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# Local perceptions and sociocultural value of Hooded Vultures *Necrosyrtes monachus* in Burkina Faso, West Africa

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Hooded Vultures have suffered from dramatic population declines in recent decades owing to anthropogenic pressures. To properly address this threat, the sociocultural perspectives towards this species should be considered. We examined peoples' perceptions, knowledge and beliefs on Hooded Vulture's sociocultural values in Burkina Faso through face-to-face surveys at 20 sites spread across the country. A total of 900 interviews (with 600 householders and 300 butchers) revealed valuable knowledge and an overall positive perception of Hooded Vultures. More than 72% ( $n = 653$ ) of interviewees (mostly Mossi, Bissa and Gourmatché ethnic groups) regarded Hooded Vultures as important, venerated and sacred birds, and we received no reports of Hooded Vultures attacking livestock—which is all beneficial to their conservation. Conversely, a minority of interviewees (12%,  $n = 108$ ) believed that Hooded Vultures are harmful, but the reasons provided for this view were insubstantial. Nevertheless, the negative views towards Hooded Vultures should be urgently examined. Furthermore, the vast majority of respondents (84%,  $n = 753$ ) viewed Hooded Vulture populations as having decreased and the main reasons provided were decreasing food availability, intentional killing using poisoned baits for belief-based use, habitat loss or degradation, and unintentional poisoning. Interestingly, most respondents (84%,  $n = 760$ ) were acutely aware of the imminence of the Hooded Vulture's possible extinction and are willing to take conservation measures, suggesting both support and eventual success for conservation actions in this area. The key actions suggested by local communities are valuable for vulture conservation and include severely punishing poachers, supplying safe food for Hooded Vultures, preserving and restoring habitat, and raising awareness of Hooded Vulture conservation.

## Perceptions locales et valeur socioculturelle des Vautours Charognards au Burkina Faso

Au cours des dernières décennies, les populations de Vautour Charognard ont connu un déclin spectaculaire en raison des pressions anthropiques. Pour mieux faire face à cette menace, les aspects socioculturels de cette espèce doivent être pris en considération. Pour ce faire, nous avons examiné les perceptions, les connaissances et les croyances des populations sur les valeurs socioculturelles du Vautour Charognard au Burkina Faso à travers des enquêtes sous forme d'interview dans 20 sites répartis sur l'ensemble du pays. Un total de 900 entretiens auprès de 600 chefs de famille et 300 bouchers ont révélé des connaissances intéressantes et une perception globalement positive des Vautours Charognards. Plus de 72% ( $n = 653$ ) des personnes interrogées (principalement des groupes ethniques Mossi, Bissa et Gourmatché) considèrent les Vautours Charognards comme des oiseaux importants, vénérés et sacrés, et nous n'avons reçu aucune mention faisant part d'attaques de Vautours Charognards sur le bétail, ce qui est un avantage pour leur sauvegarde. À l'inverse, une minorité de personnes interrogées (12%,  $n = 108$ ) estiment que les Vautours Charognards sont nuisibles, mais les raisons invoquées pour justifier ces propos ne sont pas substantielles. Néanmoins, ces opinions négatives à l'égard des Vautours Charognards doivent faire l'objet d'une attention, de toute urgence. Par ailleurs, la grande majorité des répondants (84%,  $n = 753$ ) perçoivent une diminution des populations de Vautours Charognards et les principales raisons invoquées sont la réduction de la disponibilité de la nourriture, les tueries intentionnelles à l'aide d'appâts empoisonnés pour une utilisation dans des pratiques basées sur des croyances, la perte et la dégradation de l'habitat et les empoisonnements non intentionnels. Il est important de noter que la grande majorité des répondants (84%,  $n = 760$ ) sont particulièrement conscients de l'imminence de l'extinction du Vautour Charognard et sont prêts à entreprendre des mesures de conservation, ce qui présage à la fois un soutien des communautés locales et un succès éventuel des actions de conservation dans cette région. Les actions prioritaires suggérées par les communautés locales sont intéressantes pour la conservation des Vautours Charognards et comprennent la répression sévère des braconniers, l'approvisionnement en nourriture saine pour les Vautours Charognards, la préservation et la restauration de l'habitat, et la sensibilisation à la conservation des Vautours Charognards.

**Keywords:** anthropogenic threats, conflict and management, cultural use, cultural ecosystem services, local knowledge and perceptions, poisoning, vulture conservation

## Introduction

Eleven species of vulture occur in Africa (Ogada and Buij 2011), six of which are found in West Africa (Borrow and Demey 2014). These are the Hooded Vulture *Necrosyrtes monachus*, White-backed Vulture *Gyps africanus*, White-headed Vulture *Trigonoceps occipitalis*, Rüppell's Vulture *Gyps rueppelli*, Lappet-faced Vulture *Torgos tracheliotos* and Egyptian Vulture *Neophron percnopterus*. Of these, the Hooded Vulture is the most closely associated with human habitations (Mundy et al. 1992; Thiollay 2006b, 2007b; Henriques et al. 2017), while the local ranges of the other vulture species are confined to protected areas (Mundy et al. 1992; Thiollay 2007a; Ogada and Buij 2011).

For centuries, Hooded Vultures in West Africa were common and strongly commensal with humans (Mundy et al. 1992; Thiollay 2006b, 2007b); they interacted with humans and had a place in the local culture (Mundy et al. 1992). Hooded Vultures were once frequently observed in public places, at landfill sites and open dumpsters, and around slaughterhouses and meat markets, often just a few meters away from people (Weesie and Belemsobgo 1997; Ogada and Buij 2011). Despite this close relationship with humans in West Africa, the regional Hooded Vulture population has declined by 45% from the 1970s to 2004 (Thiollay 2006a, 2006b; Mullié et al. 2017).

Various anthropogenic threats, such as unintentional and intentional poisoning, and harvesting for belief-based use (also called traditional medicine), are considered responsible for the decline of Hooded Vultures in their West African range (Ogada and Buij 2011; Buij et al. 2016; Ogada et al. 2016a; Botha et al. 2017; Margalida et al. 2019; Henriques et al. 2020; Williams et al. 2021). To address the drivers of these threats to Hooded Vultures, the sociocultural perceptions of this species must be explored.

It is important to understand how species persist with increasing urbanisation and habitat transformation in the region (Moriconi-Ebrard et al. 2016). The relationship between humans and scavengers has existed since the Late Pliocene, when people first used vultures to find meat to scavenge (Moleón et al. 2014). Today this relationship between humans and vultures continues, with many farmers noticing vultures to discover dead livestock (Reson 2012; Santangeli et al. 2016; Morales-Reyes et al. 2017). In addition, people may use vultures to locate human settlements (Thiollay 2006a) and to detect poaching activities inside protected areas (Ogada et al. 2016a). Vultures also provide cultural ecosystem services, such as aesthetic experiences, spiritual reflection and enjoyment (Milcu et al. 2013). Therefore, the cultural value of vultures to communities is an integral aspect to consider (Boakye et al. 2019) and can be beneficial to conservation goals (Daboné et al. 2016). However, in general, the sociocultural value of vultures in West Africa is poorly known and has, so far, received little research attention.

