ORIGINAL PAPER

Factors influencing conservation attitudes of local people in Western Serengeti, Tanzania

**Jafari R. Kideghesho · Eivin Røskaft
Bjørn P. Kaltenborn**

Abstract   Attitudinal studies are increasingly being adopted as tools for evaluating public understanding, acceptance and the impact of conservation interventions. The findings of these studies have been useful in guiding the policy interventions. Many factors affect conservation attitudes positively or negatively. The factors inspiring positive attitudes are likely to enhance the conservation objectives while those inducing negative attitudes may detrimentally undermine these objectives. The magnitude of the resultant effects of each particular factor is determined by the historical, political, ecological, socio-cultural and economic conditions and this may call for different management interventions. In this study we examined how conservation attitudes in western Serengeti are shaped by the following factors: level of conflicts with protected areas; wildlife imposed constraints (inadequate pasture, water, diseases, loss of livestock during migration, theft and depredation); participation in the community based project; and socio-demographic factors (age, education level, wealth, immigration, gender and household size). The results indicated that the level of conflicts, participation in the community based project, inadequate pasture, lack of water, diseases, wealth and education were important in shaping peoples' attitudes. However, in a stepwise linear regression analysis, 59% of the variation in peoples' attitudes was explained by three variables i.e., conflict level with protected areas, lack of water and participation in the community based project. In addition to these variables, level of education also contributed in explaining 51% of the variation in people's attitude regarding the status of the game reserves. Five variables (lack of water, level of education, inadequate pasture, participation in the

J. R. Kideghesho (✉)
Department of Wildlife Management, Sokoine University of Agriculture (SUA), 3073,
Chuo Kikuu, Morogoro, Tanzania
e-mail: kideghesho@yahoo.com

E. Røskaft
Norwegian University of Science and Technology (NTNU), Biologisk Institutt,
7491 Trondheim, Norway

B. P. Kaltenborn
Norwegian Institute for Nature Research (NINA), Fakkelgården, Storhove N-2624, Norway

community based project and diseases) explained 12% of the variation in people's attitude towards Serengeti National Park. The paper discusses the implications for conservation of these results and recommends some measures to realise effective conservation of wildlife resources.

Keywords Attitudes · Benefits · Conflicts · Conservation · Protected areas · Socio-demographic variables · Tanzania · Western Serengeti

Introduction

Over the past two decades the importance of understanding local communities' attitudes, needs and aspirations has received increasing attention among researchers, donors, conservation agencies and protected area authorities. This importance commensurates with the paradigm shift where the local communities are recognised as the key focus for success of the conservation agenda (Baldus et al. 2003; Barrows and Fabricius 2002; Hackel 1999; Western 2001). Attitudinal studies are being widely used in evaluating public understanding, acceptance and the impact of conservation interventions, as well as to inform the development of new management strategies (see e.g., Gillingham and Lee 1999; Holmes 2003; Infield 1988; Kalternborn and Bjerke 2002; Kalternborn et al. 1999; McClanahan et al. 2005; Parry and Campbell 1992; Songorwa 1999; Røskaft et al. in press).

A growing research-based literature indicates that support to conservation is often compromised in situations where people's interests and livelihoods are threatened. Kalternborn et al. (1999) and Røskaft et al. (in press) reported antagonistic attitudes toward large carnivores in Norway among the sheep farmers in areas with a high degree of depredation. In Wisconsin, USA, individuals reporting losses to wolves (*Canis lupus*) and other predators were more likely to favour extermination of the predator population (Naughton-Treves, et al. 2003). In Tanzania, grievances with the park or park officials inspired people's desire to see the parks degazetted(Newmark et al. 1993). Gillingham and Lee (1999) observed that villagers around Selous Game Reserve were ready to support conservation so long it did not threaten their interests and livelihoods. In the same areas, strong opposition against the conservation programme was reported due to increased crop damage and associated opportunity costs (Songorwa 1999). In Kenya's Laikipia District, peasants perceived many aspects of wildlife conservation negatively due to costs inflicted by crop raiders and dangerous wild animals (Gadd 2005). In Mozambique, farmers who lost crops to elephants (*Loxodonta africana*) were more negative to Maputo Elephant Reserve than non-victims (De Boer and Baquete 1993). In Uganda, the families which were allowed to resettle in the Lake Mburo National Park in 1986 after eviction in 1983 opted for slaughtering of wildlife in an attempt to eliminate the area's conservation value and, therefore, preclude the possibility of being re-evicted (Hulme 1997).

