Identifying anthropogenic threats to Cape Vultures (*Gyps coprotheres*) using community perceptions in communal farmland, Eastern Cape Province, South Africa

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Summary

Declines in Old World vulture populations have been linked to anthropogenic pressures. To assess these threats, the social dimensions of vulture conservation must be explored. Prior research in Africa focused on commercial farmers' perceptions of vultures and identified that small stock farmers used poison more than large stock farmers to deter livestock predators. However, the vulnerable Cape Vulture, *Gyps coprotheres*, breeds throughout communal farmland in the Eastern Cape Province, South Africa. Consequently, community interviews were conducted within the vultures' foraging range of the Msikaba Cape Vulture colony, separating regions according to the amount of transformed land. Residents in the least transformed land region perceived the smallest reductions in livestock ownership over the past ten years. While residents of the moderately transformed region perceived the greatest reductions in livestock ownership. Livestock carcasses were reported to be available for vultures at 'informal vulture restaurants'. Arrangement of livestock carcasses was found to be independent of land use; however type of carcass consumed varied. None of the respondents stated they used poison to eliminate livestock predators. More respondents cited illegal

poaching of vultures for traditional medicine as a threat. Despite this pressure, the majority stated that vultures benefited the community.

Key words: Avian scavengers, livelihoods, land use, communal farmland, illegal poaching, social perception

Introduction

Worldwide humans have transformed the landscape, displaced species and caused mass extinctions (Alroy 2001; McKee *et al.* 2004). Despite these pressures, biodiversity still persists (Jenkins *et al.* 2013). It is important to understand how species persist in human-altered landscapes, to aid in the conservation and management of threatened species (Norris and Harper 2004; Jost Robinson et al. 2011). Vultures have interacted with humans for centuries (Mundy et al. 1992; Moleón et al. 2014). They provide a valuable ecosystem service by consuming carcasses which prevents the spread of disease, recycles nutrients, and is a waste removal option that is both cost effective and low on carbon emissions (Dupont *et al.* 2012; Ganz *et al.* 2012; Ogada *et al.* 2012b)

Globally, 61% of vulture species are threatened with extinction (Ogada *et al.* 2012a). The cause for these declines are mainly from anthropogenic pressures (Ogada *et al.* 2012a). Asia and Africa have experienced the most dramatic vulture declines in recent years (Pain *et al.* 2008; Virani *et al.* 2011; Ogada *et al.* 2012a). Vulture declines in Asia were linked to diclofenac, a non-steroid anti-inflammatory drug (NSAID), which is highly toxic to vultures when present in carrion (Oaks *et al.* 2004; Gilbert *et al.* 2006). Declines of African vulture populations are less understood because of the diversity of threats encountered across the landscape (Thiollay 2006; Virani et al. 2011; Ogada et al. 2012a; Monadjem et al. 2013a).

It is vital to understand threats to vultures in terms of land uses and local human livelihoods. Previous research in Africa focused on the human dimensions of vulture

conservation in commercial farming and protected areas (Boshoff and Currie 1981; Robertson and Boshoff 1986; Brown and Piper 1988; Monadjem and Garcelon 2005; Murn and Anderson 2008; Bamford et al. 2009). Relatively few studies have addressed the human dimension in communal owned farmland, despite its prevalence in Africa (Boshoff and Vernon 1980; Vernon 1998; Bamford et al. 2007; Virani et al. 2011). Furthermore, communal farmland in South Africa is expected to undergo rapid development in terms of electrification, urbanisation, and continued human population growth (DEDEAT 2012; Sheehan and Sanderson 2012).

The eastern part (east of 27°E) of the Eastern Cape Province, South Africa includes the communal area formerly known as the Transkei (Boshoff *et al.* 2009). This area was one of the ten Bantustan homelands created under segregation laws of the former apartheid government of South Africa (Kepe 1997). The dominate livelihood of the amaXhosa people, the ethnic majority, is a combination of subsistence agriculture, local employment, remittances from industrial sectors, and government grants (Kepe 1997; Shackleton *et al.* 2013).

The Cape Vulture (*Gyps coprotheres*) is endemic to southern Africa and is listed as 'Vulnerable' under the IUCN and the South African Red Data Book (Anderson 2000; BirdLife International 2012). The global population is about 8,000-10,000 individuals and the regional population of Cape Vultures in the Eastern Cape Province is estimated at 2,000 individuals (Boshoff *et al.* 2009; BirdLife International 2013). It is the most common vulture in the study area, with only the Bearded (*Gypaetus barbatus*) and Egyptian (*Neophron percnopterus*) Vultures overlapping rarely (Mundy *et al.* 1992). The majority of active Cape Vulture sites in the Eastern Cape Province are within or near (< 50 km) communal farmland on inaccessible cliffs in river gorges (Piper 2005; Boshoff *et al.* 2009).

