

Diversity of Large and Medium Sized Mammals and their Challenges to National Parks in Amhara Regional State North Western Ethiopia

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Abstract. The objective of this survey was to identify the diversity, abundance of medium and large mammals & their challenges affecting conservation and management of national parks in the region and to suggest management strategies that can bring solutions to the problems. Studies on the species diversity and distribution of medium and large mammals were carried out from August 2020 to 2021. Data were collected using line transect technique. A total of 45 medium & large-sized species of mammals were recorded, distributed among 15 families and 8 orders during the study period, through visual observation, interview & indirect signs of their presence. Order Carnivora was the first & the most abundant in terms of number of families (7 families) and species (18 species), followed by Artiodactyla (the second abundant – 3 families and 15 species), Primate (represented by 1 family belonging to 6 species), and Hyracoidea (1 family belonging to 2 species), whereas three mammalian orders (Proboscidea, Rodentia & Lagomorpha) were represented by a single family and a single species for each. The most recognized endemic wild mammals in the region are Walia Ibex (*Capra walie*), Gelada Baboon (*Theropithecus gelada*), Ethiopian Wolf (*Canis simensis*), Menelik buck Bush (*Tragelaphus meneliki*), and Starck's Hare (*Lepus starcki*). The major challenges to the conservation of wild mammals species identified in parks were: over-grazing; illegal human settlement; agricultural expansion; pastoralist movement (foreign nomads of Felata); illegal hunting; drought causing migration of mammals; human-wildlife conflict; conflict interests among woredas (kebeles) regarding scouts employment; conflict interests among communities to give mule transport (services) for visitors; insufficient camp site; insufficient number of scouts; insufficient physical infrastructure (road light); over-harvesting of resources; problem of a well-defined Buffer Zone; deforestation for firewood, charcoal & building; human induced wild fire; lack of training for scouts; lack of community awareness; wild mammals being killed with chemicals added to the water to catch fish.

Key words: National parks, Diversity, Wild Mammals, endemic

Introduction

According to Gashaw (2015), protected areas were created to protect the major biodiversity throughout the world. Thus, these areas have a significant role in conserving biodiversity. Protected areas cover almost 13% of the Earth's land surface (Chape *et al.*, 2003). The global protected area network now exceeds 100,000 sites of the world's land surface. Protected areas aim to conserve biodiversity by protecting species, habitats and other biodiversity features within their boundaries. Creation of protected areas, such as national parks, has globally been considered as the principal strategy for biodiversity conservation, climate change, mitigation and adaptation. As a result, the number and size of protected areas have been showing increasing.

Ethiopia is often known as 'the roof of Africa' due to its mountainous nature. It is endowed with extensive and unique environmental conditions, ranging from Ras Dejen at altitude of 4,653 m above sea level to Dallol, 116 m below sea level at Afar depressions (Tekalign, 2006). According to Young (2012), Ethiopia has so far established several protected areas which include 21 national parks, 2 sanctuaries, 8 wildlife reserves, 20 controlled hunting areas, 6 open hunting areas, 6 community conservation areas and 58 national forest priority

areas. These protected areas have been playing key roles in economic, recreation, ecotourism, ecological and social structure of the community.

Amara Region has 7 national parks (Simien Mountain National Park, Alitash National Park, Bahir Dar Millennium National Park, Borna sayint National Park, Woleka beto National Park, Godebie National Park & Bakussa National Park), 1 Biosphere reserve (Tana Haik), 4 community conservation areas (Menz Guassa, Abune yeosph, Mahibere selasie & Guna community conservation) areas & other priority forests.

According to (NSW, 2015), national parks are areas of land protected to conserve native plants & animals & their habitats, places of natural attractiveness, historic heritage & indigenous cultures. Also, these areas are centers of gene-banks & traditional ecological knowledge & have a direct economic benefit to the country; bringing in international revenue from tourism & carbon trading. A national park is a reserved area of land owned by the government which is protected from industrialization, human exploitation, & pollution.

Wild mammals are used to include all mammals which have not been domesticated. Medium & large sized mammals' define as including all non-rodent & terrestrial mammals. According to Emmons and Feer (1997), classified mammals as medium-sized (weighing 2–7 kg; & large-sized (weighing more than 7 kg). According to Dereje *et al.* (2015), more than 60% of the mammal species in Ethiopia are medium and large-sized.

