



Habitat Preference and Foraging Behaviour in Adult Red-tailed Monkeys (*Cercopithecus ascanius*)

Habitatval och födosöksbeteende hos vuxna rödsvansmarkattor (Cercopithecus ascanius)

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SUMMARY

The red-tailed monkey (*Cercopithecus ascanius*) is a small, alert and active animal inhabiting forests with dense vegetation and as such hard to observe in its natural habitat. The principal aim of this study was to scrutinize whether the methods, previously used in a behavioural study of the blue monkey (*Cercopithecus mitis*) can be applied in studies of the red-tailed monkey's behaviour as well. Additionally, habitat preference and foraging behaviour of the red-tailed monkey were examined. The study was carried out between the 16th and the 22nd of March 2009 in the Sabaringo forest, located on the western border of the Masai Mara National Reserve. Non-lactating and lactating females with their offspring were observed. Because we could not recognise individual animals a focal animal was selected by the proximity to the observer and overall visibility. During this time a total of 66 hours of data was collected of which 54 hours were for adult females and 12 hours for offspring. Recordings of foraging, postural, locomotor and social behaviours were made on foot, employing the interval sampling method. No statistical analyses have been made in this descriptive study. Overall, the monkeys showed clear preference for the tree habitat. Non-lactating females spent a considerable part of their time on the ground but lactating females almost never went there which was most likely a form of an antipredatory behaviour. Sitting was the most common postural behaviour regardless of habitat type whilst lying almost never occurred. Standing but especially moving behaviours were higher in occurrence when the monkeys were on the ground presumably because this open habitat required them to be more alert and vigilant. The performance of "Other behaviour", which was mainly comprised of playing and grooming, was not tremendous. Foraging behaviour occurred in all habitats but most commonly on the ground. A large proportion of the time spent on the ground was dedicated to foraging on fallen fruit but also on leaves which the monkeys picked from low tree branches and saplings. There was a more even distribution between the preferences for leaves and fruits when the monkeys were on trees whilst leaves were favoured in the vine habitat. During the foraging time spent on man-made objects the monkeys were feeding predominantly on "Other food" which included trash, grass and unidentified food. Curiously, we did not record any cases of feeding on arthropod prey despite the fact that the other studies reported this to be an important part of the red-tailed monkey's diet. The methods used in this study proved viable for observations of the red-tailed monkey's behaviour.

Key words: *Cercopithecus ascanius*; Sabaringo forest; habitat preference; foraging; postural behaviour; locomotor behaviour

SAMMANFATTNING

Rödsvansmarkattan (*Cercopithecus ascanius*) är en liten, uppmärksam och aktiv apa som lever i skogar med tät vegetation och är därför svår att observera i dess naturliga habitat. Huvudsyftet i denna studie var att testa om metoderna, som tidigare användes i en beteendestudie på den blå markattan (*Cercopithecus mitis*), kan tillämpas i studier av rödsvansmarkattans beteende. Ytterligare undersöktes rödsvansmarkattans habitatval och födosöksbeteende. Studien genomfördes mellan den 16 och den 22 mars 2009 i Sabaringoskogen, på den västra gränsen av Masai Mara Nationalreservatet. Icke-lakterande och lakterande honor med sina ungar observerades. Eftersom vi inte kunde särskilja mellan individerna valdes fokala djur med avseende på deras närhet till observatören och generell översiktighet. Under denna tid samlades totalt 66 timmar av data in av vilka 54 timmar var för vuxna honor och 12 timmar för ungar. Vi använde intervallregistrering med en-minutsintervall och noterade apornas födosöksbeteende samt kroppsställning, rörelse och socialt beteende. Inga statistiska analyser utfördes i denna deskriptiva studie. Totalt sett prefererade aporna trädhabitat. Icke-lakterande honor spenderade en avsevärd del av sin tid på marken medan lakterande honor nästan aldrig var där vilket antagligen var en form av anti-predator beteende. Sittande var den vanligaste kroppsställningen oavsett habitat medan liggande nästan aldrig förekom. Aporna stod och rörde på sig oftare när de var på marken jämfört med andra habitat, troligen eftersom detta habitat krävde en högre vaksamhet. Annat beteende vilket framför allt inkluderade lek och putsning var ganska lågt förekommande. Fodosöksbeteende förekom i alla habitat men i högst grad när aporna var på marken. En större del av tiden som aporna spenderade på marken åt de frukt men också löv som de plockade från nedre grenar och telningar. För övrigt var löv favoritföda i klängväxthabitat medan aporna åt nästan samma mängder löv och frukt i trädhabitat. När aporna utförde födosöksbeteende på konstgjorda objekt var annan föda, vilket inkluderade sopor, gräs och oidentifierbar föda, mest populär. Inga tillfällen då aporna åt leddjur noterades trots att flera studier nämner dessa som en viktig del av deras kost. De metoder som användes i denna studie visade sig användbara i beteendestudier på rödsvansmarkattor.

