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Distribution, habitat use and population status of African wild dog in the Tchabal Mbabo mountain range, Adamawa region, Cameroon

Final Report

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Data Availability Statement

The datasets generated the current study are not yet publicly available and could not be used without the author consent due to [REASON(S) WHY DATA ARE NOT PUBLIC] but will be available from the corresponding author on reasonable request.

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Abstract

The local extinction of the African wild dog is currently underway across its range of distribution, due to habitat loss, human threat usually as the result of retaliation, prey depletion, and diseases such as rabies, which are frequently transmitted by sympatric domestic dogs. African wild dog has received considerable research efforts in other parts of the world, but in Cameroon particularly in the Tchabal Mbabo Mountain Range information on this carnivore is difficult to obtain due to its elusive nature. In the such context, we undertook this study using Local Ecological Knowledge (LEK) based-approach through the semi-structured questionnaire coupled with camera trapping technique to document the presence of African wild dog species in the Tchabal Mbabo mountains range and provide baseline information on their distribution, habitat preference, and in long term establish a conservation plan in Cameroon. From 215 peoples surveyed in eight villages around the Tchabal Mbabo mountain, only 46.0% of respondents recognized the species and the majority of them (72.7%) said they had seen it before in their environment, particularly in the dry season. Majority of local people said that the African wild dog population has declined over the last years, which leading to the low observation of this species in the area. African wild dog does not have any cultural value for local people and despite that, they interest in the conservation of African wild dog. However, the extension of pasture areas and bushfire were the main threats to wild dog population. From camera trap survey, we accumulated a total of 1460 operational camera trap days, and with this sampling effort, no evidence of the African wild dog was recorded during this study. However, this result may not reflect reality due to the 07 camera traps and 11 SD cards stolen, which were deployed in one of the area where hunters claimed to have seen this species in February, March and June of this year. We recorded 791 independent events of 27 species of large and medium-sized terrestrial mammals belonging to five taxonomic orders and 13 families. We also recorded four different habitat types (woodland savannah, shrubland savannah, grassland savannah, and forest galleries) and identified three major anthropogenic threats notably bushfires, human trails and livestock which threaten the habitats of several mammal species among which the wild dog habitats and therefore leading to their scarcity.

Keywords: African wild dog, habitats, human activities, Tchabal Mbabo Mountain, conservation

Introduction

African wild dogs (*Lycaon pictus*) are among the world's endangered large carnivores. The local extinction of this species is currently underway across its range of distribution, due to habitat loss, human threat usually as the result of retaliation, prey depletion, and diseases such as rabies, which are frequently transmitted by sympatric domestic dogs (Woodroffe & Sillero-Zubiri, 2020). They are highly sociable and able to disperse over large distances and colonize new areas (Woodroffe & Ginsberg, 1998). Owing to their status and ecological traits, this carnivore has received considerable research efforts in other parts of the world (Komas et al., 2023). In Cameroon, African wild dogs were historically distributed in the northern part of the country. However, information on this carnivore is difficult to obtain due to the rarity of the species which is increasingly difficult to observe. In the Tchabal Mbabo area, no presence evidence of the African wild dog population was known. However, following field surveys conducted by the Cameroon Wildlife Conservation Society (CWCS), the African wild dog previously reported extinct in the area by IUCN was recently confirmed by local hunters to still be present (Usongo, 2019). Moreover, in June 2021, during an ethnozoological survey, the local population reported that wild dogs still occur in the area although they are not commonly observed (Massoh et al., *in prep*). In addition, two individuals were observed by local guides during a mammal survey conducted in this mountain range (FODER, 2021). Based to the observations reported, we undertook this study using LEK based-approach coupled with camera trapping technique to confirm or not the presence of the African wild dog in this part of the country.

General objective: This study aims to document the presence of African wild dog species in the Tchabal Mbabo mountains range and provide baseline information on their distribution, habitat preference, and in long term establish a conservation plan in Cameroon.

