The Distribution and Conservation Status of De Brazza Monkey (*Cercopithecus neglectus*) in the Mathews Range Forest Reserve in Samburu Kenya.

© Helen Douglas-Dufresne

Principal Investigator: Iregi Mwenja

Associate Research scientist

Institute of Primate Research of the National Museums of Kenya

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CONSERVATION INTERNATIONAL

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Acronyms

a.s.l.	Above Sea Level
CI	Conservation International
FFI	Fauna and Flora International
IUCN	World Conservation union
KIFCON	Kenya Indigenous Forest Conservation Programme

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Abstract

The De Brazza monkey (*Cercopithecus neglectus*) is endangered in Kenya due to rapid habitat loss, (Kingdon, 1997), but much of its ecology and conservation status remain unknown due to its cryptic nature and the few number of studies carried out locally. Western Kenya was the hitherto known eastern most range of the species on the continent until the discovery of a new population in the Mathew ranges, east of the Eastern arm of The Great Rift Valley. This discovery on the eastern region of the Great Rift Valley came as big a surprise to many primatologists.

This first study on the satellite population aimed at mapping the species distribution in the Mathews Range Forest Reserve and establishing its conservation status in order to recommend viable *in-situ* conservation interventions. Field observations, line transects and interviews were the methods employed to meet the objectives. The project recruited and trained 18 scouts and guides from the local Samburu people who worked with the team during the entire project duration. Some of the scouts now working for the Milgis Trust continue with the species monitoring.

During the survey, 162 De Brazza distributed in 24 troops were counted in fourteen (14) separate *laggas* (river valleys). Surprisingly, the first ever record of De Brazza occurring above 2100m a.s.l. was recorded here at 2203m. a.s.l. By Extrapolating information gathered on this study - from the interviews and the field observations, the population of the entire Mathews Range Forest Reserve was estimated at 200-300. Again, during the study, our scouts confirmed the species sightings in the neighbouring Leroghi and Ndotto forests, meaning the population in the region is even higher. Mt Nyiru in the north is also suspected to harbour the species.

The Mathews Range Forest Reserve is generally not under any severe anthropogenic pressure due to its remote location and the sparse human population neighbouring the forest. But there is human and livestock encroachment in the forest in search of pasture, honey and medicinal herbs. These human activities are mostly directed at the lower slopes, (between 850m -1300 m asl where 75% of the De Brazza occur); of the evergreen riverine forest leading to serious human/De Brazza conflict. Livestock incursion is more common and more serious during the dry season and periods of drought. The livestock are brought to the forest and fed on the branches of the riverine tree species, significantly degrading the De Brazza habitat.

It was evident from the field study that little is known on the primates in the four (4) Forest Reserves of Samburu including the little known Endangered endemic Black and white Colobus IUCN (2006). With a confirmation of the occurrence of the two species in the four Forest Reserves, a survey to document their distribution and conservation status is urgent and should be carried out sooner rather than later so that *in-situ* conservation measures can be initiated before it is too late. This more so for Leroghi forest which currently faces serious habitat degradation.

1.0 Introduction

1.1 Background information

The De Brazza (*Cercopithecus neglectus*) is a rare monkey in Kenya facing threats of local extinction. The species is found across Equatorial Africa with a wide but discontinuous distribution in all places it occurs. While widespread in Central and West Africa, it is rare and found in isolated pockets in East Africa. De Brazza inhabits the forest along the banks of streams and rivers, preferring the mid and lower canopy layers. These areas generally have a very dense understory, which is necessary for forage and camouflage of the De Brazza.

Nevertheless, very little has been done on the survival of this species in the country. Previous studies, a comprehensive one in 1983, a census in 1998, and a preliminary Rapid National Survey conducted in 2004 are the only known national level studies on the species in Kenya. I believe that there are some populations of this species which are sparsely distributed, not documented but still remain. This inadequacy of information can largely be attributed to the low level of awareness on the species ecology and distribution in Kenya.

Respectable primatologists in Kenya among them Booth (1962), L. Leakey (1969), Brennan and Else (1984), Tsingalia (1987), Wahome (1989) and Karere (1995) have in the past warned that the species faces local extinction due to the rapid habitat loss and population decline, unless urgent conservation measures are taken to save the few remaining and protect their dwindling habitats. The threats are as a result of human population increase and advances in modern technology putting a lot of pressure on the land to meet rising demand for arable land for agricultural production, settlement and infrastructure development.

Earlier studies (Brennan, 1984; Karere, 1995; Olubayo, 1998) were brief and partial. They had missed out on many troops widely distributed over western Kenya which were later discovered and studied in the 2006 Western Kenya De Brazza Survey. The additional sightings in that survey led to the review of the estimates of the De Brazza population in western Kenya upward from 200 to 716 (Mwenja 2006).

The discovery of the Mathews Range Forest Reserve population, a population outside the species known geographic range in Africa – East of the Great Rift Valley, was reported by Helen Douglas-Dufresne and Grete Davey. They spotted the species five years ago and published photographic evidence in *Swara* in 2004 (Douglas-Dufresne, 2004). This pioneering study on the satellite population has looked into collecting baseline data on the spatial distribution, threats and relative abundance of De Brazza in the Mathews range opening the population to future studies and proactive conservation interventions. The Mathews range is an isolated habitat that lies outside the species known ecological and geographical range in Africa.

There are no serious threats facing the Mathew's Range Forest Reserve currently, but there are sporadic cases of tree cutting of branches and debarking in pursuit of honey and cattle pasture, and herbs (Bronner 1990). The low anthropogenic pressure on the forest is mainly due to the remoteness of the place and the sparse human population areas

adjacent to the forest. The Samburu simple way of life - nomadic cattle rearing - has little negative impact on the forest ecosystems where they only venture during the dry season in search of pasture and water.

1.2 Species information

Physical Characteristics

They are among the most handsome species of primates but least known African forest primates. Its most unmistakable feature is its white beard and muzzle; highlighted by a chestnut brown patch - even the young are born with a beard (Kingdon 1971; Olubayo, *et al* 1998). The coat is pale blue-grey in colour, accented with a thin white strip running down along the hind leg, with a pure white rump. The newly born have a brown coat with an indistinct white chin. They do not acquire the distinctive white beard or chestnut brow patch until they are 13-15 months.

Figure1: A male and female De Brazza monkey at the institute of Primate research.

De Brazza's are strongly sexually dimorphic. On average the male weighs 7 Kg (15 pounds) and the female reaching only up to 4.5 Kg (10 pounds) (Kingdon 1971, Gautier-Hion and Gautier 1978, Norwak 1991). Males become sexually mature at 4 years of age but do not generally breed until 6-8 years. Females mature at three years but breed at 4-5 years (Brennan 1989, Harvey 1985). Male head to body length is 19 to 23.5 inches (47.5 to 52 cm) and the tail length is 23-31 inches (57.5-77.5 cm). Female head and body length is15.5-21.5 inches (39-54cm) and the tail length 18.5-22.5 inches (46-56cm). The tail length is longer than the combined head-body length.

Unlike other species of primates, De Brazza rarely use group calls, and social alarm calls are absent (Mate *et al*, 1995). Not only are they the only species of guenon that does not respond to alarm calls of other monkey species, but also actively avoid contact with other animals. In the rare encounters that do occur, they utilize predatory behaviour of silence and concealment (McGraw 1994). When fully frightened, males will shake branches and bark to divert attention from the group (Gautier-Hion, 1988). As a result the male may even attack the predator in defence of the troop.