Nyckelord: *Cercopithecus ascanius*; Sabaringoskog; habitatval; födosöksbeteende; kroppsställning; rörelse

1. INTRODUCTION

1.1. Red-tailed monkey

The red-tailed monkey (*Cercopithecus ascanius*), also known as schmidt's guenon or coppertail monkey, is a species of primate belonging to the genus *Cercopithecus* in the *Cercopithecidae* family. The taxonomy of this large and diverse genus, often referred to as guenons, is rather complicated. There are several different opinions about its classification, both at the generic and at the specific level. There are five recognised subspecies of the red-tailed monkey today, namely *C. a. ascanius*, *C. a. atrinatus*, *C. a. katangae*, *C. a. schmidti*, and *C. a. whitesidei* (Butynski, 2002; Grubb et al., 2003). The species is native to Angola, Central African Republic, Democratic Republic of Congo, Kenya, Uganda and Zambia (Groves, 2005).

Male and female red-tailed monkeys are very similar in appearance with some sexual dimorphism displayed in body size. Females have an average body mass of 2.9 kg whilst males are slightly heavier, averaging 3.7 kg in body mass (Fleagle, 1999). The dorsal body surface and limbs are covered with speckled grey-brown fur whereas the ventral side is pale cream in colour. The characteristic for this species is the dark blue face with thick long white hairs on the cheeks, white heart-shaped nose spot and russet coloured tail which earned this species its common name (Buxton, 1952).

This diurnal and arboreal monkey (Butynski, 2002) exhibits peak activity at sunrise and sunset (Buxton, 1952). The area occupied by a group of red-tailed monkeys is called a home range and its size varies between 24 and 60 ha. Females and juveniles actively defend their territories whilst adult males are rarely participating (Cords, 1987). The species has a unimale social system. A group comprises of a single adult male, many adult females with their offspring and many juveniles. Young males disperse from their natal groups upon reaching maturity and continue to live a solitary life, temporarily joining groups of females during the breeding season (Cords, 1987; Cowlshaw & Dunbar, 2000). The average group size differs from site to site (McGraw, 1994; Windfelder & Lwanga, 2002; Baranga, 2004a) with upper group size limit appearing to be approximately 50 individuals at which point group fission occurs (Windfelder & Lwanga, 2002). Red-tailed monkeys frequently form polyspecific associations with other members of the *Cercopithecidae* family. A number of studies suggested the reason for this to be antipredatory benefits and increased foraging efficiency (Cords, 2000; McGraw, 1994; Teelen, 2007) whilst others argue that these are merely cases of random associations (Chapman & Chapman, 2000). Hybridisation with other guenon species is not uncommon and fertile hybrids have been recorded at several different locations (Detwiler, 2002).

Red-tailed monkey is listed as Least Concern in The IUCN Red List of Threatened Species because it inhabits a wide variety of habitats and can withstand some hunting pressure due to its relatively high population. However, even though there appear to be no major threats to the species as a whole, it is likely that some local populations may be negatively affected by severe habitat loss or hunting (IUCN, 2009). Additionally, the red-tailed monkey is a potential prey for crowned hawk-eagles (Buxton, 1952; Cords, 2000; Struhsaker & Leakey, 1990), chimpanzees (Watts & Mitani, 2002; Hosaka et al., 2001) and humans (Dupain & Van Elsacker, 2001; Wolfheim, 1983) which also poses a threat for the species. Finally, as

is the case with many other forest-dwelling animals, constant deforestation raises many questions about the future status of the red-tailed monkey (Baranga, 2004b)

1.1.1. Habitat

Primarily an arboreal species, the red-tailed monkey can survive in a wide variety of habitats. This forest-dwelling guenon typically inhabits lowland rain forests, riverine galleries, colonising, secondary growth and regenerating forests as well as acacia woodlands, dry evergreen forests and disturbed deciduous forests near old agricultural areas (Wolfheim, 1983). It is often found near tree fall gaps and forest edges (Thomas, 1991; Baranga, 2004a) occupying lower to mid canopy (Cords, 1987; Gebo & Chapman, 1995) but during the day it can be seen on the ground foraging on fallen fruit and insects (McGraw, 1994). It prefers areas with dense tangled vegetation (Wolfheim, 1983). However, when in mixed-species groups, the red-tailed monkey spends more time in the open (Cords, 1987).

It is not clear as to which extent habitat disturbances affect the populations of red-tailed monkeys. Several studies have found them to be resilient to habitat disturbance. In Kakamega Forest, Mammides et al. (2008) noted that the most disturbed forest area had the highest monkey density. Conversely, in Kibale Forest National Park red-tail monkeys were abundant in all areas except for the most logged ones, where the population density continues to decline even decades after logging (Baranga, 2004b; Chapman et al., 2000). Furthermore, Gillespie et al. (2005) showed that the monkeys from logged forest in Kibale National Park had higher prevalence of parasites compared to those from undisturbed forest and argued the reason for this to be dietary stress resulting in lowered immune system.

