CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences

Antelopes in Protected Areas in West African Savannah: Case Study of Western Hartebeest in Niokolo Koba NP, Senegal

BACHELOR'S THESIS

Prague 2022

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Declaration

I hereby declare that I wrote this thesis entitled, *Antelopes in protected areas in West African savannah: Case study of Western hartebeest in Niokolo Koba NP, Senegal*, independently, all texts in this thesis are original, and all sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In Prague

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Tereza Jechová

Acknowledgements

I would like to express many thanks to my supervisor doc. Ing. Karolína Brandlová Ph.D. for her time, cooperation, mentoring, provide me materials, her guidance, and patience during the writing of this bachelor thesis. We are grateful to Panthera Senegal and Directorate of National Parks in senegal for their work in the Niokolo Koba National Park and for sharing the camera trap images for analyses.

Abstract

This bachelor thesis consists of two parts. The first part review available information about Western African antelopes and their habits, with a special focus on the Western Hartebeest *(Alcelaphus buselaphus major)*, including their distribution in protected areas, and their behaviour, diet, ecology, and threats.

The practical part contains analysis of population of Western Hartebeest from Niokolo Koba National Park in Senegal. It is based on camera trap images provided by Panthera Senegal and Directorate of National Parks Senegal. In total, 295 images from 18 camera trap stations were organised into 79 independent events relatively evenly distributed across the sampled areas in the NKNP. Animals were mostly active during the day (23% during the night). The mean group size recorded from the camera trap data was 2.72±2.8 (1-16) individuals. The recorded herds contained juveniles and 16 contained subadult individuals. The adult sex ratio was female biased, 1:2 (male: females). Animals were mostly walking, running or standing, but also few social interactions were recorded. In general, demographic status of the Western Hartebeest population in the NKNP seems promising. Deeper analyses of space use and resource selection are recommended as a future step.

Key words: antelopes, savanna, West Africa, Senegal, Niokolo Koba, camera traps, national park, Hartebeest

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List of the abbreviations used in the thesis

IUCN (International Union for Conservation of Nature)

CZU (Czech University of Life Sciences in Prague)

NP (National Park)

NKNP (Niokolo Koba National Park)

CT (Camera Trap)

CTs (Camera Traps)

1 Introduction

Western Hartebeest, *Alcelaphus buselaphus major*, is an antelope species living in the West Africa in savanna belt from Senegal to Niger. Currently, the Western Hartebeest is listed as vulnerable (IUCN Red List 2016). The population is still decreasing because of poaching and expansion of farming land and livestock. In 2013 the population of hartebeest was around 36.000 individuals (Kingdon 2013). This study focuses on the population of Western Hartebeest in the National Park Niokolo Koba, which is located in the south-eastern Senegal (UNESCO 2020).

Western Hartebeest are active in the morning or in the evening, during the day, they are hide in the shadow shelter. They are typical plain antelopes, ranging in the savanna and grassland and shrubland. This antelope is grouping into 5-12 individuals in one herd (Casteló 2016).

This work summarises the data about Western Hartebeest and other antelopes, also predators and their environment. Also, there were used a camera trap for observation of Western Hartebeest and their demography and behaviour.

2 Literature review

2.1 Protected areas and national parks

National parks have to protect natural and historical elements, also there maintain the original habitats and ecosystem functions in the original state. National parks are a crucial tool for the protection of natural resources and may be also used for recreation (Prato 2001).

Protected areas are very important for the protection of biodiversity. They are used for maintaining of functioning ecosystems and serve as refuge for animal or plant species (IUCN 2013).

Creating of national parks or protected areas is because of protection of nature and living animals and also for joy for people. To fulfil their roles, protected areas should

follow strict rules, people must respect the borders of the park, they must not be degrading natural resources. But there are not only the strict rules, there exists many types of protected areas. Tourism provides a way, how could be the relation between people and protected areas better and with benefits for both sides. Also, there is a provision of labour to local people and learning knowledge about animals lives, why they should protect them, and how to fight against illegal hunting. High interesting of tourists bring needs of infrastructure and employees (IUCN 2018).

Protected areas and national parks are the main tools of *in-situ* conservation, which means, protection of wild animals in their original habitats with their original distribution range (Maxted 2001).

2.2 Characteristic of savanna ecosystem and savanna vegetation

Savanna is a tropical or near-tropical seasonal ecosystem characterized by an herbaceous layer where is the main representation of grasses and also with an incoherent layer of shrubs and trees (Skarpe 1992).

However, according to book by Peter Frank Scogings and Manesh Sankaran, Savanna woody plants and large herbivores, is very hard to define what exactly is savanna and map savanna because both are very variable in the structure. Savannas are large surfaces which cover terrestrial biosphere. *"It is important to consider that African savannas are the birthplace of modern humans"* (Scogings et al. 2020).

Productivity of the savanna ecosystem is affected by accessibility of water (Hill & Hanan 2011). The savannas regularly burn, which stimulate the grass to grow if the fires are not too intense. Natural fires arise due to lightning during the storms (Skarpe 1992). Fire is a very important modifier in savanna and it influences composition of vegetation. Also, antelopes and other grazers influence the area (Bond et al. 2005).

In Western Africa, we can find three main types of savanna ecosystem, Sahel in the north with low mean rainfall, Sudanian savanna to the south and Guinean savanna with higher mean rainfall (Fig.1).

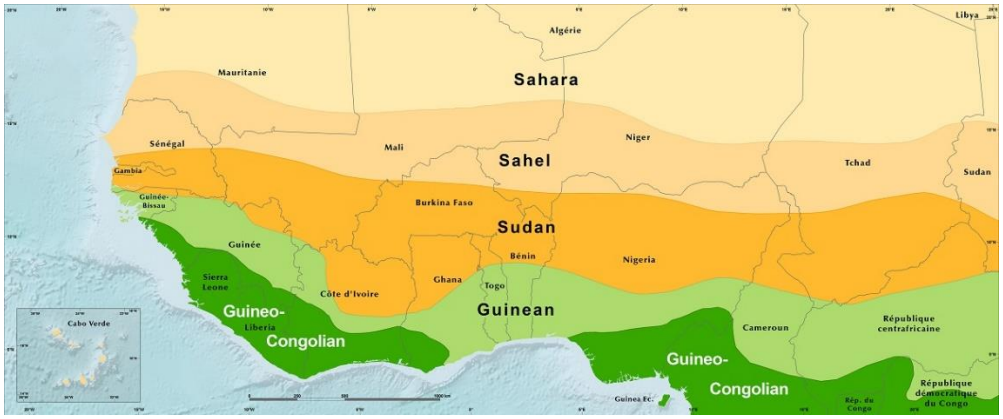

Figure 1: Map of West Africa with illustration of bioclimatic belts (Source: eros.usgs.gov)

2.3 Wildlife of Western Africa

Wildlife in West African savannah is diverse, however this thesis focuses on mammals. This chapter focuses on an analysis on mammalian species in the selected region. Here are mentioned some species from families *Suidae, Hippopotamidae, Giraffidae and Bovidae*.

