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RESEARCH ARTICLE

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

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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.

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-Bi et al., 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-Bi et al., 2017). These practices reflect the

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

Material and Methods:-

Located in northeastern Côte d'Ivoire, the Comoé National Park (CNP) is both a World Heritage Site and a Biosphere Reserve. It covers an area of 1,148,756 hectares. It is bounded by latitudes 8°30' and 9°36' North and longitudes 3°60' and 4°25' West (OIPR, 2015). The CNP, is crossed from north to south by the Comoé River, it is part of the "Northern Plateaux" geophysical region. Its vegetation is diverse, comprising mainly savanna and forest formations (Poilecot, 1989; Konan et al., 2020). This environment is home to over 497 bird species (Poilecot,1989; Fisher et al.; 2002; Lauginie, 2007), 135 mammal species, 35 amphibian species, 71 reptile species and 60 fish species **(**OIPR, 2015**)**. The CNP covers five departments (Dabakala, Bouna, Nassian, Tehini and Kong) and more than twenty sub-prefectures (OIPR, 2015). These sub-prefectures are populated by several villages with a large and diverse population in terms of ethnic groups (RGPH, 2021). In addition, more than twenty of these villages are located on the periphery of the CNP (Figure 1). These various localities are subject to a transitional subhumid tropical climate, characterized by alternating rainy and dry seasons, with a unimodal rainfall pattern. Average annual rainfall ranges between 900 and 1.200 mm (OIPR, 2015).

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

Concerning the Data collection, it began with an exploratory phase from June 15 to 18, 2022 with 50 randomly selected people in villages bordering the CNP, in line with the work of Lougbegnon et al. (2015), Wédjangnon et al. (2016), Awo et al. (2020) and Yevide et al. (2022). This phase identified the proportion of people with knowledge of wildlife, in particular vultures and their various uses. The quantitative data obtained were used to determine the sample size (n) using Dagnelie's (1998) mathematical formula: $n = u^{(2)}(-\alpha/2)*p(1-p)/d^2$; n = sample size; $u1-\alpha/2$= value of the normal distribution at the probability value withα = 5% and u=1.96. p= proportion of people with knowledge of vulture use around the CNP (41 of the 50 people questioned have knowledge of vulture use, p=41x100/50= 82%); d: margin of error set at 5% (d= 0.05). Thus, the sample size for this study was initially estimated at 227 people. In the second phase, the questionnaire guide developed and implemented using Kobocollect v2022.1.2 software (KoBo Toolbox) was readjusted (Yaokokoré-Béibro et al., 2010; Koué-Bi et al., 2017; Awo et al., 2020). To ensure coverage of the theoretical sample size, the sample size was increased to 255 people. Thus, the actual collection was done through a semi-structured survey from June 25 to August 30, 2022, during individual face-to-face interviews (Koué-Bi et al., 2017; Houessou, 2018; Awo et al., 2020). A few focus groups were organized with a view to adjusting and consolidating divergent ideas (Yaokokoré-Béibro et al., 2010; Koué-Bi et al., 2017). Following the work of Salewski (2018, 2019, 2020), this survey took place in 23 villages located mainly in the northern, eastern and southern zones of the PNC periphery. The choice of villages was based on their accessibility, their proximity to the park, the safety of the area and the presence of vultures. Sampling was carried out using the "snowball" method (Awo et al., 2020), and only people with knowledge of avian fauna, especially vultures and their various uses, were interviewed. Thus, several social categories were targeted, including village chiefs, former poachers, farmers, traditional healers and young people

familiar with vultures (Yaokokoré-Béibro et al., 2010). Local translators facilitated communication during these interviews.

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

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

Results:-

Structure of the survey population:-

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

Local vulture nomenclature according to the different sociolinguistic groups surveyed:-

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

Criteria for identifying vultures:-

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

Categories of use and use of vultures by local populations:-

The vulture species identified in the study area are used in a variety of ways by local populations. Indeed, five main categories of use were distinguished by the respondents (Figure 4). The most widely used by the populations surveyed was traditional medicine, with a frequency of quotation (FC) of 90.43%. It is followed by magic and food, each with a frequency of use equivalent to 28.72%. With a CF=1.06%, ornament is the least cited category in the practices of the populations surveyed (Figure 4). The Kruskal-Wallis statistical test carried out showed no significant difference ($p > 0.05$) between the different areas or categories of use. In addition, the Informant Consensus Factors (ICFs) revealed a broad consensus on the use of vultures in traditional medicine, food and magic (ICF= 0.97 for each) by the populations living around Comoé National Park. Consensus on the economic use of vultures in the study area is low (CFI=0.25) (Table 2**).** As for the ornamental use of vultures, there was no consensus (FCI= 0).

