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LOCAL KNOWLEDGE AND DRIVERS OF HUMAN-PRIMATES CONFLICTS AROUND COMOE NATIONAL PARK, NORTHEASTERN COTE D'IVOIRE

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ABSTRACT

Human activities near Comoé National Park are leading to conflicts with wild animals, especially primates. They leave the park seeking food and shelter in nearby farming sites, which impedes efforts for sustainable conservation and management. In this context, a better understanding of indigenous knowledge may inform strategies for mitigating and resolving human-primate conflicts. This study aimed to understand local knowledge of human-primate conflicts, categorize them, and identify contributing factors. Data was collected in September 2022 from 502 participants, including residents, hunters, and park managers, using focus group discussion (n = 115) and semi-structured questionnaire (n = 387) in 35 localities around Comoé National Park. Findings revealed that primate species like patas monkey (*Erythrocebus patas*) (99.0%), green monkey (*Chlorocebus sabaeus*) (87.8%), and olive baboon (*Papio anubis*) (82.9%) are well-known among respondents due to their proximity to riverine areas. Primates are culturally significant for the Koulango, Lobi, and Malinké ethnic groups, who use them mainly for food, medicine, and spiritual purposes. Non-human primates, notably patas monkey (*Erythrocebus patas*) (98.9%), green monkey (*Chlorocebus sabaeus*) (36.1%), olive baboon (*Papio Anubis*) (6.5%), and white-naped mangabey (*Cercocebus lunulatus*) (2.7%), were identified as crop raiders by farmers. This study identified ten crops affected by primate foraging, with the most damaged ones being yam (*Dioscorea spp*) (80.1%), maize (*Zea mays*) (75.6%), and cassava (*Manihot esculenta*) (65.8%) cultivated at park vicinity. Most local communities use traps (90.3%) and watch guarding (79.1%) to prevent crop damage from primates. Factors such as crop types, proximity of farms and reduction of food availability in the park are translated by the monkeys' exit from the park for the surrounding plantations. Preserving the natural habitats of primates reduces human-primate conflicts by keeping animals out of riparian farms.

Keywords: Local knowledge, Human-primate Conflicts, Crop raiding, Comoé National Park, Côte d'Ivoire.

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INTRODUCTION

The Comoé National Park (CNP) is the largest protected area in Côte d'Ivoire and one of the largest in West Africa. CNP host several mammals including non-human primates (NHP). Currently, it still sheltering nine diurnal Non-human primate species (Lapuente *et al.*, 2017; Matsuda Goodwin *et al.*, 2020), with some of them threatened. These include the chimpanzee (*Pan troglodytes verus*), white-thighed colobus monkey (*Colobus vellerosus*), white-naped mangabey (*Cercocebus lunulatus*), olive colobus monkey (*Procolobus verus*), *and* Lowe's monkey (*Cercopithecus lowei*), according to the International Union for Conservation of Nature (IUCN) Red List (IUCN, 2023). Unfortunately, this park, like many other protected areas in Côte d'Ivoire, faces challenges arising from human activities, including poaching, illegal gold mining, and notably agricultural exploitation on the periphery, which constitutes permanent pressure on the animals but especially on their habitat (Fischer, 2005; Atta *et al.*, 2020). Consequently, animals are crossing park boundaries seeking for food and shelter in nearby human-inhabited areas like plantations. This leads to an increase in conflicts between human and wild animals, especially primates, thereby impeding efforts towards sustainable management and conservation. Indeed, the growing human activities near CNP are leading to ecological imbalances that threaten wild animal survival, notably non-human primate species through weak availability of

food (Sangne *et al.*, 2019). With the ongoing expansion of human populations and increased encroachment into natural habitats through activities like agriculture, mining, and other extractive industries, as well as the development of roads and settlements, the frequency and prevalence of human–primate conflicts are expected to rise (Hockings, 2016). These threats could ultimately reduce their ability to reproduce and may even lead to significantly reduce their survival. It is therefore imperative to implement effective conservation and management strategies to safeguard these species. The development of these strategies requires an analysis of the factors likely to create and/or exacerbate the conflict between humans and animals. Thus, in addition to the surveillance and awareness campaign led by the park manager, it is necessary to understand the dynamics of Human-wildlife relationships around the park and particularly the contributing factors of non-human primate conflicts. Furthermore, it is essential to acknowledge that people's attitudes and interactions with non-human primates can vary depending on cultural and contextual factors (Naughton-Treves, 2005; Odunlami and Osumenya, 2020). Despite this, while primate damage might drive conflict, it is becoming increasingly acknowledged that different goals, perceptions, and levels of empowerment between humans might be a root of conservation conflicts (Hockings, 2016). Therefore, a better understanding of indigenous knowledge may inform strategies for mitigating and resolving human-primate conflicts around the park. The study was conducted with the objective to assess local knowledge and interactions with non-human primates around CNP. The study aimed to gauge indigenous knowledge of non-human primates, categorize human-primate conflicts, and to identify factors contributing to conflicts around CNP.

MATERIALS AND METHODS

Study area: The CNP is a significant protected area located in the northeastern part of Côte d'Ivoire, (8°30'N to 9°37'N latitude and 3°7'W to 4°25'W longitude). It was designated as a Biosphere Reserve in 1982 and later recognized as a World Heritage Site in 1983, highlighting its ecological importance. CNP covers an extensive area of 1,148,756 hectares (Order n° 2018-497 of 23 May 2018), making it the largest national park in Côte d'Ivoire and the largest protected area in Sub-Saharan West Africa. The park boasts diverse vegetation types, including wooded savannahs, shrub savannahs, gallery forests, and forest islands. However, savannah formations dominate the landscape, covering 96% of the park's total area. Gallery forests and forest islands, which make up 4% of the area (Hennenberg, 2005; Konan *et al.*, 2020), are vital habitats for non-human primates (Lauginie, 2007, Lapuente *et al.*, 2017). CNP experiences a hot and dry tropical climate. The average annual temperature is around 27°C, with an average annual precipitation of approximately 1090 mm (Hennenberg, 2005). The indigenous population primarily consists of various ethnic groups, such as Koulango, Lobi, Lohoron, Malinké, and Djimini. Additionally, there are other ethnic groups such as Senoufo, Yacouba, and Baoulé, as well as immigrants from neighboring countries such as Burkina Faso, Ghana, Mali, Nigeria, and Mauritania. Comoé National Park's ecological significance, rich biodiversity, and the coexistence of indigenous and immigrant populations make it an important region for conservation and sustainable development efforts (Table 1).

Data collection methods: In September 2022, data was gathered from 502 participants of 35 localities, which included residents, hunters, and park officials, through a combination of 24 focus group discussion (n = 115) and 387 semi-structured questionnaires. The people involved in the focus group discussion were community leaders such as chiefs, presidents of youth groups and/or associations. The group interviews focused on three areas: how the village was created, knowledge about NHP, and CNP's conservation actions. In this study, participants were asked to select the correct image of primate species, either from the African Mammals guide (Kingdon, 2017) or the photographs captured during the field sessions at CNP. Focus groups or expression groups involve gathering a small group of individuals to facilitate open discussions and collect qualitative insights on the topics under investigation (Harrell and Bradley, 2009). Focus group discussion data was recorded in the notebook and mobile phone for transcription.