This study with members of local communities in Burkina Faso aimed to reveal the relationships that people in West Africa have with Hooded Vultures. Our goal was to describe the knowledge and perceived cultural value of Hooded Vultures among people living in towns and townships of Burkina Faso. Specifically, we investigated the local

knowledge that people have regarding the beliefs relating to Hooded Vulture and the cultural uses for this species—in other words, the Hooded Vulture's main importance for people, the harm caused by and to this species, and the benefits this species enjoys from its cohabitation with humans. Given that in West Africa, the Hooded Vulture is an important species in the everyday lives of people, is generally considered harmless to livestock (Ogada et al. 2012a) and provides critical ecological services in human settlements (Ogada and Buij 2011), we predicted that people value this bird and the ecosystem services it provides. However, with the high level of demand for vulture body parts in West Africa and the recent increasing profitability of the regional trade in vulture body parts (Buij et al. 2016), there is certainly growing concern about a possible change in perceptions and loss of the local cultural regard toward Hooded Vultures in favour of valuing this species for its body parts alone.

## Materials and methods

### Study area

Burkina Faso is located at the centre of West Africa in the sub-Saharan region between 9°20' N and 15°03' N, and 2°20' E and 5°03' W (Figure 1). In Burkina Faso, the Soudano-Sahelian climate is characterised by highly irregular rainfall patterns with marked differences between a short rainy season from June to October and a long dry season from November to May (MECV 2007; Ibrahim et al. 2014). Land-use types include agricultural land, open savanna, urban areas, and protected areas in which the country's six vulture species occur (Weesie and Belemsobgo 1997; Balança et al. 2007; Portier 2007).

Burkina Faso has about 60 ethnic groups practicing different cultures and religions. These ethnic groups are often grouped according to their languages and social organisation, and they comprise the Mossi, Fulani, Bobo, Gourounsi, Dagari-Lobi, Bisa, Sénoufo, Gourmantché and Mandingue ethnic groups. These various ethnicities and cultures consequently imply different lifestyles and therefore different relationships with the Hooded Vulture, the only vulture species that is seen close to human settlements (Thiollay 2006a).

We chose our 20 survey sites to represent the main cultural groups and their ethnic diversity (Figure 1). The survey sites were selected through purposive sampling method, a type of nonprobability sampling (Babbie 1999), to be characteristic or representative of all nine of the main cultural groups. We included one town and one township within the geographical area of each of the nine ethnic groups, and we also included Burkina Faso's two large urban centres, Ouagadougou and Bobo Dioulasso, which are ethnically and culturally diverse.

### Data collection

#### Survey design

To increase the odds of gathering informative, high-quality responses to our survey questions and to improve



**Figure 1:** Locations of the 20 survey sites, and the different ethnic groups surveyed. Only the names of the towns are given and not all associated township names appear on the map

representativeness, we used a mixture of nonprobability (purposeful) sampling (Patton 2002) and random sampling, conducted from 3 March 2018 to 30 June 2018. We collected data using face-to-face interviews using a questionnaire composed of closed and open-ended questions. This process was complemented by qualitative data in the form of stories and perceptions that gave an added dimension to the survey data (O'Connor and Gibson 2003). The questions were read and, if required, translated by the local field assistant to interviewees and the answers were recorded on the questionnaire. The interviewer took field notes and observations during interviews. In this survey, we defined local knowledge as 'the body of knowledge, belief and practice that evolves and is passed down through generations about the relationship between humans and vultures' (adapted from Berkes et al. 2000; Díaz et al. 2015; Craig et al. 2018).

Full surveys were conducted by the first author in five languages: Mooré, Bissa, Dioula, Fulfulde and French, with a local field assistant acting as a translator during most surveys. After identifying potential interviewees in households and at abattoirs, we considered their willingness to participate, their availability, and their ability

to communicate experiences and opinions, before selecting interviewees for our survey (Spradley 1979; Bernard 2002). We obtained informed consent from all interviewees prior to their inclusion in the study. In all cases, we followed ethical standards of the relevant national and institutional committees for social surveys by informing respondents that their participation was voluntary, that they could leave the survey at any time, and that we would ensure their anonymity. Photographs of Hooded Vultures were used to aid the respondents' identification of the species.

#### *Nonprobability (purposeful) sampling of slaughterhouses*

In each locality, the nonprobability (purposeful) sampling method (Patton 2002) was used to identify individuals (or groups of individuals) who were particularly knowledgeable about or experienced with our survey topic (Cresswell and Plano Clark 2011). The people interviewed in this context were butchers, who are key players for Hooded Vulture conservation in West Africa and have a close relationship with this species (Mundy et al. 1992; Wessie and Belemsobgo 1997; Thiollay 2006b). A typical workday for a butcher at a slaughterhouse in Burkina Faso involves the slaughter of goats, sheep, pigs and cows, from 05:00 to



07:00, and then veterinary control to protect public health, from 07:00 to 11:00. Over 30 butchers were present at each slaughterhouse site every day. We aimed to survey 15 butchers per day, between 07:00 and 11:00, in each of the 20 localities, comprising a total of 300 butchers surveyed. Each interview took 10 to 15 min to complete.

#### *Random sampling of households*

We collected data systematically from household respondents (every tenth household) in households that were randomly chosen in each study area. Given that the abattoir sites frequented by Hooded Vultures are located on the outskirts of cities/towns/townships, we started with the household closest to the abattoir, and from there we systematically selected every tenth household from which to interview a respondent, moving through the town or the township. We took the survey unit as the household, and we surveyed one person from each household (often the head of the household or their representative). We assumed that heads of households would have many obligations and so would be more available and willing to take part in our surveys in the evenings. Therefore, we conducted our interviews from 15:00 to 19:00. Surveys took an average of 15 min to complete (range: 8 to 40 min). We targeted 30 households over two successive days in each of the 20 localities, producing a total of 600 households that took part in our survey.

#### **Survey instrument**

The initial questionnaire was drafted by taking into account the particular considerations and concerns highlighted in the scientific literature and in the Multi-Species Action Plan to Conserve African-Eurasian Vultures (Vulture MsAP) (Botha et al. 2017), namely that there is an urgent need to improve our understanding of the sociocultural value of vultures and the main drivers underlying the belief-based use of vulture body parts. Next, validation of the questionnaire content and ethical review were done (Field 2009; Taherdoost 2016) with the assistance of three vulture specialists and two experts in social science, who each reviewed the questionnaire to ensure that the questions were relevant to the study and complied with the ethical standards of the relevant national and institutional committees on human experimentation. A field pre-test was conducted using a small sample size of 35 people (20 householders and 15 butchers) (Sheatsley 1983; Chaudhary and Isreal 2014) to improve the readability and clarity of the questionnaire and to assess its validity under actual survey conditions. To measure internal consistency of the items of the questionnaire, a reliability test was done using Cronbach's alpha, based on the field pre-test data (Rovai et al. 2014). Reliability tests resulting in an alpha of 0.70 are generally accepted as indicating high reliability (Rovai et al. 2014).

The final consolidated survey tool included five sections, each comprised of closed and open-ended statements running concurrently. The first section asked for demographic characteristics, while the second focused on local community perceptions of Hooded Vultures. The third section focused on cultural beliefs regarding Hooded Vultures. Section four asked about the sociocultural value

of Hooded Vultures, with interview questions exploring people's opinions on the benefits of the Hooded Vulture as well as conflict between people and Hooded Vultures. Lastly, section five focused on key actions for Hooded Vulture conservation. In the survey, the closed-ended statements were ranked on a three-point Likert scale; this scale was used rather than the typical seven-point Likert scale (Sivacek and Cronon 1982) for the purpose of facilitating translation and interpretation of the statements. Furthermore, considering our study area where the majority of survey participants were poorly educated, in cases where when one is in agreement, then he/she strongly supports the statement, and therefore multiple levels of agreement do not exist.

