i>Nectarinia venusta</i>	14	F	N
1159	Northern Double-collared Sunbird	<i>Nectarinia preussi</i>	1419-21	C	F
1165	Marico Sunbird	<i>Nectarinia mariquensis</i>	13	C	N
1171	Black-bellied Sunbird	<i>Nectarinia nectarinioides</i>	13	R	N
1180	Golden-winged Sunbird	<i>Nectarinia reichenowi</i>	19-23	C	N
	<b>PLOCEIDAE</b>				
1197	White-browed Sparrow-weaver	<i>Plocepasser mahali</i>	9-13	C	N
1205	Baglafaecht Weaver	<i>Ploceus baglafaecht</i>	14-20	C	F/N
1226	Vitelline Masked Weaver	<i>Ploceus velatus</i>	13	F	N
1236	Chestnut Weaver	<i>Ploceus rubiginosus</i>	14	R	N
1240	Brown-capped Weaver	<i>Ploceus insignic</i>	14-21	C	F
	<b>ESTRILDIDAE</b>				
1294	African Firefinch	<i>Lagonosticta rubricate</i>	11-13	C	N
1299	Yellow-bellied Waxbill	<i>Estrilda quartinia</i>	9-20	C	F/N
1301	Crimson-rumped Waxbill	<i>Estrilda rhodopyga</i>	13	F	N
1303	Common waxbill	<i>Estrilda astrild</i>	13	F	N
1309	Red-cheeked Cordon-bleu	<i>Uraeginthus Bengalus</i>	14	F	F/N
1311	Purple Genadier	<i>Uraeginthus ianthinogaster</i>	12-13	C	N
1317	Grey-headed Silverbill	<i>Lonchura griseicapilla</i>	12-13	R	N
1319	Black-and-white Manikin	<i>Lonchura bicolor</i>	14-20	F	F/N
1329	Straw-tailed Whydah	<i>Vidua fischeri</i>	11	F	N
	<b>FRINGILLIDAE</b>				
1343	Streaky Seedeater	<i>Serinus striolatus</i>	19-20	C	F

<sup>1</sup>. The species numbers, spelling of species' names, and taxonomy adopted here is that compiled by the Ornithological Sub-committee of the East Africa Natural History Society (EANHS 1996).

<sup>2</sup>. One of nine species recorded by Stuart Keith in the Ngeng River area of the Mathews Range during 15-19 November 1962 but which were not recorded during the present survey.

3. Species for which the present survey provides a significant extension of the geographic range.

4. Abundance index (when surveying in habitat that is suitable for the species):

C = 'Common'. Species encountered every day

F = 'Fairly common'. Species encountered on the majority of days

U = 'Uncommon'. Species not encountered on the majority of days

R = 'Rare'. No more than two encounters

5. Primary habitat:

F = 'Forest species'. Species which usually, or always, use forest. This includes primary forest, secondary, degraded forest, forest remnants, forest edge, or forest-related habitats (*e.g.*, streams, ponds, glades, bush, bracken fern and gaps in forest).

F/N = 'Forest/non-forest species'. Species which use both forest and non-forest habitats such as woodland, swamp, scrub or bush savannah. Many are frequently found on the forest edge.

N = 'Non-forest species'. Species which seldom, if ever, use forest or its associated habitats. These species are strongly associated with other habitat types (*e.g.*, open water, bush, savannah or grassland).

M = 'Migrant species'. Palearctic migrant which may, or may not, be dependent upon forest.

#### IV. Human impact in the Mathews Range forests

The forests of the Mathews that are above 1400 m asl are relatively untouched and form an important water catchment for a large semi-arid part of Kenya. It is crucial for both wildlife and humans that the Mathews remains healthy. As such, practical and efficient conservation actions are of great importance for this site. Human activities within the forest include (1) grazing of livestock, (2) cutting of trees and branches for leaf fodder for livestock, (3) burning of forest and swamp vegetation, and (4) hunting. During surveys, evidence of human activities were recorded whenever encountered. Figure 16 presents sites where the cutting of trees of cattle fodder was observed.