The semi-structured questionnaire survey had three main objectives: to assess the extent of local communities' knowledge about non-human primates, to categorize conflicts between human and primates, and to understand the CNP's management policy. The survey targeted individuals of hunting age (for men) and those aged at least 18, regardless of gender, across all socio-professional strata. This demographic selection ensures that the survey collected input from those most likely to have relevant knowledge and experiences regarding non-human primates and potential conflicts. Semi-structured questionnaires typically consist of a set of predetermined questions while allowing for flexibility to explore specific topics in more detail based on respondents' answers (Bryman, 2016; Rahman, 2019). The KoboToolbox server was used to design a semi-structured questionnaire, which was then deployed on a mobile phone through the KoboCollect application. The data from the questionnaire was collected using KoboCollect. Combining both quantitative and qualitative methods provides a foundation for our research and contributes to understanding the study area.

Table 1: List of localities located far to CNP boundary (the others are close to the park limits).

Localities	Longitude	Latitude	Distance from CNP boundary
Bilimono	-4,14674	8,93299	12,33 km
Gawy	-4,09701	8,95159	6,15 km
Gorowi	-3,98588	8,82765	4,17 km
Kolon	-4,21448	9,04925	3,88 km
Kongolo-Sobara	-4,49355	9,12441	9,85 km
Korowita	-4,40201	9,06411	4,17 km
Logota	-4,38687	9,43783	3,16 km
Mapina	-4,39073	9,42760	3,99 km
Pongala	-4,47483	9,20261	8,44 km

Data analysis

Focus group data analysis: To analyze data obtained from the focus group, several metrics were computed. These metrics included the Citation Frequency of various uses, the Use Value of parts used, the Informant Consensus Factor, the Loyalty Level among respondents, Diversity of Uses, and Fairness/Equitability of Uses.

The Citation frequency measures the diversity of uses by populations. According to (Mouzoun, 2018), it was calculated using the formula below: CF = (n/N)x100 with n = number of citations of a category of use and N = total number of respondents.

The Use value index was used to assess the importance of primate species within the local community. According to the formula used (Sop *et al.*, 2012; Awo *et al.*, 2020), it was calculated as follows: UV = ∑U/N with ∑U = set of citations of organs used and N = total number of respondents.

The Informant Consensus Factor provides an understanding of the level of consensus of the populations on the uses of primate species. It was calculated using the formula used by (Yetein *et al.*, 2013), as follows: ICF = (Nur-Nt)/(Nur-1) with Nur = number of citations for each category of use and Nt = number of species used. ICF ranges from 0 to 1. A value close to 1 indicates a high level of consensus, conversely, a low value indicates a low level of consensus.

The Loyalty level measures the degree of consensus within the respondents on the use of the species in a category compared to the different categories of use. It was calculated using the formula used by (Yetein *et al.*, 2013), as follows: NF = Nci/Nct with Nci = number of citations of a species for a category of use and Nct = number of citations of the species for all categories of use.

The Diversity of Use measures the importance of use categories and how they contribute to the total value of uses. It was calculated using the formula used by (Logbo *et al.*, 2019; Awo *et al.*, 2020), as follows: UD = Ucx/Uct with Ucx = number of uses reported by category of use and Uct = number of citations of uses for all categories combined. A low UD value indicates the low use of the species, conversely, a high value indicates the high use of the species. Thus, the species is said to be multipurpose.

The Fairness of Use measures the degree of homogeneity of knowledge within the surveyed population and ranges between 0 and 1. It was calculated using the formula used by (Awo *et al.*, 2020; Zanvo, 2022), as follows: UE = UD/UDmax with UD = value of diversity of uses and UDmax = maximum value of diversity of uses. If UE < 0.5, the knowledge is not homogeneous, but when UE > 0.5, the knowledge is homogeneous.

Semi-structured data analysis: Descriptive statistics, such as frequencies and percentages, were used, along with custom cross-tabulation functions to assess respondents' answers in the case of questions with multiple responses. Frequencies were calculated for all instances of non-human primates involved in conflicts with local populations. Furthermore, the non-parametric Chi-square test was employed at the threshold α = 5% to determine if there was a correlation between the distance of the crop farms from the park and non-human primate species involved in the conflict around CNP.

RESULTS

Socio-demographic profile of the surveyed population: A total of 387 participants underwent individual semi-structured interviews across 35 localities around CNP. The socio-demographic analysis revealed that most respondents were Ivorian (93.5%), representing eight ethnic groups, with the most common being Malinké (45.6%) and Koulango (35.6%). Moreover, the survey participants were predominantly men (92.8%). Additionally, the results indicated that the average age group of the respondents ranged from 31 to 43 years old (34.4%). Most of them were engaged in farming activities (75.2%) and were either non-schooled (38.8%) or had received quranic teaching (32.6%) (Table 2).

Local names of primate species in the study area: According to the survey conducted, different ethnic groups residing around CNP use varied names for non-human primates. Table 3 provides a list of these local names. The study included eight ethnic groups, and it was noted that the names of primate species differed among them.

Table 2: Socio-demographic profile of the surveyed population nearby Comoé National Park.

Interviewees		Category of respondents							
		Park manager		Hunter		Resident		Total	
		n	P (%)	N	P (%)	n	P (%)	n	P (%)
Nationality	Burkinabé	0	0,0	0	0,0	15	4,1	15	3,9
	Ghanaian	0	0,0	0	0,0	2	0,5	2	0,5
	Ivorian	**4**	**100,0**	**16**	**100,0**	**342**	**93,2**	**362**	**93,5**
	Malian	0	0,0	0	0,0	2	0,5	2	0,5
	Mauritanian	0	0,0	0	0,0	5	1,4	5	1,3
	Nigerian	0	0,0	0	0,0	1	0,3	1	0,3
	Total	4	100,0	16	100,0	367	100,0	387	100,0
Ethnic group (Ivorian)	Baoulé	3	75,0	1	6,3	1	0,3	5	1,4
	Djimini	0	0,0	0	0,0	5	1,5	5	1,4
	Koulango	**1**	**25,0**	**8**	**50,0**	**120**	**35,1**	**129**	**35,6**
	Lobi	0	0,0	4	25,0	40	11,7	44	12,2
	Lohoron	0	0,0	0	0,0	5	1,5	5	1,4
	Malinké	**0**	**0,0**	**3**	**18,8**	**162**	**47,4**	**165**	**45,6**
	Sénoufo	0	0,0	0	0,0	8	2,3	8	2,2
	Yacouba	0	0,0	0	0,0	1	0,3	1	0,3
	Total	4	100,0	16	100,0	342	100,0	362	100,0
Gender	Woman	0	0,0	0	0,0	28	7,6	28	7,2
	Man	**4**	**100,0**	**16**	**100,0**	**339**	**92,4**	**359**	**92,8**
	Total	4	100,0	16	100,0	367	100,0	387	100,0
Age class of interviewee	[18-30]	0	0,0	0	0,0	83	22,6	83	21,4
	[31-43]	**1**	**25,0**	**9**	**56,3**	**123**	**33,5**	**133**	**34,4**
	[44-56]	3	75,0	4	25,0	91	24,8	98	25,3
	[57-69]	0	0,0	2	12,5	55	15,0	57	14,7
	[70 et +]	0	0,0	1	6,3	15	4,1	16	4,1
	Total	4	100,0	16	100,0	367	100,0	387	100,0
Socoi-economic sector	**Agriculture**	**0**	**0,0**	**16**	**100,0**	**275**	**74,9**	**291**	**75,2**
	Breeding	0	0,0	0	0,0	6	1,6	6	1,6
	Private employee	0	0,0	0	0,0	8	2,2	8	2,1
	Public employee	4	100,0	0	0,0	3	0,8	7	1,8
	Study	0	0,0	0	0,0	4	1,1	4	1,0
	Trades	0	0,0	0	0,0	60	16,3	60	15,5
	Gold panning	0	0,0	0	0,0	3	0,8	3	0,8
	Fishing	0	0,0	0	0,0	8	2,2	8	2,1
	Total	4	100,0	16	100,0	367	100,0	387	100,0
Education level	**Quranic teaching**	**0**	**0,0**	**4**	**25,0**	**122**	**33,2**	**126**	**32,6**
	Evening class	0	0,0	0	0,0	2	0,5	2	0,5
	Unschooled	**0**	**0,0**	**6**	**37,5**	**144**	**39,2**	**150**	**38,8**
	Primary	0	0,0	6	37,5	56	15,3	62	16,0
	High school	0	0,0	0	0,0	41	11,2	41	10,6
	Higher school	4	100,0	0	0,0	2	0,5	6	1,6
	Total	4	100,0	16	100,0	367	100,0	387	100,0

