

CRUCIAL ROLE OF VULTURES IN THE LIVES OF LOCAL COMMUNITIES ON THE OUTSKIRTS OF COMOÉ NATIONAL PARK, NORTHEASTERN CÔTE D'IVOIRE.

ABSTRACT

In the context of the preservation of vultures in the Comoé National Park of Côte d'Ivoire, an ethnozoological study was carried out from August 1st to August 30, 2022, among 255 people living in the sideline of the park. The aim was to document local knowledge of vultures for the development of inclusive conservation programs. Based on a survey, a list of five vulture species was drawn up. Five categories of use were inventoried, with different frequencies of citation: traditional medicine (FC= 90.43%), magic (FC=28.72%), food (FC=28.72%), economy (FC=2.31%) and ornament (FC=1.06%). In all, thirteen parts of these vultures' organs are used in various ways by the populations. Ten of these organs are used to treat disease, and eleven for magical purposes. The most used parts are the head (VU=0.27), legs (VU=0.25) and beak (VU=0.21). These results reveal the importance of vultures for the populations living around the Comoé National Park. They shed light on some of the factors that threaten vultures, and alert managers to the need to take the needs of the populations into account in biodiversity conservation measures.

Keywords: Vultures; use; ethnozoological knowledge; biodiversity; Comoé National Park; Ivory Coast

Introduction

Birds play an indispensable role in the balance of biodiversity, combining pleasure, aesthetics and economic growth through ecotourism, while also having a proven ecological importance. This particular distinction is well observed in vultures, which have a crucial role in cleaning up environments (Blondel and Desmets 2018; Daboné et al., 2019). Indeed, by consuming animal carcasses, these avian species considerably reduce disease transmission and water pollution (Buij et al., 2016). Moreover, because of their cohabitation with humans, vultures occupy a significant place in their daily lives (Kpera and Mensah, 2004; Yaokokore-Beibro et al., 2010; Koué-Bietal., 2017; Asso et al., 2024). Surely, like many bird species, vultures are used by humans for protection, feeding and maintaining sacred links with nature (Kpera and Mensah, 2004; Koué-Bietal., 2017). These practices reflect the level of knowledge held by local populations about avian wildlife (Asso et al., 2024). However, vulture populations have experienced a significant decline in recent years due to several factors, such as the fragmentation of their habitats and numerous uses by humans (Houessou, 2018; Clément Daboné et al., 2019; Daboné et al., 2023). As a result of this decline, this group of birds is now classified as one of the most threatened species worldwide, particularly in West Africa (Ogada et al., 2016; IUCN, 2025).

In Côte d'Ivoire, five of the six Vulture species identified (Borrow and Demey, 2015), are threatened (Bird Life International, 2018; IUCN, 2025). This reveals the need to develop the most effective conservation strategies for these species, even though, recent

42 studies have shown that these vultures are mainly
43 confined to protected areas, notably the Comoé National Park (PNC) (Salewski, 2018, 2019, 2020).
44 However, data on the various endogenous knowledge and traditional practices related to vultures
45 by the populations surrounding this park are almost non-existent. It was in this context that
46 this study was undertaken and carried out in the outlying villages of the Comoé National Park. It
47 documented local knowledge of vultures in order to develop effective strategies for their
48 conservation. The main aims were to determine the criteria by which people recognize vultures, to
49 identify the different categories of vulture use, and to list the parties and bodies involved in these
50 uses.

51 **Material and methods**

52 Located in northeastern Côte d'Ivoire, the Comoé National Park (CNP) is both a World
53 Heritage Site and a Biosphere Reserve. It covers an area of 1,148,756 hectares. It is bounded by
54 latitudes 8°30' and 9°36' North and longitudes 3°60' and 4°25' West (OIPR, 2015). The CNP, is
55 crossed from north to south by the Comoé River, it is part of the "Northern Plateaux" geophysical
56 region. Its vegetation is diverse, comprising mainly savanna and forest formations (Poilecot, 1989;
57 Konan et al.,
58 2020). This environment is home to over 497 bird species (Poilecot, 1989; Fisher et al.; 2002; Laugini
59 e, 2007), 135 mammal species, 35 amphibian species, 71 reptile species and 60 fish species
60 (OIPR, 2015). The CNP covers five departments (Dabakala, Bouna, Nassian, Tehini and
61 Kong) and more than twenty sub-prefectures (OIPR, 2015). These sub-
62 prefectures are populated by several villages
63 with a large and diverse population in terms of ethnic groups (RGPH, 2021). In addition, more than
64 twenty of these villages are located on the periphery of the CNP (Figure 1). These various localities
65 are subject to a transitional sub-humid tropical climate, characterized by alternating rainy and dry
66 seasons, with a unimodal rainfall pattern. Average annual rainfall ranges between 900 and 1,200
67 mm (OIPR, 2015).

