

**Aspects of the use of vultures in traditional medicine in
KwaZulu-Natal, South Africa, and conservation implications**

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**Submitted in fulfilment of the academic requirements for the
degree of**

Doctor of Philosophy

in the Discipline of Ecological Sciences

School of Life Sciences

College of Agriculture, Engineering and Science

University of KwaZulu-Natal

Pietermaritzburg Campus

2022



**UNIVERSITY OF
KWAZULU-NATAL**

**INYUVESI
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ABSTRACT

Eighty percent of people in developing countries use traditional medicine either as a primary source of healthcare or as supplementary to western medicine. Traditional medicines are mainly derived from wild plants and animals. There has been a marked global increase in the use of animals and their body parts as ingredients in traditional medicine. The harvesting and use of wildlife resources in traditional medicine are largely unregulated and involve many species of conservation concern. This is true for African vultures, as evidence indicates that traditional medicine is responsible for 29% of African vulture mortalities. Currently, six out of seven vulture species in South Africa face a serious threat of extinction. The threatened species are listed under the Threatened or Protected Species regulations, which prohibit hunting and consumption. However, evidence suggests a long-standing use of vultures in traditional medicine in KwaZulu-Natal, South Africa, yet so much remains unknown about this practice. Understanding the belief system and the socio-economic dispositions underpinning the belief-based use of vultures will favour vulture conservation efforts in the province.

Research was undertaken with the aim of advancing the knowledge base regarding the use of vultures in traditional medicine in KwaZulu-Natal. Accordingly, the following objectives were established: 1) to assess human-vulture interactions in a dynamic ecosystem, 2) to evaluate the dynamics behind the illegal harvesting and trade of vultures and their body parts, 3) to investigate the ethnomedicinal use of vultures by traditional health practitioners and 4) report on the efficacy of religion as an alternative for traditional medicine use. The study involved local communities surrounding protected areas and specific groups such as hunters, *muthi* traders, and traditional healers. A mixed-methodology approach was adopted, and data were collected using questionnaire surveys, in-depth interviews, focus group discussions and observations. A total of 728 respondents

contributed to this study. Local people's perceptions towards vultures were predominantly positive. Respondents appreciated vultures for removing carcasses, thus keeping the environment clean. Results also demonstrated that hunting and wildlife consumption were common in the study areas, and that the hunting and use of vultures were a part of this. Vultures were harvested from protected areas and sold directly to traditional healers and also to *muthi* traders. Vultures were reportedly important in traditional medicine, but their harvesting was limited because it was perceived as a criminal activity, and the birds reportedly occurred in smaller numbers than before. In traditional medicine, seven vulture parts were used, but the head treated the majority (62%) of ailments reported. Seventy-one percent of the uses for vulture-based remedies were spiritual in nature. Religious practices such as church attendance, prayer and fasting, coupled with products like holy water, can provide relief from physical and psychological ailments. In this study, the role of religion in contributing positively to human health and well-being was underscored. Overall, results from this study can be instrumental in guiding efforts to improve vulture conservation in KwaZulu-Natal and other parts of South Africa.

PREFACE

The data presented in this thesis were collected in KwaZulu-Natal Province, South Africa, from March 2018 to December 2021. Field work was carried out while registered in the School of Life Sciences, University of KwaZulu-Natal, Pietermaritzburg, under the supervision of Prof Colleen T. Downs and co-supervisor, Dr S. A. Jeanetta Selier.


This thesis represents original work by the author and has not otherwise been submitted in any form for any degree or diploma to any University. Where use has been made of the work of others, due acknowledgements are provided in the text.



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January 2022

I certify that the above statement is correct, and as the candidate's main supervisor I have approved this thesis for submission.



.....

Prof Colleen T. Downs

Supervisor

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DECLARATION 1 – PLAGIARISM

I, Nomthandazo Samantha Manqele, declare that:

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DECLARATION 2 – PUBLICATIONS

DETAILS OF CONTRIBUTION TO PUBLICATIONS that form part and/or include research presented in this thesis.

Note: some of these publications have been submitted and are in review.

Publication 1 (Provisionally accepted to the Journal of Ornithology)

Mangele, N.S., Selier, S.A.J. Taylor, J. and Downs, C.T. Vulture perceptions in a socio-ecological system: A case study of three protected areas in KwaZulu-Natal, South Africa.

Author contributions:

All authors conceived the research idea. SAJS and CTD sought funding. NSM collected and analysed data and drafted the manuscript. SAJS, JT and CTD provided comments and revisions to the manuscript.

Publication 2 (Formatted for XXX)

Mangele, N.S., Selier, S.A.J. and Downs, C.T. Aspects of the illegal hunting and trade of vultures in northern KwaZulu-Natal, South Africa.

Author contributions:

All authors conceived the research idea. SAJS and CTD sought funding. NSM collected and analysed data and drafted the manuscript. SAJS and CTD provided comments and revisions to the manuscript.

Publication 3 (Submitted to Journal of Ornithology)

Mangele, N.S., Selier, S.A.J. and Downs, C.T. African traditional medicine and the ethnomedicinal use of vultures by traditional health practitioners of KwaZulu-Natal Province, South Africa.

Author contributions:

All authors conceived the study with input from the steering committee. NSM conducted data collection, data analysis and paper writing. CTD and SAJS provided supervision and paper revision. All authors read and approved the final manuscript.

Publication 4 (Formatted for African Journal of Religion, Philosophy and Culture)

Mangele, N.S., Selier, S.A.J. and Downs, C.T. Traditional medicine use and the case of religion as a viable alternative in KwaZulu-Natal, South Africa.

Author contributions:

All authors conceived the research idea. NSM collected and analysed data and drafted the manuscript. SAJS and CTD provided comments and revisions to the manuscript.

Signed:



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Nomthandazo S. Mangele

January 2022

ACKNOWLEDGEMENTS

I would like to extend my sincere gratitude to my supervisors, Prof Colleen Downs and Dr Jeanetta Selier, for their guidance and unwavering support throughout my PhD journey. I also thank all members of this research's steering committee (Dr T. Cunningham, Dr J. Taylor, S. McKean, M. Gerard and C. Kelly, for dedicating their time to guiding the course of this work and providing constructive input where needed.

This research was funded by the South African National Biodiversity Institute, to which I extend my sincere gratitude. I also thank the Wildlife Act and Ford Wildlife Foundation for providing additional financial support and transport, respectively.

To all the respondents who participated in this research, I thank you all for welcoming me into your homes and trusting me with your knowledge and experiences.

To my research team, Nontembiso, Xola, Mlungisi, Asekho, Lereko, Senzokuhle, Makhosi, Thokozani, Senzo and Sibangani, your hard work and dedication to this research is highly appreciated.

I am grateful to my dearest daughter, Khwezi, for being patient with *Mommie*. To my Mother, Nokuthula and my friends, Xolile and Fundiswa, thank you for being my cheering squad; I am thankful for all the support and endless words of encouragement. To everyone who contributed to the success of this work in any manner, thank you.

DEDICATION

I dedicate this work in memory of Mr Musa Khanyile, who nurtured my passion for Natural Resource Management. He created a home away from home on campus and cherished us as though we were his own children. He believed in us, which inspired us to believe in ourselves.

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CHAPTER ONE

Introduction

1.1 Consumptive uses of wild fauna

The management of natural resources has shifted considerably with changing power regimes over time (Brooks 2005; Cooney et al. 2018). In previous centuries natural resources were a prime representation of wealth, highly contested upon and often unfairly landed on the hands of the powerful minority at the expense of the rest of the people (Peters 2004). Although much remains the same especially with regards to the value of natural resources as they considerably underpin human development; today their management is shared amongst governments, the private sector and indigenous communities (Lindsey et al. 2013). Local people continue to rely on natural resources for their livelihoods (Bennett and Dearden 2014; Bennett et al. 2017; Cooney et al. 2018). One of the most prominent and widespread aspects of human reliance on nature is the consumptive use of wild fauna for food and medicines (Lee et al. 2020). Wildlife-based resources are important to marginalised people because they are readily available and often more accessible than non-wildlife-based alternatives (Kiffner et al. 2015). Human practices involving wildlife consumption and or use are fortified by cultural norms and traditional knowledge systems held by millions of communities spread across the world (Morsello et al. 2015).

The consumption of meat derived from wild animals is well established and has been consistently growing, particularly in Africa, Asia and Latin America (Wilkie et al. 2016; Nielsen et al. 2018; Lee et al. 2020). Meat derived from wildlife is termed bushmeat and according to Nasi et al. (2011), tons approximating six million of it, are harvested in the tropics annually, contributing billions of dollars to local economies. Bushmeat consumption is underpinned by complex socio-economic factors (Ceppi and Nielsen 2014; Cawthorn and Hoffman 2015). Many studies have

assessed the drivers of bushmeat consumption, mainly to elucidate the influence of poverty on the reported high demand (Lee et al. 2020). Evidence demonstrates that bushmeat consumption is prevalent in poor communities (Ceppi and Nielsen 2014; Luiselli et al. 2019; Lee et al. 2020); possibly contributing to food security and poverty alleviation (Kiffner et al. 2015; Nielsen et al. 2018). Multiple nutrients contained in bushmeat make its consumption important for improving and maintaining human health and well-being (Golden et al. 2011; Sarti et al. 2015). For rural people living at the margins of the economy with limited opportunities for income generation, selling bushmeat contributes to household incomes, according to Cawthon and Hoffman (2015). Rogan et al. (2018) have shown that unemployed men in southern Africa generate up to 40% of their total household income from bushmeat sales. Although bushmeat consumption can be an everyday occurrence, it has also been shown to increase during ceremonial events, such as the rite of passage, where large quantities of meat are consumed (Morsello et al. 2015; Lee et al. 2020). In most cases, culture represents one of the strongest motivations for bushmeat consumption (Morsello et al. 2015; Luiselli et al. 2019). Ceppi and Nielsen (2014) assert that the importance of bushmeat goes beyond the provision of protein, income and prestige, but also that other benefits emanate from bushmeat consumption, including harvesting animal body parts for use in folk healing practices.

1.2 Traditional medicine

According to the World Health Organisation (WHO) (2004), traditional medicine is “the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not, that are used to maintain health, as well as to prevent, diagnose, improve or treat physical and mental illnesses”. Traditional medicine has a long history

in disease management, dating even before the advent of western medicine (Abdullahi 2011). African Traditional Medicine, Chinese Traditional Medicine, Unani and Ayurveda are some of the most prominent traditional medicine systems today (Mukherjee et al. 2017; Ezekwesili-Ofili and Okaka 2019; Wang et al. 2021). These systems and other localised ones are reported to cater for most of the population in developing countries (Ezekwesili-Ofili and Okaka 2019). Traditional medicine is used by people of all ages in urban and rural areas for common and chronic diseases (Ezekwesili-Ofili and Okaka 2019). A key characteristic of traditional medicine is that it adopts a holistic approach to disease management. In diagnosis and treatment, various aspects are considered, including physical, psychological, and spiritual dimensions (Mukherjee et al. 2017). Levels of dependence on traditional medicine differ. Traditional medicine may be used to supplement modern healthcare (UNESCO 2013). In other cases, traditional medicine may be used instead of modern medicine (Mothibe and Sibanda 2019). Therefore, traditional medicine represents a comprehensive healthcare system that contributes considerably to primary healthcare delivery worldwide (Kamsu-Foguem et al. 2013).

Convenience in terms of availability, accessibility and acceptability is the main attribute upon which the importance of traditional medicine is premised against modern medicine (Anyinam 1987; James et al. 2018; Mothibe and Sibanda 2019). The role of traditional medicine is also recognised particularly in the context of limited access to modern healthcare services, especially for people living in remote rural areas (James et al. 2018). According to Ezekwesili-Ofili and Okaka (2019), traditional medicine is the first approach to treating ailments in rural Ghana. In addition, traditional medicines have been extensively used in the fight against diseases that have long burdened the world and healthcare systems, such as Malaria, Ebola and HIV/AIDS, in Africa (James et al. 2018). Some traditional health systems have been invaluable in the discovery and

development of new drugs (Adeleye et al. 2021). For its role in improving global healthcare coverage, traditional medicine has been recognised by the World Health Organisation, resulting in petitions for it to be formally incorporated into national healthcare systems, globally (De Roubaix 2016; Kasilo et al. 2019).

1.2.1 Zootherapy

Traditional medicine is predominantly underpinned by biological-based therapies, meaning it involves the use of herbs, minerals, and animal body parts as key ingredients in healing practices (James et al. 2018; Ezekwesili-Ofili and Okaka 2019). Plants are the most common and abundant ingredients in traditional medicine (Ezekwesili-Ofili and Okaka 2019). Several reports allude to the widespread use of wild animals as ingredients in traditional medicine (Alves et al. 2017; D’Cruze et al. 2020). Studies show that many animal species are revered for their perceived medicinal potency and magical powers (Pietersen et al. 2014; Izah and Seiyaboh 2018). These animals, their parts and byproducts form an integral component of traditional medicine in many cultures (Adeola 1992; Durojaye 2008). The branch of traditional medicine involving the use of wild animals is known as zootherapy. Williams et al. (2014) recorded about 306 wild bird species that were sold for traditional medicine in 25 African countries. Similarly, 204 vertebrate species in Brazil were reportedly used for the traditional treatment of 165 ailments (Alves et al. 2017). The selection of animals and their parts for use in traditional medicine is guided by their bioactive properties, behavioural ecology, and mythological beliefs and perceptions that people may hold about them (Durojaye 2008).

Resources for zootherapy are often provided through trade in open markets across major cities (Ajagun et al. 2017; D’Cruze et al. 2020). Traditional medicine markets are predominantly

furnished by indigenous resources, although some exotic species may occur (Alves et al. 2013; Ajagun et al. 2017). The trade in wildlife-based medicinal resources represents a significant source of income for those involved in it (Alves et al. 2013). However, this activity is mostly unregulated and involves many species already under the threat of extinction (Benítez-López et al. 2017; Izah and Seiyaboh 2018). Overharvesting can drive serious reductions in populations of target species causing overarching ecosystem-wide negative impacts. Large-sized, cultural keystone species are particularly vulnerable to overharvesting resulting from well-established uses within their cultural range (Pietersen et al. 2014; William et al. 2014). These species are often preferred owing to their high market value (Ajagun et al. 2017). Human consumption of wildlife has resulted in environmental, socio-economic and health crises (Anyinam 1995; van Vliet et al. 2017), and another notable negative implication is the loss of biodiversity (Anyinam 1995; Lee et al. 2020).

1.3 Vultures

Vultures are large-sized scavenging birds of the raptor guild. They are found in Asia, Africa, Europe, and North and South America (Buechley and Şekercioğlu 2016). These birds inhabit a diverse range of terrestrial habitats, including forests, mountains, savannas, and coastlands. Vultures are predominantly obligate scavengers and have diets consisting mainly of large to medium-sized vertebrate carrion (Buechley and Şekercioğlu 2016). There are 23 known species of vultures globally, which are divided into Old and New World vultures (Buechley and Şekercioğlu 2016). These birds are important in their environments as they provide ecosystem services such as carrion removal, which controls the spread of diseases from wildlife to domestic animals and humans and facilitates nutrient cycling (Buechley and Şekercioğlu 2016; Craig et al. 2018; Morales-Reyes et al. 2018). In addition, vultures have become important contributors to

local economies through ecotourism (Mullie et al. 2017; Garcia-Jimenez et al. 2021). A number of studies have been conducted to assess local people's perceptions of vultures (Craig et al. 2018; Mdhllano et al. 2018; Mashele et al. 2021). Such studies have been invaluable in demonstrating the level of awareness and the relationship people have with these birds across their range (Cortez-Avizanda et al. 2018). Findings show that local people are quite aware of vultures and appreciate the services they render in their immediate environments (Craig et al. 2018; Morales-Reyes et al. 2018; Mashele et al. 2021). The services most revered include carcass removal as well as livestock carcass location for herders (Craig et al. 2018; Morales-Reyes et al. 2018; Mashele et al. 2021).

Despite the widespread knowledge of the importance of vultures, these birds have sustained significant population declines, especially in Asia and Africa (Prakash et al. 2003; Naidoo et al. 2010; Ogada and Keesing 2010; Murn et al. 2013; Botha et al. 2017). This has made vultures the most threatened group of raptors worldwide (McClure et al. 2018). Asian vulture populations sustained significant declines, particularly from the early 1980s to the late 1990s (Prakash et al. 2003). This was caused by the non-steroidal anti-inflammatory drug (NSAID), diclofenac, which was widely used to treat livestock (Prakash et al. 2003). The banning of this substance arrested the unprecedented vulture population decline the region was experiencing (Prakash et al. 2012). The issue, however, is ongoing for African vultures as the widespread use of poison threatens most species. Poisoning is reportedly the major factor leading to vulture population declines in Africa presently (Ogada et al. 2012). Vultures are poisoned intentionally and unintentionally, and most of these incidents are often described as catastrophic (Groom et al. 2013; Ogada 2014). Intentional poisoning occurs when poachers lace carcasses with poison as bait for vultures (Botha et al. 2017; Monadjem et al. 2018). This is done to prevent these birds, which often circle high in the air above carcasses, from alerting field rangers of the poachers' illicit activities (Mdhllano et al. 2018). Poison

is also used as a hunting technique for vultures since they are considered difficult to catch using conventional hunting tools (Botha et al. 2017; Williams et al. 2021). Vultures also become unintended victims of human-wildlife conflict when they find and scavenge on poisoned baits laid for problem-causing animals (Ogada 2014). Moreover, lead exposure suspected to originate from the use of lead bullets in the wild has been shown to cause harm to vultures in southern Africa (Naidoo et al. 2017; Kruger and Amar 2018). Ogada et al. (2016) state that poison is responsible for 61% of African vulture mortalities.

Poison is not the only threat to vultures on the continent; habitat loss, food shortages, energy infrastructure, land-use change, and possibly climate change are responsible for a portion of vulture mortalities (Virani et al. 2011; Ogada et al. 2016; Botha et al. 2017). Notably, mounting evidence demonstrates that the long-standing traditional medicine and belief-based practices contribute considerably to the observed African vulture crisis (Buij et al. 2016). Vultures are perceived to possess special medicinal, magical and spiritual properties (Saidu and Buij 2018). Consequently, their body parts are harvested and sold in open markets and through clandestine pathways to be utilised in folk healing and belief-based practices (McKean et al. 2013; Ajagun et al. 2017; Saidu and Buij 2018). According to available data, the medicinal use of vultures is prevalent in West and southern Africa, where it has been ongoing for a long time (Cunningham and Zondi 1991; Adeola 1992; Hengari et al. 2004; McKean et al. 2013; Williams et al. 2014; Mashele et al. 2021; Williams et al. 2021). Evidence shows that in traditional medicine, vultures are perceived as having the ability to bestow luck, clairvoyant powers, and provide protection against evil spirits (Hengari et al. 2004; McKean et al. 2013; Mashele et al. 2021a,b; Williams et al. 2021). All species are utilised, and it is estimated that 29% of vulture mortalities in Africa are due to their use in traditional medicine (Ogada et al. 2016).

1.4 Study rationale

Presently, four out of seven vulture species occurring in South Africa are regionally listed as Critically Endangered (Table 1.1). Two species are categorised as Endangered, and one is listed as Least Concern (Allan 2015; Kruger 2015; SANBI 2015) (Table 1.1). Traditional medicine use is widespread and contributes to the illegal and unsustainable harvesting of vultures in parts of the country (McKean et al. 2013; Nieman et al. 2019; Mashele et al. 2021a,b). Cultural beliefs change over time; either they proliferate (Williams et al. 2021) or disintegrate (Craig et al. 2018). Given the present threatened status of vulture populations in the country, research into the broad human dimensions of vulture conservation could be of value to initiatives and policies aimed at halting the increasing anthropogenic threats to vultures, in particular their use in traditional medicine.

Table 1.1. Vulture species occurring in South Africa with their regional and global threat statuses.

| Vulture Species | | Status | |
|-----------------|------------------------------|--------------------|-----------------|
| Common name | Scientific name | Regional | Global |
| Hooded | <i>Necrosyrtes monachus</i> | CR ^a | CR ^e |
| White-backed | <i>Gyps africanus</i> | CR ^a | CR ^f |
| White-headed | <i>Aegypius occipitalis</i> | CR ^a | CR ^f |
| Cape | <i>Gyps coprotheres</i> | EN ^a | VU ^f |
| Lappet-faced | <i>Torgos tracheliotos</i> | EN ^a | EN ^f |
| Bearded | <i>Gypaetus barbatus</i> | CR ^b | NT ^f |
| Palm-nut | <i>Gypohierax angolensis</i> | LC ^{d, 1} | LC ^f |

1. Temporary reference a. Reference: (Allan 2015) b. Reference: (Kruger 2015) c. Reference: (SANBI 2015) d. Reference: (Birdlife International 2016) e. Reference: (Birdlife International 2017) f. Reference: (Birdlife International 2021). CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, and LC = Least Concern.

1.5 Aim and objectives

This research was undertaken with the aim to contribute insights into the formulation of initiatives and policies aimed at addressing the present African vulture crisis by probing into the less understood but prominent element of vulture conservation, which is their use in healing and belief-based practices of local people in the province of KwaZulu-Natal, South Africa. The following objectives and sub-objectives were addressed:

1.4.1. To undertake an assessment of local people's perceptions of vultures and conservation perspectives in a dynamic ecosystem.

The sub-objectives were:

- To ascertain the socio-economic attributes of local people that co-exist with vultures.
- To measure local people's awareness and familiarity with vultures
- To examine benefits and possible costs to local people arising from of co-existing with vultures.
- To identify human-induced direct and indirect threats to vultures.
- To gauge the level of support local people may exhibit for the protection of vultures.

1.4.2. To examine aspects of the illegal hunting and trade of vultures within the broader practice of traditional hunting.

The sub-objectives were:

- To assess traditional hunting practices and patterns.
- To evaluate the sourcing of vultures for trade.
- To illustrate the trade network structure and price distribution.
- Determine vulture conservation perspectives of hunters and traders.

1.4.3. To justify the use of vultures in healing and belief-based practices within the broader traditional healing system and narrate traditional health practitioner perspectives on using poisoned birds.

The sub-objectives were:

- To provide a broad description of traditional healing and its value.
- To examine the involvement of animals in healing practices.
- To determine vulture parts used in traditional medicine.
- To ascertain and categorise uses of vulture-derived remedies.
- To assess traditional health practitioners' knowledge of vulture poisoning and risk perspectives.

1.4.4. To assess factors that influence traditional medicine use with a special focus on the role of gambling and conduct an exploration of viable alternatives to the use of traditional medicine.

The sub-objectives were:

- To evaluate public traditional medicine use and its dynamics.
- To test the hypothesis that links vulture utilisation in traditional medicine with the increase in gambling practices.
- To describe vulture uses and conditions treated.
- To determine the viability of religion as an alternative for traditional medicine, using a case study of the Nazareth Baptist Church.

1.6 Thesis structure

This thesis consists of six chapters, four of which are formatted as manuscripts for submission to relevant international peer-reviewed journals. The first chapter represents the literature review of

the concepts pertinent to this research. The last chapter (Chapter six) provides a summary of the research findings and recommendations. The remaining chapters, two, three, four and five, are data chapters addressing the main research questions and are summarised as follows:

Chapter 2: Vulture perceptions in a socio-ecological system: A case study of three protected areas in KwaZulu-Natal, South Africa.

A study was conducted to assess public perceptions about vultures in a dynamic ecosystem. We probed into concepts of awareness, beliefs, threats and conservation perspectives. The key aim of this study was to generate information on the relationship between local people and vultures to aid in improving vulture conservation efforts in the areas studied.

Chapter 3: Aspects of the illegal hunting and trade of vultures in northern KwaZulu-Natal, South Africa.

Hunting as a prevailing cultural activity in rural communities of KwaZulu-Natal was investigated. This study further assessed the dynamics of the illegal sourcing and sale of vultures for use in traditional medicine practices. Northern KwaZulu-Natal local hunters and *muthi* traders stationed at Mona market were interviewed for this study. This study's results aim to provide insights to help guide the law enforcement component of vulture conservation.

Chapter 4: African traditional medicine and the ethnomedicinal use of vultures by traditional health practitioners of KwaZulu-Natal, South Africa.

This study evaluated aspects of traditional healing through the perspective of traditional health practitioners. In addition, the use of vultures and their body parts as ingredients in traditional remedies was investigated. Results were quantified to identify the most used parts, ailments they treated and the level of consensus amongst healers regarding parts and ailments they were reported

to treat. The types of ailments for which vultures were used in traditional medicine were determined.

Chapter 5: Traditional medicine use, the gambling hypothesis and the case of religion as a viable alternative to traditional medicine in KwaZulu-Natal, South Africa.

This study investigated the use of traditional medicine, its prevalence and factors that influence reliance, such as gender, age, occupation and religion. In addition, a hypothesis that linked the reported increased use of vultures in traditional medicine with gambling was tested. Lastly, in this research study, religion was explored as an alternative to the use of traditional medicine.

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CHAPTER TWO

Vulture perceptions in a socio-ecological system: A case study of three protected areas in KwaZulu-Natal, South Africa

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Running header: Human-vulture interactions in communities adjacent to protected areas

2.1 Abstract

Vultures are currently the most threatened raptor guild in the world. Threats to vultures are numerous and mainly anthropogenic. Understanding the relationship between human communities and threatened species can guide and strengthen conservation initiatives. We assessed the awareness, benefits, beliefs, threats, and conservation perspectives of people surrounding protected areas accommodating the few remaining vulture strongholds in KwaZulu-Natal, South Africa. We conducted a total of 450 semi-structured interviews and seven focus group discussions. Respondents demonstrated a strong awareness of vultures and reportedly derived benefits from having these avian scavengers in their localities. The most cited benefit (65%) was carrion removal. A predominant belief amongst local people was that vultures are potent in traditional medicine (66%); this was regarded by the majority of respondents (79%) as the main driver for the illegal killing of vultures. Most participants (84%) viewed vulture populations to have declined. Overall, local people demonstrated complex but predominantly positive perceptions toward vultures. Mounting evidence of the use of vultures in traditional medicine compels urgent action. We recommend co-learning based engagements between resource users and conservation scientists.

Keywords: Local Ecological Knowledge; Awareness; Traditional medicine; Threatened species conservation; Ecosystem services

2.2 Introduction

Populations of old-world vultures have undergone dramatic declines in recent decades owing to multiple environmental and anthropogenic threats (Prakash et al. 2003; Ogada et al. 2012; Botha et al. 2017; McClure et al. 2018; Safford et al. 2019). Threats to vultures worldwide include land-use change, food shortages, direct hunting, poisoning, energy infrastructure, and possibly climate change (Virani et al. 2011; Odino et al. 2014; Pomeroy et al. 2015; Botha et al. 2017; Safford et al. 2019). In sub-Saharan Africa, home to eight vulture species, both intentional and unintentional poisoning incidents have been chiefly responsible for most vulture mortalities within the past three decades (Kruger et al. 2015; Botha et al. 2017; Monadjem et al. 2018). In parts of Africa, vultures have been found poisoned, with body parts removed, in particular their heads and feet, and evidence links this to their use in belief-based practices (McKean et al. 2013; Mashele et al. 2021a,b). The ethnomedicinal consumption of vultures is reportedly well-established in South Africa (McKean et al. 2013; Williams et al. 2014; Pfeiffer et al. 2015; Botha et al. 2017). A recent study has indicated that African traditional healers use up to 800 vultures annually, within the Kruger to Canyons Biosphere Reserve (Mashele et al. 2021b), which covers an area of about 20 000 km² (Coetzer et al. 2010).

Protected areas play a major role as refugia for vultures (Morales-Reyes et al. 2015), but these avian scavengers are wide-ranging, and their activities cover vast areas, including those unprotected, where their vulnerability to mortality is often heightened (Kruger et al. 2015; Oliva-Vidal et al. 2022). For example, communal and agricultural lands attract vultures by providing food in the form of livestock and ungulate carcasses (Pfeiffer et al. 2015; Delgado-Gonzalez et al. 2022). Addressing anthropogenic threats and mortality risks to vultures solely from a protected area standpoint may be ineffective, as vultures cannot be physically confined within the boundaries

of protected areas (Kane et al. 2022). Mashele et al. (2021b) reported that vultures used by traditional health practitioners in Kruger to Canyons Biosphere Reserve were sourced from protected areas and communal rangelands. This therefore highlights the importance of considering relationships between local communities and vultures if threats to these species are to be reduced. In addition, evaluating psycho-social dynamics that directly and indirectly affect vulture conservation can help strengthen the effectiveness of conservation initiatives such as the Vulture Safe Zones framework that has recently been adopted in southern Africa (Endangered Wildlife Trust 2021; Whittington 2022).

Research concerning human-vulture relations provides a rich and unique perspective that is supplementary to ecological vulture conservation strategies (Morales-Reyes et al. 2018; Garcia-Jimenez et al. 2022). However, such research is seriously lacking in the context of South Africa but see (Pfeiffer et al. 2015; Mashele et al. 2021a), particularly in KwaZulu-Natal although this province hosts a relatively high diversity of vulture species occurring in the country (Rushworth et al. 2007; McKean et al. 2013; Kruger et al. 2015; Rushworth et al. 2018). Social sciences provide tools for assessing human dimensions of environmental phenomena (Bennett et al. 2017). Through this multidisciplinary approach, scholars in the field of environmental science have been able to ascertain how local people perceive and adapt to environmental changes (Below et al. 2015). But more importantly, studies of human perceptions, attitudes, beliefs and knowledge have a way of revealing existing and potential threats to species as well as opportunities for improving the conservation of threatened species (Bennett 2016; Nash et al. 2016; Cailly-Arnulphi et al. 2017; Thondhlana and Cundill 2017). Our study investigated the awareness, benefits, beliefs, threats and conservation perspectives of people residing adjacent to three protected areas, housing the remaining vulture strongholds in KwaZulu-Natal, South Africa.