Different parts and organs of vultures used by people around Comoé National Park:-

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

Figures and Images

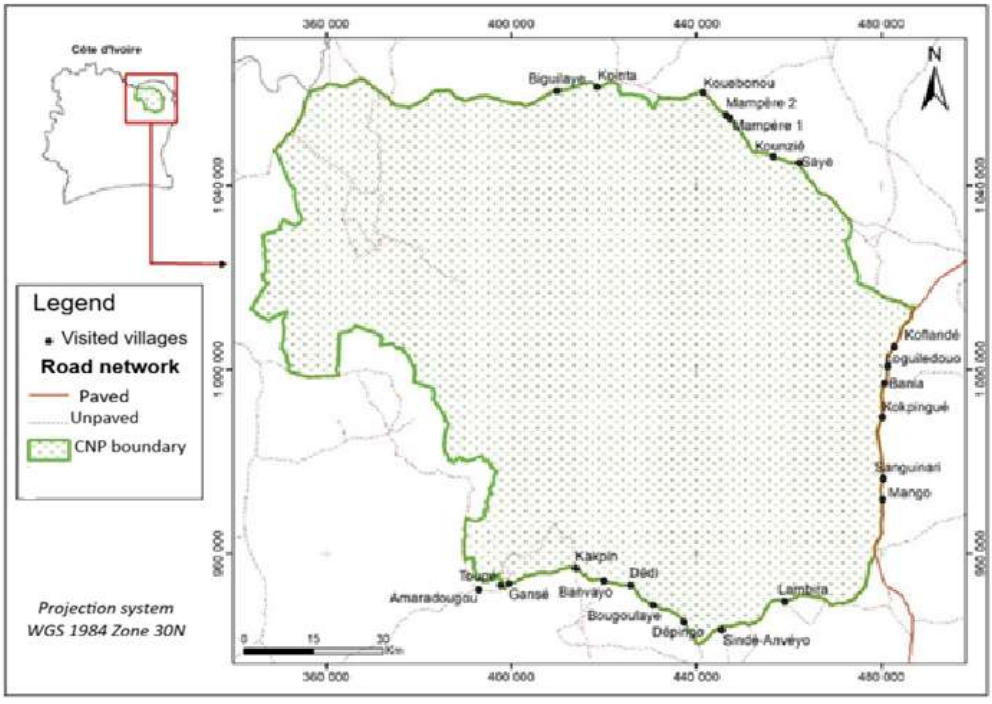

Figure 1: Location map of surveyed villages around Comoé National Park, Côte d'Ivoire

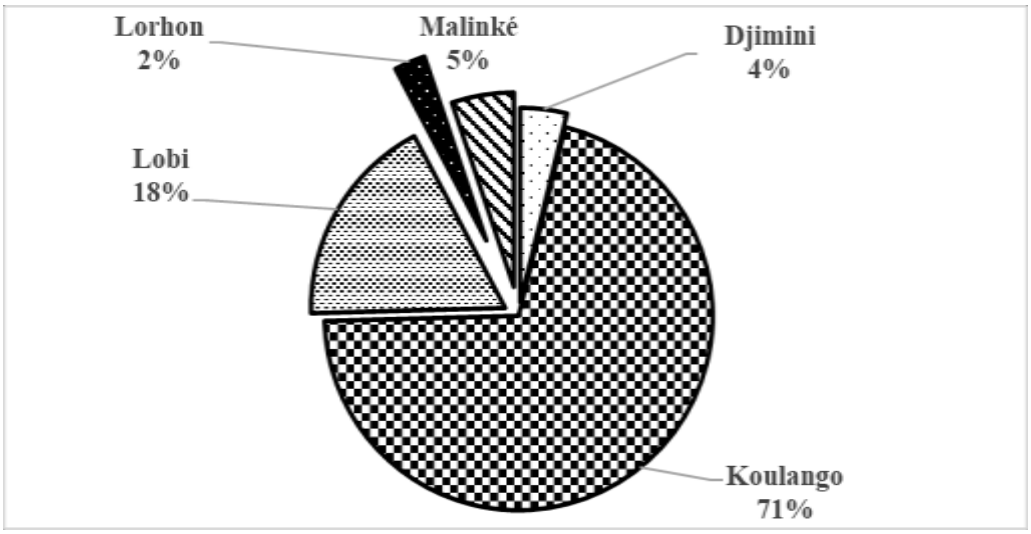

Figure 3: Population structure and participation rate in the ethnozoological survey around Comoé National Park in 2022