68 The biological material used consisted of various species of vulture found in the Comoé
69 National Park and its peripheral zone. For data collection, a questionnaire guided developed using
70 KoboCollect software and integrated into a tablet was used. A digital camera was used to take
71 photos, and a GPS device to geolocate the survey sites. A West African bird identification guide
72 (Borrow and Demey, 2015) was used for vulture recognition and identification.

73 Concerning the Data collection, it began with an exploratory phase from June
74 15 to 18, 2022 with 50 randomly selected people in villages bordering the CNP, in line with the work of
75 Lougbegnon et al. (2015), Wédjangnon et al. (2016), Awo et al. (2020) and Yevide et al. (2022).
76 This phase identified the proportion of people with knowledge of wildlife, in particular vultures
77 and their various uses. The quantitative data obtained were used to determine the sample size
78 (n) using Dagnelie's (1998) mathematical formula: $n = u^2 (\frac{p(1-p)}{d^2})$; n = sample size; $u_{\alpha/2}$ =
79 value of the normal distribution at the probability value with $\alpha = 5\%$ and $u = 1.96$. p =
80 proportion of people with knowledge of vulture
81 use around the CNP (41 of the 50 people questioned have knowledge of
82 vulture use, $p = 41 \times 100 / 50 = 82\%$); d : margin of error set at 5% ($d = 0.05$). Thus, the sample size for
83 this study was initially estimated at 227 people. In the second phase, the questionnaire guide
84 developed and implemented using KoboCollect 2022.1.2 software (KoBo Toolbox) was

85 readjusted (Yaokokoré-Béibroetal., 2010; Koué-Biet al., 2017; Awoetal., 2020). To ensure
86 coverage of the theoretical sample size, the sample size was increased to 255 people. Thus, the
87 actual collection was done through a semi-structured survey from June 25 to August 30, 2022,
88 during individual face-to-face interviews (Koué-Biet al., 2017; Houessou, 2018; Awoetal., 2020).
89 A few focus groups were organized with a view to adjusting and consolidating divergent ideas
90 (Yaokokoré-Béibroetal., 2010; Koué-Biet al., 2017). Following the work of Salewski (2018, 2019,
91 2020), this survey took place in 23 villages located mainly in the northern, eastern and
92 southern zones of the PNC periphery. The choice of villages was based on their accessibility, their
93 proximity to the park, the safety of the area and the presence of vultures. Sampling was carried out
94 using the "snowball" method (Awoetal., 2020), and only people with knowledge of avian fauna,
95 especially vultures and their various uses, were interviewed. Thus, several social categories were
96 targeted, including village chiefs, former poachers, farmers, traditional healers and young people
97 familiar with vultures (Yaokokoré-Béibroet
98 al., 2010). Local translators facilitated communication during these interviews.