Ecology

The De Brazza monkey is one of the most unusual species in the group of old world monkeys commonly known as guenons (Nowak 1991; MacDonald 1993). Though they are good swimmers, De Brazza are arboreal, spending 70% of

their time in the understory and 20% on the ground (Gautier-Hion, 1988). They live in forests along the banks of streams and rivers, at the mid or lower canopy layers of the forest. They are diurnal, spending the majority of their time at the lower canopy or on the forest floor feeding. They are omnivores, primarily feeding on fruits and seeds, leaves, arthropods, flowers and mushrooms (Staaden, 1996). Once a food source has been located, they will visit the source repeatedly, resulting in not even a half-eaten fruit being left behind (Rowe, 1996). Occasionally they will also eat small mammals and birds (Lee 1988, Eng 2000).

Figure2: The species inhabits the mountain lower elevation preferring low canopy riverine forest with thick undergrowth for cover.

Predators are avoided by concealment, large inter-individual distances within troops, relatively small group sizes, and avoidance of polyspecific associations (Gautier-Hion and Gautier 1978, Wahome 1989). Females generally give birth to single offspring, although twins rarely occur. Their gestation period lasts between 177 and 187 days with an inter-birth interval of 12 months (Brennan 1989). Lifespan in the wild is up to 22 years and in captivity up to 30 years.

Distribution

In Africa the De Brazza monkey inhabits Equatorial African forests from Guinea to Ethiopia. It is largely riparian and much of it remains unknown. It is fairly common in its core range within the Riparian and swampy forest in the Congo Basin from S.E Cameroon, Equatorial Guinea, Angola, and in extreme Eastern and Western Uganda and Western Kenya (Brennan, 1984; Decker, 1985). Pockets of population are also found in some parts of South West Ethiopia and Southern Sudan. In Kenya, the species is rare and occurs in small isolated populations some of which inhabit privately owned land. Habitat destruction mainly through deforestation to pave way for agriculture remains a major threat and cause for the alarming decline of the De Brazza's population in Kenya (Brennan 1985).

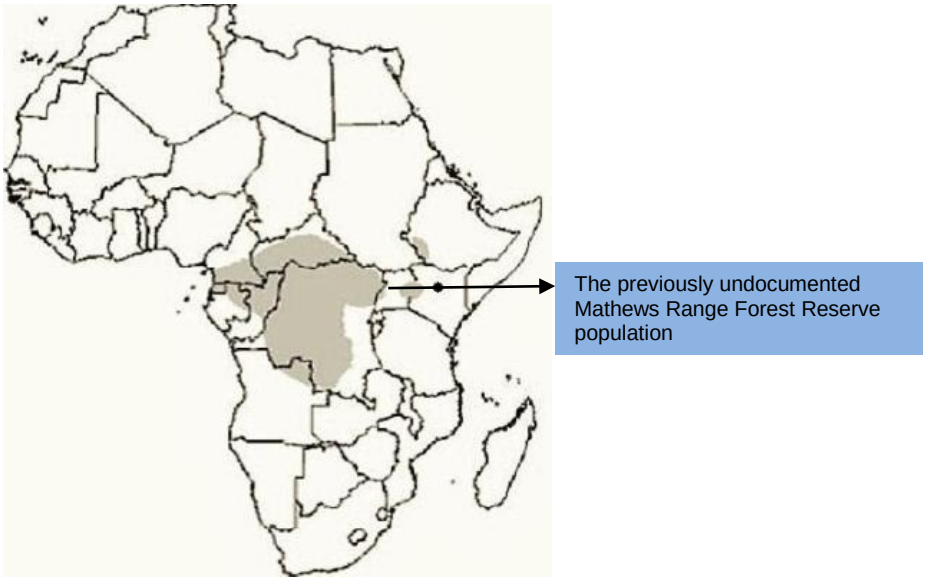


Figure 3: Map of Africa showing the distribution of the species Cercopithecus neglectus in the continent.

De Brazza monkey is known to be at risk of local extinction with high sub-populations confined in the Cherang'any hills, Saiwa Swamp National Park, Mt. Elgon, Kisere and Kakamega Forests, the previously known range of the species. Despite its existence in the named western Kenya ecological sites, it is only accorded formal protection in Mt. Elgon and Saiwa Swamp National Parks only. However, the range of the De Brazza was recently expanded eastward with the discovery of Mathew's Range population (Mwenja 2004; Douglas-Dufresne, 2005). The species is not only restricted to swampy forests throughout its range; it has a tolerance for altitude ranging up to 2100m and is found in closed forests, in bamboo and along the water courses of dry montane forest (Kingdon, 1974). The species is characterized by concealment in the face of predators, large individual distances within troops, (Gautier-Hion and gautier, 1978), relatively small group sizes and avoidance of polyspecific associations (Gautier-Hion and Gautier 1978, Wahome *et al* 1993). In Kenya, they are reported to be tolerant of black and white colobus monkeys (*Colobus spp).*

Social Organization

De Brazza's social organization is partially known. It is reported that East Africa De Brazzas tend to be polygamous whereas those in Gabon are monogamous in their family structures. The Gabon type lives in small monogamous groups comprising of an adult male, adult female and one or two off-springs. However, those in Kenya have troops consisting of more than one adult female. These have been observed in Kisere, Kakamega and Saiwa Swamp, hence suggesting the possibility of differences in inter-population in social structure. The species exhibit timed daily diurnal activities. Feeding in the early morning and late afternoon around the sleeping sites is remarkable. Grooming and resting occur at mid-day while movement is intense during feeding especially between feeding trees. They are mainly frugivores consuming varieties of trees. They are omnivores like other cercopithecines and feed on leaves and insects to supplement the fruit diet with other vital nutrients. Reproductive patterns of De Brazza are unknown in the wild. However, in captivity first pregnancy occurs at three and half years, earlier than in most Cercopithecus which is four years on average. Their gestation period is estimated at 170 days with breeding in captivity occurring throughout the year.

Conservation Status

De Brazza monkey in Kenya, Uganda and Ethiopia are endangered due to rapid habitat lose (Kingdon, 1997). The most critical factor endangering primate populations is habitat destruction (Mittermeir and cheney 1987, Oates 1996). Particularly, this has been through rapid deforestation to meet the rising demand for agricultural land, settlement, domestic fuel, and timber as a result of explosive human population growth. Other threats include competition with other primates, trade and hunting for bush meat. However, the surviving small populations of the species have been and continue to be pushed up stream to higher altitudes or left in small isolated remnant habitats that cannot sustain them and severely expose them to poaching (Mwenja 2004). Today the largest population is straddled in very thin, increasingly fragmented strips of riparian forest on privately owned land, usually in small isolated groups. These pockets maintain troops comprising of a few monkeys, which may not be genetically viable (Brennan 1984, Mwenja 2004). Low fertility rate and high infant mortality makes it difficult for De Brazza to respond to strong anthropogenic forces (Brennan 1989, Eng 2000). Approximately 23% of females and 20% of males die before reaching one year of age (Staaden 1996). Population density per square kilometre in Gabon was estimated to be 28 -50 De Brazza per square kilometre (Quaries, 1976; Gautier-Hion, 1978) while in western Kenya' Saiwa Swamp National Park the estimate is 35 De Brazza (Brennan 1984, Wahome 1989).

The CBSG IUCN/SSC supplement of global captive action plan for primates suggested over 100 000 De Brazza in Africa (Discussion Edition, 15 September 1991). The species is listed in "appendix II" in the CITES list (UNEP-WCMA 2005), while IUCN gives De Brazza a conservation rank of 3 out of 6, with the degree of threat rated as 1 (i.e. low risk of extinction at present) and taxonomic distinctiveness rated as 2 (i.e. not more than one close relative), while the U.S Fish and Wildlife Service has not listed this species (Staaden 1996). However, the species status in Kenya and in the Eastern most range is less than 1 percent of the continent population, which is far worse than in the Congo Basin where these general listings are largely derived from. While large populations of De Brazza are found in Central Africa (Gautier-Hion and Gautier 1978), the population in Kenya is low and under immense anthropogenic pressure (Brennan 1985, Brennan and Else 1984, Decker 1985). The America Zoo and Aquarium Association (AZA) currently sponsors 84 Species Survival Plan (SSPs), programs that manage captive populations of endangered and threatened animals. One SSP however, was awarded to a list that is not listed - the De Brazza monkey. Unlike many programs whose immediate goal is to prevent extinction, the De Brazza program proactively works to prevent future drastic down-to-the-wire conservation.