According to Borges *et al.* (2014), class mammalian is composed of 5,487 species in the world & more than 1,150 species of mammals are found in Africa and Ethiopia possesses more than 320 mammals, of these, 36 are endemic to the country (Alemneh, 2015; Rabira *et al.*, 2015). Ethiopia is among the world best biodiversity areas in terms of richness and endemism of mammalian species.

Ethiopia has a varied topography from 116 m below sea level at the Afar triangle to 4,653 m above sea level at mount Ras-Dashen. The variations in climate, topography & vegetation have contributed to the presence of a large number of endemic mammalian species. It is distinguished from all other African countries by its large area of highlands. Over 80% of African highland areas above 3,000 m altitude are located in Ethiopia (Dereje *et al.*, 2015). The highlands are with a high number of endemic mammalian.

Amahara Region has a varied topography from 500 m below sea level at Metemma to 4,653 m above sea level at mount Ras-Dashen. The highest level of mammalian endemism is found. The Region is attributed to the existence of highland & variations in temperature, rain fall & it is one of the wild mammals potential regions. The diverse habitat & variable topography & climate condition of the Region have contributed to diversity of mammals species. The Region, currently possesses more than 50 species of mammals of which 5 are endemic. Despite the rich diversity of the Region wild mammals, there are a number of factors both anthropogenic & natural threatened them. As a result, the populations of mammals have been declined.

Materials and Methods

Description of the Study Areas

The Amhara region is located in the northwestern part of Ethiopia between 9° 20' & 14°20' north, & 36°20' & 40°20' east. It covers about 170,152 km² areas. The region shares boundaries with Tigray region in the north, Afar region in the east, Oromia region in the south, Benishangul-Gumuz region in the south west, and Sudan in the west.

This study was focused on the status of mammals and threats to mammals' conservation within the current network of Amhara National Park located in northwestern & eastern part of the country. The study sites include Alitash National Park, Simien Mountains National Park, Borena Sayint wrhimenu National Park & Bakussa National Park.

Simien Mountains National Park was established in 1969. It is located at coordinate of $8^{\circ}54'N$ and $39^{\circ}56' E$ in the North Gonder Zone of the Amhara National Regional State. Ras Dejen (or Dashen), the highest peak in Ethiopia. Simien Mountains National Park is one of the largest national parks in Ethiopia. The park is situated among five Woredas namely Byeda (18 kebeles), Janamra (10 kebeles), Telemt (3 kebeles), Aderqye (5 kebeles), and Debarqe (8 kebeles). The largest portion of the park is found in Byeda Woreda (18 kebeles).

Alatish National Park is found Amhara Regional State west Gonder zone in Quara woreda located between $11^{\circ}47'5.4''$ to $12^{\circ}31'3.6''N$ latitude & $35^{\circ}15'48''$ to $35^{\circ}48'51'' E$ Longitude. It shares boundaries in the west to Sudan's Dinder National Park, in the south along Ayma River with Bambaho to Omedela borders to Benishangul Gumuz Regional State, in the East Bambaho and Gelgu, in the North east to Mehadid, in the North Bermel and marwuha Kebeles of Quara Woreda. Alatish National Park is 565 km away from Bahir Dar and is about 1,130 km North West away from Addis Ababa. Alatish National Park is 13 KM (Arial) distance away from Gelegu Capital city of Quara to the west.

Borena Sayint National Park is found in South Wollo Zone (Amhara Regional State) & lies between $10^{\circ}50'45.4''$ - $10^{\circ}53'58.3''$ latitude & $38^{\circ}40'28.4''$ - $38^{\circ}54'49''$ longitude. The park is located in the northeastern part of Ethiopia about 600km by road from Addis Ababa, 205 km from Dessie and 16km from Mekane Selam, the capital city of Borena Woreda. The park is situated among six Woredas namely Borena Sayint (9 kebeles), Mehal Sayint (3 kebeles), Amhara Sayint (8 kebeles), Lega Ambo (8 kebeles), Tenta (2 kebeles), and Mekedela (4 kebeles). The largest portion of the park is found in Borena Sayint Woreda.