2.3.1 Herbivores excluding antelopes

In Western Africa, there live three species representing family *Suidae*. The first example is Red River Hog, *Potamochoerus porcus*, it is the smallest of suids characterized by russet colour and white dorsal line which start behind the head. Its ears are black with long tip, carrying white tail. This species is endemic to Africa and its expansion is from West to Central African forests (Kingdon 2013). Red River Hog is listed as Least Concern (IUCN Red List 2016).

Forest Hog, *Hylochoerus meinertzhageni*, is large pig and its body is covered by long black hair. This species inhabits montane forests, where is water source nearby. Forest Hog is listed as Least Concern (IUCN Red List 2016).

Common Warthog, *Phacochoerus africanus*. This pig with long tusks is ranging moist and dry savanna grassland or open bushlands. Interesting is that they are sleeping in holes in the ground at night. Typical sign of this animal is erect tail when it is running.

Their snout and teeth are designed for grazing (Kingdon 2013). Common Warthog is listed as Least Concent (IUCN Red List 2016).

Both species of family *Hippopotamidae* are present in the West African region. It is Common Hippopotamus, *Hippopotamus amphibius*, this animal species is characterized by its barrel shaped body, short legs and bare skin. Nostrils are on the top of snout. It has small ears. Hippos are ranging in sub–Saharan Africa, from Senegal to Sudan and Ethiopia, also in East and South Africa. There are also present in the Okavango Delta in Botswana. Common Hippos need access to water, because of thermoregulation and skin protection. Their diet is primarily grass. Common Hippopotamus is listed as Vulnerable (IUCN Red List 2017). In West African coast, there also live Pygmy Hippopotamus, *Choeropsis liberiensis*, which is listed as Endangered (IUCN Red List 2015).

Family *Giraffidae*, there is also one representative and it is Giraffe, *Giraffa camelopardalis*. It is the tallest animal and it is characterized by very long neck and limbs. Their colour is individually variable and it is unique for every individual. Their patches are going to darker as they get older (Kingdon 2013). Current distribution of giraffes in West Africa is the only in SW Niger and it is subspecies named West African giraffe, *G. c. peralta.* Giraffe is listed as Vulnerable (IUCN Red List 2018).

In family *Bovidae*, there are many representatives, start with African Buffalo, *Syncerus caffer*. It is large animal with black colour, and it has large horns in both sexes. Compared to females, males have a hump located behind back of the head. Historical distribution of buffaloes is in whole savanna zone, from Senegal to central Africa, East and South Africa. Their population is decreasing. The West African savanna buffalo, *S. c. brachyceros*, is characterized by combination of black and red coloration and its populations are decreasing and extinct in many former range countries (Kingdon 2013). African Buffalo is ranging semi-arid bushland, woodlands, and forests. African Buffalo is listed as Near Threatened (IUCN Red List 2019).

Antelopes as part of Bovidea family are discussed in separate chapter.

Very important animal species that should be mentioned is African Forest Elephant, *Loxodonta cyclotis*, which is listed as Critically Endangered (IUCN Red List 2021). The population trend is decreasing. Elephants are ranging primarily in the forest

but also in savanna and shrubland and their area of range is in Niokolo Koba NP (IUCN Red List 2021). The population of elephants is decreasing because of poaching for ivory. The African Forest Elephant has rounded head and ears and the colour of tusks is dark. The skin of elephants is totally hairless. Tusks are present in both sexes. Elephants are active during the day but also during the night. During the day, they take short rest in the shadow. Elephants are dependent on water and they drink 2-3 times per day and they eat grass (Furstenburg 2010). Elephant is the largest land mammal. Their social behaviour is matriarchal with herds and males are separate or alone. They are very contact animals, they touch each other during the resting or drinking and also mothers gripp calf´s tail to guide them. When calfs are older they sometimes hold mother´s tail (Estes 1991).

2.3.2 Antelopes

This chapter discuss which species of antelopes live in western Africa and Niokolo Koba National Park. Antelopes also belong to the family *Bovidae.* This summary starts with small antelopes, continue with medium – sized and end with large antelopes.

At the first part are mentioned antelopes which are living in the western Africa except these which are living in the NKNP.

The smallest antelope is the Royal Antelope, *Neotragus pygmaeus.* It has thin, long legs, relatively small ears and tiny tail with white coloration at lower part. Its colour is reddish or golden–brown and chest is white. It has also conical horns, but very small (Kingdon 2013). These antelopes are ranging in lowland rainforest from south west Guinea, according to map it lives in Guineo-Congolian bioclimatic belt. This species is Least Concern (IUCN Red List 2016).

Another small–sized antelope is Maxwell´s Duiker, *Philantomba maxwelli,* with changing colour from sandy–brown to grey or black. Legs are slim and the tail is haired. Its territory of ranging is in lowland forests from Gambia and Senegal up to Benin and Nigeria (IUCN Red List 2016). Interesting thing is that the name of this species is named for Sir Charles William Maxwell, who was Senegal´s Governor. Maxwell´s Duiker is listed as Least Concern (IUCN Red List 2016).

The Yellow-backed Duiker, *Cephalophus silvicultor,* is the largest of duiker species. Their population is currently decreasing. They inhabit forest and savanna areas. It is listed as Near Threatened (IUCN Red List 2016).

Red-fronted Gazelle, *Eudorcas rufifrons,* has reddish colour with dark band on the flanks. Horns are quite long with S-shape. The horns of males are thick and ringed in comparison with females. It ranges in Sahel bioclimatic belt. This gazelle is listed as Vulnerable (IUCN Red List 2017).

To the group of large sized antelopes belongs Bongo, *Tragelaphus eurycerus,* its colour is reddish-brown, with white and black spots on the legs and long spiral horns. Their tail is long with black tuft at the end. Horns are present un bith sexes. Differences between males and females horns are that males have thicker and wider spread horns (Kingdon 2013). This species is ranging in forest areas and forest-savanna in the lowlands of West Africa. Bongo is listed as Near Threatened (IUCN Red List 2016).

