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Local People's Perceptions of Benefits and Costs of Protected Areas: The Case of Tarangire National Park and the Surrounding Ecosystem, Northern Tanzania

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Cover Page Footnote

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RESEARCH ARTICLE

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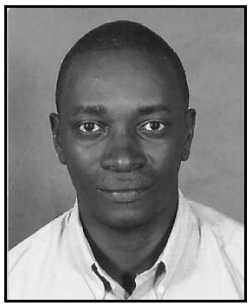

FELIX J. MKONYI

ABSTRACT

A better understanding of the benefits and costs of conservation to people living adjacent to protected areas is fundamental to balancing their conservation goals and needs. This study based in the Tarangire-Simanjiro ecosystem explored the costs, benefits, and attitudes of local people living adjacent to Tarangire National Park in northern Tanzania. In-depth interviews were conducted with 30 respondents randomly selected from the sample of 300 respondents used previously for a larger survey. Results indicate mixed responses toward protected areas. The majority of respondents held positive attitudes toward the park (56.7 percent) and park staff (63.3 percent) but had negative attitudes toward the Simanjiro Plains (53.3 percent). Despite the costs of living in proximity to the park, the majority of respondents viewed the park staff favorably, which may contribute toward improved conservation and increased tolerance. The revenue from ecotourism, support for community development projects, and wildlife protection were the top three perceived benefits, while crop raiding and livestock depredation, restricted access to the park, and clashes with park rangers were the greatest perceived costs. Binary logistic regression analyses showed that interaction with park staff was the predictor of a positive attitude toward the park, while lack of ecotourism benefits and living in the vicinity of the park were predictors of negative attitudes. Attitudes toward the Simanjiro Plains were significantly positively correlated with overall income sufficiency, although older respondents were more likely to express negative attitudes toward it. Most respondents were willing to support large carnivore conservation despite having problems with them. The findings suggest that interventions aimed at improving positive attitudes toward protected areas should focus on an equitable ecotourism revenue-sharing with adjacent communities, positive interactions with park staff, and overall household income sufficiency to win the support of local communities and thus ensure effective conservation of protected areas.

INTRODUCTION

Understanding the benefits and costs of conservation to people living within or adjacent to protected areas is fundamental to balancing conservation goals and needs of local human populations (Bruyere et al. 2009; Karanth and DeFries 2010; Naughton-Treves et al. 2005). Protected area-related benefits include employment opportunities from tourism, ecotourism benefits, access to protected area resources such as grazing land, water sources, thatching grass and so forth, support for community development projects, and conservation of wildlife. Furthermore, protected areas can also provide benefits that are less tangible, including the provision of ecosystem services, recreation, spirituality, cultural contexts, education, and sci-

entific research and monitoring (Allendorf et al. 2007; Harmon 2003), and these benefits can impact overall perceptions and attitudes of local people.

People living in and around protected areas interact with ecotourism as a source of revenue to support protected areas and local communities (West et al. 2006). However, ecotourism may lead to undesirable social, cultural, and economic consequences–it can cause conflict and changes in land-use and land tenure rights (Bookbinder et al. 1998), can fail to deliver promises of community-level benefits (Krüger 2005, Stone and Wall 2004), and might displace people from protected areas and impact local people's cultures and sacred places (West et al. 2006).

Protected area-related costs include damage of crops and livestock, disease transmission, threats to human safety from wild animals, restrictions over access to pasture and water for livestock, and conflicts with park staff (Allendorf et al. 2006; Clements et al. 2014; Kideghesho et al 2007). The nature of these costs and benefits depends upon the protected area's status and governance, as well as its history of use. One of the approaches for the conservation of biodiversity in national parks is the traditional park management approach (protectionism approach) which denies local people access to park resources (Adams 2004). For instance, some national parks restrict access to resource use because of the laws and regulations surrounding a park's establishment. Others allow local people who neighbor these parks to have access to specific resources from the park for subsistence use (Tumusiime et al. 2011). Therefore, restriction of access to protected areas resources (e.g., restrictions over access to grazing, water for livestock, or fuelwood) is regarded as a cost, and regulated access to specific resources for subsistence use is regarded as a direct benefit.

Some authors have argued that local communities are unlikely to support protected areas if they have negative perceptions and attitudes toward them (Gillingham and Lee 2003; Kideghesho et al. 2007). On the contrary, where local communities perceive protected areas positively, they are likely to be more supportive of protected areas (Archabald and Naughton-Treves 2001; Holmes 2013; Kideghesho et al. 2007). A study conducted by Kideghesho et al. (2007) revealed that factors instigating positive attitudes are likely to enhance conservation goals while factors inducing negative attitudes will detrimentally undermine these goals.

Previous studies have also shown that local people's perceptions of and attitudes toward protected areas or conservation are shaped by their socioeconomic characteristics (including livestock holdings, land ownership, occupation, income sources), the experience of losses, perceived benefits of protected areas, perception of protected area existence (Allendorf et al. 2006), perceived relationship with protected area management and protected areas staff (Allendorf et al. 2012; Kideghesho et al. 2007; Sarker and Røskaft 2011); involvement in protected area conservation, and level of awareness of protected areas (Dimitrakopoulos et al. 2010), demographic characteristics (education, age, gender, household size) (Kideghesho et al. 2007; Mutanga et al. 2015) and ecological factors (distance from the park boundary) (Abukari and Mwalyosi 2018; Spiteri and Nepal 2006). Therefore, effective management of protected areas calls for an understanding of people's attitudes and the factors behind these attitudes (Allendorf et al. 2006; Sarker and Røskaft 2011).

This study, largely based in the Tarangire-Simanjiro ecosystem, explored the costs, benefits and attitudes of local people living adjacent to Tarangire National Park in northern Tanzania. Most previous studies in Tarangire National Park have focused on attitudes and various factors that influence people's attitudes toward the park (Abukari and Mwalyosi 2018), park-community interactions (Baird et al. 2009; Davis 2011;

Sachedina 2008), the effect of wildlife conservation on local perceptions of risk (Baird et al. 2009), conservation as a disturbance in social-ecological systems (Baird and Leslie 2013), and livelihood diversification through the adoption of cultivation by the pastoral Maasai (McCabe 2003; 2010). This present study builds on these previous works and updates current knowledge of conservation benefits and costs to park-adjacent communities identified by other scholars (Baird et al. 2009; Baird 2014).

Building on these and other studies that have assessed community attitudes and perceptions toward protected areas (Mutanga et al. 2015; Newmark et al. 1993; Sarker and Røskaft 2011), this study is aimed at filling this knowledge gap. It contributes to the protected area-local community relationship literature by exploring the perceived costs and benefits of communities living adjacent to Tarangire National Park. This study also assesses factors that influence people's attitudes toward protected areas (Abukari and Mwalyosi 2018; Allendorf et al. 2012; Kideghesho et al. 2007).

THEORETICAL FRAMEWORK

The specific objectives of the present study were to: 1) determine the perceived costs and benefits of local communities living adjacent to Tarangire National Park; 2) assess the attitudes and perceptions of local communities toward the Tarangire National Park and Simanjiro Plains; 3) assess the perceptions of local communities toward the park staff; and 4) identify factors that influence local communities' attitudes toward Tarangire National Park and Simanjiro Plains. A better understanding of local perceptions of costs and benefits of living next to the protected areas could enhance community support for protected areas and guide conservation policy.

