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Update the survey of the Populations of Artiodactyls and threats in the Dassioko Sud Forest Reserve, Côte d'Ivoire

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Abstract

Côte d'Ivoire comprises part of West Africa's Guinean Forest Region, an ecosystem of great biological richness, species diversity, and endemism. The region is known to be involved in the World Biodiversity Hotspot. The country was covered by 16 million hectares of forest which is habitat of several animal species. However, this forest is continuously facing a huge human pressure that leads to a high deforestation rate as well as the depopulation of the wildlife inhabiting that natural habitat. From July 1st 2021 to September 1st 2021, we conducted survey in the Dassioko Forest Reserve and the surrounding villages. The interviewees were asked to indicate the Artiodactyl species present in their area as well as its abundance. In addition, we carried foot survey in the Reserve. During the survey we collected any evidence of the artiodactyl species, by sighting foot prints and dung. Also, we collected the human activities inside the forest. The interviews will the local communities revealed that 15 species still present in the area. However, during the foot survey conducted inside the forest we sighted 9 species. The Endangered Pygmy Hippopotamus, *Choeropsis liberiensis* was observed in the forest. In addition, we observed three species with conservation concern: the Bongo, *Tragelaphus eurycerus* (0.62 encounter/Km), the Yellow Backed Duiker, *Cephalophus silvicultor* (0.3 encounter/Km) and the Bay Duiker, *Cephalophus dorsalis* (0.45 encounter/Km).The survey showed that the main threat on the wild are forest encroachment and poaching. So conservation must be taken to mitigate the threat.

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Introduction

Tropical forests of Africa have long been considered as areas of high ecological value because of the predominance of several species of conservation interest. Indeed, Côte d'Ivoire comprises part of West Africa's Guinean Forest Region, an ecosystem of great biological richness, species diversity, and endemism. The region is known to be involved in the World Biodiversity Hotspot, hosting over 2,250 endemic plant and 270 vertebrate species (Myers *et al.,* 2000). This resource is an integral part of the cultural and economic life of local populations in interaction with this biodiversity (Leonard and Hibo, 1994). Early after the independence of Côte d'Ivoire, the country was covered by 16 million hectares of forest which is habitat of several animal species. However, this forest is continuously facing a huge human pressure that leads to a high deforestation rate as well as the depopulation of the wildlife inhabiting that natural habitat (Brou *et al.*, 1999; Brou *et al.,* 2005). Large-scale bushmeat extraction combined with dramatic alteration of West Africa's original forest cover has led to severe declines of large mammal populations within the past decades (Achard *et al.*, 2002; Fasona and Omojola, 2009), even within few protected areas (Craigie *et al.*, 2010). Previous study estimated that 120,000 tons of game is consumed in Côte d'Ivoire as a source of animal protein, compared to 45,000 tons of domestic meat (Caspary, 1996).

This continuous and uncontrolled slaughter of wildlife constitutes a great loss in terms of biodiversity. It concerns all animals but especially large mammals in classified forests (Ross, 2014; Béné *et al.*, 2013). Indeed, large mammals are primary focus of hunters because of their body size that can provide relative more income for the household. In tropical Africa bushmeat is a significant source of animal protein (Wilkie *et al.,* 2005) and is a vital component of food security and income for rural communities (Fa *et al.*, 2005; Mbete *et al.,* 2011). Although illegal in many countries, the bushmeat trade is a flourishing economic activity. Following socioeconomic transformations, including increased pressures from burgeoning human populations and commercial logging, and the generalized use of firearms, bushmeat hunting has reached unsustainable levels for many mammalian species (Jenkins *et al.,* 2011) relative to their rarity and distribution (Fa *et al.*, 2014), leading to the local extinction of vulnerable species (Oates *et al.,* 2000; Cowlishaw *et al.,* 2005). One of the main economic factors driving the exponential increase in bushmeat offtake is the increasing demand for wild meat in urban areas, which has resulted in the establishment of urban bushmeat markets supplied by a multitude of, sometimes remote, hunting sites (Edderai and Dame, 2006).

In Côte d'Ivoire forest reserves also called classified forests are considered as protected areas which are supposed to be the refugee of the wildlife, are partly or totally occupied by people that convert the natural habitat of the wildlife into farms since the politic and military crisis of 2010 (Bitty *et al.,* 2015). We previously conducted survey in several forests of Côte d'Ivoire in order to evaluate the conservation state of the wild (Bitty *et al.,* 2015; Yao *et al.*, 2018). These surveys highlighted the importance of the Dassioko Sud Forest Reserve in terms of biodiversity (Gonédélé *et al.,* 2014; Yao *et al.,* 2018). Furthermore, the Dassioko Forest harbours several threatened species that include the West African Elephant, *Loxodonta africana* the white-napped Mangabey, *Cercocebus lunulatus*, the white breast Guineafowl (*Agelastes meleagrides*). However, despite of the richness of that in term s of vertebrate species, the forest face the continuous human activities which constitute a real threat on the fauna and particularly the Artiodactyls which are the primary target of hunters. Previous study showed the abundance of the duikers in the Dassioko Forest. So based on the high deforestation rate in the area, it becomes necessary to frequently monitor the fauna of that forest.