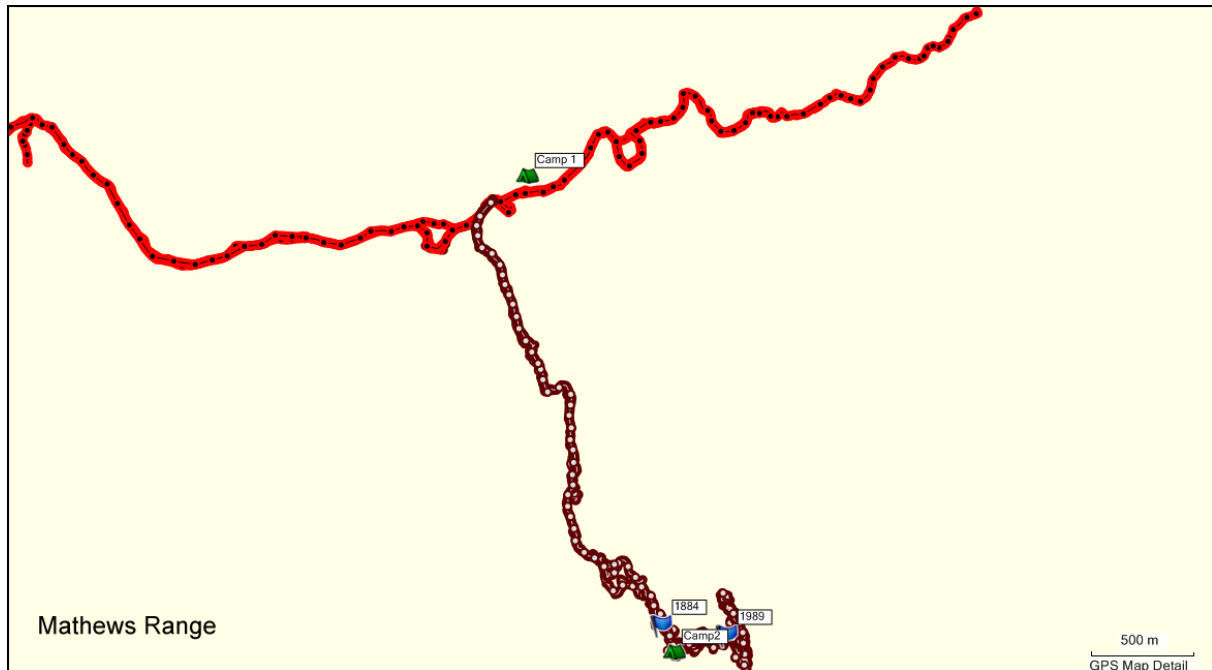


Figure 16. Survey transects in S Mathews Range (Camps 1 & 2). The red transect is the main route used by people. The brown transect represents a freshly cut forest. Blue flags on the brown transect represent sites where trees had been cut for cattle fodder.

Along the red transect (main route used by people; Figure 16) many trees were cut down for livestock fodder during the last drought. There was abundant evidence of fodder harvesting that was older than 1 year. On this transect, 14 people with small herds of livestock were encountered (0.66 people/km; 0.77 people/h, n=14). No people were encountered along the brown transect (Figure 16) within the forest. Two livestock fodder sites were found along the brown transect at 1884 m and 1989 m asl (Figure 16).

In the N Mathews, no people were encountered along the transects within the forest. Eight livestock fodder sites were found along the transect at 1408 - 1809 m asl (Figure 17). One abandoned livestock boma was found at (1996 m asl).

At the mid- and higher elevations of S Mathews the primary trees cut for livestock fodder are *Olea capensis hochstetteri*, *Olea europaea cuspidata*, and *Chionanthus battiscombei*. In N Mathews the primary tree cut for livestock fodder is *Craibia laurentii* (Quentin Luke pers comm.)