Specific objectives: (1) Assess the local knowledge of African wild dogs among the local communities as well as the potential threats to this species due to cohabitation with humans; **(2)** Confirm the presence evidence of the African wild dog species occurring in the Tchabal Mbabo mountains range using camera traps; **(3)** Developing a distribution map of this large carnivore's species population in the study areas for a long-term monitoring system; **(4)** Characterize the vegetation formations of the survey area to evaluate the wild dog's habitat preferences.

Methods

Study site

Our study was carried out in the Tchabal Mbabo Mountain Range (TMMR) of Cameroon (Fig.1). The TMMR with an average area of 1052.51 km^2, is situated in the Adamawa Region between 07°-07°30'N and 12°-12°20'E. TMMR landscape has four vegetation types: forest galleries, herbaceous savannahs, dried mountain forests, and woody savannahs forest galleries (Chapman, 2004). The climate is a transitional subtropical type, characterized by two seasons per year, average annual rainfall varies between 1,000 and 2,000 mm, while average temperature is 23°C (Tsalefac et al., 2003). "Mbororo" are the dominant tribe, but other ethnic groups are also present in this area (MINFOF 2018). African wild dog population was assessed through questionnaire and camera trap surveys.

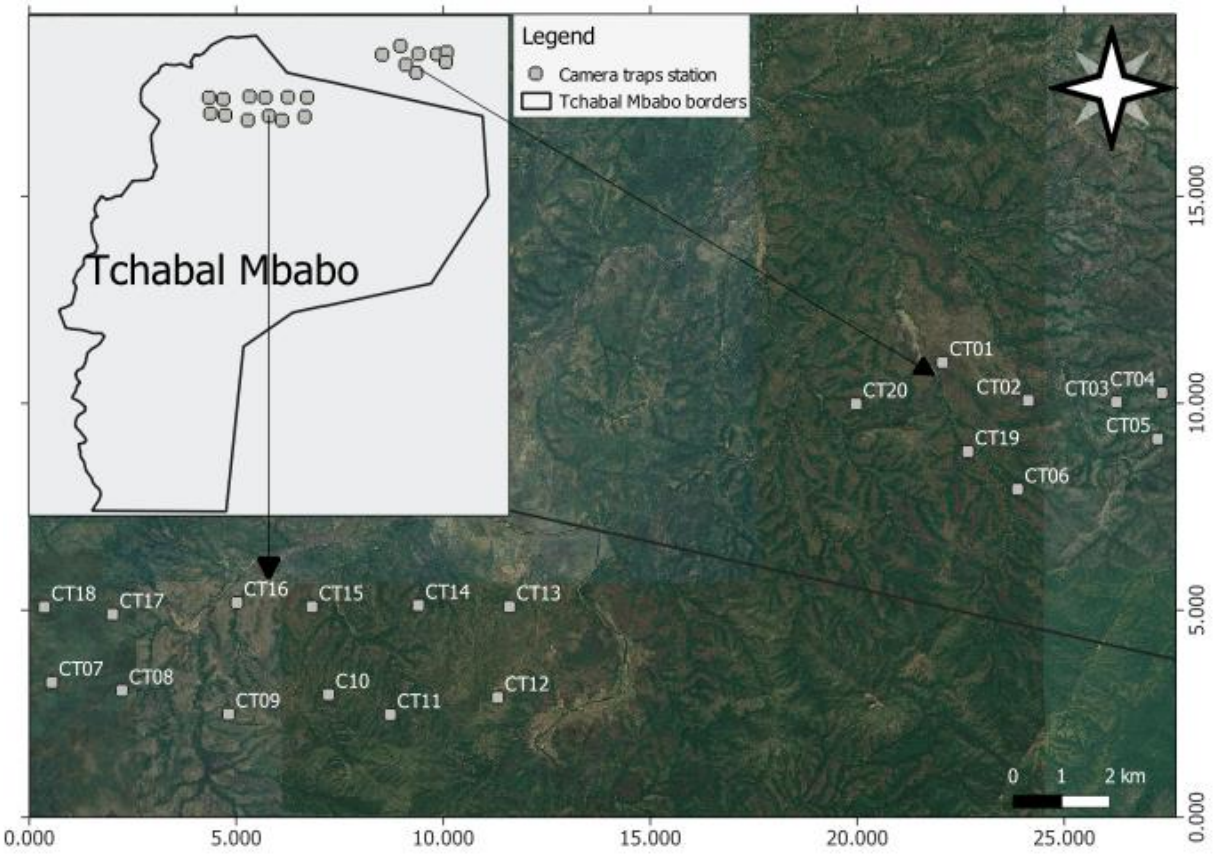

Figure 1: Location of camera trap stations in the northern periphery of the Tchabal Mbabo Mountain Range