#### **Data analysis**

Data analysis was performed using SPSS 27.0. The data were summarised using descriptive statistics, in tables, pie charts and histograms. Closed-ended statements gathered in all five sections of the questionnaire were separately coded with the numbers 1, 2 and 3, representing 'agree/yes', 'neutral/do not know' and 'disagree/no', respectively. Interview statements were read, re-read, and then classified based on their similarities, dissimilarities, and key words and phrases (Babbie 1999). This led to the identification of themes, categories, codes, patterns and relationships from the data (O'Connor and Gibson 2003; Burnard et al. 2008). The generated codes were verified and discussed between the authors and the first author's supervisor to ensure consistency. Any discrepancies in codes were discussed until a consensus was reached. The qualitative statements in the form of stories and personal observations supplied supplementary information to the open- and closed-ended answers, and this provided a deeper understanding of the respondents' feelings and arguments.

We used a bivariate analysis, Chi-square ( $\chi^2$ ), to determine differences in responses through interviewees status. We predicted significant differences ( $p < 0.05$ ) in responses between members of households and butchers, residents of townships (less-transformed areas) and residents of towns (more-transformed areas), and people from different age groups, ethnic groups and professions.

#### **Results**

The reliability test done to measure internal consistency of the items led to a Cronbach's alpha of  $>0.78$ , indicating high reliability. Furthermore, our three experts evaluated the questionnaire and validated its content, stating that it included all items that were essential for our survey topic. Thus, this section details the findings of the study based on the themes determined by the initial analysis, specifically issues including local knowledge and perceptions; cultural beliefs and uses; attitudes and the relationships between the local communities and the Hooded Vulture; and issues related to species conservation.

#### **Demographics of respondents**

In the 20 localities surveyed, we completed a total of 900 interviews, with 600 householders and 300 butchers.

Almost all (94%) of the interviewees were men, ranging in age from 16 to 85 years, with most (80%) between age 21 and 60 years (Table 1). This skew towards men may be because, with our nonprobability sampling method, we aimed to select individuals or groups of individuals with extensive knowledge or experience with the topics on which our survey questions were focused, and so we targeted butchers, a profession in which women are currently hardly ever hired in Burkina Faso. Moreover, using the random sampling method, we took the household as the survey unit, and households were generally represented by men. We surveyed women rarely (50 out of 600), only when their husbands were unavailable. Some women (23 out of 73) preferred to pass the survey to their sons (aged 16–25 years). These women stated that vultures are such sacred and mysterious birds that they were uncomfortable talking about them. A total of 205 (34.16%) respondents were farmers, 171 (28.5%) were informal-sector employees, 60 (10%) were merchants, 45 (7.5%) were housewives, 36 (6%) were livestock breeders, and the remaining 83 (14%) were government employees, private-sector employees, or pupils or students.

Overall, perceptions and knowledge of Hooded Vultures were not significantly different between interviewees' age-classes and professions, or between residents of townships (less-transformed areas) and towns (more-transformed areas). A similar trend was found

concerning perceptions and knowledge between members of households and butchers whom we surveyed, except for the question related to Hooded Vulture population trends and the question about how Hooded Vultures benefit from their closeness to humans.

### Qualitative observations

The reactions of each respondent were intently observed, such as when handing the picture of a Hooded Vulture to respondents. Most of them quickly identified the bird and commented on its rapid decline. Their statements included: '*It was widespread in former times*' and '*Where did this vulture go? I have not seen it in our town/township for several years*'. These statements highlight the respondents' cognisance of the decline of this species. Throughout the survey, the Hooded Vulture was often perceived as sacred, presumably because of its cultural uses and the protection afforded to it. Hooded Vultures were also perceived as harmless to livestock, providers of significant ecosystem services, with great sociocultural value, and known to patiently wait for its food. These statements were supported by local proverbs about vultures, such as: (1) '*Where there are Hooded Vultures circling around, there was always a carcass*', which points out the cleaning services that Hooded Vulture provide, and the use of Hooded Vulture behaviour when looking for livestock that were missing and presumed to have died as well as its alleged clairvoyance; (2) '*The vulture started hovering and circling around, before the donkey died*', which highlights the Hooded Vulture's patience when searching for or waiting for its food; (3) '*God is all-providing for the vulture*'; (4) '*The hawk says: "I feed on my own strength", and the vulture says: "I feed on what comes from the heavens"*', which expresses its harmlessness to livestock and the fact that it feeds predominantly on detritus and carcasses; and (5) '*The vulture says: "I have no time to wash my clothes because every day is a market day in one locality or another." That is why his pelt is brown*', which emphasises the Hooded Vulture's tireless daily provisioning of ecosystem services (cleaning services), so far as to almost forget about oneself.

### Perceptions about the Hooded Vulture's closeness to human settlements

A total of 505 householders (84%) and 275 butchers (92%) perceived that the Hooded Vulture cohabits with humans and is closely connected with human settlements. Perceptions were dependent on the localities in which we surveyed (Pearson  $\chi^2$  test = 223.52, df = 11,  $p < 0.001$ ) and on the ethnic groups that respondents belonged to (Pearson  $\chi^2$  test = 96.23, df = 40,  $p < 0.001$ ). Human–Hooded Vulture cohabitation is perceived as real, peaceful and well known by local communities in the Centre, East, Centre-East and North regions, where the Mossi, Fulani, Bissa and Gourma ethnic groups constitute the majority of the population. About 85% of the respondents ( $n_1 = 494$  householders,  $n_2 = 270$  butchers) reported that this cohabitation has existed in the past and is not a result of any recent change in the Hooded Vulture's behaviour. However, in the West, South-West and Centre-West regions, where Gourounsi, Dagari-Lobi, Bobo, Mandingue

**Table 1:** Socioeconomic and demographic profiles of the participants surveyed across the 20 localities in Burkina Faso, in May/June 2018

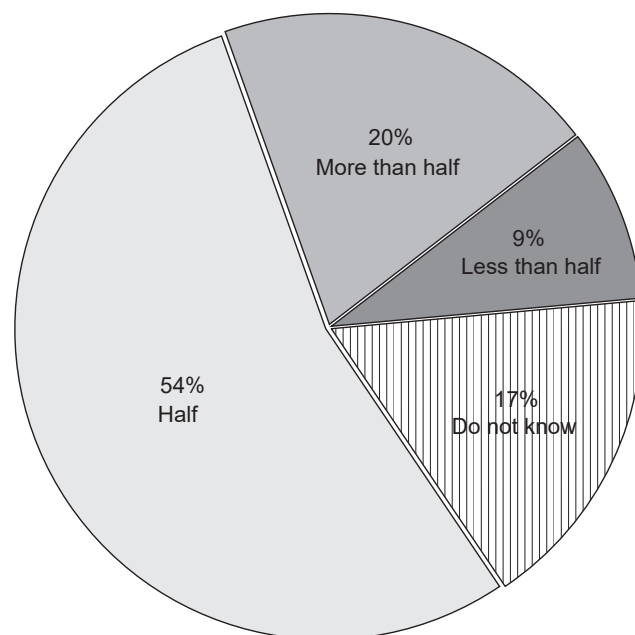
Variable	Study community		No. of respondents (% of total)
	Households $n_1$ (%)	Butchers $n_2$ (%)	
Gender			
Female	50 (8.3)	0 (0)	50 (5.6)
Male	550 (91.7)	300 (100)	850 (94.4)
Age group			
17–20	19 (3.2)	10 (3.3)	29 (3.2)
21–40	215 (35.8)	140 (46.7)	355 (39.4)
41–60	235 (39.2)	128 (42.7)	363 (40.3)
>60	131 (21.8)	22 (7.3)	153 (17.0)
Profession			
Farmer	205 (34.2)	–	205 (34.2)
Informal sector	171 (28.5)	–	171 (28.5)
Merchant	60 (10.0)	–	60 (10.0)
Housewife	45 (7.5)	–	45 (7.5)
Livestock breeder	36 (6.0)	–	36 (6.0)
Government employee	35 (5.8)	–	35 (5.8)
Pupil and student	28 (4.7)	–	28 (4.7)
Private sector	20 (3.3)	–	20 (3.3)
Ethnic group			
Mossi	314 (52.3)	96 (32.0)	410 (45.6)
Fulani	103 (17.2)	123 (41.0)	226 (25.1)
Gourounsi	48 (8.0)	17 (5.7)	65 (7.2)
Bissa	30 (5.0)	12 (4.0)	42 (4.7)
Gourma	27 (4.5)	15 (5.0)	42 (4.7)
Dagari-Lobi	25 (4.2)	3 (1.0)	28 (3.1)
Bobo	22 (3.7)	21 (7.0)	43 (4.8)
Mandingue	16 (2.7)	7 (2.3)	23 (2.6)
Sénoufo	15 (2.5)	6 (2.0)	21 (2.3)