As a way of reducing opposition and ensuring local support to conservation, the benefit-based approaches are being widely adopted. The approaches are based on the premise that tangible benefits from conservation are vital motivational factors for local people to change their attitudes, support conservation efforts, and align their behaviours with conservation goals (Archabald and Naughton-Treves 2001; Gadd 2005; Gillingham and Lee 1999; Holmes 2003; Lewis et al. 1990). The

impacts of benefits in changing attitudes and engendering local support may be enhanced by regular contacts between the wildlife staff and local communities (Holmes 2003; Hulme 1997). However, the desired effects of benefit-based approaches have often been temporary or rare. The reasons behind this observation are: inadequate benefits (compared to costs of conservation); inequitable distribution; undelivered promises and unrealised expectations (Gadd 2005; Songorwa 1999); and lack of, or limited participation of communities in decision-making for resource management (Parry and Campbell 1992; Songorwa 1999). Other reasons include problematic, untested and unjustified assumptions; failure to honour communities' priorities (Songorwa 1999); inadequate political commitment (Songorwa 2004b); inadequate socio-economic data for effective design (Wells and Brandon 1992); and obscure critical linkage between development and conservation (Barrett and Arcese 1995; Newmark and Hough 2000; Songorwa et al. 2000; Wells and Brandon 1992).

In addition to conservation costs and benefits, socio-demographic factors are also important predictors of conservation attitudes. Those commonly found in the literature include wealth, ethnicity, gender, education, size of household, occupation and age (Infield 1988; Kalternborn et al. 1999; McClanahan et al. 2005; Røskaft et al. 2004, in press).

Framing the issue

In developing countries, pressures on natural resources are growing in line with increasing human populations (Hackel 1999; Kideghesho et al. 2005b; Madulu 2004; Songorwa 2004a). Creation of protected areas is increasingly being adopted as the most feasible strategy in mitigating the undesirable effects generated by these pressures. The last two decades have seen a significant growth of protected areas. The World Data Base on Protected Areas indicates that some 20 million km^2 or 12.7% of the earth's land surface is occupied by 104,791 protected areas (Chape et al. 2005). This is a dramatic increase compared to 1980 where the PAs network covered only 3% of the earth's surface (Brockington 2004). Most of these protected areas are situated in developing countries, where the focus for further expansion is placed due to their high level of biodiversity (Chape et al. 2005; Naughton-Treves et al. 2005).

The salient feature shared by many African protected areas is historical poor public relations and, therefore, minimal support from local communities. This problem is attributed to marginalisation of local people by conservation policies and legislation. Forceful eviction of the natives from the protected areas and criminalisation of their practices perpetrated on grounds of safeguarding the ecological integrity (Bonner 1993) had fomented hatred and local resentment toward conservation policies (IIED 1994; Machlis 1989; Neumann 1992; Wells and Brandon 1992; Western 1984). In addition to opportunity costs of land and related resources, local communities also bear other disproportionate costs through crop damage, livestock depredation and wildlife-related accidents (See e.g., Archabald and Naughton-Treves 2001; De Boer and Baquete 1993).

The above challenges have prompted a consensus that the ecological reasons alone are insufficient in ensuring the survival of protected areas (Baldus et al. 2003; Barrows and Fabricius 2002; Hackel 1999; Western 2001). Indeed, public acceptance is critical to the success of conservation objectives, as Stankey and Shindler (2006:29)

put it, "conservation policies and practices are inherently social phenomena, as are the intended and unintended changes in human behaviour they induce". This recognition has inspired adoption of different human-inclusive strategies guided by the philosophy that if conservation is to prosper, it should not be pursued against the interests of the communities. The growing urgency for conservation of biodiversity at the face of human population increase and increasing levels of consumption poses two important challenges: (1) the feasibility of creating more protected areas and at the same time changing the attitude of the already antagonistic local people, and (2) evaluating the adequacy of the current conservation strategies and their sustainability in maintaining the desired conservation attitudes and behaviours.