1.3 Justification

Based on subjective assessments through sightings as well as on extrapolation on the bases of prior surveys, it is certain that the population of the De Brazza is going down owing to habitat alteration and direct persecution. However, since the surveys have largely been intermittent and lacked standardization, the status of the primate cannot be authoritatively ascertained. With the 'discovery' of the Mathew range population the issue was further complicated meriting this study to help in the update of the national status of the species. Unfortunately, most of the recommendations from the previous studies have not been implemented, leaving the De Brazza in a precarious position, threatened with extermination. Among them is continuous survey of the De Brazza population in the country, which the present study tries to achieve. In addition, population structure, a factor crucial in understanding the species population growth trends,

habitat disturbances, and social organization is also critical. Such factors are necessary to make informed decisions in designing the conservation intervention of any threatened or endangered species.

Moreover, adverse effects that affect the survival of any species require elimination or mitigation measures. Nonetheless, it is quite challenging to put in place such measures unless the root causes and the threats are known. Consequently, identification of the major threats facing the Mathew range De Brazza's population is significant in deciding on early and professional interventions to safeguard the species and its habitat. This study being the first ever for this population provides the baseline information to be the stepping-stone for further research work geared towards sustainable conservation and management of the De Brazza in the Mathews range.

1.4 Objectives of the Study

Main Goal

Improved awareness on the De Brazza monkey among key stakeholders and enhanced conservation of the species in the Mathews Range Forest Reserve.

Specific Objectives

1. To determine the population status and map the distribution of the De Brazza monkey in the Mathews Range.
2. To identify some of the threats facing the De Brazza monkey in the Mathews Range.
3. To draw recommendations on possible conservation options for the De Brazza monkey in the Mathews Range.

2.0 Methodology

2.1 Description of study area

Location and size

The Mathews Range is an isolated habitat that was originally gazetted in 1956 as Crown Forest, primarily for the protection of water catchment areas, and was in 1964 declared a Central Forest. The original area was 231,700 acres. There have been no excisions and the gazetted area following metrication is now 93,765 Ha. KIFCON has represented the best available estimate at the present time of 97,400 Ha, 3.8 % higher than the officially recorded gazetted area. The forest is located in Samburu District and falls under the administration of the District Forest Office (DFO), Maralal.

Table 1. The Mathew range forest conservation and protection status

Details	**Legal notice**	**Date**	**Area (Ha)**
Gazettement as crown forest, Boundary Plan 175/41	454	1956	93 765
Declared Central Forest	174	1964	93 765
Gazetted Forest Reserve Area			**93 675**

Source KIFCON 1994

Topography, Soil and Climate

The Mathews Range forms the southern part of a mountain chain, running in an approximately north/south direction, crossing the savannah plains of Samburu District. The highest point of the Mathews Range also referred to as Ol Doinyo Lenkiyo, is the southern outlier called Warges rising to 2,688m. The Mathews Range points further to the north on the main range rising to 2 375m. The geology of the Mathews Range can be described as a cretaceous peneplain lying at around 2,200m, and formed since the Precambrian. The soils are developed on an undifferentiated basement system, rocks predominantly gneisses, rich in iron-magnesium minerals, and comprise mainly eutric cambisols with lithosols and eutric regosols. They are somewhat excessively drained, shallow to moderate deep, reddish brown, friable sandy clay loams. On the lower slopes of the mountain are a high proportion of stones and at the higher elevation soils are quite acidic (KIFCON, 1994).

With the exception of Ewaso Ngiro there are no permanent rivers in Samburu District. Drainage takes place in “laggas” – drainage lines that only contain water after heavy rainfall. Seepage from “laggas” is the main source of ground water replenishment in the lowland areas. Most of the ground water present in aquifers is not supplied from “laggas” but from the forested mountain areas. Here rainfall is higher and because of better soil conditions more water seeps into the ground instead of flowing away on the surface. The most important role of the Mathews Range is catchment protection and this was the main reason of protection.

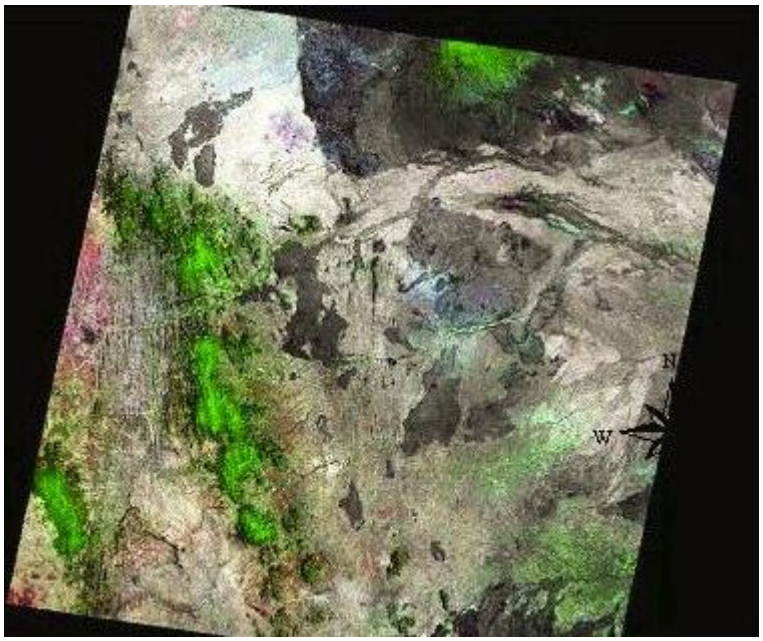


Figure 4: Landsat image showing Mathews range forest in the centre surrounded by dry Samburu plain. The Forest Reserve was gazetted due to its importance as a water catchment area in the region.

Figure 5: Ngeng' River at Ngilai, one of the rivers draining central Mathews.

Mean annual rainfall at Wamba averages below 700mm, with peaks in April and November. Over half of the expected annual precipitation falls in these two months. Little, if any, rain falls between May and October, with December to March also being very dry months. No data on rainfall exists for the mountain areas of the Mathews Range, although Bronner (1990) compared rainfall at Wamba with that at the summit of Warges and a position mid slope over the two month wet season (mid March to mid May 1988) and noted a 179% and 153% increase respectively of the two sites over Wamba. Extrapolation of these results would indicate a mean annual precipitation of 1,000mm mid-slope and over 1,200mm on the top of the Range. Temperatures are high and the mean monthly minimum temperatures for Wamba range from 14°C in the rainy season to 20°C in the dry season. Daily minimum temperatures exceed 30°C in the dry season. Relative humidity often drops below 40% in the late afternoon during the dry season.

Flora and Fauna

There are three main forest types i.e. *Croton megalocarpus* forest, *Juniperus-Olea* forest and mixed *Podocarpus* forest (Beentje 1990). The *Croton megalocarpus* forest is the typical vegetation over the greater area of the Mathews range at

altitudes between 1 500m and 2000m. On its lower border, the *Croton* forest gives way to bushland, whilst above 1,900m it is replaced by *Podocarpus* forest. The number of species found within the *Croton* forest is comparatively low. Other common species include *Teclea simplicifolia* and *Encephalartos hildebrandtii*. The latter is endemic to the Mathews Range and Ndoto Mountains. In general the canopy cover is two-layered, with large individual specimens of *Croton* emerging from a closed lower tree layer. The field layer is well developed only where the tree layer is sparse enough for light to reach the ground.