and Sénoufo groups predominate, this cohabitation was perceived as almost absent. Hooded Vulture breeding activities and nesting sites were reported to be well known by ~35% of respondents ( $n_1 = 194, n_2 = 124$ ). This statement was dependent on locality surveyed (Pearson  $\chi^2$  test = 149.41,  $df = 40, p < 0.001$ ). Localities such as Fada N’Gourma, Ouahigouya, Tenkodogo and Djibo were mentioned as areas where Hooded Vultures breed (more than 60% of the respondents mentioned these localities), while in Bobo Dioulasso, Banfora, Koudougou very few local communities knew of Hooded Vulture breeding activities (only ~9% of the respondents in these localities).

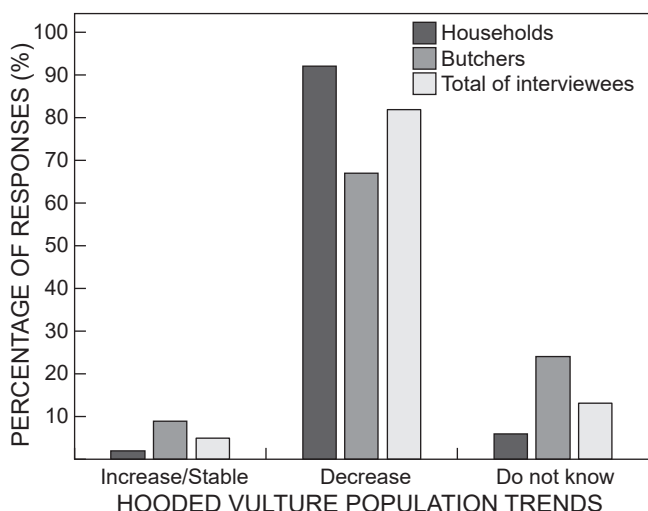
**Local community perceptions of the Hooded Vulture population trend, and the extent and causes of its decline**

Most of the respondents (84%;  $n_1 = 551, n_2 = 202$ ) (Figure 2) had noticed a decrease in the Hooded Vulture population. Overall, ~54% ( $n_1 = 379, n_2 = 106$ ) thought that the Hooded Vulture population had decreased by less than half; ~20% ( $n_1 = 104, n_2 = 75$ ) thought it had decreased by about half; and ~9% thought it had decreased by more than half (Figure 3). In accordance with this statement, ~42% ( $n_1 = 253, n_2 = 125$ ) of the respondents highlighted that Hooded Vulture carcasses are more frequently encountered in their localities. According to them, the main reasons for the occurrence of Hooded Vulture carcasses in their given locality included poaching by use of poisoned baits (poaching), unintentional poisoning, electrocution at electricity poles, and collisions with motor vehicles. Perceptions about Hooded Vulture population declines were dependent on the interviewee group (Pearson  $\chi^2$  test = 23.35,  $df = 2, p < 0.001$ ): more household respondents than butchers had noticed a decrease in the local Hooded Vulture’s population. Some respondents provided reasons for the decrease in the Hooded Vulture populations ( $n_1 = 483, n_2 = 162$ ), the main reasons being decreasing food availability (21%;  $n_1 = 145, n_2 = 45$ ), intentional killing using poisoned baits for belief-based use (also called

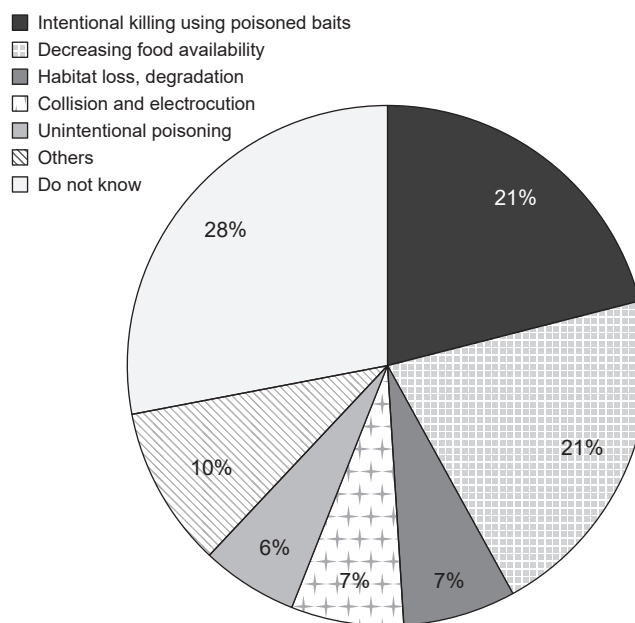
traditional medicine, 21%;  $n_1 = 130, n_2 = 57$ ), habitat loss and degradation (7%;  $n_1 = 51, n_2 = 10$ ), and unintentional poisoning (6%;  $n_1 = 39, n_2 = 16$ ) (Figure 4). Other reasons mentioned less frequently (by 10% of respondents) (Figure 4) were collisions with motor vehicles, electrocution on energy infrastructure, migration, water shortages, diseases, harvesting for consumption, human population increase, and people’s absence of tolerance and appreciation for vultures.