1.1.2. Locomotor and postural behaviour

The red-tailed monkey spends most of its time in lower or mid canopy, sitting on a medium or a small sized support. During feeding, the monkey usually uses a horizontal support and bipedal standing as posture whereas it employs standing and reclining postural behaviours when resting. Males and females do not demonstrate any appreciable differences in locomotor behaviour. The monkey prefers to move by climbing and quadrupedalism, utilising vertical supports (Gebo & Chapman, 1995). Struhsaker (1980) suggested that this locomotor behaviour is closely associated with foraging behaviour, specifically searching for arthropod food and fruits of optimal ripeness. Additionally, the red-tailed monkey possesses postcranial adaptation that points towards tendencies for climbing and leaping (McGraw, 2000). It usually leaps from horizontal to horizontal or oblique to oblique supports. Most of the leaps are less than two body lengths in distance, although a leap can span up to six body lengths. Leaping, however, is not as common locomotor behaviour as one might expect from a monkey of this size (Gebo & Chapman, 1995).

1.1.3. Foraging behaviour

The red-tailed monkey is, like most other guenons, mainly frugivorous (Cords, 1987; Chapman et al., 2002) and serves an important role in the ecosystem as a seed disperser (Lambert, 1999; 2001). Its diet exhibits daily as well as seasonal variation when it comes to plant specific material. Fruits are mostly popular in the morning and in the evening whilst

leaves and invertebrates are favoured during the day. Fruit and leaf consumption have bimodal annual distribution, with fruit consumption peaking during the middle of the dry and rainy seasons (Cords, 1987). The red-tailed monkey is a generalist in diet, and despite its small body size is able to extract nutrients from high fibre food (Lambert, 2002; Wrangham et al., 1998). Fruit is high in energy but low in protein, and minerals. Lipid availability is highly variable depending on tree species but most fruit tends to be low on lipids (Rode et al., 2006). Therefore the red-tailed monkey often supplements its diet with other non-fruit plant material or lower-quality food (Lambert, 2002; Wrangham et al., 1998) and arthropods, even during the periods of ripe fruit abundance. Insects are a major source of protein which the monkey captures from surfaces of the leaves, stems and twigs (Cords, 1986). Moreover, the red-tailed monkey has been observed to hunt green pigeons (*Treron calva*) by employing stalking strategies (Furuichi, 2006). Notorious as a crop raider (Cowlshaw & Dunbar, 2000), it has also been reported to steal from crops of pineapples, passion fruits, bananas, maize, millet, beans and pumpkins (Wolfheim, 1983).

The red tailed monkey developed several strategies to maximise its food intake. It has elongated cheek pouches which are used for food storage (Rode et al., 2006) and presumably to soften unripe fruit and initiate digestion (Lambert, 1999). It is often seen in mixed-species groups with other primates which presumably increases its foraging efficiency. Cords (1987) observed these associations in Kakamega Forest and suggested that red-tailed monkeys used the blue monkeys (*Cercopithecus mitis*) as guides to food sites not recently fed upon thus improving their consumption of ripe fruit. Enstam and Isbell (2007) proposed that other beneficiary effects of polyspecific associations also include access to otherwise unavailable food, increased prey capture rate and reduced scramble competition. Furthermore, in Kibale Forest National Park, where the density of primates is high, the red tailed monkey is known to rise early to forage before other primates arrive at the food source (Struhsaker, 1978 in Baranga 2004b).

1.2. Aims of the study

Red-tailed monkeys are small, alert, very active animals and as such hard to observe in the dense foliage and to follow through the thick undergrowth of the forests they inhabit. The principal aim of this study was to scrutinize whether the methods, previously used in a behavioural study of the blue monkey (*Cercopithecus mitis*), can be applied in studies of the red-tailed monkey's behaviour as well. Additionally, the aims of the study were to examine the habitat use of the group of red-tailed monkeys in the Sabaringo forest, focusing on the differences in habitat preference between lactating and non-lactating females and common behaviours occurring in different habitats as well as to examine foraging behaviour and determine which food they show preference for in different habitats.

2. MATERIAL AND METHOD

2.1. Study site

The Masai Mara National Reserve (MMNR) lies in south-western Kenya and is the northernmost part of the Mara-Serengeti ecosystem. The reserve was formed in 1965. It occupies an area of 1672 km² with the rainfall of average 1200 mm per annum. The mean monthly maximum temperature is 27 - 28°C with the minimum temperatures varying from 16°C during the hot months of October-March to 13°C in the period between May and August (Sinclair, 1995). The annual rainfall pattern is bimodal with two dry seasons and two rainy seasons. The long rains usually occur from March to May and the short rains in November and December. Due to its high rainfall resulting in permanent water and high grassland productivity, MMNR serves as a dry season refuge to most migratory animals of the Mara-Serengeti ecosystem and is therefore a very important part of the ecosystem despite its relatively small size (Brotten & Said, 1995).