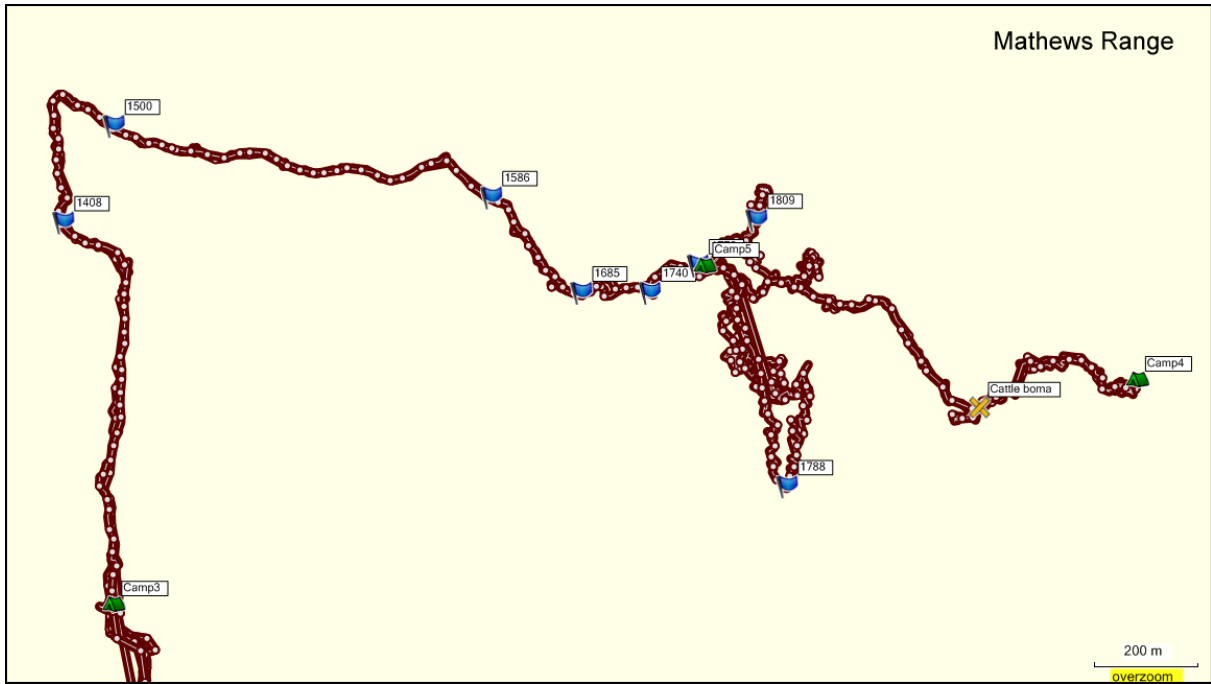


Figure 17. Survey transects N Mathews Range (Camps 3, 4 & 5). Blue flags represent sites where trees had been cut for cattle fodder.

## RECOMMENDATIONS

1. Stop the hunting of *Colobus guereza*---an internationally recognized ‘Endangered’ subspecies. It might be possible to find alternative, sustainable, material (‘fake fur’) to replace the black-and-white pelt of this monkey as now used in traditional ceremonies. This attractive monkey, which people can view at some sites, should serve as the ‘flagship’ species for the Namyunyak Conservancy.
2. Prevent fires in the Mathews, or at least greatly reduce the incident of fire. This would (1) allow the forest to regenerate and support the most threatened of the species of this area, and (2) allow at least partial recovery of this vital watershed.
3. If one of the reasons for the setting of fire is to control tick transmitted diseases to livestock, then the installation of cattle dips that have minimum environmental impact should be considered.
4. Find alternatives to the cutting of trees as a source of fodder for livestock. It might be possible to grow plantations of particular tree species in the bushlands whereby the trees provide building poles, firewood, erosion control, and fodder for livestock. If livestock are in numbers that require entrance to the forest and the cutting of trees for fodder, then that should be taken as an indication of a stocking rate that is unsustainable and damaging to the environment.
5. Put into place a properly managed, sustainable, livestock production program. Continued over-stocking will further degrade the Namyunyak Conservancy in a number of ways, reducing options for sustainable livelihoods and reducing over all productivity.
6. Monitor focal species on a regular basis so as to assess population trends. This will allow for the evaluation of conservation actions and help guide adjustments to these actions (see section below).
7. Reintroduce the black rhinoceros to the Namyunyak Conservancy. The successful reintroduction of black rhinoceros to this site will enhance the image of the Namyunyak Conservancy, serve as a tourist attraction, and create jobs for local people.
8. Expand the ecotourism program for the Namyunyak Conservancy to include wilderness hiking and over-night camping in some of the more remote parts of the Mathews Range. Well-trained, ‘natural history guides’ would add to this ‘wilderness experience’.

### **Recommendations for monitoring primates, large mammals and birds**

Successful conservation is measured by the status of plants, animals and the ecological community as a whole. This, however, requires long-term ecological monitoring (Struhsaker 2007). Diurnal primates are relatively easy to monitor for a number of reasons (*e.g.*, they live in groups, give loud calls, large body size). Table 5. provides an overview of the recommended focal species to monitor in the Mathews forests.