n = number of respondents, P (%) = percentage

Semi-structured questionnaires survey: A total of 387 individuals were interviewed, including park manager, hunters, and residents. Out of the 387 interviewees, 385 were acquainted with the nine diurnal primate species

sheltering in CNP. The findings elucidated that patas monkey, green monkey, and olive baboon have the highest citations, accounting for 99.0%, 87.8%, and 82.9%, respectively. Subsequently, chimpanzee and white-thighed colobus monkey follow with frequencies of 56.4% and 44.4%, respectively. Conversely, the spot-nosed monkey, white-naped mangabey, Lowe's monkey, and olive colobus monkey are relatively less known to the surveyed population, with frequencies of 26.0%, 19.5%, 15.8%, and 7.8%, respectively (Table 4).

Table 3: Local names of non-human primates used by the ethnic groups surveyed.

Scientific name	Common name	Local name	Ethnic group
Cercocebus lunulatus (Temminck, 1853)	White-naped mangabey	Gamein	Koulango
		Gbonsoula	Malinké, Djimini
		Gbonsole	Lobi
		Tavier	Baoulé
		Effiègbèlè	Ewe (Ghanaian)
Pan troglodytes verus Schwarz, 1934	Western chimpanzee	Akatia or sangbayayô	Koulango
		Woroni	Malinké, Lobi
		Aketia	Ewe (Ghanaian)
Colobus vellerosus Geoffrey, 1834	White-thighed colobus monkey	Bergoua	Koulango, Malinké
		Poubanan	Lobi
Papio anubis (Lesson, 1827)	Olive baboon	Harô or gbohoman	Koulango
		Gbohunko	Lobi
		Gbohoman	Lohoron
		Gbon	Malinké
		Kèssè	Ewe (Ghanaian)
Erythrocebus patas (Schreber, 1774)	Patas monkey	Gbalvanyi	Koulango
		Dassiè or cocossiè	Lobi
		Namman	Mossi (Burkinabe)
		Abladjé	Ewe (Ghanaian)
		Soulawlé	Malinké
Chlorocebus sabaeus (Linné, 1766)	Green monkey	Gbalbidio, Gbalhandio, Kolgbaliô, Hanni, Gandilô	Koulango
		Cocobrié	Lobi
		Canan or pkami	Lohoron
		Soulafi	Malinké
		Effiè	Ewe (Ghanaian)
Cercopithecus lowei Thomas, 1923	Lowe’s monkey	Cocoubiré	Koulango
		Atapka	Ewe (Ghanaian)
Cercopithecus petaurista (Schreber, 1774)	Lesser-spotted nosed monkey	Tchréfi or tchréhô or sanvouyô or sanvou	Koulango
		Effièyé	Ewe (Ghanaian)
Procolobus verus (Van Beneden, 1838)	Olive colobus monkey	Abladjé	Ashanti (Ghana)

Use of non-human primate species by local communities in the study area: Results regarding the use of non-human primate species (NHP) are based on data collected from focus group discussion (n = 115) conducted across 21 localities around CNP. Residents have identified three main categories of NHP use : food, pharmacopeia, and beliefs. Notably, the primary usage was for food, accounting for 100%, followed by pharmacopeia with 47.8% of citations. Beliefs (26.1%) represent the lowest use of NHP around CNP. The total use value (UV) for NHP species obtained is 1.78. Furthermore, various parts of these NHPs are used according to specific needs. The most frequently mentioned parts in all categories were meat (100%) for food, skin (34.8%), and skull and bones (26.1%) for medicine and beliefs. The tail (4.3%) was exclusively used in medicine, while droppings (4.3%) were solely used in beliefs (Figure 2).

Table 4: Knowledge of non-human primate species among respondents around Comoé National Park

Common name	Category of respondents							
	Manager (n=4)		Hunter (n=16)		Resident (n=367)		Total	
	n	P (%)	n	P (%)	n	P (%)	n	P (%)
White-naped mangabey	1	25,0	15	93,8	59	16,2	**75**	**19,5**
Patas monkey	4	100,0	16	100,0	361	98,9	**381**	**99,0**
Western chimpanzee	4	100,0	14	87,5	199	54,5	**217**	**56,4**
White-thighed colobus monkey	2	50,0	15	93,8	154	42,2	**171**	**44,4**
Olive baboon	4	100,0	16	100,0	299	81,9	**319**	**82,9**
Green monkey	1	25,0	16	100,0	321	87,9	**338**	**87,8**
Lowe's monkey	1	25,0	11	68,8	49	13,4	**61**	**15,8**
Lesser spot-nosed monkey	2	50,0	14	87,5	84	23,0	**100**	**26,0**
Olive colobus monkey	0	0,0	8	50,0	22	6,0	**30**	**7,8**
Total	**4**	**100,0**	**16**	**100,0**	**365**	**100,0**	**385**	**100,0**

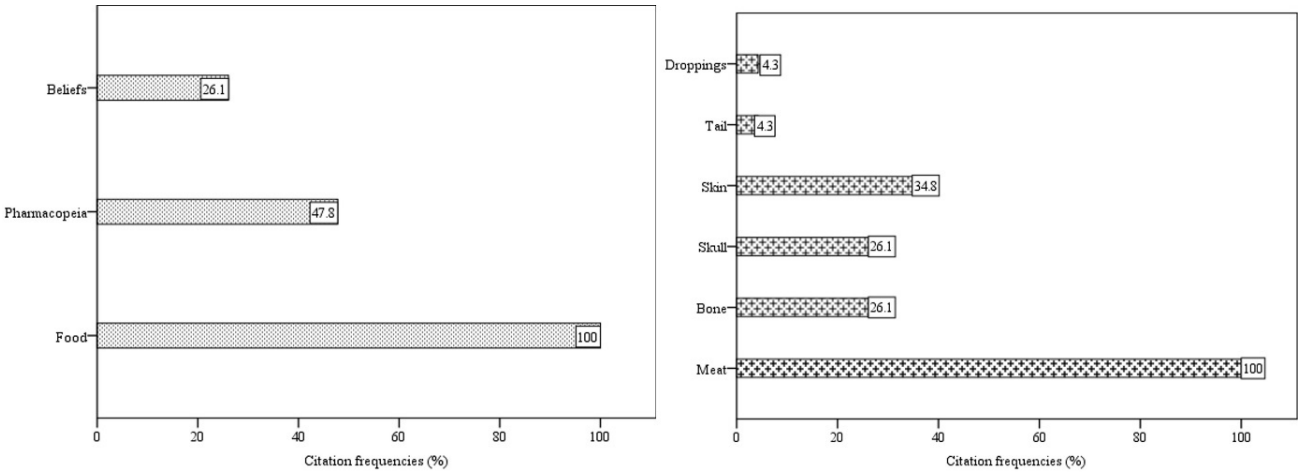

Figure 2: Use categories and parts of primate species used within the residents around the CNP.