2.3 Methods

2.3.1 Study sites

The present study involved communities bordering three protected areas, in KwaZulu-Natal, namely Giant's Castle Game Reserve, Hluhluwe-iMfolozi Park (HiP) and Mkhuze Game Reserve (Fig 2.1).

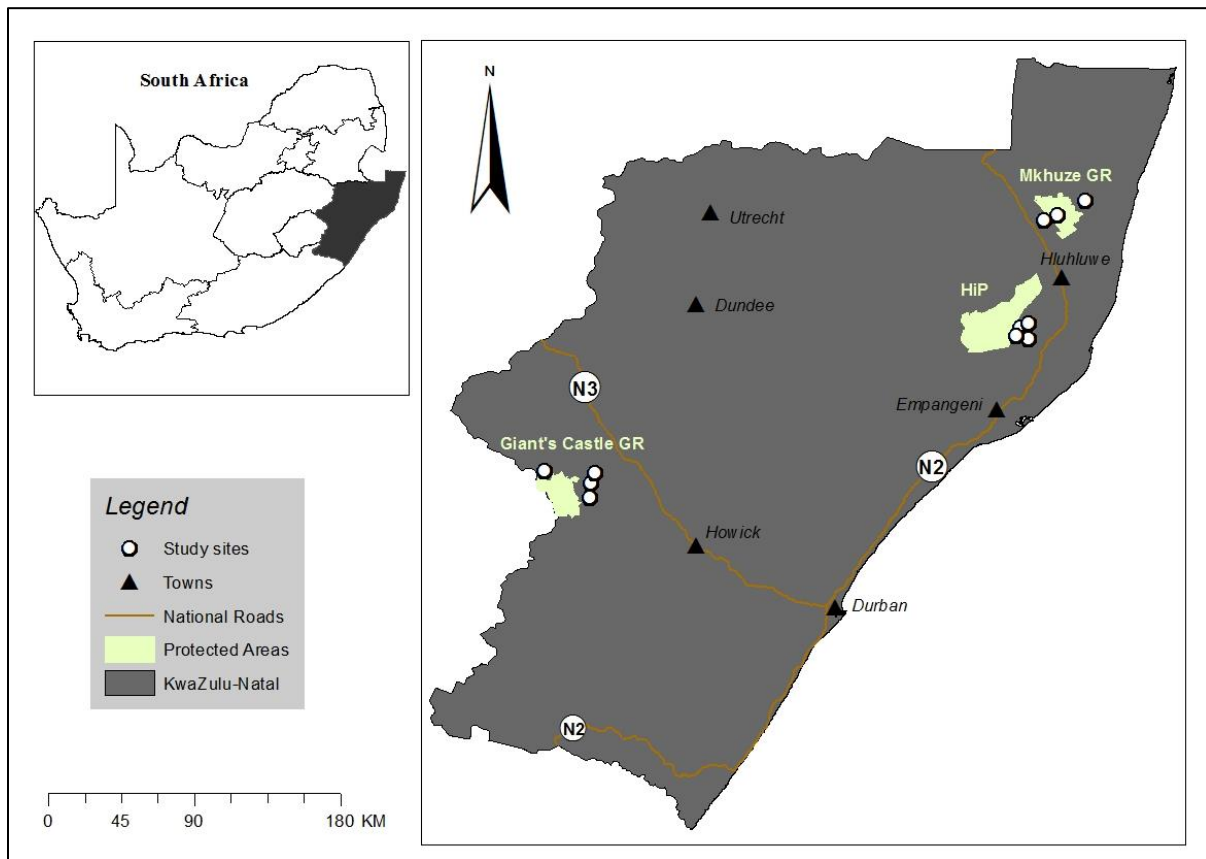


Fig. 2.1 Map showing study sites adjacent to three protected areas in KwaZulu-Natal, South Africa.

Giant's Castle is within Maloti Drakensberg Park (MDP), a World Heritage Site situated on the western boundary of KwaZulu-Natal, forming the border between South Africa and Lesotho

(Fig. 1). Giant's Castle is home to the Bearded (*Gypaetus barbatus*) and Cape (*Gyps coprotheres*) Vultures. Both are cliff-nesting species that have suffered dramatic population declines. The species have lost large proportions of their home ranges as anthropogenic land uses expanded over time (Brown 1991; Kruger et al. 2015). Bearded and Cape Vultures are globally listed as Vulnerable and Near-Threatened, respectively (Birdlife International 2021a, b). Notably, there is a sharp contrast between the global and regional status of the Bearded Vulture, as this bird is listed as Critically Endangered in southern Africa (Kruger 2015).

Mkhuze and HiP are located in uMkhanyakude District Municipality, north of KwaZulu-Natal. This area supports the majority of tree-nesting vulture species remaining in the province (Rushworth et al. 2018), the Lappet-faced Vulture (*Torgos tracheliotos*), globally listed as Endangered as well as the White-backed (*Gyps africanus*) and White-headed (*Aegypius occipitalis*) Vultures, both listed as Critically Endangered (BirdLife International, 2021c, d, e). The three protected areas are surrounded by isiZulu-speaking communities of Nguni descent, whose livelihoods are predominantly centred around agro-pastoralism. Conservation, tourism, agriculture and trade are other economic activities, and sources of employment common in the areas studied (Nsukwini and Bob 2016).

2.3.2 Data collection and analyses

The communities included in this study were located within 15 km of the reference protected areas (Fig. 2.1). Data were collected between May and August 2019 through household interviews coupled with focus group discussions (FGD). Approval of the ethical appropriacy of the research instrument was granted by the University of KwaZulu-Natal, Ethics committee (Reference: HSS/1089/108D). Permission to conduct research was sourced from the respective traditional

authorities in each study area. The research team spent a maximum of 10 days in each study area, during which further analyses of the sites, participation in local events and pilot studies were conducted. The pilot study outcomes helped rephrase some questions and remove those that were considered sensitive such as the level of education. We observed that some participants would suggest that they could not participate in the study because they either never went to school or had low educational attainment. To proceed, we explained that the purpose of the study was to solicit experience-based knowledge.

We followed a simple random sampling technique (Cohen et al. 2017), where every second closest household was selected. This is because rural settlements do not always follow a linear structure. The interviews were semi-structured, and the guide consisted of closed and open-ended questions (Dawson 2007; Supplementary information Table S2.1). The interviews were conducted in isiZulu, mostly at the homesteads of the participants and in the company of trained local research assistants. Interviews lasted between 15 and 45 min. Verbal consent was obtained from each study participant before the interviews were administered. Only participants 18 years and older were invited to participate, and both gender groups were incorporated.

A total of 450 household interviews and seven focus group discussions were conducted. Data were supplemented with observations and informal conversations with key informants working in the conservation sector. The focus group discussions consisted of 12 to 14 members and were non-gender specific (Dawson 2007). Participants were recruited with the assistance of traditional authorities and local field assistants. We hosted seven groups in total, with discussions lasting up to 1.5 h. Besides socio-economic and demographic attributes, questions were mainly centred around familiarity with vultures, encounters, benefits, beliefs, threats and conservation perspectives. Data were captured and analysed using Excel© and the Statistical Package for the

Social Sciences© (SPSS). Analyses included descriptive statistics, regressions (i.e., ordinal and multinomial) and Chi-Squared tests of significance.

Of the 450 interviews, 430 (96%) qualified for analyses. The interviews that were excluded from the analyses (n = 20) were incomplete, and these mainly included interviews where the participant opted out before the interview was finalised, mainly because of other commitments.

2.4 Results

2.4.1 Study composition and respondents' demographic attributes

A summary of the sample composition, study participants' demographic, and socio-economic attributes is shown in Table 2.1. Fifty-six percent (n = 240) of the study participants were male, while 44% (n = 190) were female. The majority (30%, n = 127) of respondents were between the ages of 42 and 50 years, while those between the ages of 18 and 25 years constituted the smallest fraction of our sample (5%, n = 22). The unemployment rate within the study group was high (57%, n = 245). Other respondents were pensioners (20%, n = 85), self-employed individuals (7%, n = 28) and scholars (3%, n = 14).

Most households (52%, n = 198) were involved in agro-pastoralism (a combination of livestock and crop farming) (Table 2.1). They kept goats and cattle and produced beans, maize, a variety of vegetables, and cotton for subsistence. Livestock ownership and crop farming constituted 24% (n = 91) and 20% (n = 77) of the listed activities, respectively. Natural resource collection was less prevalent across all study sites (4%, n = 14). Resources collected were plant material for craft, firewood, wild fruits and bushmeat. All activities were small-scale and predominantly subsistence-based.

Table 2.1 Sample composition, demographic and socioeconomic attributes of the study participants.

| Region | | Maloti DP | Northern KwaZulu-Natal | | Total |
|-----------------------|------------------------|----------------|------------------------|------------------------|------------|
| Protected areas | | Giant's Castle | Mkhuze | Hluhluwe iMfolozi Park | |
| Number of respondents | | 139 (32%) | 188 (44%) | 103 (24%) | |
| Gender | Female | 62 | 74 | 54 | 190 |
| | Male | 77 | 115 | 48 | 240 |
| Total | | | | | 430 |
| Age | 18-25 | 7 | 11 | 4 | 22 |
| | 26-33 | 21 | 41 | 19 | 81 |
| | 34-41 | 29 | 49 | 30 | 108 |
| | 42-50 | 39 | 59 | 29 | 127 |
| | >50 | 43 | 29 | 20 | 92 |
| | Total | | | | 430 |
| | | | | | |
| Occupation | Employed | 16 | 26 | 16 | 58 |
| | Self-employed | 14 | 8 | 6 | 28 |
| | Scholar | 3 | 9 | 2 | 14 |
| | Pensioner | 38 | 29 | 18 | 85 |
| | Unemployed | 68 | 117 | 60 | 245 |
| | Total | | | | 430 |
| Livelihood activity | Agro-pastoralism | 59 | 91 | 48 | 198 |
| | Livestock ownership | 25 | 42 | 24 | 91 |
| | Crop farming | 33 | 31 | 13 | 77 |
| | Natural resource coll. | 4 | 6 | 4 | 14 |
| | Total | | | | 380 |

Note: Participants who were not engaged in any traditional livelihood activity during the study (13%, n = 58) were excluded from the summary table above. Participants who practised multiple activities (2%, n = 8) were included in the table and all activities listed were incorporated.

2.4.2 Local people's awareness and familiarity with vultures

The present study was conducted in two geographically distinct regions of Maloti Drakensberg Park and northern KwaZulu-Natal, with different vulture species occurring in them. Most participants (84%, n = 361) reported having encountered vultures within 12 months of the study. A standard-resolution image list was provided for respondents to identify the species they had seen. The list contained images of six vulture species, five resident, and one locally extinct (Supplementary Information Table S2.1). Respondents (89%, n = 320) accurately identified

species in relation to their local geographic distribution. Encounters were reflective of species' population densities. For example, respondents reported more sightings of White-backed (47%, n = 150) and Cape (40%, n = 128) Vultures in comparison with Bearded Vultures (2%, n = 6) (Fig. 2.2a). Vulture awareness among the participants was strong (95%, n = 408), albeit at different levels (Fig. 2.2b). To gauge awareness and assign scales, we considered responses to encounter, species encountered, site of encounter and activity of the species during an encounter (Fig. 2.3).

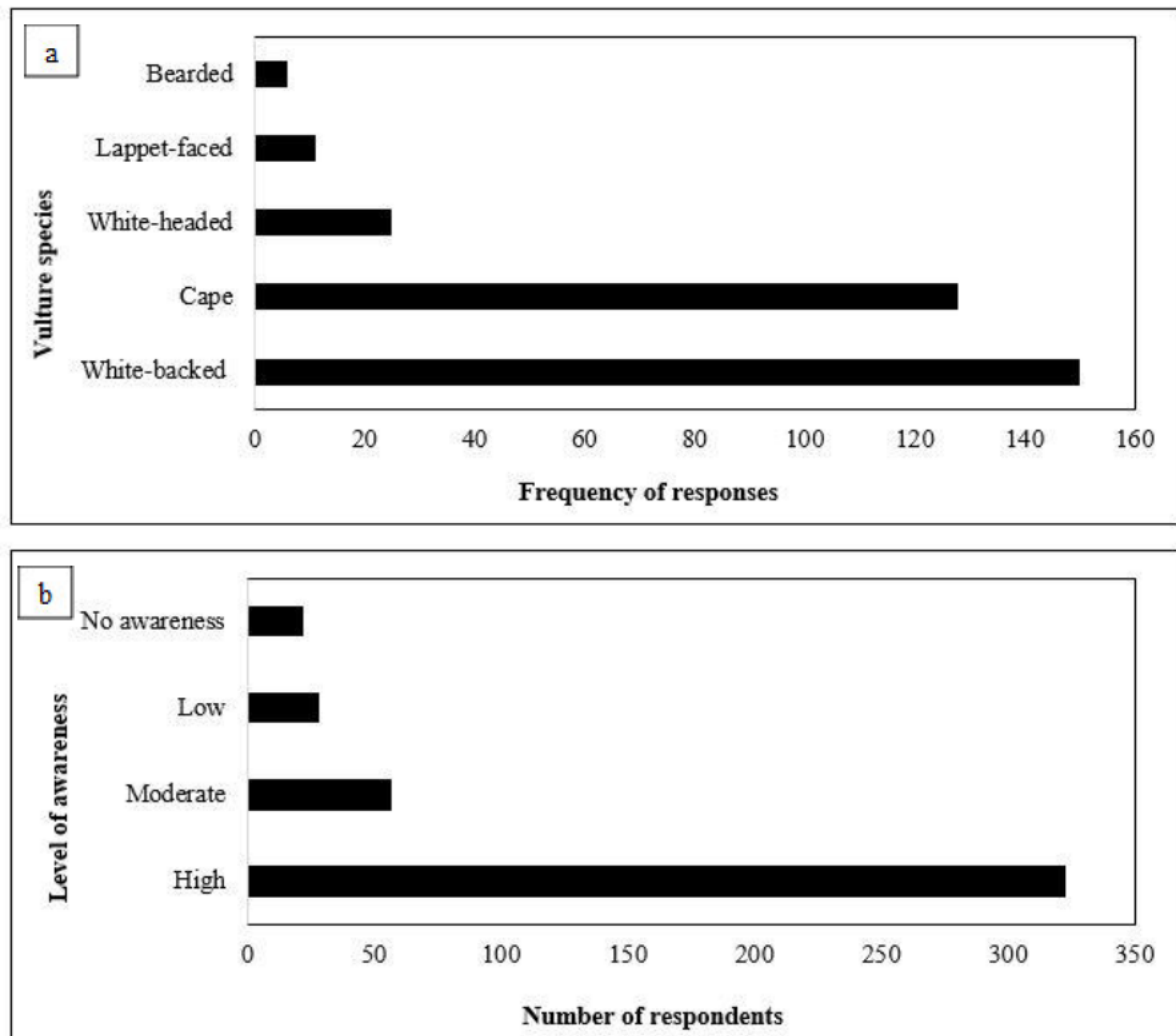


Fig. 2.2 Frequency of responses to a. vulture species encountered and b. levels of awareness expressed by respondents.

Respondents who demonstrated a high level of awareness were many (57%, n = 323). Study site and gender were found to be significant in predicting awareness and familiarity with vultures. Respondents living around Giant's Castle GR were likely to fall within the high level of awareness category (Wald = 25.3, P = 0.0001) and were 6.2 times more likely to exhibit high awareness than participants living near Mkhuze. With reference to gender, males were 1.7 times more likely to demonstrate high levels of awareness than female participants (Wald = 4.3, P = 0.039) (Supplementary information Table S2.2).

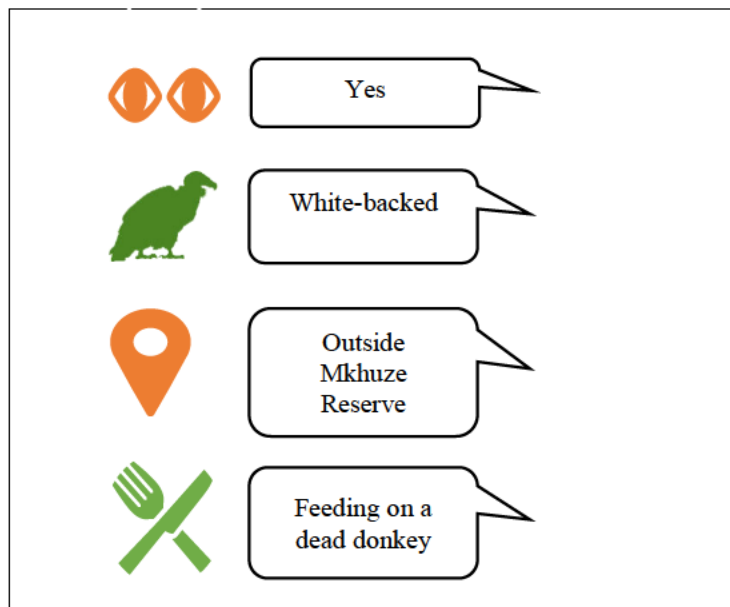


Fig. 2.3 A scenario in which a respondent would be assigned High Awareness (4/4).

2.4.3 Benefits derived by local people from having vultures in their localities

Most (82 %, n = 354) participants derived benefits from coexisting with vultures. The majority of respondents (65%, n = 199) appreciated vultures for feeding on carcasses in the fields, thus keeping the environment clean (regulatory services). Northern KwaZulu-Natal participants gave accounts of the past few years when drought conditions were severe in the region and cattle mortality was

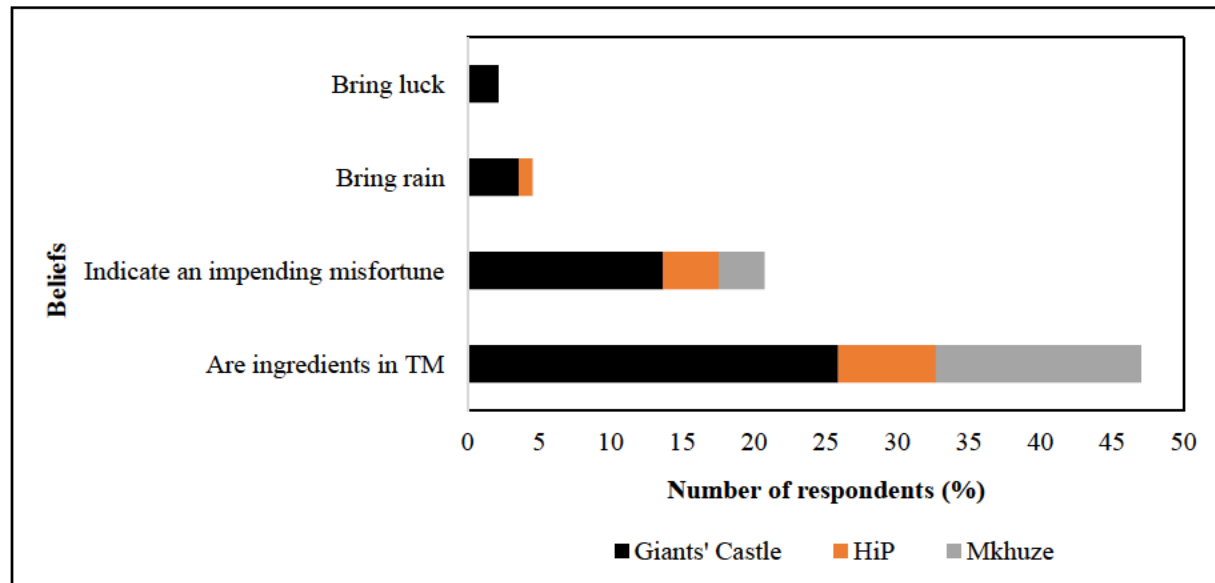
high. Respondents stated that carcass management would have been a major challenge to livestock owners had it not been for vultures coming into communal lands and consuming the dead cattle. They further reported that the environment would have been uninhabitable because of the smell of rotting carcasses if vultures had not fed on them. Vultures were also admired for helping residents find livestock that had gone missing (20%, $n = 71$). In addition, 14% ($n = 49$) of the participants admired vultures for their importance as constituents of local natural heritage – to be preserved for future generations. Tourism and bushmeat were the least mentioned benefits associated with vultures in the communities visited (1.4% and 1%, respectively).

Gender was significant in predicting benefits perceived by local people. Male participants were 2.1 times more likely to cite a benefit from carcass removal than females (Wald = 7.6, $P = 0.006$). These respondents were also 3.4 times more likely to benefit from the location of missing livestock than their female counterparts (Wald = 12, $P = 0.0001$). In addition, natural heritage was a benefit mostly mentioned by males 3.7 times more than females (Wald = 11, $P = 0.001$) (Supplementary information Table S2.3).

2.4.4 Locally shared beliefs about vultures

Only 25% ($n = 108$) of the study participants presented beliefs about vultures (Fig. 2.4). The most predominant belief was associated with vultures having traditional medicine properties (66%; $n = 71$). In addition, a sighting of vultures circling over one's property was believed to indicate an impending great misfortune (20%; $n = 22$). A small proportion of respondents believed vultures to be bearers of rain and luck (11% and 3%, respectively). Again, beliefs about vultures were best explained by gender. Male participants were 8.2 times more likely to believe in vultures as of value

in traditional medicine rather than indicators of misfortune compared with females (Wald = 12.8, $P = 0.0001$) (Supplementary information Table S2.4).



Note [TM means Traditional Medicine]

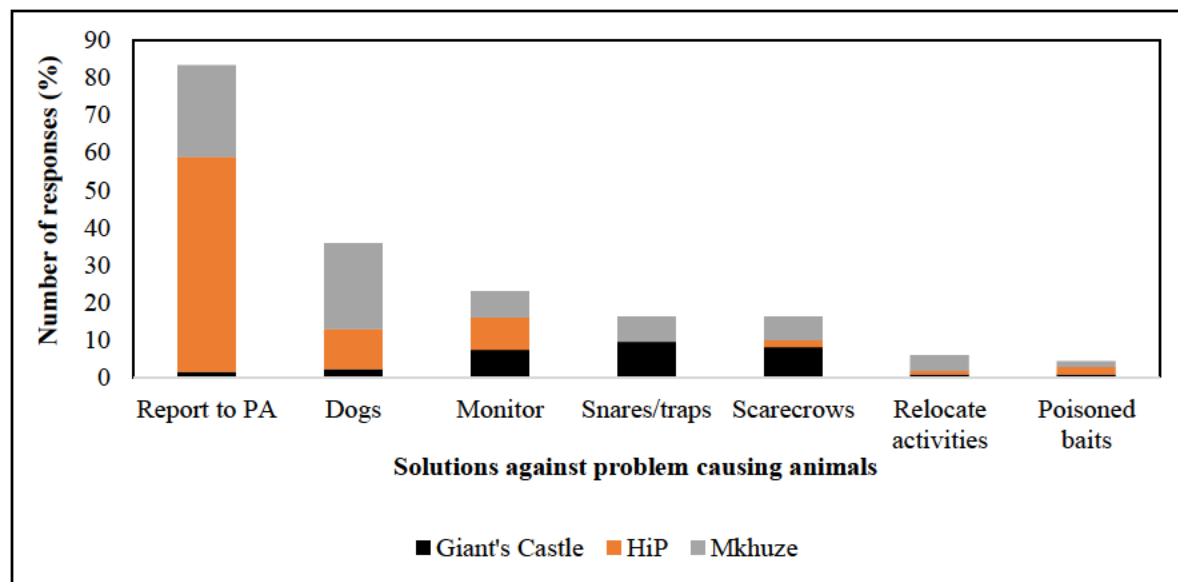
Fig. 2.4 Study participants' beliefs about vultures reported per study site.

2.4.5 Threats to vultures

Indirect threats: Solutions to problem-causing animals

Results from our pilot study highlighted that wildlife invasions in communal lands frequently occurred. To ascertain whether vultures were exposed to indirect poisoning in the form of problem-causing animal control, we asked the participants about their management of damage-causing wild animals. Wild animals reported to cause problems in communal lands were leopard (*Panthera pardus*), spotted hyaena (*Crocuta crocuta*), black-backed jackal (*Canis mesomelas*), serval (*Serval leptailurus*), chacma baboon (*Papio ursinus*), Pied Crow (*Corvus albus*) and eagles. Damages caused were mainly livestock depredation and occasional crop raiding. The reporting of incidents

to protected area authorities was the most common response to problem-causing animals (37%, n = 107) (Fig. 2.5). The second most predominant response was retaliation through hunting with dogs (30%, n = 87). Other respondents cited the use of snares/traps (11%, n = 32). The use of poisoned baits was less common in the surveyed areas (2%, n = 6) (Fig. 2.5). Some respondents reported moving their activities to areas with less wildlife interference.

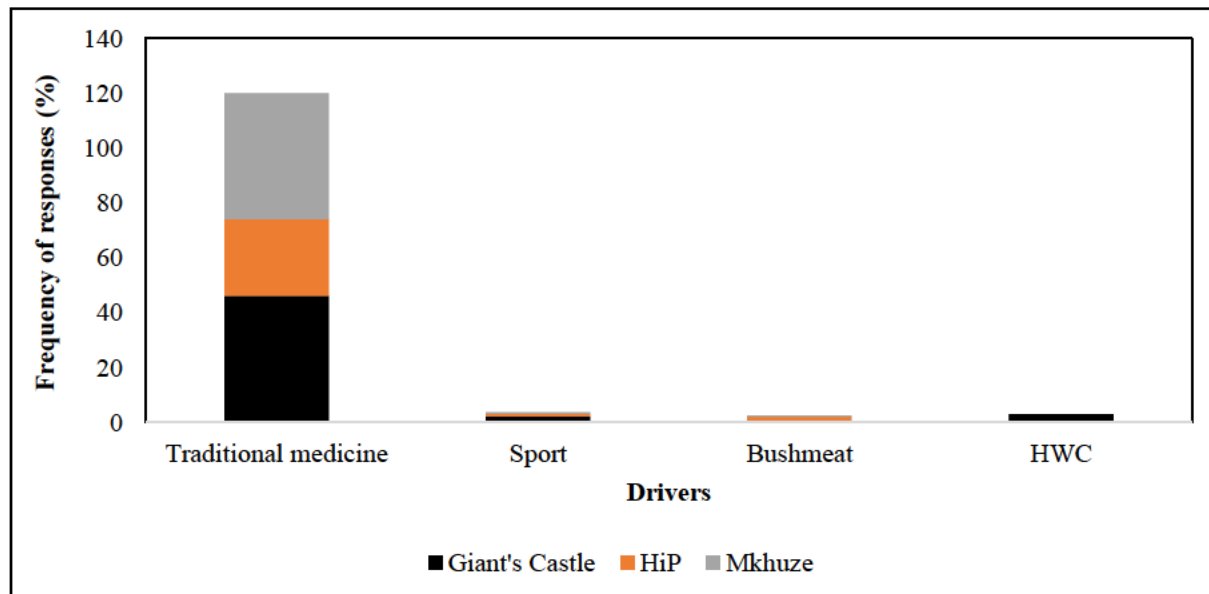


Note [PA means Protected Area]

Fig. 2.5 Summary of responses to problem-causing animals adopted by local communities reported per study area.

Direct threats: What drives the killing of vultures by residents?

Forty-five percent (n = 193) of the respondents expressed awareness of factors that motivated the hunting of vultures in their local areas. Traditional medicine use was the most reported driver for hunting vultures (93%, n = 181). Vultures were rarely hunted for sport and bushmeat (3% and 2%, respectively). Similarly, the killing of vultures as a result of conflict with humans was almost non-existent (2%, n = 2) (Fig. 2.6).



Note [HWC means Human-Wildlife Conflict]

Fig. 2.6 Drivers of the illegal killing of vultures as reported by respondents per study site.

2.4.6 Local people's vulture conservation perspectives

We investigated the status of vulture populations from the local people's perspective. Many participants had noticed changes in vulture populations over the last 10 years (63%, $n = 272$). Most (84%, $n = 228$) believed that vulture populations were in decline (Table 2.2). The majority of respondents (83%, $n = 357$) stated that local vultures should be protected mainly through collaborative efforts between conservation agencies and local communities. However, a significant proportion of respondents (33%, $n = 117$) perceived that vulture were better off in the hands of conservation agencies (Table 2.2).

Support for the protection of vultures was determined by study site, gender and age. Giant's Castle residents were 2.8 times more likely to support vulture protection than Mkhuze respondents (Wald = 6.9, $P = 0.009$). Similarly, HiP residents were even more (5.6 times) likely to favour

vulture protection than their neighbours in Mkhuze (Wald = 20.7, $P = 0.0001$). Male respondents were reportedly less likely (0.3 times) to support vulture protection than females (Wald = 13, $P = 0.0001$) (Supplementary information Table S2.5). The latter finding is contradictory to perceptions expressed by male participants throughout this study. Furthermore, our analyses showed that the oldest members of our study, respondents over 50 years, were more likely to support vulture protection than all other age groups represented in the study.

