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Original Research

Survey of Large Mammals in Komto National Forest Priority, East Wollega Zone, Ethiopia

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Abstract

This study aimed to collect land marking data on large mammals in western Ethiopia's Komto National Forest Priority. Using the line transect method, the survey collected direct and indirect observations, including footprints, pugmarks, tracks, feces, and sounds. The large mammal species were categorized into 11 families, 19 species, and 5 orders. The most diverse family was Cercopithecoidea, followed by Suidae. The study aimed to provide valuable insights into the mammal population. The study analyzed the abundance of various carnivore species in a specific area, with Colobus guerza being the most abundant species. However, common jackal and bushbuck had low densities, attributed to higher bushmeat hunting practices and high human disturbance. The lower abundance of bushbuck was attributed to their secretive nature and the presence of high human disturbance, while the lower abundance of large carnivores was attributed to their secretive nature. As carnivores are at the top trophic level, their rarity can significantly affect the ecological balance and biodiversity of the area in the long run unless appropriate actions are taken to minimize human disturbance in and around Komto Forest Priority Area, western Ethiopia.

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INTRODUCTION

Among the world's most significant contributors to biodiversity are mammals (Nowak, 1991; Wilson and Reeder, 2005). Worldwide, they can be found (Vaughan et al., 2000; Collier et al., 2007). Animals classified as large mammals include a broad range of species from various trophic levels, including herbivores and top carnivores (Kormos et al., 2003). In their environments, they engage with intricate and distinctive elements (Gutiérrez & Garbino, 2018). Large herbivores act as ecological engineers by altering the structure and species composition of vegetation, whereas large predators commonly influence the quantity, distribution, and behaviour of prey animals (Berger et al., 2001). Despite this, they have had a sharp reduction across their geographic ranges and are mainly vulnerable to habitat degradation (Kingdon, 1997; Cooperrider et al., 1986; Davies et al., 2007).

The expansion of human development is causing habitat for mammals and other organisms to disappear at an alarming rate (Leykun Abune, 2000; Cambel et al., 2002). This is the reason behind the loss or reduction of many mammal species globally (Kingdon, 1997;

Zinner et al., 2001; Knapp et al., 2008b). The biological resource survey is an estimation of diversity with respect to species richness and abundances, followed by monitoring (Campbell et al., 2002). Studying biodiversity is still a major focus in wildlife conservation and management because of the increasing anthropogenic threat to life forms (Wilson et al., 1996; Cambell et al., 2002; Baillie et al., 2004; Wilson and Reeder, 2005). Monitoring makes conservation efforts like managing, creating, and restoring habitats, as well as protecting and resurrecting species, necessary (Campbell et al., 2002; Dinerstein, 2003). For conservation policies and management techniques to be effectively directed, accurate evaluations of species richness and population densities are necessary (Costa et al., 2005; Chapman et al., 2006).

Ethiopia boasts a surprising number of wide biological areas due to its profound geological history, vast latitudinal dispersion, and immense altitudinal range (Yalden, 1992; Mengesha & Bekele, 2008). This contributes a significant amount of flora and wildlife to the nation (Fetene et al., 2011; Melaku, 2011). However, only a few regions of the nation have had documentation of their richness and abundance published, and the Komto Forest has gotten scant attention. Thus, the purpose of this survey was to determine the anthropogenic effect as well as the variety and abundance of large mammals in western Ethiopia's Komto National Forest Priority Area.

MATERIALS AND METHODS

Description of the study area

Komto Forest was demarcated as a National Forest Priority Area in 1991, covering a total area of about 9,100 ha, including Komto Mountain, the adjacent forest, and the surrounding bushlands and grasslands. The area is situated at 9˚05’ 10"–9˚ 06’ 35” N latitude and 036˚ 36’ 47"–036˚ 38’ 10” E longitude, with an elevation ranging from 2,135 to 2,482 m above sea level. It is located 330 km west of Addis Ababa and 12 km east of Nekemte town (Fig. 1). Komto Forest is characterized by a warm temperate (Woina Dega) climatic condition. The rainy season extends from May to October, with a mean annual rainfall of 2,031 mm and a mean minimum and maximum temperature of 12.2 oC and 27.9 oC, respectively (Mossisa Geleta et al., 2011). The area is characterized by natural afro-forest vegetation. Currently, the local communities around the Komto Forest are encroaching into the forest for settlement, agricultural activities, charcoal production, and grazing by domestic animals, threatening the existence of Komto Forest biodiversity resources.