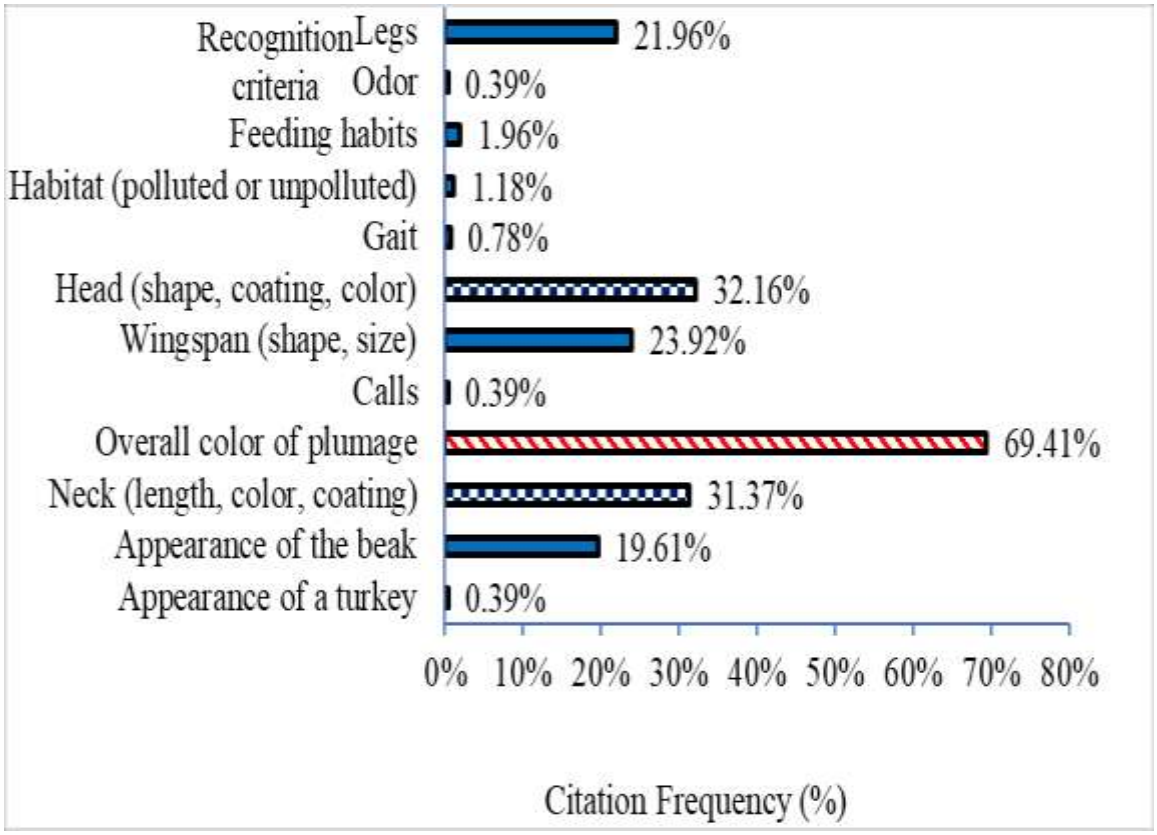

Figure 2: Vulture recognition criteria listed by people living around Comoé National Park in 2022