#### I. Recommendations for monitoring species in the forests of the Mathews Range

Table 5. Focal species for monitoring, technique, and time schedule

Species	Patrol-based survey and camera trap surveys	Interview survey
<b>I. Primates</b>		
Baboons	Every patrol	
Guereza	Every patrol	6 months
De Brazza's monkey	Every patrol	6 months
<b>II. Large mammals</b>		
Honey badger	Every patrol	
Spotted hyena	Every patrol	
Striped hyena	Every patrol	
Common genet	Every patrol	
African palm civet	Every patrol	
Leopard	Every patrol	
African elephant	Every patrol	6 months
Bush pig	Every patrol	
African buffalo	Every patrol	6 months
Bushbuck	Every patrol	
Bush duiker	Every patrol	
<b>III. Birds</b>		
Guinea fowl	Every patrol	
<b>IV. Human impact</b>		
Fodder harvest sites	Every patrol	6 months
Burning of vegetation	Every patrol	6 months
Boma / campsites	Every patrol	6 months
Poaching activities	Every patrol	6 months
Other evidence of human activities	Every patrol	6 months

### Patrol-based surveys and camera trap surveys

Patrol-based surveys (also sometimes called 'reconnaissance surveys') are conducted by patrol teams. The patrol teams follow pre-existing trails when possible to minimise the impact of their activities in the area. Patrol surveys should be conducted as often as possible with a minimum of once every 2 months. The team records sightings, vocalizations, tracks, dung and other evidence of the focal species (Table 3). A detailed description of this survey technique can be found in White & Edwards (2000, pp. 225-275), Chapter 13, "Methods for assessing the status of animal populations". This chapter also describes how to assess species densities by dung, nests or tracks. White & Lee (2000) provide similar information (Chapter 10). Davies (2002), in Chapter 10, describes techniques to assess large and medium-sized mammal densities. He provides recording sheets for large and medium-sized mammals (Chapter 5) and primates (Chapter 6) and birds (Chapter 7).

Camera traps should be used during patrol-based surveys to record secretive and/or nocturnal species near camps. Camera traps should be placed on trails to record species 0.5 - 1.5 m above the ground.

### **Interviews**

Interviews with the local communities within Namunyak Conservancy should be conducted to discuss species population trends and human impact in the Mathews. During these interviews the following topics should be discussed in detail:

- (1) encounters with focal species (Table 5; presence/absence, distribution, trends)
- (2) additions to the mammal and bird species lists
- (3) trends in human impact of the forest (harvest of fodder, burning of vegetation, encountered bomas or campsites, evidence of poaching, hunting of guereza, etc.)
- (4) recommendations for conservation activities

A minimum of four communities, preferably six, evenly distributed over Namunyak Conservancy should be interviewed. The same communities should be interviewed over time.

## **CONSTRAINTS**

Ideally, transects to assess species presence and abundance are easy to follow and have not been used by others for at least 24 hours prior to the transect. In the case of the June 2010 survey, transects were sometimes not easy to find or follow and, more importantly, all transects were in frequent use by local people, porters, guides and other researchers. Given the nature of this survey, particularly the rather large number of people involved and the limited time, these constraints could not be overcome. None-the-less, the strong impression is that a good start has been made towards documenting the primate, larger mammal and bird diversity of the Mathews, with some data now available on altitudinal range, habitat use, and abundance.

Particular mention should be made of the 'unnecessary noise' that people made both in camp and while in the forest. Porters were especially noisy, as were rangers and guides when they were not in the presence of researchers. This means that some species that would have been detected were not detected.

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## LITERATURE

Britton, P.L. (ed.) 1980. *Birds of East Africa, their Habit, Status and Distribution*. East Africa Natural History Society, Nairobi.

Butynski, T.M. & De Jong, Y.A. 2004. Natural history of the Somali lesser galago (*Galago gallarum*). *Journal of East African Natural History* 93: 23-38.

Butynski, T. M. & de Jong, Y. A. 2007. Distribution of the potto (Primates: Lorisidae) *Perodicticus potto* (Müller, 1776) in eastern Africa, with a description of a new subspecies from Mount Kenya. *Journal of East African Natural History* 96: 113-147.

Butynski, T.M. & De Jong, Y.A. In Press. *Galago gallarum* Somali Galago. In: *The Mammals of Africa*, Vol. 2, Primates, T. M. Butynski, J. Kingdon and J. Kalina (eds.). University of California Press, Berkeley, CA.

Davies, G. 2002. *African Forest Biodiversity. A Field Survey Manual for Vertebrates*. Earthwatch Institute, Oxford, UK. Pp 161.