Methodology

Questionnaire survey: The questionnaire survey was conducted on July 22 to 31th, 2023 in eight villages around the Tchabal Mbabo mountains. These villages were primarily selected among those located around the study area and secondly based on their accessibility.

Respondents were selected using the snowball sampling technique i.e. with the help of local translators, the interviewers introduced to locals likely to have good Local Ecological Knowledge on the African wild dog. We used a semi-structured questionnaire comprising both open- and closed-ended questions (Newing et al., 2011). Each interview was done with one person at a time and lasted less than 30 minutes, and a local guide to translated questions in the local language when necessary to ensure consistent communication with respondents (Fig. 2).

Figure 2: Principal investigator discussing with local population: (a) without translator, (b) with translator

Camera trap survey: From 8th January to 4th August 2024, we used two systematic grid cell to establish 20 camera traps in the Shrubland savannah, Woodland savannah, and Forest galleries in the TMMR during the dry and the rainy seasons. Each camera station located within a grid cell was georeferenced using a Garmin 64S Global Positioning System (GPS) and was placed at 2 km intervals. These cameras were generally installed in the open areas especially on wild prey and livestock trails base on the literature knowledge (Komas et al., 2023) and the perception of local communities on wild dog obtained during the questionnaire survey conducted on July, 2023. Camera traps were strapped on trees at a height of 30-40 cm above the ground, perpendicular to wild dog targeted location and at a distance of 4-8 m following the protocol from Bruce et al. (2018) adapted for medium to large-sized mammal surveys (Fig. 3).

Figure 3: Camera traps deployment: (a) principal investigator setting on camera trap, (b&c) test of camera functioning.

Data analysis

For the questionnaire data, we performed univariate analyses of frequencies using descriptive statistics, including the socio-demographic parameters of respondents, the knowledge of wild dog (identification, sightings, population trend, and cultural use), threats and conservation of wild dog. Differences in frequencies between the modalities were assessed using Chi-square tests. For camera traps, all images contained in the SD card were identified using Wild ID software. Data was extracted from Wild ID into Microsoft Excel format for analyses. We calculated the trapping rate (TR) of a species as the number of its photographic events divided by the total number of camera days (sampling effort), multiplied by 100. The kilometric abundance indices (IKAs) of human activities encountered was calculated according to the following formula:

$$IKA = \frac{Total\ number\ of\ sightings\ of\ human\ index\ activity\ "i"}{Total\ distance\ covered}$$

Results

Knowledge and identification of the African wild dog

African wild dog was not largely known by people around the Tchabal Mbabo mountain range, because few respondents (46.0%, n=99) claimed to know this species. This species was named « Safadou » in their native language by 28.4% (n=61) of respondents, and only 4.91% of them (n=3) were able to name it French as « Chien sauvage » which means “wild dog”.

Occurrence and sighting of the African wild dog

Of the respondents who reported knowing the African wild dog (n=99), most of them (72.7%, n=72) said they had seen this species before. Of those who had seen wild dog species once, the majority (63.9%; $\chi 2$ [df = 3, n=46]= 26.477, p< 0.001; Table 1) reported seeing it in the savannah areas, the forest galleries (45.8%, n=33), the village (31.9%, n=23), and at the mount (12.5%, n=9). In the savannah habitat, the wild dogs were most frequently encountered on livestock trails (73.9%, n=34), and wild prey trails (60.9%, n=28). The same trend was found in the forest galleries where this sepcies was most frequently observed on livestock trails (75.8%, n=25), and wild prey trails (57.6%, n=19). The other specific sighting locations reported by local people included burrows/dens and humans trails.