Table 2.2 Study participants' vulture conservation perspectives.

| Have you noticed any change in vulture populations over the last 10 years | No. of responses | % |
|--|-------------------------|----------|
| Yes | 272 | 63 |
| No | 143 | 33 |
| I have no idea | 15 | 3 |
| If yes, what is the direction of this change? | | |
| The local population has declined | 228 | 84 |
| The local population has increased | 40 | 14 |
| The population increases and decreases | 1 | 0 |
| I am not sure | 3 | 2 |
| Should vultures be protected? | | |
| Yes | 375 | 83 |
| No | 73 | 17 |
| Who should take on the task of making sure that vultures are protected? | | |
| Conservation agencies | 117 | 33 |
| Local communities | 77 | 22 |
| Both conservation agencies and local communities | 127 | 36 |
| I do not know | 54 | 15 |

2.5 Discussion

2.5.1 Local people's awareness and familiarity with vultures

The present study builds on assessments of public perceptions about vultures conducted in parts of southern Africa (Mdhlano et al. 2018; Craig et al. 2018; Mashele et al. 2021a) and southwest Europe (Cortés-Avizanda et al. 2018; Morales-Reyes et al. 2018; Oliva-Vidal et al. 2022). It is the first of its kind in KwaZulu-Natal, an important ecological zone for vultures, especially in light of the Vulture Safe Zones initiative to be implemented in the region (Whittington 2022).

Many respondents reported encounters with vultures and could identify the species they had seen from the image list provided. The majority of encounters were related to species' local spatial distribution. For example, Giant's Castle respondents were more familiar with Cape and Bearded Vultures, whereas respondents from Mkhuze and HiP were familiar with White-backed, Lappet-faced and White-headed Vultures. Moreover, encounters with vultures were in accordance with species' relative abundance (Rushworth et al. 2018). Common species, such as White-backed and Cape Vultures, were frequently cited as species encountered contrary to species with lower population numbers. Local people demonstrated considerable awareness of vultures. When awareness was tested at different levels, more than half of the respondents obtained the highest score.

Awareness was best predicted by study site and gender. Respondents residing adjacent to Giant's Castle were more likely to demonstrate increased familiarity with vultures. This can be attributed to greater visualisation in Giant's Castle as the vultures in this area occupy mountain cliffs surrounding villages and are seen almost on a daily basis flying in and out of their roosts. Furthermore, high awareness levels were predominantly observed in male rather than in female participants. Numerous narratives about vultures were willingly shared by men, often with great

passion. Other studies have shared similar observations (Ehlers-Smith et al. 2021; Hariohay et al. 2022). According to Pam et al. (2018), people often learn better about nature through personal encounters. The assignment of duties is often governed by traditional gender roles, especially in rural agro-pastoralist communities (Pokou et al. 2021). Accordingly, men spend most of their time in the wilderness rearing livestock, hunting and gathering various raw materials (Hariohay et al. 2022). Spending time in the wilderness facilitates exposure to wildlife, enhancing familiarity and increasing knowledge about resident wildlife (Clamsen and Roskaft 2013; Pokou et al. 2021). Our findings suggest that awareness among local communities can be used as an additional source of basic knowledge when designing programs to improve vulture conservation. From a conservation perspective, adequate awareness among local people is admirable as studies show that where awareness is limited, misinformation prevails, posing a threat to species, especially those with peculiar behaviours such as vultures (Oliva-Vidal et al. 2022).

2.5.2 Benefits derived by local people from having vultures in their localities

Generally, birds provide numerous economic, cultural and ecological benefits that broadly support human well-being and livelihoods (Clamsen and Røskaft 2013; Mwadzingeni et al. 2018; Garcia-Jimenez et al. 2021). Benefits derived from coexisting with wildlife can play a key role in shaping local people's perceptions and attitudes toward biodiversity and its conservation (Partasmita et al. 2016; Kwaslema et al. 2018; Ehlers-Smith et al. 2021). Different population groups, such as farmers and tourists, appreciate vultures for providing niche-based provisioning, and regulatory and cultural ecosystem services (Cortés-Avizanda et al. 2018; Garcia-Jimenez et al. 2021). Many of our study participants derived benefits from the occurrence of vultures in their environments. Carrion removal was the most appreciated service provided by vultures as it reportedly helps keep

the environment habitable while possibly preventing the spread of diseases from animals to humans (Morales-Reyes et al. 2018). Study participants from northern KwaZulu-Natal (HiP and Mkhuze) gave a narrative about a severe drought that hit the region between 2015 and 2016, decimating large herds of livestock (Vetter et al. 2020; Lottering et al. 2021). More than 40 000 cattle were lost by the end of 2015 in KwaZulu-Natal (Vetter et al. 2020). Respondents indicated that vultures removed most carcasses the community would have otherwise battled to dispose of promptly.

Carrion removal is the most recognised and valued material benefit of human-vulture coexistence worldwide (Moleon et al. 2014; Cortez-Avizanda et al. 2018; Craig et al. 2018; Mdhllano et al. 2018). In a study conducted in two municipalities of the Eastern Cape Province, Pfeiffer et al. (2015) indicated that 82% of the participants noted that Cape Vultures consumed livestock that had died from natural causes or predation. It has been established that vultures have a natural competitive advantage over scavenging mammals and can control their populations, especially in communal lands (Whelan et al. 2008). Vultures are also the only scavenger guild that can alternate between protected areas and communal lands without initiating human-wildlife conflict. Moreover, there is evidence to suggest that by using the freely available carrion removal service provided by vultures, regions can reduce their carbon footprint and save on monetary resources (Morales-Reyes et al. 2015).

Vultures were also valuable to local people for assisting in locating missing cattle. Herders often found the location of their lost and often dead cattle by following vulture cues. This relationship has been observed in other parts of southern Africa (Craig et al. 2018; Mdhllano et al. 2018). Carcass location is an essential contribution because many rural communities in southern Africa customarily rely on livestock farming to secure their livelihoods. In dry seasons when

pasture and drinking water are reduced, cattle travel long distances searching for food and water, often unattended. By being naturally drawn to carcasses, vultures provide cues for owners to locate their cattle in the event of death. This information can help farmers quantify costs and adopt better management and monitoring practices to reduce cattle mortalities. The aforementioned scenario provides evidence of local people using local ecological knowledge (LEK) and experience to take advantage of ecosystem services (Morales-Reyes et al. 2018; Ehlers Smith et al. 2021).

2.5.3 Locally shared beliefs about vultures

A few participants (25%) presented beliefs about vultures, mainly concerning their alleged traditional medicine usefulness. Vultures were also considered a sign of misfortune. Beliefs were best predicted by gender. Male participants were more inclined to believe in vultures' medicinal importance than their association with misfortunes.

Vultures were believed to have a keen sense of smell, enabling them to locate carcasses from vast distances. Locally, they are otherwise called *izwangomoya* (main name: *Inqe*) because they find food by deciphering the contents of the air while flying, often in circular motions. Therefore, by using certain vulture parts, especially the head, ordinary people can gain the ability to see into the future or obtain information that would otherwise be inaccessible to them. However, this belief contradicts scientific evidence, demonstrating that Old World vultures locate carcasses by sight, relying on collective foraging strategies and following cues provided by other scavengers (Kane et al. 2015; Buechley and Şekerciöğlu 2016). Nonetheless, the belief-based use of vultures is seemingly prevalent in southern Africa (Cunningham and Zondi 1991; McKean et al. 2013; Williams et al. 2014; Mdhlano et al. 2018; Mashele et al. 2021b). In the present study, traditional medicine was the most reported driver for the killing of vultures, especially in northern KwaZulu-

Natal. Ogada et al. (2016) state that traditional medicine is responsible for approximately 29% of African vulture mortalities. Existing evidence further indicates that the use of vulture parts in traditional medicine is projected to increase. Hence, McKean et al. (2013) suggest the need to devise strategies to support cultural traditions while ensuring the long-term persistence of natural resources that form part of these beliefs. Such initiatives may require meaningful deliberations between resource users and conservation practitioners.

Culturally, human-raptor relations are complex, ranging from raptors being considered sacred to being perceived as bad omens (Wyndham and Park 2018; Horgan et al. 2021). Despite being known as bringers of luck and rain, owing to their close association with carcasses, vultures were believed by many (20%) participants to indicate an impending misfortune if they were spotted flying in a circular motion above someone's property. We link this belief to an isiZulu idiom, *uzulelwa amanje*, meaning vultures are hovering over you. This phrase is often used when threatening or warning someone whose behaviour is about to land them in danger. Such impressions suggest that historically, vultures were once widespread across KwaZulu-Natal and interactions with local people were established, gaining their prominence in the isiZulu culture and folklore. These findings reveal nuances of non-material culture and identity-related values of vultures worth exploring (Garcia-Jimenez et al. 2022).

The dimension of hidden or non-material costs of coexisting with wildlife to humans is often neglected in human-wildlife conflict management (Barua et al. 2020; Thondhlana et al. 2020). Feelings of anxiety, stress and fear associated with coexisting with wildlife, whether facilitated by experience or perceptions, are as important as tangible (quantifiable) wildlife conservation costs borne by local people (Thondhlana et al. 2020). The perception of vultures as

bearers of unfortunate events may have psychological effects on belief holders, spurring negative attitudes and animosity toward these birds (Thinley et al. 2019).

2.5.4 Threats to vultures and conservation perspectives

Socio-ecological landscapes are commonly associated with human-wildlife conflicts. Often, local people living next to wildlife are vulnerable to disturbances in the form of livestock predation and crop raiding. Measures usually adopted by victims of human-wildlife conflict include capturing and/ or persecution (Hariohay et al. 2018). Most cases of human-wildlife conflict involve predators preying on livestock. Therefore, livestock owners tend to place poisoned baits to eradicate the perceived culprits. Farmers have long considered poisoning the most effective predator control (Ogada 2014). Although vultures are seldom targeted in retaliatory wildlife killings, they do, however, fall victim to unintentional poisoning (Ogada 2014). This is common in parts of Africa, Asia and Europe, representing one of the major threats to vulture populations globally (Ogada et al. 2012; Botha et al. 2017).

To ascertain if vultures were potentially exposed to indirect poisoning in our study areas, we enquired about local people's approaches to livestock depredation. The participants were most likely to report cases to the neighbouring protected area. Another common method was the use of dogs to hunt down the problem animal(s). The use of poison was rarely reported in the surveyed areas. Similarly, Pfeiffer et al. (2015) found that using poison in predator management was not common in communities neighbouring the Msikaba Cape Vulture Colony. Rather, it has been indicated that the use of poison predominates in commercial farmlands neighbouring protected areas (Lindsey et al. 2013).

Poison can also be used in poaching activities (i.e., poaching for rhino (*Rhinocerotidae*) horns or elephant (*Loxodonta africana*) ivory) and harvesting for bushmeat and traditional medicine use (Ogada 2014; Hariohay et al. 2022). These factors were not explored in the present study, so poisoning cannot be ruled out as a potential threat to vultures in KwaZulu-Natal. In fact, there has been evidence pointing to the intentional poisoning of vultures for use in traditional medicine (pers. comm. C. Kelly, 2020). Moreover, using toxic substances to kill wildlife is illegal, while most apex predators are threatened and therefore protected by the law against illegal killing (Ogada et al. 2003; Lindsey et al. 2013). It is then likely that respondents underreported their use of poison against problem-causing animals in fear of potential prosecution (Shanee 2012). Therefore, these results should be interpreted with caution.

Only 2% of our participants reported vulture conflict with humans, mainly in the form of chicken depredation. Local people, especially farmers, are increasingly reporting vultures as causing damage to livestock, but conservation scientists are disputing this (Craig et al. 2018; Duriez et al. 2019; Oliva-Vidal et al. 2022). According to Duriez et al. (2019), vultures seldom cause harm or disturbance to humans and their livelihoods. When this occurs, it is mainly through secondary interference, such as inflicting minor injuries on frail livestock, which may result in fatality (Duriez et al. 2019). These authors further indicate that this behaviour was long identified in vultures and does not represent a behavioural change in response to food availability. In the present study, vultures were probably confused with eagles (that occasionally prey on livestock, especially chickens, as easy prey). Increased local people's familiarity with vultures that were observed in this study could best explain the less reporting of vultures as damage-causing animals.

Population dynamics and conservation perspectives

Vulture populations were perceived to have declined in the last 10 years (Safford et al. 2019). This observation is in agreement with empirical reports largely indicating that vulture populations across southern Africa have declined dramatically over the last three decades (Ogada et al. 2012, 2016; Kruger et al. 2015; Rushworth et al. 2018). The protection of vultures was supported by a great number of respondents. This outcome could be attributed to their natural heritage importance (non-material) as well as the tangible benefits that local people enjoy by having vultures in their localities, such as carrion removal and cattle location. We tested support for the protection of vultures against multiple factors, mainly demographic and socioeconomic. Age and gender were found to be the best predictors of support for vulture conservation. Participants over 50 were most likely to advocate for the protection of vultures. Surprisingly, male participants were less likely to favour protecting vultures than females. This finding was in contradiction with the perceptions expressed by men throughout the study. Male participants exhibited stronger awareness of vultures. These participants also perceived vultures as useful, more than their female counterparts. Regarding beliefs, men were less likely to associate vultures with misfortunes. We found that most participants, males, in particular, were mostly positive about vultures and wished to see them thrive in their localities.

2.6 Conclusions

Ecologically, vultures have demonstrated the criteria needed to justify their consideration as species of high conservation concern (Safford et al. 2019). Even the priority level bestowed upon these species globally corroborates the urgency of their crisis (Botha et al. 2017). Usually, wildlife species have values beyond their ecological importance. This study investigated vulture

perceptions in a dynamic ecosystem to identify social aspects to consider in designing vulture conservation initiatives. Our results suggest that vultures are salient in the landscapes they occupy as providers of regulatory and provisioning ecosystem services (i.e., carrion removal and signalling livestock carcass location). Vulture awareness and familiarity among local people were adequate and may have played a role in facilitating the exploitation of ecosystem services provided by vultures. The study participants exhibited predominantly positive perceptions towards vultures, which can aid in soliciting support for conservation initiatives aimed at improving vulture conservation.

This study demonstrates that the use of vultures in traditional medicine is a prevalent practice and a predominant perception towards these birds in rural KwaZulu-Natal. Considering the current vulture crisis, we recommend engagements with resource users, especially traditional healers. These suggested deliberations should be grounded in co-learning and the establishment of sustainable use patterns. In addition, we propose incorporating the already existing local community-based initiatives in vulture conservation strategies. One particular example is the horse racing initiative that is gaining momentum in rural KwaZulu-Natal. It involves people of all ages as supporters, horse owners, jockeys, trainers etc. Vultures can be incorporated, for instance, in the naming of horses and event themes. This can raise awareness and challenge existing perceptions, especially those relating to vultures as useful in traditional medicine.

2.7 Declarations

Conflict of interest statement

The authors declare no conflict of interest.

Availability of data and material

Data for this study belong to the University of KwaZulu-Natal but are available on request from the authors.

Acknowledgements

We are grateful to the South African National Biodiversity Institute (ZA) for funding this study. Valuable input from this study's steering committee, which included Steve McKean, and Chris Kelly, is highly appreciated. Many thanks to the study participants for their time and accommodation. We thank all the research assistants for their dedication to this work. The support received from the University of KwaZulu-Natal (ZA), WildlifeAct (ZA), the National Research Foundation (ZA, Grant 98404) and the Ford Wildlife Foundation (ZA) is greatly appreciated.

Author contributions

All authors conceived the research idea. JS and CTD sought funding. NSM collected the data. NSM analysed the data. NSM drafted the manuscript, and all authors provided comments and revisions to the manuscript.

Ethical approval

Approval of the ethical appropriacy of the research instrument was granted by the University of KwaZulu- Natal, Ethics committee (Reference: HSS/1089/108D).

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2.9 Supplementary Information

Supplementary information Table S2.1 Study questionnaire used in the present study.

| |
|---------------------------------|
| Date: |
| Community/village: |
| GPS Coordinates..... |
| Interviewer: |
| Interview ID..... |

1. Demographic and socio-economic information

1.1. Age

| | | | | |
|----------|----------|----------|----------|--------|
| a. 18-25 | b. 26-33 | c. 34-41 | d. 42-50 | e. >50 |
|----------|----------|----------|----------|--------|

1.2. Gender

| | |
|---------|-----------|
| a. Male | b. Female |
|---------|-----------|

1.3. Level of education

| | | | |
|---------|------------|--------------|-------------|
| a. None | b. Primary | c. Secondary | d. Tertiary |
|---------|------------|--------------|-------------|

1.4. Occupation (Free listing)

1.5. Livelihood (free listing)

1.6. Resources

| | | | |
|---------|--------------|-----------------------|---------|
| a. Land | b. Livestock | c. Land and livestock | d. None |
|---------|--------------|-----------------------|---------|

2. knowledge of and threats to vultures

2.1. What local name(s) do you use when referring to vultures?

2.2. What is the meaning of these local names or name?

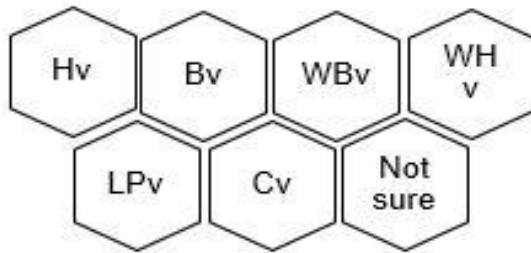
2.3. Have you seen a vulture in this area over the last 12 months?

| | |
|--------|-------|
| a. Yes | b. No |
|--------|-------|

2.4. How often do you see them?

| | | | |
|---------------|----------|-----------|-----------|
| a. Very often | b. Often | c. Seldom | d. Rarely |
|---------------|----------|-----------|-----------|

2.5. Which species do you often see?



2.6. What do you see them doing?

| | | | |
|------------|------------|--------------------|----------|
| a. Feeding | b. Nesting | c. Roosting/flying | d. Other |
|------------|------------|--------------------|----------|

2.6.1. If feeding, what do they eat in these communal lands?

2.7. How do you or other community members deal with problem causing animals (list animals)?

2.8. Can you give me reasons why a person would kill a vulture? (Free listing)

2.9. Have you noticed any change in vulture populations over the last 10 years?

| | |
|--------|-------|
| a. Yes | b. No |
|--------|-------|

2.9.1. If yes, what kind of change have you noticed?

3. Perceptions about vultures and their uses

3.1. Are vultures of any importance in this community? please elaborate

3.2. Are there any beliefs about vultures that are shared in this community?

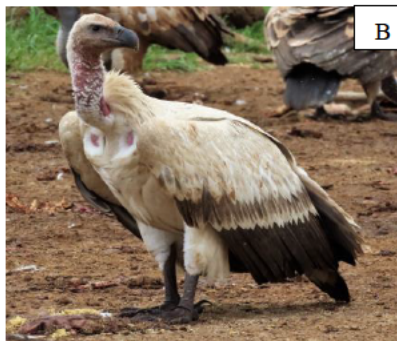
3.3. What comes to mind when you see a vulture and why is this the case?

3.4. What do you think would happen if vultures were to disappear?

3.5. Are you in support of vulture protection?

3.6. Who should take on the task of making sure that vultures are effectively protected, please explain?

3.7. Would you be willing to participate in future vulture conservation initiatives?



Supplementary information Table S2.2 Ordinal logistic regression of awareness level as the dependent variable and study site, gender, age, occupation and livelihood as independent variables in the present study.

| Parameter Estimates | | | | | | | | | |
|---------------------|----------------|----------------|------------|--------|----|--------|-------|-------------------------|-------------|
| | | Estimate | Std. Error | Wald | df | Exp(B) | Sig. | 95% Confidence Interval | |
| | | | | | | | | Lower Bound | Upper Bound |
| Threshold | [Awareness= 0] | -2.864 | 0.942 | 9.237 | 1 | 0.057 | 0.002 | -4.711 | -1.017 |
| | [Awareness= 1] | -1.908 | 0.929 | 4.223 | 1 | 0.148 | 0.040 | -3.729 | -0.088 |
| | [Awareness= 2] | -0.893 | 0.923 | 0.936 | 1 | 0.409 | 0.333 | -2.703 | 0.916 |
| Awareness | [Study site=1] | 1.826 | 0.363 | 25.316 | 1 | 6.212 | 0.000 | 1.115 | 2.538 |
| | [Study site=1] | -0.023 | 0.262 | 0.008 | 1 | 0.977 | 0.930 | -0.536 | 0.490 |
| | [Study site=3] | 0 ^a | | | 0 | 1 | | | |
| | [Age=1] | -1.045 | 0.723 | 2.089 | 1 | 0.352 | 0.148 | -2.461 | 0.372 |
| | [Age=2] | -0.080 | 0.576 | 0.019 | 1 | 0.923 | 0.889 | -1.209 | 1.048 |
| | [Age=3] | 0.193 | 0.556 | 0.121 | 1 | 1.213 | 0.728 | -0.896 | 1.283 |
| | [Age=4] | -0.120 | 0.531 | 0.051 | 1 | 0.887 | 0.821 | -1.160 | 0.920 |
| | [Age=5] | 0 ^a | | | 0 | 1 | | | |
| | [Gender=1] | 0.510 | 0.247 | 4.278 | 1 | 1.665 | 0.039 | 0.027 | 0.993 |
| | [Gender=2] | 0 ^a | | | 0 | 1 | | | |
| | [Occupation=1] | -0.355 | 0.340 | 1.095 | 1 | 0.701 | 0.295 | -1.021 | 0.310 |
| | [Occupation=2] | 0.422 | 0.600 | 0.495 | 1 | 1.525 | 0.482 | -0.754 | 1.598 |
| | [Occupation=3] | -0.157 | 0.631 | 0.062 | 1 | 0.855 | 0.804 | -1.393 | 1.080 |
| | [Occupation=4] | 0.223 | 0.536 | 0.173 | 1 | 1.250 | 0.677 | -0.827 | 1.274 |
| | [Occupation=5] | 0 ^a | | | 0 | 1 | | | |
| | [Livelihood=0] | -1.089 | 0.848 | 1.651 | 1 | 0.337 | 0.199 | -2.750 | 0.572 |
| | [Livelihood=1] | -0.225 | 0.813 | 0.076 | 1 | 0.799 | 0.782 | -1.818 | 1.368 |
| | [Livelihood=2] | -0.565 | 0.830 | 0.463 | 1 | 0.568 | 0.496 | -2.192 | 1.062 |
| | [Livelihood=3] | -0.245 | 0.853 | 0.083 | 1 | 0.782 | 0.774 | -1.918 | 1.427 |
| | [Livelihood=4] | 0 ^a | | | 0 | 1 | | | |

Supplementary information Table S2.3 Multinomial regression of benefits as the dependent variable and gender, age, study site, occupation and livelihood as independent factors (a. the reference category is none).

| Parameter Estimates | | | | | | | | | | |
|---------------------|--------|----------------|-----------|------------|--------|----|-------|--------|------------------------------------|-------------|
| Benefits | Factor | Category | B | Std. Error | Wald | df | Sig. | Exp(B) | 95% Confidence Interval for Exp(B) | |
| | | | | | | | | | Lower Bound | Upper Bound |
| Cleaning | | Intercept | 1.377 | 1.171 | 1.382 | 1 | 0.24 | | | |
| | Site | Giant's Castle | -0.025 | 0.315 | 0.006 | 1 | 0.938 | 0.976 | 0.526 | 1.81 |
| | | HiP | -0.775 | 0.31 | 6.253 | 1 | 0.012 | 0.461 | 0.251 | 0.846 |
| | | Mkhuze | Reference | | | | | | | |
| | Gender | Male | 0.757 | 0.274 | 7.648 | 1 | 0.006 | 2.131 | 1.247 | 3.644 |
| | | Female | Reference | | | | | | | |
| Location | | Intercept | -15.98 | 2400.885 | 0 | 1 | 0.995 | | | |
| | Site | Giant's Castle | -0.57 | 0.416 | 1.878 | 1 | 0.171 | 0.565 | 0.25 | 1.278 |
| | | HiP | -0.817 | 0.399 | 4.187 | 1 | 0.041 | 0.442 | 0.202 | 0.966 |
| | | Mkhuze | Reference | | | | | | | |
| | Gender | Male | 1.232 | 0.354 | 12.118 | 1 | 0 | 3.429 | 1.713 | 6.864 |
| | | Female | Reference | | | | | | | |
| Heritage | | Intercept | -1.016 | 1.761 | 0.333 | 1 | 0.564 | | | |
| | Site | Giant's Castle | -0.246 | 0.417 | 0.348 | 1 | 0.555 | 0.782 | 0.346 | 1.77 |
| | | HiP | -1.94 | 0.594 | 10.686 | 1 | 0.001 | 0.144 | 0.045 | 0.46 |
| | | Mkhuze | Reference | | | | | | | |
| | Gender | Male | 1.317 | 0.396 | 11.048 | 1 | 0.001 | 3.734 | 1.717 | 8.119 |
| | | Female | Reference | | | | | | | |
| Medicine | | Intercept | 1.572 | 2.071 | 0.576 | 1 | 0.448 | | | |
| | Site | Giant's Castle | 0.398 | 0.607 | 0.429 | 1 | 0.513 | 1.488 | 0.453 | 4.892 |
| | | HiP | -2.171 | 1.127 | 3.707 | 1 | 0.054 | 0.114 | 0.013 | 1.04 |
| | | Mkhuze | Reference | | | | | | | |

Supplementary information Table S2.4 Multinomial regression of beliefs (medicine only) as the dependent variable, and gender as this was the only significant independent variable.

| Parameter Estimates | | | | | | | | | |
|----------------------|-----------|----------------|------------|--------|----|------|--------|------------------------------------|-------------|
| Beliefs ^a | | B | Std. Error | Wald | df | Sig. | Exp(B) | 95% Confidence Interval for Exp(B) | |
| | | | | | | | | Lower Bound | Upper Bound |
| Medicine | Intercept | 18.089 | 4172.896 | .000 | 1 | .997 | | | |
| | [Male] | 2.104 | .587 | 12.831 | 1 | .000 | 8.195 | 2.592 | 25.906 |
| | [Female] | 0 ^b | . | . | 0 | . | . | . | . |

- a. The reference category is: Misfortune.
- b. This parameter is set to zero because it is redundant.

Supplementary information Table S2.5 Multinomial regression of support (YES/NO) as the dependent variable and study site, age, gender, occupation, livelihood and encounter independent variables.

| Parameter estimates | | | | | | | | | |
|----------------------|----------------|--------|------------|--------|----|-------|--------|------------------------------------|-------------|
| Support ^a | | B | Std. Error | Wald | df | Sig. | Exp(B) | 95% Confidence Interval for Exp(B) | |
| | | | | | | | | Lower Bound | Upper Bound |
| No | Intercept | -1.346 | 1.379 | 0.953 | 1 | 0.329 | | | |
| | [Study site=1] | 1.045 | 0.397 | 6.922 | 1 | 0.009 | 2.844 | 1.305 | 6.196 |
| | [Study site=2] | 1.728 | 0.378 | 20.868 | 1 | 0 | 5.629 | 2.682 | 11.815 |
| | [Study site=3] | 0b | | | 0 | | | | |
| | [Age=1] | -0.948 | 0.922 | 1.057 | 1 | 0.304 | 0.388 | 0.064 | 2.36 |
| | [Age=2] | -1.215 | 0.641 | 3.594 | 1 | 0.058 | 0.297 | 0.084 | 1.042 |
| | [Age=3] | -1.179 | 0.584 | 4.066 | 1 | 0.044 | 0.308 | 0.098 | 0.968 |
| | [Age=4] | -1.319 | 0.569 | 5.373 | 1 | 0.02 | 0.268 | 0.088 | 0.816 |
| | [Age=5] | 0b | | | 0 | | | | |
| | [gender=1] | -1.1 | 0.305 | 13.033 | 1 | 0 | 0.333 | 0.183 | 0.605 |
| | [gender=2] | 0b | | | 0 | | | | |
| | [occupation=1] | 1.279 | 1.223 | 1.093 | 1 | 0.296 | 3.594 | 0.327 | 39.529 |
| | [occupation=2] | 0.462 | 1.179 | 0.154 | 1 | 0.695 | 1.587 | 0.158 | 15.992 |
| | [occupation=3] | 0.046 | 1.373 | 0.001 | 1 | 0.973 | 1.047 | 0.071 | 15.435 |
| | [occupation=4] | 0.148 | 1.294 | 0.013 | 1 | 0.909 | 1.16 | 0.092 | 14.643 |
| | [occupation=5] | 0b | | | 0 | | | | |
| | [livelihood=1] | -0.275 | 0.484 | 0.323 | 1 | 0.57 | 0.759 | 0.294 | 1.961 |
| | [livelihood=2] | -0.029 | 0.499 | 0.003 | 1 | 0.953 | 0.971 | 0.365 | 2.583 |
| | [livelihood=3] | -0.603 | 0.438 | 1.9 | 1 | 0.168 | 0.547 | 0.232 | 1.29 |
| | [livelihood=4] | 0.892 | 0.785 | 1.29 | 1 | 0.256 | 2.44 | 0.523 | 11.373 |
| | [livelihood=5] | 0b | | | 0 | | | | |
| | [Encounter=0] | 0.36 | 0.414 | 0.755 | 1 | 0.385 | 1.433 | 0.637 | 3.225 |
| | [Encounter=1] | 0b | | | 0 | | | | |

a. The reference category is: Yes.

b. This parameter is set to zero because it is redundant.

