

Awareness and Attitudes towards Vultures in Communities around Manyelanong and Tswapong Hills, Botswana

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Abstract

Several vulture species are classified as endangered due to their massive global decline in populations. Humans and other species in the ecosystem may suffer because of this decline. Identification of vulture conservation threats, and creation of sustainable wildlife conservation depends on understanding the attitudes and views of local communities. Research on threats, attitudes, and views of local communities towards vulture conservation in Botswana is limited. The current study yields key insights about the perceptions and knowledge of local communities towards vultures in the Manyelanong and Tswapong hills, Botswana which are crucial foraging and breeding habitats for cape vultures *Gyps coprotheres*. A questionnaire survey was employed, comprising both open-ended and closed-ended questions about respondents' perceptions of vultures, their knowledge of them, and how frequently they had seen them in their neighbourhoods. The questionnaire was implemented on 120 randomly selected households near the breeding grounds of vultures. Both qualitative and quantitative techniques were used to analyse the data. Some socioeconomic factors, including education level, age, occupation, residence, and favourable attitude towards vultures, showed a significant association. The physical and behavioural traits of the species had an impact on how the locals felt about vultures. Age, education, and participation level of respondents had an impact on their attitudes towards conservation. The ecological significance of vulture species is recognised by communities, who are concerned about their population declines. Therefore, comprehensive awareness-raising campaigns should be encouraged to protect vulture species.

Keywords: attitudes, awareness, endangered species, local knowledge, raptors, vulture conservation

1. Introduction

Vulture populations have been declining globally, resulting in most species being classified as endangered (Buechley & Şekercioğlu, 2016). In Africa, six of the nine vulture species found on the continent are currently classified as Endangered or Critically Endangered in the International Union for Conservation of Nature (IUCN) Red List (IUCN, 2018) (Table 1). In southern Asia, the use of veterinary drugs such as diclofenac in cattle carcasses threatened the existence of vulture populations in the late 1990s – early 2000 (Green et al., 2004; Oaks et al., 2004). Of recent, Botswana like other Southern African countries has seen a rise in vulture poisoning cases that have decimated their populations and other raptor species that scavenge on carcasses (Garbett, Herremans, Maude, Reading, & Amar, 2018). The majority of vulture poisoning in Southern Africa are driven by different motives which includes wildlife poaching and killing by traditional healers and users (Owolabi, Odewumi, & Agbelusi, 2021; Rondeau & Thiollay, 2004). The literature suggest that there are different causes of poisoning, such as inadvertent lead poisoning from used ammunition (Garbett et al., 2018; Naidoo, Wolter, Espie & Kotze, 2012), toxicity with a specific purpose for religious usage and unintentional poisoning when farmers hunt problem carnivores that prey on livestock (Herholdt & Anderson, 2006). According to Manqele, Selier, Taylor & Downs (2023), evidence connects the poisoning of vultures and the removal of body parts, particularly their heads and feet, in some parts of Africa to their usage in belief-related rituals.

Table 1. Vulture species found in Botswana, and their current worldwide population status as per the IUCN Red List classification (Adapted from Goikantswemang, 2019)

Species	IUCN Red List category	Population Status	Source
Hooded Vulture <i>Necrosyrtes monachus</i>	Critically Endangered	Rapid decline of 83% over three generations (53 years), estimate of 131 000 mature individuals.	(Ogada & Buij, 2011)
White-backed Vulture <i>Gyps africanus</i>	Critically Endangered	Median estimate of 90 % declines over three generations (56 years)	(El Khamlichi et al., 2022; Shiferaw et al., 2022b),
Lappet-faced Vulture/Nubian Vulture <i>Torgos tracheliotos</i>	Endangered	Population trend (Suspected decline of 20%) in Southern Africa and population Estimate (500 pairs or more) in Southern Africa	(Shobrak, 1996)
White-headed Vulture <i>Trigonoceps occipitalis</i>	Critically Endangered	Median estimate of 96% decline in West Africa (45 years).	(Ogada et al., 2016)
Cape Griffon <i>Gyps coprotheres</i>	Endangered	Declining at ~89% over three generations	(McClure et al., 2023)