The second part is about antelopes which are living in Niokolo Koba National Park (Derbianus Conservation 2020).

Red–Flanked Duiker, *Cephalophus rufilatus,* is coloured with orange–red on the face and neck. It has short legs and tail is with black tuft and it moves from side to side. It is endemic to Africa, ranging is from Senegal and Gambia to Sudan (Kingdon J. 2013). It lives in forest edges, in the Sudano-Guinean bioclimatic belt. This animal species is listed as Least Concern (IUCN Red List 2016).

This antelope is count in small medium-sized antelopes, and its name is Oribi, *Ourebia ourebi.* Its colour is brown but on the legs are white and sandy colour. The tail is short and dark with tuft. In comparison between males and females, only males have horns (Kingdon 2013). The range of this antelope is extensive, it occurs in savanna areas from Guinea, Senegal and Gambia to Cameroon. It lives in Sudanian bioclimatic belt. Oribi is listed as Least Concern (IUCN Red List 2016).

Bushbuck, *Tragelaphus scriptus,* represent medium-sized antelopes. It is characterized by white spots on the body and its red or brown colour. Horns are present only in males (Estes 1991). Horns are spiral and can be straight or a little curved (Kingdon 2013). This antelope is ranging in 40 countries in Africa. Bushbuck is listed as Least Concern (IUCN Red List 2016).

Common Duiker, also known as Grey, Bush or Grimm´s Duiker, *Sylvicapra grimmia,* is an antelope which has colour variation according to the place of occurrence. It is the only duiker species found in open savanna woodlands (Kingdon 2013). This animal species is widely distributed in Africa. Common Duiker is listed as Least Concern (IUCN Red List 2016).

Kob, *Kobus kob,* is endemic to Africa, ranging in belt running from Senegal to Ethiopia. It lives in Niokolo Koba National Park, but it ranges in the whole Sudanian bioclimatic belt in areas near water. Males are horned and they have muscular neck, females are hornless and thin (Kingdon 2013). The colour is from light brown to reddish (Estes 1991). Kob is listed as Least Concern (IUCN Red List 2016).

Giant Eland, also known as Lord Derby´s Eland, *Tragelaphus derbianus,* is the largest antelope species (Estes 1991). The body is ruddy fawn and on the sides are usually 10-18 white vertical stripes (Kingdon 2013). There is dark mane on the neck. Tail is long with black tuft. Females are smaller. Horns are present in both sexes. Horns are very large and massive. Number of white vertical stripes are distinctive feature between Western Giant Eland and Eastern Giant Eland. Distribution of Western Giant Eland is restricted to Niokolo Koba National Park in Senegal. Giant Eland occupies woodland and forest-savanna areas. These antelopes are able to move long distances per day from 5 to 20 kilometres. This antelope drinks daily when it is possible and water resource is accessible (Kingdon 2013). They wander during the day and night. They have very good sense of smell and hearing. Lord Derby´s Eland is listed as Vulnerable and the Western subspecies is Critically Endangered (IUCN Red List 2017).

Waterbuck, *Kobus ellipsiprymnus,* is the one of the heaviest antelopes. There are two subspecies. First one is Common Waterbuck, *Kobus ellipsiprymnus ellipsiprymnus,* with white ellipse on the bottom, while Defassa Waterbucks, *Kobus ellipsiprymnus defassa,* occurring in the West Africa have all white rumps (Kingdon 2013). Males have long, inwardly curving horns. Their colour is grey, but legs are darker. They are ranging in sub-Saharan Africa in savanna lowlands. This antelope is also possible to find in Senegal in Niokolo Koba National Park. Waterbucks, already obvious from the name, are water-dependent species (Kingdon 2013). Defassa Waterbuck is ranging in the belt from Senegal to Ethiopia and is limited to areas with at least 750 mm annual rainfall, whereas

Common Waterbuck is ranging in South East parts of Africa and live in drier habitats. The Defassa Waterbuck is listed as Near Threatened (IUCN Red List 2016).

Roan Antelope, *Hippotragus equinus,* is the second tallest antelope and third heaviest antelope. It has short, grey to brown mane which extends from neck to withers. Its colour is sandy-fawn or reddish-fawn. Face is black. Horns are present in both sexes, and they are curved backwards. This antelope is ranging in savanna woodlands and grassland of sub-Saharan Africa in Sudan bioclimatic belt. Roan Antelope is listed as Least Concern (IUCN Red List 2017).

Western Hartebeest, *Alcelaphus buselaphus major,* are not so variable in the horn shape and colour of fur. Hartebeest belongs to medium-size antelopes with long and slim legs. They have hump over the shoulders because of long dorsal processes of vertebrae (Estes 1991). There are many subspecies of hartebeest occurring in different geographical regions of Africa. The subspecies differ in coloration (Kingdon 2013). Bubal Hartebeest, *A. b. buselaphus,* is extinct and it was ranging from Morocco to Israel. Western Hartebeest or Kanki, *A. b. major,* is in West Africa, ranging from Senegal to Niger. It is very large subspecies with gold or mid-brown fur. Horns are U-shaped (Fig. 4.). Lelwel Hartebeest, *A. b. lelwel,* is ranging in Central Africa and Chad, Ethiopia and Kenya. Horns are V-shaped. Swayne´s Hartebeest or Korkay, *A. b. swaynei,* lives in Ethiopia, it was extinct in Somalia. Its colour is reddish-brown. Tora Hartebeest, *A. b. tora,* is in Ethiopia and Eritrea. Its colour is reddish to ochre. Coke´s Hartebeest or Kongoni, *A. b. cokii,* is ranging in Tanzania and Kenya. Its colour is mid-brown.
The Lichtenstein´s Hartebeest or Nkonzi, *A. b. lichtensteinii,* is ranging in woodlands in south-central Africa. It is a large subspecies with mid-brown fur. Horns are short. And Red Hartebeest, *A. b. caama,* is living in Southern Africa. Its colour is chestnut-brown. Horns are in shape of high "V" (Kingdon 2013). (Fig. 3).