Bakussa Regional Park is found Awi Zone in Amhara Regional State. Located between $36^{\circ}0'13.2''$ $36^{\circ}19'17.4'' E$ latitude & $11^{\circ}39'13.7''$ to $11^{\circ}59'12.7'' N$ longitudes. The park is found in the northwestern part of Ethiopia about 116 km by road from Addis Ababa, 210 km from Enjabara and 60 km from Fendeka, the capital city of Jawi Woreda. The park is situated between two Kebeles (41,311.35 hectares Bagussa Marieam Kebele, 3416 hectares Bagussa Kidanmihirte Kebele) & the surface area of the Park is 44727.35 hectares. The largest portion of the park is found in Bagussa Marieam Kebele.

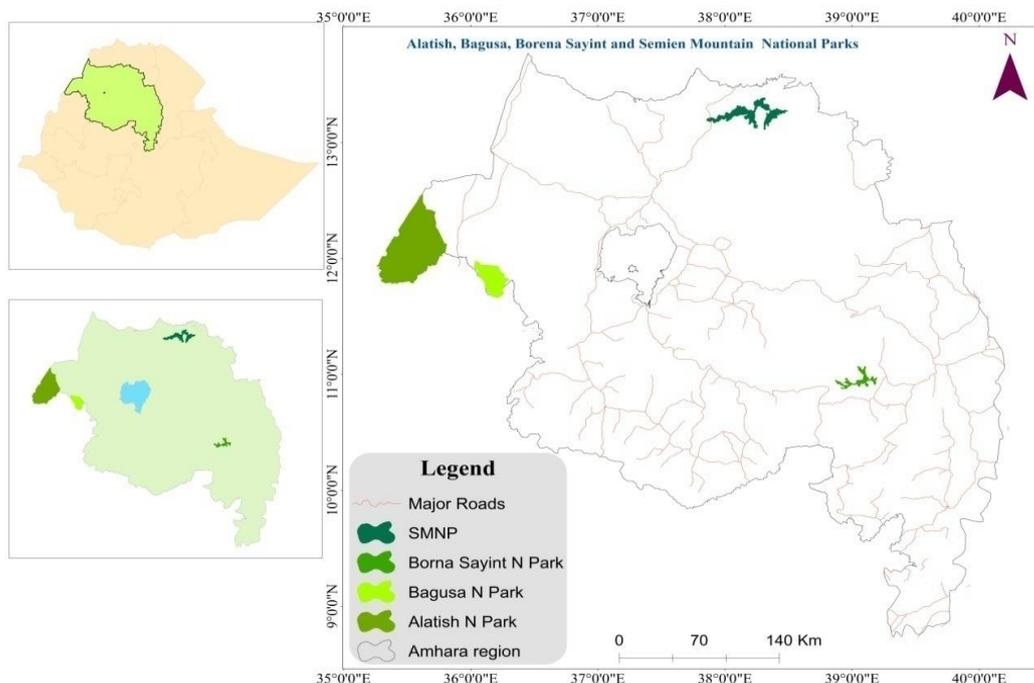


Figure 1. Map of the study area (source from Google Earth)

Materials

Materials used to accomplish this study efficiently and properly were: digital photo camera, 10 x 40 binocular, Geographic Positioning System (GPS), field guidelines, topographic map & mammal guide books.

Method of Data Collection

A preliminary survey was conducted in the study areas to get a general view of the area was carried out at the beginning of July 2020 together basic information about the area. During this preliminary survey, consultation was carried out with protected area Officials, experts and scouts to locate sampling sites. 36 line transects of 1km to 2km were randomly & systematically selected to cover the study areas.

The actual study was carried out August 2018 to March 2021 covering dry seasons. Data was collected through observation and group discussions with key informants. Group discussions were employed to collect the required data to assess the diversity of mammals and their challenges.

Survey of medium & large sized mammals in the study area was on foot along a randomly selected line transects. A total of thirty six lines transects, were established nine lines transects for each. In riverine forest transects length 2km width 200m, natural forest length 1.5m width 100m and wood land length 2.5m width 300m. Transect width ranged from 150m to 200m depending on vegetation cover & topography of the study site.

Both direct & indirect techniques were employed in the field. Surveys in the sampled areas were performed twice daily, early in the morning from 6:00 to 10:00am & late in the afternoon from 4:00 to 6:30 pm when most mammals were more active in the study area.

During data collection, the observers walk on foot along each transects & count all the individuals species by direct observation using eyes & binocular. Indirect observation was using indirect evidences (fecal droppings, animal parts, hair samples, burrows, foot print & pellets). For the species identification of mammals' field guide book (Kingdon, 1997; Yirgo, 2008) was used.