**Figure 3:** Knowledge of the extent of the decline in Hooded Vulture population size



**Figure 2:** Knowledge of Hooded Vulture population trends



**Figure 4:** Knowledge about the causes of Hooded Vulture declines

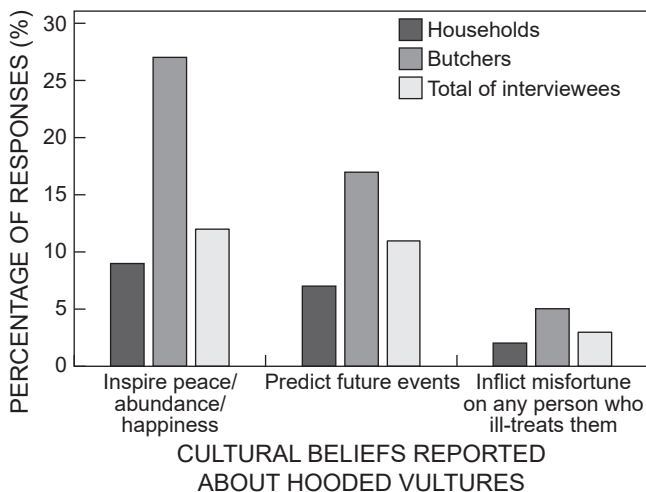


**Cultural beliefs about Hooded Vultures**

Cultural beliefs about Hooded Vultures were both positive (that the birds are valuable) and negative (stigmatising). Some local beliefs stated (from ~25% of the respondents;  $n_1 = 94, n_2 = 129$ ) (Figure 5) were that: (i) Hooded Vultures, through their behaviour, can predict future events (good or sad) in the hours ahead (11%); (ii) the presence of Hooded Vultures in a locality, in a field, near a house, at a slaughterhouse or market, indicates that peace, tolerance, mutual aid, happiness and abundance prevail in that place (12%); and (iii) any persecution of Hooded Vultures can inflict misfortune on the culprit, their accomplices or their family (3%). Alongside these positive cultural beliefs about Hooded Vultures, other stigmatising beliefs (reported by ~23% of the respondents;  $n_1 = 144, n_2 = 66$ ) (Figure 6) were also reported, for instance: (i) the Hooded Vulture is a bird of ill omen (2%); (ii) it is 'useless' and not eaten (8%); and (iii) it is unhygienic and apt to be a vector of disease (8%). Other stigmatising beliefs mentioned (by 6% of the respondents) were: (iv) the Hooded Vulture is used by villains to cast evil curses or spells on people; (v) it uses human bones or meat to feed their fledglings, and without this the fledgling will not fly away; (vi) anyone who touches or looks into a Hooded Vulture's nest may fall mysteriously ill; (vii) it is considered harmless to livestock but can be a potential menace to new-born or young animals; and (viii) it causes disturbance when butchers are slaughtering animals in the slaughterhouse.

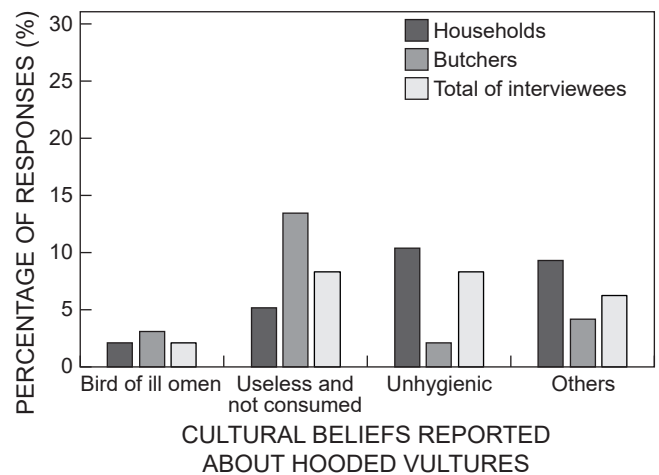
**Cultural uses of Hooded Vultures**

About 33% of the households ( $n_1 = 200$ ) and the majority of butchers (80%,  $n_2 = 239$ ) surveyed had knowledge of the cultural uses of Hooded Vultures (Figure 7). We heard about some cultural uses more frequently than others (Figure 7), and this was related to the interviewee's ethnic group (Pearson  $\chi^2$  test = 96.48,  $df = 63, p = 0.004$ ). Most of the cultural uses that we heard about were reported by Mossi ( $n_1 = 120, n_2 = 155$ ), Fulani ( $n_1 = 20, n_2 = 33$ ), and Bissa ( $n_1 = 23, n_2 = 25$ ). The cultural uses reported

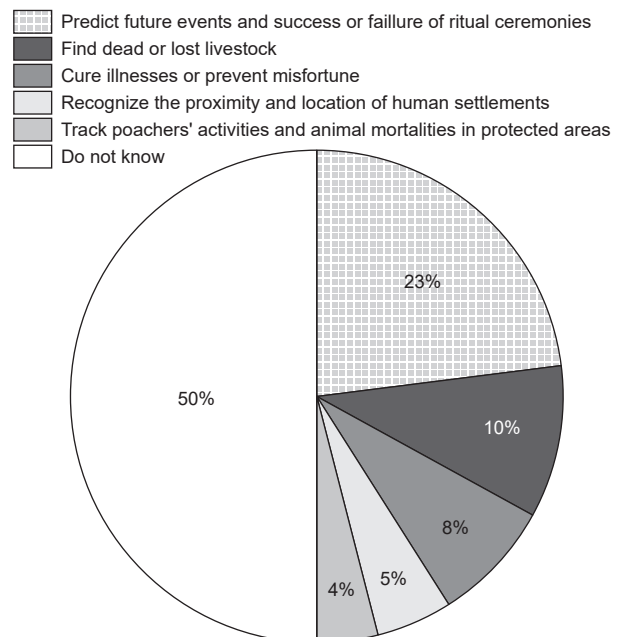


**Figure 5:** Positive cultural beliefs reported about Hooded Vultures

were: (i) Hooded Vulture behaviour (a bird behaving unusually, for example) interpreted by fetish priests to predict future events in the hours and days ahead, or as an indicator of the success or failure of ritual ceremonies (23%) (for example, during rituals in which animals are sacrificed, if Hooded Vultures are wheeling mid-air, rounding up or roosting in the surrounding area, then the ceremony is considered successful; if not, it is deemed to be a failure); (ii) farmers and livestock breeders making use of Hooded Vulture behaviour (unusual wheeling round mid-air, unusual circling) to find dead or lost livestock in the fields, bushes or forest (10%); (iii) use of the body parts of Hooded Vultures to cure a range of illnesses or to prevent misfortune (8%); (iv) observation of vultures' behaviour (e.g. wheeling in mid-air or roosting in a given



**Figure 6:** Negative cultural beliefs reported about Hooded Vultures



**Figure 7:** Knowledge about cultural uses of Hooded Vultures

area) by people lost in the forest or bush to recognise their proximity to human settlements (5%); and (v) Hooded Vulture behaviour (e.g. unusual wheeling round in mid-air, unusual rounding up) observed by foresters, rangers and eco-guards to track poacher activity or to survey animal mortalities in protected areas (4%) (Figure 7).

### Sacredness of Hooded Vultures

Most interviewees regarded Hooded Vultures as sacred birds (67%;  $n_1 = 327$ ,  $n_2 = 278$ ), while 13% ( $n_1 = 96$ ,  $n_2 = 9$ ) regarded this vulture as an ordinary bird like any other. The main reasons for this were: (i) tradition forbids the consumption of Hooded Vultures (30%); (ii) tradition forbids any action aimed at ill-treating Hooded Vultures (28%); (iii) Hooded Vultures are venerated and protected by people in some areas (5%); and (iv) persecution, ill-treatment and killing of Hooded Vultures can bring misfortune to the culprits, their accomplices and their family (5%).

### Sociocultural uses of Hooded Vulture body parts

The Hooded Vulture's head was reportedly the most often used body part (22% of respondents), followed by its feathers (5%) and bones (1%). The body parts were reportedly used to bring good luck when gambling, and during competitions and contests (11%), to bring customers to traders (4%), and to increase luck for gold diggers at artisanal gold-panning sites (9%) (Figure 8). The bones and feathers were reportedly used to treat various diseases (7%) (Figure 8). For example, the bones were reportedly used when brewing mixtures for use in ointments to treat oedema and various skin diseases, whereas the feathers were reportedly used to treat earaches and sickle cell disease. Other diseases reportedly treatable with Hooded Vulture body parts were asthma and coughs.