CHAPTER THREE

Aspects of the illegal hunting and trade of vultures in northern KwaZulu-Natal, South Africa

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Running header: Illegal hunting and trade of vultures in northern KwaZulu-Natal

3.1 Abstract

The harvesting and trade in species used in traditional medicine are predominantly illegal and, therefore, unregulated and likely unsustainable. This represents a major conservation challenge, especially when considering species that are naturally rare and those with declining populations. This is true for vultures in South Africa and other parts of Africa. Despite their populations having declined considerably in the last few decades, evidence reveals a persistent use of vultures by traditional health practitioners in South Africa. However, less is understood about the key factors that define the hunting of these birds within certain localities. Considering this, a study was conducted to evaluate the aspects of the illegal hunting and trade in vultures in one of the source areas for the country's traditional medicine market. Data were collected through in-depth interviews with local hunters and *muthi* traders. Our findings revealed that vultures were hunted by small groups of up to five local hunters, predominantly consisting of unemployed young men between the ages of 24 and 40. Multiple hunting techniques were utilised, but hunters preferred poison (38%) and firearms (31%). The respondents stated that vultures were mainly hunted upon request and traded through locally established networks involving hunters, traditional health practitioners and *muthi* traders. Vultures were reportedly sold directly to traditional health practitioners but sometimes to traders working in the local market (Mona). Prices for the whole carcass ranged from R500 to R2 000. Perceptions shared by the study respondents about vultures in relation to their hunting and trade alluded to the difficulty in obtaining these birds. This was attributed mainly to vultures' conservation status and the associated risks of having them in your possession. Moreover, vultures were reportedly hard to find as they spent most of their time in protected areas, their low numbers were also highlighted as an exacerbating factor. The trade and use of vultures in traditional medicine is a well-established practice that is threatening to their

populations. There are intricate socio-economic influences at play and addressing these may contribute to positive conservation outcomes for vulture species occurring in northern KwaZulu-Natal.

Keywords: Wildlife, Socio-economic factors, Conservation, Protected Areas, *Muthi* markets

3.2 Introduction

In recent decades there has been a measurable shift towards valuing biodiversity not only for the goods but also for the ecosystem services it provides (Cunningham 2016). Ecosystem services can be subtle but also tangible and obvious; focusing on these benefits strengthens the argument for biodiversity conservation (Wilson and Primack 2019). The key premise is that people can, directly and indirectly, derive benefits by maintaining and preserving the healthy functioning of natural systems (Cunningham 2016). Certainly, human societies largely recognise and value the role of biodiversity and various ecological functions performed by species that, in turn, support their well-being and livelihoods (Craig *et al.* 2018; Mdhlano *et al.* 2018). However, healthy ecosystems that provide services over considerable spatial and temporal scales require high biodiversity functionality (Sekercioglu *et al.* 2016). Globally, conserving ecosystems has proven challenging as biodiversity deteriorates under multiple human-induced threats (Liang *et al.* 2013). The commercialisation of biological resources, a shift from subsistence use, represents one of the biggest threats to biodiversity globally (Ling *et al.* 2013; Young *et al.* 2016).

The world's biodiversity hotspots are experiencing an increase in wildlife extraction for trade (Nellemann *et al.* 2016). Trade occurs at local and international levels (Broad *et al.* 2014). It involves a wide range of wild fauna and flora (Gluszek *et al.* 2020). Some of the world's biodiverse regions in Africa, Latin America and South-East Asia have experienced a notable increase in the

harvesting and trade of wild animals (Nellemann *et al.* 2016; Gluszek *et al.* 2020). This form of trade is massive and underpins the sales of live animals to be kept as pets, animals for food, parts and derivatives for ornamentation, and traditional medicine (Lindsey *et al.* 2013; Young *et al.* 2016; Burivalova *et al.* 2017; Wilson and Primack 2019). The wildlife trade is entangled in the socio-economic conditions of local communities (Broad *et al.* 2014). Culture has been underscored as one of the significant factors facilitating the illegal wildlife trade (Williams *et al.* 2014). Persistent poverty in low-income regions has been shown to act as a push factor in the increased trade and consumption of wildlife (Nellemann *et al.* 2016). Trade is structured in network systems typically involving harvesters, middlemen and retailers (Broad *et al.* 2014). According to Abi-Said *et al.* (2018), the wildlife trade represents an important source of income for many marginalised people residing in biodiversity-rich environments working on the trade frontlines.

However, a part of the trade in wildlife resources occurs illegally and is therefore highly unsustainable (Buij *et al.* 2016). Illegal wildlife trade is the world's fourth-largest form of crime, accounting for US\$ 7 to 23 billion annually (Nellemann *et al.* 2016). It involves many species of high conservation concern, including protected, threatened, keystone and rare species (Buij *et al.* 2016; Shepherd *et al.* 2017). Illegal wildlife trade directly contributes to defaunation in many ecosystems of the world (do Nascimento *et al.* 2015; Benítez-López *et al.* 2017). Extensive removal of wildlife leading to reductions in populations has been shown to result in empty forests (Redford 1992; Ripple *et al.* 2016). Having lost their ecological functionality, these biomes cannot effectively support human well-being and livelihoods over time (Benítez-López 2017).

The outbreak of zoonotic diseases as well as the vast distribution of alien invasive species, are some of the major consequences of the illegal trade in wildlife (Liang *et al.* 2013; Broad *et al.* 2014). Research on the illegal wildlife trade emanating from multiple disciplines has considerably

improved the understanding of such a complex phenomenon and significantly driven policy formulation toward the conservation of threatened species. However, most work has remained biased toward transnational trade involving large charismatic mammals such as African elephants (*Loxodonta* spp.), bears (*Ursus* spp.), rhinos (family *Rhinocerotidae*), pangolins (family *Manidae*) and tigers (*Panthera tigris*). A better understanding of domestic wildlife trade is of equal importance as this may supplement initiatives aimed at regulating trade at both national and supranational levels (Atuo *et al.* 2015; McEvoy *et al.* 2019). Such intervention is critical, especially for cultural keystone species, with increasing regional importance.

Traditional medicine has been highlighted as one of the major drivers behind the current African vulture crisis (Ogada *et al.* 2016; Botha *et al.* 2017). One of the sources of concern is the poisoning of vultures as a harvesting method (Botha *et al.* 2017; Gore *et al.* 2020). This contributes to large-scale declines in these social birds and raises concerns for human well-being. Research shows that vultures are valuable in traditional medicine in South Africa (McKean *et al.* 2013; Mashele *et al.* 2021a,b). They are perceived to treat numerous ailments, but their importance is derived from their perceived spiritual or magic-based capabilities (McKean *et al.* 2013; Mashele *et al.* 2021a). To this end, vultures are highly sought-after despite their populations having declined considerably in the last few decades. Various legal instruments governing their harvesting and use protect vultures in South Africa and its provinces. For example, out of seven vulture species currently found in South Africa, one is listed as Critically Endangered, while four are listed as Endangered under the Threatened or Protected Species Regulations (ToPS) 2007 (Government Gazette 29657 vol. 152,27 February 2007) promulgated in terms of the National Environmental Management: Biodiversity Act (Act no. 10 of 2004) (NEMBA). This means that these five species should not be hunted or killed by any means, method or device, including searching, pursuing,

luring, or injuring with the intention to hunt or kill, except for conservation, enforcement or scientific purposes (Molewa, 2015). Additional legislation protecting vultures is reviewed by Thompson and Blackmore (2020). However, it is acknowledged that laws have not effectively halted illicit hunting and trade in vultures. This subsequently highlights the need for an improved understanding of the dynamics of the sourcing and sale of vultures to guide integrated conservation strategies. To this end, we conducted a study to assess hunting as a cultural practice and its influence on the hunting and trade of vultures in northern KwaZulu-Natal, South Africa. Northern KwaZulu-Natal represents one of the main regions in South Africa, where vultures are reportedly sourced for the country's traditional medicine markets (McKean *et al.* 2013).

3.3 Methods

3.3.1 Study sites

Protected areas

This study was conducted in the Zululand district of KwaZulu-Natal, in tribal, rural communities adjoining two protected areas, namely, Hluhluwe iMfolozi Park (HiP), and Mkhuze Game Reserve (Figure 3.1). The provincial conservation authority, Ezemvelo KZN Wildlife, manages the two protected areas. The region is home to four tree nesting vulture species (Rushworth *et al.* 2018). Three of which are recognised as globally threatened and include the White-headed (*Aegypius occipitalis*) and White-backed vultures (*Gyps africanus*), which are listed as Critically Endangered, as well as the Lappet-faced vulture (*Torgos tracheliotos*), currently listed as Endangered (BirdLife International, 2021a, b, c).

Hluhluwe iMfolozi Park (HiP), is the largest state-owned protected area in northern KwaZulu-Natal, covering 900 km² (Rushworth *et al.* 2018). The Park was formed through the

consolidation of Hluhluwe and iMfolozi Game Reserves; both proclaimed in 1895. These two game reserves are connected by the Corridor Reserve established in 1989 (Brooks 2005). Hluhluwe iMfolozi Park is situated in a pristine landscape with several rare, endemic, and threatened species found in the reserve, making it one of the key conservation areas and a renowned tourist destination in the country (Rushworth *et al.* 2018). eNsolweni, eGunjaneni and eSiyembeni are the three nearby communities that were sampled in the study (Figure 3.1).

Spanning approximately 348 km², Mkhuze Game Reserve is situated on the western end of the Indian Ocean coastal plain that runs from Mozambique to South Africa (Gush 2000). The reserve is one of South Africa's earliest game reserves, established in 1912. It is a part of iSimangaliso Wetland Park, one of the country's most important ecological systems and a World Heritage Site (UNESCO 1999; Taylor and Peacock 2018). For Mkhuze, we conducted our interviews in kwaNgwenya, a large tribal community occupying the southern boundary of the reserve (Figure 3.1).

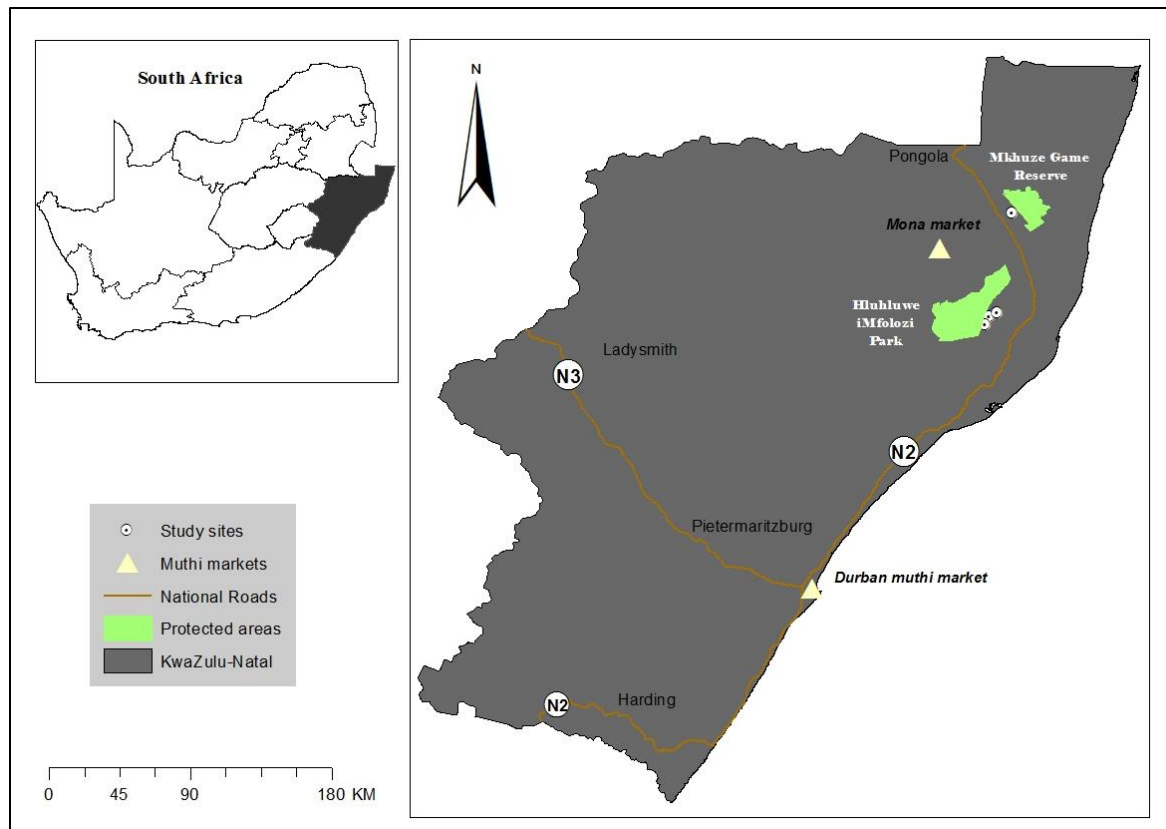


Figure 3.1 Study sites in northern KwaZulu-Natal, South Africa.

Study sites are inhabited by isiZulu speaking Nguni communities that practise small-scale commercial agro-pastoralism (Nsukwini and Bob 2016). Livestock mainly consists of cattle, goats, sheep, and donkeys. Common crops include maize, yams, peanuts, sweet potatoes and cotton. Unemployment is reported to be relatively high, and dependence on natural resources is characteristic of these communities (Nsukwini and Bob 2019). Large commercial farms specialising in crops, livestock, and game form part of the broader landscape.

Mona muthi market

A local market was also visited during the course of the study. Mona is a large wholesale market situated near kwaHlabisa, northern of KwaZulu-Natal (Figure 3.1). The market opens once every

month for four days (Eshowe 2017). Many products are sold in the market, including vehicles, cattle, craftwork, traditional attire, traditional food, medicinal plants, wild animal carcasses, body parts and by-products such as skins, bones, feathers and fats. Mona market supports hundreds of informal traders from northern and central KwaZulu-Natal regions. The market attracts customers from other parts of KwaZulu-Natal and neighbouring provinces with traditional healers on site.

3.3.2 Data collection and analyses

The research instrument used in the present study was approved by the Ethics Committee of the University of KwaZulu-Natal, under reference number: HSS/1089/108D. Before data collection, meetings were held with tribal leaders to introduce the study and seek permission to conduct interviews with the relevant community groups. Data collection took place between August and September 2020. Because the sites included in this study had been part of the previous research conducted by the authors (Chapter two), a pilot study was not conducted.

We adopted a mixed sampling method consisting of purposive and snowball sampling techniques (Cohen *et al.* 2002). We used existing evidence of the direct hunting of vultures and poisoning incidents in selecting relevant communities for the study. In each site, the researchers were accompanied by a local resident who was involved in local hunting activities and familiar with hunters in the area (Kanagavel *et al.* 2016). These individuals also participated in the study as key informants. Participant selection was guided by key informants and referrals from other respondents (Kanagavel *et al.* 2016). Due to the sensitivity of the study, the two techniques adopted were advantageous as they gave participants the confidence to engage meaningfully (Chang *et al.* 2018). The use of the snowball sampling method is common in research investigating illegal activities and sensitive topics, often involving hard-to-access groups (Kanagavel *et al.* 2016;

Brancati 2018). The same approach was applied to trader participant recruitment. Out of eight traders that were approached, only four consented to participate in the study.

Twenty-five participants were successfully recruited, consisting of twenty-one hunters and four *muthi* traders. Verbal consent was ensured with each participant before the interviews were administered. The interviews were administered using an interview guide mainly consisting of open-ended questions. All interviews were conducted in isiZulu and lasted between 15 to 45 minutes. Due to the sensitivity of the study, some participants seemed uncomfortable regardless of the assurance of anonymity, some information was withheld even against probing efforts. In research involving human subjects, participants' concern about legal implications of disclosing certain information is one of the most common challenges of collecting data, especially on illegal activities (Chang *et al.* 2018).

Most interviews were conducted in the participants' homes and in some cases, outside, in the fields for those we found attending to their livestock. For traders, visits to the market consisted of observations and informal conversations before potential participants were identified and approached for interviews. The interviews were recorded (with consent from each participant), transcribed verbatim and translated into English (Aiyadurai *et al.* 2010). Further, data were coded and manually organised into themes using Thematic analysis. This method allows for a systematic identification and organisation of data into patterns of meaning (Braun and Clarke 2012). The main themes that were derived from the dataset were traditional hunting, vulture hunting and aspects of trade in vultures.

3.4 Results

3.4.1 Hunting in northern KwaZulu-Natal

The study involved participants residing adjacent to Mkhuze Game Reserve and HiP. We interviewed local hunters (84%, $n = 21$) and *muthi* traders operating in Mona market (16%, $n = 4$). Of the 21 hunters interviewed, nine (43%) were from communities around Mkhuze, and 12 (57%) lived adjacent to HiP. Our study consisted of 24 (86%) male participants and one (4%) female (Table 3.1).

Table 3.1 Summary of the study sample.

| Study site | No. of participants | Gender (Male) | Gender (Female) | Mean age \pm SD [range] (Years) |
|------------------------------|------------------------|---------------|-----------------|-----------------------------------|
| Hluhluwe iMfolozi Park (HiP) | 12 hunters | 12 | 0 | 64 ± 14 [24-65] |
| Mkhuze Game Reserve | 9 hunters* | 9 | 0 | 49 ± 13 [33-65] |
| Mona Market | 4 <i>muthi</i> traders | 3 | 1 | 35 ± 8 [24-42] |
| Total | 25 | 24 | 0 | |

*Includes two key informants

Our results demonstrated that hunting in the rural areas of northern KwaZulu-Natal is a long-standing, relatively prevalent activity. Hunting was predominantly practised by men; women's involvement was limited to looking after the hunting dogs and meat preparation after successful hunting trips. Hunters in the present study consisted of young, middle-aged and old males. The youngest hunter interviewed was 24, and the oldest was 65 years old. We found it normal for rural boys to practise small-scale hunting in the nearby woodlands while rearing livestock. For example, "*I grew up hunting in this area as a young boy; when we were out looking after livestock, we would bring dogs and sometimes hunt small antelope in the fields*" (HU-07). It was reported that boys could start hunting from as early as the age of nine. The majority of

respondents (81%, n = 17) defined their hunting as sport-based (socio-cultural), with a few hunting for subsistence (19%, n = 4). However, sport and subsistence hunting overlapped considerably at times because meat from sport hunts (predominantly antelope) was consumed at home and shared with neighbours.

Subsistence hunters reportedly hunted alone or in smaller groups of two to three men. Hunters mainly targeted a variety of antelope and harvests were predominantly for household consumption but also for trade within the community. Subsistence hunters frequented protected areas and used various hunting techniques, including dogs, snares, traps and spears. Our results reveal that subsistence hunting represented an auxiliary source of cash income for some local young men. One asserted: *“We do not have jobs, so we live off the land. This is what we know”* (HU-05). In addition, hunters sold non-bushmeat products such as animal skins, horns and teeth for use in traditional medicine and in making traditional garments.

Sport hunting was performed with dogs, referred to by local residents as ‘Greyhounds’ (Figure 3.2). These dogs were known to be fast runners, and the main target species were antelope. Hunters bet on the dogs, and the owner of the dog that demonstrated desirable hunting skills and caught the target animal first would get offers to sell the dog or sometimes money. Money or livestock was reportedly used in exchange for dogs. A hunter, who also specialised in raising hunting dogs, claimed that an adult dog costs between R8 000 (~US\$556) and R10 000 (~US\$662), which is equivalent to six goats. Puppies were sold for about R4 000 (~US\$280) each. Hunters further indicated that hunting helped them maintain good health. It also played a role in controlling or keeping at bay problem-causing animals such as hyaenas (*Hyaenidae* spp.), inhabiting forest patches outside protected areas. *“Hunting is more like a sport and some kind of exercise for us. We mainly search for antelope, but we also chase away problem-causing animals. If we are always*

in the forest, we can manage to keep them away from the village because they are quite problematic.” (HU-04).

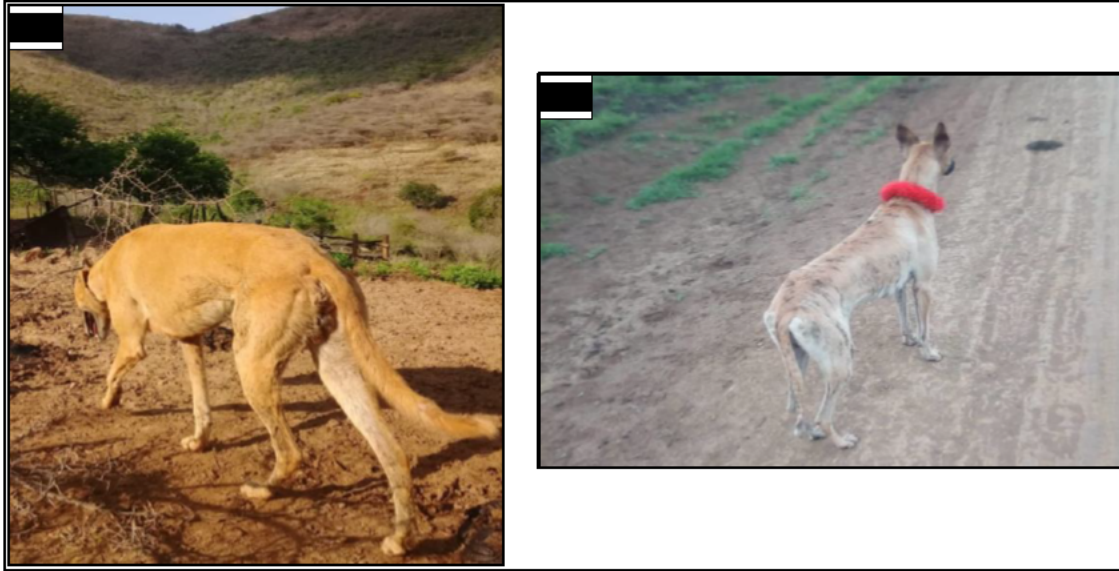


Figure 3.2 Examples of hunting dogs owned by the study participants (September 2020).

Hunting trips were undertaken at least twice a week. Hunters went out in groups of more than 50 men, from the local areas (hosts) and neighbouring towns (visitors). For example, in Mkhuze, visiting hunters came from uPhongolo, KwaNongoma and uMtubatuba. Hunting took place mainly in communal lands. One of the respondents reported that they obtained 11 different animals on their last hunting expedition and that this number could go up to 13. Respondents revealed that everything encountered was hunted, but the main target species were antelope. In addition, most hunters claimed that they only hunted during the winter season when the grass is shorter and because hunting did not interfere with breeding during this time. However, single and group-led hunting activities were frequently observed by the researchers in early spring, from August to September. One of the respondents corroborated these observations and claimed, “*We*

change areas so that antelope numbers can recover but we do not have specific hunting seasons”.

From this, we deduced that hunting took place throughout the year and possibly peaked in winter when labour demands in neighbouring commercial farms declined. Hunters were aware of the unsustainable nature of their hunting patterns. The majority of hunters, especially older men, reported that most wildlife had declined in non-protected areas. For example, *“I hunt a lot. You see those mountains? We go there and even beyond, looking for antelope, but they are not as many as they used to be. Some have disappeared completely, for example, you do not see uMziki (oribi, Ourebia ourebi) anywhere around here anymore”* (HU-17). Other hunters admitted that the decline in wildlife was a result of unregulated hunting habits. For example, *“Previously, there were hunting seasons but now people hunt at any time”* (HU-14). Nonetheless, there was confidence demonstrated by others that wild animals were not nearing extinction, for example; *“People have been hunting here for years and there are still some animals left, they can never be finished”* (HU-02).

3.4.2 The illegal sourcing of vultures for trade in northern KwaZulu-Natal

Our results indicated that hunters who participated in vulture hunting operated in small groups of three to five hunters within local communities and were not widespread across the study region. Based on our interviews and data from monitoring programmes, we estimated that there were about five to eight vulture hunter groups operating in northern KwaZulu-Natal from Mtubatuba to Manguzi, at the time of the study. Respondents who admitted to hunting vultures were from HiP, aged between 24 and 40 years and all had part-time jobs. It was indicated that the hunting of vultures was primarily performed by the select hunters who had identified this niche as profitable. Vulture hunting was predominantly deliberate and required serious planning. It also did not seem

desirable or practical to the majority of respondents. Although most hunters generally owned hunting dogs, the methods used in hunting vultures were not common or easily accessible. For example, *“I don’t think people who hunt vultures are ordinary hunters. Because ordinary hunters hunt with dogs and you cannot hunt vultures with dogs because they can sense dogs from a distance and get away”* (HU-11).

The most frequently cited hunting techniques were poison (38%) and firearms (31%) (Figure 3.3). Hunters lured vultures out of protected areas and private game reserves using livestock carcasses as bait. In poisoning, the carcass would be laced with a lethal substance, resulting in death after ingestion. Carcasses were not laced with poison when firearms were used as the preferred technique. Encounters also occurred when vultures visited communal areas to scavenge, although this was opportunistic and rare. Hunters reported using goats, cattle or donkeys and sometimes antelope as bait. Donkeys were available within most HiP communities. One of the respondents claimed that there was a period when the game reserve purchased donkeys from local people (probably as part of a supplementary feeding initiative), which led to these animals being raised in large numbers. However, this was apparently temporary, and when the protected area suspended the initiative, residents abandoned their many donkeys as they had no other use for them. Now, these animals were available to hunters who made use of them as bait for capturing vultures. One participant explained, *“The reserve used to buy donkeys from the local people. People raised donkeys, but now the reserve is not buying them anymore. Most of them (the donkeys) are abandoned, and now hunters use them to lure vultures out of the game reserve. I suggest that the reserve collects all the stray donkeys to reduce vulture poisoning in this area”* (HU-01).

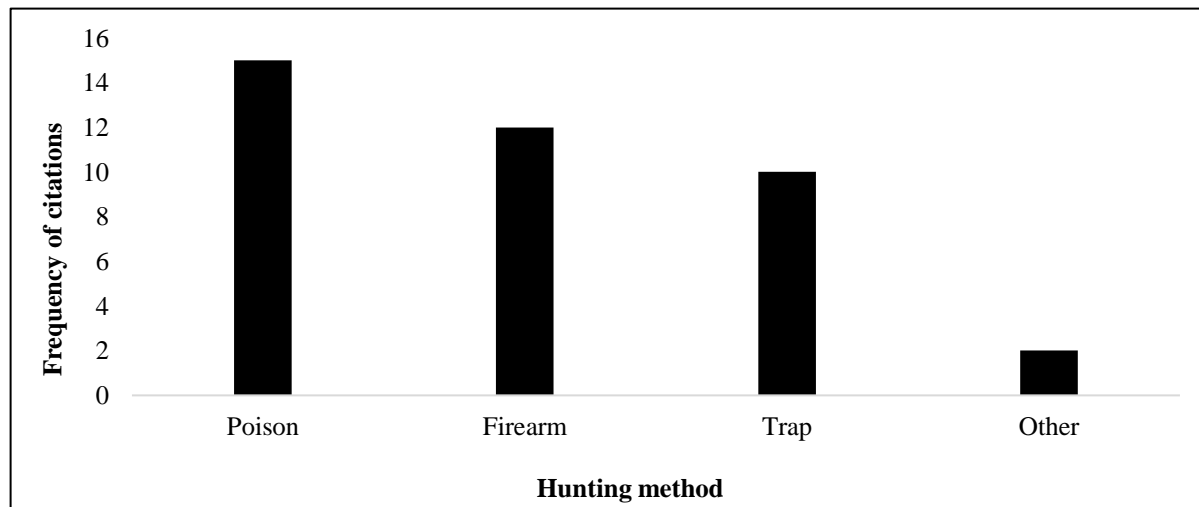


Figure 3.3 Methods used to hunt vultures in northern KwaZulu-Natal, and the number of times each method was mentioned (n = 39) (Note: Other = sticks and stones).

3.4.3 Trade networks and prices

It was reported that vulture hunters worked within networks consisting of hunters, traditional healers and *muthi* traders from across the region. Vultures were hunted upon requests, and in most cases, these were single vulture requests. One of the hunters supported this; “*No one would ask you for more than one vultures at a time*” (HU-02). Hunters sold their vulture harvests directly to traditional healers but also to traders selling products in *muthi* markets and local towns. Except for vultures sold within the community, most respondents reported that vultures harvested from the region were mainly destined for Mona Market (Figure 3.4).

Hunters reported selling vultures whole at prices ranging from R500 (~US\$34) to R1 000 (~US\$67). One hunter claimed; “*In most cases, I do not sell them for much because I cannot do anything with the bird, once it is in my possession, I want to quickly get rid of it. So, we are open to negotiations with buyers, and these might lead to us having to sell the birds for lower prices than initially planned*” (HU-02). In comparison, traders reportedly sold the birds in portions and

sometimes whole at higher prices than hunters. Trader prices for the whole vulture carcass ranged from R1 500 (~US\$101) to R2 000 (~US\$135) and R500 (~US\$34) for the head. Respondents reported that prices varied greatly depending on the product quality and the place of sale. Fresh products and those sold far from the source or in large cities, where demand is higher (e.g., Durban *muthi* market) were more expensive.



Figure 3.4 Images of a whole vulture and parts displayed for sale at Mona Market and prices (June 2020).

3.4.4 Perceptions and uses of vultures

Respondents were aware that hunting and trade activities involving vultures are prohibited. Therefore, having a vulture in one's possession was considered a risk. *"They are protected species in the country and having a vulture in your possession is not a small thing."* (HU-10). Participants reported that vultures were dangerous to human beings and hard to kill. *"If there is a dead animal they set traps, you cannot easily approach that bird because it is dangerous, it can kill you."* (HU-

19). Vultures were said to avoid human contact and consequently spent most of their time in game reserves. Vultures also avoided carcasses that were located in close proximity to human habitation and activities. *"Vultures are not easy to find. They are not killed very often because they do not come to villages but spend most of the time in game reserves."* (HU-15). Respondents indicated that the birds were not coming to the villages as they used to before, which they attributed to the increase in human settlements. *"It is not easy to get a vulture because they are not as many as they used to be."* (Hu-17). We also gathered that vultures avoided sites where they had been hunted or previously experienced disturbances. Declines in vulture populations were reported by the respondents, especially older hunters. One of them claimed: *"There used to be a lot of them (vultures) feeding on livestock carcasses in these lands (communal) but now we go years without seeing them. They spend most of their time in reserves now. Livestock die and end up being eaten by dogs and hyaenas"* (HU-15).