About 39% of Botswana borders are gazetted as protected area (Tyler & Bishop, 1998). As such, Botswana is better positioned to play a significant role in efforts towards vulture conservation. However, the population trends of any vulture species in the nation, have never been scientifically documented. Additionally, literature does not demonstrate if the poisoning incidences of vultures have contributed to their localised population declines (Leepile et al., 2020). Research regarding human perceptions, attitudes, beliefs, and knowledge may reveal both current and potential risks to species as well as ways of strengthening the conservation of the threatened species (Manqele et al., 2023; Thondhlana & Cundill, 2017). Inadequate empirical research has been done to determine how people view vultures and how their views are affected by their understanding about vultures. There is limited empirical data examining how people in Botswana perceive vultures. Given that it is widely acknowledged that vulture survival is critical and beneficial to both communities and the environment (Ogada, Botha & Shaw, 2016), there is need to examine people's awareness and attitudes towards vultures and their management. To address these issues, this study seeks to assess awareness and attitudes towards vultures and their conservation in people living adjacent to Tswapong and Manyelanong hills, where we find breeding colonies of cape vultures in Botswana. Therefore, by evaluating people's awareness and attitudes towards vultures in these areas, this study will contribute to the formulation and implementation of policies relating to vulture conservation in Botswana.

2. Materials and Methods

2.1 Study Area

The study was conducted in communities bordering Manyelanong hill (Otse) and Tswapong hills (Goo – tau and Moremi) Botswana (Fig. 1). These hills are key breeding sites for cape vultures in Botswana. Tswapong communities are found in the Goo-tau and Moremi villages, whereas Balete community are found in Otse village. These communities solemnly depend on ecotourism, agropastoralism and conservation for their livelihoods. The Tswapong hills are in eastern Central District, about 40km south-east of Palapye, Botswana. The hills complex, which are between 850 – 1000metres high, span about 70km from east to west and roughly 15km from north to south. The Manyelanong hill is situated north of Otse village and is estimated to have a terrain elevation of 1490m above sea level. The average annual rainfall in Tswapong region is 440mm, and the average minimum temperature ranges from 12.5 °C in the summer to 6 °C in the winter, while the highest temperature ranges from 21.5 °C in the winter to 40.5 °C in the summer. Otse has annual high temperature of about 30 °C, annual low temperature of about 16.8 °C, with annual rainfall estimated about 400mm (Botswana Meteorological Services, 2023). The hills are made primarily of sandstone and quartzites, frequently with sheer sides and vertical cliffs.

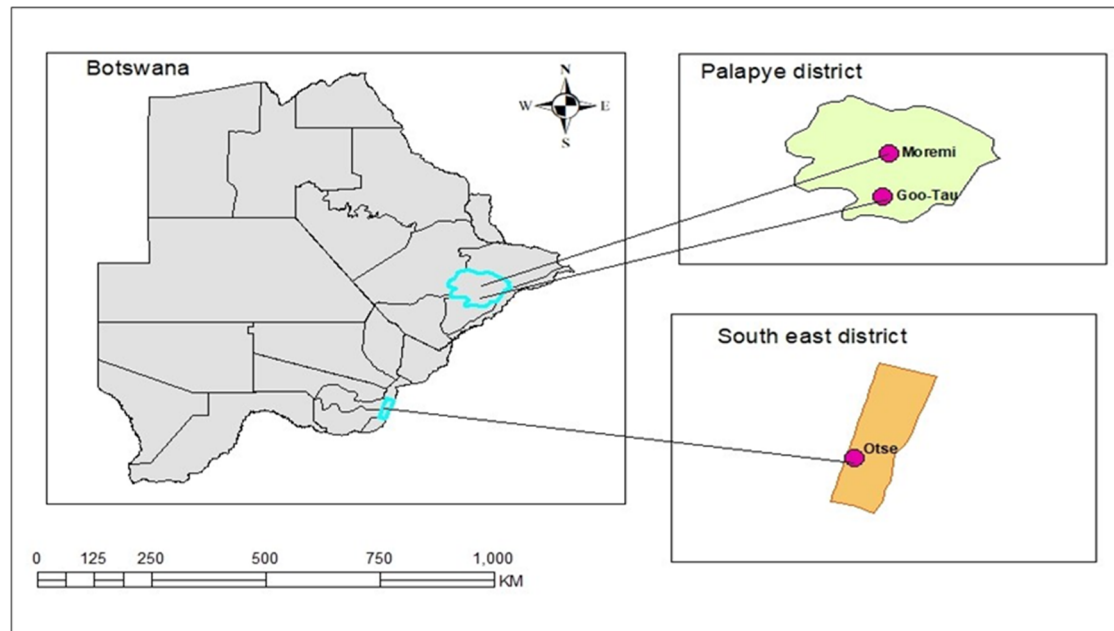


Figure 1. Study sites in Otse (Manyelanong) and Tswapong (Goo-tau and Moremi) Botswana