The study was carried out in the Sabaringo forest around the Kichwa Tembo Tented Camp located on the western border of the MMNR, at the base of the Oloololo escarpment and alongside the Sabaringo River (35° E, 1.2° S, 1634 MASL). The forest covers an area of 24 ha. It is a semi-dry deciduous forest, dominated by *Diospyros abyssinica*, *Euclea divinorum* and *Teclea nobilis*. The tallest trees are approximately 20 metres and there is a dense floor vegetation of different shrubs, vines and herbs. In addition to the redbill monkey, the Sabaringo forest is home to warthog (*Phacochoerus aethiopicus*), blue monkey (*Cercopithecus mitis*), tree hyrax (*Dendrohyrax dorsalis*), banded mongoose (*Mungos mungo*) and several bird species. Since 1994 the entire forest has been enclosed by an electric fence that keeps larger herbivores, such as elephants and hippopotamuses, outside the area. The fence presumably also reduces the number of predators, although leopards, hyenas and snakes can cross it easily. Within the area there are 40 tents for tourists, a bar and a restaurant with adherent kitchen, a pool, a reception, a gift shop, the main office, two management houses and a staff quarter with adjacent football field. The area is evidently affected by the human presence in form of paths and waste disposal sites where the garbage is either being buried under a shallow layer of soil or burned. A more private lodge, the Bateleur Camp is situated in the south-eastern corner of the forest. A wooden fence separates the two lodges. We were allowed to follow the monkeys all over the fenced area with the exception of the Bateleur Camp. When a focal animal moved in to the Bateleur Camp or over the fences surrounding the lodge we stopped the observation.

2.2. Study subjects

The focal group of wild red-tailed monkeys (*Cercopithecus ascanius*) consisted of approximately 30 individuals. The monkeys were used to the vicinity of tourists and tolerated our presence during the observation period. We could not recognise individual animals but estimated that there were three lactating females with one offspring each, about ten non-lactating females and many juveniles. No dominant males were noticed.

2.3. Data collection

The data was collected between the 16th and the 22nd of March 2009. Depending on the weather conditions, we would start observations at around 08:30 and finish between 17:00 and 18:00. The monkeys would typically spend early afternoon in the Bateleur camp area which resulted in few recordings being made during this time period. Recordings of the monkeys' behaviour were made on foot by one or two parallel teams. Depending on the habitat and the focal monkey's activity, each team was comprised of one to three observers and one writer who recorded the behaviours on a paper sheet. Each team observed either one lactating female with its offspring or a non-lactating female. A focal animal was selected based on its proximity to the observer and overall visibility. If the focal animal was lost the particular observation was stopped and a new observation, with a different focal animal was started. Observations lasted on average 1:42 hours, with the shortest one lasting 12 minutes and the longest one lasting 4 hours. We collected a total of 66 hours of data of which 54 hours were for adult females and 12 hours for offspring.

Recording techniques were similar to those previously used by Nilsson (2007), Linderöth (2009) and Hansson (in press) in the behavioural study of the blue monkeys (*Cercopithecus mitis*) in the Sabaringo forest. Instantaneous sampling was employed, with one minute intervals. The recorded behaviours were foraging, standing, lying, sitting, moving, playing, grooming, other social behaviour and missing observations (Table 1). Additionally, we recorded if the offspring was carried on mother, trying to suckle or suckling. When the monkey was foraging we recorded even whether the focal animal was foraging on leaves, buds, fruits, seeds, bark or other food material. In case of playing and grooming, the partner was recorded as itself, mother, other adult, juvenile, offspring or other infant. In addition to these behaviours we also recorded the position of our focal animal i.e. whether the animal was on the ground, a tree, a vine or a human made object.

Table 1. Definition of the behaviours observed in the red-tailed monkeys.

Behaviour	Definition
Foraging	Chewing, gathering or manipulating potential food.
Standing	Standing up on four limbs alternatively upright on its rear limbs.
Lying	The monkey's torso leaning against an object.
Sitting	Sitting on its bottom.
Moving	Walking, running or jumping at a certain direction with all four limbs in motion.
Playing	Undirected movements with another individual or by itself.
Grooming	Manipulation of own or other monkey's fur with mouth or hands or manipulation of the focal animal's fur by other monkey's mouth or hands.
Carried on mother	Offspring carried by mother with or without suckling.
Trying to suckle	Offspring trying to put its mother's nipple in its mouth without suckling taking place.
Suckling	Offspring holding its mother's nipple in its mouth for a duration longer than 10 seconds.
Other social behaviour	Antagonistic or sexual behaviour.
Missing observation	Unable to identify behaviour or monkey was out of sight.

2.4. Data analysis

The numbers of observations for each of the analysed behaviours as well as occurrences of selected food materials in each habitat were summed up. These sums were then used to calculate the percentages which were applied in the figures. The same procedure was carried out for lactating and non-lactating females, where the numbers of observations per habitat per monkey type were summed up.

No statistical analyses have been made in this descriptive study.

3. RESULTS

3.1. Habitat preference

The habitat preference for lactating and non-lactating females is shown in figure 1.