Following adoption of community conservation as a complementary (or an alternative) conservation strategy to fences and fines, protected area authorities and donor agencies often claim success over this strategy. However, such claims are seldom supported by empirical data. In some cases hostility and non-compliance to protected area regulations are apparent, but the factors responsible are inadequately addressed. The tendency has often been to blame local people for being ignorant and arrogant (Kideghesho et al. 2005a) and, consequently, stringent law enforcement measures have often taken precedence in suppressing local opposition to conservation efforts. Effective management of the protected areas requires rigorous assessment of the perceptions and factors behind these perceptions (McClanahan et al. 2005). In this study, we sought to undertake such an assessment with a view to contributing to a scientific basis for management of the Serengeti ecosystem. In particular, we tested the following hypotheses:

1. Local communities experiencing more costs from wildlife conservation are less likely to support protected areas.
2. Local communities who receive more benefits from conservation initiatives will be more positive to protected areas.
3. Conservation attitudes will be more positive to Serengeti National Park than to the adjacent Game Reserves.

We also tested attitude with respect to socio-demographic factors viz. gender, education, residence status, household size and wealth.

Methodology

Study area

The study was conducted in six villages of three administrative districts of Serengeti, Bunda and Magu around the Western Corridor of Serengeti. The corridor serves as a buffer zone for the worldwide renowned Serengeti National Park, spanning an area of 14,763 km^2. The park, gazetted in 1951, is both a Biosphere Reserve and World Heritage Site since 1981 (UNESCO 2003). The park is buffered from human impact by four Game Reserves in the Western part viz. Maswa (2,200 km^2), Ikorongo (1,867 km^2), Grumeti (1,900 km^2) and Kijereshi (65.7 km^2) (Figure 1). The last three GRs attained their current status in 1994 after being upgraded from Game Controlled Areas.
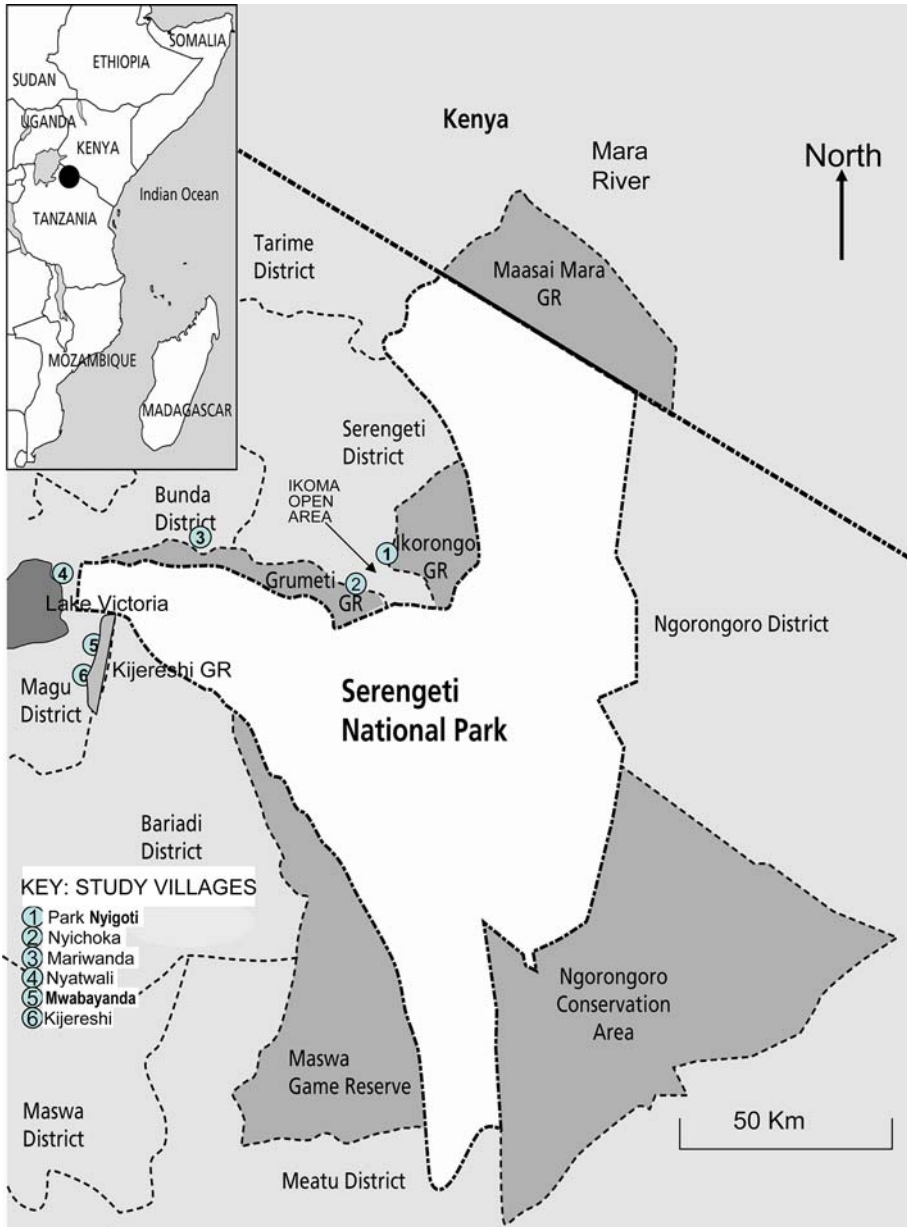
Fig. 1 Serengeti National Park, study villages and adjacent projected areas