The Tswapong hills have deep pools that are created by the streams fed by natural springs. Goo-Moremi Gorge in the Tswapong hills contains some of the easily accessible waterfalls. Good water supplies and soils enable the region's diversified flora and fauna to exist (Borello & Borello, 2002). According to Goikantsemang (2019), the study area is made up of savannah hill woodland, which is dominated by lavender croton *Croton gratusissimus* and camelthorn *Acacia nigrescens*, with mopane *Colophospermum mopane* forest on the silt floodplains. Aerial surveys conducted by the Department of Wildlife and National Parks (2022), Botswana over the project area and Goikantsemang (2019) revealed the presence of wild populations of the ungulates such as kudu *Tragelaphus strepsiceros*, impala *Aepyceros melampus*, duiker *Sylvicapra gramma*, and steenbok *Raphicerus campestris*. In this area, klipspringers *Oreotragus oreotragus*, warthogs *Phacochoerus africanus*, leopards *Panthera pardus*, hyenas *Hyaena brunnea*, baboons *Papio ursinus*, and rock dasies *Procavia capensis* are also sighted.

2.2 Methods

Stratified random and purposeful sampling were used in this study. A mixed approach (research strategy that incorporates qualitative and quantitative research techniques into a single study) was used to better understand how individuals felt about vultures. This study followed a nested approach where data was gathered concurrently. This was done to generate data that could be used to make generalisations about attitudes and local knowledge of vultures. The survey data was supplemented by qualitative data in the form of narratives and perceptions, which provided the data a new depth. A more comprehensive method to research, suitable for comprehending cultural ties to wildlife at various scales, resulted from collecting both at the same time. There was a total of 40 responders drawn from each of the three study sites that are home to larger breeding colonies of cape vultures. Resource limitation resulted in a limited sample size. The respondents were randomly chosen from various households. A home was deemed to consist of one or more people who shared a roof for the purposes of this study. Some interviews were left out of the analyses, and they mostly consisted of interviews where the respondents withdrew before the interview was done, usually due to other obligations. To replace the discarded questionnaires, a similar number to the ones ruled out were replaced by increasing the number of participants. For example, in Goo-tau a total of eight questionnaires were not completed, and then eight extra respondents were consulted to cover up for that limitation.

3. Data Analysis

Both qualitative and quantitative analyses were used for data analysis. Review of the literature revealed this analytic approach is appropriate in identify connections between human actions and their physical environments (Mackay & Campbell, 2004). Additionally, Tashakkori & Teddlie (1998) contend that this mixed approach is a useful validation tool, as it supplements the data from one method with data from another. Descriptive statistics

were used to summarise the data. The closed-ended statements from each of the four sections were individually coded, with one, two, and three denoting agree, neutrality, and disagreement, respectively. Using a technique known as open coding, which involves reviewing the data repeatedly for important words, phrases, similarities, and differences (Reson, 2012), interview statements were read and categorised based on their similarities as perceived by the researcher. Themes or categories were created from the qualitative text using this inductive Qualitative Data Analysis (QDA) approach for interpretation (Strauss & Corbin, 1997). Contingency analysis and One-Way Analysis of Variance (ANOVA) were used to establish relationships between study variables of interest, such as correlations between attitude scores and respondent demographic data including age, gender, and educational attainment. Depending on whatever statistical technique yielded correct results, additional techniques like the chi-square and multiple comparison test were also employed. The Statistical Package for the Social Sciences (IBM SPSS, 2022) was used for all calculations.

4. Results

4.1 Demographic Characteristics of the Respondents and the Study Sample

Descriptive statistics suggested that the majority (25.8%, $n = 31$) of respondents were between the ages of 18 and 32 years, whilst those above the age of 70 constituted the smallest proportion of the study sample (12.5%, $n = 15$, Table 2). Of the respondents, 58.8% ($n = 67$) were females, whilst 44.2% ($n = 53$) were males. Respondents who attended secondary education were higher (38.3%, $n = 46$) compared to all other levels of education. Most respondents (59.2%, $n = 71$) indicated that they were heads of households. About half of interviewed people (50%, $n = 60$) were religious, with those that were non-religious making the least count (5%, $n = 6$). Most of households (40%, $n = 48$) were involved in agriculture activities such as keeping livestock and growing crops (Table 2).