The *Juniperus/Juniperus-Olea* forest is present only in outlines between the *Croton* and *Podocarpus* forest, unlike in other mountain forested areas of Northern Kenya (e.g. Leroghi Plateau and Mt. Kulal) where it forms a distinct altitudinal belt. The *Podocarpus* forest is the typical vegetation cover above 2,000m and is characterized by a high degree of canopy closure (>75%) a sparse shrub layer, and despite the shade, a well developed field layer, the most typical example of which are species of *Impatiens*. The forest crown is densely covered with epiphytic mosses and lichens. The forest is also characterized by a group of species not found in other forest types: *Lepidotrichilia volkensii, Ekebergia rueppelaina, Teclea nobilis*, *Faurea saligna* and in more open spaces *Dovyalis abyssinica*. Other tree species above 1,900m include *ipomea wightii, Glycine wightii, Thunbergia alata and Conyza pyrrhopappa, Albizia gummifera, Dombeya goetzenii, Croton macrostachyus* etc.

There is a substantial elephant population together with smaller numbers of buffaloes, lions, kudus, waterbucks, bushbucks, forest hogs, Warthogs, porcupines, leopards, Hyenas, Dik diks, etc. There are also endemic sub-species of *Colobus guereza percivali* listed as endangered in the IUCN Redlist (IUCN 2006) vervet monkeys, Baboons and the De Brazza monkey satellite population. The region is high in endemism and there are possibilities that Sykes monkey and prosimians are also present in the neighbouring forest on the north (*personal communication,* Butynski). The avian and butterfly population is also reported to be of note, with several endemic races of butterflies being found in the area (Larsen, 1992). There is also a substantial population of flying mammals, *Megachiropteras* and *Microchiropteras*.

Forest Utilization and Threats

The Mathews Range is barely utilized in terms of timber and wood products. The forest is considered to largely uninfluenced by man (Bronner 1990). The croton forest lies at too high an altitude and too far from any settlement to be convenient for the collection of firewood or production of charcoal. Occasionally, the trees are felled by honey Ndorobo people during honey harvesting. Fire is also not a major threat in the medium and high altitude areas, where even in the dry seasons it is not sufficiently dry, nor is there sufficient fuel loading to allow large fires to spread. Unlike in other parts of the country where the *Podocarpus* forest is under threat from agricultural clearance (e.g. Mt. Kenya and the Aberdares) the Mathews Range has been exempted from such interference because of its inaccessibility and the low population level in the surrounding areas.

The forests of the Mathews Range are used extensively for the grazing of livestock, especially in the dry season and drought years. Grazing was formerly restricted to areas below 1,500m, although the Ndorobo were permitted to graze their animals at higher altitudes. Today grazing within the forest area is theoretically illegal but practically legal. Traditionally, the forest is also used for the collection of food and medicinal plants. The results of several ethno botanical studies (e.g. Ichikawa 1980; Becker 1984; Politz and Lekelely 1988) carried out in Samburu District indicate

that a number of species from the high forest are used by both humans and livestock for consumption and medicinal purposes.

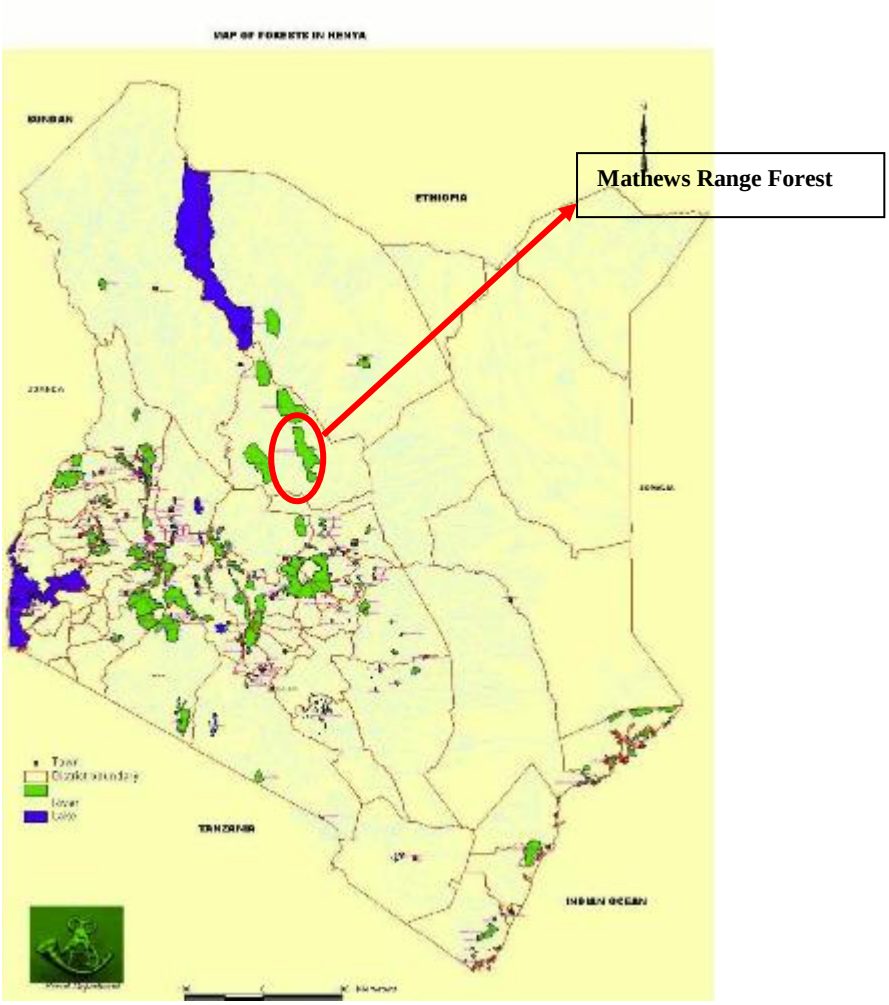


Figure 6: Map of the Forests Reserve of Kenya showing the Mathews range forest reserve

2.2 Materials

1. Cameras
2. Pair of binoculars
3. Global positioning system (GPS)
4. Data sheets
5. Stationary (Field notebooks, clipboards, Pencils and pens)
6. First aid kits
7. Primates identification cards
8. Samburu thematic map

2.3 Data collection

2.3.1 Field observation

General survey methods suitable for collection of data on geographical distribution, estimating densities, assessing habitat and limited information on age and sex composition over a short duration were used (Struhksaker 1981). Six Research assistants with a university degree in the related field were recruited in the study and 18 local guides and scouts. These recruits were first trained on basic primate survey skills and data collection methodologies. The recruits helped in the navigation and location of troops within the dense unexplored forest, while the research assistants did the observation and data recording.

Figure 7: Training local Samburu on how to use a GPS. The projects aim to use the scouts' trained in the successive studies in future.

De Brazza is largely riparian (Hill 1966, Kingdon 1974, Gautier-Hion and Gautier 1978, Wolfheim 1983) and all field visits were directed at the section of the Rivers valleys (*"laggas").* The search was done in the morning hours from 08:00 hours to 11:00 hours and in the afternoon from 15:00 hours to 17:00 hours when the De Brazza's are active. The walk along the "laggas" was slow and quiet, at less than 1km/hr stopping every 60m for 50 seconds. (Butynski, 1984). Since the survey's immediate goal was first to locate the troops in the Mathews range, the natural Transects ("laggas") were used. This was also necessitated by the difficult undulating terrain and inaccessibility of some areas.