Hyaena numbers were reported to have increased dramatically outside protected areas and were linked to numerous livestock depredation incidents in local communities adjoining protected areas. One of the hunters stated that; *"Hyaenas killed 11 goats a few weeks ago, here. They are too many, and are a big problem, but no one is doing anything about it. We need help on how to remove them from here because even dogs are terrified of them"* (HU-09).

We found that vulture parts were popular as ingredients in traditional medicine and other related practices. The use of vultures in traditional medicine was informed by their scavenging behaviour. Respondents perceived vultures to be able to locate carcasses from vast distances, using their heightened sense of smell facilitated by a substance found in their brains known as *ithuko*. Vultures were considered extremely sensitive to signals carried through the air; hence they are called *izwangomoya*. *"Besides their ability to sense, vultures are wary of their surroundings, they*

can tell if a place is dangerous and leave. For example, if they smell the blood of another vulture, they will not eat there.” (HU-18).

The parts used in traditional medicine were the head/brain, heart and bones. These parts were used for various issues with medicinal and belief-based orientations. For example, vulture parts were reportedly used to sharpen hunting dogs (41%, n = 12) and to enhance divination (38%, n = 11) (Figure 3.5). The parts were smoked to enhance a diviner’s ability to foresee and find hidden things. Other uses involved good fortune, attracting customers, obtaining strength and bravery, and treating headaches and mental illness.

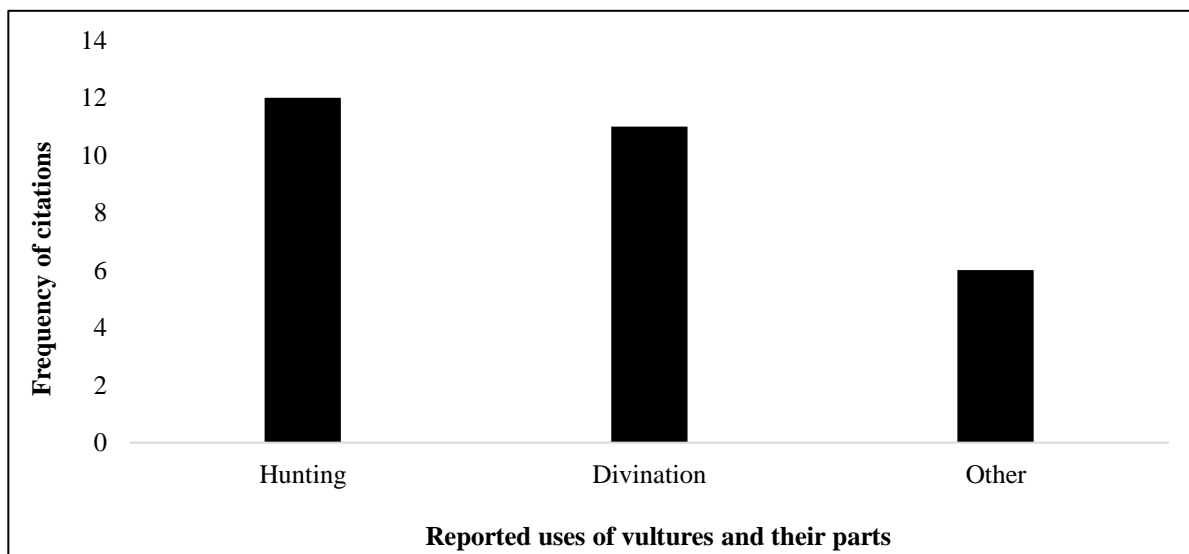


Figure 3.5 Vulture uses, as reported by hunters and traders in the present study (n = 29).

3.5 Discussion

3.5.1 Hunting in northern KwaZulu-Natal

Wildlife hunting is a long-standing cultural practice for many indigenous societies worldwide (Luz *et al.* 2017; Eid and Handal 2018). It is at the frontier of the human-animal interface (Bonwitt *et*

al. 2018). In the present study, we found hunting to be prevalent despite the low numbers of wildlife remaining in communal lands. Hunting was male-dominated, as in other studies in the province (Dlamini 2005). The strong cultural element of hunting in this study was observed as in other studies (Bonwitt *et al.* 2018; Manqele *et al.* 2018). Most hunters were adults; boys were taken to the field as early as the age of nine to hunt. This knowledge transfer system indicates the importance and relevance of this practice.

We identified two dominant forms of hunting, which we categorised as sport (socio-cultural) and subsistence (economic) (Vliet *et al.* 2016). We observed some overlaps and levels of integration between the functionalities of these two types of hunting. Sport hunting was the most prevalent and was performed mainly for the purposes of enjoyment and socialisation. This activity was associated with significant levels of bushmeat consumption as the main target species were antelope. Meat from hunting expeditions was consumed with other hunters and neighbours at home. Therefore, it played a role in improving food security (Vliet *et al.* 2016). A by-product of this activity was livestock protection, as hunters reportedly hunted problem-causing animals when encountered during hunting trips. This form of hunting also presented opportunities for income generation for some hunters, primarily through dog sales. At the time of the study, one of the respondents had recently sold two of his hunting dogs for R16 000 (~US\$1139). In addition, hunters locally traded in parts such as skins, bones and feathers from hunted animals. Although antelope were the main target species, all animals encountered were hunted. Therefore, the practice was poorly regulated and consequently unsustainable.

Subsistence hunting constituted the hunting of bushmeat species primarily for household consumption, which was often accompanied by meat sales within the community. Subsistence hunters frequented protected areas, hunted in smaller groups and utilised a diversity of hunting

tools, possibly to increase their catch. The observed high levels of unemployment in our study areas implied that hunters had more time to be out in the fields. This attribute was significant as a motivator and an enabler for hunting activities, both sport and subsistence. Moreover, one key element of hunting was income generation; both sport and subsistence hunters generated income through hunting. Although this was a by-product of both forms of hunting, it draws attention to the scarcity of opportunities for income generation in the areas studied.

Poor agricultural productivity, low monthly incomes, inequality and lack of economic alternatives are key economic factors driving local people's dependence on wildlife resources (Aiyadurai *et al.* 2010; Lindsey *et al.* 2011;). These conditions are increasingly common in most communities near wildlife areas in the Global South (McMillan and Nguyen 2014; Nsukwini and Bob 2019). However, participants in the current study demonstrated a relatively low level of consistent dependence on wildlife resources for subsistence; this has also been shown in other studies (Sandalj *et al.* 2016; Manqele *et al.* 2018; Rogan *et al.* 2018). The shift in dependence on wildlife has been driven mainly by economic and political changes that have opened a diversity of opportunities for people to source income. In addition, the low numbers of wildlife remaining in communal lands and the risk of hunting inside the game reserves are likely responsible for the observed reduced reliance on bushmeat as a substantial livelihood source.

3.5.2 The illegal sourcing of vultures for trade in northern KwaZulu-Natal

The hunting of vultures, in particular, was an endeavour that had developed in response to the persistent demand for vultures in traditional medicine practices, as found in other studies (McKean *et al.* 2013; Pfeiffer *et al.* 2015; Mashele *et al.* 2021a). Vultures in northern KwaZulu-Natal were illegally hunted by local hunters who operated in groups of three to five men. These hunting

syndicates were not widespread across the region. Except for opportunistic harvests, we estimated about five to eight hunting groups specialising in vultures across northern KwaZulu-Natal, from uMtubatuba to Manguzi. The hunting of vultures was not a full-time economic activity but took place mostly upon requests, which were irregular. One hunter reported that they sometimes hunted without any requests and searched for buyers through their networks when they were short on cash.

Those who hunted vultures were reportedly discreet in their operations within the communities. Their activities were not widely known or talked about. We attributed this outcome to a combination of factors. Although hunting is a locally accepted cultural practice and a livelihood activity in rural KwaZulu-Natal (Dlamini 2005), hunting vultures was somewhat contested within local communities. We found from our previous study that vultures were not perceived as problem-causing animals; instead, they were valued for their ecological role as scavengers and as part of the local natural heritage (Chapter two). This may result in their hunting being frowned upon by some community members. The majority of local people's disapproval of illegal hunting and trade in wildlife can result in reduced wildlife crime (Gastañaga *et al.* 2011). In their study, Gastañaga *et al.* (2017) revealed that local people believed that illegal wildlife activities tainted the image of their community and threatened its tourism potential. In light of this, most residents were against wildlife crimes. This social construct resulted in reduced illegal hunting and trade incidents by local residents.

In addition, the rapid decline in vulture populations over the last few decades has solicited increased attention and dedication to vultures from the conservation sector (Botha *et al.* 2017). Some of the strategies implemented include awareness-raising, population monitoring and law enforcement presence in areas deemed as hotspots for vulture hunting and/or trade, including our study sites. This increased presence has improved awareness regarding the current plight of

vultures and reinforced the illegality of their capturing and possession. This has potentially translated to fewer people engaging in illegal vulture harvesting, and those who choose to engage in such activities are compelled to operate secretly. Increased awareness in conservation has been associated with changes in behaviour that potentially reduce illegal activities against wildlife (Keane *et al.* 2011). However, it remains uncertain whether the combination of local appreciation and increased conservation efforts has resulted in lower numbers of people engaging in vulture hunting or in hunters keeping their activities well concealed.

The hunting of vultures was predominantly commercial. We found that hunters who specialised in vultures were young people between the ages of 24 and 40 years. All of them had part-time jobs at the time of the study. Often, low-income groups practice illegal wildlife trade (Atuo *et al.* 2015). McKean *et al.* (2013) revealed that most people involved in the vulture trade were low-income groups. Due to our research's illicit and sensitive nature, we could not solicit adequate information on the socio-economic characteristics of hunters, especially those involved in vulture harvesting and sales directly (Duffy and St. John 2013). Their involvement in vulture trade could be driven by the need to supplement their existing sources of income.

Poison and firearms were considered the most used tools for killing vultures. Poisoning has been flagged in Africa as one of the main contributors to the present vulture crisis (Virani *et al.* 2011; Botha *et al.* 2017; Gore *et al.* 2020). However, the majority of vulture poisoning incidents are reportedly indirect. For example, vultures fall victim to farmer-carnivore conflict and game poaching activities. It appears that the primary poisoning of these birds is gaining momentum in the region. A practice that is partly driven by their demand in traditional medicine markets (McKean *et al.* 2013). In the present study, we found that firearms had gained preference over poison, because most healers had become cautious of using poisoned vultures, as found in another

recent study (Mashele *et al.* 2021a). Except for the infrequent instances where vultures visited communal lands to scavenge, these birds were mainly lured out of protected areas and private game reserves to be killed in communal lands. Livestock (i.e., cattle, goats, and donkeys) carcasses were used as bait. The availability of donkeys in communal lands was understood to aid the illegal hunting of vultures. One of our respondents indicated that the availability of donkeys in HiP (that were mainly used as bait) had been facilitated by a previous partnership between local residents and the game reserve. Hunters only secured other livestock carcasses when there had been incidents such as depredation, disease, and drought-related mortalities. This is because livestock, cattle and goats mainly serve cultural and legitimate economic purposes in rural African communities.

3.5.3 Trade networks and indirect implications of the decline in vulture populations

We found that trade in vultures did not follow a single route and was, therefore, unpredictable, a common phenomenon in the illegal wildlife trade (Leberatto 2016). Trade occurred within closed networks comprising hunters, traditional healers, and traders. Depending on hunter operation and network structure, vultures were sold directly to traditional healers in the community through the networks or sold to traders for further sales in the local *muthi* market. Atuo *et al.* (2015) observed a similar pattern in their assessment of the avian body parts trade, where they found that products were sold through door-door platforms and open markets. Mona Market is within 50 km of the study areas (communal lands and protected areas). It is a local wholesale market where various products are sold, including hand-work products, livestock, medicinal plants and animal parts, *inter alia*. Considering the cost and potential risk of travel, this market was the most convenient platform for selling vultures harvested in the region. However, this market opens once a month for

a few days up to one week. As a result of this limitation, other avenues were likely used to sell the products. Some vultures harvested from northern KwaZulu-Natal were found in Warwick Junction *muthi* market, the biggest market in the province situated approximately 300 km from the study sites. Small-scale erratic off-market sales were also observed in local towns (pers. obs.).

Vultures were sold whole or in portions. Whole vultures were found fresh, while parts could be sold dried. We observed significant variations in the pricing of vultures, generally. Hunter prices and trader prices differed, with hunters selling vultures whole for relatively lower prices. Broad *et al.* (2014) show that revenue distribution along the trade system is uneven. Harvesters often generate lower incomes compared with middlemen and retailers. Trader prices ranged from R1 500 (~US\$101) to R2 000 (~US\$135) for a whole bird carcass. Notably, traders alternatively sold birds in parts (i.e., head, wings, and feet). For example, the head alone was sold for R500 (~US\$34), and it was the most expensive and sought-after product in the market, as shown in other studies (McKean *et al.* 2013; Mashele *et al.* 2021a, b).

Even among traders, vulture prices varied, depending on the product quality and the place of sale. Fresh products and those sold far from the source and in high-demand locations (e.g., Durban) were more expensive. Mashele *et al.* (2021a) shared similar inferences in a study conducted in Kruger to Canyons Biosphere region, South Africa. The authors further highlighted that vulture prices varied based on traders' economic background, source, and level of difficulty in obtaining products and bird gender, with prices decreasing for male vultures (Mashele *et al.* 2021a, b). Despite the observed differences in revenue and its distribution along the trade route, it was evident that vultures were high valued species in the markets.

We found that a combination of three factors accounted for the high commercial value of vultures in the markets. Firstly, vultures' protection status and law awareness imply that possession

is a high risk (Challender and McMillan 2014), which justified the high market price for vultures. Secondly, vultures were said to avoid communal lands and spent most of their time in reserves, which limited their accessibility. This was in alignment with the observed decline in their populations. Species perceived as declining are often assigned high market prices (Atuo *et al.* 2015). In addition, as species become rare, the cost of harvesting increases as they likely require greater hunting skills and more time dedication (Abi-Said *et al.* 2018). Thirdly, vultures are typically highly revered in traditional medicine because of their belief-based attributes (McKean *et al.* 2013; Boakye *et al.* 2019; Mashele *et al.* 2021a, b). Durojaye and Olufemi (2015) noted that a species' price in the market could be determined by the benefits expected to be obtained from its use.

The respondents expressed that they were burdened by problem-causing animals, in particular, hyaenas. The recent perceived increase in hyaenas in communal areas was linked to the decline in vultures. Respondents claimed that livestock carcasses in communal lands were attracting more hyaenas following the decline in vultures and their retreat to protected areas. Prey abundance and lack of intraspecific competition were most likely driving the increase and facilitating permanent residence of hyaenas in communal areas. In the previous chapter (Chapter 2), residents underscored the important role of vultures in livestock carcass removal, especially because of the proneness of the area to dry conditions which often leads to high cattle mortality. The link between the reduction in vulture populations and the reported increase in mammalian scavengers is possibly significant and requires further investigation.

Ogada *et al.* (2012) presented evidence signalling a correlation between declines in vulture populations and the increased presence of facultative scavengers, especially hyaenas and jackals (*Caninae* spp.). Their results showed that facultative scavengers take dominance in the absence of

vultures. They further observed that carcasses remain longer in the environment without vultures, attracting an increased number of mammalian scavengers, facilitating contact with domestic animals and representing a serious risk of disease transmission. The increase in hyaena populations outside protected areas is of concern considering human health and livelihoods (Ogada *et al.* 2012; Mhlanga *et al.* 2019).

According to our participants, vulture parts, especially the head/brain, were used mainly in traditional medicine for hunting dogs. The remedy derived from the vulture head/brain was perceived to strengthen dogs' hunting senses. This was in accordance with the seemingly increasing practice of sport hunting. Parts of the head and or brain were dried, crushed into powder and mixed with parts from other meat-eating animals such as eagles (Family *Accipitridae*). The product was administered to the dog through feeding (mixed with food) or sniffing. The majority of hunters obtained this product from traditional healers, while a few knew how to mix it for themselves. Using this product for a dog was believed to strengthen its hunting senses, which enabled the dog to run faster and find prey quicker. Although most hunters used this product, excessive and prolonged utilisation was believed to result in dogs preying on goats and having to be put down. According to our knowledge, this is the first report of the use of vulture-derived traditional medicine on domestic animals.

3.6 Study limitations

This study was initiated with the aim of assessing aspects relating to the hunting of vultures in northern KwaZulu-Natal. This study was qualitative and data were derived primarily from interviews and observations as supplementary. Although the interviews were guided, conversations with the participants differed significantly. This is because of the sensitive nature of

the study, not only from the vulture conservation perspective. There was a possibility of encountering hunters who were involved in other illegal activities and in possession of critical information. For example, one of the hunters interviewed was a former rhino poacher. In light of the aforementioned, certain questions were deliberately omitted while others were added with careful discretion. However, key questions were asked, and probes were also employed to make sure that responses to these questions were provided. Scientific research standards were carefully adhered to in order to ensure data quality. Data synthesis was deliberately limited to retain data originality and keep up with the study qualitative nature of the research. Data presented here may have limited generalisation potential considering that the study involved two sites of the same region and a relatively small sample size, particularly regarding the *muthi* trader category.

3.7 Conclusions

Although an ancient practice, wildlife hunting predominates in contemporary rural areas of developing countries. Hunting takes place for various purposes, including subsistence, sport, culture, income generation and problem-causing animal management. Hunting has been closely linked to socio-economic conditions endemic to remote rural areas in the Global South, where poverty is prevalent because of limited agricultural potential, high unemployment levels and scarce income generation opportunities. In these settings, the livelihood strategies of local people tend to involve living off the land and the resources it furnishes. This study was primarily aimed at examining the aspects of the sourcing and trade of vultures for use in traditional medicine. However, we found that this practice was not exclusive but was, in fact, a part of a broader resident culture of hunting for socio-cultural and economic purposes predominant in the study areas.

We found that vulture hunters operated in small syndicates. These hunters mainly used poison and firearms to kill vultures. Since vultures were known to spend most of their time in protected areas, livestock carcasses were used to lure them out. Donkeys, in particular, were perceived to facilitate the hunting of vultures as they were freely available to hunters in one of our study sites. Vultures were traded in complex networks involving hunters, *muthi* traders and traditional health practitioners. Trade occurred in local communities, neighbouring towns and the local market, Mona. The hunting and trade of vultures was a significant source of income for those involved in these activities, as the birds were traded at relatively high prices. In addition, to being highly esteemed in traditional medicine, the high market value of vultures was owed to their rarity and difficulty in sourcing because of low numbers, protection status and the fact that they spent most of their time in protected areas. Hunters were aware of the decline in vulture populations in their areas. They suspected their reduced visits to communal lands had resulted in the increase in scavenging mammal populations. Law enforcement and awareness programmes in the studied areas may be having a positive impact, and we suggest that these programmes be continued. Further research would benefit vulture conservation by investigating the relationship between the reduction in vulture populations and the increase in mammalian scavengers in communal lands.

3.8 Declarations

Conflict of interest statement

The authors declare no conflict of interest nor competing interests.

Availability of data and material

Data for this study is available on request from the authors but belong to the University of KwaZulu-Natal.

Acknowledgements

The authors would like to thank the South African National Biodiversity Institute for funding this study. Valuable input received from this research's steering committee is highly appreciated. Many thanks to the study participants for their time and accommodation. We thank all the research assistants for their dedication to this work. The support received from the University of KwaZulu-Natal (ZA), the National Research Foundation (ZA, Grant 98404) and the Ford Wildlife Foundation (ZA) is greatly appreciated.

Author contributions

All authors conceived the research idea. JS and CTD sought funding. NSM collected the data. NSM analysed the data. NSM drafted the manuscript, and all authors provided comments and revisions to the manuscript.

Ethical approval

Approval of the ethical appropriacy of the research instrument was granted by the University of KwaZulu-Natal, Ethics committee (Reference: HSS/1089/108D).

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3.10 Supplementary Information

Supplementary information Table S3.1 Study sample composition

| Interview ID | Location | Category | Gender | Key-informant | Age |
|--------------|----------|----------|--------|---------------|-----|
| 1 | HiP | Hunter | Male | No | 40 |
| 2 | HiP | Hunter | Male | No | 24 |
| 3 | HiP | Hunter | Male | No | 50 |
| 4 | HiP | Hunter | Male | No | 65 |
| 5 | HiP | Hunter | Male | No | 48 |
| 6 | HiP | Hunter | Male | No | 30 |
| 7 | HiP | Hunter | Male | No | 32 |
| 8 | Mkhuze | Hunter | Male | No | 55 |
| 9 | Mkhuze | Hunter | Male | Yes | 35 |
| 10 | Mkhuze | Hunter | Male | No | 33 |
| 11 | Mkhuze | Hunter | Male | No | 39 |
| 12 | Mkhuze | Hunter | Male | No | 58 |
| 13 | Mkhuze | Hunter | Male | No | 35 |
| 14 | HiP | Hunter | Male | Yes | 36 |
| 15 | HiP | Hunter | Male | No | 52 |
| 16 | HiP | Hunter | Male | No | 62 |
| 17 | HiP | Hunter | Male | No | 60 |
| 18 | HiP | Hunter | Male | No | 55 |
| 19 | Mkhuze | Hunter | Male | No | 65 |
| 20 | Mkhuze | Hunter | Male | No | 58 |
| 21 | Mkhuze | Hunter | Male | No | 63 |
| 22 | Mona | Trader | Male | No | 30 |
| 23 | Mona | Trader | Male | No | 42 |
| 24 | Mona | Trader | Female | No | 42 |
| 25 | Mona | Trader | Male | No | 27 |

CHAPTER FOUR

The ethnomedicinal use of vultures by traditional health practitioners in KwaZulu-Natal, South Africa

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Submitted to: *Journal of Ornithology*

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Running header: Ethnomedicinal use of vultures

4.1 Abstract

African traditional medicine contributes to greater healthcare coverage by providing primary healthcare to rural dwellers, who often have limited access to modern medical services. In some instances, the prevalence of traditional medicine use has been shown to put pressure on biological resources upon which it relies. Indigenous people have identified many wild animals as possessing curative properties. The use of animals and their body parts as ingredients in traditional medicine is often poorly regulated. This represents a major challenge for biodiversity conservation, especially concerning species that are increasingly susceptible to offtakes. We investigated traditional health practitioners' ethnomedicinal use of vultures in KwaZulu-Natal, South Africa. In-depth interviews were conducted with 26 traditional health practitioners from uThukela and Zululand district municipalities. Data collected were analysed through qualitative and quantitative methodologies. Divination was identified as the most prominent form of traditional healing among the participants. We documented seven parts of the vulture that were used for a range of ailments in traditional medicine. When the Use Value (UV) index was calculated for each part, the head obtained the highest (0.92). Consensus on parts and their uses were generally low across the study group. Of 21 conditions reportedly treated with vulture parts, 71% were spiritual infirmities or uses. The participants were aware of the hunting of vultures through the use of poison and demonstrated different views about the risks associated with this. Overall, our results are comparable with most studies that highlight the predominant use of African vultures in belief-based practices. More dedicated awareness is required to educate traditional healers about the health risks of using poisoned products in medicine. We also suggest including resource users as active stakeholders in biodiversity conservation. Prioritisation of efforts to institutionalise and regulate traditional medicine may result in positive health and biodiversity conservation outcomes.

Keywords: Traditional medicine, Wildlife, Threatened species, Use Value, belief-based uses

4.2 Introduction

Over the ages many cultures worldwide developed their own healthcare systems to help overcome physical and mental health problems (Benedict 2014). The World Health Organization (WHO) defines traditional medicine as “the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not, that are used to maintain health, as well as to prevent, diagnose, improve or treat physical and mental illnesses” (World Health Organization 2004: 06). Traditional medicine indigenous to African cultures is known as African Traditional Medicine (Mothibe and Sibanda 2019), *muthi* in some indigenous languages. One of the distinctive characteristics of African traditional medicine is the inherent consideration of natural and supernatural forces in etiologies of illness. African traditional health practitioners employ a holistic approach to disease management, where well-being is examined from spiritual, cultural, physical and psychological dimensions (Ozioma and Chinwe 2019). According to Abdullahi (2011), traditional medicine was the main source of primary healthcare for the majority of the African population before the introduction of modern healthcare to the continent. Despite significant improvements and increased access to modern healthcare, evidence indicates that the use of traditional medicines remains prevalent in most African communities (James et al. 2018).

Although traditional medicine is often described as affordable, accessible, and culturally acceptable (Kamsu-Foguem 2013; Kasilo et al. 2019), a large proportion of its use derives from the pluralistic nature of healthcare systems common in most African countries, where modern medicine is appreciated but used simultaneously with traditional medicine (Nxumalo et al. 2011;

James et al. 2018). The role played by African traditional medicine in contributing to greater healthcare coverage is well recognised by the World Health Organisation (Kasilo et al. 2019). Nonetheless, issues of efficacy, safety concerns, and the integration of traditional medicine into formal health care systems dominate debates in the domain of traditional medicine (De Roubaix 2016; Zuma et al. 2016; Mutola et al. 2021).

The majority of the population in sub-Saharan Africa resides in rural areas (Crush and Fyne 2010; De Brauw et al. 2014). These areas are the most marginalised settings in the sub-continent, as they persistently fall behind in terms of economic progress (Darkoh 2009; Saghir and Santoro 2018). Consequently, service delivery in rural southern Africa has considerable shortcomings, one key example being the provision of conventional primary healthcare services. Rural residents are therefore driven to rely on traditional medicine as a fall-back strategy and a viable alternative (Sato 2012; Saghir and Santoro 2018). In recent decades, the region has been experiencing rapid rural-urban migration, with countries like Namibia, Botswana, Angola and South Africa now having over half of their populations occupying towns and cities (World Bank 2021). The reported increasing use of traditional medicine by city occupants is indicative of cultural diffusions, characteristic of migration processes. The strong belief in African healing practices has been a prominent factor in the choice of African traditional medicine use, especially in KwaZulu-Natal, South Africa (Berglund 1975, Cunningham and Zondi 1991; Zuma et al. 2016).

The predominant dependence of traditional medicine on wild-sourced biological resources has attracted considerable controversy because of increasingly unsustainable use patterns that contribute to biodiversity loss (Alves et al. 2013; Williams et al. 2017). In addition to the many plant species that are used for medicinal purposes within their local environments, indigenous people have identified a number of wild animals as possessing curative properties (Soewu 2008;

Vats and Thomas 2015; Izah 2018; Nieman et al. 2019). However, evidence on the pharmaceutical effects of faunal resources used in traditional medicine is lacking. Only a few studies exist, for example, Dinesh et al. (2013) demonstrate that the coelomic fluid of the African nightcrawler (*Eudrilus eugeniae*) is cytotoxic (i.e., it can kill cancer cells). Traditional knowledge and cultural belief systems remain the basis for the widespread ethnomedicinal use of fauna (Vats and Thomas 2015; Borah and Prasad 2017). If the popularity and demand for animals in traditional medicine increase, there is an expected increase in activities such as hunting and trade. Most animals used in traditional medicine are wild-sourced (Soewu 2008; Alves et al. 2013; Soewu and Sodeinde 2015; Loko et al. 2019), often with little to no adherence to regulatory mechanisms put in place to ensure sustainability (Djagoun et al. 2013; Adhikari et al. 2020). Both local and international markets drive the demand for biological resources to furnish the traditional medicine industry (Williams and Whiting 2016; Williams et al. 2017). With regards to local trade, sales generally occur in open markets across cities and within local community networks (Atuo et al. 2015; Neiman et al. 2019). Trade in wildlife resources for traditional medicine often represents an important source of income for those involved in it, especially those who are economically marginalised (Alves et al. 2013; McKean et al. 2013). This poses a challenge in finding equitable trade-offs between socio-economic obligations and biodiversity conservation outcomes.

Some argue that traditional medicine may not always represent an immediate threat to wildlife species (Ferreira et al. 2013; William et al. 2014). However, species' levels of vulnerability to stresses differ. Some wild animal cultural keystone species may have a limited capacity to withstand sustained offtakes. These are usually large-sized or long-lived, charismatic, peculiar and strong characters that are used in belief-based practices (Williams et al. 2014; Durojaye and Olufemi 2015). Generally, most large-sized species occur in relatively low densities,

are slow reproducing, have long life histories and are likely facing multiple anthropogenic threats (Whiting et al. 2013). Such species are highly vulnerable to offtakes, especially under uncontrolled harvesting regimes, as is often the case with traditional medicine use. Ethnographic studies provide valuable insights into the value of species in traditional therapies of various ethnic groups (Williams et al. 2014; 2017). These studies may help highlight species whose populations may be compromised as a result of use in traditional medicine.

Historically vulture species have been used in traditional medicine in parts of South Africa, but research demonstrates that there has been an increase in their demand in recent years (Cunningham and Zondi 1991; McKean et al. 2013; Whiting et al. 2013; Neiman et al. 2019; Mashele et al. 2021). Most extant vulture species are highly threatened owing to multiple stressors, including habitat modification, electrocutions, collisions, direct hunting and poisoning (Botha et al. 2017; Kruger et al. 2015; Ogada 2014; Rushworth et al. 2018). Out of the seven vulture species occurring in South Africa, four are regionally listed as Critically Endangered, two are categorised as Endangered, and one is listed as Least Concern (Geldmann et al. 2013; Allan 2015a,b,c; Kruger 2015; Taylor and Peacock 2018). Poisoning has been identified as one of the techniques used by hunters to acquire vultures for trade and use in traditional medicine (Botha et al. 2017). The impact of poison on wildlife, including vultures, is often catastrophic, with overarching implications for biodiversity conservation (Groom et al. 2013). From a human health perspective, there may be risks stemming from using poisoned products, although this needs further investigation. There is a possibility that traditional health practitioners are not aware that some of the vultures traded for use in traditional medicine may be contaminated with poison. We conducted a study in KwaZulu-Natal to solicit traditional healers' perspectives on the present dynamics of the use of vultures in

traditional medicine, including parts used, conditions treated, and perceptions concerning the use of poisoned vultures and their body parts as ingredients in traditional medicine.