Sample Size and Sampling Techniques

Out of seven national parks found in the Region, the study was conducted only in four national parks. Simien Mountains National Park, Alataish National Park, Borena Sayint National Park, & Bakussa Regional Park were selected by purposive sampling method. Samples were taken from different census zones based on the vegetation cover (Riverine forest, bush land, & natural forest). According to similar study conducted by Redfern *et al.* (2003), transect sampling is a widely used survey technique. From each national parks nine transects a total of 36 were selected by random sampling method. The individuals who made ranking of the threat factors was selected based on their expertise on related field.

Data Analysis

Statistical analysis Shannon-Wiener diversity index (H) was used to analyze the data. The species evenness and diversity of mammals in each habitat type were also computed using the Shannon-Wiener diversity index (Roberts, 2011) based on the formula indicated below:

$$H' = -\sum (p_i \ln p_i)$$

Shannon-Weiner diversity index assumes that all species are represented in a sample species and calculated by the formula, where H = Shannon-Weiner diversity index.

Results and Discussion

Species Diversity

Table 1. Mammals' diversity in the study area

No	Common name	Scientific name	Family	Order
1	Crested porcupine	<i>Hystrix cristata</i>	Hystricidae	Rodentia
2	Aardvark	<i>Orycteropus afer</i>	Oryctetropoide	Tublidentata
3	African elephant	<i>Loxodonta africana</i>	Elephntidae	Proboscidea
4	Ethiopian highland hare	<i>Lepus starcki</i>	Leporidae	Lagomorpha
5	Rock hyrax	<i>Procavia capensis</i>	Procavildae	Hyracoidea
6	Yellow-spotted rock hyrax	<i>Heterohyrax brucei</i>	Procavildae	Hyracoidea
7	Vervet monkey	<i>Chlorocebus pygerythrus</i>	Cercopithecidae	Primates
8	Patas monkey	<i>Erythrocebus patas</i>	Cercopithecidae	Primates
9	Gelada	<i>Theropithecus gelada</i>	Cercopithecidae	Primates
10	Abyssinian black-and-white colobus	<i>Colobus guereza</i>	Cercopithecidae	Primates
11	Hamadryas baboon	<i>Papio hamadryas</i>	Cercopithecidae	Primates
12	Olive baboon	<i>Papio anubis</i>	Cercopithecidae	Primates
13	Leopard	<i>Panthera pardus</i>	Felidae	Carnivora
14	Caracal	<i>Caracal caracal</i>	Felidae	Carnivora
14	Serval	<i>Leptailurus serval</i>	Felidae	Carnivora
15	Golden jackal	<i>Canis aureus</i>	Canidae	Carnivora
17	Black-backed jackal	<i>Lupulella mesomelas</i> or <i>Canis mesomelas</i>	Canidae	Carnivora
18	African wild dog	<i>Lycaon pictus</i>	Canidae	Carnivora
19	Side-striped jackal	<i>Lupulella adusta</i> or <i>Canis adustus</i>	Canidae	Carnivora
20	Wild cat	<i>Felis silvestris</i>	Canidae	Carnivora
21	Ethiopian wolf	<i>Canis simensis</i>	Canidae	Carnivora
22	Spotted hyena	<i>Crocuta crocuta</i>	Hyaenidae	Carnivora
23	Striped hyena	<i>Hyaena hyaena</i>	Hyaenidae	Carnivora
24	Wild pig	<i>Sus scrofa</i>	Suidae	Carnivora
25	Honey badger	<i>Mellivora capensis</i>	Mustelidae	Carnivora
26	Slender mongoose	<i>Galerella sanguinea</i>	Herpestidae	Carnivora
27	White-tailed mongoose	<i>Ichneumia albicauda</i>	Herpestidae	Carnivora
28	African civet	<i>Civettictis civetta</i>	Viverridae	Carnivora
29	Common genet	<i>Genetta genetta</i>	Viverridae	Carnivora
30	Lion	<i>Panthera leo</i>	Felidae	Carnivora
31	Bushbuck	<i>Tragelaphus scriptu</i>	Bovidae	Artiodactyla
32	Bohor reedbuck	<i>Redunca redunca</i>	Bovidae	Artiodactyla
33	Greater kudu	<i>Tragelaphus strepsiceros</i>	Bovidae	Artiodactyla
34	Artiodactyla	<i>Bovidae</i>	Bovidae	Artiodactyla
35	Oribi	<i>Ourebia ourebi</i>	Bovidae	Artiodactyla
36	Menilk bush buck	<i>Traglaphus scriptus meneliki</i>	Bovidae	Artiodactyla