### Value of Hooded Vultures to local communities and the benefits they receive from their closeness to humans

Most of the respondents (72.6%;  $n_1 = 382$ ,  $n_2 = 271$ ) indicated that they found Hooded Vultures useful. Of the interviewees who provided reasons for this usefulness, 50% thought that Hooded Vultures clean the environment and eliminate foul odours (without any cost) in abattoirs and around human settlements, 10% saw the value of vultures as a national wildlife resource with considerable value to tourism, 9% thought Hooded Vultures do not interfere with or in any way damage local people's activities, and 4% stated that Hooded Vulture are useful because they mitigate the spread of human and animal diseases by rapidly disposing of carcasses. Furthermore, over half of the respondents (55%;  $n_1 = 226$ ,  $n_2 = 266$ ) stated that Hooded Vultures benefit from their closeness to humans. Of those, a relatively greater number of butchers (65% compared with 30% of households) (Pearson  $\chi^2$  test = 21.08, df = 3,  $p < 0.001$ ) stated that Hooded Vultures feed on food of anthropogenic origin (e.g. domestic animals' organs and carcasses), 11% of total interviewees saw the benefits to Hooded Vultures of protection provided by local people, and 2% stated that vultures were protected by legislation.

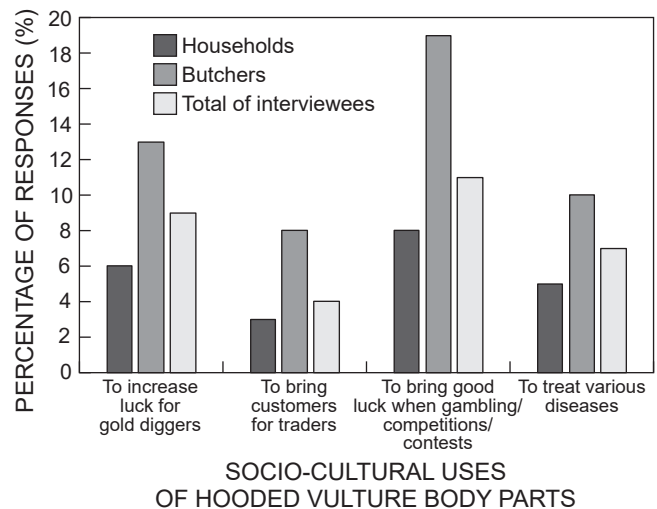


Figure 8: Knowledge about the sociocultural uses of Hooded Vulture body parts

### Perceived effects of Hooded Vultures on livestock and other damage (conflict) inflicted by this bird on local communities

A total of 340 households (56.7%) and almost all the butchers surveyed (97.7%;  $n_2 = 293$ ) stated that Hooded Vultures are harmless to livestock. According to these respondents, Hooded Vultures do not attack livestock or poultry (36%) and never capture prey for their food (22%), but rather feed exclusively on detritus and carcasses (13%). However, some interviewees stated that Hooded Vultures cause damage to local communities (12%;  $n_1 = 31$ ,  $n_2 = 77$ ), such as by picking at pieces of meat in abattoirs or markets (5%), that they signal the location of poachers' activities to foresters and eco-guards by following poachers into protected areas (5.1%), and that they can cause contamination by pecking at meat in abattoirs or markets (2%).

### Key actions for Hooded Vulture conservation

Most respondents (67%;  $n_1 = 421$ ,  $n_2 = 181$ ) were concerned about the extinction of Hooded Vulture in the years ahead if threats to the species are not mitigated, while 22% found that this vulture will manage to survive. The vast majority (84%;  $n_1 = 517$ ,  $n_2 = 243$ ) said they were willing to take part in conservation measures, while only 16% said they were not willing to participate in vulture conservation. The key actions suggested by the people we surveyed were: (i) severely punishing poachers who kill wildlife and specifically vultures (19%); (ii) supplying safe food for Hooded Vultures (17%); (iii) establishing and expanding forest reserves (11%); (iv) planting large trees to provide roosting/nesting habitat (11%); and (v) raising awareness in the local community of vultures' ecological roles, the threats they face, and best practices to adopt for vulture conservation initiatives (10%) (Table 2). Other conservation measures mentioned were restricting access to and use of hazardous toxic substances (5%), training personnel to monitor and protect Hooded Vultures (4%), constructing and rehabilitating water points (3%), and captive breeding (2%).

**Table 2:** Key actions for Hooded Vulture conservation suggested by interviewees across 20 localities in Burkina Faso

Suggested conservation actions	Householders <i>n</i> (%)	Butchers <i>n</i> (%)	Total <i>n</i> (%)
Severe punishment of poachers	115 (19.2)	54 (18.0)	169 (18.8)
Supplying safe food for Hooded Vultures	104 (17.3)	53 (17.7)	157 (17.4)
Establishing or expanding forest reserves	58 (9.7)	45 (15.0)	103 (11.4)
Planting large trees for nesting/roosting	77 (12.8)	23 (7.7)	100 (11.1)
Sensitising local people to threats facing vultures	68 (11.3)	22 (7.3)	90 (10.0)
Restricting access to and use of hazardous toxic substances	24 (4.0)	20 (6.7)	44 (4.9)
Training personnel to monitor and protect vultures	31 (5.2)	8 (2.7)	39 (4.33)
Constructing and rehabilitating water points	20 (3.3)	5 (1.7)	25 (2.8)
Captive breeding	12 (2.0)	8 (2.7)	20 (2.2)
Total	509 (84.8)	238 (79.3)	747 (83.0)

## Discussion

Local people's perceptions of Hooded Vultures were very similar between residents of less-urbanised townships versus more-urbanised towns, between people of different age classes, and between people with different professions. A similar trend was witnessed from both householders and butchers, where the latter was the group of respondents who we assumed to be particularly knowledgeable about and experienced with our survey topic, since they see large numbers of Hooded Vultures daily at their workplace. Not only do local communities recognise the declines of Hooded Vulture populations, but they also have strong beliefs around this species, as evidenced by the stories and proverbs they related to us, which highlights the ecosystem services that Hooded Vultures provide, the species' sociocultural value, and that it is harmless to livestock. This constitutes strong evidence that Hooded Vultures in Burkina Faso have been and still are an important species in the everyday lives of people. Corroborating this, previous studies found that in this area, Hooded Vultures are relatively common and interact with local people to such an extent that the birds breed in city centres and in peripheral urban areas, often within only 5–10 m from houses (Weesie and Belemsobgo 1997; Ogada and Buij 2011; Daboné et al. 2016, 2019).

### **Perceptions of Hooded Vultures' proximity to human settlements**

Overall, we found that local communities in Burkina Faso have good knowledge about Hooded Vultures. For the most part, the local communities surveyed perceived Hooded Vultures as closely connected with human settlements, similar to people's perceptions elsewhere in West Africa (Mundy et al. 1992; Thiollay 2006b, 2007b; Henriques et al. 2017). However, this cohabitation with people is not thought to be uniform across the country. We found that in the Centre, East, Centre-East and North regions of Burkina Faso, localities in which the Mossi, Fulani, Bissa and Gourma ethnic groups predominate, cohabitation between Hooded Vultures and local people is perceived to be very close. However, in the West, South-West and Centre-West regions, where Gourounsi, Dagari-Lobi, Bobo, Mandingue and Sénoufo are in the majority, this cohabitation is perceived as almost absent.

These contrasting perceptions of Hooded Vultures' connection with humans may be related to variation in the species' population density throughout Burkina Faso, and how much importance each ethnic group attaches to this species. Referring to this disparity in Hooded Vulture density in this area, Thiollay (2006b) stated that Hooded Vultures were densely distributed across the Centre region of Burkina Faso but had largely declined in the West and South-West. In addition, Hooded Vultures have long been considered a venerated and sacred bird by several ethnic groups, including the Mossi, Bissa and Gourmatché (Daboné et al. 2019).