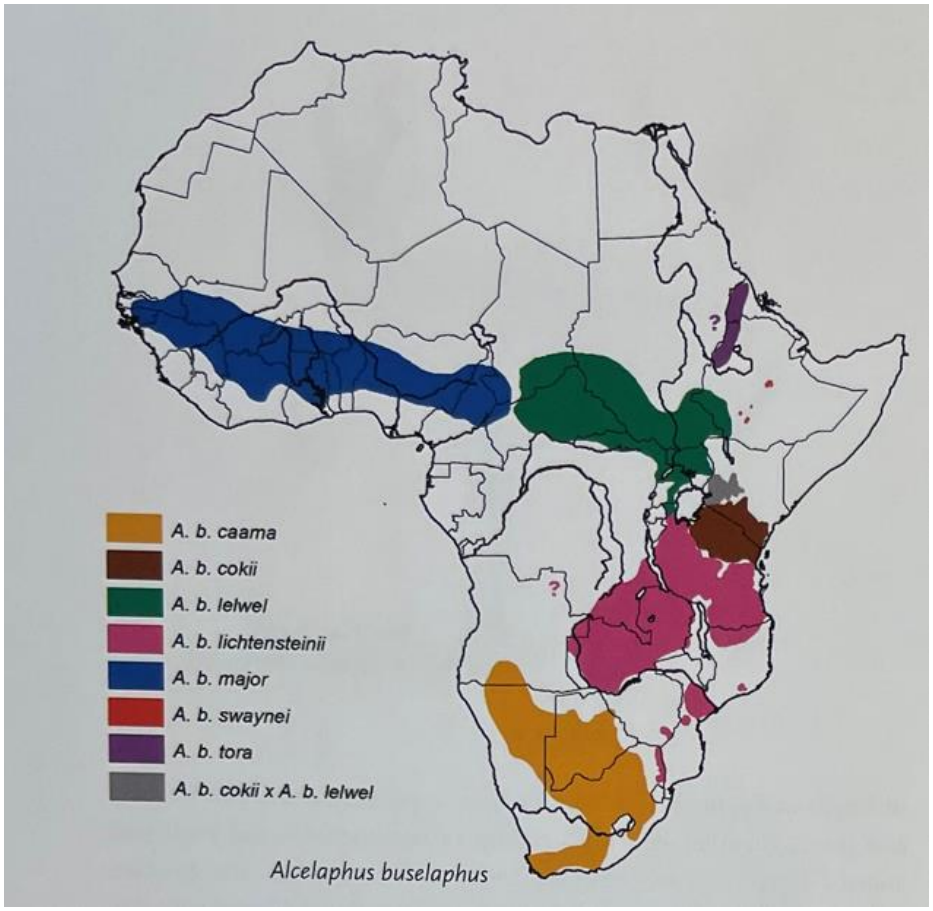

Figure 2: Map of hartebeest distribution (source: Kingdon J. 2013 Mammals of Africa, p. 516)

All subspecies have white underparts, and their tails are long ended with black tuft. Females have horns but more slender and less angular than males. Horns reach a length of up to 30-70 cm depending on the subspecies (Kingdon 2013). Hartebeest are ranging from North Africa to the Middle East, in savannas and grasslands and woodlands. The number of hartebeest is decreasing, because of hunting and the expansion of farming (IUCN Red List 2016). Western Hartebeest are occurring in or near protected areas, however their populations are declining, including the population in the Niokolo Koba (Kingdon 2013).

The hartebeest are mostly found in grasslands. They dependent availability of drinking water. The Western Hartebeest is listed as Vulnerable (IUCN Red List 2017).

The last antelope species worth mentioning is Korrigum, *Damaliscus lunatus korrigum*, also known as Senegal Hartebeest (Fig.3.). This antelope is listed as

Endangered (IUCN Red List 2017). Number of individuals ranges between 1,295-1,855 and the population is still decreasing. This species was extinct in Niokolo Koba in Senegal (IUCN Red List 2017). In the past, Korrigum occurred area from Mauritania and Senegal to Chad. Since the beginning of the 20th century the population of Korrigum has been decreasing. Currently, the Korrigum is extinct in Senegal (Chardonnet 2004). It is because of expansion of cattle and hunting for meat (Grubb 1998). This antelope inhabits floodplains and also grasslands in West Africa, and it is moving during the seasons between Sahel and grasslands, also to savannas and to the floodplains of Niger river (IUCN Red List 2017). The main recognition feature is black strip from the forehead to the snout. These antelopes are grouping into the herd of 15-30 individuals (Casteló 2016).

Figure 3: Photos of Korrigum (source: José R. Castelló 2016)

Figure 4: Photos of Western Hartebeest (source: José R. Castelló 2016)

2.3.3 Predators

The carnivores are a group of animals that feed mainly on meat. Their teeth are adjusted for slicing the meat. Carnivores are from small-sized to large-sized animals, adapted to all habitats, from the Sahara desert to poles (Hunter 2019).

This chapter focuses on species that are either antelope predators in Western Africa or may be threat for their offspring.

Golden jackal, *Canis aureus,* is the most common of small carnivores. Side-striped Jackal, *Canis adustus,* occurs in the belt extend from Senegal to Ethiopia and also in east and south of Africa. Its habitat is in the edge of forest and savanna. It is nocturnal animal, but it is also active in the dawn or twilight. Their diet includes fish and gazelle fawns (Kingdon 2013).

Lion, *Panthera leo,* is the largest of the cats which is ranging in the southern Africa, east coast and in the belt running from Senegal and Gambia to Somalia. They occur savanna and shrubland. The main difference between males and females are

significant at first glance. Males have thick mane which is various in colour and length individually. Lions roar to mark their territories. Their diet consists of mammals. Prey of lions can weigh from 50 to 300 kg (Kingdon 2013). Any other preys can be attacked. Small preys are hunted by individuals and the bigger ones are hunted by the group. According to IUCN Red List of Threatened Species population of lions is decreasing and the West African lion is listed as Critically Endangered (IUCN Red List 2016).

Leopard, *Panthera pardus*, is a big cat with many black and brown spots that cover whole surface of body. They are distributed throughout Africa and also in Asia. Leopards need dense vegetation for hiding them from lions, hyaenas and also humans. Their diet is consisting of small to medium-large mammals. Leopards can kill large antelopes, but they prefer smaller preys than they are (Kingdon 2013). Leopard is listed as Critically Endangered, and their population is decreasing (IUCN Red List 2020).