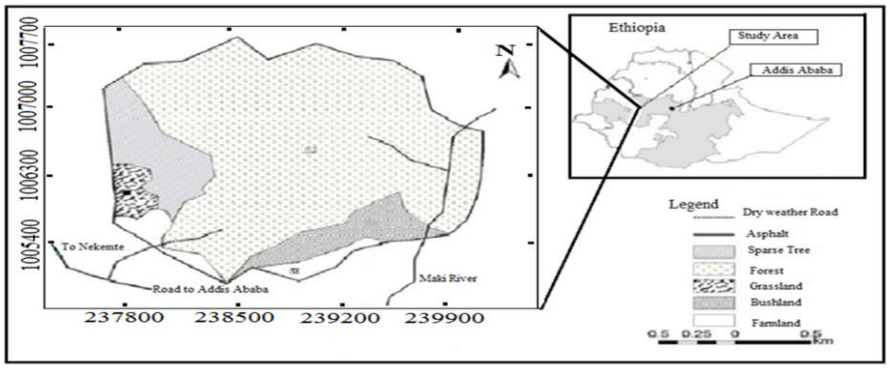

Figure 1 *Map of the study area (Source: adopted from Mosissa et. al., 2011)*

MATERIALS AND METHODS

We used binoculars, a digital camera, a GPS, a field guide book, data sheets and a tape recorder as field equipment for our investigation. Between October 2017 and February 2018, a survey of the diversity and quantity of big mammals in the main forest and its environs was carried out. Using standard and systematic wildlife survey techniques, every effort was made to enumerate the diversity of large mammals (Norton-Griffith, 1978). Using the global positioning system (GPS), line transects of 2 km in length and 200 m in breadth were placed at 300 m intervals. For primate width of observation, transect-to-animal distance was also employed (Butynski, 1990). Data sheets were used to document sightings of all large mammals, vocalisations, and indirect indicators (tracks, footprints, pugmarks, scat/feces, and so on), as well as human activities while using a GPS while strolling along transects. When animals were found, the name of the species and the quantity of individuals seen were noted. We used local knowledge and the Kingdon Field Guide to African Mammals (Kingdon, 1997) to identify the species of mammals. To learn more about the history of mammal variety in the region, an oral interview with the Komto indigenous people was done in addition to the main data.

Conventional methods were utilised to calculate the density and diversity of large mammals. The animals' signs and firsthand interactions were used to compile the species richness. The length (l) and width (W) of the strip sample (km) were multiplied to determine the area of the sample units (Sutherland, 2006). The total number of animals seen and noted in all observations was combined for every mammal species. As a result, the density of each species was determined by adding up all of the animal sightings across all observations, dividing by the product of the total counts and the sample unit's total area, and applying the following formula:

$$D = \frac{n_i}{2LW}$$

Where n_i = the total number of individuals of a species i, L = the length of transects, and 2W = the effective strip width.

RESULTS AND DISCUSSION

Results

For both sustenance and as a source of other income, the majority of the Komto local communities make their living by selling charcoal and fuel wood. The protected area was shown to be being encroached upon by extensive agricultural growth. It was common to see cattle grazing inside the protected area. Nevertheless, eighteen species of large and medium-sized mammals were identified. Direct observation yielded the highest proportion of these species (61.11%). Just 22.22% and 16.67%, respectively, were obtained through oral interviews with members of the local community and indirect signals (Fig. 2).