In this study, an attitude refers to a psychological tendency of humans to evaluate a particular entity, called an attitude object, with some degree of favorability or unfavorability connected with their behaviors as asserted in the Theory of Reasoned Action and the Theory of Planned Behavior (Ajzen 2012). An attitude embraces a set of three elements: 1) feeling (e.g., like or dislike of a protected area); 2) belief (i.e., cognition or thought about the protected area and its conservation); and 3) action or behavioral intentions (e.g., participation in protected area conservation). In this regard, the Theory of Planned Behavior's importance for protected areas management is the possibility that fostering positive attitudes toward protected areas among residents might lead to pro-conservation behaviors. Beliefs are associations that people establish between the attitude object (i.e., protected areas) and various attributes (Allendorf 2007). In this study, perception is defined as people's beliefs that are derived from their experiences and interactions with protected areas; and is likely to be one of the emotional components that determine attitudes or behavior (Allendorf et al. 2006; Xu et al. 2006). Although perceptions may be substantially different from reality, they shape people's actions or behaviors. The attitude was determined by asking people if they like or dislike the area, while perceptions were generated by asking people why they like or dislike the area, looking at the benefits of the area that people perceived (positive attributes) and problems the area caused (negative attributes).

The present study applied the Theory of Reasoned Action and Theory of Planned Behavior (Ajzen 2012; Fishbein and Ajzen 1975) to understand people's attitudes in three constructs: 1) feelings (e.g., like or dislike of protected area); 2) beliefs (i.e., cognition or thought about the protected area and its conservation); and 3) action or behavioral intentions (e.g., participation in protected area conservation). The application of these social-psychological theories to this study is that the theories provide further explanations into the connection between feelings, beliefs and be-

havioral intentions as they may influence local people's pro-conservation behaviors and support for protected areas. From a conservation standpoint, it is perceived that positive conservation attitudes or positive attitudes toward a protected area are likely to be linked to pro-conservation behaviors (Holmes 2003) or socio-demographic variables (Allendorf et al. 2012; Mehta and Heinen 2001). Although it is accepted that positive conservation attitudes may not directly translate into pro-conservation behaviors (Infield and Namara 2001; St John et al. 2010; Waylen et al. 2009), social psychologists and conservationists agree that attitudes are a useful predictor of behavior (Holmes 2003; Waylen et al. 2009).

This study also adopted the social exchange theory framework (Homans, 1961; Sharpley, 2014), to understand how people's attitudes toward nearby protected areas are linked to the way they perceive the flow of costs and benefits from protected areas. Ap (1992) describes social exchange theory as "a general sociological theory concerned with understanding the exchange of resources between individuals and groups in an interaction situation." The extended social exchange theory (Blau, 1964; Emerson, 1976) describes how people develop attitudes toward an object (a person or thing) based on their subjective cost-benefit analysis. The theory posits that objects that generate net benefits are more likely to be perceived positively, while those associated with net losses will tend to be perceived negatively (Napier and Napier 1991).

In a protected area context, the social exchange theory dictates that rational human beings base their behavioral choices on maximizing gains and minimizing costs, implying that if local people perceive benefit from the existence of a protected area, they will be more likely to support conservation and the continued existence of the protected area and vice versa. Hence, the balance between positive perceptions of benefits from protected areas and negative perceptions caused by the costs will determine whether people support the conservation and the continued existence of the protected area. Generally, the social exchange theory can be classified into three analytical concepts: rewards, costs, and resources (Blau 1964; Emerson 1976). Homans (1961) defined costs as something of value that is given up; it can also be the withdrawal of a reward or punishment, it can be time, effort, or money. Rewards can be anything whether the pleasures, satisfaction and gratifications a person enjoys from participating in a relationship (Thibaut and Kelley 1959).

Given the concerns of this study, attitudes might also be affected by anticipated rewards (e.g., promises of employment opportunities, support for conservation development projects or compensation for crop damage and livestock depredation by wildlife) and, if these promises are not fulfilled, can negatively affect people's relationships with a protected area (Boonzaier 1996; Fiallo and Jacobson 1995; Ite 1996). For example, when a person perceives the benefits of the relationship as outweighing the perceived costs, then the theory predicts that the person will choose to engage in a relationship. For social exchange theorists, when the costs and benefits are equal in a relationship, then that relationship is not equitable. Therefore, exchange theory is neither a matter of equal gain nor a "zero-sum game" in which the gains of some equal the losses of others (Blau 1964).

Factors such as costs (human-wildlife conflict, i.e., livestock depredation, crop-raiding, restricted access to natural resources, loss of human life, and disease transmission) and benefits (protected area-based employment, community development, ecosystem services, etc.) affect the way protected area management and communities relate with each other. When communities do not receive benefits and bear the costs of conservation, they are likely to have a negative relationship with the protected area (Allendorf et al. 2007, Kideghesho and Mtoni 2008; Mutanga et al. 2017). Consequently, if protected area management does not

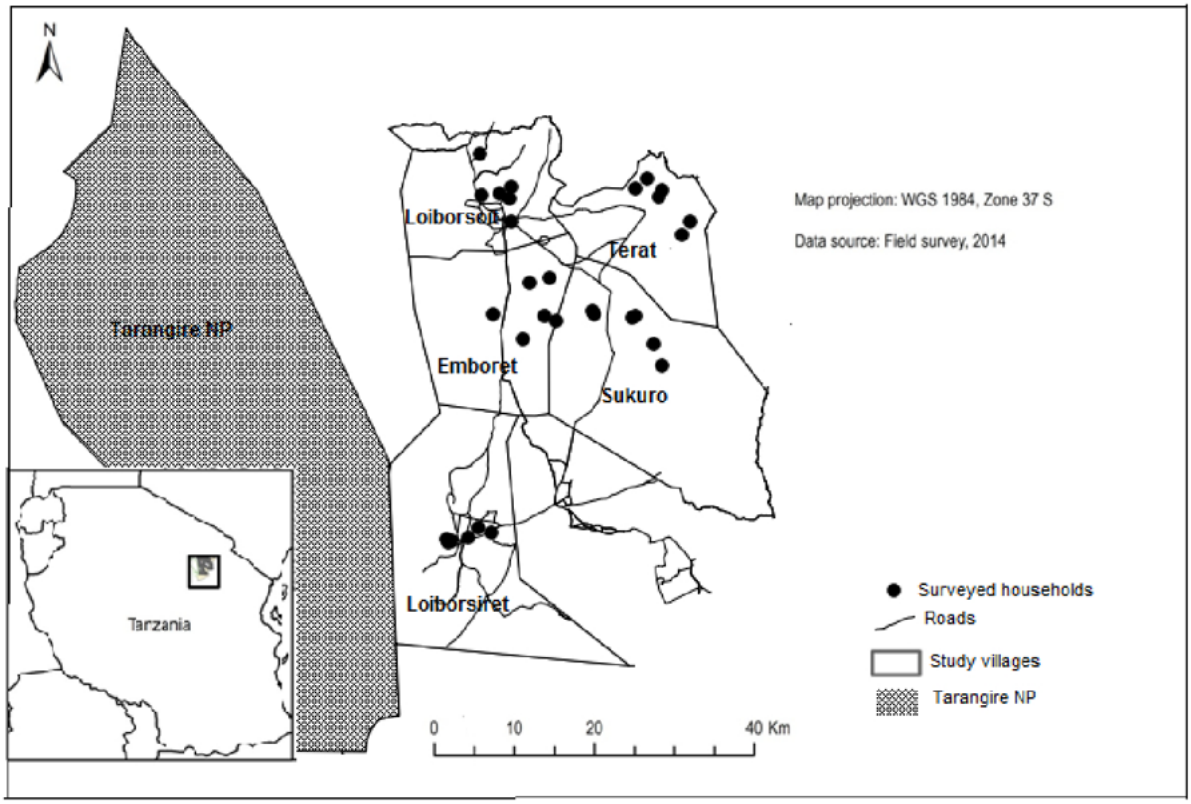

FIGURE 1. Study Area

see the importance of offering some benefits to the communities or reducing human-wildlife conflict, they are likely to have a negative relationship with the communities. Therefore, people's perceptions and attitudes toward protected areas are largely influenced by the perceived costs and benefits of protected areas (Allendorf et al. 2007; Tessema et al. 2010). By using the social exchange theory framework, this qualitative study examines the local people's perceptions of the benefits and costs of protected areas, with a particular focus on Tarangire National Park and the surrounding ecosystem in northern Tanzania.