The latter three Game Reserves play vital ecological roles. Besides serving as buffer zones for Serengeti National Park, they are also critical migratory corridors for ungulates migrating between the Tanzania's Serengeti National Park and Kenya's Maasai Mara National Reserve. The migration involving some 1.4 million wildebeest (*Connochaetes taurinus*), 0.2 million zebra (*Equus burchelli*) and

0.7 million Thompson's gazelle (*Gazella thompsoni*) (Norton-Griffiths 1995), is one of the best known biological phenomena in the world. The area also provides habitats and dispersal areas for resident herbivores such as giraffe (*Giraffa camelopardalis*), Grant's gazelle (*Gazella grantii*), elephants (*Loxodonta africana*) and hippo (*Hippopotamus amphibius*). Serengeti is also a home for over 500 bird species including ostrich (*Struthio camelus*) -the biggest bird in the world (Sinclair 1995).

Western Serengeti is composed of multi-ethnic groups numbering to over 20. The dominant groups are Ikoma, Isenye, Kurya, Sukuma, Zanaki, Jita, Ikizu, Ngoreme, Taturu and Luo. The current population, estimated at two million (URT 2002), pursue cultivation and livestock keeping as its main livelihood strategies. However, illegal hunting is also pursued to supplement the latter strategies, as they barely sustain the household budgets. The average annual income ranges from US $ 150–200 (Johannesen 2003), far less than Tanzania's average per capita income of US $ 280 (WB 2003).

The economic options pursued by local communities in order to cope with poverty situation along with rapid population growth and resultant high levels of consumption—threatened the ecological integrity and survival of Serengeti National Park (Kideghesho et al. 2005a, b). Intervention from the government and its conservation agencies in order to mitigate these threats became inevitable. This intervention involved upgrading of the previously Game Controlled Areas to Game Reserves in 1994. The prohibitive and restrictive nature of the latter category has made this intervention costly to local people by curtailing their access to livelihood strategies. As a result, the Western Serengeti has become a centre of conflicts between the local people and conservation authorities. The conflicts have become more apparent since 2000 following effective enforcement of law which culminated in forceful eviction of the local people. In Tanzania's wildlife protected areas system, the National Parks is the highest management category and, therefore, the most prohibitive and restrictive in terms of access to resources by local communities. The legal uses in this category are limited to non-consumptive utilisation form only (e.g., game viewing, research and photographic tourism). In addition to uses permitted in the national parks, the Tanzania Wildlife Conservation Act No. 12 permits licensed hunting in the Game Reserves but prohibits illegal entry, cultivation and livestock grazing. These uses are permitted in the Game Controlled Areas, thus making them the least and the weakest management category (URT 1974).

Data collection

The questionnaire survey involved respondents from a randomly selected sample of 282 households drawn from the village registers. For the purpose of this study, household was defined as a group of one or more persons living together under the same roof or several roofs within the same dwelling and eating from the same pot or making common provision for food and other living arrangements. The villages covered were Park Nyigoti (*n* = 45) and Nyichoka (*n* = 44) in Serengeti District, Mariwanda (*n* = 45) and Nyatwali (*n* = 48) in Bunda District and Kijereshi (*n* = 50) and Mwabayanda (*n* = 50) in Magu District. The household heads were targeted as the respondents. In case of absence their wives or another permanently resident-adults (> 18 years) in the households took part in the interview. Over 80% of the households were male-headed. This resulted in gender imbalance composed of 65%

males and 35% females. The date for interview was communicated to each selected household in 1–2 days before. Cultural reasons hindered the desire of achieving gender-balance by interviewing women in presence of husbands. A few people (< 5%) who declined to participate in the interview on grounds of problems such as sickness were replaced by their neighbours. The purpose of the interview was explained as seeking to know how people interact with wildlife and protected areas. All interviews were conducted in Swahili and carried out by the first author who had been conducting research on the villages on wildlife conservation and land use aspects for about 2 years. Therefore he had won confidence of the villagers as a result of this prior interaction.