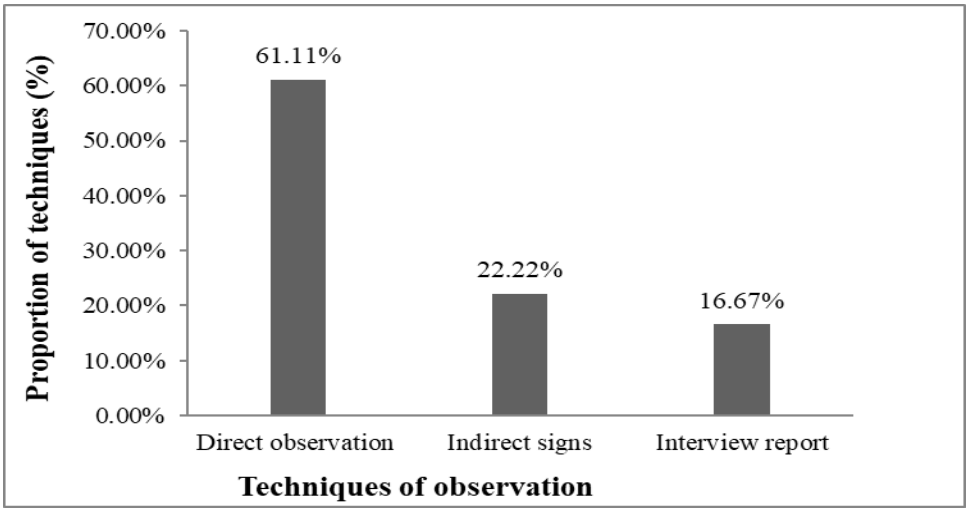

Figure 2 Different *Techniques Mammals Observation*

Eleven families and five orders were used to classify the eighteen species of large mammals that were seen during the current survey. During the present survey, the presence of large mammal species such as Hylochoerus meiertzhageni, Mellivora capensis, Civvetta civettica, Crocuta crocuta, and Histrix cristata was confirmed through observation of their signs in the field. However, during the oral interview, the local community in the research region reported seeing carnivores such common jackals (Canis mesomelas), serval cats (Felis serval), and leopards (Panthera pardus). With four species (Papio anubis, Cercopethicus aethiops, Cercopethicus a. pygerythus, and Cercopethicus neglectus), the Cercopithecidae family was the most diverse of the eleven families. The Suidae family, with three species (Hylochoerus meiertzhageni, Phacochoerus africanus, and Potamocherus larvatus), was next. Canidae, Colobinae, Mustelidae, Hynaenidae, Viverridae, and Hystricidae are all represented by one species per family, whereas Bovidae and Felidae have two species each (Table 1).

Table 1

Medium and large mammals recorded in Komto Forest

Order	Family	Species name	Common name	Afan Oromo name
Primate	Cercopithecidae	*Papio Anubis,*	Anubs baboon	Jaldeessa
		Cercopethicus aethiops,	Grevet monkey	Qamalee
		Cercopethicus neglectus,	DeBrazzes monkey	Canoo
		Cercopethicus a. pygerythus	Vervet monkey	Qamalee
	Colobinae	*Colobus guerza*	Guerza	Weennii

Artiodactyla	Bovidae	*Tragelaphus scriptus,*	Bushback	Bosonuu
		Redunca redunca	Bohor Reed buck	Quruphee
	Suidae	*Potamocherus larvatus,*	Bush pig	Booyyee
		Phacochoerus africanus,	CommonWarthog	Karkarroo
		Hyochoerus meiertzhageni	Giant forest hog	Abbaa gurraa
Carnivora	Mustelidae	*Mellivora capensis*	Honey Badger	Hamaa
	Canidae	*Canis aureus*	Common Jackal	Waangoo
	Felidae	*Felis serval*	Serval Cat	Iyyaa
		Panthera pardus	Leopard	Qeerransa
	Viverridae	*Civvetta civettica*	African Civet	Xirinyii
	Hynaenidae	*Crocuta crocuta*	Spotted Hyaena	Waraabessa
Lagomarpha	Leporidae	*Lepus habissincus*	Abyssinian Hare	Illeettii
Rodentia	Hystricidae	*Histrix cristata*	Crested porcupine	Xaddee

During the survey period, the highest abundance of medium- and large-sized mammals was recorded in thick forest habitat (66.42%), followed by bushland habitat (24.63%). However, the least abundance of mammals was recorded in plantation forests (8.96%). Among the large mammals observed, *Colobus guereza* had the highest frequency of sightings (24.19%), followed by Anubs baboon (20.32%). The least sighted species were common jackal (2.26%) and bushbuck (1.61%) (Table 2).

Table 2

Distribution and relative abundance of medium and large mammals in Komto Forest

Species name	Habitat types			Relative Abundance (%)
	Thick forest	Bushland	Plantation	
Colobus guerza	25	4	3	24.19%
Papio anubis	14	7	6	20.32%
Cercopethicus neglectus	25	-	-	18.39%
Cercopethicus aethiops	12	5	2	13.87%
Cercopethicus a. pygerythus	7	6	-	10.00%
Redunca redunca	2	5	-	5.06%
Phacochoerus africanus	3	2	-	3.55%
Canis aureus	1	2	1	2.26%
Tragelaphus scriptus	-	2	-	1.61%
Total	89(66.42%)	33(24.63%)	12(8.96%)	100%

Based on the survey's absolute mean density, Colobus guerza was found to be the most prevalent species (20.833±7.184), while the anubs baboon and de'Brazza monkey had absolute mean densities of 17.305±4.26 and 15.832±6.701, respectively. The Vervet and Grevet monkeys had mean densities of 8.620±2.923 and 11.941±4.356, respectively. In contrast, bushbuck and common jackal were found to have lower absolute mean densities, at 1.431± 1.184 and 1.940± 1.348, respectively (Table 3).