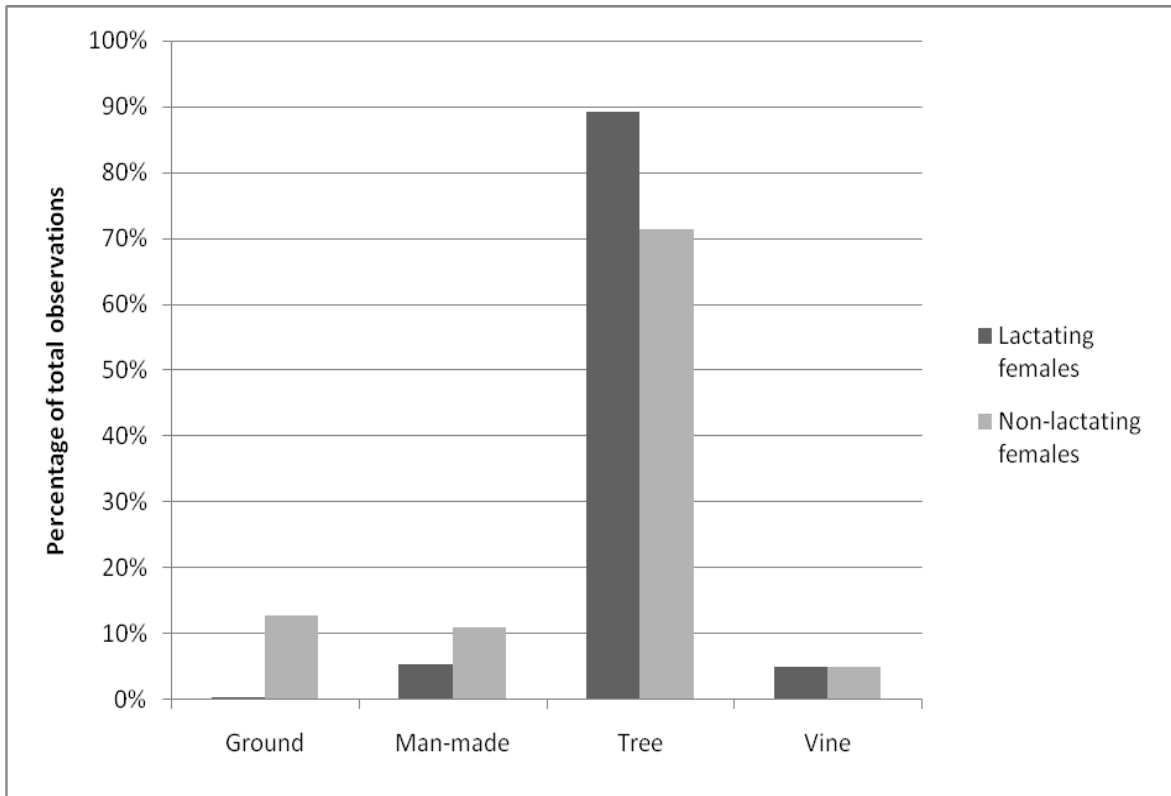


Figure 1. Percent of time lactating respectively non-lactating females of red-tailed monkeys spent in different habitats.

There was an apparent preference for tree habitat for both lactating and non-lactating females. However, lactating females were more often in trees than non-lactating ones. Whilst non-lactating females spent a considerable part of their time on the ground, the lactating females almost never went there. Both groups spent equal amount of time on vines. In comparison to lactating females, the non-lactating ones spent slightly more time on man-made objects.

3.2. Common behaviours

Figure 2 shows the distribution of common behaviours in different habitats. Playing, grooming and other social behaviours were merged to form a new category called “Other behaviour”.