Table 2. Socio-economic and demographic characteristics of respondents in the study sites

Social demographic characteristics	Study sites			Total
	Goo-tau	Moremi	Otse	
	# (%)	# (%)	# (%)	# (%)
Age				
18-32	13(32.5)	9(22.5)	9(22.5)	31(25.8)
33-45	8(20.0)	9(22.5)	10(25.0)	27(22.5)
46-55	10(25.0)	12(30.0)	5(12.5)	27(22.5)
56-70	5(12.5)	5(12.5)	10(25.0)	20(16.7)
Above 70	4(10.0)	5(12.5)	6(15.0)	15(12.5)
Gender				
Male	18(45.0)	17(42.5)	18(45.0)	53(44.2)
Female	22(55.0)	23(57.5)	22(55.0)	67(55.8)
Level of education				
None	8(20.0)	8(20.0)	9(22.5)	25(20.8)
Primary	6(15.0)	5(12.5)	8(20.0)	19(15.8)
Secondary	18(45.0)	18(45.0)	10(25.0)	46(38.3)
College/University	8(20.0)	9(22.5)	13(32.5)	30(25.0)
Head of Family				
Yes	24(60.0)	22(55.0)	25(62.5)	71(59.2)
No	16(40.0)	18(45.0)	15(37.5)	49(40.8)
Religiosity				
Very religious	11(27.5)	25(62.5)	24(60.0)	60(50.0)
Moderately religious	11(27.5)	5(12.5)	10(25.0)	26(21.7)
Somewhat religious	8(20.0)	3(7.5)	3(7.5)	14(11.7)
Slightly religious	4(10.0)	2(5.0)	0(0)	6(5.0)
Not at all religious	6(15.0)	5(12.5)	3(7.5)	14(11.7)
Source of livelihood				
Agriculture	20(50.0)	13(32.5)	15(37.5)	48(40.0)
Business	4(10.0)	1(2.5)	2(5.0)	7(5.8)
Employed	9(22.5)	8(20.0)	9(22.5)	26(21.7)
Unemployed	7(17.5)	10(25.0)	4(10.0)	21(17.5)
Tourism	0(0)	8(20.0)	10(25.0)	18(15.0)
Period of residence				
Since birth	33(82.5)	26(65)	33(82.5)	92(76.7)
0-10 years	1(2.5)	9(22.5)	5(12.5)	15(12.5)
10-20 years	2(5.0)	2(5.0)	1(2.5)	5(4.2)
20-30 years	1(2.5)	1(2.5)	0(0)	2(1.7)
30-40 years	2(5.0)	0(0)	0(0)	2(1.7)
Visitor	1(2.5)	2(5.0)	1(2.5)	4(3.3)

4.2 Socio-Economic Importance of Vultures

Respondents from Otse and Goo-tau reported that vultures contribute mostly to tourism attraction and cleaning the environment relative to indication of carcass presence (Fig. 2), whereas respondents in Moremi indicated that

vultures contributed mostly to the notification of the presence of carcass relative to tourism attraction and cleaning the environment (Fig. 2).

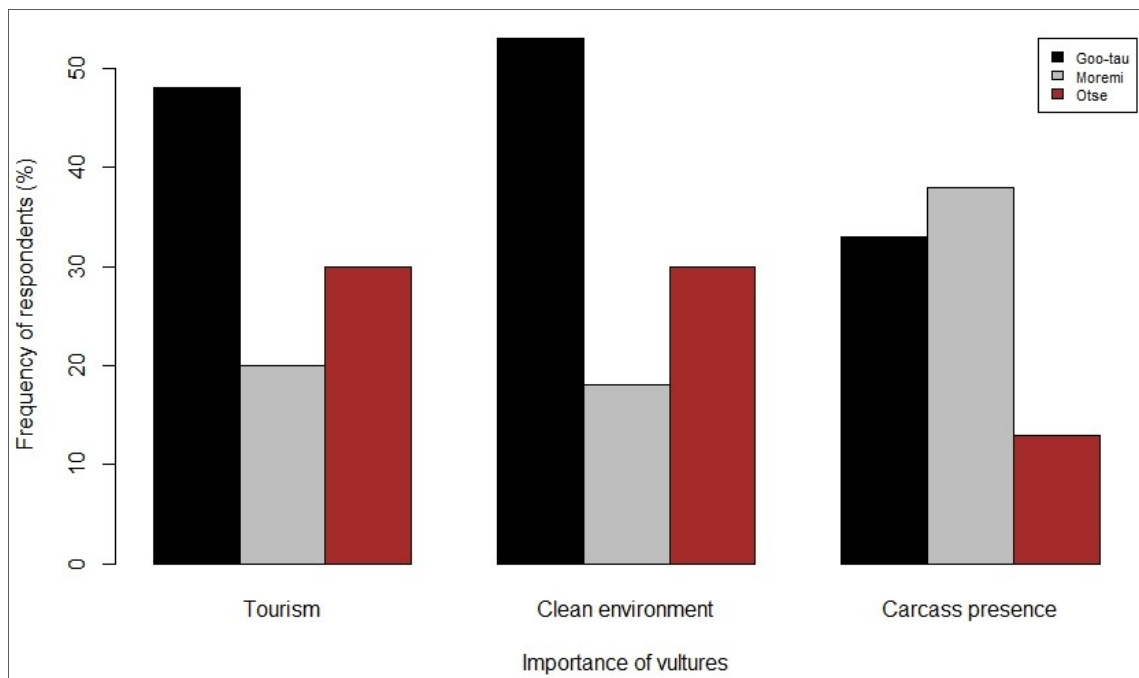


Figure 2. Socio-economic importance of vultures in the study sites (Moremi, Goo-tau and Otse villages, Botswana)