All areas in the Mathews Range were covered, starting with those on the periphery and low elevations and then to the interior and higher elevations. Time spent in these regions depended on the area to be covered and accessibility. One region was done first before proceeding to the next to avoid the error of double counting. Each lagga was surveyed at least twice in different times to increase the chances of sighting the De Brazza. *Laggas* adjacent to each other were done simultaneously to avoid double counting the individuals in the groups that could be using two laggas as their home range. All *laggas* were sampled from the foot of the slope to the foot of the cliff or to the top where one or more *laggas* would emerge or where the area is inaccessible.

Figure 8: a tributary of the Wamba River. The rivers have a high population on the endangered Colobus guereza percivali.

2.3.2 Interviews

The interviews were in form of a short semi-structured schedule that largely targeted those who had gone into the forest and had seen the De Brazza's. Many respondents were interviewed but those who had seen the De Brazzas, and their livelihood is highly dependent on the forest were regarded as the key informants. Interviews were meant to compliment the data collected from the field surveys. The information collected via the interviews included the name of the respondent, social-economic aspect (duration of stay, occupation), population and distribution of De Brazza (number seen, area seen, and frequency of sighting), diet and habitat preference.

2.3.3 Data Recording

The data collected was recorded in data sheets that had been well-structured to tackle the question of distribution and abundance of the De Brazza monkey in the Mathews Range. The information gathered included the date, name of the place, time spent (starting and finishing time), number sighted (adults and young), activity, association with other animals, tree species, elevation, GPS co-ordinates, mode of detection and any other important remarks. Each data sheet represented one Lagga, which in turn represented a single transect or sampling unit. Photographs were also taken where possible to compliment the data recorded.

2.3.4 Limitations

1. Inadequate awareness on the species in the area by the local community making it hard to secure guides familiar with the primate and its ecology.
2. There was poor visibility caused by dense under growth and sometimes heavy rainfall limiting the sight distance to only a few meters.
3. The undulating terrain of the study area is very steep and rough in some areas making those areas virtually inaccessible.
4. Lack of established tracks/trails and dense undergrowth making movement very difficult and time consuming.

3.0 Results

3.1 Population Status

A total of 162 De Brazza in 24 troops were seen during the survey. These included 139 adult De Brazza and 23 young ones. These were found in ten separate *laggas* distributed all over the mountain ranges save for the north-western part where presence of the species needs to be investigated further. The areas surveyed included those in the forest interior and at high elevations (Napuruwaso, Olkaera, Manoea, Rapaelpapit Nachapa, Kiserian, Kojos, Ntukunda and Wamba) and those at the periphery of the forest on the lower elevations (Nkii, Murit, Miwaa, Sitin, Nkarenarok and Nkarenaibor). Various tree species were also rated top De Brazza preferences in terms of food and habitat with the ficus species emerging as the most preferred. Though the threats arising from the anthropogenic activities in the forest are generally negligible, the impact of human activities on the lower elevations of Nkarenarok, Nkii, Sitin Miwaa and Murit during the dry season is significant.

3.1.1 Nkii *M34*

Nkii is at the periphery of the Mathews on the Eastern side neighbouring Miwaa to the North, Ntukunda to the west and Andou to the south. This region comprise of three laggas in which two had De Brazza. One troop of 18 individuals was found in the main Nkii lagga and another troop of 5 in the Loipidipid lagga. Altogether Nkii registered a total of 23 individuals with 18 adults and 5 young ones. The highest number of De Brazza in one troop was found here. Tree species recorded here were the *Ficus sycomorus* and *Feidherbia albida*. *Ficus sycomorus* was in its fruiting season with very ripe fruits. The turaco birds were also sighted in plenty in this region as in other areas where the De Brazza was found. The area was the most heavily impacted by human activities like cattle grazing and tree felling to feed livestock.

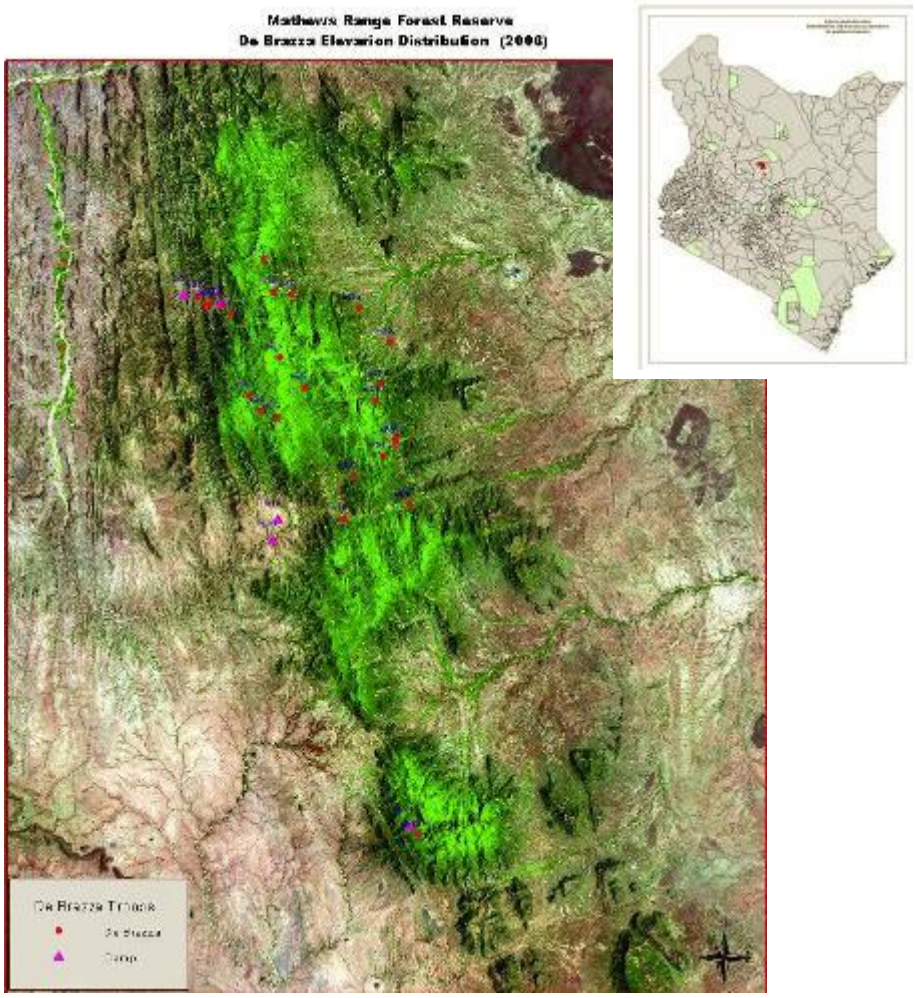
3.1.2 Sitin and Miwaa *M27, M28 M29 M30*

Sitin and Miwaa covers an expansive part of the Northern side of the Mathews range and contains numerous *laggas* most of which are inhabited by the De Brazza. The survey registered a maximum of 51 De Brazza, all in eight different troops. The *laggas* surveyed included the Tulupu with 10 De Brazza sighted, Namgel with 5, Sereleiyai 4, Serenolpere 6, Serekin 3, Karepo 4, Ntukunda 7, Sereleiyai 10 and Nolkupuli 2. This brought the total number of De Brazza counted in the region to 51, exceeding the Nkii population by far. Tree species on which the De Brazza was seen feeding or resting included the *Harrisonia abyssinica, Scutia myrtina, Faidherbia albida, Vepris nobilis* and *Rhamnus staddo.*

3.1.3 Nkarenarok *M3, M5, M8, M35*

The region is situated to the West in the Mathews range and contains a considerable population of De Brazza which are more noticeable than in any other region because of the open vegetation and gentle topography. The region has two main laggas i.e. Losing'ate and Lecesei. Two troops, one with thirteen (13) individuals and the other with five (5) were sighted at Lecesei. While two more troops of eight (8) and five (5) individuals at Losing'ate bringing the total sighted to 31 in this area. The fruiting *Ficus sycomorus* species of tree dominant in the area was evidently the most preferred for food. A group of vervet monkeys were twice recorded feeding together with the De Brazza monkey, a very rare and strange occurrence as the two species have been recorded to be intolerant in other parts in Kenya. A group of baboons was also seen here.