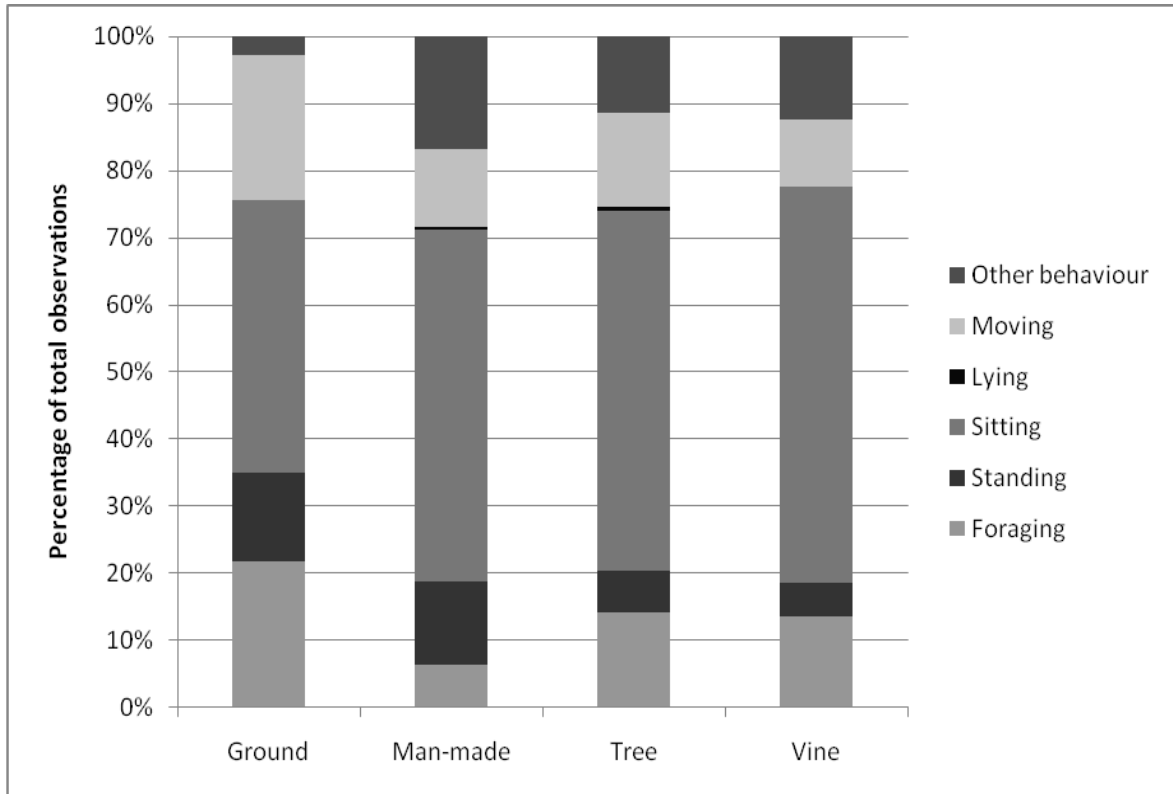


Figure 2. Percent of time red-tailed monkeys spent performing common behaviours in different habitats. Other behaviour includes playing, grooming and other social behaviours.

The monkeys spent most of their time sitting, regardless of habitat type. Conversely, there were very few recordings of lying behaviour. This behaviour never occurred when the monkeys were on the ground or on a vine and only rarely when the monkeys were in a tree or on a man-made object. The monkeys spent more time moving as well as standing when on the ground compared to other habitats. A large proportion of their time spent on the ground was dedicated to foraging whereas almost no time was spent on “Other behaviour”. Such behaviour, however, was more prevalent on man-made objects, trees and vines. Foraging behaviour did not differ between tree and vine habitats but was the second least common behaviour performed on man-made objects, right after lying.

3.3. Foraging behaviour

Figure 3 shows which food material the monkeys showed preference for in different habitats. Recordings for buds, seeds, bark and other food materials (which included trash, grass and unidentified food) were merged into a category called “Other food”.

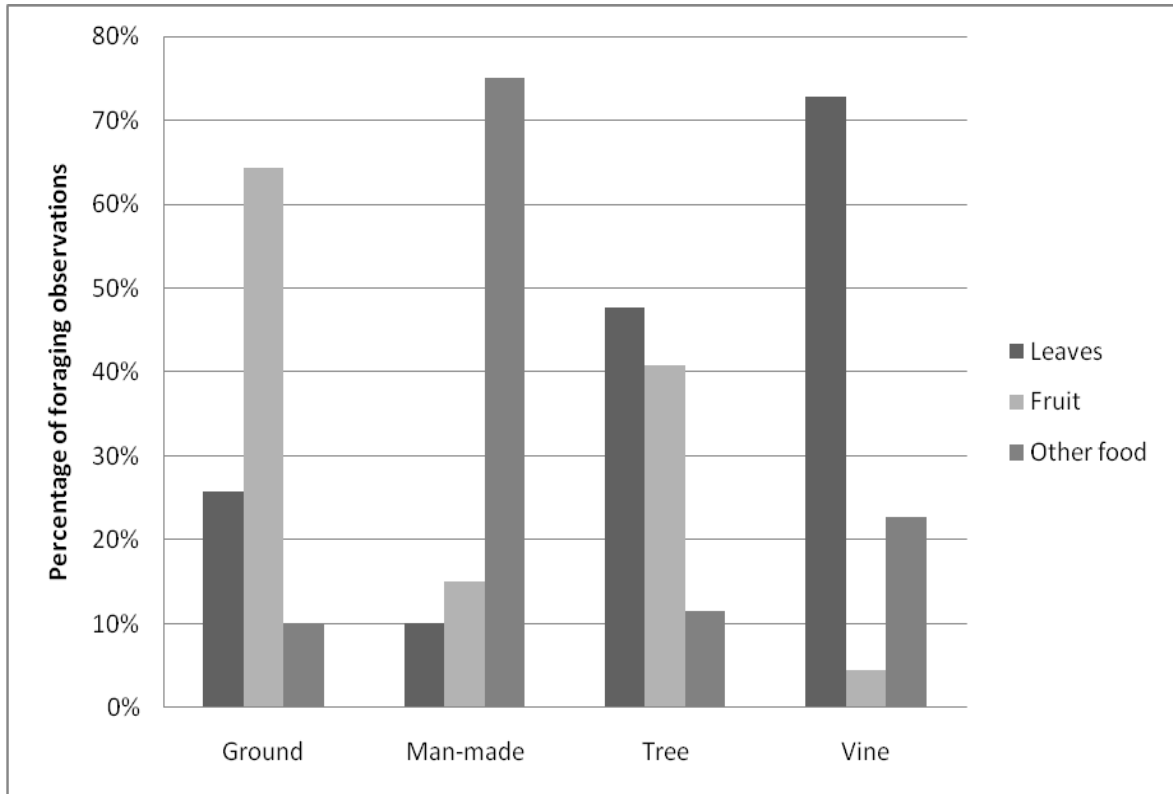


Figure 3. Percent of total foraging time red-tailed monkeys spent foraging on selected food materials in different habitats. Other food includes buds, seeds, bark, trash and unidentified food.

