

Distribution of protected area and large-sized mammals order in Ethiopia

Tamirat Haile Chankallo^{1,*}

¹Ethiopian Wildlife Conservation Authority, Nech Sar National Park, Arba Minch

Abstract

Ethiopia is one of the countries found in the eastern horn of Africa, which is endowed with beautiful landscape and topography from which diverse habitats and fauna composition. The objective of this paper is to review relevant documents on distribution of protected area and large-sized mammals order in Ethiopia. The Method of the data were by compiling related information from different sources like published articles grey literature and other office reports from concerned institutions. Altitudinal and geographical variations made the Ethiopia to be among the biodiversity-rich nations in the world. Mammal fauna in Ethiopia consists of 326 species, among 144 genera, 43 families and 14 orders; out of which 32 mammals of the country categories under critically threatened group. Among the mammals in Ethiopia eight of them are endemic. Among mammals' antelopes are flagships (charismatic). The large mammals are mainly concentrated in the south and southwest border.

Introduction

Ethiopia is located in the Horn of Africa between 3⁰N and 15⁰ 00'N longitude and 33⁰ 00'E and 48⁰ 00'E latitudes and covers an area of 1.13 million km² (of which 1.12 and 0.01 million km² are land and water bodies, respectively) [1][2]. There are five biomes and various sets of ecosystems [3][4]. The altitudinal difference ranges from the highest peak at Ras Dashen (4620 m) to (126 m) below sea level in the Afar depression [3]. Such altitudinal and geographical variations made the country to be among the biodiversity-rich nations in the world [2][5]. The country has established several protected areas since the 1960's. There are more than 175 protected areas under different categories in the country [6]. The oldest protected areas in the country are Menagesha suba community-managed forest, Awash National Park, Simen Mountain National Park, Abijatta-Shalla Lakes National Park, and Gambela National Park [7]. Mammals are mainly concentrated in the southern parts and southwest border and adjacent areas of the country [8]. The mountain massifs in the north and centre parts are also home to many endemic species of mammals [9][8][10]. The Ethiopian highly comprised by wildlife fauna and flora [6], which results in the countries' status as a global biodiversity hotspot [6][9][11]. The Objective of the Review Paper is to review the protected area and Distribution of large-sized mammals in Ethiopia. The Methods All the data here were compiled from different documents available in wide relevant sources (Such

Review Article

Open Access & Peer-Reviewed Article

DOI: 10.14302/issn.2997-2248.jwl-23-4439

Corresponding author:

Tamirat Haile Chankallo, Ethiopian Wildlife Conservation Authority, Nech Sar National Park, Arba Minch.

Keywords:

Biomes, Ecosystem's systems, Mammals distribution, protected area.

Received: Jan 20, 2023

Accepted: Feb 15, 2023

Published: Feb 22, 2023

Academic Editor:

Andreia Manuela Garcês, University of Trás-os-Montes and Alto Douro.

Citation:

Tamirat Haile Chankallo (2023) Distribution of protected area and large-sized mammals order in Ethiopia. Journal of Wildlife - 1 (1):17-27. <https://doi.org/10.14302/issn.2997-2248.jwl-23-4439>

as, published articles, Google Scholars; web of sciences, science hubs using some important Keywords. Among the few online searching were mammals, biodiversity, distribution Ethiopia mammals. In this review paper is more than 44 published articles were reviewed.

Biomes and ecosystems in ethiopia

Ethiopia is stratified into five main ecological zones; The Sudanian, Congo-Guinean, Sahel arid zone, Somali-Maasai, and the Afro-tropical and montane [11][2]. These geographical diversities form sets of new twelve major distinct vegetation zones or ecosystems [3]. These are (1) Desert and semi-desert scrubland, (2) Acacia-Commiphora woodland and bushland, (3) Wooded grassland of the western Gambela region, (4) Combretum-Terminalia woodland and wooded grassland, (5) Dry evergreen Afromontane forest and grassland complex, (6) Moist evergreen Afromontane forest, (7) Transitional rainforest, (8) Ericaceous belt, (9) Afroalpine belt, (10) Riverine vegetation, (11) Freshwater lakes, lakeshores, marshes, swamps and flood plains vegetation, and (12) Salt-water lakes, lakeshores, salt marshes and pan vegetation These varieties of ecosystems have brought an extremely diverse flora and fauna [2][3][4].Table.1