The information solicited included respondents' socio-demographic variables (gender, age, level of education i.e., uneducated, adult, primary or secondary; the household size i.e., number of people living in the household, type of residence i.e., born or migrated from other places); economic activities; the costs and benefits generated by protected areas; and their attitudes towards the protected areas. As a measure of attitudes three questions were posed: (1) ''How do you rate your relationship with the protected area close to your village'' (good, fair or poor)? (2) ''Which idea would you support regarding the status of a game reserve'' (degazette, reduce its size, and retain it as it is or expand it)? (3) ''Which idea would you support regarding the status of Serengeti National Park'' (as in 2)?

The attitude concept, when properly defined, has three components: one dealing with behaviour—or rather the intentions to carry out a specific behaviour (such as supporting or resisting an action); a cognitive or knowledge component; and an affective component dealing with normative beliefs and emotions. In our case, we were seeking information about two elements: how do people feel (affective) about the protected areas; and to what extent will they support management actions regulating the protected areas (behavioural intentions).

The study villages were categorised into two groups: those participating in the community based project (Serengeti Regional Conservation Project—hereafter called SRCP villages: Nyichoka and Mariwanda); and those not participating (Non-SRCP villages: Park Nyigoti, Nyatwali, Mwabayanda and Kijereshi). SRCP is a community based conservation project started in 1988 with the goal of reconciling human development needs with conservation goals. The project, funded by the Tanzania government in collaboration with the Norwegian Agency for International Development (NORAD), aimed at providing tangible benefits to local people through community hunting. The project was operating in 14 pilot villages located in Serengeti and Bunda districts. Like similar conservation projects, SRCP sought to motivate local people to align their behaviours with conservation goals. Further categorisation of the villages was based on the level of conflicts villages experienced with protected areas—those with serious conflicts (hereafter called CONFLICT villages: Mwabayanda, Kijereshi and Mariwanda) and those with minimal conflicts (NON-CONFLICT villages: Park Nyigoti, Nyichoka and Nyatwali). The levels of conflicts were established during the village meetings, focus group discussions and by using the key informants. The conflict villages were the ones which were directly affected by the recent gazetement of the three Game Reserves (Kijereshi, Ikorongo and Grumeti) through eviction and/or prohibition from access to resources.

Five constraints to livestock production were examined to assess their impact in shaping peoples' attitudes toward the protected areas. These were inadequate pasture, livestock depredation, diseases, restriction over access to water, loss of

livestock during wildebeest migration, and theft. Villagers identified these constraints during the village meetings, which were held with the first author. The respondents to the questionnaire were required to rank them based on how they perceived their effect on livestock husbandry (important and non-important).

Data were analysed by using SPSS (the Statistical Package for the Social Sciences, version 12.0). Because most of the data were non-parametric we based our analyses on non-parametric statistics unless otherwise stated. However, because no multivariate non-parametric test exists, we applied a robust linear regression analysis for this purpose. Independent variables in the stepwise regression analysis were coded as follows: conflict with protected areas (serious = 1; minimal = 2); participation in SRCP (Yes = 1; No = 2); level of education (no = 1; adult education = 2; primary = 3; secondary = 4); gender (male = 1; female = 2); wealth (number of livestock) and age (number of years). Each of the four constraints to livestock keeping viz. lack of water, inadequate pasture, livestock depredation and diseases, were coded as (important = 1; non-important = 2).

Results

The effects of conflicts level and participation in SRCP on people's relationship with the protected areas

There was a positive correlation between the two attitudes (1) "relationship to Game Reserves" and (2) "the idea regarding the status of the Game Reserves" (r_{sp} = 0.642, N = 282, P < 0.001). Both these attitudes, on the other hand, were not correlated with the attitude of (3) "How people regarded the status of Serengeti National Park" (r_{sp} = 0.024, N = 282, P = 0.694 and r_{sp} = 0.014, N = 282, P = 0.809, respectively).

