Local people's perceptions of wildlife species in two distinct landscapes of Northern Tanzania

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ABSTRACT

Local attitudes towards wildlife species are key for the coexistence between humans and wildlife. To assess how economic, social, and psychological factors affect human perception of wildlife species we conducted questionnaire surveys in two ecologically and culturally distinct rural areas of Northern Tanzania (Mbulu Plateau highlands and Rift Valley lowlands). Using responses of 356 individuals we determined local preferences for population sizes of 31 wildlife species. For five of these species or species groups (rodents, hyena, birds of prey, African elephant, jackal), more than 30% of participants desired a population decline. To investigate correlates for desired population reductions of these species, we ran species-specific (five listed species and African lion) and study area-specific generalized linear mixed models that accounted for spatial autocorrelation. Using these models we assessed relationships between the likelihood of respondents desiring a population decline and six hypothesized explanatory variables: gender; age; ethnicity, and wealth of participant; perceived frequency of negative interactions with; and fear of each species. In both the highland and lowland and for all species, participants that perceived higher instances of negative interactions with wildlife were more likely to prefer smaller future populations, but relationships between perceived frequency of negative interactions and attitudes were often non-linear. People who feared a species were also more likely to desire a population decline. Other variables (gender, age, ethnicity, wealth) showed species- and area-level variations, and we observed substantial spatial variation in expressed attitudes towards species. Thus, negative attitudes towards wildlife appear to be mainly associated with past (negative) experiences and fear, but not necessarily with associated costs or socio-demographic variables. To ensure coexistence between wildlife and humans, we suggest (1) wildlife damage prevention through technical measures and (2) educational initiatives to increase positive attitudes towards wildlife.

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1. Introduction

A growing body of literature from the Western world (mainly Europe and the United States of America) suggests a general amiability towards nature among the general public (Van den Born, Lenders, De Groot, & Huijsman, 2001) and growing appreciation for the numerous positive advantages of biodiversity for human well-being (Dallimer et al., 2012). In terms of wildlife conservation, several studies propose that the perceived attractiveness of a species influences the desirability of future population increases, suggesting that aesthetics impact the support for conservation endeavours throughout society (e.g. Belaire, Westphal, Whelan, & Minor, 2015; Knight, 2008; Marešová & Frynta, 2008; Tisdell, Wilson, & Nantha, 2006). However, ecological functions (Montgomery, 2002), particularly negative interactions with, and harmfulness or perceived risk of a given species, may substantially affect people's images of the species and subsequently their support for its conservation (Fischer et al., 2011; Verbruegge et al., 2013). Costs and risks associated with wildlife may be predominant in shaping attitudes towards them in developing countries, as poverty is generally associated with rather "short-sighted and risk-averse" decisions (Haushofer & Fehr, 2014).

In Tanzania, wildlife populations are ecologically reliant on social, political, and economic conditions outside of protected areas, because these formally less protected lands frequently constitute essential migratory corridors and dispersal areas (Nelson, 2008; Newmark, 2008). The effectiveness of broad-scale conservation efforts are therefore dependent on decisions made by

landowners and local residents, especially in regions adjacent to protected areas (Nelson, 2008). With a nation-wide human population growth rate of 3.2% in 2014 (World Bank, 2016), these corridors and dispersal areas are increasingly encroached upon (Msoffe et al., 2011; Prins, 1987; Salerno, Borgerhoff Mulder, & Kefauver, 2014). Encroachment on wildlife habitat often results in an increase of human-wildlife encounters (Barua, Bhagwat, & Jadhav, 2012) and therefore increases the possibility for human-wildlife conflicts (HWC) (Robertson & Hutto, 2006). Potentially harmful species range from insects to elephants, and may cause problems such as the destruction of crops or property, depredation of livestock, competition for resources, pathogen transmission, and injury to, or loss of human life (Dickman 2010; Madden, 2004; Ogra, 2008; Rust & Marker 2014). Instances of HWC are increasingly common in regions surrounding protected areas in Tanzania (Dickman, Hazzah, Carbone, & Durant, 2014; Newmark, Manyanza, Gamassa, & Sariko, 1994). These adverse interactions often cause animosity towards wildlife, potentially leading to a desire for the reduction or eradication of problem animals (Riley & Decker, 2000). Damages caused by wildlife also threaten the economic well-being of people involved, the impact of which depends largely on their accumulated wealth and the means by which they earn a living (Bagchi & Mishra, 2006). Costs include (but are not limited to) loss of crops or livestock, decreased food security, increased workload, and participation in illegal or dangerous activities (such as the retaliatory killing of wildlife); all of which may further perpetuate the cycle of animosity towards wildlife (Ogra, 2008). In contrast, economic circumstances may bolster positive perceptions of wildlife when they act as a lucrative source of income for those working in the tourism industry (Kinnaird & O'Brien, 2012).