Diversity of ethiopia mammals

The country is also rich in its faunal diversity [4]. The Ethiopian mammal fauna consists of 326 species, under 144 genera, 43 families and 14 orders [6][9]. The number of mammals in Ethiopia is much higher than in other African countries [8]. Ethiopia contains over 55 endemic small and large mammals [8][12]. More than 60% of the mammal species in the country are large-sized; of the total number of mammals known to exist in the country, 57 mammalian species are endemic (i.e.,36 rodents, 10 shrews, 3 bats, 2 primates, 5 artiodactyls, and 1 carnivore) [8][13]. Table.2

There are 32 threatened mammals under three categories Critically Endangered, Endangered and Vulnerable. Among threatened mammal species recorded, 19 are large-sized mammalian and only 13 are small mammals [8]. Among these eight are larger mammals: Ethiopia wolf (*Canis simensis*), Gelada baboon (*Theropithecus gelada*), Menelik’s bushbuck (*Tragelaphus scripus Meneliki*), Mountain Nyala (*Tragelaphus buxtoni*), Starch’s hare (*Lepus Starcki*), Swayne’s, hartebeest (*Alcelaphus buselaphus*), Bale monkey (*Chlorocebus djamdjamensis*) and Waliai Ibex (*Capra walie*),

Table 1. protected areas under different categories and management pages of Ethiopia

No.	Protected Areas	Federal	Region	Total
1	National parks	14	13	27
2	Wildlife Sanctuaries	2	-	2
3	Wildlife Reserves	1	4	5
4	Community Conservation Areas	-	10	10
5	Open Hunting Area	-	6	6
6	Controlled Hunting areas	-	25	25
7	Biosphere Reserves areas	-	4	4
8	wildlife rescue centres	-	6	6
9	National Reserve Forest areas	-	95	95

Source: [6].

Table 2. Wildlife (fauna and flora) resources of Ethiopia.

No	Main Category	numbers of Species	Numbers of Endemic Species
1	Mammals	326	57
2	Birds	918	19
3	Reptiles,	240	25
4	Fish	200	41 fresh- water fishes
5	Amphibians	79	
6	Arthropods	1,225	7
7	Butterflies	324	-

Source: [6][9][11].

and the rest are smaller ones including 3, 7 and 36 species of bats, insectivores and rodents, respectively [8][9][14]. (Figure 1 to Figure 8) Source [6].

The threatened large-sized mammals include Black Rhinoceros (*Diceros bicornis*), Grevy's Zebra (*Equus grevyi*), Wild Ass (*African Equus africanus*), Walia Ibex (*Capra walle*) and Ethiopian Wolf (*Canis simensis*) [8][14][15]. The charismatic large mammals in the country are Beisa Oryx (*Taurotragus oryx*), Swayne'Hartebeest (*Alcelaphus buselaphus*), Greater Kudu (*Tragelaphus strepsiceros*), Grant gazelle (*Nanger granti*), Somali Wild Ass (*Equus africanus somalienisis*), Grevy's Zebra (*Equus grevyi*),