Carrion is more readily available in communal farming areas where livestock losses are higher than commercial farming areas (Mundy *et al.* 1992; Vernon 1998; Boshoff *et al.* 2009). Furthermore, carcasses contaminated with poison to eliminate livestock predators are scarcer in communal farmland than in commercial farming areas (Brown and Piper 1988; Boshoff et al. 2009). It is possible that poison may be too expensive for communal farmers to afford, but other social and cultural factors may influence this practice. However, knowledge on how communal farmers in the former Transkei manage livestock predators is unknown (Piper and Ruddle 1986).

Illegal poaching of vultures for traditional medicine is thought to be relatively high because of strong cultural traditions and limited access to Western medicine in the former Transkei (Cunningham and Zondi 1991b; Mander et al. 2007). Consuming vulture parts, specifically the head/brains, is thought to give the user clairvoyance powers (Cunningham and Zondi 1991b; Mundy et al. 1992; Mander et al. 2007). The sale of these parts is thought to fluctuate with major sporting events (i.e. World Cup) (Mander *et al.* 2007). Previous studies interviewed traditional healers and vulture part consumers, but little is known how African people in general perceive vultures (Beilis and Esterhuizen 2005; Mander et al. 2007).

Land use in the former Transkei was relatively unchanged until the democratic elections of 1994, when social grants were provided by the government and less need was placed on subsistence agriculture (Shackleton *et al.* 2013). Since the 1990s, fields have been abandoned and the population has moved toward crowded towns (Vernon 1998; Shackleton *et al.* 2013). Despite land uses changing relatively rapidly in the former Transkei, little is known how vulture populations have been effected (Vernon 1998; DEDEAT 2012).

Thus the aim of this study was to determine how communal land communities within the foraging range of the Msikaba Cape Vulture colony perceive vultures and threats to them.

Residents of highly transformed areas may not be as closely associated with the residents of low or moderately transformed areas. We expected that vultures in the former Transkei would have access to abundant livestock carcasses because of high livestock mortality, carcasses would be relatively safe from limited use of poison as predator control, and use of vulture parts in traditional medicine would be high because of strong cultural traditions (Brown and Piper 1988; Cunningham and Zondi 1991b; Vernon 1998). Participants of the interviews were identified using two approaches: 1) Attending community events (n = 104) and 2) Random door-to-door interviews near active Cape Vulture roosts (n = 98) (Fig. 1). In general, residents of these rural communities are more comfortable interacting in groups than individually (pers. Obs.). Effort was made to engage community members at tribal and municipal meetings, church services, and after-school programs. Since residents near active roosts are location specific, interviews were done opportunistically in those locations with individuals.

Methods

Study Area

The Msikaba Cape Vulture colony (31°16'S, 29°59'E 200 m asl) is one of the largest colonies in the former Transkei, and is located in Mkambati Nature Reserve (MNR;(Boshoff and Minnie 2011). It is the closest colony to the ocean at 2 km in the world (Mundy *et al.* 1992). MNR is a provincial reserve managed by the Eastern Cape Parks and Tourism Agency (ECPTA) in collaboration with the Mkambati Land Trust (Fig. 1). The majority of the Cape Vulture nests are located on southwest facing cliffs of the Msikaba River gorge inside MNR. During the Cape Vulture breeding season (May – October), a breeding adult vulture's daily foraging range was calculated as 40-150 km from the colony (Ruxton and Houston 2002;

Boshoff and Minnie 2011). Consequently interviews were conducted within this range, which covers an area of 11,310 km^2.