4.3 Methods

4.3.1 Study sites

Our study involved traditional health practitioners residing in KwaZulu-Natal Province, South Africa, particularly within uThukela and Zululand district municipalities. Sampled areas were in or adjacent to the towns of Pietermaritzburg, Estcourt, Ladysmith, Vryheid, Nongoma, uMtubatuba, Mkhuze and uPhongolo (Fig. 4.1).

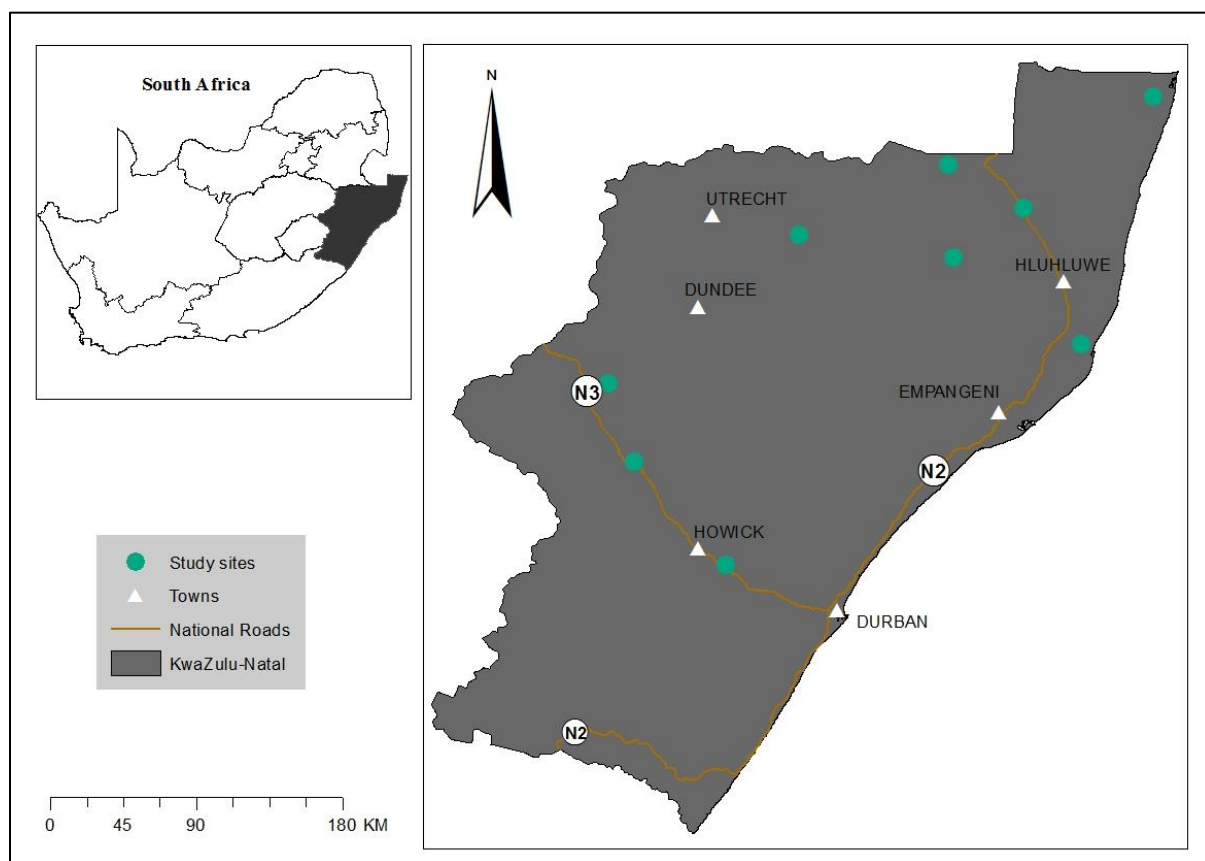


Fig. 4.1 Study sites in KwaZulu-Natal Province, South Africa.

4.3.2 Data collection and analyses

We followed a mixed-method approach containing qualitative and quantitative research design features. Our mixed sampling method consisted of purposive and snowball sampling. Purposive sampling is a qualitative technique used in studies involving homogenous individuals based on characteristics, knowledge, and experiences (Brancati 2018; Cohen et al. 2022). This technique was suitable as the study intended to solicit the knowledge held specifically by traditional health practitioners in KwaZulu-Natal (Albuquerque 2014). One of the main advantages of purposive sampling is the optimum use of time and resources (Albuquerque et al. 2014). Local traditional health practitioner societies serving as representatives for traditional healers were identified and contacted by the researcher. Several meetings were held between the researcher and leaders of the selected societies, during which the study purpose and requirements were discussed. Outcomes from the meetings were shared with the rest of the members. From this phase, the researcher was given a list of traditional health practitioners (with their contact details) willing to participate in the study. Subsequently, the snowball sampling technique was used to obtain additional participants. The snowball technique is particularly beneficial when conducting research involving hard-to-access populations (Albuquerque et al. 2014; Chang et al. 2017). Indeed, traditional healers are not easily approachable to people who are not seeking to use their services. In addition, early in the study, it was established that most local traditional health practitioners were not keen on participating in research studies because of past experiences of intellectual property rights violations (pers. comm.).

A semi-structured interview guide was formulated and used to guide the interview process. The first section of the research instrument was intended to obtain the demographic attributes of the study participants. The second section was dedicated to questions concerning the

ethnomedicinal use of vultures. The interviews were conducted in July 2019 and again from September to December 2020. Interviews were conducted in isiZulu (the home language of the participants), and they lasted from 30 to 45 min. Ethical clearance for the study was granted by the University of KwaZulu-Natal Ethics Committee under the reference number: *HSS/1089/108D*. Verbal consent was obtained from each participant before the interviews were administered.

Free-listing was adopted, and participants were (for some questions) at liberty to give multiple responses (e.g., ailments known by the participant that were treated by a particular part). Qualitative data were coded and arranged into various themes. The thematic analysis allows for a systematic arrangement of data into patterns of meaning (Braun and Clarke 2021).

4.3.3 Use value

The Use Value (UV) index was computed for all vulture parts reported using the formula from Phillips et al. (1994). The formula for this index is often used to indicate species' ethnomedicinal importance in a given community (Ozioma et al. 2006). It has, however, also been used in previous studies to demonstrate the value of different body parts of species used in traditional medicine (Boakye et al. 2019; 2021). In the latter manner, the index was used in the present study, and computed as follows:

$$UV = \frac{\sum Up}{n}$$

Where: *Up* represents the number of times a particular part was cited as being used and *n*, the total number of respondents.

4.3.4 Informant Agreement Ratio (IAR)

Homogeneity of knowledge is one of the key indicators of the cultural importance of resources (Hernandez et al. 2015). To demonstrate the level of consensus among the study participants about parts and ailments these parts were reported to treat, we used the Informant Agreement Ratio (IAR) (Boakye et al. 2019). This index is alternatively known as the Informant Consensus Factor (ICF) (Loko et al. 2019). The following formula was used to compute the index:

$$IAR = \frac{nr - na}{nr - 1}$$

Where: *nr* represents the total number of times a specific part was reported and *na* the total number of conditions reportedly treated with this body part. The IAR results vary from 0 to 1. One represents the highest level of agreement between respondents. Zero and values closer to zero indicate an absence of and lowest levels of consensus among respondents regarding parts and ailments for which they are prescribed and a high variation in uses for the part concerned (Heinrich et al. 1998; Boakye et al. 2019; Loko et al. 2019).

Uses were categorised as either medicinal or spiritual. From these two categories, uses or ailments of physical nature were classified using the International Classification of Diseases 10 version 2019 (ICD 2022). Spiritual ailments/uses were classed according to what the treatment was intended to achieve (i.e., intelligence for learners was classified under *Acts of enhancing*).

4.4 Results

4.4.1 Study composition and participant information

The study included 26 participants, 15 (58%) males and 11 (42%) females. Twenty-four of the respondents participated as interviewees, while two contributed as key informants. Analyses of data were thus based on 24 respondents (Table 4.1). The youngest participant was 29 years old,

the oldest was 70 years, and the average age of respondents was 54 years. In this study, we identified three main types of traditional health practitioners, namely, diviner (59%), herbalist (21%) and faith healer (8%) (Zuma et al. 2016 provide a detailed description of traditional health practitioner typology and roles). Other participants identified as more than one type of healer [i.e., faith healer + herbalist (8%) and diviner + herbalist (4%)] (Table 4.1). Participants provided healing services to people of all races, gender and age groups, presenting general physical ailments, sexual reproductive health-related issues and mental illness. Some of the study participants also furnished spiritual healing services such as protection against acts of witchcraft.

Table 4.1 Demographic summary of the study sample.

| Study site | No. of participants | Gender (Male) | Gender (Female) | Mean age \pm SD [range] | No. of healers/type | | | | No of participants that use vultures |
|------------------|---------------------|---------------|-----------------|---------------------------|---------------------|-----------|--------------|----------------|--------------------------------------|
| | | | | | Diviner | Herbalist | Faith healer | Hybrid | |
| Vryheid | 6 | 1 | 5 | 53 \pm 9 [40-65] | 5 | 0 | 1 | 0 | 5 |
| Estcourt | 5 | 3 | 2 | 55 \pm 12 [37-65] | 2 | 1 | 1 | 1 ^a | 3 |
| Phongolo | 4 | 3 | 1 | 56 \pm 4 [50-60] | 1 | 1 | 0 | 2 ^b | 4 |
| Mkhuze | 2 | 2 | 0 | 32 \pm 4 [29-35] | 2 | 0 | 0 | 0 | 2 |
| Nongoma | 2 | 1 | 1 | 57 \pm 2 [55-58] | 1 | 1 | 0 | 0 | 2 |
| Ladysmith | 1 | 0 | 1 | 58 | 1 | 0 | 0 | 0 | 1 |
| Mtubatuba | 1 | 1 | 0 | 58 | 0 | 1 | 0 | 0 | 1 |
| Pietermaritzburg | 1 | 1 | 0 | 48 | 1 | 0 | 0 | 0 | 1 |
| Somkhanda | 1 | 0 | 1 | 70 | 1 | 0 | 0 | 0 | 1 |
| Thengane | 1 | 1 | 0 | 68 | 0 | 1 | 0 | 0 | 0 |
| Total | 24 | 13 | 11 | 54 \pm 11 [29-70] | 14 | 5 | 2 | 3 | 20 |

a Hybrid is Herbalist+Diviner

b Hybrid is Herbalist+Faith healer

Moreover, respondents helped people build and maintain good relationships with their ancestors. It was indicated that human-ancestral relations are an important aspect of life, and if left unattended, they may cause one to experience misfortunes and/or illnesses. Study participants

performed spiritual cleansing for their patients and provided training to those who had been called into divination and other forms of traditional healing.

4.4.2 Vultures in traditional medicine

Participants fell into two categories; they were either vulture users (83%) or non-vulture users, who were aware of the use of vultures in traditional medicine (17%). All the diviners in our study used vultures in their healing practices. All participants who identified as faith healers did not use vultures. The association between healer type and vulture use was significant ($X^2 = 15.360$, $df = 4$, $P = 0.004$).

4.4.3 Vulture parts

Seven vulture parts were identified as of use for a range of ailments and conditions in traditional medicine (Tables 4.2 and 4.3). *Ithuko*, a fluid-like substance (as described by the participants) found in the vulture brain, was reportedly the main product that traditional healers required. However, because of the perception that this substance disappears as soon as the bird dies, it was challenging to harvest as this had to be done while the bird was still alive. Most healers resorted to using the vulture's head or brain. The head and brain were thus combined into one part, namely the head, as these parts were often mentioned as one by the respondents, and their uses overlapped. The head had the highest number of use reports ($n = 22$, 92%), followed by bones ($n = 6$; 25%). Body parts with the lowest use citations were the eyes ($n = 2$) and eggs ($n = 1$). Similarly, the UV for the head was highest, at 0.9, while bones demonstrated a UV of 0.2 (Table 4.2).

The vulture head was predominantly used as an ingredient in concoctions for *umhlahlo*, the ability to foretell, which was, overall, the most reported use for vulture parts in traditional medicine (72%). The head was also used as treatment for *izizwe*, a spiritual illness that manifests through

mental disorientation and uncontrollable wailing. Enhancing intelligence in learners and curing headaches were among other uses of the head. Vulture bones were linked to 24% of the uses reported, including fractured bones, stroke, *izizwe* and protection against bad spirits. Parts were not exclusive to just one condition or ailments; for example, the head, bones and heart could all be used in concoctions to enable foretelling.

Table 4.2 Summary showing Use Values (UV) and Informant Agreement Ratios (IAR) of vulture body parts used in traditional medicine. (*nr* is the total number of use reports for a specific part and *na* is the total number of conditions treated with each body part).

| Part | UV | nr | na | IAR |
|-------------|-----------|-----------|-----------|------------|
| Head | 0.91 | 22 | 14 | 0.35 |
| Bones | 0.25 | 6 | 5 | 0.20 |
| Heart | 0.17 | 4 | 3 | 0.33 |
| Wings | 0.13 | 3 | 1 | 1.00 |
| Eyes | 0.08 | 2 | 2 | - |
| Claws | 0.21 | 5 | 4 | 0.25 |
| Eggs | 0.04 | 1 | 1 | - |

The Informant Agreement Ratio (IAR) was calculated for each part in relation to the uses for which they were reported (Table 4.2). Although the level of agreement among the participants was generally low, vulture wings obtained the highest IAR (1.00). The head and heart followed, each obtaining consensus levels of 0.35 and 0.33, respectively (Table 4.2). Due to our small sample size, respondent consensus for eggs and eyes could not be computed.

4.4.4 Ailments or uses

We identified a total of 21 uses for vultures and their parts in traditional medicine and further classified them as either spiritual (i.e., Matters concerning the supernatural) or physical (i.e., Diseases of the body) (Table 4.3). Matters of spiritual nature constituted 71% of the reported vulture uses.

Table 4.3 Two-way themed summary table of ailments/belief-based uses associated with vultures, categories and citation frequency for each ailment/use.

| Theme | Ailment/use (n = 21) | Category | Citation frequency (total=48) |
|------------------------|----------------------------|---|-------------------------------|
| Spiritual (71%) | Foresee | Acts of bringing forth | 15 |
| | <i>Izizwe</i> | | 4 |
| | Bring back lost lover | | 2 |
| | Win dice games | | 1 |
| | Business success | | 2 |
| | Bring back stolen property | | 1 |
| | Good fortune | | 1 |
| | Career success | | 1 |
| | Intelligence in learners | Acts of enhancing | 3 |
| | Strength for remedies | | 1 |
| | Sharpen hunting dogs | | 1 |
| | Strength | | 3 |
| | Protection | Acts of protecting | 3 |
| | Dispel bad spirits | | 1 |
| | Protection from lightening | | 1 |
| Physical (29%) | Epilepsy | Nervous system & neurological disorders | 2 |
| | Stroke | | 1 |
| | Headaches | | 2 |
| | Heart palpitations | Diseases of the circulatory system | 1 |
| | Poor eye sight | Diseases of the visual system | 1 |
| | Fractured bones | Injuries | 1 |

Only 29% of the cited uses for vultures and their parts in traditional healing practices were for physical well-being (Table 4.3). All ailments and conditions were further divided into sub-categories. For spiritual conditions, the majority (53%) of uses were associated with “acts of bringing forth”; where vultures and their parts were used to retrieve or obtain something. Other acts included enhancement of abilities (27%) and protection against unwelcome spirits and misfortunes (20%). Pertaining to physical ailments, vultures and their parts were mainly used to treat the nervous system and neurological disorders, including epilepsy, headaches, and strokes. These ailments accounted for 50% of the conditions cited. Other ailments were associated with the circulatory system (heart palpitations), the visual system (poor eyesight) and injuries (bone fractures) (Table 4.3).

4.4.5 Preparation and perceptions of the use of poison to harvest vultures

Preparation for vulture parts such as bones, head and claws consisted of drying, crushing into powder and mixing with other material, mainly from plants. The concoctions were administered through smoking/inhaling or ingestion (with food). Most respondents (94%) revealed that one vulture could last them a year. The justification for this was that a small (approximately a quarter of a teaspoon) portion of the powdered material was added to a concoction. Healers also reported that they seldom encountered cases where their patient or client would require that they use a vulture part.

The use of poisoned baits by hunters to kill vultures for trade was well-known to our study participants. However, views regarding risks associated with using possibly poison-contaminated products in healing practices differed (Table 4.4). On the one hand, there were traditional health practitioners who were against the use of poisoned baits, as vultures killed in this manner were

deemed unsafe to use. On the other hand, we found participants who believed that parts were safe to use after removing the internal organs and leaving them out to dry out.

Table 4.4 Participants' responses regarding the risks of using poisoned vultures and their by-products in traditional medicine (n = 10).

| Participant response (s) | Reference (Respondent ID) |
|---|---------------------------|
| People are using poison to kill vultures. Poison is harmful to patients. Even when the parts are dried, poison remains in the veins. It is like alcohol in your system. That is why I do not use vultures very often. I would rather go inside the reserve than buy from traders. | #thp13 |
| Poison is bad, that is why I avoid using them (vultures). Using poisoned birds is adding to sickness. | #thp19 |
| We are careful about what we buy; we always ask before we buy because we cannot risk using poisoned birds. | #thp21 |
| We cannot use vultures killed through poison. I do not buy from the <i>muthi</i> market because I have no idea of how the birds would have been obtained. | #thp22 |
| Poisoned vultures are harmless; we dry the parts before we use them thereby eliminating the fluids that carry the poison. The poison evaporates. | #thp14 |
| Poison has no negative effect if you discard the internal organs. | #thp16 |
| Patients could die because of the use of poisoned products. | #thp10 |
| Poison is bad, we must find out how the vulture was killed before we buy it. | #thp08 |
| Poison is very dangerous. Our aim is to heal people and not the opposite. Sometimes it is difficult to tell if poison was used to kill a vulture because someone would come selling a few parts. Using poisoned products can ruin your practice and reputation. | #thp11 |
| Vultures are difficult to find, poison works faster and better. But it is wasteful, several vultures die but not all of them are taken. | #thp07 |

4.5 Discussion

4.5.1 Study composition

Four types of traditional healers are recognised in South Africa (Sodi et al. 2011). Three were identified in the present study, and these included diviners (59%), herbalists (21%) and faith healers (8%). This composition is comparable to an exploratory study conducted in KwaZulu-Natal in which the authors identified the same three types of healers (Zuma et al. 2016). The absence of birth attendants from both studies and other local literature (i.e., Abdullahi et al. 2011; Laher 2014) could likely signal an increased reliance on western doctors for childbirth in KwaZulu-Natal. In addition, the study constituted more diviners compared with other traditional health practitioner types. There is evidence to suggest that divination is presently the most prominent practised form of indigenous healing in the province (Zuma et al. 2016).

4.5.2 Vultures in traditional medicine

In addition to the treatment of physical and mental ailments, animals hold symbolic meanings, are sacrificed for ritualistic and religious purposes based on belief-based and mythological premises unique to different ethnic groups (Vats and Thomas 2015; Borah and Prasad 2017). All respondents who identified as diviners used vultures in their healing practices, while all faith healers did not use vultures. Divination is predominantly associated with foretelling, and vultures are largely perceived by traditional health practitioners as good carriers of the knowledge of events to happen (Cunningham and Zondi 1991; McKean et al. 2013; Mashele et al. 2021). The relationship between healer type and vulture use was significant. The main reason for non-use was the belief underpinning the nature of one's work, training and calling. Other respondents did not believe in animals having healing properties, and one of them was of the view that this practice

was abnormal. They posited: “*It is plants that heal human ailments, the tendency of involving animals in traditional healing practices is the reason why some people use human body parts in traditional medicine*” (thp09).

We identified seven vulture parts that were used by the study participants in traditional medicine (i.e., head, bones, claws, wings, heart, eyes and eggs). Other studies have noted the use of the beak, feathers, blood and intestines (Boakye et al. 2021; Mashele et al. 2021). The head had the highest number of citations and, consequently, the highest Use Value (0.9). This indicates that this part is an important ingredient in traditional remedies (Alves et al. 2012). Most studies on the use of vultures in traditional medicine have made similar observations about the importance of the head (McKean et al. 2013; Saidu and Buij 2013; Boakye et al. 2019). The head was linked to 15 out of 21 uses reported for vultures in traditional medicine. Previous studies have shown that in parts of Africa, the vulture head is believed to possess clairvoyant powers and may be used to increase success during gambling, betting, and contests (Cunningham and Zondi 1991; McKean et al. 2013; Chigunta 2017). According to Cunningham and Zondi (1991), this derives from the vultures’ perceived great sight and ability to locate carcasses from vast distances away when scavenging. Moreover, vultures are believed to possess the ability to discern when an animal is about to die.

Similarly, foretelling, also referred to as clairvoyance in other studies (Cunningham and Zondi 1991), was the most cited use for the vulture head in the present study. However, this use was predominantly associated with the practice of divination. *Umhlahlo*, was the most cited rationale for the overall involvement of vultures in traditional medicine. Divination allows the healer to enter the supernatural domain where they can interact with their ancestors. In this realm, healers can access information that is considered beyond the reach of the rational human mind

(Ezekwesili-Ofili and Okaka 2019). Traditional healers use this supernatural skill in diagnosis as well as in explaining illness causality and determining suitable treatment (Laher 2014; Zuma et al. 2016). Through clairvoyance, traditional healers can see events before they happen and devise protection measures if the events foreseen are to cause harm to either themselves or their patients. In addition, the vulture head, bones and, in some cases, the heart, were reportedly used in training upcoming diviners (*amaThwasa*). Inhaling smoke from the powdered vulture head mixed with dried plant material and parts from other animals (e.g., eagle or hyaena) was believed to assist in introducing initiates into divination. The ability to foretell is one of the key determinants of one's readiness to take on the role of a diviner within the greater practice of traditional medicine.

According to our knowledge, the information on the number of traditional health practitioners presently operating in KwaZulu-Natal is not available. However, in 2007 there were 25 000 traditional health practitioners in the province, according to Gqaleni in Zuma (2016). Over the years, this number has likely increased significantly. Due to persisting high levels of youth unemployment and deteriorating socio-economic conditions, young people, especially in rural and peri-urban areas, are driven to seek opportunities in the informal sector (Graham and Mlatsheni 2015; Thompson and Blackmore 2020). In recent years, there has been an increase in the number of young people training as traditional healers, particularly diviners (Ngobese, 2020 pers. comm.). In addition, the present economic insecurity has resulted in greater socio-psychological stress, causing people to seek explanations and solutions from traditional health practitioners, thus increasing the demand for such services. These factors could partly explain the prevailing illegal use of vultures and other biotic resources in traditional medicine.

Izizwe was also frequently mentioned as one of the conditions for which the vulture head was used. *Izizwe* (directly translated as *nations*) is a spiritual illness that manifests in auditory

hallucinations, screaming and disorientation. According to Mbongwa (2021 pers. comm.), a concoction, also called *izizwe*, is made from plant and animal-derived materials around the African continent (hence the name). The ingredients must be sourced from different countries for the concoction to be effective. When taken, this mixture evokes spirits that alter one's behaviour for good or bad, depending on one's intention. *Izizwe* is often used for bad intentions, including manipulating people into adhering to your will. Laher (2014) provides an example of a suitor who used *izizwe* to cause a lady to run to his home on her "own" after she turned down his marriage proposal. It is believed that specific body parts of an animal with peculiar and/or superior behavioural traits, such as the African vulture (*Gyps spp.*) or lion (*Panthera leo*), are fused in a concoction that is used to counteract the bad spirit and relieve the affliction.

We found uses for vulture parts in traditional medicine and associated practices were relatively diverse. The IAR was generally low regarding conditions for which each part was reportedly used. The wings obtained the highest IAR of 1.00 for strength. We suggest that this finding be interpreted with caution as the high IAR demonstrated for the heart may not be a true reflection of respondents' consensus, considering that the study sample was small. The head obtained an IAR of 0.35, which was relatively low. Although the reported uses for the head were numerous, most were single reports, indicating high heterogeneity. Ezekwesili-Ofili and Okaka (2019) suggest that traditional healers often lack coherence on ingredients, preparation procedures and dosage of traditional medicines. Low consensus on what parts were used for, especially those of high value, may signify high versatility and cultural significance (Durojaye and Olufemi 2015). Although low consensus could also be attributed to limited resources causing traditional healers to use whatever is available in their time of need.

We identified a total of 21 ailments (or situations) that were managed using vulture parts in this study, the majority of which were spiritual (71%). These uses were further categorised into *Acts*. The majority of uses (53%) were concerned with bringing forth; some examples include foretelling, winning dice games, business success and bringing back lost lovers. Evidence suggests that in African traditional medicine, vultures are predominantly used for the management of spiritual ailments (McKean et al. 2013; Saidu and Buij 2013; Boakye et al. 2019; Mashele et al. 2021). One of the participants in a qualitative study conducted by Mashele et al. (2021) defines the role of vultures in traditional medicine by stating; “*Vulture muthi (medicine) does not cure any illnesses, but it does cure curses*”. The use of vultures and other threatened species in traditional medicine, especially for spiritual ailments, is likely to continue since there are no known clinical alternatives for spiritual afflictions (Nieman et al. 2013; Boakye et al. 2019).

Respondents claimed that one vulture per healer was sufficient to last for a year. This is comparable with what was reported by traditional health practitioners of the Kruger to Canyons Biosphere Reserve, who required 1-2 vultures per year (Mashele et al. 2021). The drying of parts facilitates preservation, representing a sustainable use strategy by healers. In addition, only a small portion of the powdered parts is used at a time, as previously indicated. According to traditional health practitioners, this portion is mixed with other products from plants, other animals, and abiotic materials; therefore, only a hint is needed. Unfortunately, these inferences might be ineffective in the case of southern Africa, considering that vulture populations have sustained considerable declines to allow for any offtakes. The legislation does not allow for any harvesting of the birds except under special circumstances such as research, law enforcement and or conservation (Geldmann et al. 2013; Williams and Whiting 2016).

Nonetheless, law enforcement remains limited, and the illegal hunting of vultures for use in traditional medicine represents a constant threat. Traditional health practitioners propose the domestication of vultures, while traditional leaders recommend the adoption of strategies that consider the socio-economic importance of vultures to local people. From the conservation perspective, opportunities to provide birds that have died because of natural causes, collisions with energy infrastructure and electrocutions may exist. In addition, feathers from live birds may also be made available to traditional healers. However, these proposals require in-depth deliberation between all parties concerned. There is also a need to understand people's perceptions of spiritual illnesses and consider alternative management of such conditions. A range of options should be explored and integrated into efforts to reduce the illegal use of vultures and other threatened species in traditional medicine.

The study participants were well aware of the use of poison to capture vultures for use in traditional medicine. Traditional health practitioners expressed conflicting opinions about using vultures that had been killed through poison. On the one hand, poison was perceived by many to be dangerous. Vultures and parts were carefully selected to avoid buying poisoned ones. Notably, other healers had decided to stop using vulture parts because of the increase in their poisoning. On the other hand, some healers reported that vultures had become difficult to find, and options were limited. They described ways they have avoided poison consumption risks, such as drying the parts they require and discarding internal organs before use. Williams and Whiting (2016) indicate that modes of administration such as burning and sniffing, or inhaling (which are relevant to vulture use) may reduce exposure if poison was used as a hunting method. However, there is concern that the effects of poison consumption may take a long time to manifest, thus making it nearly impossible to trace the affliction back to traditional medicine use. Generally, most of the toxic substances used

to kill vultures in South Africa are derived from agricultural pesticides (McKean et al. 2013; Mashele et al. 2021). Rani et al. (2021) report that human exposure to pesticides can result in various health problems, including cancer, respiratory disorders, neurological disorders, and reproductive syndromes, *inter alia*. Therefore, we propose further research on the long- and short-term health implications of secondary poison ingestion and suggest that traditional healers are educated about the possible risks of using poisoned products in their healing practices.

4.6 Conclusions

This work presents an assessment of the ethnomedicinal use of vultures in KwaZulu-Natal from traditional health practitioners' perspectives. Diviners were significantly the most common type of traditional health practitioners in the study and whose practices were largely associated with the inclusion of vulture parts as ingredients in traditional medicine. We identified seven vulture body parts that were used for a range of ailments and conditions. Although the head was the main part that healers required, seemingly all parts were used, possibly because of limitations in access. The use of vulture parts in traditional medicine was primarily connected to spiritual dimensions of well-being. Results derived from this study are comparable with the existing body of literature highlighting the established belief-based use of vultures and their body parts in traditional healing practices, especially in southern and Western Africa. Moreover, our study participants were aware of the hunters' use of poison to kill vultures. This, however, was not an adequate deterrent to some healers who had found ways to navigate using possibly poison-contaminated products. Balancing conservation outcomes and socio-economic requirements of local communities remains a major challenge. In light of the results presented here, supplementary to the institutionalisation of traditional medicine, we suggest a wide-scale establishment of collaborative conservation

initiatives mainly involving traditional healers and conservation practitioners. The initiatives must focus broadly on safe and reliable resource supply, sustainability, and effective conservation of biodiversity resources. People who rely on natural resources should be invited to actively participate in their conservation to safeguard their livelihoods and indigenous knowledge.