De Jong, Y.A. & Butynski, T.M. 2004. Surveys of the Somali lesser bushbaby (*Galago gallarum*) and northern lesser bushbaby (*Galago senegalensis*) in Kenya and Ethiopia. Unpublished report to Primate Action [www.iucnredlist.org](http://www.iucnredlist.org). Fund and Primate Conservation Inc., Washington, D.C.

De Jong, Y.A & Butynski, T.M. 2009. *Primate Biogeography, Diversity, Taxonomy and Conservation of the Coastal Forests of Kenya*. Report to the Critical Ecosystem Partnership Fund. Eastern Africa Primate Diversity and Conservation Program, Nanyuki, Kenya.

De Jong, Y.A. & Butynski, T.M. 2010a. Eastern Africa Primate Platform: Biogeography, Taxonomy, Diversity, and Conservation Status of Primates in Eastern Africa. [www.wildsolutions.nl](http://www.wildsolutions.nl).

De Jong, Y.A. & Butynski, T.M. 2010b. Photographic Maps of the Primates of Kenya and Tanzania: A Tool for Identification and Conservation. *Primate Conservation* 25.

Douglas-Dufresne, H. 2005. Proof positive. *Swara* 28: 68.

EANHS. 1996. *Check-list of the Birds of Kenya* (3<sup>rd</sup> ed.). 1996. Ornithological Subcommittee, East Africa Natural History Society, Nairobi.

Fashing, P.J. & Oates, J.F. In Press. *Colobus guereza* Guereza. In: *The Mammals of Africa*, Vol. 2, Primates, T. M. Butynski, J. Kingdon and J. Kalina (eds.). University of California Press, Berkeley, CA.

Gautier-Hion, A. In Press. *Cercopithecus neglectus* De Brazza's Monkey. In: *The Mammals of Africa*, Vol. 2, Primates, T. M. Butynski, J. Kingdon and J. Kalina (eds.). University of California Press, Berkeley, CA.

Groves, C.P. 2001. *Primate Taxonomy*. Smithsonian Institution Press, Washington D.C. 350 pp.

Hacker, J.E. Cowlshaw, G & Williams, P.H. 1998. Patterns of African Primate Diversity and their Evaluation for the Selection of Conservation Areas. *Biological Conservation* 84: 251-262.

Isbell, L.A. & Enstam Jaffe, K. In Press. *Chlorocebus pygerythrus* Vervet. In: *The Mammals of Africa*, Vol. 2, Primates, T. M. Butynski, J. Kingdon and J. Kalina (eds.). University of California Press, Berkeley, CA.

IUCN 2010. *The IUCN Redlist of Threatened Species*. Website: [www.iucnredlist.org](http://www.iucnredlist.org).

Kingdon, J. 1971. *East African Mammals, an Atlas of Evolutions in Africa*. Vol I. Academic Press, London.

Kingdon, J. 1997. *The Kingdon Field Guide to African Mammals*. Academic Press, San Francisco. 476 pp.

Mwenja, I. 2007. A new population of De Brazza's monkey in Kenya. *Primate Conservation* 22: 117-122.

Mwenja, I. 2008. The distribution of the Endangered Mt Uargues guereza, the de Brazza's, the Patas, and the Sykes' monkey, the Somali and Senegal lesser galagos in Samburu, northern Kenya. Unpublished report to the Rufford Small Grants Foundation. 31 pp.

Mwenja, I. 2009. *Rare endangered colobus monkey facing extinction in Northern Kenya*. Website: [www.newdesignworld.com](http://www.newdesignworld.com).

Northern Rangeland Trust 2010. *Namunyak Wildlife Conservation Trust*. [www.nrt-kenya.org](http://www.nrt-kenya.org).

Struhsaker, T.T. 2007. Long-term research and conservation in Kibale National Park. In: Wrangham, R. & Ross, E (eds). *Science and Conservation in African Forests. The benefits of long-term research*. Cambridge University Press, Cambridge UK. Pp 27-37.

Thouless, C.R. 1993. Laikipia Elephant Project, final report to the Kenya Wildlife Service, Worldwide Fund for Nature, Zoological Society of London and Gallmann Memorial Foundation.

White, L. & Edwards, A. 2000. Conservation Research in the African Rain Forests, A Technical Handbook. Wildlife Conservation Society, New York, USA. Pp. 454.