Figure 9: Nkarenarok river.



3.1.4 Andou, Murit, and Nkarenaibor, *M18, M19*

These areas are located on the southern to eastern side of the Mathews Range. Murit is located between Andou and Nkarenaibor with Ndonyowasin to the East, Andou borders Nkii to the north and Nkarenaibor is adjacent to Ngilai and the KWS ground. The survey registered 17 De Brazza within one troop in Murit in the main *lagga* called Mpaga. The troop had a total of 4 young ones. The other *laggas* neighbouring Murit had no De Brazza recorded. The animals were found at a bush of *Scutia myrtina* trees feeding on the lush green leaves of these trees.

3.1.5 Kiserian and Kojos *M22*

These areas have one *lagga* with each draining their water into the main Ng'eny River. At the foot of these *laggas* the vegetation was marked with small shrubs, the height gradually increasing almost simultaneously with the altitude. One De Brazza was sighted in each of these two regions during the survey bringing the total to two (2). At the highest elevation on Kiserian, a group of black and white Colobus Monkeys was detected by vocalization. The tree species dominating the area were *Teclea simplicifolia* and *Vangueria madagascariensis.*

3.1.6 Ntukunda *M17*

Ntukunda is in mid-altitude bordering Nkii, Miwaa, and Kojos on the lower sides. It lies on the Eastern side of the Mathews and is dominated by a dense forest of very tall trees. Throughout the survey three (3) De Brazza were observed in Ntukunda near the slopes of Miwaa. These animals were sighted together with a group of more than 10 black and white Colobus monkeys and then escaped toward Miwaa. A total of three (3) groups of black and white Colobus monkeys were sighted in Ntukunda and two (2) more detected through territorial calls.

Figure 10: An infant black and white colobus that dropped from the grip of its mother in Ntukunda.

Figure 11: Lesipiti, a local 'Ndorobo' holding the C.g. percivali infant before re-uniting it with the mother.

3.1.7 Napuruwaso *M24*

The region is located to the west of Kitich Camp. It is in the central part of the Mathews together with Nashapa, Olkaela, and Ng'eny and contains very tall and dense vegetations. The two days survey (14 man hours), yielded a total of 7 De Brazza; 4 adults and 3 young ones all in one group at the top of the canopy. These animals were less wary and even came to the lower branches indicating minimum persecution from people in the area. This tolerance of human presence is probably due to fewer disturbances from human presence since the area is at a high altitude and is far from human settlement. The altitude taken was 2059m. No Colobus monkey was recorded in this region. Other notable species of wildlife found here were a troop of baboons, turacos and forest hornbills. The tree species recorded were *podocarpus falcutus* and *Ficus Thoningi*

3.1.8 Rapaelpapit *M23*

Rapaelpapit neighbours Napuruwaso and Olkaera and has the same vegetation and altitudinal characteristics as Napuruwaso. A group of 3 De Brazza was sighted at Nolkileju *Lagga*, feeding on a *Podocarpus falcatus* tree, all of them adults. Other notable species of wildlife found here were a troop of baboons, turacos and forest hornbills. Though the area has very tall and dense vegetation similar to that preferred by the black and white Colobus monkey, none was sighted.

3.1.9 Olkaera *M22*

Olkaera neighbours Rapaelpapit and Manoea with considerable thick and tall vegetation and a high altitude. It has the highest altitude recorded of all the areas surveyed of 2203m. One De Brazza was recorded here (within a period of a 15.5 man hours survey), resting on a *Faidherbia albida* tree species. Other species of wildlife recorded here were lions, buffaloes, forest dik dik, porcupines, turacos, and forest hornbills.

3.1.10 Manoea and Nashapa *M25*

From Olkaera is the Manoea region that borders Nashapa to the West. This region is closely similar to Olkaera in term of altitude and vegetation. No De Brazza was found here. Nashapa is a bit extensive and borders Sitin to the North and Nkarenarok to the West. The vegetation is short and shrubby. One De Brazza was found here. Black and white Colobus monkey vocalization could be heard on Nashapa *lagga*.

3.1.11 Rocheta *M26*

This *lagga* drains into the Ng'eng River just like Nashapa and Manoea on the higher elevations. The troop occurred near a trail of a well visited tourist Camp which has used this trail for decades without sighting the De Brazza troop at Rocheta. These areas have very high canopy and thick undergrowth. Seven De Brazza were observed at Ng'eny but none at Rocheta. The fish eagle, leopards, elephants and the baboons are common here.

3.1.12 Ndoinyo lenkiyu *M37*

Ol Ndoinyo lenkiyu also known as the Mathews point is centrally located on the Mathews Range above Nkarenarok. It is the furthest area that was surveyed to the west. This area recorded 10 individuals in one troop.

3.1.13 Wamba *M13*

Wamba *lagga*, whose main river drains at Mt Uaragess, is located on the southern part of Mathews Range Forest Reserve. A total of seven monkeys all in one troop were recorded here. Numerous troops of black and white Colobus monkeys were also seen here and this was believed to be the main habitat for the endemic Black and white Colobus, *Colobus guereza percivali* hence its common name, the Mt Uaragess Black and white Colobus. However, larger populations of this IUCN listed endangered sub-species were recorded throughout the study in the Mathews range and reliable reports of sightings from neighbouring forests – Ndotto, Mt. Nyiru and Leroghi also collected.

Figure 12: Endangered black and white colobus on a juniperus tree in Mt Uarges.

3.2 Results Tables

Table 1: Summary of distribution and abundance of De Brazza in the Mathew's Range

Lugga	GPS Coordinates (°)	Elevation (m)	No. Seen		Preferred trees	Other spp seen
			Adults	**Young**		
Napuruwaso	N 01.17571 E 037.26918	2059	*4*	*3*	*Podocarpus falcatus*	Baboons, Turaco, Forest hornbills
Rapaelpapit	N 01.25451 E 037.25695	2054	*3*	*0*	*Podocarpus falcatus*	Baboons, Turaco, Forest hornbills
Nachapa	N 01.29343 E 037.27028	1897	*1*	*0*	-	Turaco, Forest hornbills
Olkaela	N 01.24943 E 037.26859	2203	*1*	*0*	*Feidherbia albida*	Lion, Buffalos, Turaco, duiker
Rocheta	N 01.27118 E 037.28797	1456	*7*	*0*	-	Turaco, Cattle *porrs*
Kiserian	N 01.20616 E 037.34498	1369	*1*	*0*	-	Forest hornbills, Black and white colobus,
Ntukunda	N 01.22111 E 037.34515	-	*3*	*0*	-	Black and white Colobus turaco, buffalos
Nkii	N 1.23174 E 37.3538	1152	*18*	*5*	*Ficus spp.* *Faidherbia albida*	
Murit	N 01.18610 E037.36497		*14*	*3*	*Scutia myrtina*	-
Nkarenarok	N 01.33887 E 037.19995	1157	*26*	*5*	*Ficus sycomorus, Trichilia emetica*	Baboons, hyena, buffalo's elephants
Sitin and Miwaa	N 01.27418 E 037.34284	866 to 1335	*46*	*4*	*Scutia myrtina, Faidherbia albida*	-