4.3 Knowledge and Opinions about Vultures and Their Importance

Of the respondents, 98.3% (n = 118) reported that vultures are birds of prey which feed on carcasses, whereas about 8% (n = 9) reported that some vulture species kill livestock. Less than 50% of the respondents indicated that, they have seen dead vultures in their surroundings (34.2%, n = 41), and have participated in previous vulture awareness day campaigns (40%, n = 48). About 98% (n = 117) of the respondents believe that vultures should be conserved for future generations, and it is important to educate people about their significance in the ecosystems (Table 3).

Table 3. Knowledge and opinions about vultures and their importance in the study sites

knowledge and opinion about vultures	Extent of agreement by respondents			Total #(%)
	Goo-tau #(%)	Moremi #(%)	Otse #(%)	
Vultures are birds of prey that feed on carcasses	40(100)	39(97)	39(97)	118(98)
Vultures combat spread of diseases across other carnivorous animals	32(80)	40(100)	35(87)	107(89)
Sometimes vulture species kill livestock	3(7)	2(5)	4(10)	9(7)
Vultures sometimes compete with scavengers for carcasses and eventually get killed	31(77)	38(95)	27(67)	96(80)
I have seen dead vultures in this area	7(17)	21(52)	13(32)	41(34)
Vegetation cover around this area has decreased in recent years	36(90)	33(82)	27(67)	96(80)
We should conserve vultures for our future generations	37(92)	40(100)	40(100)	117(97)
I participated in previous vulture awareness day	16(40)	17(42)	15(37)	48(40)
I would like to participate in any other event of vulture awareness in future	38(95)	34(85)	32(80)	104(86)
It is important to protect breeding habitats for vultures	38(95)	38(95)	37(92)	113(94)
It is important to educate people about vultures in this area	39(97)	40(100)	38(95)	117(97)
Vultures are generally declining in this area	33(82)	28(70)	29(72)	90(75)

4.4 Perceived Stories about Vultures

The results demonstrated that respondents from Otse and Moremi reported that vultures can be used for ceremonial, direction, medicinal and spiritual purposes (Fig. 3). Respondents in Goo-tau believed that vultures are important for spiritual, superstition, killing of warriors during wars and medicinal purposes, but did not believe that vultures could be important for ceremonial purposes and indication of direction (Fig. 3).