In addition to costs, psychological influences are crucial factors in HWC situations. In particular, humans may fear certain species; i.e. some people may have negative emotions towards a species due to the belief that it compromises their well-being or personal safety, stemming from a combination of personal experiences, instinctual predispositions, and anecdotal influences (Thirgood, Woodroffe, & Rabinowitz, 2005). The effects of fear can manifest as an untiring sense of worry, leading to fatigue, stress, and an overall diminished psychological well-being (Ogra, 2008). Fear and its many effects can induce a perceived inability to control one's own environment (Ajzen 2002), provoking a sense of vulnerability that may favour extreme measures to alleviate the problem (such as illegally killing an animal) rather than employing preventative measures (Carter, Riley, & Liu, 2012; Jenks, Songsasen, Kanchanasaka, Leimgruber, & Fuller, 2014; Lüchtrath & Schraml, 2015; Treves et al., 2002).

Attitudes and beliefs can be shaped not only by past interactions with wildlife, associated costs, and fear, but also by social influences such as peer pressure, conformity, and persuasion (Kansky & Knight, 2014). These stimuli have the potential to outweigh actual intensity of negative interactions in terms of influencing perceptions of wildlife; in some cases the reduction of wildlife-associated damages does not necessarily reconcile with more favourable attitudes towards wildlife (Dickman, 2010; Marker, 2002). In addition, cultural variations in animism can directly impact people's interactions with species (Glaw, Vences, & Randrianiaina, 2008). Beliefs can also manifest separately within generations, gender groups, or as reactions to relevant political events (Carter et al., 2012).

Real or perceived threats associated with wildlife often lead to a decreased appreciation for species (Hazzah et al., 2014; Nelson, Bidwell, & Sillero-Zubiri, 2003), and have historically had large impacts on biodiversity (Carter et al., 2012). Although human persecution is probably a main driver of wildlife population declines throughout Africa (Craigie et al., 2010; Darimont et al., 2009; Kinnaird & O'Brien, 2012), we know relatively little about the factors that shape such attitudes, and hence preferences for future population sizes of wildlife, including past experiences (perceived

frequency of negative interactions), psychological (fear), socio-demographic (age, ethnicity, and gender), and economic (wealth) factors. Examples across the world (de Pinho, Grilo, Boone, Galvin, & Snodgrass, 2014; Gusset, Swarner, Mponwane, Keletile, & McNutt, 2009; Kansky, Kidd, & Knight, 2014; Kellert, Black, Rush, & Bath, 1996; Lindsey, Du Toit, & Mills, 2005; Lüchtrath & Schraml, 2015; Ogra, 2008; Zimmermann, Walpole, & Leader-Williams, 2005) suggest that attitudes may be caused by a combination of these factors, though the importance and direction of these correlates vary by region and species. In this study we analyse (i) how wild animal species are perceived and (ii) what socio-demographic, economic, and psychological factors act as driving forces for negative perceptions in two adjacent but distinct rural areas of northern Tanzania.

2. Material and methods

2.1. Study area

This study was carried out in Babati, Monduli and Karatu districts of Northern Tanzania encompassing the Karatu highlands and the Rift Valley lowlands (Fig. 1). The survey area spans a gradient of land use practices adjacent to various levels of conservation, including Lake Manyara and Tarangire National Parks (LMNP, TNP), Manyara Ranch Conservancy (MR), Mto Wa Mbu game-controlled area (GCA), and the Ngorongoro Conservation area (NCA). The eastern part of the study area holds the largest concentration of elephants *Loxodonta africana* in Northern Tanzania, and the second largest population of migratory ungulates (mainly zebra *Equus quagga* and wildebeest *Connochaetes taurinus*) in East Africa (Msoffe et al., 2011). Several large carnivores also occur throughout the landscape including lion *Panthera leo*, leopard *Panthera pardus*, and spotted hyena *Crocuta crocuta* (Koziarski, Kissui, & Kiffner, 2016). Three distinct seasons occur in the region that are driving factors for the migration of ungulates; the short rains from November to January; long rains from February to May; and the dry season from June to October (Kiffner et al., 2014).

Geologically and ethnically the area is divided into two zones: the Rift Valley lowlands (hereafter the "valley"), and the Mbulu Plateau highlands (hereafter the "highlands"), which are separated by an escarpment (Loth & Prins, 1986). The valley is considered semi-arid, while the higher elevations of the escarpment and uplands range from semi-arid to humid (Prins, 1987). There is a distinct land-use difference between the valley and highlands; pastoralist Maasai use the lowlands and forest zones primarily for livestock grazing, while the highlands are populated primarily by Iraqw farmers who use the land for agriculture (Prins, 1987). A map of the study area was overlaid with a 5×5 km grid (from $35.561714°$ to $36.101307°$ E and $-3.768853°$ to $-35.284234°$S) and forty-six of these grid blocks were selected as survey sites, given the availability of human settlements within them (Fig. 1).

2.2. Interview protocol

A structured social survey of 356 individuals within the 46 cells (21 in the highland and 26 in the valley; between 3 and 10 households with an average of 8 households per cell) was conducted through the use of questionnaires over a period of ten days during November 2014. The survey featured questions on 31 animal species (or species groups hereafter referred to as species; local people often do not differentiate between similar species such as spotted hyena *Crocuta crocuta* and striped hyena *Hyena hyeana*) native to Northern Tanzania. The species list included primates, ungulates, carnivores, rodents, and functional groups of birds (Table 1), and were chosen because they are of variable