STUDY AREA

This study was conducted on the Simanjiro Plains which are part of the Tarangire-Simanjiro Ecosystem in northern Tanzania (3°52' and 4°24' S and 36°05' and 36°39' E) (Figure 1). The Simanjiro Plains are a key dispersal area for wildlife with extensive grasslands that provide critical grazing and calving areas for wildebeest (*Connochaetes taurinus*) and zebra (*Equus burchellii*) during the wet season (November - May) and grazing for pastoralists during the dry season (June – October) (Gereta et al. 2004). Large carnivores include lions (*Panthera leo*), cheetahs (*Acinonyx jubatus*), leopards (*P. pardus*), African wild dogs (*Lycaon pictus*), and spotted (*Crocuta crocuta*) and striped hyenas (*Hyena hyena*).

The major ethnic groups in the study area are Maasai and WaArusha. Both groups historically depended exclusively on livestock as their means of subsistence but the WaArusha have a higher frequency of practicing subsistence agriculture. Traditionally, the Maasai were pastoralists. However, due to increasing pressures on their land (Igoe and Brockington 1999), pastoral Maasai have now diversified their livelihoods into agriculture (Baird and Leslie 2013; McCabe et al. 2010) and wage labor including migration to urban areas and the tanzanite gem mines (McCabe et al. 2014).

When the Tarangire National Park was created in 1970, the "fences and fines" approach was used and as a result, many pastoral Maasai were evicted from the park and, henceforth, access to water sources and pastures essential to herding communities was cut off (Igoe and Brockington 1999). The fences and fines approach was later replaced by a community-based conservation approach on the premise that tangible benefits are the vital motivational factors for local people to align their behaviors with conservation goals (Gibson and Marks 1995; Western 1994).

METHODS

Data were collected through in-depth interviews from a random sample of 30 participants between October and November 2014. A qualitative study was conducted to follow up on findings from quantitative data obtained from June to July 2014 main questionnaire survey (see Mkonyi et al. 2017a). Five study villages were selected (Loiborsoit, Terat, Emboret, Sukuro and Loiborsiret) (Figure 1), based on geographic proximity to the eastern border of Tarangire National Park. During the previous quantitative study, these villages were randomly selected, and then households were selected by consulting lists of Maasai **bomas** provided by local village offices. A total of 300 bomas were randomly selected from these lists. The Maasai boma is composed of more than one household situated in a circle around a central paddock, where livestock are kept at night. Bomas were visited, and one household was selected within each boma randomly using a random number generator in Microsoft Excel as a sampling unit (see Mkonyi et al. 2017a). In this study, six households were randomly selected from each village from the list of 300 households used in the main survey (i.e., 10 percent of households interviewed). Following Wenden (1982), an aide memoir was prepared to contain important topics that would be covered during the discussion.

The semi-structured interviews employed a blend of closed and open-ended questions, often accompanied by follow-up why or how questions. Verbal informed consent was obtained from all the subjects before participation and data were kept anonymously. The interviews covered the respondent's background and demographic profile including age, gender, village, ethnic group, education level and household size, reasons for settling in the Simanjiro Plains (if they were not born in the area), length of residence in the area, socioeconomic characteristics (number of livestock owned, landholding, occupation, sources of income and income sufficiency). The interview also probed the reported incidents of livestock attacks by large carnivores over the last two years, community attitudes toward the Simanjiro Plains (looking at the perceived costs and benefits of living in the area) and community attitudes toward the presence of Tarangire National Park (looking at the perceived costs and benefits of its presence, the perceived impact of it on people's lives and perceptions of park staff-community relationship and interaction). General and specific questions were asked about each topic in order to clarify or gain an in-depth understanding of the interview topics.

A researcher spent four months in the area before conducting the in-depth interviews in order to build rapport with the local communities. In this way, people were willing to discuss and to give out in-depth information and respond accurately and honestly to sensitive questions posed to them. The interview was conducted in a local language (i.e., Swahili language – with the aid of a translator speaking Maasai where needed). Interviews and discussions were recorded using a hand-held digital voice recorder after which all the records were eventually cross-checked and transcribed. All the discussions took between one and two hours to complete.

DATA ANALYSIS

Continuous variables were analyzed using standard descriptive statistics (means, standard deviations, ranges, percentages and frequencies of counts, tables and charts). Categorical variables were converted into a set of dichotomous, dummy-coded variables. Content analysis (Patton 1990) was performed where raw data were condensed into categories or themes and patterns based on the interpretation obtained from the interview. Verbatim quotations from informants and quantitative data were used as evidence to support claims and express meanings.

Spearman rank correlation coefficients (rs) checked for multicollinearity of the predictor variables for all possible variable pairs. A cutoff of $rs \geq 0.6$ was chosen to indicate high collinearity between predictor variables (Zuur et al. 2010). There was no strong collinearity detected among the predictor variables (all $rs < 0.6$), suggesting that any collinearity among variables was unlikely to affect statistical inference (Zuur et al. 2010). The household survey data were analyzed using Pearson's $\chi 2$ tests to determine homogeneity of proportions of categorical demographic and socio-economic variables, followed by Generalized Linear Models with binomial distribution and logit link function to identify variables related to various attitudes ($p<0.05$).

A total of fifteen independent variables were generated and incorporated in the Generalized Linear Models (Table 1). Livestock numbers were converted to Tropical Livestock Units to standardize cattle, goats and sheep and the household size was expressed in adult equivalent units (Table 1, see footnotes to Table 1 for the definition of the terms). Generalized Linear Models have a single, common dependent variable – a binary "yes" or "no" response to the questions of (i) whether they like or dislike the presence of the Tarangire National Park (ii) whether they like or dislike living in the Simanjiro Plains. Thus, the individual's attitude was rated with a 2-point scale ("0" for dislike or "1" for like) assuming that in answering the question, respondents evaluate the attributes to the Tarangire National Park or Simanjiro Plains based on their beliefs and express this evaluation in their overall attitude. A summary of 30 questionnaire questions and responses used in this study are presented in Table A1.

All candidate models were ranked in order of parsimony based on the Akaike's Information Criterion (AIC) corrected for small sample size (AICc) and Akaike weights (ωi) (Burnham and Anderson 2002). Model-averaged coefficients of predictor variables were calculated based on top-ranked models with $\Delta AICc < 2$. All tests were two-tailed and significance was measured at $P<0.05$. Only statistically significant results are reported in this paper. The potential limitations of this study are that the respondents' perceptions may not be representative of community views and, due to the small sample size, it may not be possible to generalize the implications of the findings.

Other caveats in this study include under-representation of females in the sample. Also, using a dichotomous measure (like or dislike) of attitude does not capture all the dimensions of the people's attitudes toward protected areas. Finally, variables from which attitudes were inferred cannot be said to be all-inclusive because some predictor variables were excluded in the final regression model. Therefore, the results should be interpreted cautiously. However, despite these caveats, the results provide some valuable insights into the local communities' perceptions of the benefits and costs of living adjacent to the protected areas.