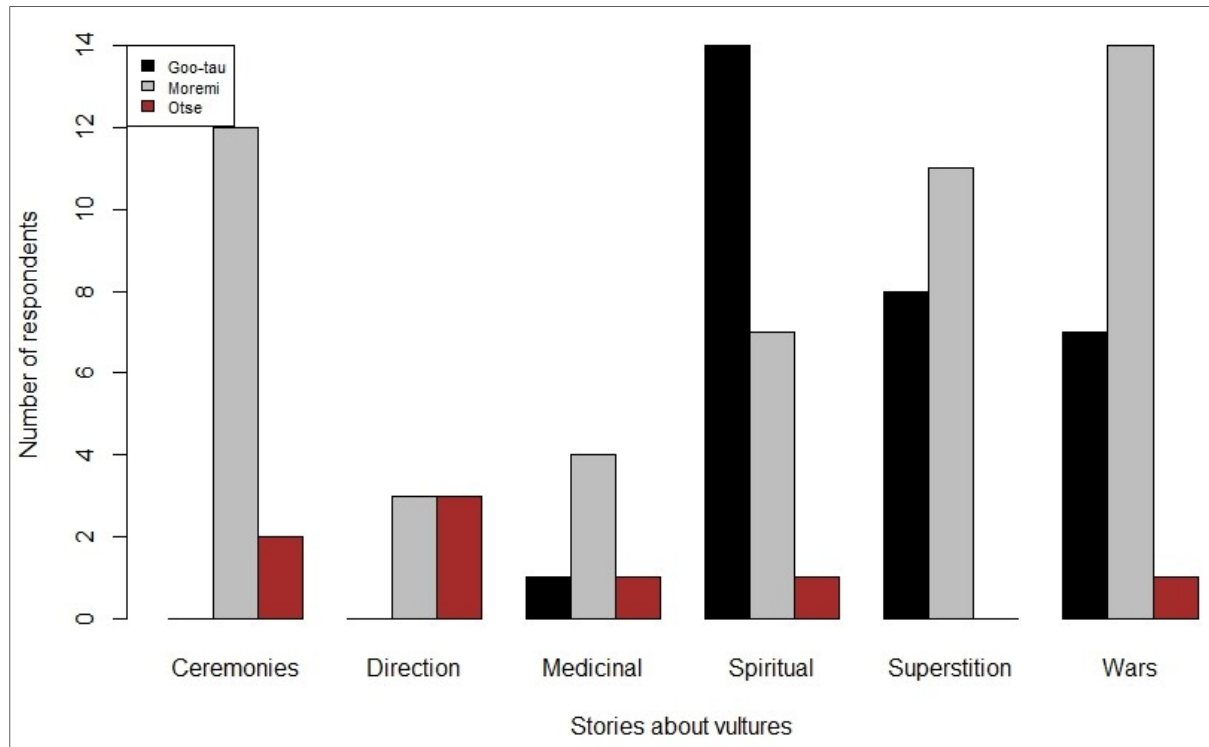


Figure 3. Perceived stories about vultures in the study sites

4.5 Socio-Cultural Uses of Vulture Body Parts

Respondents across the three sites demonstrated that vulture body parts are important and used for various purposes. For instance, their feathers are used as a healing tool in some diseases of infants. Respondents in Otse revealed that eggs from vultures are used for magic purposes, whereas respondents from Moremi and Goo-tau also suggested that eggs are mostly used for healing activities. Similarly, Goo-tau respondents suggested that the heart of a vulture is used to enhance dreaming. Respondents in Moremi and Otse indicated that bones from vultures are used for treating certain diseases (Fig. 4).

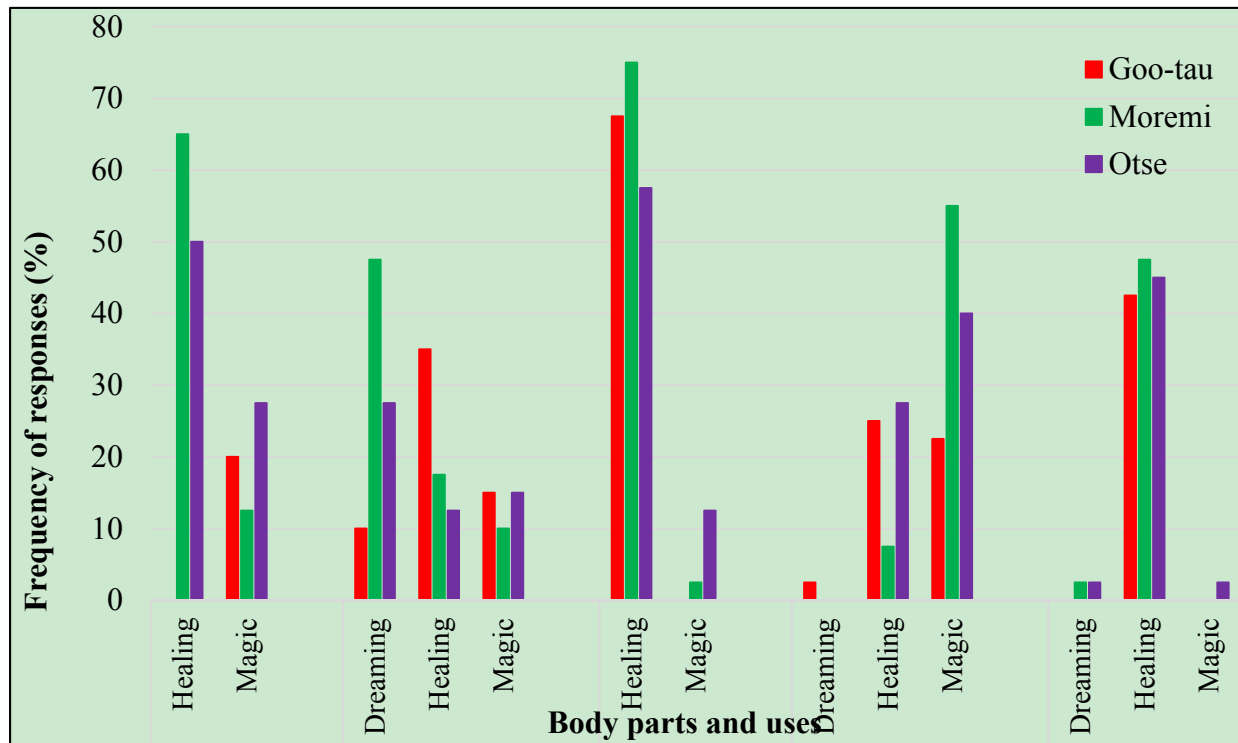


Figure 4. Socio-cultural uses of vulture body parts across Moremi, Goo-tau and Otse villages

4.6 Awareness on Vulture Poisoning

The majority of the respondents (60%, n = 72) in the three sites suggested that vultures are sometimes poisoned by the consumption of poisoned carcasses (Table 4). In addition, 56% (n = 68) believed that people in the study sites poison carcasses to target vultures (Table 4).