99 For the data processing,
100 people surveyed were divided into three age categories: "young people" (aged between 16 and 29),
101 "adults" (aged between 30 and 59) and "old people" (aged over 59) (Awoetal., 2020). The
102 Excel spreadsheet was used to draw up age histograms and calculate various ethnozoological
103 characterization indices. The first is the Frequency of Citation (FC) to assess the proportions of
104 vulture use by local populations (Mouzoun, 2018). It was determined using the following formula:
105 $CF = (n/N) \times 100$; n = number of citations of a use category; N = total number of respondents. Next,
106 the Use Value (UV) was calculated to determine the importance of the vulture parts and organs
107 used by the populations. Use Value (UV) is the ratio of the sum of citations of parts or organs by
108 the number of respondents (N_t) (Awoetal., 2020). Its mathematical formula is: $VU = (\sum U) / N_t$;
109 where $\sum U$ = sum of the citations of the U bodies and N_t = total number of respondents. Finally, the
110 Informative Consensus Factor (ICF) was determined, using the following formula: $ICF = (N_u -$
111 $N_t) / (N_u - 1)$; N_u being the number of citations for a use category and N_t , the total number of
112 parts or organs used by informants in a use category. The Informant Consensus Factor captures
113 the level of consensus among surveyed populations on the uses of species parts or organs
114 (Mouzoun, 2018). Its value varies from 0 to 1. Thus, the closer it is to 1, the more the organ or part
115 is used by several people for the same purpose. And the closer it is to 0, the fewer people use this
116 organ or part for the same purpose (Babacar et al., 2023).

117 Data analysis was carried out using XLSTAT software (version 2016). The non-parametric
118 Kruskal-Wallis test with K samples was used to compare citation frequencies between vulture
119 recognition criteria, proportions of citations of vulture species in the area and use categories.

120 **Results**

121 **Structure of the survey population**

122 Of all those interviewed, 72.55% were Koulango, 16.08% Lobi, 5.49% Malinké, 3.53%
123 Djimini and 2.35% Lohoron (Figure 2). Respondents were 93.27% male and 6.73% female. In
124 terms of age distribution, 5% of respondents were young people, 61% adults and 34% elderly, with
125 an average age of 52. The populations surveyed were classified according to their socio-
126 professional categories. These included 80.78% farmers, 9.02% ex-poachers, 5.10% traditional

127 healers and 5.10% other occupations, such as housewives and
128 shopkeepers.

129 **Local vulture nomenclature according to the different sociolinguistic groups surveyed**

130 Vulture species such as the carrion vulture, the African vulture and the palm vulture are
131 referred to by two or three names in the same language. In some local languages, a single common
132 name is given to all vulture species. In most cases, the names in the different local languages are
133 linked to the species' diet. Among the Koulango, the palm vulture is known as "tchêhô", meaning
134 "he who loves palm seeds", while the carrion vulture is known as "côcôssaki" or
135 "congodouga" or
136 "plôh", meaning "he who loves meat". Among the Lobi, "Dougn" designates "the animal that eats
137 meat" or "the bird that can't do without meat". Among the Malinke, "Douga" is given to both the
138 carrion vulture and the African vulture, and refers to the species that "eats dead animals and animal
139 remains". Exceptionally, the palm vulture is referred to as "Doungbôlô", which refers to "the bird
140 with two-colored plumage" (Table 1). The five vulture species identified were not all
141 named by all the people surveyed. In fact, apart from the Koulango, who were able to recognize
142 and name all five species, the Lobi, Lorhon
143 and Malinké surveyed were able to recognize three species: the carrion vulture, the African vultur
144 e and the palm vulture. The Djimini people recognized only the African Vulture and the Palm
145 Vulture.

146 **Criteria for identifying vultures**

147 The survey revealed that 94% of respondents were able to cite at least one criterion for
148 distinguishing vulture species. Conversely, 6% of respondents were unable to
149 distinguish between these species. Speaking of identification criteria, the survey showed that
150 a total of 12 main criteria
151 were identified by respondents to distinguish not only vultures from other birds, but mainly vulture
152 species from each other. In terms of citation frequencies, the most important of these criteria is
153 general plumage color, with a Citation Frequency (CF) equivalent to 69.41%. This criterion is
154 followed by "head description" (CF=32.16%), which includes shape, covering and color. Next
155 come the distinction of the neck (length, color, presence or absence of feathers) (FC=31.37%).
156 The least cited criteria are the turkey's appearance, its calls and its smell, each with a FC=0.39%
157 (Figure 3). The Kruskal-Wallis statistical test performed on the data shows no significant
158 difference between vulture recognition criteria ($p > 0.05$).

159 **Categories of use and use of vultures by local populations**

160 The vulture species identified in the study are used in a variety of ways by local
161 populations. Indeed, five main categories of use were distinguished by the respondents
162 (Figure 4).