The majority of the respondents (N = 282) rated the relationship with protected areas as poor while a minority rated it as good or fair. The villagers with minimal conflicts with protected areas differed significantly from those having serious conflicts in their perception about the relationship with the protected areas (Table 1), those with minimal conflicts being more positive. This finding supports the hypothesis that communities which experience more wildlife induced costs are less likely to support conservation. Again, the majority of the respondents supported the idea of degazetting the Game Reserves compared to those who held the opinion that their size should be reduced or retained as they were. Overall the views of the respondents from villages with serious conflicts differed significantly from those coming from villages with minimal conflicts, those with minimal conflicts being more positive to Game Reserves (Table 1). A significant majority of 86% (n = 282) supported the idea of retaining Serengeti National Park and there was no significant difference between the villagers with serious and those with minimal conflicts in this respect (Table 1). This finding supports the hypothesis that conservation attitudes were more positive to the Serengeti National Park than to the adjacent Game Reserves.

Respondents' relationship with protected areas differed significantly between the SRCP and non-SRCP villagers, those from SRCP being more positive. Although SRCP villagers were slightly more positive to Game Reserves than non-SRCP villagers, the difference was not significant. Likewise, the difference in attitude

Table 1 The impact of conflicts level and participation in Serengeti Regional Conservation Project on attitude about the relationship with protected areas (N = 282, differences tested with χ^2 tests)

Question	Category	Conflict level with protected areas			χ^2	df	P
		Serious	Minimal	Total			
How do you rate the relationship with protected areas	Good	0 (0%)	70 (51.1%)	70(24.8%)	170.5	2	<0.001
	Fair	7 (4.8%)	41 (29.9%)	48 (17.0%)			
	Poor	138 (95.2%)	26 (19.0%)	164 (58.2%)			
Which idea would you support regarding a Game Reserve close to your village	Degazette	110 (75.9%)	22 (16.5%)	132 (47.5%)	115.9	2	<0.001
	Reduce its size	31 (21.4%)	45 (33.8%)	76 (27.3%)			
	Retain it as it is	4 (2.8%)	66 (49.6%)	70 (25.2%)			
Which idea would you support regarding Serengeti National Park	Degazette	2 (1.4%)	0 (0%)	2 (0.7%)	3.72	3	NS
	Reduce its size	15 (10.8%)	19 (14.4%)	34 (12.5%)			
	Retain it as it is	122 (87.8%)	112 (84.8%)	234 (86.3%)			
		Participation in SRCP					
		Yes	No	Total			
How do you rate the relationship with protected areas	Good	22 (24.7%)	48 (24.9%)	70 (24.8%)	64.6	2	<0.001
	Fair	23 (25.8%)	25 (13.0%)	48 (17.0%)			
	Poor	44 (49.4%)	120 (62.2%)	164 (58.2%)			
Which idea would you support regarding a Game Reserve close to your village	Degazette	33 (37.5%)	99 (52.1%)	132 (47.5%)	5.20	2	NS
	Reduce its size	28 (31.8%)	48 (25.3%)	76 (27.3%)			
	Retain it as it is	27 (30.7%)	43 (22.6%)	70 (25.2%)			
Which idea would you support regarding Serengeti National Park	Degazette	0 (0%)	2 (1.1%)	2 (0.7%)	4.51	3	NS
	Reduce its size	15 (18.1%)	19 (10.1%)	34 (12.5%)			
	Retain it as it is	68 (81.9%)	167 (88.8%)	235 (86.7%)			

regarding the status of Serengeti National Park between the SRCP and non-SRCP people was not significant. A majority from both types of villages supported the current status of the park (Table 1).

Constraints to livestock keeping

Of the six constraints facing livestock keeping, four (i.e., depredation, inadequate pasture, diseases and lack of water) appeared to have an influence on how people perceived protected areas. The other two (theft and loss of livestock during wildebeest migration) had no significant influence (Table 2).

Effects of socio-demographic conditions

The only socio-demographic variable influencing how people perceived protected areas was wealth, i.e., number of livestock—with wealthier households being more negative to the protected areas. The five other variables (gender, age, education, family size, and nature of residence) had no significant influence (Table 3).