Material and methods

Study area

The Dassioko Forest is one of the last remaining protected fragments of coastal forest in Côte d'Ivoire. The forest is located from 5°00'06" - 5°07'23"N to 5°49'48" - 5°56'57" (Fig. 1). The forest is about 8000 hectares size. The climate of the region is equatorial, characterised by heavy rainfall and annual

temperatures that range between 20°C and 33°C. The vegetation of the reserve is evergreen rainforest, typical of that within the Guinean forest block (Yao *et al.*, 2018; Kouamé and Zoro Bi, 2010).

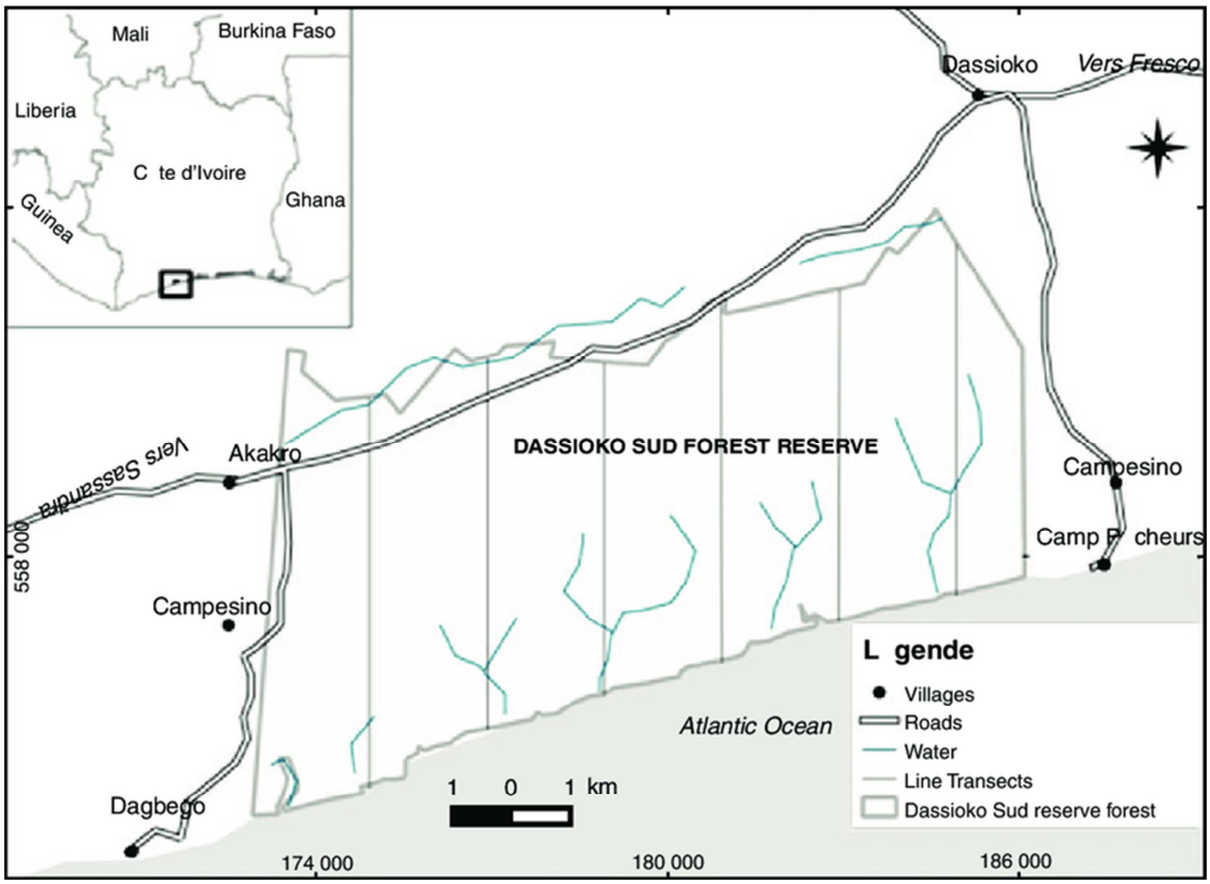

Fig. 1. Location of the Dassioko forest reserve.

Data collection

From July 1st 2021 to September 1st 2021, we conducted survey in the Dassioko Forest Reserve and the surrounding villages.