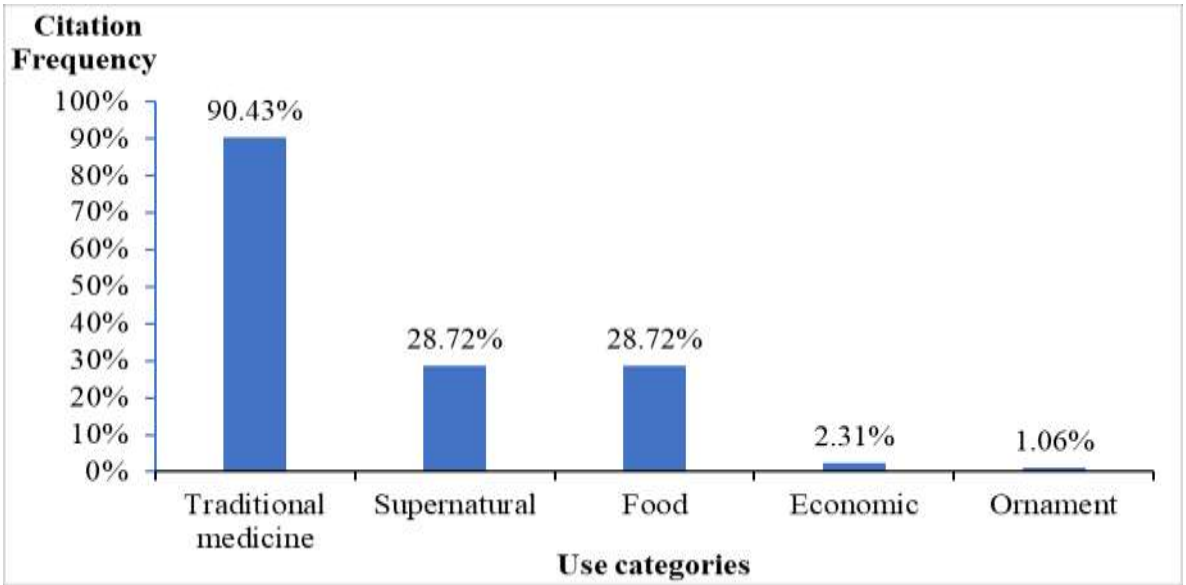

Figure 4: Categories of vulture use identified by people around Comoé National Park in 2022

Tables:-

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

Common names	Scientific names	Koulango	Lobi	Lorhon	Malinké	Djimini
1) Hooded vulture	Necrosyrtes monachus	Congodouga/ Côcôssaki/ Plôh	Wanwan	Kpilê	Douga	Douha Sama-djiguê
2) White-backed vulture	Gyps africanus	Palahan/Plôh	Dougn/ Gouwôh/ Gbôlô	Kpilê	Douga	
3) Palm-nut Vulture	*4)* Gypohierax angolensis	*5)* Tchêhô	*6)* Dougn gbôlô/ *7)* Kalanco/Brambe	*8)* Kinko	*9)* Bongue	
10) Lappet-faced vulture*	*11)* Torgos tracheliotos	*12)* Plôh	*13)* -	*14)* -	*15)* -	
16) White-headed vulture*	*17)* Trigonoceps occipitalis	*18)* Plôh	*19)* Dougn	*20)* -	*21)* -	

*** Species not universally known**

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	-

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

Discussion:-

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

As far as knowledge of vultures is concerned, it should be noted that the people surveyed have a good knowledge of the species. They were able to identify five species of vulture in the study area. Apart from the fact that vultures have their own names in local languages, the majority of these populations differentiate between species on the

basis of criteria. The most important of those criteria, in terms of frequency of citation are the general color of the plumage, the head, the neck, the wingspan, the legs and the appearance of the beak. These data show that local populations have their own criteria for characterizing an animal species (Alves and van Vliet, 2018). Moreover, most of these criteria are based on observation. This could mean that local populations are very observant of elements of nature (Pinton and Grenand, 2007; Koue-Bi et al., 2023). These distinctive criteria, with the exception of the neck and beak, have been recognized as recognition traits of the carrion vulture in Benin **(**Houessou, 2018**)**. These criteria help local populations to gain a better understanding of animal species. This knowledge of vulture species by the populations surveyed indicates a closely link between humans and these avian species. It is this knowledge that is reflected in the different uses to which the parts or organs of these animals are put. For example, the total use value of vultures is 2.04. This value reflects their intensive use by local populations. Indeed, five categories of use were identified in the course of this study, with a strong consensus on traditional medicine (90.43%). This consensus could therefore attest to the fact that vultures are frequently used as auxiliaries for the treatment of several ailments among the populations around this protected area (Manqele et al., 2023; Ouattara et al., 2025).

On the basis of these results, it is important to underline that traditional medicine, magic and food represent the three main uses identified during this study. In fact, thirteen vulture parts and organs are used in five categories: eleven for magic, ten for traditional medicine, six for food, four for economic purposes and one for ornamental purposes. Seven of these parts have also been found in the treatment of various diseases in Kwazulu-natal, South Africa (Manqele et al., 2023). In addition, the most commonly used parts are the head, legs and beak of vultures. These parts show high levels of consensus regarding their use in Traditional Medicine (0.96), food (0.96) and magic (0.90). Those results reflect and confirm 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 purposes (Daboné et al., 2019; Asso et al., 2024). These findings are in line with the work of Buij et al. (2016), who asserted that vulture body parts are valued in many African cultures (Daboné et al., 2023). Indeed, according to these authors, many African cultures consider that these vulture body parts have the ability to cure various physical and mental illnesses, improve chances or increase intelligence in children. In the same vein, Schlee (2010) added that palm vultures are often harvested for traditional medicine and fetishism. In line with these findings, Schlee (2010) also indicated that the legs, heads and brains of all vulture species are particularly prized by fetishists for their supposed mystical powers and clairvoyance. These various uses suggest that vulture species in the study area are coveted by local populations, as is the case in neighbouring Burkina Faso (Daboné et al., 2023).

Conclusion:-

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

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