Table 1: Percentage of respondents who reported seeing the African wild dog in the general location, and in the specific places where species had often seen.

General location	Specific location	Relative frequency (n)
General sighting locations	Savannah	63.9 (46)
	Forest gallerie	45.8 (33)
	Village	31.9 (23)
	Mount	12.5 (9)
Savannah	Burrows/dens	17.4 (8)
	Livestock trails	73.9 (34)
	Wild prey trails	60.9 (28)
	Human trails	21.7 (10)
Forest gallerie	Burrows/dens	21.2 (7)
	Livestock trails	75.8 (25)
	Wild prey trails	57.6 (19)
	Human trails	33.3 (11)

n= frequencies

Of those who had seen African wild dog once (n=72), the majority (45.8%; $\chi 2$ [df = 3, n=33] = 32.667, p< 0.001) reported seeing it in the dry season compared to 34.7% (n=25) who mentioned seeing it in the rainy season, 18.1% (n=13) who reported sighting it in both dry and rainy seasons and 1.4% (n=1), who did not remember. Among the respondents who reported seeing the African wild dog in the dry season, the most of them (28%, n=7) reported sighted it in December; while among who reported seeing it in the rainy season, the majority (33.3%, n=6) reported sighted it in July (Fig. 4).

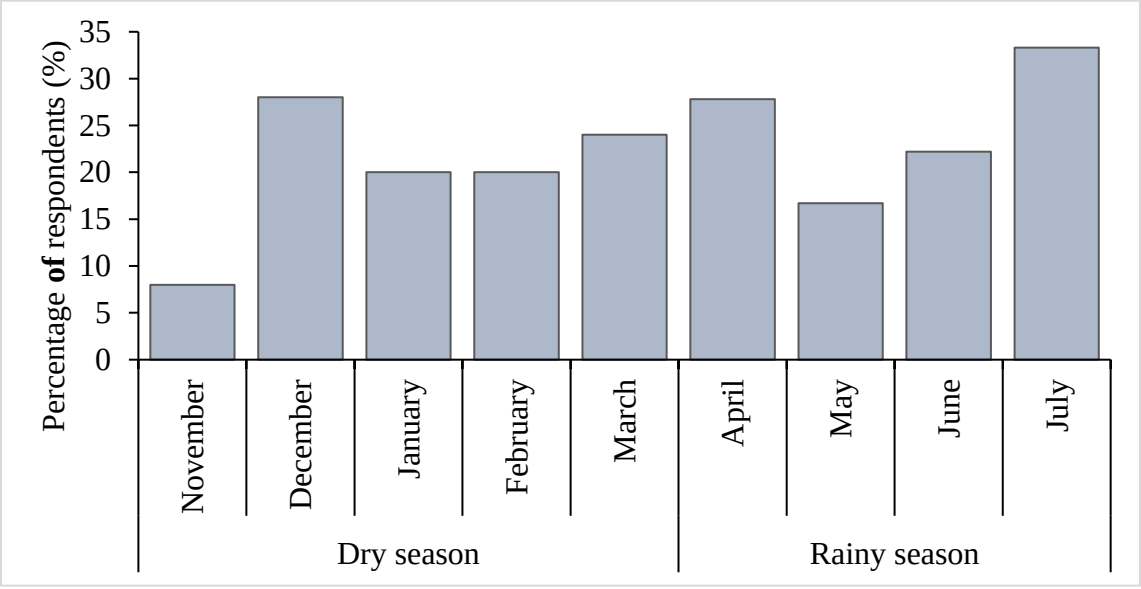

Figure 4: Percentage of respondents who reported seeing the African wild dog in a specific month.

Perceived wild dog population trends

Of those who had seen African wild dog before, the majority (63.9%, n=46) reported the last time they had seen this species was before 2020. Of those who perceived a trend in the African wild dog population over the previous years (n=72), the majority (70.8%; $\chi 2$ [df = 2, n=51] = 46.583, p< 0.001) reported it as decreasing, while 19.4% (n=14) reported it as increasing and 9.7% (n=7) had no idea.