Wamba	-	-	*6*	*1*	-	Black & white Colobus monkey, lion, leopard and buffalos
Ndoinyo lenkiyu	-	-	*8*	*2*	-	
TOTAL			***139***	***23***		

Table 2: Relative abundance of De Brazza in percentages

Region	**Abundance**	**No of Troops**	**(%) Rel. abundance**
Nkii	23	2	14.2
Nkarenarok	31	4	19.14
Sitin and Miwaa	50	8	30.86
Napuruwaso	7	1	4.32
Rapaelpapit	3	1	1.85
Olkaera	1	1	0.61
Murit	17	1	10.49
Rcheta	7	1	4.32
Ndoinyo lenkiyu	10	1	6.17
Nashapa	1	1	0.61
Kojos	1	1	0.61
Kiserian	1	1	0.61
Wamba	7	1	4.32
Ntukunda	3	1	1.85
Total	**162**	**24**	**100%**

3.3 Awareness Creation

The local people and Research Assistants were trained on basic De Brazza ecology and conservation, and data collection to equip them with relevant skills to work in the survey and use them to convey the knowledge to a wider audience in the different localities among the local Samburu community. In collaboration with the Milgis Trust, the scouts will be sent to the schools to teach school children on the primates of the region and general wildlife conservation to raise the level of awareness from an early age.

During the field surveys, the community members were also not left behind in the training and awareness creation aimed at raising the level of awareness on the importance of wildlife and the benefits that accrues from their conservation i.e. economic, socio-cultural and environmental. This was done through outreach programs around the villages surrounding the forest targeting local gatherings like "*Barazas"* and tribal meetings.

The people, who have traditionally lived in harmony with wildlife, were very receptive to this message and are quickly embracing the community wildlife conservation concept being practiced in Samburu through establishment of Community Wildlife Conservancies. The local initiative under the umbrella of the Milgis Trust is mobilizing the community in the entire region to embrace this concept by reducing livestock and relaying more on income from eco-tourism.

Figure 13: PI Iregi Mwenja teaching the local Samburu on the primates of the area at Ngilai.

3.4 Threats Facing the De Brazza in the Mathews

The Mathews range forest is uninfluenced by man (Bronner 1990). The riparian vegetation, the ideal habitat for the De Brazza, is however affected during the dry season. In some areas there are little to medium alterations caused by man in pursuit of pasture, food and medicinal herbs.

The most affected habitats are those near settlements with low altitudes and easily accessible. These areas are preferred first during the onset of drought and they are grazed and exhausted first before proceeding to the interior of the Mathews Range. Nkii, Sitin, Nkarenarok, and Murit are such areas at the periphery, which also recorded the highest numbers of De Brazza during the survey. Livestock are fed species of tree like *Faidherbia albida* who's the branches are cut leaving the trunk only. *Faidherbia albida* has soft leaves which sometimes are fed on by the De Brazza to compliment their fruit diet. The other tree species cut from the stem are the *Teclea simplicifolia*. at Kiserian and Ntukunda also to provide pasture to the livestock. Large tree are cut at a low frequency by the honey gatherers in their attempt to access the honey higher up the trees.

Figure 14: Branches are seen re-sprouting after they were cut to feed livestock in the dry season.

In some places, the forest and other vegetation along the rivers have been burned either by the honey collectors or livestock keepers to trigger pasture regeneration and control ticks. Areas near the settlements are largely grazed whereas those far from people are affected by honey and medicinal collection.

Figure 15: Livestock grazing at Sitin, an area leading in the population of De Brazza at the Mathews Range.

There are possible clues of physical persecution of the De Brazza by the local people though not yet confirmed. The De Brazza population near the settlements is very wary compared to those farther away and at higher elevations. Poaching/hunting, poisoning, snaring or any other type of killing of the De Brazza was not evident in the area. Consequently the Forest Reserve is currently one of the least disturbed De Brazza habitats in Kenya. The people living there are pastoralists and their culture does not allow them to kill wildlife for food.

4.0 Discussions

4.1 Population ecology

According to Jonathan Kingdon (1974), (Brennan 1984) and (Wahome 1989) De Brazza keeps close to the water source ranging not farther than 200 meters from the water point. All the De Brazza's seen in the Mathew's Range were within the 200 metres save for one troop at Ntukunda that was seen 1000 metres away from the nearest water source. Their longitudinal range is approximately one kilometre along the direction of the river. They showed a considerable preference to riverine tree species especially *ficus spp*. which dominates their habitats in *Nkii* and *Nkarenarok.*

Seven of the ten most preferred plant species which make up 80% of the de Brazza diet in Kisere Forest Reserve (Wahome 1989) are also found in the Mathews ranges (KIFCON, 1994) where they are also among the most preferred species. This implies that the satellite population's habitat has significant similarities with that in Western Kenya and this could explain the species presence in that isolated habitat and probably explains the absence of the species in other forests in Western Kenya like south Nandi, Buyangu and Isecho forest of the wider Kakamega forest (Mwenja 2006) which has significant differences in the occurrence of the De Brazza's most preferred plant species (Karere 2000).

The top ten most important species used by the de Brazza's monkey in Kisere Forest:

Plant Species in Kisere	Percent Use	**Found in Mathews**
1. Ficus thoningii	*25.4*	***Yes***
2. Celtis durandii	*17.6*	***Yes***
3. Manilkara butugi	*15.9*	***Yes***
4. Chaetacme aristata	*9.5*	***Yes***
5. Neobutome wightii	*7.8*	***yes***
6. Issaglassa taxa	*6.1*	***Not known***
7. Prunus africana	*5.3*	***Not known***
8. Celtis africana	*4.4*	***yes***
9. Ipomoea wightii	*4.4*	***Not Known***
10. Blighie unijugate	*3.6*	***Not known***

Source; Wahome 1989

Others used by the De Brazza in Kisere (Wahome 1989) and also found in Mathews Range forest reserve:

11. Ficus natalensis
12. Strychnos usambarensis
13. Dombeya spp
14. Diospyros abyssinica
15. Croton megalocarpus

De Brazza's in the regions most frequented by man were more wary and they escaped long before one could approach them. This may indicate possible persecution by man. They are generally referred to as cryptic and shy, having a quiet and secretive life (Kingdon 1974), but those deep in the forest were not so wary and even sometimes came to the lower branches giving us a good opportunity count them.

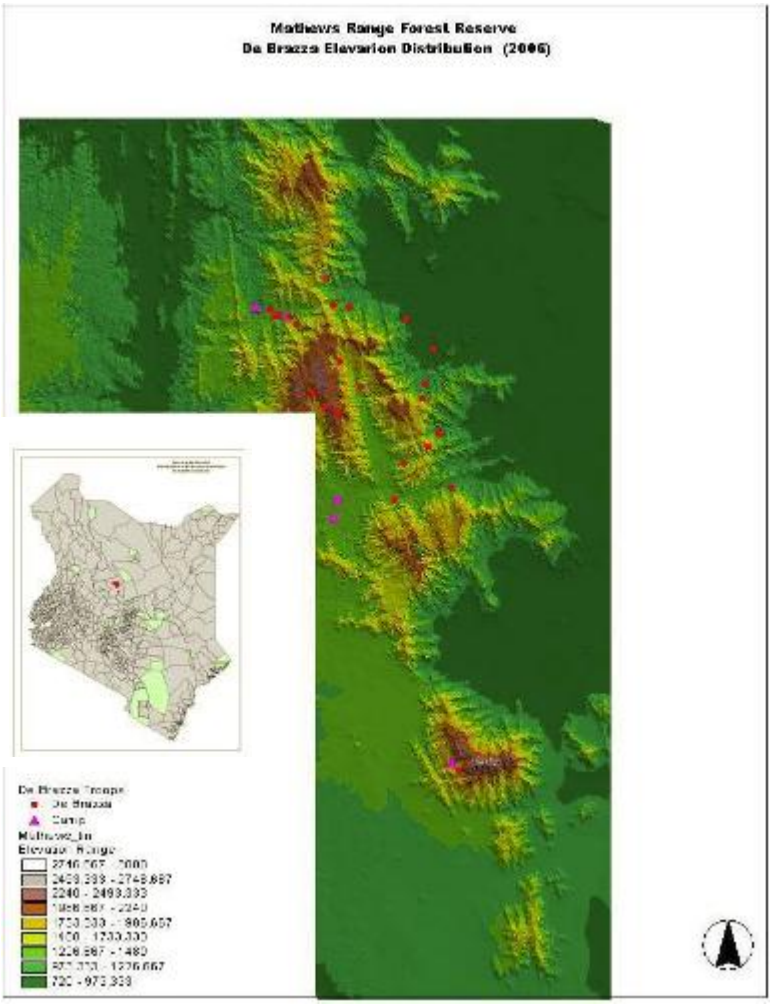
There is also a marked association between the De Brazza and other species. Almost all regions with the De Brazza contained the turacos and sometimes the forest wattle hornbill. These are frugivore birds which may be utilizing the same fruit resources either in competition or facilitated feeding.