Food use: Consumption of NHP is a significant source of animal protein for local communities around CNP. Figure 3 below illustrates the NHP species that were commonly used for food, along with their citation frequencies (FC) and loyalty level (NF). Analysis of the figure shows that eight NHP species are used for food, out of which three are more commonly used. These species are *Papio anubis*, *Chlorocebus sabaeus*, and *Erythrocebus patas* with an FC of 100%, 100%, and 91.3% respectively. Additionally, the eight species have loyalty levels ranging from 20.1% to 22.1%.

Medicinal use: Local communities living around CNP have extensive knowledge about human ailments and the NHP species that can be used to cure them. A total of seven NHP species are used in pharmacopeia (traditional medicine) to treat seven specific illnesses: monkey disease, angina, diarrhea, malnutrition, breast cancer, swelling in the neck, and premature birth (Table 5). It appears on the table that, *Erythrocebus patas* is the most used species with a Citation Frequency (CF = 72.7%), a Level of Fidelity (NF = 42.1%), and an Informant Consensus Factor (IFC = 0.84). This species' skin and tail are used to treat malnutrition, breast cancer, neck swelling, and angina among Koulango and Lobi people. The next primate species under consideration is *Papio anubis,* with a CF of 36.4%, an NF of 21.1%, and an ICF of 0.68. Its skull is used to treat monkey disease, malnutrition, and diarrhea, while the bone treats diarrhea among Koulango. *Cercocebus lunulatus* skull is used to treat monkey disease and those of *Chlorocebus sabaeus* to treat premature birth. Among Lobi ethnic group, the skin of *Cercocebus lunulatus*, *Chlorocebus sabaeus*, *Colobus vellerosus*, *Cercopithecus lowei*, and *Cercopithecus petaurista* is used for treating angina.

Beliefs: This study highlighted the knowledge of residents on the use of NHP in beliefs. Four species were identified (Table 6), with *Pan troglodytes verus* being the most used. Its skull and upper limb bone are believed to make one strong among Koulango and Malinké ethnic group. The decoction obtained from the mixture of the organ with roots, or a plant is used as bathing water to wash the child during six and seven days according to the gender. The skull of *Papio anubis* is used similarly with a lower frequency respectively among Lobi and Malinké

ethnic group. *Colobus vellerosus* and *Erythrocebus patas* are the least used. The droppings of white-thighed colobus monkey are used to bury a king among Koulango, and the skin of patas monkey is used as gris-gris (making yourself invisible) among Malinké ethnic group.

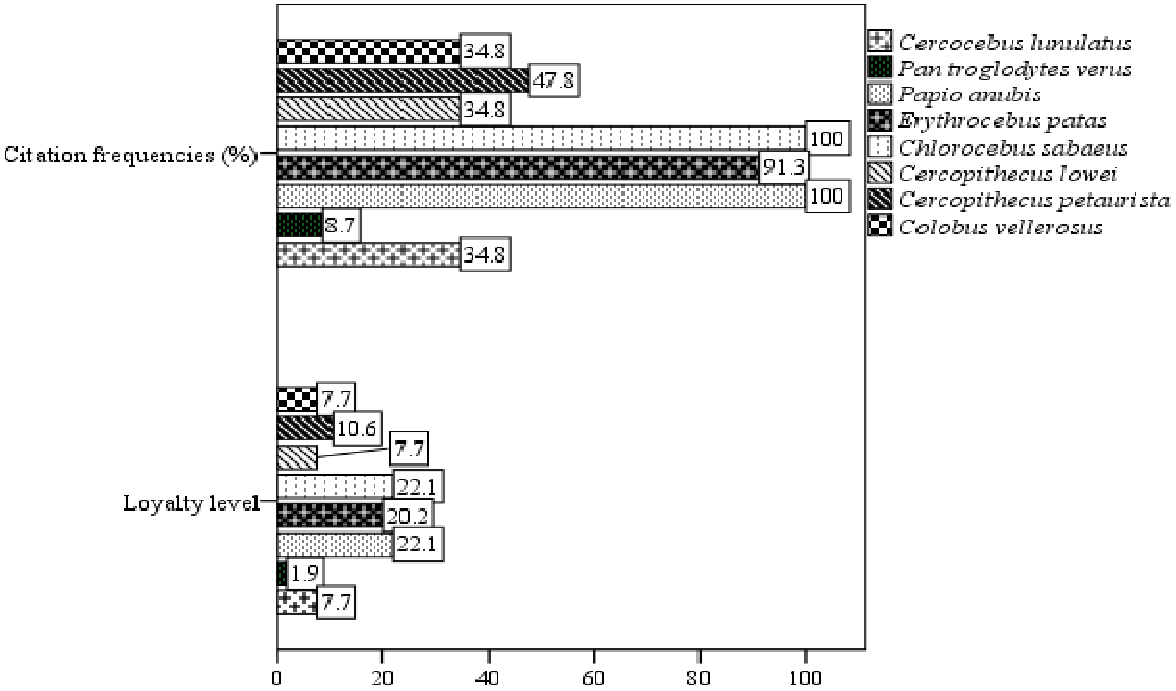

Figure 3: Citation frequencies and loyalty level of NHP used in food according to respondents.

Table 5: Perception of NHP species and parts used in traditional pharmacopeia to cure human ailments

Primate species	CF (%)	NF (%)	IFC	Ailments treated	Parts used
Cercocebus lunulatus	18,2	10,5	0,33	Monkey disease	Skull
				Angina	Skin
Papio anubis	36,4	21,1	0,68	Monkey disease	
				Diarrhea	Skull
				Malnutrition	
Erythrocebus patas	72,7	42,1	0,84	Malnutrition	
				Breast cancer	Skin
				Swelling in the neck	
				Angina	Skin or tail
Chlorocebus sabaeus	18,2	10,5	0,33	Premature born child	Skull
				Angina	Skin
Colobus vellerosus	9,1	5,3	-0,33	Angina	
Cercopithecus lowei	9,1	5,3	-0,33		Skin
Cercopithecus petaurista	9,1	5,3	-0,33		

Citation frequencies (CF), Level of Fidelity (NF), Informant Consensus Factor (ICF)

Table 6: Perception of NHP species and parts used in beliefs according to respondents.