Interview with the local community

We carried Interview in the villages surrounding the Dassioko Forest to assess the knowledge of the local community about the Artiodactyls in their area. The interviews were based on the Artiodactyl species occurring around as well as their abundance. Interviewees were hunters or former hunters in order to make sure that the information gathered were reliable. Furthermore, we asked to them to list the threat on the fauna in general and particularly on the Artiodactyls. However, Information on the presence of a taxon was accepted when there was concordance between local name, description, call of species given by the interviewee and the subsequent picture identification.

Foot survey

After the interviews with the local community we visited the Dassioko Forest to assess the species and abundance of the Artiodactyls. Because line transects require to encounter the animals, we used former old trials of hunters during the study. Also when the vegetation was not too much dense, we walked in a chosen direction using the compass. Furthermore, during the survey we walked slowly along the trials to sight the animals. We recorded any evidence of presence of the Artiodactyls. So we identified all foot prints we met as well as the dungs. Data recorded for each observation included the date, time, species and the location by using a GPS device. The data collection stated at 6h30am and ended at 18h with a break between 12h and 13h. In addition, we collected all human activities encountered during the survey. In sum a total of 140 km have been covered during the study.

Data analysis

Follow up previous studies (Seber, 1982; Hoppe-Dominik, 1989; Yao *et al.,* 2018), the number of sightings per kilometre walked, defined as 'encounter rate', was computed as an index of relative abundance. Indeed, relative abundance constitutes an indirect measure of the size of an animal population. Its determination is based on the number of signs of animals seen per unit of time or distance covered.

Results and discussion

Result

Interview with local community

The interview revealed the presence of 15 species of Artiodactyls mammals in the area including the Dassioko Sud Forest Reserve (Table 1). According to the interviewees Six (06) taxa (*Philantomba maxwellii, Cephalophus dossalis, Cephalophus niger, Tragelaphus eurycerus, Tragelaphus scriptus* and *Syncerus caffer nanus)* are abundant in the area. Four species (04) are few (*Cephalophus silvicultor, Cephalophus jentinki, Cephalophus monticola* and *Hyemoschus aquaticus*) while Five (05) others are rare (*Cephalophus zebra, Neotragus pygameus, Phacochoerus africanus, Potamochoerus larvatus* and *Choeropsis liberiensis*).

Foot survey

The foot survey showed that the Dassioko Forest Reserve still habours Nine (09) species of Artiodactyls (Table 2). According to the highest relative abundance to the lowest we list the Artiodactyls encountered in the Dassioko Forest as the following:

- the Maxwell's Duiker, *Philantomba maxwellii* with a relative abundance of 1.33 observations /Km
- the Bushbuck, *Tragelaphus scriptus* with a relative abundance of 0.92 observations /Km;
- the Bongo, *Tragelaphus eurycerus* with a relative abundance 0.62 observations /Km;
- the Bay Duiker, *Cephalophus dorsalis* with a relative abundance of 0.45 observations /Km ;
- the Yellow backed duiker *Cephalophus silvicultor* with a relative abundance of 0.3 observations /Km;
- the Black Duiker, *Cephalophus niger* with a relative abundance of 0.29 observations /Km
- the African Buffalo, *Syncerus caffer* with a relative abundance of 0.04 observations /Km ;
- the Pygmy Hippopotamus, *Choeropsis liberiensis* with a relative abundance of 0.01 observations /Km;
- the Water Chevrotain, *Hyemoschus aquaticus* with a relative abundance of 0.01 observations /Km

Human activities inside the Forest Reserve

Anthropogenic activities are the main threat on the wildlife. These activities involved poaching and forest encroachment for farming. Indeed; the encounter rate of the gun shell was 0.47 gun shell/Km during the survey. We also encountered nail trap during the survey with an encounter rate of 0.92 nail/Km. In addition several cocoa farms were encountered which reduce the original habitat of the wildlife (Table 3).

Table 1. Species present in the area according to the local community.

Common Name	Scientific Name	Local Name	Status
Black backed Duiker	*Cephalophus dossalis* (Gray, 1846)	Hêbê	Ab.***
Black Duiker	*Cephalophus Niger* (Gray, 1846)	Klazobli	**Ab.***
Yellow backed Duiker	*Cephalophus Silvicultor* (Afzelius, 1815)		Ab*
Jentink's Duiker	*Cephalophus Jentinki* (Thomas, 1892)	Poê	Rare
Blue Duiker	*Cephalophus monticola* (Thunberg, 1789)	Mlépleu	Ab*
Zebra Duiker	*Cephalophus zebra* (J.E. Gray, 1838)	Zablêlê	Rare
Bongo	*Tragelaphus euryceros* (Ogilbyi, 1837)	Djé	Ab***
Bushbuck	*Tragelaphus scriptus* (Pallas, 1766)	Louie	Ab***
Royale Antelope	*Neotragus pygmaeus*	Namo	Rare
African Buffalo	*Syncerus caffer nanus* (Sparrman, 1779)	Blé	Ab***
Common Warthog	*Phacochoerus africanus* (Cuvier, 1816)	Kla-Boloukpa	Ab*
Bush pig	*Potamochoerus larvatus*	Boloukpa	Rare
Pygmy Hippo	*Choeropsis liberiensis* (Morton, 1849)	Boloukpa	Rare
Water Chevrotain	*Hyemoschus aquaticus* (Ogilby,1841)	Gnidjré Ab*	