Cheetah, *Acinonyx jubatus,* is a cat with black spots that are covering the body. Their area of ranging is in southern Africa, some parts of east coast and in Benin, Niger and Algeria. Diet of Cheetah is consisting of antelopes such as Impala, Kob or springboks and also gazelles (Kingdon 2013). Cheetah is listed as Vulnerable and its population is still decreasing (IUCN Red List 2015).

Spotted Hyaena, *Crocuta crocuta,* is ranging in the belt running from Senegal and Gambia to Somalia, also in Ethiopia, Kenya and eastern regions of Africa and southern Africa (Kingdon 2013). It has short and brushy tail, and their body is covered by irregular spots (Estes 1991). Hyaenas are often heard, their calling is loud, and it is possible to hear it from very far distances, up to 5 kilometres. The areas of their occurrence are savanna and grassland parts. They are scavengers wherever other animals leave their prey. Hyaenas also could be killers, but they choose which animal want to kill, for example zebras are not so much represented in their diet, because zebras are fast, while common Waterbuck is slower than zebra and they are more killed by hyaenas (Kingdon 2013). Spotted Hyaena is listed as Least Concern (IUCN Red List 2015).

African Wild Dog, *Lycaon pictus,* represent other representative of predators occurring in Western Africa. The population of African Wild dogs are highly fragmented and decreasing in numbers. It is listed as Critically Endangered (IUCN Red List 2012).

And the last predator does not belong to mammals but to reptiles. Central African Rock Python, *Python sebae*, is a large serpent. Its colour is olive with dark-brown patterns. Their distribution is in Western Africa, include mainly Senegal and Gambia. Diet of Python is mammals and birds, livestock and any other animals are occasional preys. This serpent is not poisonous, it is a constrictor (Trape & Mané 2006).

2.4 Niokolo Koba NP

Niokolo Koba National Park is located in Senegal (Fig. 5.) and was established in 1954. (UNESCO 2020). It is the largest national park in Western Africa and is categorized on World Heritage UNESCO list (van der Burgt et al. 1996). This park lies in southeastern part of Senegal along the borders of Guinea. The area of this national park covers 9,130 km^2 (Brandlová et al. 2018). The river Gambia flows through this park and it provides water throughout the year. Along the river there is a gallery forest and most of the area is covered by wooden savannah. This national park is a refuge of many wildlife species, such as the largest antelope the Derby Eland, Western Hartebeest and many other species of antelopes, but it is also refuge for big cats, such as lions and leopards, and for chimpanzees, elephants, reptiles and birds (Chen et al. 2020).

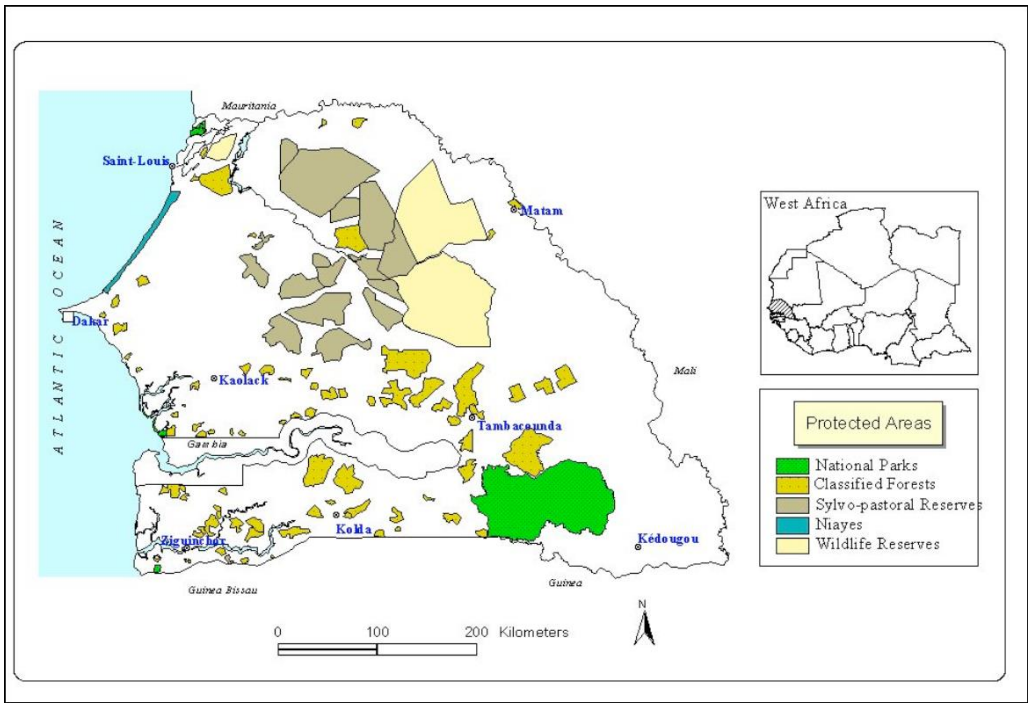

Figure 5: Map of Niokolo Koba NP (source: Ece M. 2012)

2.4.1 Ecosystem of Niokolo Koba NP

The ecosystem of Niokolo Koba is very diverse and cover unique ecosystems of the Sudanese bioclimatic zone, starting with river Gambia, which is main source of water for animals and plants along the river, continuing with gallery-forest, dry forest, which may be really dense. Despite of the generally low elevation, the terrain is hilly and with rocky slopes. The area is a homeland of many animals, there is extraordinary density of wildlife species. It includes more than 70 species of mammals, around 330 species of birds, there are also many reptiles and amphibian species. The main mammals in this national park are lions, Derby´s Eland and Hartebeest, but elephants are also present, even if in very low numbers. Also, should be mentioned that there is very high diversity of flora, counting around 1500 plant species. This park is very large, and it is possible to see main aspects of the Sudano-Guinean savanna type ecosystem, with very high biodiversity (UNESCO 2020), (Brandlová et al. 2018).

2.4.2 Location

National Park is located in the Sudano-Guinean savanna zone in south-eastern Senegal. In the national park flows river Gambia with tributary of river Niokolo-Koba (UNESCO 2020). This park stretches over three administrative areas Tambacounda, Kolda and Kédougou. National Park is located between the 12°30´ and 13°70´ of west longitude and between the 12°60´and 13°40´north latitude and neighbours with the Badiar National Park in the Republic of Guinea (Rabeil et al. 2018).

2.4.3 Area

Niokolo Koba National Park is covering 913,000 ha and it is the oldest and largest national park in Senegal. In NKNP is high diversity of animal species, but also there is a high diversity of plan species (Brandlová et al. 2018). This park is relatively flat terrain that becomes more rugged towards the south. In this protected area are three main types of environments, valley, plateau, and hills (Rabeil et al. 2018).