37	Klipspringer	<i>Oreotragus oreotragus</i>	Bovidae	Artiodactyla
38	Rroan antelope	<i>Hippotragus equinus</i>	Bovidae	Artiodactyla
39	Hartebeest	<i>Alcelaphus buselaphus</i>	Bovidae	Artiodactyla
40	Waterbuck	<i>Kobus ellipsiprymnus</i>	Bovidae	Artiodactyla
41	Common eland	<i>Taurotragus oryx</i>	Bovidae	Artiodactyla
42	Common duiker	<i>Sylvicapra grimmia</i>	Bovidae	Artiodactyla
43	Walia ibex	<i>Capra waliae</i>	Bovidae	Artiodactyla
44	Common warthog	<i>Phacochoerus africanus</i>	Suidae	Artiodactyla
45	Giraffe	<i>Giraffa camelopardalis</i>	Girffidae	Artiodactyla

In the present study, the total of 45 medium & large-sized species of mammals were recorded, distributed among 15 families and 8 orders during the study period, through visual observation, interview & indirect signs of their presence. Order Carnivora was the first & the most abundant in terms of number of families (7 families) and species (18 species), followed by Artiodactyla (the second abundant – 3 families and 15 species), Primate (represented by 1 family belonging to 6 species), and Hyracoidea (1 family belonging to 2 species), whereas three mammalian orders (Proboscidea, Rodentia & Lagomorpha) were represented by a single family and a single species for each in the study area (Table 1).

Table 2. Mammals' diversity from the four National Parks

No	Common name	Scientific name	Statu s	Body weig ht	National parks			
					Simi en	Alati sh	Bak ussa	Bor na
1	Abyssinian black-and-white colobus	<i>Colobus guereza</i>	LC	L	√		√	√
2	Bushbuck	<i>Tragelaphus scriptu</i>	LC	L				
3	Crested porcupine	<i>Hystrix cristata</i>	LC	L	√	√	√	√
4	Klipspringer	<i>Oreotragus oreotragus</i>	LC	L	√	√		√
5	Leopard	<i>Panthera pardus</i>	VU	L	√	√	√	√
6	Spotted hyena	<i>Crocuta crocuta</i>	LC	L	√	√	√	√
7	Caracal	<i>Caracal caracal</i>	LC	L				
8	Gelada	<i>Theropithecus gelada</i>	LC	L	√			√
9	Menilk bush buck	<i>Traglaphus scriptus meneliki</i>	LC	L	√			√
10	Golden jackal	<i>Canis aureus</i>	LC	L	√			
11	Serval	<i>Leptailurus serval</i>	LC	L	√	√		√
12	Honey badger	<i>Mellivora capensis</i>	LC	L	√	√		√
13	Vervet monkey	<i>Chlorocebus pygerythrus</i>	LC	M	√	√	√	√
14	White-tailed mongoose	<i>Ichneumia albicauda</i>	LC	M				√
15	Rock hyrax	<i>Procavia capensis</i>	LC	M				√
16	Yellow-spotted rock hyrax	<i>Heterohyrax brucei</i>	LC	M				√
17	African civet	<i>Civettictis civetta</i>	LC	L	√	√	√	