163 The most widely used by the population surveyed was traditional medicine, with a frequency of
164 quotation (FC) of 90.43%. It is followed by magic and food, each with a frequency of use
165 equivalent to 28.72%. With a CF=1.06%, ornament is the least cited category in the practices of
166 the population surveyed (Figure 4). The Kruskal-Wallis statistical test carried out showed no
167 significant difference ($p > 0.05$) between the different areas or categories of use.

168 In addition, the Informant Consensus Factors (ICFs) revealed a broad consensus on the use
169 of vultures in traditional medicine, food and magic (ICF=0.97 for each) by the populations living
170 around Comoé National Park. Consensus on the economic use of vultures in the study area is low
171 (CFI=0.25) (Table 2). As for the ornamental use of vultures, there was no consensus (FCI= 0).

172 **Different parts and organs of vultures used by people around Comoé National Park.**

173 A total of 13 vulture parts and organs are used in the five use categories by local people
174 around Comoé National Park. The total use value (UV) of these different parts in the use categories
175 is 2.04. The organs and parts with the highest VU are the head (VU=0.27), legs (0.25) and beak (0.21)
176 (Table 3). Flesh (0.18), feathers (0.17), skin (0.16), bones (0.15), eyes (0.15) and neck (0.11) have
177 a VU between 0.1 and 0.2. These different values show the interest shown in vultures
178 by the local population. These VU values show that the head and legs of vultures are the body parts
179 most involved in four categories of use: traditional medicine, food, magic and economy. These
180 same categories apply to the use of feathers, with the difference that food is replaced by ornament.
181 Certain organs are used in all three categories at the same time; this is the case of the skin, which
182 in addition to being used for food, is used along with the beak in traditional medicine and magic.
183 Other parts are used in two different categories. Claws, blood and droppings, for example, are
184 auxiliaries in traditional medicine and magic. The brain is the only organ used exclusively in magic.

185 **Discussion**

186 The people surveyed in this study were 93% male and less than 7% female, indicating a greater
187 use of wildlife by men than by women. These proportions reveal that generally women
188 are not in direct contact with wildlife. This finding is in line with Yaokokoré-Béibro et al. (2010), who
189 showed in an ethnozoological study around the Badenou classified forest in Korhogo, northern
190 Côte d'Ivoire, that men are the most involved in wildlife-related activities. In the same vein and
191 mainly on vultures in Benin, Houessou (2018) reported that very few women broach vulture-related
192 topics, those who do being often perceived as "witches".

193 As far as knowledge of vultures is concerned, it should be noted that the people surveyed have a
194 good knowledge of the species. They were able to identify five species of vulture in the
195 study area. Apart from the fact that vultures have their own names in local languages, the majority
196 of these populations differentiate between species on the basis of criteria. The most important of
197 those criteria, in terms of frequency of citation are the general color of the plumage, the head, the neck,
198 the wingspan, the legs and the appearance of the beak. These data show that local populations have
199 their own criteria for characterizing an animal species (Alves and van Vliet, 2018). Moreover,
200 most of these criteria are based on observation. This could mean that local populations are very
201 observant of elements of nature (Pinton and Grenand, 2007; Koue-Biet
202 al., 2023). These distinctive criteria, with the exception of the neck and beak, have been recognized
203 as recognition traits of the carrion vulture in Benin (Houessou, 2018). These criteria help local
204 populations to gain a better understanding of animal species. This knowledge of vulture species by
205 the populations surveyed indicates a closely link between humans and these avian species. It is this
206 knowledge that is reflected in the different uses to which the parts or organs of these animals are
207 put. For example, the total use value of vultures is 2.04. This value reflects their intensive use by
208 local populations. Indeed, five categories of use were identified in the course of this study, with a
209 strong consensus on traditional medicine (90.43%). This consensus could therefore attest to the
210

211 fact that vultures are frequently used as auxiliaries for the treatment of several ailments among the
212 populations around this protected area (Manqele et al., 2023; Ouattara et al., 2025).