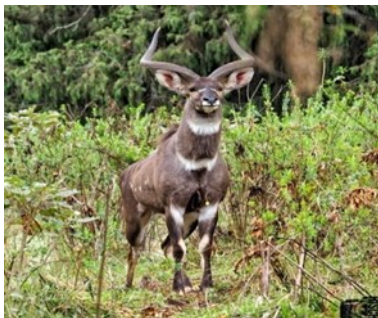


Figure 1. Tragelaphus buxtoni



Figure 2. Canis simensis



Figure 3. Tragelaphus scripus Meneliki



Figure 4. Theropithecus gelada



Figure 5. Chorocebus djamdjamensis

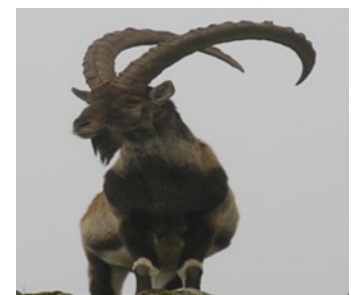


Figure 6. Capra walie



Figure 7. Alcelaphus buselaphus



Figure 8. Lepus Starcki

Waterbuck (*Kobus ellipsiprymnus defessa*), Serval Cat (*Felis serval*), Elephant (*Loxodonta african*), Reticulated giraffe (*Giraffa camelopardalis*), Buffalo (*syncerrus caffer*), Dibatag (*Ammodorcas clarkei*), Gerenuk (*Litocranius walleri*), Long-necked Antelopes (*Hippotragus equinus*) and other plain animals inhabit ecosystem [5][9]. (Figure 9 to Figure 11). Source [6].

Primates' distribution and habitat

The present distribution and habitat of the order Primates species in Ethiopia are well documented [7] [16][17]. The following primate distribution and habitats are presented as per the studies mentioned by the authors above. Hamadryads' baboon (*Papio hamadryas*) found in North, Northwest, East, Southeast, Awash National Park and Kafata Shiraro National Park. It lives in the rocky hill arid areas. It mostly prefers lower altitudes bellows 100 masl [18]. The Anubis baboon (*Papio Anubis*) distributed everywhere in Ethiopia, except an Eastern border [19][20][21]. The Gelada baboon (*Theropithecus gelada*) distributed in the country in the highland area, especially in the North central and Eastern Rift Valley. The habitat is mainly on montane grassland cliffs and slope areas [9][14].

The Vervet monkey (*Chlorocebus pygerythrus*) found in Ethiopia through widespread except an extreme Northeast border. The Vervet monkey (*Chlorocebus pygerythrus*) live in the riverine forest, woodland, and forest [19][20][22][23]. The Blue monkey (*Cercopithecus mitis*) distributed in the country Northwest and Southwest part of the country. The habitat types include, densely vegetated habitat [14]. The DE Brazza's monkey (*Cercopithecus neglectus*) found in an extreme Southwestern border. It lives in mainly lowland associations. The habitats types are mainly swamped forest bamboo thickets, and dense forests [23][24]. The Patas monkey (*Erythrocebus patas*) distributed in Ethiopia West, Southwest, and Eastward to Djibouti. The main habitat types are open dry savanna and rocky area [25]. The colobus monkey (*Colobus guereza*) distributed in Ethiopia central parts, except the

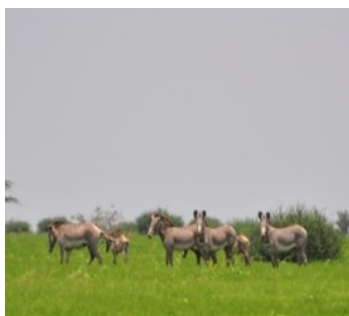


Figure 9. Equu grevyi



Figure 10. Equus africanus soma liensis

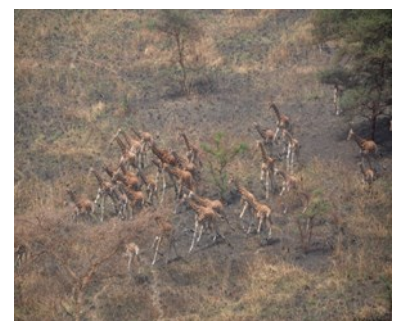


Figure 11. Giraffa camelopardalis

North parts. It lives in habitat includes forestland and riverine forest [20][23][26].

Perissodactyla distribution and habitat

The name Perissodactyla means odd-toed. This group of ungulates includes Horses families and Rhinoceros (*Diceros bicornis*). The present distributions of the order Perissodactyla species in Ethiopia are as follows: African wildass are distributed in Ethiopia mainly in the northeast. It lives in arid rugged hills and desert plains [7][9][27]. The Grevy's zebra (*Equus grevyi*) found in Afar and Chew bahar area. Its habitat is mainly open woodland savanna flat, broken hills, and semi-desert plains [7][27]. The other Perissodactyla mammal is the Burchell zebra (*Equus quagga*) distributed in the Southern Ethiopia. The habitat types include open woodland, and savanna grassland in Nech Sar National Park, Omo National Park, Mago National Park, and Borena National Park [20] The Black rhinoceros (*Diceros bicornis*) is one of the big five mammals in Africa, which found in Ethiopia. They distributed in south Ethiopia, Omo National Park, and Kenya border of Boma National Park. It mainly lives in the shrub's lands [7][9][17].