During more than half of their time spent foraging on the ground, the monkeys were foraging on fruit. The second preferred food material on the ground was leaves, which they picked from low tree branches or saplings. When on man-made objects, the monkeys were mostly feeding on other food, whereas leaves and fruits were the less popular choice. There was a more even distribution between the preferences for leaves and fruits when the monkeys were on trees. Only a small part of their time spent foraging in the tree habitat did they feed on “Other food”. These were predominantly the cases of the monkeys grabbing a food item from a litter bin and climbing a tree where they proceeded to eat it in peace. A noticeable part of observations of foraging behaviour on a vine were dedicated to leaves. “Other food” was also commonly selected by the monkeys but a very low percentage was taken by fruits.

4. DISCUSSION

4.1. Habitat preference

This study confirmed that the red-tailed monkey indeed is an arboreal species. Both lactating and non-lactating females showed a clear preference for the tree habitat. However, the time spent on the ground is not negligible. In accordance to another study (McGraw, 1994) the monkeys were often seen on the ground foraging on fallen fruit. It is interesting that the lactating females almost never went there despite the abundance of the fallen fruit which the non-lactating females were undoubtedly fond of. This is presumably a form of an antipredatory behaviour. Since most of the foraging time spent on the ground was in mixed-species groups with blue monkeys, it is plausible that the lactating females kept away from these larger and more dominant guenons. Other explanation for this behaviour could be that the lactating females simply avoided leaving the security of their natural habitat, tree canopy. It is also possible that they viewed us as dangerous. We perceived them as moderately frightened and on several occasions during our data collecting we suspected that they were running away from us even though we were keeping the distance. This could be the main reason why it was so hard to observe this monkey type. Furthermore, lactating and pregnant females tend to eat relatively less fruit and more insects (Cords, 1986), which could also explain why the lactating females from our study spent very little time on the ground where the fruit was plentiful. Apart from the time spent on the ground, the habitat preference did not essentially differ between lactating and non-lactating females. Several studies reported that the red-tailed monkey often spent time in vine tangles (Thomas, 1991; McGraw, 1994). However, my results show that both monkey types spent only 5.1 % of their time in vines. Baranga (2004b) reported that the red-tailed monkeys from the 'Kampala area' in Uganda avoided areas of high human activity but these findings cannot be related to my results since there is a great difference between the Sabarigo forest which is a tourist populated area and locales near regular villages where these monkeys are generally considered vermin. The monkeys spent only around 10% of their time on the man-made objects. Fences were often used as pathways and buildings and tents in a relation to foraging or to rest on during the day.

Our focal group was observed in polyspecific associations with the blue monkeys, especially when foraging on the ground. These foraging areas were fairly in the open and as such posed a potential risk from predators. This could be related to findings in Cords (1987) where the red-tailed monkey tended to spend more time on open surfaces when in mixed-species groups with the blue monkey thereby exploring otherwise unavailable areas. We did not record who initiated these associations but given the results from previous studies (Cords, 1987; Teelen, 2007) it is not unreasonable to assume that the red-tailed monkey was responsible for the associations even in our study area.

4.2. Common behaviours

Regardless of habitat type, sitting was the most common posture in red-tailed monkeys of the Sabarigo forest whilst they spent almost no time lying. These results are similar to the study conducted in Kibale Forest in Uganda by Gebo and Chapman (1995) which showed that the monkeys spent 89 % of their resting time sitting, 9 % standing and 3 % lying. Compared to other habitats, the monkeys in our study spent more time standing and especially moving when they were on the ground, presumably because the habitat required

them to be more vigilant and alert. This could also explain why a very small proportion of time spent on the ground was dedicated to performance of “Other behaviour” mainly comprised of grooming and playing. Since the monkeys were more vigilant in this habitat there was very little time left for socialising. Although the red-tailed monkey is reported as a social animal, the overall amount of time spent performing this behaviour across habitats was not tremendous in our study. Nonetheless, it is possible that the monkeys were socialising by simply being near other individuals. Playing and grooming were rare behaviours in this study even though these are considered to be very important parts in the lives of social animals as well as a way to keep skin and fur clean and free from ectoparasites (Rowell et al., 1991). Worch (2002) suggested that an animal needs to be in a safe environment, relaxed and comfortable for playing behaviour to occur. This could explain why this behaviour, but also other social behaviours, almost never happened on the ground. My results show that compared to other habitats “Other behaviour” was most frequently performed when the monkeys were on man-made objects and of total time spent in this habitat 16.8 % was dedicated to the performance of this behaviour. Following the same suggestion it is not unreasonable to assume that the monkeys felt secure and relaxed when on man-made objects in contrast to Baranga (2004b) where the monkeys actively avoided areas with high human activity.