Table 4. Awareness on vulture poisoning in the three study sites

Awareness on vulture poisoning	Study sites			Total
	Goo-tau	Moremi	Otse	
	# (%)	# (%)	# (%)	
Vulture in this area sometimes feed on poisoned carcasses				
Agree	17(42.5)	24(60.0)	31(77.5)	72(60.0)
Neutral	12(30.0)	11(27.5)	4(10.0)	27(22.5)
Disagree	11(27.5)	5(12.5)	5(12.5)	21(17.5)
Sometimes people in this area poison carcasses to target vultures				
Agree	12(30.0)	27(67.5)	29(72.5)	68(56.7)
Neutral	5(12.5)	5(12.5)	3(7.5)	13(10.8)
Disagree	23(57.5)	8(20.0)	8(20.0)	39(32.5)
Poisoning is causing vulture decline in our area				
Agree	27(67.5)	35(87.5)	31(77.5)	93(77.5)
Neutral	8(20.0)	2(5.0)	3(7.5)	13(10.8)
Disagree	5(12.5)	3(7.5)	6(15.0)	9(11.7)

Chi-square test suggested significant association between age and that sometimes people in selected study sites poison carcasses to target vultures ($X^2 = 15.68, P = 0.047$), agreement by respondents that have seen dead vultures

in their local areas ($X^2 = 17.68$, $P = 0.024$) and perceived importance of vultures in ecosystems ($X^2 = 15.95$, $P = 0.043$), respectively. Multiple comparison test suggested significant relationship between poisoning of carcasses to target vultures and age class 18-32 and above 70 ($P = 0.016$), this suggested that age class 18-32 do not see poisoning of carcasses to kill vultures being a problem relative to age class above 70. The test indicated a significant relationship between association by respondents who have seen dead vultures in their local areas and age classes 18 – 32 and above 70 ($P = 0.003$), 33-45 years and 46-55 years ($P = 0.024$), 33-45 years and 56-70 years ($P = 0.034$), 33-45 years and above 70 years ($P = 0.000$), respectively. The results indicated that age class 33-45 disagreed mostly that they have seen dead vultures in their areas as compared to other age classes. The multiple comparison test also suggested a significant association ($P = 0.028$) between perceived vultures' importance in ecosystems and age class 18-32 and 46-55 respectively, with all respondents from age class 46-55 indicating that vultures play a significant role in the ecosystem as compared to age class 18-32 where two respondents did not state any vulture importance in the environment.

The Chi-square test showed that level of education was significantly associated with usage of feathers ($X^2 = 8.68$, $P = 0.018$), agreement of seeing dead vultures ($X^2 = 17.98$, $P = 0.006$), and that vultures are generally declining ($X^2 = 13.88$, $P = 0.031$) respectively. There was also a significant relationship between primary and college/university levels of education and between secondary and college/university educational levels, in relation to using vulture feathers. This suggested that majority of respondents within the secondary educational level did not see vulture feathers being useful for healing, magic and dreaming. There was no significant relationship regarding all other variables of interest to the study was found for gender.

5. Discussion

The current study builds up on the evaluations of the public's perceptions of vultures that were done in southern Africa (Craig, Thomson, & Santangeli, 2018; Manqele et al., 2023; Mdhano, Gandiwa, Muboko & Mashapa, 2019). This study is the first of its kind to be conducted in the communities of Otse, Goo-tau, and Moremi, which are significant ecological hotspots for the breeding colonies of cape vultures. Our results suggest that most respondents demonstrated that it is important for people in the local communities to be taught about vultures and the need to conserve them to enhance the ecological stability of our ecosystems. These findings is supported by Deikumah (2020) who indicated that the declining trends of vulture populations can be slowed and reversed, only once the communities starts to appreciate and understand the importance of vultures in the ecosystems. For the species to be preserved for future generations, the comprehensive conservation approach should be maintained and improved by all stakeholders, including government and non-government organisations. In fact, if a stronger conservation effort is not made in the very near future, it is likely that a number of species will go extinct (Harris, 2013) and hence destabilizing several ecosystems.