213 On the basis of these results, it is important to underline that traditional medicine, magic and food
214 represent the three main uses identified during this study. In fact, thirteen vulture parts and
215 organs are used in five categories: eleven for magic, ten for traditional medicine, six for food, four for
216 economic purposes and one for ornamental purposes. Seven of these parts have also been found in
217 the treatment of various diseases in Kwazulu-natal, South Africa (Manqele et al., 2023). In
218 addition, the most commonly used parts are the head, legs and beak of vultures. These parts show
219 high levels of consensus regarding their use in Traditional Medicine (0.96), food (0.96) and magic
220 (0.90). Those results reflect and confirm
221 the great interest that people have in animals in general (Ouattara et al., 2025), and in vultures in particular, not only for healing, but also for food and supernatural
222 purposes (Daboné et al., 2019; Asso et al., 2024). These findings are in line with the work of
223 Buijet et al. (2016), who asserted that vulture body parts are valued in many African cultures
224 (Daboné et al., 2023). Indeed, according to these authors, many African cultures consider
225 that these vulture body parts have the ability to cure various physical and mental
226 illnesses, improve chances or increase intelligence in children. In the same vein, Schlee (2010)
227 added that palm vultures are often harvested for traditional medicine and fetishism. In line with
228 these findings, Schlee (2010) also indicated that the legs, heads and brains of all vulture species
229 are particularly prized by fetishists for their supposed mystical powers and clairvoyance. These
230 various uses suggest that vulture species in the study area are coveted by local populations, as is the
231 case in neighbouring Burkina Faso (Daboné et al., 2023).
232

233 **Conclusion**

234 The ethnozoological study carried out on vulture species around the CNP showed the cultural
235 richness of local communities and their in-depth knowledge of these birds. These local populations
236 identify vultures mainly from their diet, using plumage color as the main criterion (69.41%). In
237 addition to their recognitions, 13 parts and organs of these vultures are used in traditional medicine
238 (52.69%) and food (27.31%), with a very strong consensus (0.97). In addition, vultures are used in
239 magical practices (17.09%), for ornamental purposes (46.91%) and, to a lesser extent, for economic
240 purposes (0.98%). These uses underline the significant socio-cultural and economic importance of
241 vultures within these communities. With a total use value for vultures of 2.04, their intensive use,
242 combined with varying levels of species recognition across ethnic groups, highlights the crucial
243 role vultures play in the lives of local communities, while also highlighting potential challenges for
244 their conservation.

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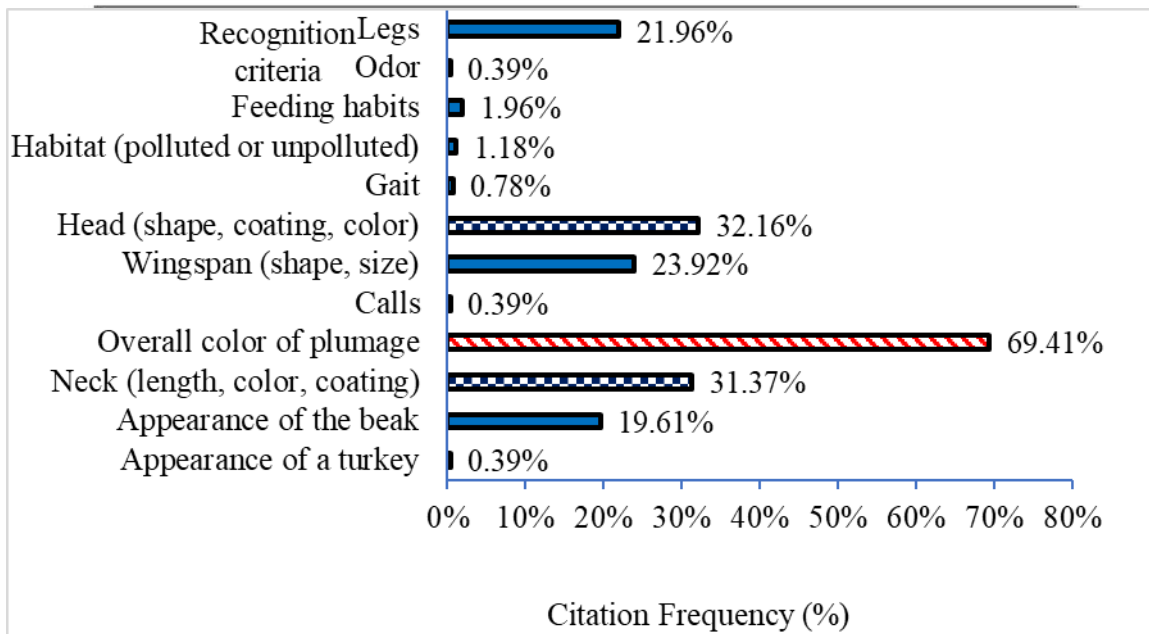