Artiodactyla distribution and habitat

The orders Artiodactyla are known as the even-toed mammals and have antlers, and horns. All Bovidae are members of the Artiodactyla including the antelopes and Buffalos of the world. Most antelope species are charismatic or flagships for the protected area of Ethiopia. The present distribution of the Order Artiodactyla species in Ethiopia follows: Common Warthog (*Phacochoerus Africanus*) distributed throughout all protected areas of the country. It lives in the forestland, open grassland, and woodland [28][29][30]. The Bushpig (*Potamochoerus larvatus*) covers a large area, except around Ogaden. They live mainly in dense forests area [20][23][31]. The Giant Forest Hog (*Hylochoerus meinertzhageni*) distributed in montane ecosystem. It is rare species and lives as in dense forests [19][23].

The Hippopotamus are one of the five big mammal species in Africa [25]. The Hippopotamidae families are members of the Artiodactyla. The Hippopotamus found in the Rift Valley lakes, and Nile systems. The Rift Valley lakes are Lake Tana, Abaya, Chamo, and the major rivers, Awash, Omo, and Nile systems. It lives in herds at aquatic environment [9][17][27]. All families of Giraffes are members of the Artiodactyla. The Reticulated Giraffe are also one of the five big mammals' species in Eastern Africa. The home range in Southwest Ethiopia, Gambella National Park through Omo, Mago National Park, Tama community managed wildlife reserves, and South Ethiopia to Borena National Park. The most preferred habitat for Giraffe are savanna plain, wooded grassland and scattered bushland [7][9][16].

The Black Buffalo (*Syncerus caffer*) is one of the largest five big terrestrial wild animals in Eastern Africa, and they distributed Northwest, West, and Southwest parts of Ethiopia. It lives in open savannas grassland, wooded grassland, forestland and riparian associations [17][23][24]. The Common Eland (*Taurotragus oryx*) found in the country only in Omo National Park and Boma National Park in Southern Sudan. They live in savanna wooded grassland, and plain grassland [7][32]. The Greater kudu (*Tragelaphus strepsiceros*) distributed in Northwest and Southeast parts of the country. Preferred habitats for kudus are open savanna, wooded grassland, and broken hill associations [20][22][31]. The Lesser kudu (*Tragelaphus imberbis*) found in Southwest and Southeast parts of the country. The main home range area is wooded grassland, bushland, open plain, sometimes in forestland and mountain hills [20][24][31]. The Mountain Nyala (*Tragelaphus buxtoni*) are one of the endemic mammal species in the country and they are particularly distributed in Arsi Bale massifs; Chercher highland, and Bale Mountains National Park. They main habitat types are montane forest, heath, and moorlands [33][34].

The Menelik's bushbuck (*Tragelaphus scripus Meneliki*) is one of the endemic mammals in Ethiopia, and they distributed in Arsi Bale massifs, Chercher highland; Menagesha suba community-managed forest, Borena saynt National Park, Semin Mountains National Park and Gussa-community protected area. It lives in the montane forest, heath, moorlands [7] [14][21].

The Bushbuck (*Tragelaphus scriptus*) are distributed in the North, Northwest, East, and Southeast parts of the country [9]. The main habitat types are riverine woodland, thickets, sparse tree, and bush [20] [22][23]. The Beisa Oryx (*Taurotragus oryx*) found in the East and southern parts of the country particularly in the Awash National Park, Hallidage National Park, Babile National Park and Borena National Park. The suitable habitat types are open savanna grassland and woodland [24]. The Roan antelope (*Hippotragus equinus*) distributed in the North and Western parts of the country commonly in Gambella National Park. It lives in tall grass and wooded grassland [9].