TABLE 1. Description of independent variables (respondents' demographic and socioeconomic status) used in generalized linear model and attitudes toward Tarangire National Park or Simanjiro Plains

Independent variables	Description of variables	Frequency (*n*)	Percentage (%)
Gender	Gender of the respondent	Male = 28	93.3
		Female = 2	6.7
Education	Educational status of respondent	Illiterate = 4	13.3
		Literate = 26	86.7
Occupation	Occupational status of respondent	Agropastoralists = 25	83.3
		Pastoralists = 3	10.0
		Others (e.g. casual laborers, business men, teachers and trophy hunting operators = 2	6.7
Any perceived benefits from Tarangire National Park	Presence/absence of benefit from the park	Yes = 19	63.3
		No = 11	36.7
Experience with livestock depredation	Presence/absence of livestock depredation	Yes = 26	86.7
		No = 4	13.3
Relationship with park staff	Relationship of respondent and the protected area staff	Good = 19	63.3
		Poor = 11	36.7
Any interaction with park staff	Interaction of respondent with park staff	Yes = 19	63.3
		No = 10	33.3
		Don't know = 1	3.3
Overall income sufficiency	Sufficiency/insufficiency of household income	Yes = 17	56.7
		No = 13	43.3
*Primary source of income (values range from 1 to 3)	Number of household income sources	One source = 7	23.3
		Two sources = 17	56.7
		Three sources = 6	20.0

Continuous variables	Description of variables	Minimum	Maximum	Mean	SD
Age (years)	Age of the respondent	22	92	43.6	15.2
Landholding size (Hectares)	Land owned by respondents in hectares	1	405	33.3	74.2
Household size (AEU)	Number of individuals in the household expressed in Adult Equivalent Units (AEU)	3	11	6.8	2.3
Livestock ownership (TLUs)	Total livestock holding expressed in TLUs	14.16	24.46	25.61	5.53
Length of residence in the area (years)	Number of years a respondent had lived at their present location	2	64	23.4	16.6
		5		22.2	12.0
Distance (km)	Distance of respondent's household from the park boundary measured in km using ArcGIS v.10.1 [ESRI, Redlands, USA]	[Close to park ≤ 15 km]			
		[Far from park ≥ 15 km]			

Note: Tropical Livestock Units (TLUs) are defined here as: 1 head of cattle = 0.7, 1 head of smallstock (sheep and goats) = 0.1 and 1 head of donkey = 0.5. 1TLU is equal to an animal with a body weight of 250 kg (Jahnke 1982). Total TLU = Livestock No. × TLU factor.

Adult Equivalent Units (AEU) is a measure of household size where the sex and age of surveyed household members are compiled. AEU by age and sex are summed up for all people in the household to compute the total AEU for the particular household. The AEU conversion factors follow the procedure used by Cavendish 2002. *Sources of income: one source (livestock sales), two sources (livestock sales and crop sales), three sources (livestock sales, crop sales and other sources of cash income).

RESULTS

Respondent's Demographic and Socioeconomic Characteristics

All of the respondents interviewed were Maasai, with ages ranging from 22 to 92 years old (Table 1). More men than women participated in this survey, probably because the sample was composed of household heads, and the great majority of these were men.

The educational status of the respondents indicated that most had at least primary or secondary education, while 13 percent had never been to school. The household size (persons per household expressed in Adult Equivalent Units) ranged from 3 to 11 members. The distance of a surveyed household from the park boundary ranged from 5 – 40 km. According to the survey results, half of the respondents were immigrants into this area, and they gave various reasons for immigrating into the area (Table 2). The length of time that a respondent had lived at their present location indicated a relatively long average tenure (mean = 23 years), with a large range (2 – 64 years).

The majority of respondents (83.3 percent) were agro-pastoralists, 10 percent were pastoralists, while others were casual laborers, businessmen or formally employed as teachers and trophy hunting operators. Respondents reported owning between 14.16 and 24.46 livestock per household expressed in Tropical Livestock Units, with a mean of 25.6 ± (SD 5.5). The landholding size of the respondents ranged from 1 to 405 ha, with a mean of 33 ± (SD 74). As shown in Table 1, the households had diversified income sources, with livestock sales and crop sales being the most important income sources. With respect to overall income sufficiency (as a proxy for wealth), the majority of the respondents (57 percent, n = 17) reported that their overall income was sufficient to support their livelihoods.

Community Attitudes Toward the Simanjiro Plains

Despite some concerns related to wild animals, approximately half of respondents (47 percent, n = 14) expressed that they liked living in the Simanjiro Plains, while more than half of the respondents (53 percent, n = 18) expressed their dislike of the Simanjiro Plains. However, no significant difference between the two categories was found ($\chi 2 = 0.50$, df = 1, $P>0.05$).

Perceptions of Simanjiro Plains-related Benefits

When asked why they liked this area, they listed arable land for agriculture and good grazing land as the top two perceived benefits (Table 3). The least perceived benefits were adequate water, good facilities like schools and hospitals, and lack of livestock diseases.

Perceptions of Simanjiro Plains-related Costs

Respondents ranked both crop raiding and livestock depredation by wildlife as the most prevalent costs in this area, accounting for 40 percent (n = 12) of all costs reported (Table 3). Nevertheless, 4 percent of the respondents (n = 13) perceived no costs from Simanjiro Plains, which shows that they were comfortable living in this area. While the majority of respondents (87 percent, n = 26) had reportedly experienced livestock depredation by large carnivores over the last two years, nearly the same number of respondents (83 percent, n = 25) reported a reduction in livestock depredation (Table A1).

TABLE 2. Summary of respondent's reasons for immigrating into the Simanjiro Plains (n = 15). Respondents gave more than one reason, so the total exceeds 100 percent

Reasons for immigrating	No. of responses (n)	% responses
Access to river water	5	33
Access to grazing land	8	53
Free of tsetse	1	7
Following their relatives	5	33
Married to this area	1	7
Moved during ujamaa villagization	1	7
Suitable land for agriculture	3	20
Access to local facilities	1	7

TABLE 3. Summary of respondent's perceptions of benefits and costs of living in the Simanjiro Plains (*N*

Perceived benefits	No. of responses (*n*)	% responses
Arable land for agriculture	18	60
Good grazing land	15	50
Adequate water	11	36.7
Good facilities	5	16.7
Free of livestock diseases	1	3.3
Perceived costs	**No. of responses (*n*)**	**% responses**
Crop raiding and livestock depredation	12	40
Livestock diseases	3	10
Drought	2	6.7
Immigration	2	6.7
Decreased area suitable for agriculture	2	6.7
Land no longer suitable for agriculture	1	3.3
Tsetse flies	1	3.3
Environmental degradation	1	3.3
Lack of access to facilities	1	3.3
None	13	43.3

Community Attitudes Toward the Presence of Tarangire National Park

More than half of respondents (57 percent, $n = 17$) answered "yes" to the question: "Do you like the presence of the Tarangire National Park" implying that they like the presence of the park, while 43 percent ($n = 13$) of the respondents indicated their dislike (Table A1).

Perceptions of Park-related Benefits

The majority of respondents (63 percent, $n = 19$) cited revenue from ecotourism as the benefit drawn from the park, while two respondents felt that the park was good as it provides employment opportunities to the youth as park rangers or part-time employees (Table 4). Yet, over half the respondents (57 percent, $n = 17$) felt that the park was good as it provides support to local communities through Community Conservation Services, also locally known as the **ujirani mwema** (good neighborliness) program (Dembe and Bergin 1996).