Cultural uses of the African wild dog

Of the respondents who mentioned knowing the African wild dog (n=99), most of them (83.84%, n=83) stated that this species is not important in their culture for three main reasons: non-consumption (53.01%, n=44), religious restriction (24.1%, n=20) and human-wild dog conflict (6.02%, n=5). Indeed, due to its morphology almost similar to the domestic dog, Islam prohibits the consumption or any other use of this species. Only 6.06% (n=6) of respondents perceived the African wild dog as being important in their culture.

African wild dog conservation and threats

Of the respondents who provided feedback on the conservation of the African wild dog (n=50), the majority (78%, n=39) indicated that the species was at risk of extinction in the region. The primary identified threats were the expansion of pasture areas (50%, n=25). Other reasons cited included, bushfire (12%, n=6), increasing of human population densities (12%, n=6), poaching (10%, n=5), decreasing of wild preys (8%, n=4), poisoning (2%, n=1), and extension of farmlands (2%, n=1). Of those who said they were interested about the conservation of African wild dog, 34% (n=17) of them mentionned the maintenance of biodiversity as the main reasons why they said they were interested in conserving African wild dog. Other reasons were that it is an endangered species (26%, n=13) and also it is a natural heritage for future generations (26%, n=13).

Camera traps biomonitoring in the TMMR

Of the 20 camera traps installed in the study area in January (dry season), we found only 15 camera traps and 12 SD micro cards 32GB during the camera trap service mission in April. During this mission, all these cameras received the new SD micro cards for the data sampling in rainy season. During the last mission recently carried out in July, only 13 camera traps and 12 memory cards were found. During the six months of data collection, 7 camera traps and 11 SD cards were stolen. Of the 13 remaining camera traps we accumulated a total of 1460

operational camera trap days. With this sampling effort, no evidence of the African wild dog was recorded during this study.

Large and medium-sized mammal species recorded in the TMMR

Over 1460 camera trap nights, we recorded 791 independent events of 27 species of large and medium-sized terrestrial mammals (see Appendix) belonging to five taxonomic orders and 13 families (Table 2). Carnivora (29.63%N) and Cetartiodactyla (29.63%N) were the most diversified, followed by Primates (22.22% N). The least diversified taxa were rodents (14.81% N) and Tubulidentata (3.70% N). Among these species, the anubis baboon (*Papio anubis*) was the most frequently recorded, followed by bushbuck (*Tragelaphus scriptus*), African civet (*Civettictis civetta*), and red-flanked duiker (*Cephalophus rufilatus*). Caracal (*Caracal caracal*), serval (*Leptailurus serval*), blue duiker (*Philantomba monticola*), African buffalo (*Syncerus caffer*), mona monkey (*Cercopithecus mona*), Patas monkey (*Erythrocebus patas*), Senegal galago (*Galago senegalensis*), and aardvark (*Orycteropus afer*) were the less detected. The conservation status of all species recorded during the study is shown in the table below (see Table 2).

Table 2: IUCN conservation status, trapping rate and the number of events of large and medium-sized mammals recorded in the TMMR.

Taxonomic groups	Common names	Scientific names	Number of events	Trapping rate	IUCN status	Cameroonian Law
Carnivora	Marsh mongoose	*Atilax paludinosus* (Cuvier, 1829)	5	0.34	LC	C
	Black-legged mongoose	*Bdeogale nigripes* (Pucheran, 1855)	24	1.64	LC	C
	Side-striped jackal	*Canis adustus* (Sundevall, 1847)	14	0.96	LC	C
	Caracal	*Caracal caracal* (Schreber, 1776)	1	0.07	LC	A
	African civet	*Civettictis civetta* Schreber, 1776	104	7.12	LC	B
	Blotched Genet	*Genetta maculata* (Gray, 1830)	39	2.67	LC	B
	Serval	*Leptailurus serval* (Schreber, 1776)	1	0.07	LC	B
	African palm Civet	*Nandinia binotata* (Gray, 1830)	5	0.34	LC	C