Figure 3: Vulture recognition criteria listed by people living around Comoé National Park in 2022

Figure 1: Location map of surveyed villages around Comoé National Park, Côte d'Ivoire

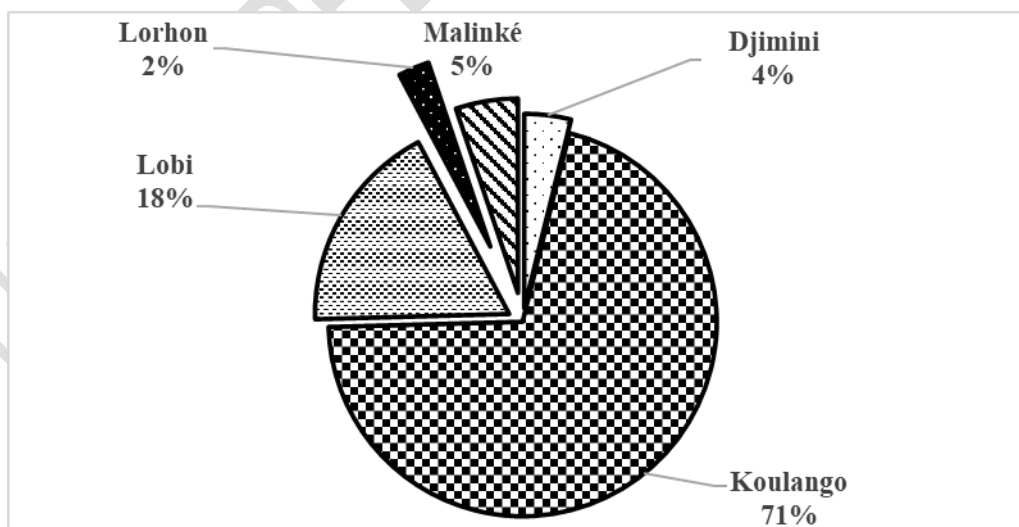


Figure 2: Population structure and participation rate in the ethnozoological survey around Comoé National Park in 2022