Primate species	CF (%)	NF (%)	ICF	Beliefs	Parts used
Pan troglodytes verus	66.7	44.4	0.84		Skull or arm bones
Papio anubis	50.0	33.3	0.79	Become strong	Skull or arm bones
Erythrocebus patas	16.7	11.1	1	Making yourself invisible	Skin
Colobus vellerosus	16.7	11.1	1	Bury a king of the village	Droppings

Citation frequencies (CF), Level of Fidelity (NF), Informant Consensus Factor (ICF)

Diversity and distribution of knowledge in the study area: Analysis revealed that food is the most frequently reported use within the different ethnic groups. NHP species use in pharmacopeia and beliefs were only mentioned in three ethnic groups. Diversity values (UD) were low for food use among Koulango (UD = 0.11) and Lobi (UD = 0.33) ethnic groups, while it was high among Malinké (UD = 0.50) and very high among Djimini and Lohoron (UD = 1). For pharmacopeia, diversity value was very high among Koulango (UD = 0.67) and Malinké (UD = 0.50) but low among Lobi (UD = 0.33). In this category, Koulango and Malinké place importance on traditional medicine. For beliefs, only Koulango, Lobi, and Malinké give importance to beliefs of NHP, with a generally low diversity value (0.22 for Koulango, 0.33 for Lobi, and 0.25 for Malinké). Equitability value (UE) indicates a homogeneity of knowledge across different categories. Value of fairness indicates a very good degree of knowledge at level of pharmacopeia (EU = 1). This indicates a strong homogeneity of knowledge in pharmacopeia among Koulango, Lobi, and Malinké. For food, the degree of knowledge is homogeneous among Malinké (EU = 0.50), Lobi, Djimini, and Lohoron, with an equitability value (EU = 1). Additionally, there was also a strong homogeneity of knowledge among Lobi and Malinké concerning beliefs. However, degree of knowledge is not homogeneous among Koulango for both food and beliefs (Table 7).

Table 7: Values of diversity (UD) and equitability (EU) of use categories among ethnic groups.

Use categories	Koulango		Lobi		Malinke		Lohoron		Djimini	
	UD	EU	UD	EU	UD	EU	UD	EU	UD	EU
Food	0.11	0.16	0.33	1	0.25	0.50	1	1	1	1
Pharmacopeia	0.67	1	0.33	1	0.50	1	-	-	-	-
beliefs	0.22	0.33	0.33	1	0.25	0.50	-	-	-	-

Diversity and distribution of knowledge of non-human primate species (NHP): Dietary category is the most cited use for all NHP species, based on the diversity value. This diversity is more pronounced for *Papio anubis*, which has a good distribution within three categories, including food, traditional medicine, and beliefs among Koulango and Malinké. These ethnic groups consider the species in these categories to be of great importance. Overall, all NHP species exhibit significant dietary diversity, especially among Koulango, Lobi, Malinké, and Djimini. Regarding pharmacopeia, diversity value for *Cercocebus lunulatus* is 0.50 among Koulango and Lobi. For *Erythrocebus patas*, diversity value is 0.75, 0.50, and 0.33 among Koulango, Lobi, and Malinké respectively. Diversity value for *Chlorocebus sabaeus* is 0.50 among Koulango, while for *Cercopithecus lowei*, *Cercopithecus petaurista*, and *Colobus vellerosus*, diversity value is 0.50 among Lobi. This highlights the importance of these species in traditional medicine within these ethnic groups. Diversity value for beliefs varies among different ethnic groups living around CNP. For *Papio anubis*, diversity value is 0.25, 0.50, and 0.33 for Koulango, Lobi, and Malinké ethnic groups, respectively. *Erythrocebus patas* has a diversity value of 0.33 among Malinké, while *Colobus vellerosus* has a value of 0.50 among Koulango. *Pan troglodytes verus* has a diversity value of 0.33 among the Malinké and 0.50 among Koulango. These values suggest that these species are only used in beliefs within these specific ethnic groups. Fairness value for food use is 1 for all NHP species except *Papio anubis* and *Erythrocebus patas*. This indicates that knowledge about these species is well-distributed within the surveyed ethnic groups. However, the low value of equitability recorded for *Papio anubis* and *Erythrocebus patas* indicates a lack of consistency in knowledge about food among Koulango. As for pharmacopeia, the equitability value indicates a very good degree of knowledge for *Cercocebus lunulatus*, *Papio anubis*, *Erythrocebus patas*, *Chlorocebus sabaeus*, *Cercopithecus lowei*, *Cercopithecus petaurista*, and *Colobus vellerosus* respectively, among Koulango, Lobi, and Malinké. Regarding beliefs, there is a strong homogeneity of knowledge for *Pan troglodytes verus* and *Colobus vellerosus* among Koulango, *Papio anubis* among Lobi and Malinké, and *Erythrocebus patas* among Malinké. However, there is a lack of consistency in knowledge about *Papio anubis* among Koulango (EU = 0.33) (Table 8).

Types of conflicts around CNP: Our study revealed that conflicts between human and monkeys around CNP are primarily due to dietary reasons. The study identified four monkey species that conflict with local communities (n=263) for their food resources. Among these, *Erythrocebus patas* (n=260) was the most reported, followed by *Chlorocebus sabaeus* (n=95), *Papio anubis* (n=17), and *Cercocebus lunulatus* (n=7), accounting for 98.9%, 36.1%, 6.5%, and 2.7% respectively. These species are listed as Near threatened (patas monkey), Least concern (green monkey and olive baboon) and Endangered (white-naped mangabey) according to the IUCN Red List. All of them are on CITES Appendix II. Findings showed that eleven crops were damaged by these species, including *Dioscorea sp* (n=246; 80.1%), *Zea mays* (n=232; 75.6%), *Aframomum melegueta*

Table 8: Values of diversity (UD) and equitability (EU) of NHP species among ethnic groups around CNP.

Ethnic group	Use categories	*Cercocebus lunulatus*		*Pan troglodytes verus*		*Papio anubis*		*Erythrocebus patas*		*Chlorocebus sabaeus*		*Cercopithecus lowei*		*Cercopithecus petaurista*		*Colobus vellerosus*	
		UD	**EU**	**UD**	**EU**	**UD**	**EU**	**UD**	**EU**	**UD**	**EU**	**UD**	**EU**	**UD**	**EU**	**UD**	**EU**
Koulango	Food	0.50	1	0.50	1	0.25	0.33	0.25	0.33	0.50	1	1	1	1	1	0.50	1
	pharmacopeia	0.50	1	-	-	0.75	1	0.75	1	0.50	1	-	-	-	-	-	-
	Beliefs	-	-	0.50	1	0.25	0.33	-	-	-		-	-	-	-	0.50	1
Lobi	Food	0.50	1	1	1	0.50	1	0.50	1	1	1	0.50	1	0.50	1	0.50	1
	pharmacopeia	0.50	1	-	-	-	-	0.50	1	-		0.50	1	0.50	1	0.50	1
	Beliefs	-	-	-	-	0.50	1	-	-	-		-	-	-	-	-	-
Malinké	Food	1	1	0.50	1	0.33	1	0.33	1	1	1	1	1	1	1	1	1
	Pharmacopeia	-	-	-	-	0.33	1	0.33	1	-	-	-	-	-	-	-	-
	beliefs	-	-	0.50	1	0.33	1	0.33	1	-	-	-	-	-	-	-	-
Lohoron	Food	-	-	1	1	1	1	1	1	1	1	-	-	-	-	-	-
	Pharmacopeia	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	beliefs	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
Djimini	Food	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Pharmacopeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	beliefs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 9: list of the major crop raiding by each primate species around CNP according to respondents