Table 2: Continued

Taxonomic groups	Common names	Scientific names	Number of events	Trapping rate	IUCN status	Cameroon National Law
Cetartiodactyla	Red-flanked duiker	*Cephalophus rufilatus* Gray, 1846	100	6.85	LC	C
	Yellow-backed duiker	*Cephalophus silvicultor* (Afzelius, 1815)	28	1.92	NT	B
	Kob	*Kobus kob* (Erxleben, 1777)	3	0.21	LC	B
	Common warthog	*Phacochoerus africanus* (Gmelin, 1788)	74	5.07	LC	B
	Blue duiker	*Philantomba monticola* Thunberg, 1789	1	0.07	LC	C
	Red river hog	*Potamochoerus porcus* (Linnaeus, 1758)	41	2.81	LC	B
	African buffalo	*Syncerus caffer* (Sparrman, 1779)	1	0.07	NT	B
	Bushbuck	*Tragelaphus scriptus* (Pallas, 1766)	106	7.26	LC	C
Primates	Mona monkey	*Cercopithecus mona* Schreber, 1774	1	0.07	NT	B
	Tantalus monkey	*Chlorocebus tantalus* (Ogilby, 1841)	46	3.15	LC	C
	Guereza Colobus	*Colobus guereza* Rüppell, 1835	4	0.27	LC	A
	Patas monkey	*Erythrocebus patas* (Schreber, 1775)	1	0.07	NT	C
	Senegal galago	*Galago senegalensis* É. Geoffroy Saint-Hilaire, 1796	1	0.07	LC	B
	Anubis baboon	*Papio anubis* (Lesson, 1827)	144	9.86	LC	B
Rodentia	Giant pouched rat	*Cricetomys gambianus* Waterhouse, 1840	5	0.34	LC	C
	Red-legged rope squirrel	*Funisciurus pyrropus* (Cuvier, 1833)	3	0.21	LC	C
	Crested Porcupine	*Hystrix cristata* Linnaeus, 1758	35	2.40	LC	C
	African giant squirrel	*Protoxerus stangeri* Waterhouse, 1843	3	0.21	LC	C
Tubulidentata	Aardvark	*Orycteropus afer* (Pallas, 1766)	1	0.07	LC	A

Legend: IUCN= International Union for Conservation of Nature, MINFOF= Cameroonian Ministry of Forestry and Wildlife, NT= Near Threatened, LC= Least Concern. Class A, include the species which are the nationally endangered species totally protected and cannot be hunted, captured, killed, or traded; Class B, vulnerable species can be hunted, captured, or killed, subject to the granting of a hunting license; Class C species are partially protected and can be hunted, captured, or killed following conditions laid down by the government (MINFOF, 2020).

Characterization of the vegetation formations in the survey area

We have recorded four habitat types in the survey area such as the woodland savannah, shrubland savannah, grassland savannah, and forest galleries (see Fig. 5).

Figure 5: Different habitat types recorded in the Tchabal Mbabo Mountain Range: (a) Woodland savannah, (b) Shrubland savannah, (c) Grassland savannah, (d) Forest galleries.

Human activities in the TMMR

We recorded a global IKAs of 3.125. The most encountered activities in the study area were bushfires, human trails, and livestock with an IKAs of 0.975 indices/km (31.2%, n=39), 0.925 indices/km (29.6%, n=37), and 0.8 indices/km (25.6%, n=32) respectively. The less encountered human signs were the hunting sign (0.05 indices/km), Mbororo farmland (0.05 indices/km), and Road (0.05 indices/km) (Fig. 6 & 7).