4.7 Declarations

Conflict of interest statement

The authors declare no conflict of interest nor competing interests.

Availability of data and material

Data for this study are available on request from the authors but belong to the University of KwaZulu-Natal.

Acknowledgements

We are grateful to the steering committee for guiding this study. We thank N. Mbongwa for her contributions and guidance. We also sincerely thank the study participants for their time and hospitality. We thank all the research assistants for their dedication to this work. The support received from the South African National Biodiversity Institute (ZA), the University of KwaZulu-Natal (ZA), and the Ford Wildlife Foundation (ZA) is greatly appreciated.

Ethical Approval

Ethical clearance for this study was provided by the University of KwaZulu-Natal, Ethics Committee under the reference number: HSS/1089/108D.

Source(s) of Funding

This work was funded by the South African National Biodiversity Institute (SANBI, ZA), WildlifeAct (ZA), the National Research Foundation (ZA, Grant 98404) and the University of KwaZulu-Natal (ZA).

Author contributions

All authors conceived the research idea. JS and CTD sought funding. NSM collected the data. NSM analysed the data. NSM drafted the manuscript, and all authors provided comments and revisions to the manuscript.

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CHAPTER FIVE

Traditional medicine use, the gambling hypothesis and the case of religion as a viable alternative to traditional medicine in KwaZulu-Natal, South Africa

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Formatted for: *African Journal of Religion, Philosophy and Culture*

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Running header: Traditional medicine use and religion

5.1 Abstract

Approximately 80% of the population in developing countries uses traditional medicine either as the main source of healthcare or to supplement western medicine. Traditional medicine is recognised worldwide for its contribution to greater healthcare coverage, especially in remote rural areas with limited access to healthcare. The overconsumption of wildlife resources, specifically fauna in traditional medicine practices, represents a major challenge for biodiversity conservation. In addition, unsustainable resource use patterns in traditional medicine are a threat to the future of this practice. The concept of sustainable alternatives has often been consulted in strategies aiming to address the overconsumption of wildlife resources in traditional medicine. Commonly cited alternatives often include non-endangered species, plant-based materials, farmed animals, and synthetic chemicals. Religion is a source of complementary and alternative medicine in many parts of the world, but it has not been explored as a viable alternative to traditional medicine. A two-part exploratory study was conducted to examine the dynamics of traditional medicine use and the role of religion as a potential alternative to traditional medicine systems. Data were derived from questionnaire surveys and in-depth interviews involving 235 and 12 respondents for the first and second components of the study, respectively. Traditional medicine was used by 51% of the participants, the majority (78%) of which relied on traditional healers. The participants used traditional medicine mainly for physical care (46%) and also for spiritual and magic-related needs (45%). The use of traditional medicine was correlated with most demographic attributes except for gender and age. With regards to religious orientation, participants who identified as Christians were likely not to use traditional medicine. Participants who were followers of traditional religions were more prone to using traditional medicine, while participants who identified as non-religious were equally distributed between use and non-use classifications. The case study demonstrated

that religion does provide spiritual practices and products that help improve health and wellness. Nonetheless, traditional medicine use may persist. Further investigation into religious healthcare practices is recommended.

Keywords: Religion, Zootherapy, Spiritual ailments, Gambling, Nazareth Baptist Church

5.2 Introduction

In contemporary literature, the healing of human ailments using therapeutics derived from animal products is known as zootherapy (Costa-Neto 1999). Some resources from zootherapy have been scientifically proven to possess medicinal properties (Alves et al. 2011). Nine percent of medicinal chemicals approved by the World Health Organisation (WHO) originate from wild fauna, while 11% are sourced from plants (Marques 1997 in Costa-Neto 1999). Knowledge and practices associated with animal use in traditional medicine represent an opportunity to discover new medicines for the modern world (Costa-Neto 1999; Alves et al. 2011). Despite its notable role in healthcare provision and economic development, in recent decades, zootherapy has solicited great critique for its contribution to global defaunation (i.e., the offtake of wild animals in ecosystems causing a cascade of adverse ecological effects) (Ripple et al. 2015; Benitez-Lopez et al. 2017). Resources used as ingredients in traditional medicine are often harvested from the wild, unsustainably (Alves et al. 2013; Izah and Seiyaboh 2018). In addition, traditional medicine practices have been shown to indiscriminately include species of conservation concern (Alves et al. 2011; Mardiasuti et al. 2021). Although wild animals in folk medicine are commonly known for their medicinal uses, there is also notable use of fauna for spiritual and magic-based purposes (Adeola 1992; Soewu 2008; Setlalekgomo 2014; Williams and Whiting 2016).

One particular aspect of traditional medicine is the role of the supernatural as the prime cause of illness (Laher 2014; Zuma et al. 2019). Considering this, zootherapy in Africa is not only medicinal but accommodates psychological and spiritual conditions (Soewu 2008; Izah and Seiyaboh 2018). Using medicinal fauna in addressing spiritual ailments is a widely accepted practice in parts of Africa and has drawn considerable scholarly attention (Williams and Whiting 2016; Ajagun et al. 2017; Boakye et al. 2019; Nieman et al. 2019; Mashele et al. 2021). Animals such as lions (*Panthera leo*), pythons (*Python* spp.), pangolins (family *Manidae*), porcupines (family *Hystriidae*) and vultures (*Gyps* spp.) have been utilised to provide protection, command authority, secure business success, bring good fortune, gain intelligence, and find lost lovers among other things (Vats and Thomas 2015; Williams et al. 2017; Nieman et al. 2019; Mashele et al. 2021). Considering the threats these species are already facing, their use in traditional medicine represents an additional challenge for their conservation. Reliance may be high since there are no clinical substitutes for spiritual or magic-based afflictions and uses (Boakye et al. 2019; Nieman et al. 2019).

Various strategies have been explored in attempts to address the negative impact of traditional medicine on threatened species (D'Cruze et al. 2020). These include, among others, awareness-raising, consumer behaviour change campaigns, and substitutes in the form of other wild animals, farmed animals, plants, and synthetics (Luo et al. 2013). Although, in theory, these approaches model effectiveness, especially when combined (Liu et al. 2016), their application has been largely limited, particularly in Africa. While conservation-based approaches are important in facilitating sustainable wildlife resource use in traditional medicine, there may be a need to explore alternative avenues and their potential to offset the need for wildlife use in healing practices.

In 2010, Pew (2012) estimated that 84% of the world's population is religiously affiliated. It has been stated that religion defines people's attitudes, choices, and behaviours (Patel 2010; Devine and Deneluin 2011). This translates to the formulation of values, which, when harnessed, can contribute to development outcomes such as poverty reduction, environmental protection, health, and well-being (Devine and Deneluin 2011; Spoon 2014). We identified three key ways in which religion contributes to health and well-being. Religion's strong influence in decision-making can keep people away from risky behaviours such as excessive alcohol consumption and smoking, thereby ensuring an improved quality of life (Almutairi 2016). Religion represents a coping mechanism and a source of support in difficult times, including illness, which may improve recovery or reduce the psychological effects of being unwell (Mahmoud et al. 2016). According to Malone and Dadswell (2018), even without providing a cure for physical illness, religious beliefs provide a coping mechanism, peace, and emotional stability, feelings that likely contribute to better health and well-being. More important, religion is a source of complementary and alternative medicine (CAM) in many parts of the world (Monette 2012; Qureshi et al. 2020). Spiritual CAM is characterised by practices such as prayer, meditation, fasting and the use of natural products such as honey, herbs, holy water, and oils (Alosaimi et al. 2014; Qureshi et al. 2020). Karam et al. (2015) report that religion contributes significantly to healthcare by offering a holistic approach that considers the physical, social, and spiritual dimensions of well-being.

This two-part exploratory study is a component of research that seeks to contribute insights into addressing the present African vulture crisis by probing into the less understood but prominent element of vulture conservation, which is their use in healing and belief-based practices of local people. The previous chapters reveal that vultures are illegally sourced from protected areas, traded in local *muthi* markets and used mainly in body parts (i.e., head, bones, heart) as ingredients in

traditional medicine (Chapters 2 - 4). Furthermore, the use of vultures in traditional medicine is predominantly for spiritual or magic-based conditions or purposes (e.g., foretelling and protection from evil spirits). In light of the aforementioned factors, first, we investigated the dynamics of traditional medicine use among people. Based on our findings from previous chapters, corroborated by empirical evidence (Cunningham and Zondi 1991; McKean et al. 2013), firstly, we had predicted that gambling would be one of the main drivers of the increased use of vultures in traditional medicine in KwaZulu-Natal. Secondly, we assessed the role of religion as a potential alternative to traditional medicine using a case study involving the Nazareth Baptist Church. Initially, we had planned to sample all religious groups represented in KwaZulu-Natal Province, South Africa. However, because of the impacts and restrictions of COVID-19 and time constraints, one group was selected as a case study. The Nazareth Baptist Church is an indigenous religion that was founded in KwaZulu-Natal. More than 80% of the Nazareth Baptist Church followers reside in the province. The Nazareth Baptist Church was also selected because it contains fewer divisions than other dominant religious groups, in particular those of the Christian faith.

5.3 Methods

5.3.1 Study areas

This study was conducted in KwaZulu-Natal Province, located in the eastern part of South Africa. KwaZulu-Natal is the third smallest province in the country, taking up 7.7% of the surface area. It has a population of 11.3 million people (Statistics South Africa 2019). The province is bordered by the Indian Ocean on the east and the Drakensberg Mountains to the West. The first part of the study was conducted in the Durban Central Business District (CBD) and adjacent towns of Pinetown and Isipingo. Durban is the biggest and busiest city in KwaZulu-Natal; on average, it is

estimated to receive about 250 000 daily visitors (Brophy 2019). We sampled the largest taxi ranks in the city, including the Workshop, Durban station, the Market and Dalton (Figure 5.1). The second part of the study was conducted in Durban and surrounding towns (Figure 5.1). We also approached local residents living in and around eBuhleni bamaNazaretha and iNhlankakazi Holy Mountain, respectively. These two sites are monumental and host the yearly January and July church congregations. These assemblies last for the whole month each and are mainly accompanied by mass services, a series of traditional dances (*imgidi*) and fasting throughout the month.

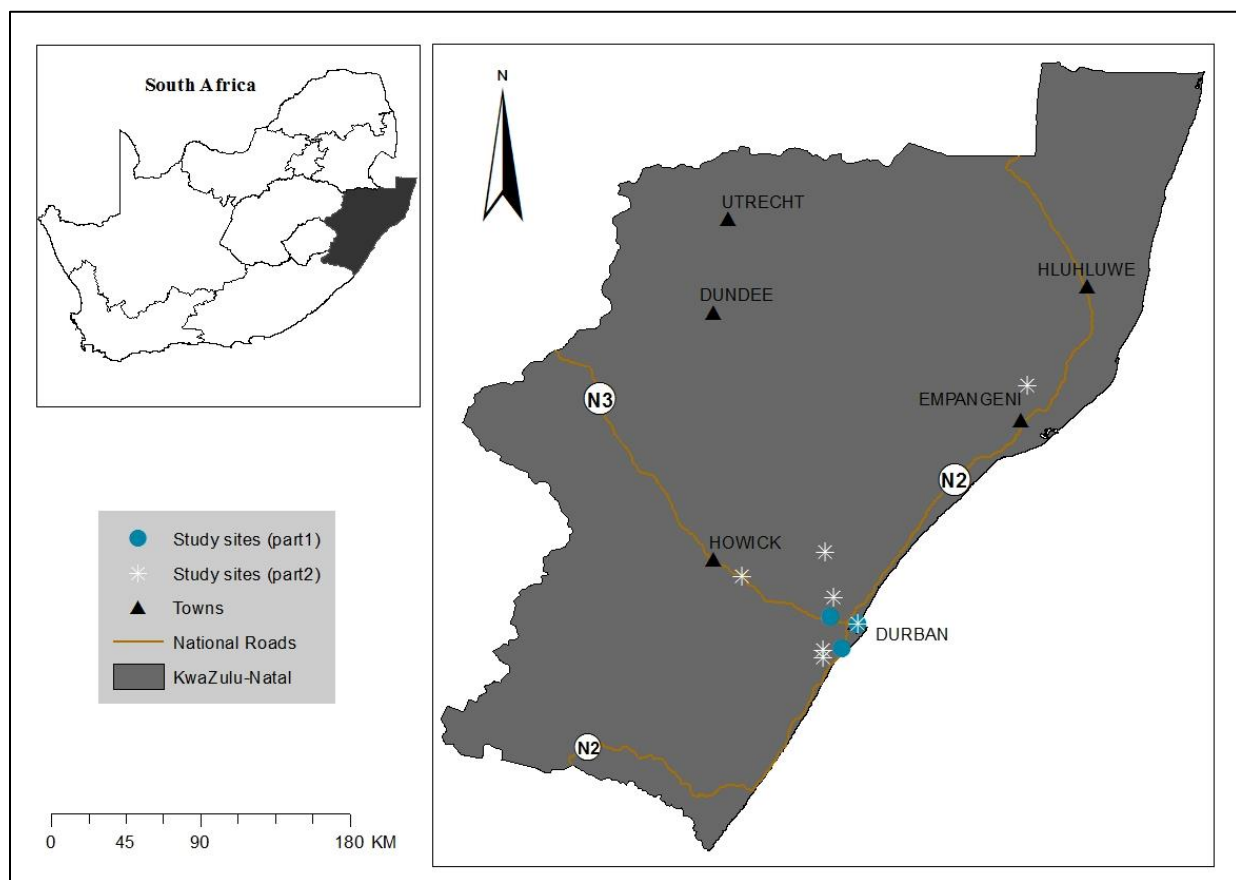


Fig. 5.1 Study sites for parts 1 and 2 in KwaZulu-Natal, South Africa.

5.3.2 Data collection and analyses

For the first part of the study, we conducted a survey using a structured questionnaire (Dawson 2007). The purpose of the survey was to detect traditional medicine use in gambling practices to deduce if vultures were involved. The interviews did not directly mention vultures to avoid any unintended outcomes, such as sparking a demand. Also, traditional healers do not disclose their ingredients to clients. Based on our previous studies (Chapters 2 - 4), and published literature (McKean et al. 2013; Mashele et al. 2021) use of *muthi* for gambling success would indicate the possible use of vultures. We adopted a simple random sampling method, which meant everyone in the population had an equal chance of being incorporated into the study (Brancati 2018). The researchers administered the interviews on a face-to-face basis in isiZulu and English. Data collection took place in 2019 from January to March. In total, 250 interviews were conducted and screened, after which 235 were selected for further analyses. The criteria for exclusion included: 1) Incomplete interviews, where the respondent opted out before the survey was complete. 2) Interviews with more than 50% unanswered questions. Data were summarised and tabulated, and descriptive statistics were also performed using IBM SPSS Statistics (version 27). We also conducted Pearson's Chi-squared tests of significance.

We conducted the second section of the study using a semi-structured interview guide with unstructured, open-ended questions in 2021 between October and December. It was exploratory in nature, so the research instrument underwent several modifications. A purposive sampling technique was used for this study. This method is non-random and does not require a set number of participants. The selection of participants is deliberate and based on the qualities the participants possess (Etikan et al. 2016). Purposive sampling supports selecting individuals or groups that are well-informed about the phenomena under investigation (Creswell and Clark 2011). This method

was most suited for the present study considering its timing and sensitive nature. The time during which the research was conducted coincided with an active court case involving the study group (pers. comm. A. Luthuli 2021). All participants were members of the Nazareth Baptist Church (Shembe). Although the study assessed individual experiences rather than expert knowledge, most were sceptical about participating because of the fear of “getting into trouble”. Upon realising this obstacle, only people with some awareness of academic research were approached. The study involved 12 participants in total. The interviews were conducted in isiZulu, mainly in person (67%); others were conducted on Zoom (16.5%) and over the telephone (16.5%). Recordings were made with the participants’ consent and later transcribed verbatim and translated into English. Data were coded and further presented using thematic analysis, which translates data into patterns of meaning (Braun and Clarke 2012). Ethical clearance for this study was provided by the University of KwaZulu-Natal Ethics Committee, and all relevant guidelines were observed.

5.4 Results

Part one - Traditional *Muthi* Use and gambling hypothesis

5.4.1 Traditional medicine use, prevalence and dynamics

5.4.1.1 Study population and composition

Our survey consisted of 235 participants, 77% were interviewed in the Durban CBD, 14% and 8% were interviewed in Pinetown and Isipingo, respectively. The majority of the study participants were male (86%), and most respondents were between the ages of 26 and 35 years (Table 5.1).

Seventy-four percent of the respondents had a secondary-level education. Others identified as having obtained primary (11%) and tertiary (32%) levels of education. Participants mainly included taxi drivers (45%), street traders (17%) and students (12%). Others were people employed

in the CBD (10%) and those seeking employment (9%). Religious affiliation captured three broad categories, namely Traditional, Christian and non-religious. Most respondents identified as Traditional (53%) and Christian (31%) (Table 5.1).

Table 5.1 Participant demographic information.

| Variable | | Number of participants | Percentage (%) |
|-----------------|-------------------|------------------------|----------------|
| Gender | Female | 32 | 14 |
| | Male | 203 | 86 |
| Age | 18-25 | 26 | 11 |
| | 26-35 | 93 | 40 |
| | 36-45 | 76 | 32 |
| | 46-55 | 36 | 15 |
| | 56&above | 4 | 2 |
| Education | Primary | 26 | 11 |
| | Secondary | 173 | 74 |
| | Tertiary | 32 | 14 |
| | NFE | 4 | 2 |
| Occupation | Student | 27 | 11 |
| | Employed | 25 | 11 |
| | Taxi owner | 1 | 0 |
| | Taxi driver | 106 | 45 |
| | TDA | 12 | 5 |
| | Uber driver | 2 | 1 |
| | Trader | 40 | 17 |
| | Employment seeker | 20 | 9 |
| | Pensioner | 2 | 1 |
| Religion | Christian | 56 | 31 |
| | Traditional | 95 | 53 |
| | Non-religious | 24 | 13 |
| | Other | 4 | 2 |
| Gambling status | Gambler | 64 | 27 |
| | Non-gambler | 171 | 73 |

[Abbreviations: NFE (No formal education); TDA (Taxi driver assistant)]

5.4.1.2 The use of traditional medicine

The use of traditional medicine was reported by 51% of the respondents versus 49% who reported not using traditional medicine. Seventy-eight percent of the participants who used traditional medicine consulted traditional healers, while 22% depended on their own knowledge. We examined if traditional medicine use was related to any of the observed participants' demographic attributes (as listed in Table 5.1) and gambling behaviour. The results revealed that traditional medicine use was significantly associated with respondents' level of education, occupation, religion and gambling status (Table 5.2) but not with gender or age. According to our findings regarding gambling status, a considerable proportion of the respondents (88%) who identified as gamblers did not use traditional medicine (Figure 5.2). Further analysis revealed that gamblers in this study were predominantly young people who were mainly involved in sports and number balls mainly at Superbets© and Hollywood Betting facilities©.

Table 5.2 Pearson's Chi-square tests results of traditional medicine use against gender, age, education, occupation, religion, and gambling status in the present study.

| Predictor variable | X ² | df | P-value |
|--------------------|----------------|------|---------|
| Gender | 0.922 | 1.00 | 0.337 |
| Age | 7.518 | 4.00 | 0.111 |
| Education | 13.85 | 2.00 | 0.003 |
| Occupation | 24.45 | 5.00 | 0.000 |
| Religion | 47.70 | 2.00 | 0.000 |
| Gambling status | 53.53 | 1.00 | 0.000 |

It was reported that gambling, especially in sports institutions, requires logic, an understanding of soccer and adequate knowledge of the teams and how they fared in their previous games. One of the respondents shared her views about traditional medicine use in gambling: *“I have heard about the use of traditional medicine in gambling and that it helps, but it has never made sense to me, and I have never tried it”* (18-25 years- F07). Using traditional medicine to win was a known phenomenon among our study participants, but it was not believed to be applicable nor effective in gambling practices. One of the respondents shared his views: *“People frequently use muthi to win, but I have never seen it work. Playing here is more than just about luck. Muthi works in other things but not here”* (46-55 years-M85). There were participants within the gambling group who used traditional medicine but for other purposes and not to increase the chances of winning when gambling. *“I do use traditional remedies for many things but not in gambling. I do not think it helps”* (26-35 years-M22). Instead, one respondent had experienced the effectiveness of traditional medicine when playing against other people, such as in cards and dice games. *“Traditional medicine works when playing cards and dice with other people but not against machines”* (46-55 years-M88).

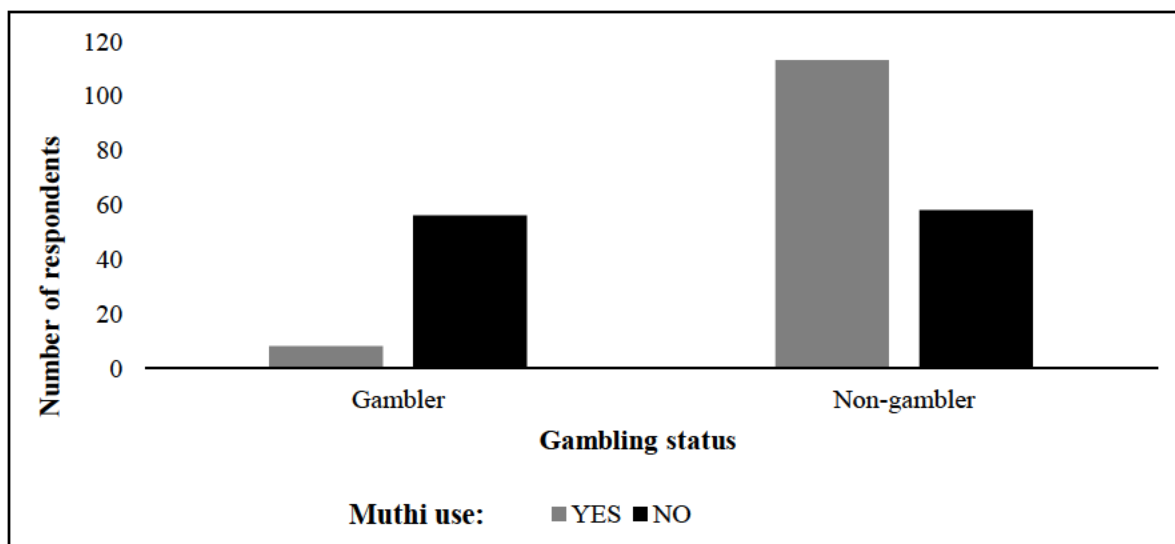


Fig. 5.2 The relationship between the use of traditional medicine and gambling status.

When considering religious affiliation, Christians were likely not to use traditional medicine. Participants who were followers of traditional religions were more prone to the use of traditional medicine. In addition, participants who identified as non-religious were equally distributed between use and non-use classifications (Figure 5.3).

Traditional medicine was found to be used for a wide range of conditions, which were grouped into five themes. We observed that the majority of the participants (46%) used traditional medicine for physical care and well-being, which relates to the use of traditional concoctions to regulate stomach acid, detox, and enhance overall physical well-being.

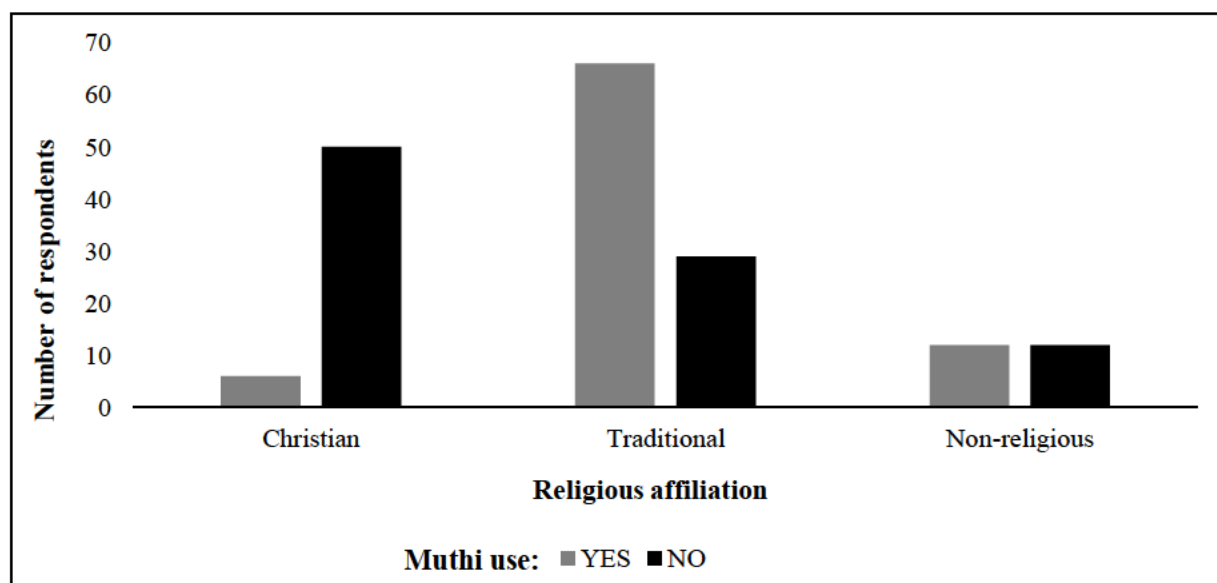


Fig. 5.3 The relationship between participant use of traditional medicine and religious affiliation.

The respondents' second most prominent themes in traditional medicine use were spiritual wellness, strength, and protection. It encapsulated the use of traditional medicine for spiritual ailments, the removal of evil spirits and protection from such spirits and physical harm. These

ailments obtained a citation value of 23%. Similarly, magic-based uses constituted 22% of the reported uses of traditional medicine. Uses of traditional medicine under this theme entailed gambling success, law evasion, charm, and infidelity prevention, among others. Use reports for managing ancestral relations, including the interpretation of messages and the treatment of common ailments, such as headaches and cold/influenza, were relatively low (6% and 3%, respectively) (Table 5.3).

Table 5.3 Reasons for the use of traditional medicine as reported by the study participants and frequency of citations (n = 161).

| Reason (Theme) | Description | Frequency | Percentage |
|--|--|-----------|------------|
| Physical care and well-being | Stomach acid regulation, detox, taking medicine to improve physical strength and overall well-being | 74 | 46 |
| Spiritual wellness, strength, and protection | Spiritual cleansing, remove bad luck, chase and keep away evil spirits, protection from physical harm such as gunshots and car accidents | 37 | 23 |
| Magic | Gambling success, erase a criminal record, evade law enforcement, charm, command respect, and prevent infidelity | 36 | 22 |
| Manage relationships with ancestors | Communicate with and appease one's ancestors, receive and interpret their messages | 9 | 6 |
| Treatment of common ailments | Headaches, cold/flu, ulcers and Sexually Transmitted Infections (STIs) | 5 | 3 |
| Total | | 161 | 100 |

Part two – Religion as an alternative to traditional medicine

5.4.2 Religion and traditional medicine use - Nazareth Baptist Church

The following results were derived from a qualitative study involving 12 participants, consisting of nine males and three females. All participants were followers of the Nazareth Baptist Church, aged between 22 and 80 years (Table 5.4). The following section presents findings on perceptions about causes of illness, principles about using traditional medicine and preventive and curative products/practices provided by the church for disease management.

Table 5.4 Study participants' information.

| ID | Gender | Age | Area | Method of capture | Mode | Interview length (minutes) |
|-----|--------|-----|------------------|-------------------|-----------|----------------------------|
| 1M | Male | 27 | Pietermaritzburg | Recorded | In-person | 60 |
| 2M | Male | 68 | iNdwedwe | Recorded | In-person | 60 |
| 3F | Female | 80 | Folweni | Recorded | In-person | 30 |
| 4M | Male | 72 | eMpangeni | Recorded | In-person | 70 |
| 5M | Male | 57 | eMpangeni | Recorded | In-person | 60 |
| 6M | Male | 68 | eMpangeni | Recorded | In-person | 60 |
| 7M | Male | 50 | Pietermaritzburg | Recorded | In-person | 60 |
| 8M | Male | 42 | Durban | Recorded | Zoom | 48 |
| 9F | Female | 22 | Adams | Recorded | Telephone | 30 |
| 10F | Female | 30 | Durban | Recorded | Telephone | 30 |
| 11M | Male | 29 | Durban | Recorded | Zoom | 45 |
| 12M | Male | 35 | iNanda | Recorded | In-person | 25 |

Note [PM. Burg means Pietermaritzburg]

5.4.2.1 Perceptions about causes of illness

The primary cause of physical illness in humans was attributed to the food that people consume. The participants highlighted that food available to people these days is of poor quality compared with previous times. Poor quality food was believed to cause direct illness and results in

vulnerability to infections. *“Nowadays the only food you can trust is that which you have produced from your own garden”* (4M). The issue of food was believed to be aggravated by the increased failure to practise good health habits such as following a healthy diet, drinking enough water, and exercising regularly. The environment was reportedly highly contaminated, and this was said to cause myriads of illnesses, especially those of respiratory nature. Some illnesses were reported to reside within families and get passed down from generation to generation.

Two main reasons were responsible for spiritual ailments. Primarily, ancestors are believed to communicate with the living through illness. Traditional healers are trained to diagnose illnesses of this nature and relay the message being communicated. Relief from the ailment follows after the patient has performed what the ancestors asked of them. *“A few years ago, my hearing was suddenly impaired, and when we searched, we found that my maternal and paternal ancestors were fighting over me”* (1M). Other respondents attributed spiritual illnesses to spiritual weakness and a poor relationship with God. For example, *“People who are poor in spirit fall ill easily, they are often vulnerable to stress which is a pathway for many ailments”* (7M). *“A disconnection from the Source can cause a void in one’s life, a lack of fulfilment which in turn attracts all sorts of disease conditions”* (11M).