Primate species	Scientific name	Common name	Respondents	Percentages (%)
Cercocebus lunulatus (n=7)	*Zea mays*	Maize	7	100.0
	Dioscorea sp	Yam	5	71,4
	Aframomum melegueta	Grains of paradis	5	71,4
Erythrocebus patas (n=260)	*Dioscorea sp*	Yam	213	81,9
	Zea mays	Maize/corn	206	79,2
	Manhiot esculenta	Cassava	174	66,9
	Phaseolus vulgaris	Beans	49	18,8
	Arachis hypogaea	Groundnuts	40	15,4
	Anacardium occidentale	Cashew apple	33	12,7
	Sorghum arundinaceum	Millet	30	11,5
	Sorghum bicolor	Sorghum	19	7.3
	Musa paradisiaca	Plantain banana	10	3.8
	Ipomea batatas	Sweet potatoes	10	3.8
Chlorocebus sabaeus (n=95)	*Dioscorea sp*	Yam	81	85.3
	Zea mays	Maize/corn	76	80.0
	Manhiot esculenta	Cassava	71	74.7
	Arachis hypogaea	Groundnuts	24	25.3
	Phaseolus vulgaris	Beans	16	16,8
	Anacardium occidentale	Cashew apple	16	16,8
	Sorghum arundinaceum	Millet	15	15,8
	Sorghum bicolor	Sorghum	7	7,4
	Musa paradisiaca	Plantain banana	4	4,2
	Ipomoea batatas	Sweet potatoes	3	3,2
Papio anubis (n=17)	*Dioscorea sp*	Yam	13	76,5
	Zea mays	Maize/corn	15	88,2
	Manhiot esculenta	Cassava	12	70,6
	Arachis hypogaea	Groundnuts	5	29,4
	Phaseolus vulgaris	Beans	3	17,6

(Total percentage exceeds 100 because the respondents were allowed to give multiple answers)

(n=5; 1.6%), *Manhiot esculenta* (n=202; 65.8%), *Phaseolus vulgaris* (n=58; 18.9%), *Arachis hypogaea* (n=46; 15.0%), *Anacardium occidentale* (n=40; 13.0%), *Sorghum arundinaceum* (n=38; 12.4%%), *Sorghum bicolor* (n=20; 6.5%) *, Musa paradisiaca* (n=10; 3.3%) *and Ipomea batatas* (n=10; 3.3%). Overall, it was evident that three crops, namely yam (*Dioscorea sp*) (80.1%), mays (*Zea mays*) (75.6%), and cassava (*Manihot esculenta*) (65.8%), are heavily preyed upon by non-human primates according to respondents (n=307) around CNP. In addition, according to respondents, patas monkey and green monkey are reported to raid 10 crops respectively, followed by olive baboon with five crops and lastly by white-naped mangabey with three crops (Table 9).

Factors favoring conflicts around CNP: To understand factors behind the looting of crops, data was collected on distance between farmland from park. Findings revealed that most of victims surveyed (n = 157) have their farm located within a 5 km radius of the park, accounting for 59.7% (Table 10). Indeed, patas monkey was the most reported (n = 156) among respondents, followed by green monkey (n = 46), olive baboon (n = 9) and lastly white-naped mangabey (n = 6). Fisher test performed at threshold $\alpha = 5\%$ showed that without the patas monkey (P-value = 0,024 < α = 0.05), there are no significant difference between distance from farmland to the park and white-naped mangabey, green monkey and baboon monkey reported as crop raiders by respondents (white-naped mangabey: P-value = 0,941 ; green monkey: P-value = 0,125 ; baboon monkey: P-value = 0,286 > α = 0.05).

Crop protection methods: According to the surveys conducted, residents in the vicinity of Comoé National Park use two methods to minimize crop damage by non-human primates such as repulsive (n=239) and harmful (n=103) methods. Among the repellent techniques, watch guarding (n=189) and a scarecrow (n=54) are the most common techniques used, accounting for 79.1% and 22.6% respectively. Lighting by firewood (n=27), bell (n=25) and opening field boundaries (n=9) are the least reported, with 11.3%, 10.5% and 3.8% respectively. On the other hand, harmful techniques such as traps (n=93), weapon (n=23) and hunting with dogs (n=10) are also

used by residents to repel crop raiders, accounting for 90.3%, 22.3% and 9.7% respectively.

Table 10: Distance between crop farm to the park according to the respondents in the vicinity of CNP

Distance to the field from the park	White-naped mangabey		Patas monkey		Green monkey		Olive baboon		Total	
	n	P (%)	n	P (%)	n	P (%)	n	P (%)	n	P (%)
0_5 km	6	85.7	156	60.0	46	48.4	9	52.9	**157**	**59.7**
6_10 km	1	14.3	47	18.1	20	21.1	3	17.6	**48**	**18.3**
> 10 km	0	0.0	57	21.9	29	30.5	5	29.4	**58**	**22.1**
Total	7	100.0	260	100.0	95	100.0	17	100.0	**263**	**100.0**

DISCUSSION

This study emphasizes the significant ethnic diversity of communities around Comoé National Park. It reveals that residents have a deep understanding of non-human primates and the different names used by them to denote each primate species demonstrate their close relationship with their environment. The study has shown that the ethnic diversity is dominated by five ethnic groups, including Koulango, Malinké, Lobi, Lohoron, and Djimini, and showed that *Erythrocebus patas*, *Chlorocebus sabaeus*, and *Papio anubis* are the most known primate species in the area. This may be due to the proximity of the savannah species at the park's periphery, based on personal observation. However, the study also found that *Cercocebus lunulatus*, *Cercopithecus lowei*, *Cercopithecus petaurista*, and *Procolobus verus* are less familiar to surrounding communities and park manager, but well-known by hunters. This could be because these species live in the forest remnants in the park and are difficult to observe. This ethnic diversity was reported by (Atta *et al.*, 2021) in their study on the uses of the African buffalo *Syncerus caffer* (Sparrman, 1779) by the populations living around Comoé National Park.

The study conducted around CNP identified eight primate species, including *Cercocebus lunulatus*, *Pan troglodytes verus*, *Erythrocebus patas*, *Chlorocebus sabaeus*, *Papio anubis*, *Colobus vellerosus*, *Cercopithecus lowei*, and *Cercopithecus petaurista*, being used by residents for food, pharmacopeia, and beliefs. The primary use across all species was for food, highlighting the importance of NHP in communities' diets. Among Koulango, Lobi, and Malinké ethnic groups, *Papio anubis* held cultural significance, being used for food, traditional medicine, and beliefs. In traditional medicine, various primate species, such as *Colobus vellerosus, Cercocebus lunulatus*, *Erythrocebus patas*, *Chlorocebus sabaeus*, *Cercopithecus lowei* and *Cercopithecus petaurista*, played a crucial role, with seven different uses identified across four organs. This research is the first of its kind in shedding light on the pharmacopeia use of NHP around CNP, particularly *Cercocebus lunulatus*. Additionally, the findings underscore the pressures exerted by local communities on the primate species in CNP. Indeed, within the nine diurnal primate species still sheltering in CNP (personal communication), two are critically endangered (*Pan troglodytes verus* and *Colobus vellerosus*), one is endangered (*Cercocebus lunulatus*), two are vulnerable (*Procolobus verus* and *Cercopithecus lowei*), two are near threatened (*Erythrocebus patas* and *Cercopithecus petaurista*), and two are least concern (*Papio anubis* and *Chlorocebus sabaeus*) according to the International Union for Conservation of Nature (IUCN) Red List (IUCN, 2023). The Chimpanzee is listed under Appendix I, while the other species are under Appendix II according to the Convention on International Trade in Endangered Species (CITES). Endangered non-human primate species are used both in pharmacopeia and beliefs, hence the need to implement conservation strategy to consider the local communities living conditions. Similar studies in Benin, Côte d'Ivoire, Burkina Faso, Nigeria and other countries around the world have documented the medicinal and belief-based uses of various wildlife species, emphasizing the broader world context (Alves *et al*., 2016; Ajagun and Anyaku, 2017; Sogbohossou *et al*., 2018; Ouoba *et al*., 2020).