18	African wild dog	<i>Lycaon pictus</i>	EN	L		√		
19	Bohor reedbuck	<i>Redunca redunca</i>	LC	L		√	√	
20	Greater kudu	<i>Tragelaphus strepsiceros</i>	LC	L		√		
21	Lesser kudu	<i>Tragelaphus imberbis</i>	LC	L				
22	Lion	<i>Panthera leo</i>	VU	L		√	√	
23	Oribi	<i>Ourebia ourebi</i>	LC	L		√	√	
24	Patas monkey	<i>Erythrocebus patas</i>	NT	M		√	√	
25	Rroan antelope	<i>Hippotragus equinus</i>	LC	L			√	
26	Side-striped jackal	<i>Lupulella adusta</i> or <i>Canis adustus</i>	LC	L			√	
27	Hartebeest	<i>Alcelaphus buselaphus</i>	LC	L			√	
28	Waterbuck	<i>Kobus ellipsiprymnus</i>	LC	L			√	
29	Aardvark	<i>Orycteropus afer</i>	LC	L				
30	Common eland	<i>Taurotragus oryx</i>	LC	L			√	
31	African elephant	<i>Loxodonta africana</i>	VU	L		√		
32	Black-backed jackal	<i>Lupulellamesomelas</i> or <i>Canis mesomelas</i>	LC	L				
33	Common warthog	<i>Phacochoerus africanus</i>	LC	L		√	√	
34	Giraffe	<i>Giraffa camelopardalis</i>	EN	L		√		
35	Common duiker	<i>Sylvicapra grimmia</i>	LC	L	√	√	√	√
36	Olive baboon	<i>Papio anubis</i>	LC	L	√	√		
37	Slender mongoose	<i>Galerella sanguinea</i>	LC	M	√	√		
38	Wild pig	<i>Sus scrofa</i>	LC	L		√		
39	Wild cat	<i>Felis silvestris</i>	LC	M		√		
40	Common genet	<i>Genetta genetta</i>	LC	M	√			√
41	Ethiopian wolf	<i>Canis simensis</i>	EN	L	√			√
42	Ethiopian highland hare	<i>Lepus starcki</i>	LC	M	√			√
43	Striped hyena	<i>Hyaena hyaena</i>	LC	L	√			
44	Hamadryas baboon	<i>Papio hamadryas</i>	LC	L	√	√		√
45	Walia ibex	<i>Capra walie</i>	EN	L	√			
					21	23	17	18

Note: E= endangered LC= least concern VU= vulnerable NT= near threatened L= large-size M= medium-size

Based on the IUCN Red List criteria, mammals of the study were grouped as follows. Among the species of mammals registered in the study area, four are categorized on the lists of endangered species (Walia ibex (*Capra walie*), Ethiopian wolf (*Canis simensis*), Giraffe (*Giraffa camelopardalis*), African wild dog (*Lycaon pictus*), two vulnerable species (African elephant (*Loxodonta Africana*), lion (*Panthera leo*), two near threatened species (Leopard (*Panthera pardus*), patas monkey (*Erythrocebus patas*) & the rest thirty seven species are least concerned see (Table 1).

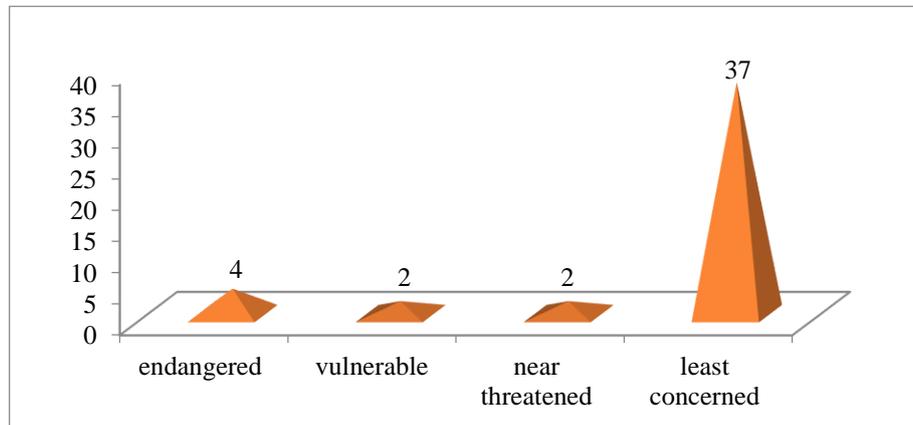


Figure 2. The status of mammals in the study area

Out of 45 mammal species observed during the study only 9 white-tailed mongoose (*Ichneumia albicauda*), vervet monkey (*Chlorocebus pygerythrus*), yellow-spotted rock hyrax (*Heterohyrax brucei*), rockhyrax (*Procapra capensis*), patas monkey (*Erythrocebus patas*), slender mongoose (*Galerella sanguine*), wild cat (*Felis silvestris*), common genet (*Genetta genetta*), Ethiopian highland hare (*Lepus starcki*) were medium sized mammals where as the rest 36 were large sized mammals see (Table 1).