Community Conservation Services is an outreach program of Tanzania National Parks that aims to identify and implement opportunities for sharing park benefits with adjacent rural communities through social services including building of classrooms, schools, dispensaries, and construction of water reservoir tanks and water bores. However, 27 percent ($n = 8$) of the respondents expressed their concern over the ujirani mwema program and claimed that it was very effective over the last 16 to 8 years but that it is gradually declining. As one respondent said:

> *In the past, the park authorities used to provide social services to the community such as the building of schools, classrooms, water pumps and dispensaries but nowadays such services have stopped* — Respondent 4, Maasai man.

Over one-third of respondents (37 percent, $n = 11$) declared no personal or communal benefits emanating from the park. Meanwhile, the majority of respondents said that they like the park because it provides protection of wild animals for the benefit of their country and future generations. As one male respondent (#247) said, "If the park would not have been there, then wild animals would have disappeared completely." Some respondents believed that the park can provide conservation education for the children in terms of being able to visit there, see and learn about wild animals. Only one person (3 percent)

TABLE 4. Summary of respondent's perceptions of benefits and costs of living in the Simanjiro Plains (*N* = 30). Respondents gave more than one reason, so the total exceeds 100Summary of respondent's perceptions of benefits and costs of living in the Tarangire National Park (*N* = 30). Respondents gave more than one reason, so the total exceeds 100 percent

Perceived benefits	No. of responses (*n*)	% responses
Tourist revenue	19	63.3
Education for the children	11	36.7
Protect wild animals	19	63.3
Community conservation services	17	56.7
Provides employment	2	6.7

Perceived costs	No. of responses (*n*)	% responses
Restricted access into the park for grazing	3	10.0
Clashes with park rangers	4	13.3
Livestock depredation and crop raiding by wild animals	9	30.0
Declining Ujirani mwema	3	10.0
None	15	50.0

seemed not to understand possible purposes of the government in establishing the park. Revenue generation through ecotourism and protection of wild animals were the main reasons given by respondents for the government to establish the park. Despite the small sample size, respondents who perceived ecotourism benefits expressed more positive attitudes toward the park than those who did not perceive ecotourism benefits ($\chi^2 = 6.1$, df = 1, $P < 0.05$).

Perceptions of Park-related Costs

When asked about the perceived costs of living adjacent to the park, about one-third of respondents (30 percent, $n = 9$) cited livestock depredation together with crop-raiding as the major cost incurred from wildlife (Table 4). Three respondents attributed their dislike of the park to the restrictions on access for livestock grazing, while four respondents attributed their dislike to the clashes with park rangers. This source of conflict was also supported by one of the respondents who said that:

> *I have no problem with the park, but I have a problem with the park rangers who harass us especially when livestock cross into the park, as we are not allowed to graze in the park.* — Respondent 61, Maasai man.

Also, restricted access to the park for livestock grazing was contended by one of the respondents that:

> *The park authorities are unfair for valuing wildlife more than livestock. I think they should allow wild animals and livestock to graze together in the park when the grazing areas become limited.* — Respondent 247, Maasai man.

Three respondents mentioned the decline of the ujirani mwema program over recent years. For instance, one of them explained that:

> *The money allocated to support community outreach programs [does] not reach the intended people. We don't see any benefits whatsoever, only the village authorities know about this and perhaps where the money goes to.* — Respondent 239, Maasai man.

However, half of the respondents said that they have no problem with the park. When asked a question on retaliation or their desire to kill problem animals, 60 percent ($n = 18$) of respondents declared that they would kill the problem animals in retaliation for livestock loss, while 70 percent ($n = 21$) of respondents said they would do the same in retaliation for human loss.

Perceptions of Park-related Effects on People's Lives

TABLE 5. A binary logistic regression of attitude toward the Simanjiro Plains as a dependent variable

			95% Wald confidence interval		Statistical tests	
Independent variables	**β**	**SE**	**Lower**	**Upper**	**Wald chi-square**	***p*-value**
(Intercept)	1.948	1.6184	-1.224	5.119	1.448	0.229
[overall income sufficiency =1] yes	1.987	0.9372	0.150	3.824	4.496	0.034
[overall income sufficiency =2] no	0[a]	.	.	.	.	.
Age	-0.076	0.0380	-0.151	-0.002	4.058	0.044
(Scale)	1[b]					

Note. "a" Set to zero because this parameter is redundant
b" Fixed at the displayed value.
β = Estimates of coefficients derived from the top model, SE = standard error

When asked about how the park has affected the overall people's lives both at the individual and community level, more than half the respondents (57 percent, $n = 17$) perceived that the community had benefited from the park through the ujirani mwema program (i.e., the building of schools, classrooms, dispensaries, etc.), while 37 percent ($n = 11$) thought that the presence of the park had no overall significant effect at both the individual and community levels (Table A1). Respondents showed mixed perceptions on the effect of the park on local livelihoods, with the majority of respondents perceiving more positive impacts from the park at a community level than at a personal level, and more respondents perceiving no effect at a personal level ($\chi^2 = 17.0$, df= 1, $P < 0.05$).

Despite the problems with large carnivores, almost two-thirds of respondents (63 percent, $n = 19$) had more positive attitudes toward large carnivore conservation. As shown in Table A1, none of the respondents reported having received compensation from Tanzania National Parks for crop or livestock losses from wildlife. Approximately, 87 percent of the respondents believed that monetary compensation will offset the costs of livestock losses, increase local tolerance of large carnivores, and improve attitudes toward conservation.

Perceptions of Park Staff-Community Relationship and Interactions

When asked about their relationship with park staff, 63 percent ($n = 19$) of the respondents reported good (positive) relations with park staff (i.e., park rangers), while over one-third (37 percent, $n = 11$) reported poor (negative) relations with park staff (Table A1). For instance, illegal grazing was one of the negative relations with park rangers. As one respondent said:

> *…During the dry season, there is less grazing available for our cattle in the village land; so we frequently take our cattle for grazing in the park. The park rangers either chase us away or arrest us with our cattle, beat us, and sometimes leading to exorbitant fines of up to Tshs 500,000/= (US$ 200).* — Respondent 56, Maasai man.

When asked what could be done to improve park-community relationships, over half of the respondents (57 percent, $n = 17$) suggested the need for improvement on the ujirani mwema program that seems to be in decline over the recent years, while relatively few respondents (13 percent, $n = 4$) suggested the need for enhancing education and conservation awareness programs. Four people suggested the need for enhancing park rangers' tolerance, while three people recommended compensation for crop damage and livestock losses. Two-thirds of respondents (63 percent, $n = 19$) had experienced personal interactions with park staff, and their interactions were mainly positive (Table A1).

Factors Influencing Community Attitudes toward Simanjiro Plains and Tarangire National Park

Age had a significant negative relationship with attitudes toward the Simanjiro Plains (i.e., the older re-

spondents were more likely to hold negative attitudes toward the Simanjiro Plains than were younger respondents), while overall income sufficiency was significantly positively associated with attitude toward the Simanjiro Plains (i.e., the households with sufficient income were more likely to hold positive attitudes than were those with insufficient income) (Table A2, Table 5). The distance from the park boundary significantly influenced the people's attitude, as those who lived close to Tarangire National Park had a negative attitude. Conversely, respondents who had experienced interactions with park staff had a positive attitude toward the park, and those respondents who did not perceive ecotourism benefits from the park had a negative attitude toward it (Table 6). None of the other ten independent variables exhibited a significant relationship to people's attitudes toward protected areas. A better understanding of how these variables shape people's attitudes toward protected areas in the future would be useful, and such a study would benefit from a larger sample.