The Hooded Vulture's close relationship with local people is long-standing, and given that this bird breeds in loose colonies, re-using the same nest sites (Mundy et al. 1992; Daboné et al. 2019), local communities have valuable knowledge about its breeding activities and nest sites. A previous study in this area elicited the help of local people, including secondary school pupils between ages 16 and 19 years, to rapidly find a large sample of active nest sites (Daboné et al. 2019). In some localities that we surveyed, such as Fada N'Gourma, Ouahigouya, Tenkodogo and Djibo, more than 60% of the respondents were aware of Hooded Vulture breeding activities and nesting locations. If these locations host important nest sites, then, given the existing cultural protection afforded to vultures (Daboné et al. 2016), their relatively high population densities, good availability of food, and the reported willingness of interviewees to participate in conservation interventions, these could be key areas for the implementation of vulture safe zones (Kane et al. 2022).

### **Perceptions of Hooded Vulture population trends and the extent of population declines**

Our interviewees perceived Hooded Vulture population sizes as having decreased. Although we assumed butchers to be more knowledgeable than household respondents about Hooded Vultures, proportionately more household respondents perceived the decrease in the local Hooded Vulture population. This likely arises from a steeper decline in numbers of Hooded Vultures in Burkina Faso's neighbourhoods and cities than at abattoirs and surrounding areas, to which the birds are presumably drawn for food. Overall, 54% ( $n = 485$ ) of our survey respondents thought that the Hooded Vulture population

had decreased by less than half, similar to the findings of Thiollay (2006a, 2006b) who stated that, from the 1970s to 2004, the number of Hooded Vultures declined by 45% in its West African range. Since then, no further study has provided regional Hooded Vulture population trends for Burkina Faso and West Africa. However, with the recent, recurring intentional vulture poisoning using poisoned baits in Burkina Faso (15 incidents from 2010 to 2016, resulting in 577 dead vultures: Daboné et al. 2022) and in a recent case where more than 2 000 Hooded Vultures were intentionally poisoned across eastern Guinea-Bissau, between September 2019 and March 2020, for belief-based use (Henriques et al. 2020), the decline of the Hooded Vulture population in West Africa is expected to be severe. Indeed, Mullié et al. (2017) reported a decrease in Hooded Vulture numbers of more than 85% over the past 50 years in Dakar (Senegal), although their study was restricted to urban areas and should therefore not be extrapolated for the whole range of the species in the region.

### **Local community perceptions of threats to Hooded Vultures**

Forty-two percent ( $n_1 = 253$ ,  $n_2 = 125$ ) of our respondents highlighted that Hooded Vulture carcasses are often encountered in their localities, suggesting that in Burkina Faso, mass mortalities of Hooded Vultures have occurred over recent decades. These mass mortalities have probably hastened the Hooded Vulture population decline which was already well underway since the 1970s in Burkina Faso and in other West African countries (Thiollay 2006a, 2006b). The main reasons provided by local communities for these declines were decreasing food availability, intentional killing of Hooded Vultures using poisoned baits for belief-based use, and to some extent habitat loss and degradation, and unintentional poisoning, corroborating the conclusions of other studies (Ogada et al. 2016a; Mullié et al. 2017; Henriques et al. 2020). Among these explanations, decreasing food availability and habitat loss and degradation distinguish themselves from the rest because they are not sufficiently considered or addressed, therefore their extent and impact on Hooded Vulture populations are not clearly defined in this region. There has been growing concern and focus on poisoning, given the high vulnerability of vulture populations to its effects (Plaza et al. 2019), and it is suggested that poisoning (whether intentional or unintentional) remains the main threat to vultures in Africa. Indeed, poisoning events involving vultures are occurring with increasing frequency and producing high mortality rates (Ogada et al. 2016b; Margalida et al. 2019; Henriques et al. 2020).

Additional threats to Hooded Vultures reported by the interviewees, and which deserve attention, include collisions with motor vehicles, electrocutions on energy infrastructure, and diseases. Highly pathogenic avian influenza has previously been confirmed in wild Hooded Vultures in Burkina Faso (Ducatez et al. 2007; Tarnagda et al. 2011). While we are not aware of die-offs elsewhere in this region, we strongly recommend that the vulnerability of vultures to this highly infectious disease, and to other infectious diseases, be assessed. The knowledge gap regarding diseases in vultures (Botha et

al. 2017) is particularly concerning because the threat of disease increases as species move towards extinction (Heard et al. 2013), and Hooded Vultures are currently assessed as Critically Endangered (BirdLife International 2017) and are undergoing population declines across their range (Odino et al. 2015; Nosazeogie et al. 2018; Williams et al. 2021; Buechley et al. 2022). Furthermore, the fact that Hooded Vultures are highly commensal in this part of their range could increase the likelihood of disease transmission at the human–livestock–wildlife disease interface (Van den Heever et al. 2021).

### **Cultural beliefs about Hooded Vultures**

Our interviewees reported cultural beliefs that could be both beneficial for, and detrimental to, Hooded Vulture conservation (Colding and Folke 2001). Positive beliefs surrounding Hooded Vultures included the perception that cohabitation with this species would increase one's wellbeing (peace, tolerance, forgiveness, and happiness), while misfortune would befall people persecuting Hooded Vultures; these are important ideas to consider and to capitalise on for conserving this species. Conversely, negative beliefs about Hooded Vultures included the idea that they are a bad omen, unhygienic, a vector of disease, a potential menace to new-born animals, and that they use human bones or flesh to feed their fledglings. The belief regarding Hooded Vultures as a bad omen could stem from the fact that this bird is allied with the idea of death in stories, myths and films told in this area, such as in the Burkinabé drama films '*Wend Kuuni*' (also known as God's Gift: Kaboré 1982) and '*Duga, les charognards*' (Dao and Lengani 2019), in which an image of Hooded Vultures was used to presage impending death. The myth that Hooded Vultures use human bones or meat to feed their fledglings may stem from their relatively long nestling period (100–120 days: Daboné et al. 2016), which has aroused curiosity and speculation among local communities. Furthermore, the perception that Hooded Vultures are a potential menace to new-born animals may be related to how this species may follow livestock in some areas and feed on placentas after parturition (Ballejo et al. 2020). Despite stemming from misconstrued observations, these negative beliefs may cause animosity towards Hooded Vultures, and should be addressed with targeted education programmes.

### **Cultural uses of Hooded Vultures**

Our findings highlight important cultural uses of Hooded Vultures in Burkina Faso that are similar to what has been reported in earlier studies (Milcu et al. 2013; Craig et al. 2018). In ancient times, vultures were an important component of people's lives; Indians, Egyptians, American Indians, Pueblo Indians, Greeks, Persians and Romans all used vultures as symbols of power, insight or purification, and as a bird with great religious importance (Kushwaha 2016). In Burkina Faso, Ethnic groups such as the Mossi, Fulani, and Bissa reported having more experience in using Hooded Vultures in their customs and traditions.

Most of the cultural uses of Hooded Vultures mentioned in this study were directly or indirectly linked to this species' scavenging nature. For example, Hooded Vultures were used when looking for livestock that were missing and



presumed to have died in the field, and when foresters, rangers or eco-guards track poachers' activities in protected areas. Several other communities in South Africa and southwestern Africa are also known to use vultures for these purposes (Reson 2012; Moleón et al. 2014; Pfeiffer et al. 2014; Santangeli et al. 2016; Craig et al. 2018). The use of Hooded Vulture behaviour to recognise the proximity to and the location of human settlements is related to the highly commensal nature of the species in West Africa (Thiollay 2007a). The remaining cultural uses of Hooded Vultures, such as interpretations of their behaviour (for example, to predict future events, or to predict whether ritual ceremonies will be successful or not) are related to their alleged clairvoyance and mystical/magical properties. Similar cultural uses were reported by Kushwaha (2016), whereby vultures are believed to have mystical/magical abilities, probably because of their ability to locate food quickly using a combination of soaring flight, excellent eyesight, and socially acquired information from other vultures (Ruxton and Houston 2004; Cortés-Avizanda et al. 2014; Duriez et al. 2014).