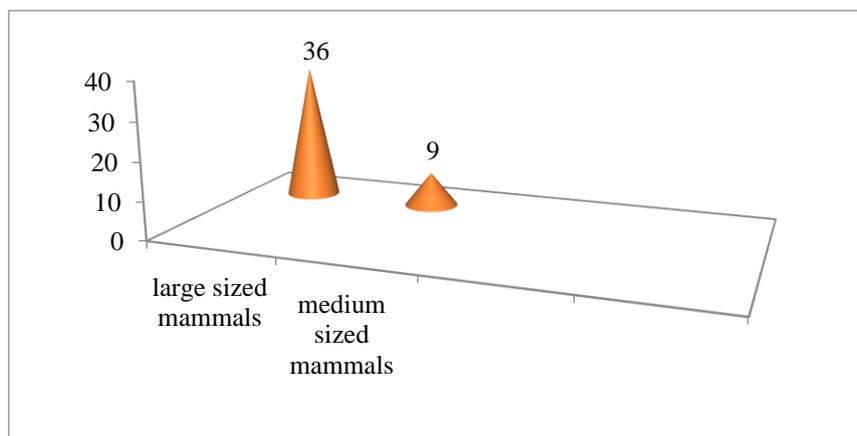


Figure 3. The number of large & medium-sized mammals in the study area

Discussion

The study area possesses wide geographic, topographic, and climatic variations these variations created ecosystem that harbors diversified-habitats that serves as home to a large number of mammal species. The study area harbors about 45 large and medium sized mammals species including 5 endemics. According to similar study conducted by Yalden (1983), the highest level of endemism is credited to the large extent of highlands of the region especially in Simien mountains known for the first levels of mammals endemism (Walia ibex (*Capra walie*), Ethiopian wolf (*Canis simensis*), Menilk bush buck (*Traglaphus scriptus meneliki*),

Gelada baboon (*Theropithecus gelada*), Ethiopian highland hare (*Lepus starcki*) & the second levels of mammals endemism (Ethiopian wolf (*Canis simensis*), Menilk bush buck (*Tragelaphus scriptus meneliki*), Gelada baboon (*Theropithecus gelada*) & Ethiopian highland hare (*Lepus starcki*) were observed in Borna National parks respectively.

African elephant (*Loxodonta Africana*) and Giraffe (*Giraffa Camelopardalis*) are migratory mammal species from Alatish National park to Dindder National Park Sudan due to shortage of water during the dry season & they are seasonally visitors.

During the study according to the interview with the local people, African wild dog (*Lycaon pictus*), Lion (*Panthera leo*), Common eland (*Tragelaphus oryx*) were seasonally visitors & Tora hartebeest (*Alcelaphus buselaphus tora*), Roan antelope (*Hippotragus equinu*) & waterbuck (*Kobus ellipsiprymnu*) were locally extinct recently from Bakussa National Park.

The major conservation challenges of the mammals in Simien Mountains National Park were human-wildlife conflict exists when wild animals damage crops; Conflict interests among woredas (kebeles) regarding for scouts employment; Conflict interests among communities to give mule transport (services) for visitors; Insufficient on-site protection, Insufficient physical infrastructure (road light), Illegal Settlement is undertaken in adjacent areas of the park, Illegal agricultural expansion, Over-grazing because most of the people engaged with live stock production; problem of a well-defined Buffer Zone out of 44 kebles, Aderky woreda 5 kebles and Debark woreda 6 kebles are absence of buffer zone. Also similar study conducted by Krebs (1978) showed that illegal hunting; Insufficient number of scouts; deforestation for firewood, charcoal and building and human induced wild fire which the reason for this fire to start & take hold was unknown but, the local people suggested that the reason might be conflict of interest between the park and the surrounding community were observed.

According to field observations and respondent information during the study, the major conservation challenges of the wild mammals in and around Alatish National park were illegal hunting mammals for meat; hunting lions for pleasure, or pride, based on their status in the community have been wearing its mane, they consider themselves as they are energetic; foreign nomads of Felata dependent on the natural resources such as hunting for meat, to sell precious animal products like ivory, ostrich eggs, skins and horns of animals; severity of drought during April and March, when rivers and the wetlands dried up that cause migration of mammals to Dinder National Park of Sudan especially elephant & Giraffe; human-wildlife conflict with crops and domestic animals; conflict of interest over resource utilization between local communities & foreign nomad (Felata), Illegal Settlements are undertaken in adjacent areas of the park; agricultural expansion and demand for grazing land were aggravated; people use fire to force out bees from a position of dwelling for honey & to clear their way between Sudan & Ethiopia for illegal trading; Insufficient on-site protection; Insufficient number of scouts and over-harvesting of resources.