DISCUSSION

Perceptions of Park-related Costs and Benefits

This study aimed to analyze the perceived costs and benefits along with attitudes of communities living adjacent to protected areas of Tarangire National Park and surrounding ecosystems to point toward potential implications for conservation. The overall findings showed that the majority of respondents held positive attitudes toward the park, while some held negative attitudes toward the park or the park rangers. These findings are in line with those reported by Abukari and Mwalyosi (2018). In addition, the findings showed that respondents who perceived ecotourism benefits from the park were more likely to have positive attitudes toward the park than did those who did not perceive ecotourism benefits, but the significance of this association will need to be further explored. Previous studies found that positive attitudes toward protected areas are associated with the receipt of ecotourism benefits (Allendorf et al. 2006; Kideghesho et al. 2007; Mfunda et al. 2012).

The present findings are also in agreement with the social exchange theory framework developed by Homans (1961) where people weigh the potential benefits and costs of social relationships and act in accordance with this calculation. In the context of protected areas, an individual's attitudes toward protected areas conservation and the subsequent level of support for it will be influenced by his or her evaluation of resulting benefits and costs. In other words, if the benefits of living near protected areas are higher compared to the costs, community support for con-

TABLE 6. A binary logistic regression of attitude toward the park as a dependent variable (yes/no) and interaction with park staff, perceived benefits from the park, distance from the park boundary as independent variables ($n = 30$).

			95% Wald confidence interval		Statistical tests	
Independent variables	**β**	**SE**	**Lower**	**Upper**	**Wald chi-square**	***p*-value**
(Intercept)	1.431	1.2224	-0.965	3.827	1.370	0.242
[interaction parkstaff=1] yes	3.513	1.5650	0.445	6.580	5.038	0.025
[interaction parkstaff=2] no	0[a]	.	.	.	.	.
[Benefit=0] no	-3.513	1.5650	-6.580	-0.445	5.038	0.025
[Benefit=1] yes	0[a]	.	.	.	.	.
[Distance = 1] close	-3.770	1.5010	-6.712	-0.828	6.309	0.012
[Distance = 2] far	0[a]	.	.	.	.	.
(Scale)	1[b]					

Note. "a" Set to zero because this parameter is redundant

servation may increase, and pro-conservation behaviors may occur and vice versa. In this study, the park-adjacent communities have an overall positive attitude toward the park related to the perceived ecotourism benefit entity, which is likely to increase support for conservation and elicit pro-conservation behaviors. However, it is worth noting that attitudes do not always predict positive conservation behaviors—as reported by Infield and Namara (2001).

Despite the reported benefits from the park, the findings also revealed the costs of its presence—such as restricted access to in-park resources (particularly pastures for livestock), clashes with park rangers, declining ujirani mwema program, crop-raiding, and livestock depredation by wildlife. These findings are consistent with those of Baird et al. (2009), Davis (2011) and Sachedina (2008), who found that local people view the park as a source of risk in their lives and thus engender negative perceptions toward conservation. The park costs for these local communities are also related to the direct consequences of physical eviction, such as the loss of agricultural land and properties when the park was established in 1970 (Igoe and Brockington 1999; McCabe 2003; McCabe et al. 2010). Previous studies elsewhere indicate that restrictions imposed on access to natural resources (Andrade and Rhodes 2012; Kideghesho et al. 2007), human-wildlife conflicts (Dickman 2008; Mkonyi et al. 2017a; Nyahongo 2007), lack of tangible benefits from the nearby park (Kideghesho et al. 2007), and harassment by park rangers (Dickman 2008; Infield and Namara 2001) usually engender negative attitudes and behavior of people living around protected areas.

Perceptions of Simanjiro Plains Costs and Benefits

This study showed that the reported negative attitudes toward the Simanjiro Plains were slightly higher than toward Tarangire National Park. For example, a higher percentage of respondents had negative rather than positive attitudes toward Simanjiro Plains. This could be due to higher incidences of livestock depredation by large carnivores (Mkonyi et al. 2017a) and crop-raiding by elephants (Meingataki 2005) reported in this area. Around 80 percent of all wildlife habitats in Tarangire National Park are on village lands, where wildlife lives alongside domestic livestock and people (Morrison et al. 2016). This might increase local people's exposure to wildlife-related risks and engender negative attitudes toward wildlife (Newmark et al. 1993). Although the Simanjiro Plains provide suitable land for agriculture and pastoral grazing during the wet season, they are still under pressure from expanding human population, agricultural expansion, and settlements, which all increasingly exclude wildlife and livestock (Msoffe et al. 2011).

Perceptions of Park-related Effects on People's Lives

The present study showed mixed perceptions on the impact of the park on local livelihoods since the majority of respondents perceived the benefits more at the community level than at the individual level, and yet others failed to perceive any benefits of the park. This finding is inconsistent with previous findings that local people do not perceive there to be benefits associated with living near Tarangire National Park (Davis 2011). For instance, Davis (2011) found that inability to access critical resources such as water and pasture inside the park along with fear of park expansion into village land cancelled out other purported communal benefits such as infrastructure development.

Contrary to the findings of this study, Songorwa (2004) showed that communities dislike communal benefits of tourism and enjoy these benefits more at individual and household levels, possibly because most wildlife-induced costs are felt at the household level rather than by the entire community. However, Sachedina (2006) found that the benefits from the park are rarely perceived at the individual household level. This disparity may be partly explained by the level of local community involvement and participation in conservation planning, decision-making and management of protected areas.

Although previous studies have shown that the Community Conservation Services program has achieved considerable success in improving the socio-economics of communities adjacent to the park (Infield and Namara 2001), this study showed that the Tarangire's Community Conservation Services program does not provide adequate services to local communities. This implies a limited social capital which is critical in conservation projects that are successfully working with local communities, and so a bottleneck for sustainable rural development (Goldman 2003; Hunt et al. 2015). Uncertainties in the amount of funds each village receives and the limited ability of Tanzania National Parks in terms of

funds and communal benefits given at the village level might be the reasons weakening the success of this program (Newmark and Hough 2000; Sekhar 2003).

Despite the reported desire to kill large carnivores by some respondents at different points in time, the majority of people were ready to support large carnivore conservation. Taken together, these mixed perceptions on large carnivores have important implications for carnivore conservation because carnivore populations have recently been declining worldwide (Ripple et al. 2014). Negative attitudes toward wildlife often encourage people to kill wild animals (Bagchi and Mishra 2006; Williams et al. 2002), and this mostly affects people who lack alternative livelihoods or those who are not dependent on protected area resources (Xu et al. 2006). However, the previous findings from this study area showed that the majority of respondents were against retaliatory or preventative carnivore killing as a way to reduce livestock depredation (Mkonyi et al. 2017c). Also, the majority of respondents claimed the problem of livestock depredation to be decreasing over the last two years. This may be due to the reported decline of large carnivore populations in this area and the current use of the fortified bomas (i.e., livestock enclosures reinforced with chain-link fences) (Lichtenfeld et al. 2014; Mkonyi et al. 2017a, b). For example, there is considerable evidence showing that fortification of bomas is associated with a reduction of livestock depredation by 90 percent (Lichtenfeld et al. 2014).