2.4.4 Protection

This national park is the under state governance, exactly by Ministry of Environment and Nature Protection and the Directorate of National Parks. In 2002 there was designed a plan for regular monitoring, for the purpose of protection of area. In 2007, the national park was listed as the World of Heritage in Danger. The main threats include poaching, hunting and also increasing human population which is connected to livestock encroachment in the park. The main steps for the protection of park are activities for stop the poaching and hunting, make a plan for protecting endangered animal species (UNESCO 2020). In the Niokolo Koba National Park, the rangers protect the wildlife. These rangers can be former poachers and they know well the area, techniques of poachers and wildlife, so it is very beneficial to employ them as rangers.

2.4.5 Wildlife in the Niokolo Koba

The most important wildlife species in Niokolo Koba National Park are Western Hartebeest, Western Derby eland, West African Lion, Leopard, African Wild Dog and Elephant. The NKNP and surrounding areas are most likely the only one place in the world, where is possible to find wild population of Western Derby eland, nonetheless these antelopes suffer by hunting and livestock encroachment (Brandlová et al. 2018).

2.5 The Western hartebeest

2.5.1 Current and historical distribution

In the past, the population of hartebeest ranged from the Cape to the Mediterranean, and also from Senegal to Somalia. According to Kingdon, Western Hartebeest occurred western savannas woodlands in western countries of Africa. Currently, they are ranging in savanna and grasslands areas, but it is possible to find them in open areas or on the edges of woodlands. The hartebeest are threatened by hunting and expansion of cultivation land and farming. Hartebeests are already extinct in Gambia, even if there may be potentionally found vagrants from Senegal. The hartebeest are mainly surviving in or near the protected areas/ national parks (Kingdon 2013).

2.5.2 Social and reproductive behaviour

Their behaviour is possible to divide to social, territorial, parent and antipredator behaviour and also reproduction. Very important is communication between hartebeest, they use visual and vocal communication (Estes 1991). Hartebeest have typical and striking colours so they can easily recognize each other. In term of vocal communication, they produce grunting sounds. About territorial behaviour, they stand in the erect stance. Hartebeest mark their territory by defecation. For hartebeest is typical to stand in the erect stance and grunt, and it is their recognitive territorial behaviour. Also, it is possible to recognize dominance, defensive or fighting behaviour or mood. When the hartebeest is in erect posture, with head up, it sends the characters of dominance, the other way around with head low posture, it sends signs of being submissive. During the fights, they are pressing on each other and they also tangle their horns (Estes 1991).

The reproductive system is polygynous, one male mates with more females (Fig.6.) Female´s gestation length is 240 days, and they give birth to only one calf. Females nurse their calves for 4 months. The young become sexually matured at 1.5 – 2.5 years. If the young survives and become an adult, their lifespan is about 19 years (Casteló 2016).

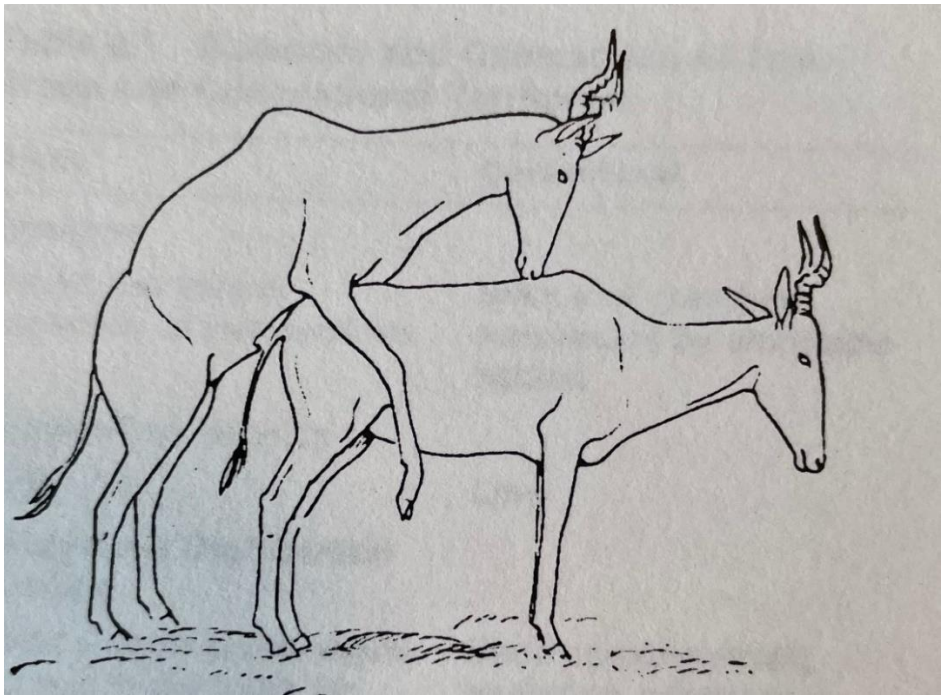

Figure 6: Copulation of hartebeest (Source: Estes R.D. 1991 The Behavior Guide to African Mammals, p. 141)

Parental care is provided by females, which are isolated with calf in the first days after parturition. Estes (1991) observed that newborn calves start to stand firmly after 30 minutes after born. 40 minutes after birth calves could start to run and walk and also they start to follow their mothers. Mothers with calves stay hiden and isolate for 2 weeks.

Hartebeest are the main prey of lions. They bunch together and stamp when the predator is close to them. The hartebeest stand in the alert posture, snor and stamp (Estes 1991).

2.5.3 Diet

According to Kingdon (2013), the diet of hartebeests is mainly grass. The hartebeest are mainly active in the morning and in the evening, during the day, they rest in the shadow. According to Haltenorth and Diller (1980), they eat grass, herbaceous plants and sometimes leaves. These antelopes drink usually daily in the morning or evening, when they are active (Haltenorth & Diller 1980).

2.5.4 Conservation

By IUCN Red List of Threatened Species is the Western Hartebeest listed as Vulnerable. Because hartebeest is grass eating animal, there is direct conflict between them and livestock. The number of hartebeest is decreasing where they do not live in the protected areas and the livestock push them out of this territory. Hartebeests are also well known for their quality meat, so their hunting represents also a major threats. This meat from hartebeest is called bushmeat (-meat from wildlife species that was illegal hunted for human consumption) and the trade of this meat is still increasing because of increased availability of modern guns which could contribute to extinction of this antelope species.