The major problem facing wild mammals in Bakussa National Park today are Insufficient on-site protection; Insufficient number of scouts; Lack of community awareness, Illegal Settlement is undertaken in inside areas of the park; agricultural expansion; free- grazing; problem of a well-defined Buffer Zone; not given attention from the Region government, Illegal hunting; Human-wildlife conflict exists where wild animals damage crops and domestic animals; Insufficient physical infrastructure; firing; deforestation for charcoal & firewood collection; Migration of wild mammals; even though the park was established in 2004, still more than 200 households are present inside the park; wild mammals were killed with chemicals added to the water to catch fish and people were migrating from different parts of the Region to the national park by bonding of different relationships.

Similar study conducted by Redfern *et al.* (2003), based on the current observation and most respondents wild mammals in and around Borena Sayint National Park is absence of Buffer Zone for the newly incorporated areas; Human-wildlife conflict exists where wild

animals damage crops; Insufficient physical infrastructure; Insufficient number of scouts; Insufficient on-site protection; agriculture expansions, and giving less attention to conservation of wild mammals from the side of local people.

According to Alemneh (2015), Rabira *et al.* (2015), Ethiopia is one of the African countries known for highest mammal species richness and possesses more than 320 mammals, of these, 36 are endemic to the country. In the Region there are more than 50 mammal species out of these 5 endemic to the Region such as Walia Ibex, Gelada Baboons, Menilek Bush buck, Starck's Hare, and Ethiopian Wolf, found in Simien Mountains & Borena Sayint National Parks. It is also home to two endangered mammal species, including Ethiopian wolf, walia ibex & giraffe, wild dog.

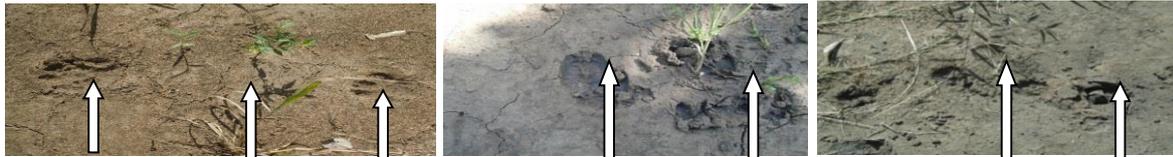


Plate 1: Hyena foot print; Plate 2: Orbi foot print; Plate 3: Greater kudu foot print



Plate 4: Dead crested porcupine; Plate 5: Leg of lion; Plate 6: Patas monkey feces; Plate 7: Orbi feces



Plate 8: Strap made in leather; Plate 9: Leather collected; Plate 10: Mane made in from lion skin wild from illegal hunting wear by the community for pride



Plate 11: Walia Ibex in Simien; Plate 12: Gelada in Borena; Plate 13: Gelada in Simien



Plate 14: Forest destroyed by wild fire

Conclusions and Recommendations

The major purpose of the study was to investigate mammal species diversity, distribution, and their threats in the study area. The present study was focused on species of medium and large-sized mammals. To conclude the major challenges to the conservation of wild mammal species identified in parks were over-grazing, illegal human settlement, agricultural expansion, pastoralist movement (foreign nomads of Felata), illegal hunting; water loss causing migration of mammals; human-wildlife conflict; Conflict interests among woredas (kebeles) regarding to scouts employment; Conflict interests among communities to give mule transport (services) for visitors; Insufficient camp site, deforestation for fire wood, charcoal & building; human induced wild fire; lack of community awareness; illegal human settlement; human-wildlife conflict; Over-harvesting of resources; agricultural expansion. Develop sense of ownership within community; awareness creation should be given; decision should be given for buffer zone issues, reduction of free grazing; avoid conflict interests; avoid human induced wild fire; sufficient camp-site protection should be built; number of scouts should be managed; training should be given for scouts and physical infrastructure should be managed. Generally the finding showed that attention should be given to the large and medium sized mammal species to avoid human disturbance on the protected areas. Therefore, joint conservation practice with the local community should be applied to conserve and improve the well being of mammals that exist in the area. To minimize the impact of anthropogenic activities on wild mammals of the study area, community education, participation, enforcement of law & rehabilitating the degraded area play a significance role for sustainability of wild mammals in protected areas.

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