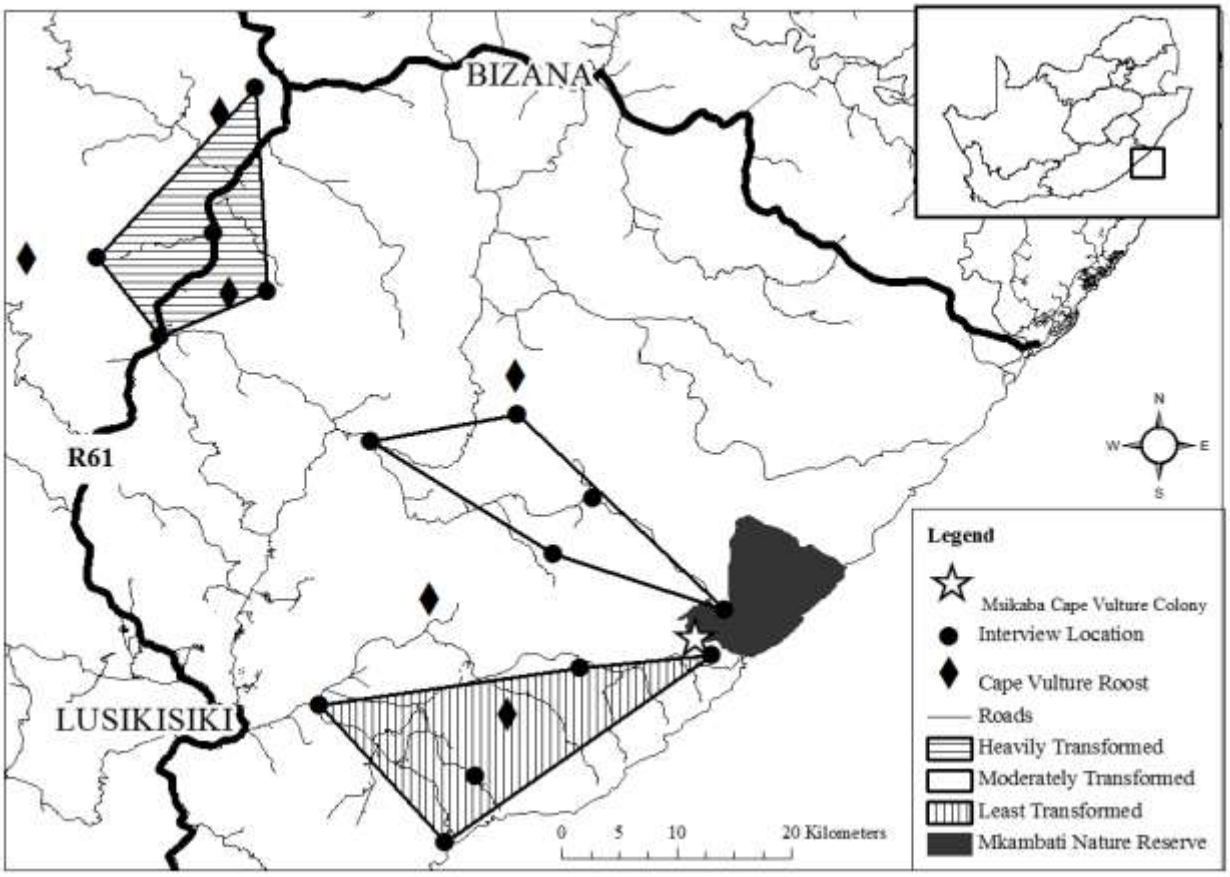

Figure 1. Locations of communities in which interviews were conducted in the Eastern Cape Province, South Africa. All interview locations were within the vulture's foraging range of the Msikaba Cape Vulture colony, which is situated on the south border of the Mkambati Nature Reserve (MNR).

The 15 villages surveyed were categorised into three areas: least transformed, moderately transformed, and most transformed (Vernon 1998; Beinart 2009). All but one village (KwaMbimba) were part of the Ngquza Hill municipality. KwaMbimba is part of the Ntabankulu municipality (Fig. 1). According to the 2011 census, the population in the Ngquza Hill municipality was 278,481 and 92% of households were located in tribal land (Statistics South Africa 2011a, b). The population of the Ntabankulu municipality was 123,976 and 95% of households were located in tribal land (Statistics South Africa 2011a, b).

The Ngquza Hill and Ntabankulu municipalities have unemployment rates of 52% and 51% respectively, which ranks them as the 9th and 10th (out of 234) municipalities with the highest unemployed populations in South Africa (Statistics South Africa 2011d).

Each region (least transformed, moderately transformed, and most transformed) differed in land cover. Connecting all interview locations with a Minimum Convex Polygon (MCP), there were differences in the amount of natural land cover. Land cover in the heavily transformed area contained the least natural land (38%). Natural land covered 63% of the communities in the moderately transformed MCP. The least transformed area communities contained the most natural land cover (81%). Interestingly, the least transformed area had the smallest percent of cultivated, degraded and plantation land cover compared to the other two regions, although not significant (Fig.1).

Questionnaire Survey

A questionnaire covering livestock ownership, carcass management, and perceptions of Cape Vultures was drafted based on Fink (2009) which consisted of mainly open-ended questions. An estimate of food availability in terms of available carcasses was ascertained by livestock ownership trends in combination with livestock carcass management. Safety of the Cape Vulture's food source was assessed by the extent of poisoned carcasses reported by participates. Perceived trends in the local vulture population were determined by comparing number of Cape Vultures observed over a 10 year period.

All interviews were done with the participation of the respondents. The survey had University of KwaZulu-Natal (UKZN) ethical clearance, which complies with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008 (Protocol number HSS/0947/012M). The local Traditional Authority gave their permission to conduct the

research before entering the communities. Interviews were conducted from June 2012 to January 2013. The three interviewers were isiXhosa speaking undergraduate students from the School of Life Sciences, UKZN. Each interview was conducted in isiXhosa and recorded in English. Photographs of the Cape Vulture were used to aid the respondent's identification of the species. The word for Cape Vulture is different between villages (Idlanga or Ixhalanga); effort was made to use the correct colloquial word.