Conservation status according to the local community: Ab*** (Abundant); Ab* (Few); Rare

Table 2. Species observed during the foot survey in the Dassioko Forest Reserve.

Common Names	Scientific Names	Conservation status (IUCN)
Black backed Duiker	*Cephalophus dossalis* (Gray, 1846)	NT
Black Duiker	*Cephalophus Niger* (Gray, 1846)	**LC**
Yellow backed Duiker	*Cephalophus Silvicultor* (Afzelius, 1815)	NT
Zebra Duiker	*Cephalophus zebra* (J.E. Gray, 1838)	LC
Bongo	*Tragelaphus euryceros* (Ogilbyi, 1837)	NT
Bushbuck	*Tragelaphus scriptus* (Pallas, 1766)	LC
African Buffalo	*Syncerus caffer nanus* (Sparrman, 1779)	LC
Pygmy Hippo	*Choeropsis liberiensis* (Morton, 1849)	EN
Water Chevrotain	*Hyemoschus aquaticus* (Ogilby,1841)	LC

LC: Least Concern; NT: Near Threatened; EN: Endangered

Discussion

The combination of the results from the interviews with the local community and those from the foot surveys made it possible to draw up the list of the Artiodactyls of the Dassioko Forest Reserve. Indeed, the interviews reported 15 Artiodactyl species in the area while the foot surveys confirmed 09 species in the forest reserve. These results emphasized the good knowledge of the terrestrial mammals by the local community due to the permanent interaction of that community with the wild (Kpétéré *et al*., 2015**).** Maybe we encountered less species during the foot survey than that reported from the interview because of the relative short time of the survey and because the survey were conducted at the same period; This could suggest to conduct further surveys within continuous and consecutives years to possibly rise more species. Among the species inventoried one is listed Endanger according the IUCN Red list, the Pygmy Hippopotamus (*Choeropsis liberiensis*). Three species are Near Threatened: the Bongo (*Tragelaphus eurycerus*), the Yellow Backed Duiker (*Cephalophus silvicultor*) and the Bay Duiker (*Cephalophus dorsalis*). During the present study we more encountered few duikers than the previous study (Yao *et al*., 2018) So the Maxwell's Duiker (1.33 encounter/Km vs 0.46 encounter/Km), the Bay Duiker (0.45 encounter/Km vs 0.067 encounter/Km), the Black Duiker (0/29 encounter/Km vs 0.074 encounter/Km) and the Yellow Backed Duiker (0.3 encounter/Km vs 0.07 encounter. Km). This difference in number is possibly tied to the politico-military crisis that occurred in Côte d'Ivoire early 2011 as the former study was conducted around that period. During the crisis which last several month the forest guard had no control of the protected area because of the militiamen (Bitty *et al.,* 2015. Gonédélé *et al.,* 2019; Kouakou *et al.,* 2020). However, despite to the relative abundance of the Endanger Pygmy Hippoptamus as well as the other Artiodactyls with conservation concern, the Dassioko Forest Reserve is under a high human pressure due to the habitat fragmentation for agriculture purpose based on the number of plantations found inside the forest reserve.

The poaching activities were reported to be high as well. Furthermore, in order to reduce the threat of the wild and their natural habitat, we support and encourage the forest guards to enhance the patrol which involved members of the surrounding villages of the forest reserve. Also we initiated several awareness campaigns to mitigate the pressure on the wild and their habitat

Conclusion

This current study emphasizes the importance of continuous bio monitoring of the wild. We encountered at least nine species of Artiodactyl which include the Endanger Pygmy Hippopotamus, *Choeropsis liberiensis*. Indeed, this species is present in just few forests in Côte d'Ivoire. So far, the Taï National Park seems to be one of the last refuge of the species. Furthermore, the presence of several species of Artiodactyl in the Dassioko Forest Reserve highlights the importance of that forest for wildlife conservation. In addition, the forest guards must keep continue the effort to improve the conservation of the forest and the wild that inhabit by increasing the number of patrols inside the forest.

Recommendation(S)

We must keep monitor the Mammal species as well as the other vertebrates to have full data base in order to plan conservation actions. The data collection must involve a whole year and be extended to consecutive years to gathered more results.

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