Multivariate analysis

In a stepwise linear regression analysis, 59% of the variation in people's attitudes on the relationship with protected areas was explained by three significant variables: (1) conflict levels with protected areas; (2) lack of water; and (3) participation in SRCP (Table 4). In addition to these variables, level of education also adds an impact factor in explaining 51% of the variation in people's attitude regarding the status of the Game Reserves (Table 4). Five variables (lack of water; level of education; inadequate pasture; participation in SRCP; and diseases) explained 12% of the variation in people's attitude on the status of Serengeti National Park (Table 4). Although several of these factors independently do not affect the attitudes toward

Table 2 The impact of different livestock keeping constraints on people's attitudes about relationship with protected areas ($N = 282$, differences tested with χ^2 tests)

Constraint	Response category	n	Relationship with the protected area (% of respondents)			χ^2	P (NS when not significant)
			Good	Fair	Poor		
	Total respondents	282	25	17	58		
Depredation	Important	115	42.6	27.0	30.4	61.7	<0.001
	Unimportant ($n = 167$)	167	12.6	10.2	77.2		
Inadequate pasture	Important ($n = 204$)	204	14.2	14.2	71.6	59.7	<0.001
	Unimportant ($n = 78$)	78	52.6	24.4	23.4		
Diseases	Important ($n = 136$)	136	30.1	25.0	44.9	20.8	<0.001
	Unimportant ($n = 146$)	146	19.9	9.6	70.5		
Theft	Important ($n = 10$)	10	20.0	0	80.0	2.71	NS
	Unimportant ($n = 272$)	272	25.5	17.6	57.4		
Lack of water	Important ($n = 224$)	224	13.8	17.9	68.3	72.7	<0.001
	Unimportant ($n = 58$)	58	67.2	13.8	19.0		
Livestock loss during migration	Important ($n = 4$)	4	50.0	50.0	0	6.00	NS
	Unimportant ($n = 278$)	278	24.5	16.5	59.0		

Table 3 The impact of socio-demographic variables on people's attitudes about their relationship with protected areas

Constraint	Response category	n	Relationship with the protected area (% of respondents)			χ^2	P (NS when not significant)
			Good	Fair	Poor		
	Total respondents	282	25	17	58		
Gender of a person	Male	115	26.9	19.2	53.8	4.02	NS
	Female	167	21.0	13.0	66.0		
Level of education	No formal education	65	10.8	24.6	64.6	12.3	NS
	Adult education	9	33.3	22.2	44.4		
	Primary education	88	27.7	14.9	57.4		
	Secondary education	20	40.0	10	50		
Residence status (Were you born in this village?)	Yes	108	25.9	11.1	63.0	4.37	NS
	No	174	24.1	20.7	55.2		
			Relationship with the protected area [Means ± Standard Error (SE) of respondents]			F	
Age of a person	Number of Years		41.0 ± 1.4	45.5 ± 1.8	45.0 ± 1.0	2.93	NS
Household size	Number of people		7.0 ± 0.2	8.0 ± 0.3	7.0 ± 0.2	1.73	NS
Wealth (No. of livestock)	Number of cattle owned		9.0 ± 1.3	15.0 ± 1.7	20.0 ± 1.6	10.1	<0.001
	Number of goats owned		7.0 ± 0.9	9.0 ± 1.1	11.0 ± 0.7	8.06	<0.001
	Number of sheep owned		3.0 ± 0.5	4.0 ± 0.8	4.0 ± 0.3	1.01	NS

Table 4 The effects of different socio-demographic variables and land use factors on attitudes (1, 2, 3) toward the protected areas (linear regression analyses)

Independent variables	(1) How do you rate your relation-ship with the protected area?		(2) Which idea do you support regarding the status of the game reserves?		(3) Which idea do you support regarding the status of the Serengeti National Park?	
	t-Value	P	t-Value	P	t-Value	P
Conflict level with protected areas	9.0	<0.001	6.7	<0.001	0.2	NS
Lack of water	4.6	<0.001	4.2	<0.001	4.2	<0.001
Participation in SRCP	2.6	<0.011	3.9	<0.001	2.3	<0.020
Gender of a person	1.2	NS	0.7	NS	0.1	NS
Level of education	1.1	NS	3.4	<0.001	4.1	<0.001
Livestock depredation	0.4	NS	0.1	NS	0.1	NS
Age of a person	0.4	NS	1.0	NS	0.1	NS
Inadequate pasture	0.3	NS	0.1	NS	2.6	<0.011
Number of cattle owned	0.2	NS	0.6	NS	0.2	NS
Number of goats owned	0.2	NS	1.3	NS	1.8	NS
Diseases	0.2	NS	0.9	NS	2.1	<0.001
r^2	0.591	<0.001	0.511	<0.001	0.124	<0.001

protection, they collectively interact in such a way that they form a significant relationship and explain a certain portion of the variance in attitudes. While this is a modest predictor conceptually it does show how several factors interact in the shaping of attitudes toward conservation.