Statistical analyses

Chi-square (χ^2) tests were used to determine differences in resident's responses in relation to land use within the vulture's foraging range. It was expected that there would be significant differences (*P*-values < 0.05) in the frequency of participant's responses across the natural land cover scale. Residents of least transformed areas were expected to answer differently than residents in more developed areas. Areas with more natural land cover may create a buffer against anthropogenic pressures facing foraging vultures. All statistics were performed in Statistica (StatSoft 2006).

Results

Demographics of respondents

A total of 202 qualitative interviews were conducted with community members within the foraging range of the Msikaba Cape Vulture colony (Table 1). Respondents varied in age with 25 (12%) 14-20 years old, 89 (44%) 21-40 years old, 67 (33%) 41-60 years old and only 21 (10%) older than 60 years. Average number of dependents per household was 5.2 ± 0.33 (SD) people. A total of 110 respondents (54%) were unemployed or earned a living through subsistence farming. The remaining 92 (46%) were employed in other sectors or were studying.

Table 1. Demographics of respondents of community interviews on livestock management and perceptions of Cape Vultures near the Msikaba Cape Vulture colony in the Eastern Cape Province.

	Percent
Gender	
Male	54
Female	46
Martial Status	
Single	53
Married	46
Age Profile	
14-20 years	12
21-40 years	44
41-60ears	33
>60 years	10
Number of Dependents	
0-1	55
2-5	45
6-10	68
>10	21
Occupation	
Unemployed/subsistence farming	54
Employed and/or studying	45

Livestock ownership trends in relation to Cape Vulture numbers

A total of 123 participants (65%) perceived that local livestock ownership had decreased in the past ten years. Perceptions were dependent on land use (χ^2 = 22.27, df = 8, *P* = 0.004). Respondents of the moderately transformed communities perceived the greatest reductions in local livestock ownership over the past ten years. Residents of the least transformed communities perceived the smallest reductions in livestock ownership over the past ten years (Fig. 2).

A similar trend was witnessed with observations of Cape Vultures (Fig. 2). Residents of the moderately transformed areas perceived the greatest reductions in the local Cape Vulture population, in contrast the least transformed areas perceived the least reductions, however this was not significant (χ^2 = 10.37, df = 8, *P* = 0.24). In general, the majority of respondents (74%, n = 136) observed that local vulture populations were stable or increasing.

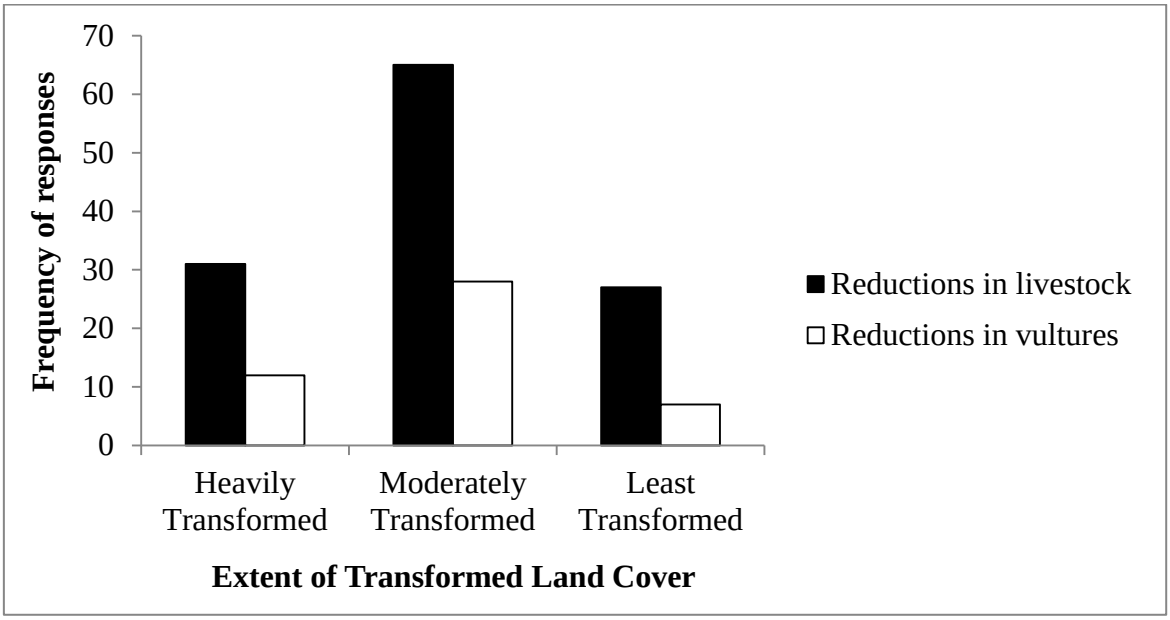

Figure 2. Perceptions of local livestock ownership and Cape Vulture population trends by community members in the Eastern Cape Province, South Africa.