The Defassa waterbuck (*Kobus ellipsiprymnus defessa*) distributed area in the Southern, Northwest, eastward to Djibouti as well as at Nech Sar National Park, Omo National Park, Mago National Park, Chebera Chuchura National Park, Maze National Park and Alatish National Park. It lives in the open woodland usually wooded grassland near rivers and near to water [31][35]. The White-eared kob (*Kobus kob leucotis*) found in Gambella National Park. It lives in the swamped and flooded grassland. The Bohor reedbuck (*Redunca redunca*) distributed in the northwest central and southwest parts of the country. The main habitat types are reed beds, floodplains and grassland (Vreugdenhil *et al.*, 2012). The Klipspringer (*Oreotragus oreotragus*) distributed in central and southwest parts of the country. The habitat types are mountainous and rocky slopes [7][36].

The Swayne's hartebeest (*Alcelaphus buselaphus*) one of the endemic mammal species in Ethiopia, and they are found in Senkelle wildlife sanctuary and Maze National Park. It lives in the wooded grassland and open grassland [28][31]. The Tora hartebeest (*Alcelaphus buselaphus tora*) the found in the Northwest parts of Ethiopia. It lives in the wooded grassland, and plain. The Lelwel hartebeest (*Alcelaphus buselaphus lelwel*) distributed in Southwest Ethiopia. The main habitat types are wooded grassland and open grassland [32]. The Gerenuk (*Litocranius walleri*) distributed in Southeast Ethiopia. It lives in the thorn scrub and thickets. The Dibatag (*Ammodorcas clarkei*) found in the Ogaden region. The main habitat types are bushland and open scrubland [7][32]. The Soemmring's gazelle (*Nanger soemmerringii*) distributed in the North, East and Southeast parts of the country. It lives in grassland and open scrubland [37][38]. The Grant's gazelle (*Nanger granti*) found in Central and south parts of Ethiopia such as Nech Sar National Park and Abijitta-Shalla National Park. It lives in the open plain and wooded grassland [39]. The Red-fronted gazelle (*Eudorcas rufifrons*) distributed in Northwest parts of the country. The main habitat type is semi-desert savanna. The Thomson's gazelle (*Eudorcas thomsonii*) distributed in the Northeastern and South parts of the country such as Awash National Park, Hallidage National Park and Boreana National Park. It lives in the open savanna grassland [32][38].

The Oribi (*Ourebia ourebi*) distributed in the central, northwest and southwest parts of the country. It lives in the wooded grassland and open grassland [38]. The Salt's Dik-dik (*Madoqua saltiana*) distributed in Northeast and Southeast parts of the country. It lives in the bushland, thickets and usually near road/track sides [38]. The Guenther's Dik-dik (*Medagua guentheri*) distributed in the South and Southeast parts of the country. Bushland and scrublands are common habitat types of this species [31][38]. The Grey duiker (*Sylvicapra grimmia*) distributed throughout the country. The habitat

types are bushland and scrublands [37]. The Walia ibex (*Capra waliae*) is one of the endemic mammals in Ethiopia, and they are distributed in Semin Mountains National Park. It lives in the sub-alpine, heathland, and grassland habitats [7] [14].

Proboscidae distribution and habitat

The Elephants (*Loxodonta african*) are group of large herbivorous land mammals. There are three extant groups of elephants: Africa savanna Elephant, Africa Forest elephant, and Asian elephant. Africa savanna Elephants are the largest of all the Elephant species. In Ethiopia they are found in Kafta Shiraro National Park, Gambella Nation Park, Omo National Park, Mago National Park and Babile Elephant sanctuary. They have wide home range and habitat preference as compared to other mammals [7] [9] [25].

Carnivora distribution and habitat

The distribution and habitat of the carnivores in Ethiopia are the following: Ethiopian wolf (*Canis simensis*) distributed in Gondar, Wollo, North Shoa, Arsi and Bale highlands. The main habitat types are afro-alpine moorlands [16][19][32][40]. The Bat-eared fox (*Otocyon megalotis*) mainly distributed in the country's Southwest, Southeast, and Southeast parts [9][16][32]. The main habitat types are short grassland and shrubland [9]. The Pale Fox (*Vulpes pallida*) distributed in the North part of the country. It lives in the sandy and stony habitats extending to deserts [9] [32] [41].