Foraging behaviour was occurring in all habitats although the least commonly when the monkeys were on man-made objects. Knowing that the monkeys spent a considerable amount of time in the area with high human activity, a higher percent of foraging behaviour in this habitat could have been expected. A probable reason for why this is not shown in my result is that when foraging on trash, the monkeys spent only few moments on a litter bin or another surface with food rests. Upon grabbing the food they would hastily climb a nearby tree.

4.3. Foraging behaviour

The red-tailed monkey is considered to be primarily frugivorous (Cords, 1987; Chapman et al., 2002). Nevertheless, our study did not reveal the same results. Taken the results from Cords (1987) into consideration which state that the fruit consumption is greatest during the middle of the dry and rainy seasons, it is to be expected that the red-tailed monkeys of the Sabaringo forest did not express the highest preference for fruit seeing that our study was conducted in the beginning of the long rainy season. Furthermore, the diet of the red-tailed monkey is variable among different locales (Chapman et al., 2002) thus it is not surprising that my results are inconsistent with those from other studies. The red-tailed monkey’s preference for food material varied between different habitats. Most of the foraging time spent on the ground was dedicated to feeding on fallen fruit. In 25.7 % of the time spent foraging on the ground the monkeys were feeding on leaves. It is important to point out that the monkeys picked the leaves from saplings and low branches i.e. they did not forage on dry leaves lying on the ground. We did not record whether the leaves they picked were mature or not but looking at the results from previous studies it is not unreasonable to assume that the monkeys were selecting young leaves. As Cords (1987) writes the red-tailed monkeys almost never opt for mature leaves since they are hard to digest. This coincides with the results from Tweheyo and Obua (2001). During the foraging time spent on man-made objects the monkeys were predominantly feeding on “Other food”. This suggests that they frequent this habitat because of the availability of different food materials left by humans. The distribution of preference for leaves and fruit was more

even in the tree habitat. “Other food” was represented with 11.5 %. These were principally the cases of monkeys eating trash. As previously mentioned they would grab a food item from a litter bin and climb a tree where they proceeded to eat it in peace. Leaves were favoured over other food materials in the vine habitat. The few recordings of foraging on fruit are presumably the cases of monkeys eating fruit from a tree the vines were attached to. It is possible that some errors were made when determining whether a monkey was feeding on plant material coming from a tree or from a vine because many of the trees had vines in their proximity.

We observed the fruit of *Warburgia ugandensis* to be a very popular choice of food with the red-tailed monkeys of the Sabaringo forest though it is curious that no other studies carried out on the red-tailed monkeys have mentioned this tree species. Numerous studies have revealed the arthropod prey to be an important part of the monkeys’ diet. In Kakamega Forest, the diet of red-tail monkeys included 25.1 % of insects (Cords, 1986). A different study showed that the average amount of time a red-tailed monkey spent feeding on insect in Kakamega Forest and Kibale National Park was 28 % and 21 % respectively (Chapman et al., 2002). However, we did not record any foraging on arthropod prey although it is likely that we recorded these occasions under unidentified food material which I included in my results as a part of the “Other food” category.

4.4. Reflections

There were several possible sources of error in this study. The data was collected in only one week and it is possible that the behavioural patterns shown in my results do not mirror the actual behavioural patterns of this group of red-tailed monkeys. The fact that we were unable to follow the monkeys in the Bateleur camp area may have also influenced our results. Since we could not recognise individuals we picked our focal animal by its proximity to the observer and overall visibility. Therefore it is not unlikely that we unintentionally selected the individuals that were less shy and more active whilst the more reserved ones were not included in our observations.

I excluded recordings of the offspring’s behaviour from my data analysis since we did not have many observation hours for this group of monkeys. Additionally, the behaviour they performed was much uniformed. It consisted for the most part of being carried on mother with sporadic suckling attempts and few playing occasions.

The general opinion is that this ethological method is applicable for the observations of the red-tailed monkeys. Whilst these monkeys indeed are very active and hard to observe in their dense habitat this is far from being impossible. In areas where the foliage and undergrowth is thicker having more observers is a necessity. In addition to the behaviours we recorded, this method also allows observations of other monkeys’ activities such as ranging patterns, travel distances and exploration of polyspecific associations with the other resident guenon, the blue monkey (*Cercopithecus mitis*).

5. CONCLUSIONS

Whilst the red-tailed monkeys of the Sabaringo forest indeed were very active and hard to follow in the dense habitat, the methods we used in this study proved viable for observations of their behaviour. The results of this study confirmed that these monkeys are arboreal. Non-lactating females spent a considerable proportion of their time on the ground but lactating females almost never went there which was most likely a form of an antipredatory behaviour. Apart from this, habitat preference did not essentially differ between these two groups. Foraging behaviour occurred in all habitats but most commonly on the ground. The food preference varied between different habitats.

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