### **Sacredness of Hooded Vultures**

The Hooded Vulture was reported to be a sacred bird by most of our interviewees in Burkina Faso. For most communities, it is regarded as a revered bird, emblematic of clairvoyance, augury and insight. This sacredness is linked to the belief that the Hooded Vulture will inflict misfortune on those who ill-treat it. This belief may contribute to the Hooded Vulture's protection in some areas (e.g. Garango and Tenkodogo), where tradition forbids the killing or ill-treatment of this species (Daboné et al. 2019). Corroboratively, no mention of the consumption of Hooded Vultures was made throughout this survey, although it has previously been documented in West Africa (Gbogbo and Awotwe-Pratt 2008; Williams et al. 2021). Elsewhere in Northeast Africa, Ancient Egyptians regarded vultures as deities, emblems of motherhood, and givers and takers of life (Kushwaha 2016). Furthermore, among the San, Basotho and Zulu tribes in southern Africa, as well as other cultures in Africa, vultures are believed to have clairvoyant and mystical/magical qualities associated with sacredness (Beilis and Esterhuizen 2005; Kushwaha 2016; McKean et al. 2018; Mashele et al. 2021).

### **Sociocultural uses of Hooded Vulture body parts**

Most respondents highlighted the sociocultural uses of Hooded Vulture body parts in this area, in accordance with the findings of other studies (Williams et al. 2014; McKean et al. 2018). Hooded Vulture heads are the body part that is most often used in our study area, as these are believed to have magical, healing and clairvoyant powers, or capable of bringing good luck when gambling, in competitions, and at artisanal gold-panning sites, in alignment with the findings of previous studies (Reson 2012; Groom et al. 2013; Buij et al. 2016; Mdhlano et al. 2019). Both the price of and the demand for vulture heads has increased in West Africa (Awoyemi 2014; McKean et al. 2018), and 36% (317 out of 879) of dead vultures found at poisoning scenes in Burkina Faso were missing heads (Daboné et al. 2019; Daboné et al. 2022).

### **The value of Hooded Vultures to local communities and the benefits they receive from their closeness to humans**

In this study, most respondents (>72%) stated that Hooded Vultures were both useful and beneficial to local communities. Above all, interviewees valued the cleaning services that Hooded Vultures provide, by cleaning the environment and eliminating foul odours, and they believed that vultures also restrict the spread of diseases in human establishments by disposing of animal carcasses promptly. Similar findings were previously reported by Markandya et al. (2008), Whelan et al. (2008) and Ogada et al. (2012b). Other interviewees described Hooded Vultures as 'harmless' as they did not pose any threat to people's livelihoods. Interestingly, this relationship between people and Hooded Vultures benefits the vultures too, as the birds feed on food in human settlements, and are legally protected, as well as being protected by local communities in this area. The positive perception of local people toward this reciprocal, mutually beneficial relationship presages both support for and success in conservation actions in this area.

### **Perceived interactions between Hooded Vultures and livestock and other damage inflicted by this bird on local communities**

In this study, there were no reports of possible attacks by Hooded Vulture on livestock or poultry. In South Africa, Europe and the United States, larger *Gyps* vultures have been reported to (rarely) attack and sometimes kill livestock if other food is lacking and/or if the animals are already in a weakened state (Avery and Cummings 2004; Margalida et al. 2011, 2014; Duriez et al. 2019; Lambertucci et al. 2021; LJT pers. observ.). However, throughout their range, Hooded Vultures are considered harmless to livestock, and our interviewees stated that this species never captures and kills prey, but rather feeds exclusively on detritus and animal carcasses.

Overall, few of the interviewees had negative views of Hooded Vultures. Some stated that Hooded Vultures can inflict damage on local communities, but the reasons they provided were weak. For example, they believed that Hooded Vultures could contaminate pieces of meat and organs in butcheries, rather than ascribing any contamination to possible carelessness or negligence by the butcher. Nevertheless, these negative views toward Hooded Vultures need to be urgently addressed through an awareness campaign.

### **Key actions for Hooded Vulture conservation**

Most respondents said they were willing to assist with conservation measures; they were aware of the urgent need for conservation interventions, and the likely imminence of the local extinction of Hooded Vultures if threats to this species are not mitigated. This is an added asset given that all vulture species in Burkina Faso have been fully protected by legislation since 1960, and Hooded Vultures are also currently protected by some local communities in this area (Daboné et al. 2019). Further consolidation of these positive perceptions is a key step for Hooded Vulture conservation in West Africa. This will especially entail environmental education for young



people in the villages and at key sites of Hooded Vulture. It would also be useful to implement organisations such as 'vulture support groups' in key vulture conservation sites, involving local communities to act as local sentinels for the sustainable conservation of vultures and their habitats.

The key actions suggested by local communities were mostly in line with those suggested by experts in the "Multi-Species Action Plan to Conserve African-Eurasian Vultures (Vulture MsAP)" (Botha et al. 2017). This reveals that local communities in this area have good knowledge of the existing threats to Hooded Vultures. Interviewees suggested severely punishing poachers, which highlights a low level of legal knowledge in the communities, or inadequate (or even a complete lack of) enforcement of the laws protecting vultures. Local communities suggested supplying food for Hooded Vultures, highlighting the perceived decrease in food availability, which has been highlighted previously, yet has not been rated as a high-priority threat in this area (Ogada and Buij 2011; Ogada et al. 2016a). Additional key actions suggested by local communities, but which could be equally valuable for vulture conservation, include the restoration and preservation of Hooded Vulture habitat, awareness-raising in communities for Hooded Vulture conservation, restricting access to and use of hazardous toxic substances, and capacity-building of conservation stakeholders to save the species from extinction.

### Limitations

According to Babbie (1999) and Ott and Longnecker (2003) the use of questionnaires can lead to possible misunderstandings, non-responses, and measurement problems. Therefore, a limitation of this study was that it relied on data obtained using a questionnaire. Another limit was the potential for bias because the lead researcher comes from the study area, and this increases the possibility of bias in the interpretation of qualitative results. Finally, the current findings do not necessarily represent the views of all people in Burkina Faso as fieldwork was limited to certain areas owing to security concerns. Studies conducted in other parts of the country may yield different results.

### Conclusions and implications for vulture conservation

There is strong evidence that Hooded Vultures in Burkina Faso have significant sociocultural value. Local communities in this region showed a good understanding and an overall positive perception of Hooded Vultures. This strong cultural attachment of communities to Hooded Vultures has led to their local protection, and a reverence for this bird in some regions of Burkina Faso (Daboné et al. 2019), both of which could benefit conservation goals. The involvement of local communities as stakeholders is an important aspect to consider in conjunction with conservation issues. However, the recent widespread harvesting of Hooded Vultures for belief-based use (Daboné et al. 2019, 2022; Henriques et al. 2020) is in contrast to the protection usually afforded to this bird in this area, suggesting that the increasing profitability of the regional trade in vulture body parts, the increased rate of diversification and urbanisation, and the increasing

abandonment of traditional ethics and moral values have probably undermined the cultural value of vultures for local people. Consequently, future conservation programmes should include awareness-raising that highlights the Hooded Vulture's cultural, ecological and economic value, as well as current legislation and criminal sentencing that face any culprits involved in Hooded Vulture poaching.

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