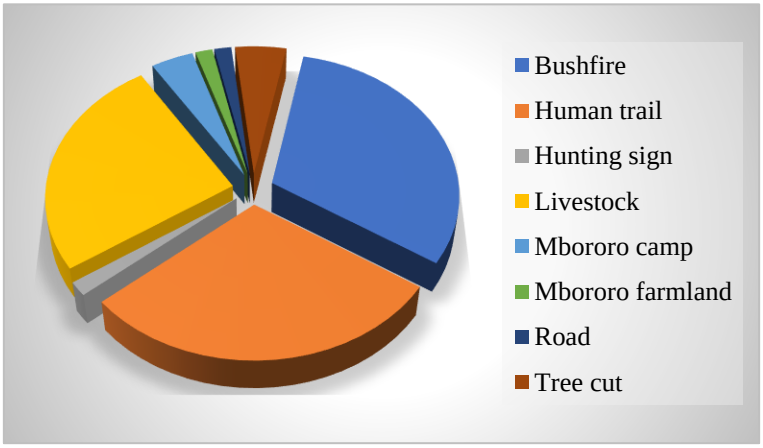

Figure 6: Proportion of each type of human activities recorded in the Tchabal Mbabo Mountain Range

Figure 7: Human activities recorded in the Tchabal Mbabo Mountain Range: (a) Livestock, (b) Mbororo camp, (c) Bushfires, (d) Tree cut, (e) Bullet, (f) Bushbuck kill

Discussion

Although we used the LEK-based approach in this study, we obtained a low number of respondents who recognized the African wild dog. Contrary results were found by Madsen et al. (2020) and Komas et al. (2023), who demonstrated the LEK-based approach as an effective tool to assess population status of this species. The difference may be related to its rarity in the study area. According to respondents, African wild dogs do occur in the study area but are known to be elusive, which may explain the low identification of this species by the local people. With the camera trapping methods used in this study, no evidence of the African wild dog was recorded. Different results were observed by Komas et al. (2023) in Bicuar National

Park, Angola, who obtained 1675 trap nights with only 110 fieldwork days. Our result may be related to the low accumulated effort due to the large number of stolen cameras and SD cards (07 camera traps and 11 SD cards). Moreover, as this species has a large home range, and usually occurs at low densities in its range (Ghoshal et al., 2019), the number of camera traps we gathered was very limited (20 camera traps) and did not allow us to cover a large part of the Tchabal Mbabo mountain range, which extends over 1052.51 km^2. However, every time when we were in the field, some hunters and farmers reported seeing it several times in the savannahs. These people, knowing that we were looking for this animal, wanted to take a picture of it, unfortunately they did not have the necessary equipment for this purpose. This statement indicates there is a strong need to train local trackers to increase the likelihood of sightings and identification of the target species during the future studies. Croes et al. (2012) in the Benoué Complex in Cameroon have also highlighted the necessity of training trackers to accurately identify the wild dog species over a wider spatial coverage.

We also recorded 791 independent events of 27 species of large and medium-sized terrestrial mammals belonging to five taxonomic orders and 13 families. Although we only covered 32 km^2 in this survey, we obtained a high number of species richness compared to the result of FODER (2021) who obtained a richness of 25 species by covering more than the half of the study area using the line transect method. Our study is the first to fully document this mammal community using camera traps in the study area, and emphasized the efficiency of camera trapping as one of the most effective techniques for sampling diverse species that are typically difficult to observe by humans. Of the mammal species recorded, three species (caracal, guereza colobus, and aardvark) belong to Class A under Cameroonian Law (MINFOF, 2020) and are of great conservation concern, although these species are not threatened according to the IUCN Red List of Threatened Species. The Tchabal Mbabo area is known as a human-dominated landscape where local people largely depend on pastoralism for their livelihoods (Bombome et al., 2004). This activity represents a significant concern for the mammalian and other wildlife species found in this landscape, which could affect the population of some species and lead to their extinction. Therefore, our results are promising for the conservation in the area and its fragile wildlife.

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Appendix: Catalogue of some mammals recoded in the TMMR.

Legend: Red-flanked Duiker (a), Yellow-backed Duiker (b), Bushbuck (c), Kob (d), African buffalo (e), Caracal (f), Serval (g), African Civet (h), Side-striped Jackal (i), Blotched Genet (j).

Legend: Black-legged mongoose (k), Marsh mongoose (l), Baboon (m), Guereza Colobus (n), Mona Monkey (o) Patas monkey (p), Tantalus monkey (q), Common warthog (r), Red River Hog (s), Crested Porcupine (t).

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