In general, birds offer a wealth of economic, cultural, and ecological benefits that largely promote human well-being and livelihoods upliftment (Clamsen & Røskaft, 2013; García-Jiménez, Morales-Reyes, Pérez-García & Margalida, 2021). This results also showed that most respondents perceived vultures as an important source of tourism in local communities, thus playing an important role in ecotourism, and hence possibilities of enhancing their livelihoods. This outcome concurs with (Markandya et al., 2008) who reported that vulture sightings are a possibility for some ecotourism businesses such as bird watching. Visitors that come to see vultures bring in more business for industries that support the tourism sector. However, vultures' existence in natural ecosystems is under threat, despite their economic contribution to ecotourism services. Anthropogenic activities, whether deliberate or accidental, have threatened several vulture species dangerously and thus pushing them towards extinction. Activities such as the consumption of poisoned carcasses, which ultimately contribute to massive die offs of vultures has been a massive challenge to their existence and conservation (Mdhano et al., 2019).

As supported by literature (Craig et al., 2018; Mdhano et al., 2019), this study noted that the communities in the study sites believed that vultures were useful in helping them find lost cattle. By paying attention to vulture signs, herders frequently discover the whereabouts of their lost and frequently dead cattle. Due to the traditional reliance on cattle keeping by many rural communities in southern Africa, carcass identification is a crucial process for economic and cultural reasons (Manqele et al., 2023). Vultures serve as markers for cattle owners to find their animals in the event of death because they are inherently drawn to carcasses. Vulture presence therefore assists farmers to accurately estimate costs and implement better management and monitoring techniques which could be used to lower the mortality rate of their cattle.

In this study, it was apparent that vulture body parts were significant and used for various purposes. For example, communities in the study sites indicated a massive usage of vulture feathers, bones and eggs for medicinal purposes (healing). These findings are in consistent with Ogada et al. (2016) who demonstrated that 29% of cases

investigated suggested that the mortality rate of African vultures is attributed to traditional medicine. The literature also suggests that there is a projected growth in the usage of vulture parts in traditional medicine (Manqele et al., 2023). Some African traditional systems believe that certain vulture body parts have magical, therapeutic, and prognosticative or fortune-telling abilities (Reson, 2012). Traditional healers highlighted that vulture body parts were used alone or in combination with plants or minerals for a variety of purposes, principally to confer clairvoyant skills, but also to encourage good dreams or improved intelligence and to alleviate ailments (Mashele, Thompson & Downs, 2021).

Despite the fact that vultures are rarely killed as payback for wildlife attacks, they might be poisoned accidentally (Ogada, 2014). In order to lessen the effects on ecosystem non-target species, campaigns to decrease the use of poisons in illegal wildlife hunting need to be enhanced (Mdhlano et al., 2019). From our results more than half of the study respondents had high awareness levels when it comes to vulture poisoning and agreed that it also led to declining vulture populations through consumption of poisoned carcasses. To minimise the effects on non-target species in the ecosystem, campaigns to prevent the use of poisons in illegal wildlife hunting need to be strengthened. These findings are supported by Safford et al. (2019) who stated that in the majority of other places, poisoning is the biggest hazard to vultures. More lately, ivory poachers have begun employing poisons to kill elephants or contaminate their bodies in order to get rid of vultures, whose overhead hovering may otherwise disclose the poachers locations (Ogada et al., 2016; Ogada et al., 2016). Poisoning is the most effective weapon because it is silent, affordable, simple to administer, and effective. However, most occurrences involving poisoning are never discovered or recorded because it is an illicit substance, making it difficult to estimate the true effects on vulture and other wildlife populations (Ogada et al., 2016; Ogada et al., 2016; Ogada, 2014; Vyas, 1999).

6. Conclusions

Little was known, prior to this study, concerning local perceptions and awareness of vultures and vulture conservation. This study demonstrated public perceptions of vultures, their knowledge levels in the study sites, how people perceive poisoning as a threat to vultures, and their attitudes towards wildlife conservation societies. Many respondents demonstrated that they understood that vultures are raptors that eat on carcasses, and most people expressed the need to protect the species of vultures that are now in existence for future generations. Efforts should be directed towards the promotion of vulture awareness campaigns to enhance their conservation. This will enable authorities to move swiftly to lessen the negative effects that vultures are already experiencing. Breeding colonies of vultures in the study sites should be protected and integrated into ecotourism activities to boost already existing tourism in nearby wildlife conservation societies.

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Authors contributions

Mr O. Mokgethi and Dr. K. Sianga were responsible for study design, data collection and drafting of the manuscript. Prof. V. Muposhi and Ms E. Kgosiesele revised the manuscript. All authors read and approved the final manuscript. All authors contributed equally to the study.

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