The Black-backed jackal (*Canis mesomelas*) distributed in the Northeast, East, central and Southern parts of the country. It has wide habitat tolerance and always absent from forestland [9]. The Side-striped Jackal (*Canis adustus*) mainly distributed in the Southern and southwestern, sometimes towards the Eastern parts of the country. They are found almost everywhere in Ehtiopia. They have preference for scattered trees and bush habitats [9]. The Golden Jackal (*Canis aureus*) is also commonly found in Ethiopia. Similar to Side-striped jackal, they have preference for scattered trees and bush habitats [9][27] [32].

The Spotted-naked otter (*Lutra maculicollis*) distributed in Central and Southwest parts of the country. The main habitats are rivers, swamps, lakes and dams [9][16] [32]. The Zorilla (*Ictonyx striatus*) distributed throughout the country. It lives in semi-arid areas. The Ratel/honey badger (*Mellivora capensis*) distributed entirely throughout the country. It lives in the all-habitat types [16] [32]. The African Civet cat (*Civettictis civetta*) mainly distributed in Central, Northwest, West and South parts of the country. It lives in densely wooded and forested habitats [23]. The Common Genets (*Genetta abyssinica*) distributed in the Northwest, South, Southwest and Central parts the country. It lives in forest, riverine and woodland habitats [9]. The White-tailed mongoose (*Ichneumia albicauda*) distributed throughout the country, except in extreme East parts of the country [9]. It lives habitat in forest margin and woodland habitats [42]. The Spotted hyena (*Crocuta crocuta*) distributed throughout the country except extreme Northeast margins. It lives in the forest and dense woodland [18][21].

The Lion (*Panthera leo*) one of the flagship species in Ethiopia distributed entirely throughout the country. It is found in Central, West, South and Eastern parts of the country [9][16][43]. The Cheetah (*Acinonyx jubatus*) distributed in the Southwest and Eastern parts of the country. It lives in grassland habitat [9][32]. The Leopard (*Panthera pardus*) distributed entirely throughout the country. The Caracal (*Caracal caracal*) distributed entirely throughout the country. It lives in savanna and forest habitats [9][16][32].

Tubulidentata distribution and habitat

The Aardvark (*Orycteropus afer*) is shy rarely seen in evening. It is nocturnal and burrows spade like scratching and track are more commonly seen than the animal itself. It is native to Africa and Ethiopia [25]. In Ethiopia, it is found everywhere. The main habitat types are open woodland, sparse scrub and grassland. It sleeps in the deep burrow digs by itself [9] [25] [36].

Pholidota distribution and habitat

They found in both high and low rainfall areas with both sandy and rocky soils, woodlands, savannas and grasslands. The species' range is determined by abundance of ants and termites [25]. The Ground pangolin (*Phataginus temminckii*) distributed throughout the country [9][44].

Rodentia distribution and habitat

The Crested Porcupine (*Hystrix cristata*) distributed in the North, East, Central, Western and South parts of the country [9]. It lives in the forest, riverine, woodland, thickets and sparse tree and bush land [9] [20][23] [25].

Conclusion

There are five biomes and various sets of ecosystems in Ethiopia. The altitudinal difference ranges from the highest peak at Ras Dashen (4620 m) to (126 m) below sea level, which made the country to be among the biodiversity-rich nations in the world. The current distribution of large-sized mammals in the five biomes, most of high concentration in Sudanian and Somali-Maasai. The large-sized endemic mammals' species which are found in Afro-alpine biomes and sub-afro alpines montane ecosystem and some of them are found at Sehal arid Arid biomes. The order of Artiodactyla, primates and Carnivora highly distributed throughout in the country respectively. Ethiopia protected area exposed by human population growth, habitat degradation, habitat destruction; bush meat hunting, invasive plant species encroachments and disease

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