High livestock mortality rates because of tick borne diseases (gall sickness and red water) were considered the main reason for declines in ownership by 62 respondents (31%).

Changes in livelihoods and traditions were reasons for a decline in livestock ownership by 42 (21%) respondents. Respondents stated that 'youth are not interested in livestock'. Use in business transactions and food security were considered the greatest benefits to owning livestock.

Safety of carcasses for vultures

A total of 114 respondents (56%) stated they had livestock killed by predators, namely Black-backed Jackal (*Canis mesomelas*). However, none of the respondents indicated that they used poisoned carcasses to kill livestock predators. Instead, respondents would rather 'hunt the predator with dogs' and 'fence livestock at night'.

Management of deceased livestock

A total of 105 respondents (52%) had livestock 'naturally/accidentally' die in the last five years. Arrangement of livestock carcasses was found to be random throughout different land uses, as there was no association with dead livestock and extent of transformed land cover ($\chi^2 = 1.04$, df = 5, $P = 0.96$).

Of cattle that died from natural causes, 80 respondents (40%) perceived that the carcass was made available to Cape Vultures by 'throwing it away'. 19 respondents (9%) stated that cattle carcasses were specifically left for Cape Vultures. If a horse or a donkey died, 98 respondents (49%) perceived that the carcass was made available to vultures. 26 respondents (13%) stated that horse and donkey carcasses were specifically left for Cape Vultures. Extent of transformed land had no effect on availability of horse or donkey carcasses ($\chi^2 = 1.98$, df = 5, $P = 0.85$) or cattle carcasses ($\chi^2 = 4.46$, df = 5, $P = 0.48$). Throughout all the villages, management of livestock carcasses was found to be a community made decision rather than the individual farmer's (pers. obs.).

When questioned about what animals consume livestock carcasses, 166 respondents (82%) mentioned Cape Vultures. 117 respondents (58%) observed vultures feeding on horses, while only 71 respondents (35%) observed vultures feeding on cattle. There was an association between respondents who observed Cape Vultures feeding on cattle or horses carcasses and extent of transformed land ($\chi^2 = 12.61$, df = 5, $P = 0.03$). More cattle carcasses were reported consumed by Cape Vultures in the least transformed areas (Fig. 3). Residents of the heavily transformed land observed the smallest number of cattle carcasses consumed by Cape Vultures. The opposite trend was found with horse carcasses in relation to extent of transformed land cover.

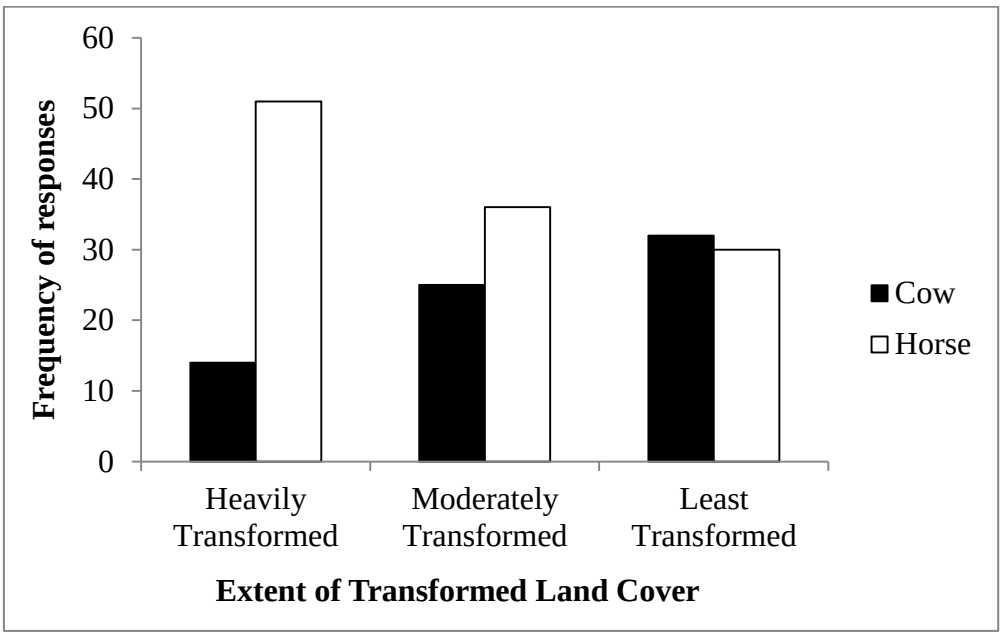

Figure 3. Type of livestock carcasses Cape Vultures consumed reported by community members of the Eastern Cape Province, South Africa.