There was some notable association of the De Brazza with other primate species including the Vervet, baboons and Colobus monkeys. Unlike in western Kenya where vervet monkeys keep a safe distance from the De Brazza (Mwenja 2006), at Ngarenarok, Vervet were seen on several occasions feeding on the same tree. A group of baboons was observed near the De Brazza at Nkarenarok, Napuruwaso and Nolkileju. Elsewhere at Ntukunda a group of Colobus monkeys was found together with a group of De Brazza. This confirms Mwenja (2004), Wahome (1989) and Decker (1985), that the De Brazza sometimes tolerates the black and white colobus monkey. The Colobus monkeys specialized on feeding at the top of the canopy while the De Brazza at the lower canopy layer (Gautier-Hion, 1988) (Wahome 1989). This niche differentiation between the Colobus and De Brazza helps them coexist.

Kingdon (1971, 1997) put the highest elevation of the species at 2,100m asl, but this was not the case for one troop which was found at slightly above 2,200m asl. However the overwhelming majority of the population inhabited areas of less that 2,100m asl in altitude. 75% of the population was concentrated between 900m asl to 1,300m asl. The remaining 25 % occurred at elevations between 1,300 m asl to 2,200m asl.

Polygamy was observed in most of the troops in the Mathews range with most of the family groups having a dominant male making this population similar to the rest of the populations in Kenya (Wahome, 1989 Brennen, 1984 and Mwenja, 2004), unlike in the Gabon basin where they are monogamous (Gautier-Hion & Gautier, 1978).
Troop sizes recorded ranged from 1-18 similar to Wahome (1993) 1-16 in the Kisere Forest Reserve average 10.1. This total population in 24 troops agrees with these estimates from the two studies.

Though the Mathew's Range Forest Reserve recorded the highest De Brazza population than any other Protected Area in Kenya, most people who live around the forest do not know the animal; more than three quarters have never seen the animals. The few people who know the animals are the 'Ndorobo' people of the Samburu who rely on honey, fruits and herbs from the forest for their livelihood. They spend more time in the forest and are the most knowledgeable on the forest biodiversity.



4.2 Benefits to Local Communities

The study was intentionally designed in such a way that the local community reaps maximum benefit from the research project. The aim was to increase the level of awareness and provide them with basic skills that will help them make informed decision on the protection of the species and its habitat today and in future.

All the scouts and guides who were recruited locally to participate in the study enjoyed free training. They were first trained on data collection techniques and ecology of the De Brazza prior to the Study. This training then provided them with a source of casual employment during the entire duration of data collection. These scouts and guides were picked from "*Manyattas*" from different locations surrounding the Forest Reserve Range. The project participated in conservation of the area not only in disseminating conservation information but also generating income to the local conservation initiative by paying conservation fees to the areas' authority.

The publicity of the area has been improved through this study and will continue doing so with the publication of this report and the subsequent journal and magazine articles. This will potentially market the area to a wider audience worldwide as an eco-tourism destination with rich, cultural and natural resources diversity.

Figure 16: There are lots of beautiful sceneries and attractions making the place ideal for eco-tourism

This study also resulted in improved knowledge of the local people concerning rich and unique biodiversity in the area particularly the De Brazza and the endangered Colobus. These findings are bound to generate a lot of interest from primatologists and other scientists who will develop an interest to study the unique biodiversity of the region.

Figure 17: Eco-tourism should be promoted as one of the sustainable alternative livelihood in the area whose potential has not been fully explored.

5.0 Recommendations

1. Since no de Brazza population was previously known to occur east of The Great Rift Valley, there is need for a genetic analysis of this satellite population to determine whether it exhibit any consideration variations with the rest of the population from which they were separated many years. The area is high in endemism including primate's species like the endangered black and white Colobus and numerous endemic species of flora and fauna.

2. The level of awareness among the local community, governmental and non-governmental organisations working in the area was surprisingly low. Only a few *Ndorobos* who spend a lot of time in the forest gathering honey and fruits knew of this species: *Lmaki.* It is only by creating awareness among all the stakeholders both locally and nationally that this species will be accorded formal protection to save it from the threat of local extinction.

3. The currents threats to the species habitat in the lower elevation of the forest reserve need to be controlled as the cutting of trees during the dry spell to feed livestock offers unfair competition for food to the shy species, destroy its habitat and source of cover leaving it open to predation and therefore interfering with the normal life processes. In some of these areas, livestock were seen inside the forest even during the wettest months of the year. This threat can be mitigated by offering the local communities with alternative sustainable livelihoods like eco-tourism so that they can reduce the number of livestock

4. The conspicuous absence of Kenya Wildlife Service in the Reserve since the relocation of the last Black rhinos to the Lewa Wildlife Conservancy is an issue that should be reconsidered given that there are numerous other endangered species that need close protection and monitoring like the elephants, which come in hundreds in search of food and water from the lower Samburu plains in the dry season. There was also one poacher sighting by the local Milgis Trust scouts last year.

5. The Forest Department should increase the staffing in the Reserve to help control the threats to this forest and help create awareness on sustainable participatory forest management and most importantly, educate the community on the Forest Act 2005 which comes into force January 2007 particularly on the new concept of Participatory Forest Management (PFM).

6. This survey, though successful in mapping the distribution of 24 troops in the forest reserve, was not exhaustive and further investigation needs to be done to locate more troops which could not be seen in the eight-month duration. There are definitely more troops within the Mathews Range Forest Reserve and effort should be made to document them.

7. During the course of the study, it emerged that the De Brazza and endemic Colobus are not confined to the Mathews range alone as earlier held. There are reliable reports of the two species in Leroghi forest, Ndotto forest and Mt Nyiru some of which were confirmed by our own scouts. The population in other forests needs

to be documented as well so that any conservation effort initiated on the two species can also address those in the neighbouring forests. Mt Kulal should also be incorporated since presence of the two cannot be ruled out based on some shared similarity in biodiversity and climatic conditions

8. The possibility of the presence of Sykes monkeys and prosimians which has been suggested by world renowned primatologist Dr Tom Butysnki (*personal Comms.*), should be investigated since very little is known on the primates of this region and more detailed studies are needed to come up with reliable profiles of the primates of Samburu.

9. Milgis Trust, a local conservation initiative by the Samburu people living in the area was formed with the aim of protecting their rich biodiversity resources through sustainable management and advocating for sustainable livelihoods. This noble initiative currently requires external support especially on organizational capacity building, alternative livelihood generation, tourism infrastructure development and marketing of the area for sustainable tourism.

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