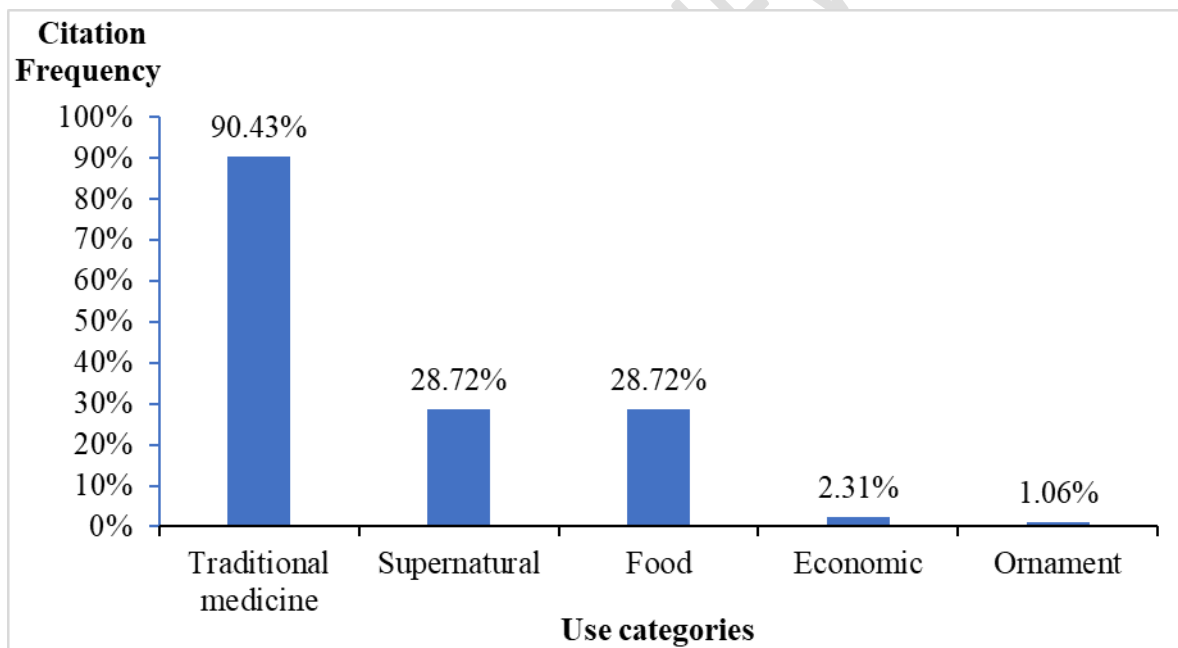


Figure 4: Categories of vulture use identified by people around Comoé National Park in 2022

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Tables

354 Table 1: Names of vulture species in local languages in the different sociolinguistic groups

Common names	Scientific names	Koulango	Lobi	Lorhon	Malinké	Djimini
Hooded vulture	<i>Necrosyrtes monachus</i>	Congodouga/ Côcôssaki/ Plôh	Wanwan	Kpilê	Douga	
White-backed vulture	<i>Gyps africanus</i>	Palahan/Plôh	Dougn/ Gouwôh/ Gbôlô	Kpilê	Douga	Douha Sama- djiguê
Palm-nut Vulture	<i>Gypohierax angolensis</i>	Tchêhô	Dougn gbôlô/ Kalanco/Brambe	Kinko	Bongue	
Lappet-faced vulture*	<i>Torgos tracheliotos</i>	Plôh	-	-	-	
White-headed vulture*	<i>Trionoceph occipitalis</i>	Plôh	Dougn	-	-	

355 * Species not universally known

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360 Table 2: Informant Consensus Factors (ICF) by categories of vulture use

Categories of use	Usage citations (Nur)	% of expressions of usage	Number of parties (Nt)	ICF
Traditional medicine	274	52.69%	10	0.97
Food	142	27.31%	6	0.96
Magic	98	18.85%	11	0.9
Economy	5	0.96%	4	0.25
Ornamentation	1	0.19%	1	-

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363 Table 3: Vulture organs and body parts used by local populations in different categories of use

Parts and organs	Categories of use	Number of citations	Usage Values (UV) by Categories	Number of citations (Nt)	UV
Claws	Traditional medicine	36	0.14	50	0.2
	Magic	14	0.05		
Feathers	Traditional medicine	26	0.1	43	0.17
	Ornament	1	0.003		
	Magic	15	0.06		
	Economy	1	0.003		
Heads	Traditional medicine	48	0.18	70	0.27
	Magic	14	0.05		
	Feeding	7	0.02		
	Economy	1	0.003		
Bones	Traditional medicine	34	0.13	38	0.15
	Magic	3	0.01		
	Economy	1	0.003		
Meat	Traditional medicine	18	0.07	45	0.18
	Feeding	27	0.11		
Beak	Traditional medicine	39	0.17	53	0.21
	Magic	14	0.05		
Skin	Traditional medicine	12	0.05	41	0.16
	Magic	2	0.007		
	Feeding	27	0.11		
Pattes	Traditional medicine	33	0.12	64	0.25
	Magic	3	0.01		
	Feeding	27	0.11		
	Economy	1	0.003		
Crottes	Traditional medicine	21	0.08	31	0.12
	Magic	10	0.04		
Eyes	Magic	12	0.05	39	0.15
	Feeding	27	0.11		
Neck	Feeding	27	0.11	28	0.11
	Economy	1	0.003		
Blood	Traditional medicine	7	0.03	9	0.04
	Magic	2	0.01		
Brain	Magic	9	0.04	9	0.04