Table-3

Density of medium and large mammals in Komto Forest

Species name	Common name	Density/Km.^{2}
Colobus guerza	Guerza	20.833± 7.184
Papio anubis	Anubs Baboon	17.305±4.26
Cercopethicus neglectus	DeBrazze's monkey	15.832±6.701
Cercopethicus aethiops	Grevet monkey	11.941±4.356
Cercopethicus a.pygerythus	Vervet monkey	8.620± 2.923
Redunca redunca	Bohor Reed buck	5.003± 0.975
Phacochoerus africanus	Common warthog	3.051± 0.749
Canis aureus	Common Jackal	1.940± 1.348
Tragelaphus scriptus	Bushbuck	1.431± 1.184

DISCUSSION

In the Komto National Forest Priority Area, extensive human activity has been detected throughout the current survey. The forest provides the indigenous people with most of their fuel wood, building materials, household goods, and charcoal, which serves as their economic foundation. Additionally, they engaged in shifting cultivation and encroached upon the National Forest Priority area. In addition to this, domestic cattle graze alongside wildlife, potentially escalating competition and contributing to disease outbreaks in the latter. Collectively, these have put Komto Forest's priceless genetic resources for plants and animals at jeopardy.

Compared to the survey conducted in Medellin (1994) which found 112-116 mammal species in undisturbed tropical rainforests in Selva Lacandona, Mexico, the 19 species of large animals in the current survey shown low diversity. 45 species of large to medium-sized animals (> 5 kg) from the Lope jungle in Gabon were reported by Tutin et al. (1997). However, the present study offered a greater diversity of large mammal species than the large mammal surveys of the Gola National Forests, Liberia (Hoke et al., 2007) and the Zaraninge Forest, Tanzania (Kiwia, 2005).

The tiny size, remote location, and poaching by the local population may be the causes of the mammal species' impoverishment in the current study region. It has been observed that on both continents and islands, there is a positive relationship between the variety of large animal species and the area's size (Reed & Fleagle, 1995; Losos and Ricklefs, 2010; Legendre & Legendre, 2012). Some big mammals that need a vast home range for feeding and reproduction may be extinct as a result of the ongoing habitat loss in Komto Forest. In a similar vein, habitat damage leading to a shortage of food, water, and cover was blamed

for the extinction of some large mammal species in Ethiopia's Alatish National Park (Girma Mengesha and Afework Bekele, 2008). Some large carnivores, like leopards, were common in the area prior to 1991, when the local community hunted them because modern guns were available for such activities during the transitional government that followed the fall of the military regime, according to secondary information obtained from the Komto Forest local community.

Of the seven primate species that are native to East African forests, the five species that were found in the current survey made up 71.43% (Burgess et al., 2004). The comparatively large diversity of primate species in Komto Forest may be due to the prolonged high rainfall. Mean annual rainfall in Madagascar and South America is directly connected with high primate species diversity (Reed & Fleagle, 1995). In addition, the diversity and abundance of primates may be explained by the significant preferences of certain individuals for secondary habitat (Mammides et al., 2008).

According to the current survey's relative abundance of mammals, Colobus guerza had the highest value. This finding is consistent with a survey carried out in somewhat damaged forest compartments of Uganda's Kibale Forest, where guereza populations had increased by nearly five times, from 22 to 100 individuals/km2; red colobus populations had fallen by one third (Oates, 1977c). This is explained by guerezas' remarkable resistance to habitat disturbance (Fashing, 2007). The most likely reason for this could be that secondary growth leaves have more nutrition than climax community species and have poorer chemical defences (Lwanga, 2006).