Community perceptions on Cape Vultures and its threats

129 respondents (64%) were afraid of Cape Vultures because of their aggressive nature while feeding. 66% (n = 134) did not know or chose not to answer the targeted questions about threats to vultures. Only 15 respondents (7%) cited poisoning as the cause of a vulture's death or acknowledged a poisoning incident (observed a dead dog next to a dead

horse). Vulture mortalities from electrocution and collision with power lines were cited less than 1% (n = 2).

The most cited cause for a vulture's death was illegal poaching for traditional medicine by 62 respondents (31%). Shooting of vultures was considered the preferred method by 74%, followed by setting traps and using dogs at 3%. None of the respondents mentioned poisoning as a method to obtain vulture for traditional medicine. Some respondents stated that vultures were difficult to catch. Young boys were found to illegally kill vultures with rocks and slingshots. It was unsure if children were killing vultures for profit. Acknowledgment of illegal poaching of vultures was not found to be dependent of extent of transformed land (χ^2= 5.46 df = 5 P = 0.36).

Despite this pressure, 135 respondents (67%) acknowledged that vultures benefit the local community. Respondents called the vultures their 'free municipality' that are 'good for pointing out dead livestock and tourism'. Positive community perceptions on vultures were not found to be associated with extent of transformed land (χ^2 = 3.38, df = 5, P = 0.64). Although, negative views were held by the minority, these respondents stated that vultures 'prevent nutrients from entering the soil, kill livestock, dogs clean up so no use for them, and that they are just birds.' 41 respondents (20%) thought of nothing when they see a vulture (Fig. 4).

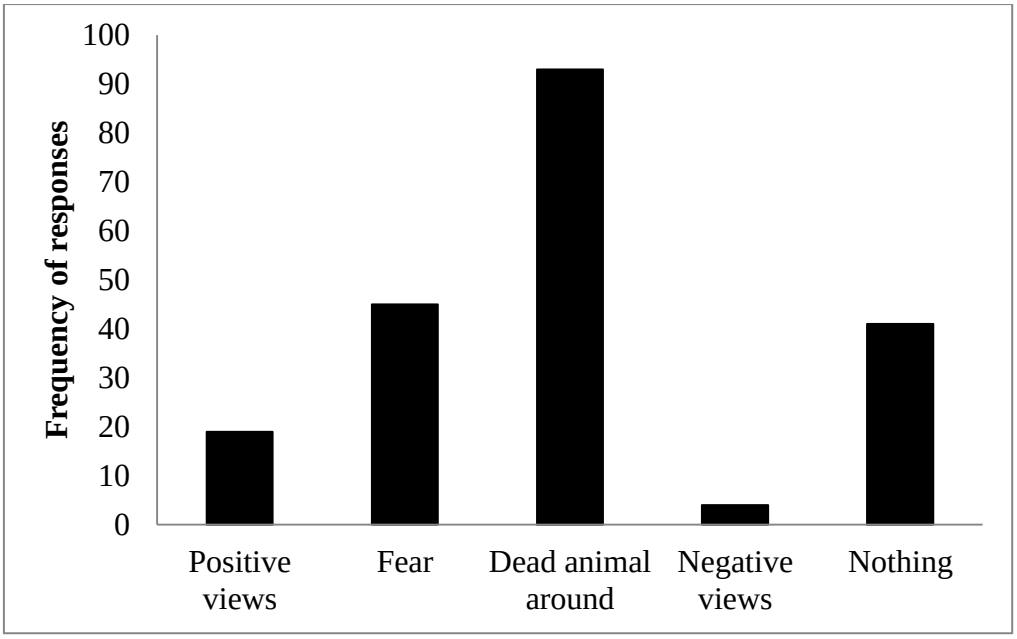

Figure 4. First impressions of Cape Vultures perceived by community members of the Eastern Cape Province, South Africa.

Discussion

Livestock ownership trends and vulture observations

Our results suggest that livestock ownership in the former Transkei is perceived to have decreased over the past ten years, coinciding with the conclusions of other studies (Vernon 1998; Shackleton *et al.* 2013). However, this decrease is not thought to be uniform across the landscape (Ainslie 2002; Ntshona and Turner 2002; Hajdu 2009; Vetter and Bond 2012). The current study found that the landscape with the least transformed land cover observed the smallest reductions in livestock ownership over the past 10 years. Since domestic livestock is considered the main food source for Cape Vultures in the former Transkei (Boshoff and Vernon 1980; Vernon 1998), availability of livestock may influence their populations.