Perceptions of Park Staff-community Relationship and Interactions

Despite the costs of living in proximity to the park, there was no evidence of marked antagonism toward park authorities—with the majority of respondents viewing the park staff more favorably, which may contribute toward improved conservation and increased tolerance. This finding is in line with other studies that found good relations with park staff to influence community attitudes (Fiallo and Jacobson 1995; Newmark et al. 1993). This study also showed that respondents who had experienced interactions with park staff were more likely to express positive attitudes toward the park than were those who had not experienced any interactions with park staff. This is in agreement with the findings of Mutanga et al. (2017) who reported that respondents with good interaction with park staff were more likely to hold positive attitudes toward protected areas.

In this study, the modes of interactions between the local communities and the park staff were mainly positive, such as when village authorities and community members interact with park officials during village general meetings, seminars, and study tours or when community members encounter park rangers in the village. In this context, different mechanisms of interactions could serve as a platform for the exchange of information where the interests, goals, and responsibilities of each actor are sincerely shared and discussed. Hough (1988) found that personal contact is effective for effective communication and for building trust between local people and park staff.

The findings further revealed that the resentment of local communities toward park staff was mainly due to conflict between park rangers and the community because of illegal grazing in the park which often leads to beating, arrest, and prosecution. This park-community conflict is unlikely to engender local communities' pro-conservation behaviors. Illegal grazing in protected areas commonly occurs when local communities or individuals experience a shortage of pasture and water sources in village lands, especially during dry seasons (Kideghesho and Msuya 2012). The present findings concur with previous studies conducted in Mikumi National Park in Tanzania (Vedeld et al. 2012), and in four protected areas in Ethiopia (Tessema et al. 2010), which reported that communities that were denied access to protected area resources like grazing lands were more likely to have negative attitudes toward protected areas. In western Serengeti, Tanzania Kideghesho et al. (2007) also found that inadequate access to pasture and harassment by park rangers generate negative attitudes for local people toward protected areas.

According to Allendorf et al. (2006), protected area staff punish the illegal actions of resource users in terms of legislation resulting in negative relationships between the protected area and the local community. Furthermore, it is well established that compensation for wildlife damage (Nyhus et al. 2005; Ogra and Badola 2008) along with benefit-sharing mechanisms (Molina-Murillo et al. 2016; Mutanga et al. 2015; 2017) can promote positive community-protected area staff relationships. Unfortunately, this study used only the community's viewpoints without a focus on

park staff perceptions. Thus, future studies should analyze the park staff perceptions and establish the determinants of park staff-community relationships from both park staff and local communities' viewpoints in order to capture differences in the perceptions of park staff and communities. Furthermore, future research focusing on the perceptions of protected areas by tourists, community-based organizations, conservationists, policy-makers, research institutions and international conservation organizations would be a useful avenue of investigation.

Factors Influencing Community Attitudes toward Simanjiro Plains and Tarangire National Park

This study revealed that the age of the respondents had a significant negative influence on people's attitudes toward protected areas (i.e., Simanjiro Plains). This finding concurs with those of previous studies done in Machalilla National Park, Ecuador by Fiallo and Jacobson (1995) and in Abijata-Shalla Lakes National Park, Ethiopia by Kumssa and Bekele (2014). They both found that younger respondents were more likely to feel positively toward protected areas than older respondents. The findings from this study suggest that older respondents are more likely to have less education, more livestock and are more affected by the wildlife damages and restriction in their use associated with the establishment of the protected areas than are younger respondents. This negative relationship between older respondents and protected areas is probably a reflection of the long exposure to wildlife-related risks, long restricted access to resource use, lower level of education, and ownership of more livestock than are owned by younger people (Fiallo and Jacobson 1995; Shibia 2010).

This study further revealed that respondents with sufficient income (as a proxy of wealth) were more likely to have positive attitudes toward Simanjiro Plains than were those with insufficient income (poor), possibly because those with more wealth have more diversified sources of income and larger assets (livestock and access to hired labor). The richer households relied on employment, livestock sale, crop sales, tourism and mining-related activities as their main sources of income, while poor households relied more heavily on crops than on livestock as the sole source of revenue. The richer households may be unlikely to be severely affected by wildlife-related costs such as human-wildlife conflicts and restricted access to natural resources (access for fuelwood and livestock grazing). This positive relationship between wealthier communities and protected areas confirms previous findings that show that wealthier households tend to be supportive of protected areas because they are not directly dependent on natural resources for survival (Kideghesho et al. 2007; Thondhlana and Cundill 2017; Snyman 2014). The findings are also in agreement with Cavendish (2000), who indicated that poor households within rural communities obtain a larger share of their total income from natural resources more than do well-off rural households and that poor households are likely to be adversely affected by restrictions on access to natural resources. Furthermore, individuals from poor households are associated with negative attitudes toward protected areas (Dolisca et al. 2006; Ferreira and Freire 2009), and these poorer individuals perceive more wildlife-induced costs such as crop damages, livestock losses and reduced access to natural resources (Spiteri and Nepal 2006; Shibia 2010).

Respondents who lived closer to the park boundary had more negative attitudes toward the park, which is consistent with previous studies (Abukari and Mwalyosi 2018; Spiteri and Nepal 2006). Generally, respondents living closer to the park boundary are expected to have more negative attitudes as they are more likely to experience conflicts with wildlife over livestock (Dickman 2008; Holmern et al. 2007; Kissui 2008), crops (Naughton-Treves and Treves 2005), or human safety (Packer et al. 2005) than are those living farther away (Mwakatobe et al. 2013).

Although several previous studies have reported strong associations of education (Kideghesho et al. 2007; Xu et al. 2006), landholding (Allendorf 2007; Infield and Namara 2001), household size (Abukari and Mwalyosi 2018; Allendorf et al. 2006), gender (Allendorf and Yang 2015; Mehta and Heinen 2001; Xu et al. 2006), residency status (Holmes 2003), occupation (Khatun et al. 2012), livestock holding (Mir et al. 2015), protected area staff-community relation (Mutanga et al. 2015), the community relation (Mutanga et al. 2015), experience of conflict with the park (Mir et al. 2015) to attitudes toward protected areas, this was not the case in the present study. This could be due to the relatively small sample size of this study and/or the sampling procedure differences.

CONCLUSION AND MANAGEMENT IMPLICATIONS

This study has provided valuable insights into the local communities' perceptions of the benefits and costs plus attitudes of living adjacent to Tarangire National Park in northern Tanzania. These insights can serve as a basis for designing interventions aimed at improving the positive relationship between protected areas and adjacent communities and balancing costs and benefits from living around protected areas. Although this study was conducted in villages adjacent to Tarangire National Park in the northern region of Tanzania, the present findings have relevance beyond the surveyed villages.

Generally, local people showed mixed perceptions on the impact of the park on their livelihoods, with benefits from the park being perceived at the community level than at the household level. The results showed that the majority of respondents generally held overall positive attitudes toward the park, which may be attributed to the perceptions of ecotourism benefits from the park. In this context, the tourism revenue-sharing program is critical in gaining local support for conservation efforts since it builds trust and improves relationships with protected area officials (Tessema et al. 2010; Mutanga et al. 2016). However, the benefits should be sufficient to offset the costs of living near protected areas and should be equitably distributed and shared with park-adjacent communities (Bookbinder et al. 1998; Groom and Harris 2008), as unequal distribution of protected area benefits might further negatively affect people's attitudes (Songorwa 1999). As per the requirement of the Community Conservation Services program, 30 percent of total annual ecotourism income from Tarangire National Park should be shared equitably with park-adjacent communities to support the community development projects, because it is perceived that park-adjacent communities do not get an equitable share of ecotourism revenue from the parks (Abukari and Mwalyosi 2018; Baird 2014).