5.4.2.2 Church- prescribed products and practices for ailment management

Water, unscented Blue Seal Vaseline©, Sunlight soap©, and candles are taken to church to be blessed by elders. The blessed products can be used at home for a variety of purposes. For example, water can be sprinkled around the house to chase away bad spirits. Prayer is of great importance as it is protective and preventive and is considered a source of hope. There are four dedicated times for prayer in the church. The installation of white stones around the homestead is also a protective

measure for the family. Moreover, large-scale church gatherings, weekly church attendance, fasting, and offerings are important in strengthening one's faith which is, in turn, believed to improve one's well-being at a holistic level. The Nazareth Baptist Church encourages members to maintain strong relations with their ancestors as this becomes an additional source of protection, guidance, and provision.

5.4.2.3 Church principles about the use of traditional medicine

The Nazareth Baptist Church reportedly prohibits the use of medicine, whether western or traditional. The main guiding book of the Church says, "*Ungawuphathi umuthi ngesandla sakho uyikholwa, uyokufa nokufa*" (Verse 45 of the Sabbath service prayer from iSihlabelelo sama-Nazaretha). This means 'do not touch medicine with your own hand as a believer; you may even die'. All participants relied on this verse as a guiding principle regarding the use of traditional medicine. However, it was observed that respondents were divided in their interpretation and understanding of this statute.

Two interpretations were noted: 1. The statute refers to all medicinal products that are sourced externally, including both western and traditional medicine, whether self-administered or provided by a professional health practitioner. "*Even after getting an injection from a doctor (modern), we remain outside the church until we are cleansed because nothing outside of the church is allowed inside*" (12M). Concoctions involving animal by-products, such as lion fats and snake venoms, are not to be used by followers. Similarly, traditional health practitioners are not to be consulted. 2. The word "*u-muthi*" in the statute refers to concoctions used with the intention to cause harm or manipulate. Examples of such practices included sending lightning to strike someone or using lion fat to obtain the essence of being feared. This type of medicine was

considered impure and not used by followers. Likewise, the use of injections and other western medications is not permitted. However, self-administered herbs such as *iboza* (misty plume bush *Tetradenia riparia*) and *inhlaba* (aloe *Aloe spicata*) that people harvest from around their yards, mix with water and drink to alleviate coughs or perform enema to cure stomach aches do not qualify as *u-muthi* (the forbidden type). These were reportedly created by God for the management of ailments.

In addition, a few exceptions were noted regarding the use of traditional medicines. If a member of the Nazareth Baptist Church has a gift of healing, they are to launch a request for permission to practise. If successful, a special cleansing ceremony will be performed for them. These practitioners will receive strict instructions that will guide their work as healers and members of the Nazareth Baptist Church. The request to practise healing was reportedly unlikely to be refused. For example, “*Being a traditional healer is a gift from the ancestors and iNkosi (lord) acknowledges that, so he will not refuse you the opportunity to practise but one has to do it within the church institution, keep it pure because a lot can go wrong with traditional medicine*” (2M). Similarly, if one is spiritually unwell and needs to embark on a spiritual-cultural journey of healing, they report to the elders of the church. During the time when they are in the healing process, they will not attend church until they are finished and have undergone purification. In addition, an exception is also observed for a follower on chronic medication. These followers are allowed to take their medication as instructed by their doctor; purification may not be applicable since the medication is taken on a daily basis and for a long period of time.

Outside of the aforementioned exceptions, it was noted that members of the Nazareth Baptist Church did resort to traditional medicine use on their own accord. This was reportedly often done in secret. The main reasons cited for using traditional medicine against the Nazareth

Baptist Church commands were lack of patience, in desperate situations where followers resorted to traditional health practices after not seeing improvement after using the church-prescribed products and or practices. Limited faith and the inability to disconnect from cultural ties were other reasons why people found themselves using traditional medicine. When one had used traditional medicine in a manner that they believed defied the Nazareth Baptist Church principle, they undertook the process of purification.

5.4.2.4 The purification process.

Purification within the Nazareth Baptist Church involves a waiting period of seven days after taking or using medication. During these seven days, one is not allowed inside the church temple. They can still attend services but will sit outside the temple's boundaries. When this waiting period is over, purification is performed by a senior member of the Nazareth Baptist Church who is appointed for this purpose (*uMhlambululi*). The one being purified does not have to explain what they did to require purification. They have to make an offering of seven Rands (silver coins only) and have their hands washed with holy water by the elder. After this process, they are allowed to worship with others inside the temple.

5.5 Discussion

5.5.1 Traditional medicine use

Traditional medicine use in the present study was moderate. Those who used traditional medicine predominantly relied on traditional health practitioners than on self-medication. This signifies the role of traditional healers as the core of the system. Physical care and well-being were the primary

reason for the use of traditional medicine in the present study. Similarly, spiritual conditions and magic-based practices were key drivers for traditional medicine use.

5.5.1.2 Traditional medicine use in gambling practices

We had predicted that people who practised gambling would likely use traditional medicine to improve their predictions and, thus, their chances of winning. However, our results showed that the majority (88%) of those who identified as gamblers were unlikely to use traditional medicine. The knowledge of the use of traditional medicine to increase one's chances of winning was common but mostly believed to be ineffective. It was only in dice and card games that traditional medicine was reported to be applicable and possibly effective. This is supported by Van Wyk (2012), who reported the prevalence of *muthi* use in dice games. In this study, *muthi* was demonstrated as responsible for unhealthy gambling behaviours. The person using *muthi* manipulates and weakens his opponent so he can take all the money in the game. The effects of this *muthi* may last for a long time, resulting in continuous losses and the inability to quit gambling. In this case, traditional medicine is not used to improve luck but as an agent of manipulation (Van Wyk 2012).

In number-based gambling practices, where people play against programmed machines, what is often applicable are superstitions, omens, lucky charms and rituals that are believed to improve one's luck. These are important as they provide an illusion of control over the outcome (Joukhador et al. 2004; Pusaksrikit et al. 2018). Traditional medicine use may be categorised as superstitious. In addition, traditional medicine has been used to attain luck and improve cognitive ability (McKean et al. 2013; Nieman et al. 2019). These attributes may be instrumental in sports and number-based gambling. The lack of *muthi* use in the present study could be attributable to

the group of people in the study, which was mainly young people, some at tertiary institutions. Young people are exposed to different philosophies that influence their worldviews, and believing in superstitions may not be their strongest inclination (Spoon 2014).

5.5.2 Religion and traditional medicine use

There was a significant relationship between religious orientation and the use of traditional medicine. Participants who followed traditional religions were more likely to use traditional medicine. However, the probability of use for participants who identified as Christians was relatively low. Religion appeared not to be the only significant factor influencing the decision to use or not use traditional medicine. This was shown by our non-religious participants, who were equally distributed between the use and non-use categories.

5.5.2.1 Is religion adequate to offset the need for traditional medicine use?

The Nazareth Baptist Church was created during the rise of the African Independent Churches, which aimed to facilitate the interpretation of the Bible in accordance with Africanism (Shange 2013). The church is strongly grounded on the concept of *Ubuntu* which advocates for humanity, harmony and unity (Shange 2013). The Nazareth Baptist Church prescribes a wide range of spiritual products and practices covering various health dimensions. The products and practices may be used for treating physical ailments, spiritual strength, protection, and success, among other things. The use of traditional medicine is forbidden, as written in the principal book of the Nazareth Baptist Church. This book states: “Do not carry medicine in your own hand as a believer, you may even die”. This implies that those who identify as church followers should not use or carry

medicine, as this could kill them. The respondents did not uniformly perceive the decree, and two different interpretations were identified in the present study.

On the one hand, respondents understood the principle of the Nazareth Baptist Church as forbidding all medicine, including modern and traditional, whether self-administered or provided by a practitioner. On the other hand, respondents interpreted the decree as prohibiting the use of medicine if it was for malicious purposes. They further indicated that the forbidden medicine includes mixtures made from animal fats, venoms and other by-products considered impure. According to this interpretation, the principle excludes the self-administration of herbs to treat common ailments and discomfort. *U-muthi* is an isiZulu term that translates to medicine. In the isiZulu language, this word can mean healing medicine and dangerous medicine (witchcraft). The context in which the word is used makes the distinction. In this case, the use of *u-muthi* could imply all kinds of medicine (including healing medicine) since the Nazareth Baptist Church provides products for treating illnesses, none of which are medicinal. The use of the word *u-muthi* could alternatively indicate medicine intended for harm (witchcraft). Notably, both interpretations include using animal-based medicines in what is forbidden. Moreover, the Nazareth Baptist Church prohibits killing wildlife; therefore, any medicines involving this act would be avoided. A more succinct definition of this principle may help pull the followers in the same direction. The openness in interpretation can undermine the effectiveness of the principle. Nonetheless, most participants considered traditional medicine use forbidden except for herbs. Most religions prohibit traditional medicine use (Owumi et al. 2013). Some suggest that this is because traditional medicine is a religion by itself (Mahaye N. pers. comm. 2021), so the moment one engages in traditional medicine practices while following a different religion (e.g., Christianity) they are straddling two distinct spiritual worlds.

Most religious or spiritual-based therapies do not involve wild animal use (Qureshi et al. 2020). The products prescribed do not have scientific bases but often involve natural products such as herbs, fruits and oils (Monette 2012; Qureshi et al. 2020). Similarly, common spiritual practices such as prayer, meditation and fasting do not involve wild animal use (Alosaimi et al. 2014). In the present study, we found that the Nazareth Baptist Church provides holistic healing using multiple practices and products that are non-zootherapeutic. Our findings suggest that the church represents an alternative for traditional medicine, even for managing non-medical conditions. However, its viability as a substitute may be compromised by the existing strong traditional culture of the Zulu people, as they constitute the majority of the followers. The Zulu culture reveres and facilitates the use of traditional medicine. It is quite common for religious beliefs to encounter competition from other existing belief systems, especially those of cultural origin. In seeking healthcare, the coexistence of different beliefs may result in followers' mixed-use of different services and healing modalities (Karam et al. 2015). Moreover, Spoon (2014) highlights that the level of adherence to religious principles when seeking healthcare may be affected by the socio-economic conditions of the patients. Religion may be adequate as an alternative healthcare system; however, human behaviour is often subjected to various strong social and economic influences and remains predominantly unpredictable. Traditional medicine use is prevalent in KwaZulu-Natal and is possibly the most preferred alternative to modern medicine. Religion does provide healing through spiritual practices; however, reliance on religion-based healthcare and wellbeing practices appears relatively low.

5.6 Conclusions

This study is a component of multidisciplinary research that seeks to identify key aspects that underpin the use of vultures and their body parts in traditional medicine in KwaZulu-Natal. In this two-part exploratory study, we first investigated the dynamics of traditional medicine use. A hypothesis of the use of traditional medicine in gambling practices was tested. In addition, the study assessed the role of religion in healthcare provision and its viability as an alternative to traditional medicine. The religion used as a case study for the second part of this study was the Nazareth Baptist Church.

Results from the first part of the study demonstrate that traditional medicine is a fairly utilised source of healthcare. Factors that influenced traditional medicine use include education, occupation, religion and gambling status. Most participants who practised gambling were likely not to use traditional medicine, especially for gambling purposes. Regarding religion, participants who identified as Christians were likely not to use traditional medicine, whereas followers of African traditional religions were likely to utilise traditional medicine and its associated practices. Physical care and well-being were the main purposes for which traditional remedies were used. In the second part of the study, our results show that the Nazareth Baptist Church provided various products and practices for managing physical and spiritual ill health. Traditional medicine use was regulated by church policy. However, church members were divided in their interpretation of and response to the church regulatory statute. One group perceived the message as forbidding all use of traditional medicine, while the other believed that traditional medicine use was forbidden only when the intention was to cause harm (e.g., witchcraft).

Due to the increase in traditional medicine use and its reliance on finite biological resources, there is an urgent need to sought alternatives and establish sustainable use patterns. This has

become crucial, particularly for African vulture species, as their consumption in belief-based practices contributes to their decline. Traditional health practitioners are using vultures mainly for magic-based and spiritual conditions. We aimed to present religion as a viable alternative to traditional medicine use, especially for spiritual and psychological conditions, as well as social challenges. Although religion represents an important source of healthcare and overall wellness, the volatility of human behaviour coupled with the strong influence of socio-economic factors in decision-making may limit its effectiveness as an alternative to the use of traditional remedies. In the context of the present study, we suggest exploring approaches directly aimed at driving cultural change regarding the use of traditional medicine in light of its negative impacts on biodiversity.

5.7 Declarations

Acknowledgements

We are grateful to the steering committee for guiding this study. We also extend our sincere gratitude to the study participants for their time and hospitality. We thank all the research assistants for their dedication to this work. The support received from the University of KwaZulu-Natal (ZA), and the Ford Wildlife Foundation (ZA) is greatly appreciated.

Funding

This work was funded by the South African National Biodiversity Institute (ZA), WildlifeAct (ZA), the National Research Foundation (ZA, Grant 98404) and the University of KwaZulu-Natal (ZA).

Ethics approval

Ethical clearance for this study was provided by the University of KwaZulu-Natal, Ethics Committee under the reference number: HSS/1089/108D

Authors' contributions

NSM, CTD and SAJS conceptualised the study with the steering committee. NSM conducted data collection, data analysis and paper writing, CTD and SAJS provided supervision and paper revision. All authors read and approved the final manuscript.

Competing interests

The authors declare no competing interests.

5.8 References

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CHAPTER SIX

Conclusions

6.1 Background

Traditional medicine, also known as folk medicine, has a long and rich history (Monette 2012). According to Abdullahi (2011), it has been fulfilling humans' healthcare and spiritual needs even before the advent of modern medicine. Today traditional medicine has become a major healthcare system in many parts of the world and caters for a considerable proportion of people living in developing countries (Kamsu-Foguem et al. 2013). Traditional medicine can be utilised as the only primary healthcare source or as a complement to modern medicines (Mothibe and Sibanda 2019). Some of the world's major traditional healthcare systems include African Traditional Medicine (ATM), Chinese Traditional Medicine (CTM), Unani and Ayurveda (Husain et al. 2010; Mukherjee et al. 2017; Ezekwesili-Ofilu and Okaka 2019; Wang et al. 2021). The widespread and persistent use of traditional medicine is predominantly owed to its cultural acceptability, accessibility and affordability, especially to marginalised remote rural communities (Kamsu-Foguem et al. 2013; James et al. 2018; Kasilo et al. 2019). Some of the practices and products originating from traditional medicine have been widely adopted and even used in western medicine (Costa-Neto 1999; Alves et al. 2011). The World Health Organisation has recognised the role of traditional medicine in contributing to greater healthcare coverage and advocates for its institutionalisation (Kasilo et al. 2019). Despite its widely acknowledged importance, traditional medicine involves an extensive and unsustainable consumption of natural resources (Izah and Seiyaboh 2018). Most species used as ingredients in traditional remedies are sourced from the wild, and in many instances, this is performed without adequate adherence to regulations (D'Cruze et al. 2020). As a result, traditional medicine has been demonstrated to involve indiscriminate use

of species of conservation concern (i.e., rare, protected and threatened species) (Boakye et al. 2015; Buij et al. 2016).

Materials of plant origin make up the largest proportion of ingredients used in traditional therapies (Ezekwesili-Ofilu and Okaka 2019). Consequently, plant species may be most affected by the observed overconsumption of resources in traditional medicine. However, there has been a considerable increase in the use of wild fauna in medicinal preparations (D’Cruze et al. 2020). This practice, often termed zootherapy, is widely accepted and involves several animal species across multiple taxa (Costa-Neto 1999; Williams et al. 2014). Animal species used in traditional medicine often face other threats, such as habitat loss, climate change, food shortages, disease outbreaks and bushmeat consumption (Williams et al. 2014; Nellemann et al. 2016). Management practices concerning animal species consumed in traditional medicine are limited and not always feasible, especially in developing countries where biodiversity conservation is already competing with many high-priority development agendas (Liu et al. 2016; Hubschle 2017). This challenge demands greater effort, innovation, and multidisciplinary action to be pursued if wild animals used in traditional medicine are to be adequately sheltered from the risk of extinction.

The present study was driven by mounting evidence highlighting the increased use of African vultures in belief-based practices (Buij et al. 2016; Ogada et al. 2016; Botha et al. 2017). This practice is common in West Africa and rapidly developing in central and sub-Saharan Africa (McKean et al. 2013; Williams et al. 2014; Buij et al. 2016; Boakye et al. 2019). In these regions, vultures are perceived to provide numerous medicinal and spiritual/magic-based benefits within the traditional medicine system (McKean et al. 2013; Williams et al. 2014; Mashele et al. 2021). Some of the reported uses include the treatment of headaches, epilepsy and strokes, as well as use for clairvoyance, intelligence in learners, dream stimulation and protection from evil spirits

(McKean et al. 2013; Mdhllano et al. 2018; Boakye et al. 2019; Mashele et al. 2021). The harvesting of vultures for traditional medicine is reportedly responsible for 29% of their population declines in Africa (Ogada et al. 2016). Vultures face numerous additional anthropogenic threats, including land use change and poisoning (Virani et al. 2011; Ogada et al. 2016). Vultures provide some of the most critical ecosystem services and benefits (McKean et al. 2013; Craig et al. 2018; Mdhllano et al. 2018). For example, vultures control the spread of diseases in the environment by consuming carcasses, and through this, vultures also contribute to nutrient cycling. They also contribute to human development and well-being by providing cultural benefits, which may be lost if threats to vultures are not urgently addressed.

By employing a mixed-method approach consisting of qualitative and quantitative research techniques, this study investigated vulture perceptions in a dynamic landscape. The study further assessed, broadly, aspects of the use of vultures in traditional medicine, including their sourcing, trade, prices and ailments treated *inter alia*. In addition, exploratory research was undertaken to provide insights about traditional medicine reliance, and we also assessed religion as an alternative to the use of traditional medicine, which would have indirect but significant implications for vulture conservation. The results emanating from this research are meant to support the formulation of effective conservation management strategies for vultures and other threatened species under the pressure of traditional medicine use. The research was conducted in KwaZulu-Natal, South Africa. Participants included various community groups. For example, we interviewed local people residing adjacent to protected areas that are home to the few remaining vulture strongholds in KwaZulu-Natal. These protected areas include Hluhluwe iMfolozi Park, Mkhuze and Giant's Castle game reserves. In addition, people in the Durban City Centre and surrounding towns were included in the study. The respondents interviewed in Durban and

neighbouring towns contributed to the study of public traditional use. Traders operating in Mona and Durban *muthi* markets were also engaged as part of the study to provide perspectives on the aspects of trade in vultures. Members of the Nazareth Baptist Church were also involved in a case study that formed part of this research.

Presented in this chapter is a summary of the findings. The chapter further provides recommendations in light of the conservation implications suggested by the results. Opportunities for future research and final remarks are also incorporated.

6.2 Summary of findings

6.2.1 Vulture perceptions

Studying the relationship between local communities and threatened species is an important step in efforts to address the pressures faced by these species. Social science provides means to probe into human-wildlife relations through the concept of perceptions (Bennett et al. 2017). Jefferson et al. (2015) define ‘perceptions’ as an all-encompassing term that refers to inquiries of human awareness, beliefs, attitudes and values and how they influence individual and social behaviour (Jefferson et al. 2015). The present study investigated awareness, benefits, beliefs, threats and conservation perspectives concerning vultures in rural communities living adjacent to three protected areas in KwaZulu-Natal. The protected areas in the study are home to the few remaining vulture strongholds in the province (Rushworth et al. 2018). The results presented here were derived from 430 household interviews and seven focus group discussions (Chapter 2).

Most respondents were aware of vultures and their basic biological traits such as feeding behaviour and habitat. Eighty-four percent of the study participants had seen vultures in the last 12 months of the study, and many (67%) saw the birds frequently. Species most encountered were

the white-backed (*Gyps africanus*) and Cape vultures (*Gyps coprotheres*) (47% and 40%, respectively), while the bearded vulture (*Gypaetus barbatus*) had the least mentions of all species encountered (2%). Most participants demonstrated a high level of awareness. Residence and gender were best at predicting awareness level. Participants residing around Giant's Castle were likely to show high awareness. Similarly, male participants were 1.665 times more likely to demonstrate high awareness than female respondents.

Eighty-two percent of our study participants perceived the presence of vultures as beneficial in their localities. The majority of respondents appreciated vultures for feeding on carcasses thus keeping the environment in a habitable state. Twenty-five percent of the study participants expressed beliefs about vultures, one predominant being the traditional medicine properties vultures possess. This belief was in particular associated with vultures' perceived scavenging strategy that enables them to locate carcasses within vast distances. Vultures were also believed to indicate an impending great misfortune such as death if they are seen circling above one's home. In addition, when we investigated the use of poison in controlling problem-causing animals, which represents a potential threat to vultures, we found that the use of poisoned baits was rare. However, vultures were reportedly vulnerable to hunting for use in traditional medicine (Chapter 2).

The majority (84%) of the responses received alluded to a decline in the vulture population over the last 10 years. The need to protect vultures was supported by many (83%). Protecting the birds was recognised as the responsibility of both the local people and conservation agencies (Chapter 2).

6.2.2 Aspects of the illegal hunting and trade of vultures in northern KwaZulu-Natal

Considering evidence regarding the use of vultures in traditional medicine, which drives their illegal hunting and trade (McKean et al. 2013; Mashele et al. 2021), a study was conducted to evaluate the fundamental aspects of this phenomenon in one of the few remaining vulture strongholds in KwaZulu-Natal (Rushworth et al. 2018). This area also represents one area that supplies vultures for the country's traditional medicine markets (McKean et al. 2013). In-depth interviews guided by a semi-structured questionnaire were conducted with 25 participants, identified as hunters (n = 21) or traders (n = 4). Due to the sensitivity of this study, the interviews started with general questions about hunting practices in the region. This established a foundation for addressing the specific questions about the hunting of vultures in the area (Chapter 3).

Hunting of wildlife was found to be a common and widely accepted practice in the study region, and it was mainly for recreational purposes. This appeared to be a developing practice that involved large groups of hunters and frequent hunting trips. Hunting was performed outside of protected areas and structured as a competition for dog owners. The species targeted were predominantly antelope, although hunters also took everything they encountered. Non-bushmeat harvests were sold for use in making traditional clothing and medicine (e.g., serval (*Leptailurus serval*) and snakes, respectively) (Chapter 3).

Vultures were hunted by small groups of up to five local hunters, predominantly consisting of unemployed young men between the ages of 24 and 40. Hunters used multiple hunting techniques but relied more on poison (38%) and firearms (31%). Livestock carcasses were utilised as bait to lure vultures out of the protected areas and private game reserves. Donkeys were readily available to hunters in communities adjacent to Hluhluwe iMfolozi Park. Vultures were hunted upon request and traded through locally established networks involving hunters, traditional health

practitioners and traders. Hunters sold vultures directly to traditional health practitioners and also to traders operating in Mona Market. Prices for the whole carcass ranged from R500 to R2 000. Perceptions shared by the study respondents about vultures in relation to their hunting and trade alluded to the difficulty in obtaining these birds. This was attributed to the fact that they are protected, and having them in your possession was a risk. Moreover, vultures reportedly avoided villages and spent most of their time in protected areas and private game reserves. Their low numbers were also highlighted as an exacerbating factor (Chapter 3).

6.2.3 Aspects of the ethnomedicinal use of vultures by traditional health practitioners

Key user engagement is crucial in improving the management of a species threatened with unsustainable consumption patterns (Liu et al. 2016). The ethnomedicinal use of vultures by traditional health practitioners in KwaZulu-Natal was thus investigated. The main objective of this assessment was to generate insights into the value of vultures in traditional medicine, including parts used and conditions treated. Furthermore, perceptions concerning the use of poisoned vultures and parts as ingredients in traditional medicine were also assessed. Data were derived from interviews involving 26 participants from uThukela and Zululand district municipalities (Chapter 4).

Eighty-three percent of the traditional health practitioners interviewed used vultures in their healing practices. The birds were predominantly sourced from markets (50%), hunters (30%) and from people working in protected areas (15%). Seven vulture parts were identified to be used as ingredients in various remedies. The head had the highest number of user reports. Similarly, when the Use Value (UV) index was calculated for each part, the head obtained the highest (0.92). This part was used in treating 62% of the ailments reported by the study participants. A total of 21

conditions were identified to be treated with vulture parts. However, the main use for vultures in traditional medicine was related to the ability to foretell (clairvoyance). When categorised, 71% of the conditions and uses were identified as spiritual ailments, while 29% were defined as medical. Medicine administration was primarily through the smoking/inhaling of products after being dried and crushed into powder. The respondents were aware of hunting vultures using poison and demonstrated different views about the health risks associated with this (Chapter 4).

6.2.4 Traditional medicine use and Religion as a viable alternative

Data presented here were obtained from a survey involving 235 respondents. Traditional medicine was used by 51% of the participants, the majority (78%) of which consulted traditional health practitioners. The use of traditional medicine was positively correlated with most demographic characteristics investigated. With regard to religious orientation, participants who identified as Christians were likely not to use traditional medicine. Participants who were followers of traditional religions were more prone to using traditional medicine, while participants who identified as non-religious were equally distributed between use and non-use classifications. The results reveal that the participants used traditional medicine mainly for physical care and well-being (46%) and also for spiritual wellness, strength and protection from evil spirits (23%) (Chapter 5).

Moreover, a qualitative study consisting of 12 participants was conducted to report on the relevance of religion as an alternative to traditional medicine use. The Nazareth Baptist Church was used as a case study. The church acknowledges spiritual ailments. It provides various spiritual products and practices for managing physical, mental and spiritual conditions. Products prescribed include Vaseline, water, soap and candles, all blessed. Wellness practices include prayer and

offering, primarily. A principle guided the use of traditional medicine by the followers as the church book states, “*Do not touch medicine with your own hand as a believer, you may even die*”. Two interpretations of this statute emerged. The one group considered all medicine to be prohibited, including modern, self-administered herbs and traditional healer consultation. The other group claimed that the forbidden medicine is western medicine and witchcraft; the use of herbs for one’s health and well-being is allowed. It was demonstrated that members of the Church did resort to traditional medicine on their own accord and predominantly in secret (Chapter 5).

6.3 Conservation recommendations

Findings emanating from this study are intended to provide valuable guidance for the formulation of management strategies that will effectively improve vulture conservation in the areas studied and potentially in other parts of the country. The following recommendations may also be considered.

- Awareness about vultures in local communities was strong, predominantly in males. Local people considerably appreciated vultures because of the benefits derived from having them in the ecosystems, and many respondents demonstrated significant support for their protection. Community groups such as senior males and herders should be placed at the forefront of conservation initiatives involving local communities as stewards because of their established positive perceptions towards vultures and their conservation. These groups can be useful as providers of knowledge and models for desired behaviours.
- Results obtained from the evaluation of illicit vulture hunting and trade corroborate findings presented by McKean et al. (2013). The illegal hunting of and trade in vultures in northern KwaZulu-Natal is prevalent and facilitated through complex patterns. However, it is

structured upon socio-economic conditions characteristic of the region. Multidisciplinary contributions are recommended to find ways to understand better and approach this predicament. These approaches may include the consideration of cultural, economic and social conditions that influence the illegal hunting and trade of vultures.

- Findings provided by the assessment of the ethnomedicinal uses of vultures and their parts support similar studies. Vultures were predominantly used in managing and overcoming spiritual conditions. We highlight the need for platforms that provide meaningful engagements between traditional health practitioners and conservation managers. Sharing of knowledge and willingness to learn may lead to a better understanding of all relevant dimensions. Furthermore, by engaging meaningfully, conservation practitioners and traditional healers can deliberate on sustainable alternatives such as feathers from live birds and other possibilities.
- Religion does represent a viable alternative for traditional medicine use. In the case study used, we found that traditional medicine use by followers was regulated. The church provided various products and practices for disease management. However, traditional medicine use was reported to prevail amongst the members of the church. This practice was reportedly linked to personal faith as well as cultural pull factors that keep members of the church attached to their cultural institutions, which may involve traditional healing practices. Cultures are dynamic and are subject to change over time. Based on our results, we propose that the use of traditional medicine and the associated over-harvesting of wildlife should be approached from a socio-economic perspective.

6.4 Final remarks

The use of vultures in traditional medicine represents a major conservation inconvenience. Efforts and resources are being diverted towards improving vulture conservation considering traditional medicine use and all the other threats facing these birds. In developing countries, options are often limited. Research can reveal gaps and areas needing immediate attention while guiding the formulation of initiatives and the distribution of resources. This research study intended to contribute to the conservation of vultures, especially in KwaZulu-Natal, by strengthening the knowledge base. This study built relationships with key stakeholders, such as traditional health practitioners in the province, thereby establishing a foundation for future engagements. Moreover, this study opened a door for conservation to explore options beyond science in attempts to enhance biodiversity conservation.

We gathered over the course of the research that social change is difficult to implement and measure. Furthermore, it is dynamic and affected by a myriad of factors. Overall, the data from close on 800 interviews conducted identified many social issues relating to vulture use in KwaZulu-Natal. Still, we could not identify specific ways of achieving social change as some people's perceptions are evolving, and this varied with age, socio-economic status, religion, etc. These perceptions and issues are documented in the respective chapters and summarised in the concluding chapter. The myriad of factors affecting vulture use and perceptions did not highlight where social change may be most effective.

6.5. References

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