In the current study area, the density of most species was rather low, with the exception of guerezas and baboons. Colobus guereza density in this survey is consistent with that of guereza from Kenya's Kakamega Forest (Fashing, 2000). Nevertheless, this result was higher than the findings of Rodgers and Homewood (1982) in Mwanihana Forest (10–11.0 animals km2) and Decker (1994) in Magombero Forest (9.0 animals km2). Colobus guereza's excellent resistance to habitat changes was suggested as the reason for the species' high density in the current survey (Fashing, 2002). Papio anubs exhibit a high density due to their diverse feeding behaviour, which includes a wide range of feeding habits and successful diet switching between primary and disturbed forests. They consume any available food, including plant and animal parts, as reported by Tutin et al. (1997) and Zinner et al. (2001).

The current Cercopethicus aethiops density record was less than that of 125.6±40.7 animals km2 from Cameron's Zaraninge Forest (Fonkwo et al., 2011) and 91.0±10.3 animals km2 from Tanzania's Kisiju Coastal Forest (Banda, 1995). The current study's decreased density of this species may be the result of habitat degradation, which puts the Cercopethicus monkey at a greater competitive disadvantage (Chapman et al., 2010). The Cercopithecus monkey preferred natural forests above damaged secondary habitats, according to a population density estimate from Zaire's Inturi Forest (Thomas, 1991).

The two Bovidae species (Tragelaphus scriptus and Redunca redunca) in this study had a lower density than those found in previous studies by Tutin et al. (1997) from the Lope Rainforest in Gabon, where the animals were found at a low density of 1.4 animals per km2. Nonetheless, Waser (1975) found that the Mweya Peninsula in Uganda had high animal populations of 9.0 per km2. Records pertaining to bushbuck density estimates exhibit significant variation, potentially due to variations in habitat conditions across locations and sampling techniques employed (Kingdon, 1997). Due to their frozen behaviour, which made them less visible throughout the survey, Menelicki's

bushbuck (Tragelaphus scriptus meneliki) in Denkoro Forest, Ethiopia, were undervalued (Dereje et al., 2010). The low population of this species may be explained by the strong demand for bushbuck meat in the local community (Muchaal & Ngandjui, 1999; Fonkwo et al., 2011). The disturbed bushland that exposed the bushbuck to predators from a distance and the strong local demand for bushbuck meat in and around Komto Forest are most likely to blame for the low density of bushbuck observed in the current survey.

The absence of suitable swampy environment was cited as the reason for the family Suidae's rarity in the current study area (Harris and Cerling, 2002). According to Stevens (2010), they favour riparian zones near streams and rivers or damp bottomlands. In addition, the three species—Phacochoerus africanus, Hylochoerus meiertzhageni, and Potamocherus larvatus—that were identified during the current investigation are heavily persecuted by the locals and are considered agricultural pests.

The majority of the large animal species in the order Carnivora in this study were only verified by means of community interviews, which may indicate that these species are uncommon in the area. Because they are at the top of the food chain, carnivores are crucial to sustaining the diversity of habitats and animal groups in any ecosystem (Berger et al., 2001). Nonetheless, the majority of ecosystems have documented their low density (Vaughan et al., 2000; Nathan, 2011). Big carnivores are delicate markers of the health of an ecosystem; they can only exist in areas where the lower trophic levels are mostly unaffected (Gese, 2001). Due to their tendency towards secrecy, non-random population distribution, and frequently nocturnal lifestyle, carnivores are notoriously challenging to census (Gros et al., 1996; Legendre & Legendre, 2012). Numerous carnivore populations are generally declining due to changes in land-use practices, habitat loss and fragmentation, disease, illegal poaching, authorised human persecution, losses in natural prey, and increased competition within carnivore guilds (Gese, 2001). Numerous large carnivore populations are negatively impacted by human involvement due to overexploitation by trophy hunting and livestock defence (Gros et al., 1996), a fact that was also verified in an oral interview with the Komto Forest local community for the current survey.

CONCLUSIONS

Even though the study region continues to serve as a haven for numerous large species, it is becoming too tiny, dispersed, and overfished to sustain them in the long run. Due to their secretive character and the high amount of human disturbance in the research area, large carnivore diversity and abundance are lower at the family level. Since carnivores are at the top of the trophic chain, their scarcity has a long-term impact on the biodiversity and ecological balance of the region. Therefore, measures that address the sustainability of these resources and an efficient land management system should be implemented in order to save the wildlife in Komto Forest. In-depth research on the area's flora and fauna should be done in order to implement thorough conservation measures.

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DECLARATION

There is no conflict of interest in this work.

DATA AVAILABILITY STATEMENT

All data were included in the article.

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