The findings in this study have five policy implications. First, the management actions should endeavor to improve the positive perceptions and attitudes of older respondents and those living closer to the park through conservation awareness education. Second, there is also a need for improving overall income sufficiency through diversifying livelihood activities as noted by Baird and Leslie (2013) and McCabe et al. (2010). Third, the management actions should enhance equitable distribution of ecotourism benefits and enhance positive park staff-community interactions either through awareness creation meetings with community leaders or villagers. Fourth, people-park staff relationships should be improved by strengthening the ujirani mwema program, revitalizing local community participation in park management and decision making, raising awareness through conservation education programs, providing training for park staff, creating park-related job opportunities and perhaps compensation for crop damage and livestock losses. Also, the implementation of environmental education programs and extending ecotourism benefits to local people have the potential to motivate them to foster positive attitudes toward protected areas and consequently adopt pro-conservation behaviors.

Fifth, given that crop damage and livestock depredation by wildlife were the main reasons for people to hold negative attitudes toward protected areas in this study, conflict mitigation efforts should focus on reducing the costs imposed by wildlife through depredation and crop damage. The construction of fortified bomas, along with improving herding practices, improving formal and conservation awareness education (Mkonyi et al. 2017a) should be used in the management of human-carnivore conflict. Correspondingly, guarding with spears and arrows, noise-making and fencing farms (Hill 2000), beehive fences, and chilli pepper methods should be used to deter crop-raiding wild animals (Fungo 2011). However, effective human-wildlife conflict mitigation interventions should focus not only on improving the cost-benefit ratio of wild animal presence but also on reducing tensions over land use and resource access (Dickman 2008).

This study was constrained by a small sample size, which might obscure a relationship between the explanatory variables and attitudes. A large sample size might have revealed more variation and provided better predictions of perceptions and attitudes. Further studies would benefit from a larger sample with variables influencing people's attitudes and perceptions toward protected areas. Further research should also seek to supplement the in-depth interview methods with other robust ethnographic methodologies such

as seasonality calendars, network analysis across stakeholders, and focus groups with different villagers about perceptions across key concepts. The overall results from this study have profound implications for conservation, especially in garnering long-term community support in protected areas management. The study recommends that interventions aimed at improving positive attitudes toward protected areas should focus on an equitable ecotourism revenue-sharing with adjacent communities, positive interactions with park staff, and overall household income sufficiency to win the support of local communities and, thus, ensure effective conservation of the protected areas.

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APPENDIX

TABLE A1. Summary of questions asked of local people living adjacent to Tarangire National Park and their responses related to perceptions and attitudes toward Simanjiro Plains and Tarangire National Park, Tanzania ($N = 30$).

Categories/Questions	Yes	No	Unknown
Attitudes toward the Simanjiro Plains			
Do you like living in the Simanjiro Plains?	46.7	53.3	
Perceptions toward large carnivores			
Are you ready to support carnivore conservation even if your family member or livestock is killed?	63.3	36.7	
Large carnivore depredation on livestock and attacks on humans			
Do you think that livestock depredation incidence has decreased over the last two years?	83.3	16.7	
Have you experienced any livestock losses from large carnivores over the last two years?	86.7	13.3	
Have you experienced someone killed by carnivores over the last two years?	3.3	0.0	
Response to large carnivore attacks to livestock and human			
Do you think that killing wild animals in retaliation for livestock loss should be allowed?	66.7	33.3	
Do you think that killing wild animals in retaliation for human loss should be allowed?	76.7	23.3	
Do you get any compensation from crop damage or livestock loss caused by wildlife?	0.0	100.0	
Do you think compensation will offset the costs of livestock losses, and increase local tolerance of large carnivores?	86.9	13.1	
Perceptions of costs and benefits of wild animals' presence			
Do you think wild animals have positive effects in your community?	83.3	16.7	
Do you think wild animals have negative effects in your community?	93.3	6.7	
Do you think that your community benefits from wild animals' presence?	66.7	33.3	
Perceptions of costs and benefits of large carnivore species' presence			
Does the presence of large carnivores bring you benefits?	50.0	50.0	
Does the presence of large carnivores bring you losses?	96.7	3.3	
Attitudes toward the Tarangire National Park			
Do you like the presence of the Tarangire National Park?	56.7	43.3	0.0
Awareness of the park's existence			
Do you know the purpose of government to establish the park?	96.7	0.0	3.3
Perceptions of park-related benefits			
Does the park provide social amenities for people in your community?	56.7	36.7	6.7
Do you think the park creates employment opportunities for local people?	6.7	93.3	0.0
Does the presence of the park bring economic benefits (through revenue from ecotourism) to people in your community?	63.3	36.7	0.0
Does the park provide conservation education for local children?	36.7	63.3	0.0
Does the park provide protection for wild animals?	63.3	36.7	0.0
Perceptions of park-related effects on people's lives			
Do you think the presence of park has positively improved the lives of people in your community?	60.0	33.3	6.7
Perceptions of park-related costs			
Does the presence of the park bring you losses through wildlife depredation and crop damage?	30.0	70.0	0.0
Does the park bring you losses through restricted access to grazing?	10.0	90.0	0.0
Do you think the park should allow people to graze livestock in the park?	40.0	60.0	0.0
Have you experienced any clashes between the park rangers and the people in your community?	13.3	86.7	0.0
Perceptions of park staff-community relationship and interaction			
Do you think your personal relationship with park staff is cordial?	63.3	36.7	0.0
Have you personally contacted/interacted with park staff?	63.3	33.3	3.3
Do you think the park staff are friendly to people in your community?	63.3	36.7	0.0

TABLE A2. ***A priori*** **candidate models for variables explaining local people's attitudes towards Simanjiro Plains in Tanzania.**

Model	K	logLik	AICc	ΔAICc	ωi
overall income.sufficiency+age	3	-15.14	37.19	0.00	0.3850
overall income.sufficiency+age+length.residence	4	-14.91	39.42	2.23	0.1262
overall income.sufficiency+household.size	3	-16.42	39.77	2.58	0.1060
age	2	-17.72	39.89	2.70	0.0998
overall income.sufficiency	2	-18.06	40.56	3.37	0.0714
age+residency.time	3	-17.62	42.17	4.98	0.0319
age+household.size	3	-17.67	42.27	5.08	0.0304
age+landholding	3	-17.69	42.30	5.11	0.0299
age+experienced.livedepr	3	-17.71	42.35	5.16	0.0292
age+education	3	-17.72	42.37	5.18	0.0289
residency.time	2	-19.75	43.95	6.76	0.0131
TLU	2	-19.90	44.24	7.05	0.0113
household.size	2	-20.10	44.65	7.46	0.0092
landholding	2	-20.15	44.74	7.55	0.0088
education+age+residency.time	4	-17.62	44.84	7.65	0.0084
distance+household.size	3	-19.40	45.72	8.53	0.0054
education	2	-20.72	45.88	8.69	0.0050

K is number of parameters in model plus 1 for intercept and error term; logLik is log-likelihood; ΔAICc is difference in AICc (model score) value, model with ΔAICc value of 0 has most support; *wi* = Akaike model weights. Only models with ΔAICc < 10 are reported. *age* = age of the respondent in years; *distance* = distance from respondent's households to the park boundary (km); *education* = education level achieved; *household.size* = household size expressed in adult equivalent units (AEU); *landholding* = land size owned by the respondents. *length.residence* = number of years since the respondent had arrived in the area; *experienced.livedepr* = experience of livestock depredation; *overall income.sufficiency* = overall household income sufficiency; *TLU* = number of livestock owned expressed in tropical livestock units.