Residents in the moderately transformed area perceived the greatest reductions in livestock ownership. Although land use differed between the heavily and moderately

transformed areas, the moderately transformed area had the highest human density of 18.5 homesteads/km^2 calculated from 2006 aerial photographs. This area may be a remnant of one of the 'betterment' programs in which families were forced into planned developments (Shackleton *et al.* 2013). The presence of the Holy Cross Mission church, one of the largest in the former Transkei, located in this area may have accelerated these programs (pers. obs.). In these areas, livelihoods have changed from subsistence agriculture to social grants and wage labour which may have decreased the amount of carrion available in addition to an anthropogenic buffer for foraging vultures (Vernon 1998; Hajdu 2009; Shackleton *et al.* 2013).

Safety of carcasses for vultures

The importance of non-contaminated carcasses for vulture survival has been highlighted in several studies (Chaudhry et al. 2012; Prakash et al. 2012; Margalida et al. 2013; Monadjem et al. 2013b). In the current study, it appears that poisoned carcasses are not a common practice for predator management or obtaining vultures for traditional medicine. Effects of poison on vulture populations can be devastating because they often die in large groups in Africa (Brown and Piper 1988; Mundy et al. 1992; Ogada et al. 2012a; Beaver 2013) and Europe (Margalida 2012). Although 15 respondents acknowledged seeing a poisoning incident, this was lower compared to 36 commercial farmers (34%) in the Drakensberg area of South Africa who used poison (Brown and Piper 1988).

However, due to stricter laws regarding the use of poison in addition to a reduction in small stock farming in the Drakensberg, only 14 commercial farmers (6%) near Lesotho admitted to using poison in a recent study (Hiltunen 2009). The commercial farmers who admitted to using poison responded via a postal survey, which are known to reveal few truthful answers about illegal activities (Hiltunen 2009). Although exact numbers of

commercial or communal farmers who use poison is difficult to obtain, it is possible that poisoned carcasses are less common in communal land than commercial farming areas.

Management of dead livestock

Tick-borne diseases (gall sickness and red water) were considered the main causes for livestock mortality in the study area. These diseases have caused livestock mortality in the former Transkei for a number of years (Villiers and Costello 2006; Beinart 2009). Although traditional methods exist to treat some of these diseases (Cunningham and Zondi 1991a), most subsistence farmers rely on government supplied services, which has been slack in recent years (Kepe 2002; Beinart 2009; Shackleton *et al.* 2013).

A percentage of livestock that died naturally was perceived to be made available to Cape Vulture. Amount of cattle carcasses available out of 9,000 regionally owned cattle (Ainslie 2002) would be 168,480 kg a year in the study area, which can support 337 breeding Cape Vulture pairs each consuming 500 kg (Mundy *et al.* 1992). This is higher than previously estimated of 81,000 kg a year for all types of carrion which can support 162 Cape Vulture breeding pairs (Vernon 1998; Ainslie 2002). Although the Msikaba Cape Vulture colony currently only supports 175 breeding pairs , factoring in the neighboring colonies of Tembukazi (120 pairs) and Ngozi (72), which would overlap with Msikaba's foraging range, the number of breeding pairs adds up to over 350 (Botha *et al.* 2012) .

As most Xhosa communities share meat resources (Ainslie 2002), management of livestock carcasses was found to be a community made decision (pers. obs). Horse meat is not traditionally eaten in South Africa (Katz 2003). Hence horse carcasses were 'thrown away' more so than cattle for vultures to feed upon. A common practice with dead livestock was to move it away from homesteads to an open field, or in other terms an 'informal vulture restaurant' (pers. obs.). In the Ngqwuza Hill municipality, the majority of residents (74.5%)

have their own refuse dump or no rubbish disposal at all (18.4%), which suggests that discarded meat is available to vultures and other scavengers (Statistics South Africa 2011c). Despite the presence of 'informal vulture restaurants', communal livestock carcasses can be considered unpredictable, as there were no trends associated with dead livestock and land use.

Observations of livestock carcasses consumed by Cape Vultures differed among land uses. The least transformed area is traditional communal grazing land used since pre-colonial time by the AmaPondo people (Beinart 2009). Residents from other villages herd their cattle to the least transformed area when conditions are harsh (Beinart 2009). Cattle density is likely higher in the least transformed area because of the extent of communal grazing land. Horses may be more plentiful in transformed areas (for use in organized horse races) and are perhaps hit and killed by cars more frequently, hence more horse carcasses were observed in the heavily transformed area (pers. obs.).

Community perceptions on Cape Vultures and its threats

In the current study, the majority of respondents (67%) stated that vultures benefitted the local community. Vultures were called a 'free municipality' by some respondents, suggesting a beneficial relationship between the communities and the vultures. Negative views of vultures were in the minority, but probably originated from ignorance or fear rather than hatred. This is illustrated by the amount of respondents that stated they think of 'nothing' or are 'fearful' when they see a vulture. In contrast, 29 South African commercial farmers (28%) who had negative views of vultures considered the birds to be harmful to their farming operations (Brown and Piper 1988). The majority of respondents in both commercial and communal land perceived that Cape Vulture populations were stable or increasing (Brown and Piper 1988).