3 Aims of thesis

The objective of this thesis was to review available information about the Western Hartebeest, their behaviour, mating system, diet, threats for them, distribution range and their conservation. The data for literature review were collected from scientific articles, books and reports from the range states.

Practical part of this thesis consists of analyse of camera traps images from the Niokolo Koba National Park, specifically to explore the demographic parameters and behaviour of this population.

4 Methods

4.1 Maps and camera traps images

Practical part of this thesis use the photos from camera traps.

Camera traps are used to study of animal behaviour and ecology, species distribution, diversity and interactions between animals and humans. Camera traps can be divided into two groups, CT with direct trigger (Fig.7.). White flash on camera trap is able to make a colour photos with high quality in the night, yet may be disturbing for the wildlife and alter its natural behaviours. On the other hand, the infrared flash does not disturb the wildlife, yet provides only black-and-white photos in the night. CT with indirect trigger and white flash were used in this study.

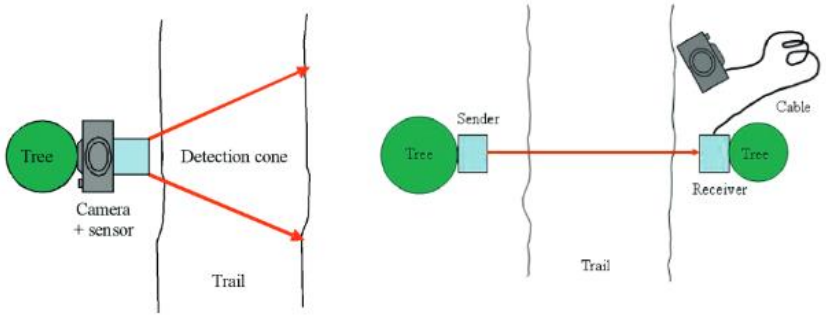

Figure 7: Difference between CT, right one with indirect trigger, left one with direct trigger (Source: Researchgate.net)

Camera trap position must consider accessibility, timing (season), and also placement of the CT, usually opportunistically on wildlife paths in an appropriate distance in order to get the full animals (Fig.8), not too high or low because it could happen that the camera trap only takes pictures of the animal´s legs or head. Also, it must be considered that the vegetation is always growing, so for example, the person have to check if the small tree will not obstruct the view when it grows up (Fig. 9.). In front of

the camera trap must not be any branch because it could cause the camera trap takes pictures of this branch when the branch is moving in the wind. CT is attached to the tree with a strap that must be properly tightened to prevent the camera trap from falling. And finally, is very important to create a map with the exact placement of the camera traps. It is necessary to have always extra batteries and SD cards with you.

The data from this study were gathered from an extensive survey of Niokolo Koba National Park organised by Panthera Senegal and Directorate of National Parks Senegal. Totally 139 camera traps were positioned in 72 camera trap stations. Hartebeests were detected on 18 camera trap stations, totally 295 images organised into 79 different events separated by at least 60 minutes interval.

Camera traps were deployed from March to June 2021, with an aim to cover evenly the surface of Niokolo Koba National Park (Fig. 10 and 11)

Figure 8: Adult Western Hartebeest (Source: Camera trap by Panthera/DPN)

Figure 9: Comparison of growing vegetation during the season (Source: Camera trap by Panthera/DPN)

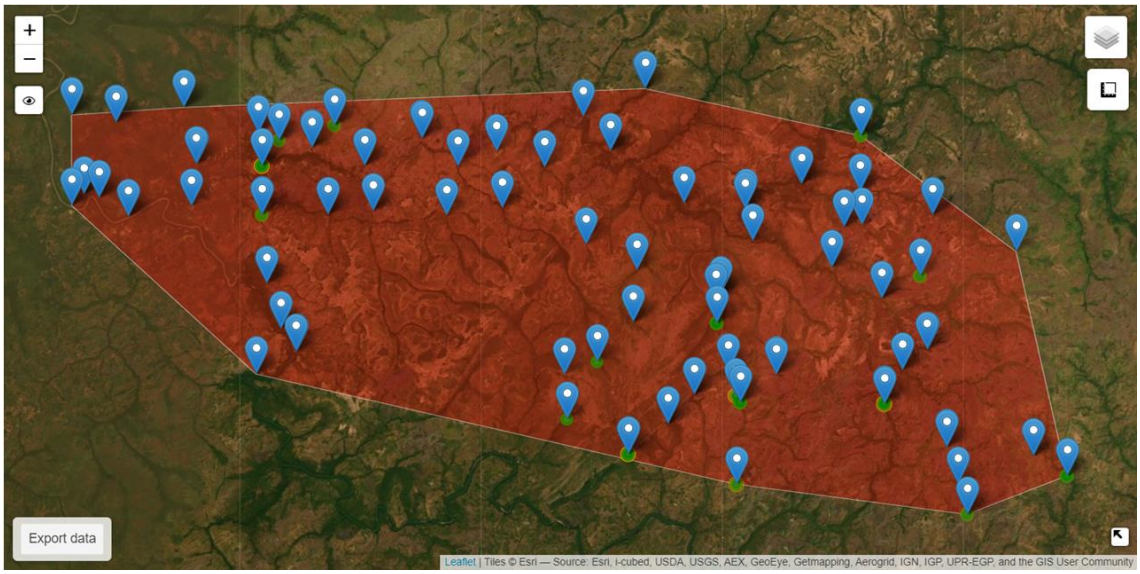

Figure 10: Positions of camera traps and detection of hartebeest in the NKNP in 2021 (Source: Panthera/DPN)