Socio-demographic findings revealed that in the peripheral areas of CNP, socio-demographic factors such as age, education level, ethnicity, and gender have a significant influence on agriculture, hunting, and wildlife conservation activities in the region. These factors play a crucial role in shaping the practices and behaviors of local communities involved in these activities. Findings also showed that most respondents were farmers aged between 31 and 43, while among hunters and residents, the majority were illiterate or had primary school or Koranic education. Koulango was predominant among hunters, while Malinké was common among residents. This shows that the community is diverse, and different ethnic groups may have distinct roles or preferences in terms of livelihood activities. Most of the respondents were men who had been residing in the locality over 20 years. This suggests that they have a deep connection with the environment, potentially influencing their livelihood practices and ecological knowledge. Given the impact of hunters on biodiversity and the reliance of

residents on natural resources, it is crucial to address their needs and interests while designing conservation strategies that respect local livelihoods and cultural practices around protected areas. The call for conservation strategies that respect local livelihoods and cultural practices highlights an awareness of the importance of integrating cultural considerations into conservation efforts.

The survey results indicated a conflict between the local communities and non-human primates, particularly regarding crop raiding. This conflict involved four NHP species, including patas monkey, green monkey, olive baboon, and white-naped mangabey. Three major food crops such as yam, maize, and cassava were significantly damaged by primates. This is due that these crops are the most cultivated in the study area. Moreover, the study highlighted that subsistence crops, are most impacted by wildlife raiding near the protected area. Without the white-naped mangabey, the other species were reported by several authors in human-wildlife conflicts (Adeola *et al*., 2018; Odunlami and Osumenya, 2020; Dibloni *et al*., 2020; Kouao and Anthelme, 2023). The most reported crops mentioned by these authors were maize, rice, groundnut, beans, and sorghum. Farmers employed repellent methods like watch guarding and scarecrows, as well as harmful methods like traps and firearms, to control animal damage (Kouao *et al.*, 2020). Most of the crop raiding occurs within a 5 km radius outside the park, potentially influenced by food availability, human pressures, and proximity of preferred foods. The vulnerability of crops to wildlife raiding increases with distance from the protected area (Ogunjobi and Adeola, 2016; Ogunjobi *et al*., 2018), and impacting local communities economically (Kouao *et al.*, 2023). Indeed, the proximity of human activities to the park was given as the reason for crop raiding. Conservation status of species, particularly the endangered *Cercocebus lunulatus*, emphasizes the need for effective conservation measures and management to mitigate conflicts between primates and human nearby the park. Further research is essential to understand these dynamics and implement measures for wildlife conservation and peaceful coexistence for food security around CNP. However, local knowledge, deeply rooted in the communities surrounding protected areas like Comoé National Park, can significantly influence the dynamics of human-wildlife conflicts. Indeed, traditional ecological knowledge, held by residents, shapes their understanding of wildlife behavior, migration patterns, and resource utilization, contributing to the identification of conflict hotspots. By incorporating and respecting this local knowledge in conservation strategies, a more nuanced and effective approach can be developed to mitigate human-wildlife conflicts.

Conclusion: Local communities around CNP possess extensive knowledge of local primates, with nine species used for food, medicine, and cultural beliefs, particularly among the Koulango, Lobi, and Malinké groups. Crop raiding by primates is widespread, affecting eleven key crops, with yam (*Dioscorea sp*), maize (*Zea mays*), and cassava (*Manhiot esculenta*) being the most impacted. The patas monkey (*Erythrocebus patas*) is responsible for most single raids. Farmers employ various deterrents, including guarding, scarecrows, firewood lighting, bells, traps, and hunting. This study highlights how farming near park boundaries provides alternative food for wildlife, emphasizing the need to establish farms at a reasonable distance to reduce crop losses.

Authors' contributions: TC and KO designed the study. TC collected, analyzed, and interpreted the data and prepared the draft. KO, MLK and IK critically revised the draft. All the authors approved the final version of the manuscript.

Conflict of interest: The authors assert the absence of any conflict of interest that might impact on the reported findings.

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REFERENCES

Adeola, A.J., A.O. Ibrahim, A.N. Adeola, S.A. Alaye and O.A. Akande (2018). Primates associated with crop raiding around Borgu sector of Kainji Lake National Park, Nigeria. World News Nat. Sci. 18 (2) 223-231. https://agro.icm.edu.pl/agro/element/bwmeta1.element.agro-69e6e90f-51c0-4056-ae5c-b84d47c19835

Ajagun, J., and E. Anyaku (2017). Conservation status of animal species used by indigenous traditional medicine practitioners in Ogbomoso, Oyo state. J. Compl. Altern. Med. Res. 3 (4): 1-8. https://doi.org/10.9734/JOCAMR/2017/36018

Alves, R. R.N., M.D.F. Melo, F.S. Ferreira, D.M.D.B.M. Trovão, T.L.P. Dias, J.V. Oliveira, R.F.P. De Lucena and R.R.D. Barboza (2016). Healing with animals in a Semiarid Northeastern area of

Brazil. Environ. Dev. Sustain. 18 (6): 1733-47. https://doi.org/10.1007/s10668-015-9715-1.

Awo, H., S.A. Chaffra, F.B Yabi, T.O Lougbegnon, M. Djondo and B. Tente (2020). Ethnozoological study and forms of use of *Trichechus senegalensis* in Southern Benin. Mar. Sci. Agron. Vét. 8 (2): 179-185. https://www.agrimaroc.org/index.php/Actes_IAVH2/article/view/870/970

Bryman, A. (2016). Social research methods. 5th Ed. Oxford University Press; New York (United States of America) 16 p. https://www.chegg.com/textbooks/social-research-methods-5th-edition-9780199689453-0199689458?

Atta, A.C.J., B. Kadjo, S. Ouattara and R.Y. Kouadio (2020). Structure of buffaloes Syncerus caffer (Sparrman, 1779) (Mammalia Bovidae) of the Comoe National Park (North-East Ivory Coast). Biodiv. Jour. 11 (4): 879–887. https://doi.org/10.31396/Biodiv.Jour.2020.11.4.879.887.

Atta, A.C.J., S. Ouattara, B. Kadjo and R.Y. Kouadio (2021). Some uses of the African buffalo Syncerus caffer (Sparrman, 1779) by the populations living around the Comoé National Park (North-East Ivory Coast). J. Anim. Plant Sci. 47 (2): 8484-8496. https://doi.org/10.35759/JAnmPlSci.v47-2.6.

Dibloni, O.T., D. Ouoba, Y.S. Zoman, S. Yameogo and B.G. Kabre (2020). Characterization of human-wildlife conflicts in the biosphere reserve of the Mare aux Hippopotames in the Southern Sudanian Zone of Burkina Faso. Afrique Science. 17 (2): 115-27. https://www.researchgate.net/publication/358965303

Fischer, F. (2005). Elephants in Côte d'Ivoire : a warning for West African conservation. Pachyderm 38: 64-75. https://www.africabib.org/rec.php?RID=Q00039831

Harrell, M.C. and M.A. Bradley (2009). Data collection methods. Semi-structured interviews and focus groups. Rand National Defense Research Instit. Santa Monica, Arlington. 146p. https://www.rand.org/pubs/technical_reports.html.

Hennenberg, K.J. (2005). Vegetation ecology of forest-savanna ecotones in the Comoé National Park (Ivory Coast): border and ecotone detection, core-area analysis, and ecotone dynamics. PhD thesis, Rostock, Univ. Dissert. Faculty of Mathematics and Natural Sciences of the University of Rostock Institute of Biosciences (IfBI) Department of General and Special Botany, Germany.110p. https://doi.org/10.18453/rosdok_id00000274

Hockings, K.J. (2016). Mitigating human–nonhuman primate conflict. In The Int. Encycl. Primatol. 1-2. John Wiley and Sons, Ltd. https://doi.org/10.1002/9781119179313.wbprim0053.