Perceived threats to Cape Vultures differed to the previous study (Brown and Piper 1988) in which the majority of commercial farmers cited poisoning, while illegal poaching of vultures was cited more by residents in communal land. Consuming vulture brains is believed to give the user clairvoyance powers in addition to relief from headaches and allergies (Cunningham and Zondi 1991b; Mundy et al. 1992; Beilis and Esterhuizen 2005; Mander et al. 2007). The total annual sale of vulture parts for traditional medicine in eastern South Africa was estimated at $115,512 (Mander *et al.* 2007).

It is difficult to obtain figures of illegally killed vultures, but the results from this study indicate that illegal poaching may be higher than previously estimated at 27 vultures (any species) a year for KwaZulu-Natal, Eastern Cape, and Lesotho (Mander *et al.* 2007). In the current study, the preferred method of obtaining vultures for traditional medicine was the use of firearms, which was much higher than a previous study with 41% of vultures harvested by shooting followed by the use of poison at 35% (Mander *et al.* 2007). In the current study, none of the respondents mentioned that poison was used to obtain vultures for traditional medicine. As the past study focused on traditional healers and vulture part consumers, the results from this study gives a general picture of how African people perceive vultures.

Two participants, who resided near a small vulture roost, stated they have eaten vulture meat, which has previously only been documented in West Africa with the consumption of Hooded Vultures (*Necrosyrtes monachus*) (Gbogbo and Awotwe-Pratt 2008). One participant stated that people targeting vultures for traditional medicine were from the neighbouring province, KwaZulu-Natal. The participant mentioned that the ‘foreigners’ were unsuccessful due to the unreachable locations of the vultures on the cliffs.

The current study reiterates that the threats facing African vulture species are diverse. Threats encountered by the Cape Vulture differ between regions in South Africa in terms of land use (communal vs. commercial farming) and ethnic group (Caucasian vs. AmaXhosa

farmers). It is important to acknowledge the differences in threats across the landscape in order to develop and build upon management plans for the Cape Vulture. Although the threats are diverse, the underlying themes are transformed landscapes and direct anthropogenic pressures. It will only be through the collaboration of different stakeholders that the survival of this species will persist.

Management implications

Areas with more natural land cover may create an anthropogenic buffer and carrion for foraging Cape Vultures in the former Transkei. Effort should be made to conserve natural areas and confine development to already transformed regions. Management of livestock carcasses on communal land was found to be a community made decision, educating community leaders about vulture-safe carcasses and benefits vultures provide the community would be effective conservation. The study suggests that illegal poaching may be more prevalent than previously estimated. Education programmes conducted in less transformed regions would be beneficial, as residents of these areas may see vulture more frequently. By working with the communities' appreciation of vultures, it is possible to expand on that theme and encourage community involvement in the conservation of the Cape Vulture.

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Appendix A. Sample interview used for community interviews on livestock management and perceptions of Cape Vultures near the Msikaba Cape Vulture colony in the Eastern Cape Province.

A. Age?
B. Gender?
    B.i. Are you married?
    B.ii. How many people do you support?
C. Occupation?
D. What village are you from?

Livestock Questions
1. Do you:
    a. Own animals b. Care for them
    c. Use to have them d. Other
2. What livestock do you have? 2.a. And how many of each?
3. Do you own more livestock now, 10 years ago, or is it the same?
If they had livestock 10 years ago,
4. What livestock did you have 10 years ago? 4.a. And how many of each?
5. What are the benefits of owning animals?

Other Livestock Questions
6. Are there more people who own livestock now than 10 years ago or is it the same?
6.a. How many more or less farmers are there? And why?
7. What has made your livestock ill in the last year?
8. What diseases have killed livestock since you have lived here?
9. What medicine have your given your livestock and how often?
10. If you have horses, do you give your horses anything to improve their performance?
11. How often do you dip your livestock?
12. What type of predators have killed your livestock?
13. How do you protect against predation of your livestock? Does anyone use poison?
14. Have your livestock ever died naturally in the last five years?
15. How did your livestock die?
16. What do you do with cows that naturally died?
17. What do you do with horses and donkeys that naturally died?
18. What animals eat the dead livestock?
19. Are there ever dead birds near the dead livestock? 19.a. What type of birds?

Vulture Questions
20. What do you think when you see a vulture (show picture)?
22. Are there any beliefs (good and bad) about vultures in this area?
21. Do vultures scare you? 21.a Why?
23. Where do you see vultures?
24. How many do you normally see?
25. What do you see them eat?
26. Have you ever found a dead vulture?
27. Do you see more vultures now, 10 years ago or is it the same? 27.a. If there is a difference, why are there more/less vultures?
28. How do you think vultures die?
29. Are vultures something that benefits the community? 29.a. Why?