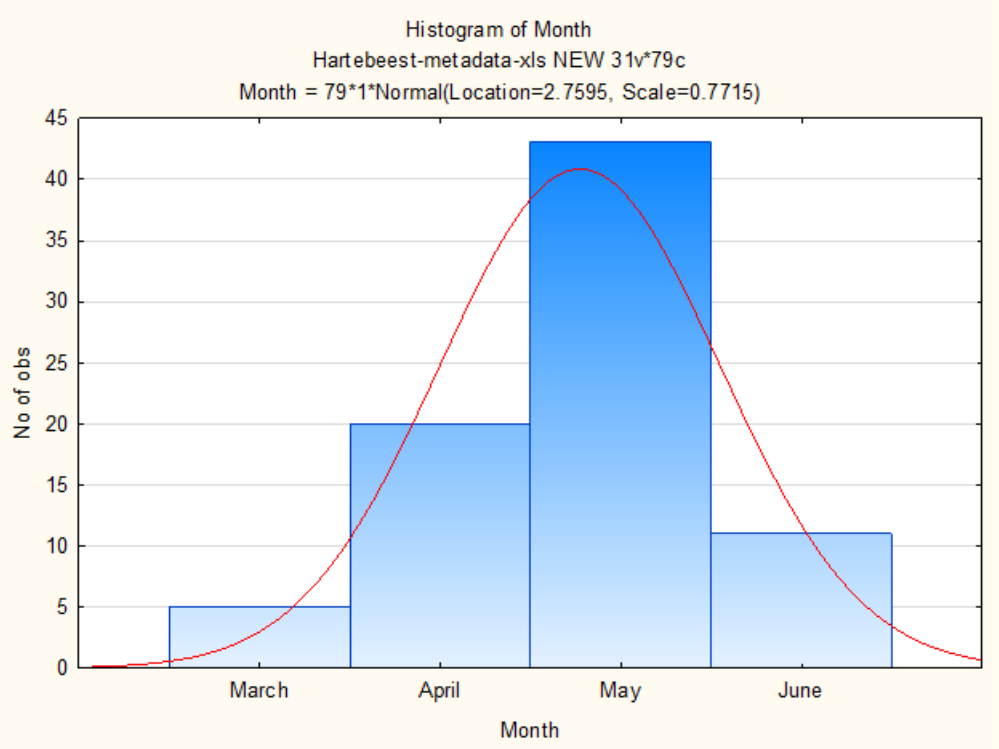

Figure 11: Frequency of camera trap images according to the month of deployment

5 Results and discussion

Results

During this survey, Western Hartebeest were captured on 26 camera traps in 18 camera trap stations. Animals were mostly active during the day (23% during the night).

The mean group size recorded from the camera trap data was 2.72±2.8 (1-16) individuals. However, 46 out of all recorded groups contained solitary individual, i. e. 22 males, 12 females, and 11 adults of unknown sex. In one case, a single calf was caught on CT. When only herds containing more than one individual were considered, the mean group size was 5.12 individuals. Out of these, there were four female herds, one group of two males, 23 mixed herds and five herds containing unknown individuals. Ten recorded herds contained juveniles and 16 contained subadult individuals. The adult sex ratio was female biased, 1:2 (male: females). Animals were mostly walking, running or standing, but also few social interactions were recorded. Males were often captured alone during the night. The images also show that the hartebeests are coming in the line, they are not

grouped but they are going in short intervals followed by each other. Also, it is possible to see that the hartebeests are making small groups and they sniffing or circling around each other.

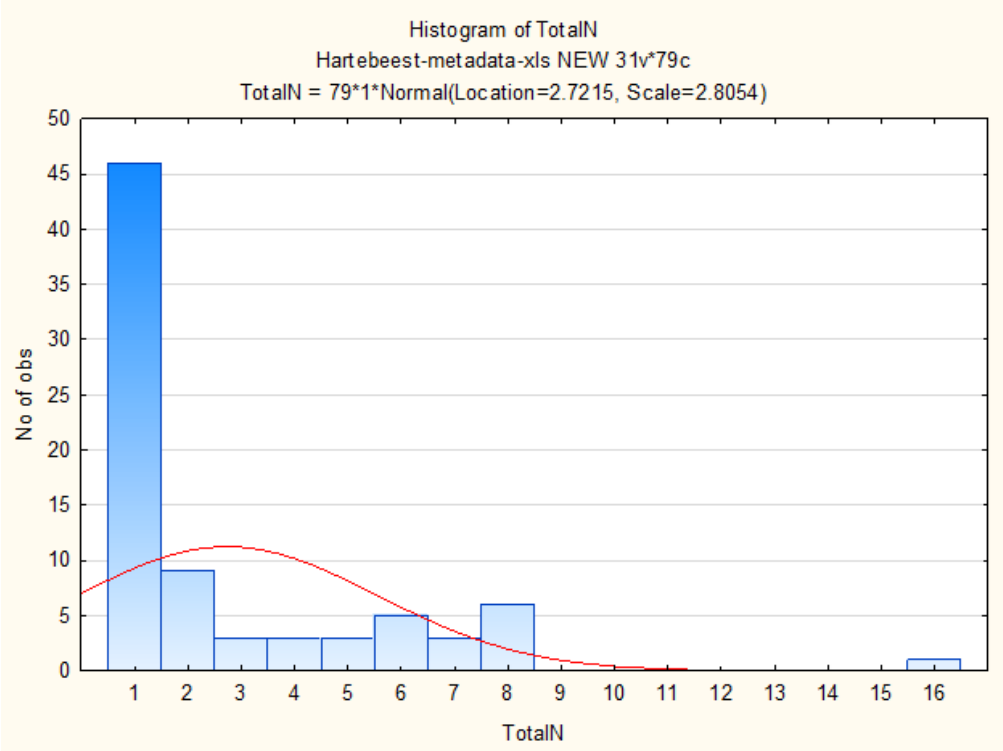

Figure 12: Observed frequency of herd size

No cameras showed injuries of the hartebeests or their pursuit by predators. The hartebeests are sometimes caught when they are running. Sometimes it is possible to see that they share place with other animals, like monkeys or bushbucks, but they do not pay attention to themselves.

Discussion

According to photos from CTs, is possible to confirm that hartebeests are making herds about 3 and more individuals, like it is written in the introduction. The number of hartebeests in the herds is the same or lower than reality because some hartebeests may not been caught on CTs and some individuals were not counted when it was not quite clear that they were other individuals. On all photos of hartebeests is visibly shown that youngs are very often close to mothers or another females. Sometimes CTs caught that in the herds where are females and youngs are also present males. It is remarkable that males were often caught on CT when they were wandering alone during the night.

Figure 13: A curious hartebeest that find a CT (Source: Camera trap by Panthera/DPN)

6 Conclusion

The thesis brought an overview of information about Western Hartebeest and a case study of the demographic parameters of the Western Hartebeest population in the Niokolo Koba National Park based on the camera trap images.

In general, demographic status of the Western Hartebeest population in the NKNP seems promising. Deeper analyses of space use and resource selection are recommended as a future step.

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Appendices

List of the Appendices:

Appendix 1: Appendix title