IUCN. 2023. The IUCN Red List of Threatened Species. IUCN Red List of Threatened Species. 2023. https://www.iucnredlist.org/en.

Kingdon, J. (2017). Mammifères d'Afrique. 2sd Ed. Delachaux; Paris (France) 304p. https://www.delachauxetniestle.com/livre/mammiferes-dafrique/9782603030547

Konan, A.S., D.F. Malan, A. Ouattara, M.D. Kougbo and M. Dogba (2020). Spatio-temporal dynamics of the vegetation of Comoé National Park in the Northeast of Côte d'Ivoire. Reb-pasres 5(2): 27-43. https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://rebpasres.org/wp-content/uploads/2021/08/REB-PASRES-N%25C2%25B0522020.pdf

Kouao, M.L., J.C.K. Bene, S. Ouattara, A.K. Djaha, A. Yao and I. Kone (2020). Nature and management of human-elephant conflicts around the Dassioko classified forest on the Ivorian coastline. J. Anim. Plant Sci. 44 (3): 7745-7757. https://m.elewa.org/Journals/wp-content/uploads/2020/06/6.Kouao_.pdf.

Kouao, M.L., E. Bogui, T. Coulibaly, A. Gnagbo and I. Koné (2023). Crop losses and patterns of wildlife damage at the periphery of Dassioko Classified Forest and Forêt des Marais Tanoé-Ehy in Côte d'Ivoire. Int. J. Biosci. 23 (5): 40-53. http://dx.doi.org/10.12692/ijb/23.5.40-53.

Kouao, M. L. and G. Anthelme (2023). Situational analysis of human and wildlife conflicts at the periphery of Forêt des Marais Tanoe-Ehy at the East of Côte d'Ivoire. 1st Ed. Emerging Issues in Environ., Geogr. Earth Sci. Turkey. 128p. https://doi.org/10.9734/bpi/eieges/v2/18158D.

Lapuente, J., T.C. Hicks and K.E. Linsenmair (2017). Fluid dipping technology of chimpanzees in Comoé National Park, Ivory Coast. American J. Primatol. 79 (5): e22628. https://doi.org/10.1002/ajp.22628.

Lauginie, F. (2007). Nature conservation and protected areas in Côte d'Ivoire**.** CEDA/NEI, Abidjan (Côte d'Ivoire). 668 p. https://bibliotheques.mnhn.fr/medias/detailstatic.

aspx?INSTANCE=exploitation&RSC_BASE=HORIZON&RSC_DOCID=519643

Logbo, J., P. Yédomonhan, B. Tenté and A. Akoegninou (2019). Uses and of *Dracaena arborea* (Willd) link among the Kwa peoples in Benin. Afrique Sci. 15 (2): 117-32. https://www.researchgate.net/publication/337893573

Matsuda Goodwin, R., S.E. Gonedelé Bi, A. Baxt, E.A. Bitty, E.D. Wiafe and A. N'Golo (2020). Surveys and canopy cameras of critically threatened monkeys in Comoé National Park, Côte d'Ivoire: A preliminary report. Annual Report of Pro Natura Foundation Japan 29: 343-58. https://doi.org/10.32215/pronatura.29.0_343

Mouzoun, S. (2018). Ecology and ethnozoological knowledge of the Crested Porcupine (Hystrix cristata Linnaeus, 1758) in the Biosphere reserves of Pendjari and W in Benin .PhD thesis. Department of Geogr. Gest. Environ., Univ. of Abomey-Calavi (Benin). 188p. https://hal.science/tel-02023660/

Naughton-Treves, L. (2005). Socio-ecological factors shaping local support for wildlife: crop-raiding by elephants and other wildlife in Africa. Cambridge University Press. 9: 252-277. https://doi.org/10.1017/CBO9780511614774.017

Odunlami, S.S. and V.O. Osumenya (2020). Human–wildlife conflict in protected areas in Nigeria: dimensions and solutions. J. Research in Forestry, Wildlife and Environ. 12 (2): 1-5. http://www.ajol.info/index.php/jrfwe

Ogunjobi, J.A. and A.J. Adeola (2016). Wild vertebrates associated with crop raiding around Kainji Lake National Park, Nigeria. Appl. Trop. Agric. 21 (3): 138-142. https://www.researchgate.net/publication/314119878

Ogunjobi, J.A., S.K. Halidu, B.R. Odebiyi and I.J. Fxentirimam (2018). Crop raiding pattern of the African elephant (Loxodonta africana) in farms around Kamuku National Park, Nigeria. Afr. J. Agric. Technol. Environ. 7: 174-87. https://www.researchgate.net/publication/331823620

Ouoba, D., O.T. Dibloni, K. Mano, Y. Ouoba and B.G. Kabre (2020). Role of wild mammals in traditional medicine and mystic practices in the province of Oubritenga, Burkina Faso. Int. J. Biol. Chem. Sci. 14(4): 1322-1340. https://doi.org/10.4314/ijbcs.v14i4.13

Rahman, M.M. (2019). Semi-structured interview: a critical analysis. University of Bath. https://scholar.google.com/scholar?hl=fr&as_sdt=0%2C5&q=Rahman%2C+M.+M.+%282019%29.+Semi-structured+interview%3A+A+critical+analysis.+University+of+Bath.+&btnG=

Sangne, C.Y., I. Bamba, B.K. Kpangui, A.K. Kouakou and Y.S.S. Barima (2019). Impact of Cashew Fields on forests and savannas in agricultural areas surrounding Comoé National Park. Int. J. Biol. Chem. Sci. 13 (2): 662-75. https://doi.org/10.4314/ijbcs.v13i2.9

Sogbohossou, E.A., B. Kassa, H.A. Akpona, I.O. Amahowe, J. Djagoun and B. Sinsin (2018). Trade in primate species for medicinal purposes in southern Benin: implications for conservation. Traffic bull. 30 (2): 49.https://www.academia.edu/69110228/Trade_in_Primate_Species_for_Medicinal_Purposes_in_Southern_Benin_Implications_for_Conservation?

Sop, T.K., J. Oldeland, F. Bognounou, U. Schmiedel and A. Thiombiano (2012). Ethnobotanical knowledge and valuation of woody plants species: a comparative analysis of three ethnic groups from the sub-Sahel of Burkina Faso. Environ. Dev. Sustain. 14: 627-49. https://doi.org/10.1007/s10668-012-9345-9

Sparrman, A.E. (1779). *Syncerus caffer in* Mammal Species of the World. National Museum of Natural History, Smithsonian Institution. Checklist dataset https://doi.org/10.15468/csfquc accessed via GBIF.org on 2025-04-04.

Yetein, M.H., L.G. Houessou, T.O. Lougbégnon, O. Teka and B. Tente (2013). Ethnobotanical study of medicinal plants used for the treatment of malaria in plateau of Allada, Benin (West Africa). J. Ethnopharmacol. 146 (1): 154-63. https://doi.org/10.1016/j.jep.2012.12.022

Zanvo, S. (2022). Assessing the conservation status of pangolins in the dahomey gap using spatial and molecular ecology, ethnozoology and conservation genetics. PhD thesis, Univ. Paul Sabatier-Toulouse III; Univ. d'Abomey-Calavi (Bénin). 242p. https://theses.hal.science/tel-03715483v1.