Discussion

Conservation attitudes towards protected areas

Generally the attitudes towards the protected areas were negative, with only 25% of respondents ($n = 282$) rating the relationship with protected areas as good. However, results support the hypothesis (3) that local communities were more supportive to Serengeti National Park than to the Game Reserves. The idea of retaining the Game Reserves against degazettement was supported by 25% of respondents compared to 86% who supported the continuation of Serengeti National Park.

The observed disparity of support between the park and Game Reserves may be explained by the age of these protected areas. Creation of Serengeti National Park—gazetted by British rule as a partial Game Reserve in 1921, then a full Game Reserve in 1929 and elevated to a National Park in 1951—involved relocation of the communities, just as what transpired in Ikorongo, Grumeti and Kijereshi Game Reserves in the early 2000. However, resistance was minimal, and people were able to tolerate the creation of the park because the land and other resources were abundant to cater for low human and livestock population. Furthermore, the majority of the villagers were either too young or were not even born when the park came into existence. Therefore, they did not feel the pain of eviction, if there was any.

The strong opposition to the park occurred in the eastern part where relocation of Maasai pastoralists left them without alternative grazing land (Bonner 1993). On the other hand, the establishment of the three Game Reserves (viz. Ikorongo, Grumeti and Kijereshi) in 1994 implied taking from communities the only land which was important in sustaining their livelihoods. The opportunity costs experienced might have diminished people's tolerance over wildlife conservation. Furthermore, establishment of these areas followed the colonial format of non-participatory decision-making, despite two decades of advocacy for conservation with people. The disparity could also be a function of geographical location of the villages. Of the studied villages, only one (Nyatwali) borders Serengeti National Park. However, the village does not experience much conflict with the park. Probably this is because dependence on park resources is minimal as the majority of the villagers earn their living through fishing in Lake Victoria.

Constraints to livestock keeping

Most of the constraints facing livestock were linked to wildlife and protected areas and, therefore, were regarded as conservation-induced costs. Those who experienced higher costs were more likely to oppose protected areas than those who were minimally affected, supporting the hypothesis that communities which experience more wildlife induced costs are less likely to support conservation. The majority rated the relationship with the Game Reserves as poor and opted for their degazettement. However, all villages, irrespective of the costs, were supportive of Serengeti National Park, suggesting that the park was not perceived as a threat to local livelihoods compared to the recently established Game Reserves. This finding supports the hypothesis that conservation attitudes were more positive to Serengeti National Park than to the adjacent Game Reserves. The low explanation value of only 12% of the variation in people's attitude toward the Serengeti National Park is probably due to the fact that most of the respondents were positive to the park. Studies conducted elsewhere also indicate prevalence of negative conservation attitudes among the people suffering from the costs of conservation [e.g., USA (Naughton-Treves et al. 2003), Norway (Kalternborn et al. 1999; Røskaft et al. in press), Kenya (Gadd 2005), Tanzania (Gillingham and Lee 1999; Newmark et al. 1993) and Mozambique (De Boer and Baquete 1993)].

Conflicts and negative attitudes towards the protected areas in Western Serengeti were correlated with restrictions over access to pasture and water for livestock, again supporting the hypothesis that communities, which experience more wildlife induced costs, are less likely to support conservation. However, the effect of pasture disappeared in the multivariate analyses. These imposed constraints were also associated with many other costs, which were not quantified in this study. For example, local communities cited the two constraints as the major predisposing factors for livestock diseases. Overcrowding and competition for limited pasture and water, infrequent dipping services (due to water scarcity), and exhaustion due to long distance of up to 200 km (covered during the seasonal migration in search of water and pasture) increase vulnerability to transmissible diseases. Villagers around Kijereshi Game Reserve perceived these problems as the fundamental causes for a decline of livestock numbers, low production, low income and general deterioration of the socio-economic life. They reported that during the drought, the market price for cattle dropped for more than 50% from between US$75 and 100 before 2000 to less

than US$50 in 2004. ''We sell them (cattle) at a throw away price'', lamented a villager.

Wildlife-related benefits

As results indicate, the SRCP—through which hunting for communities is conducted—has had a positive impact on local attitudes towards the protected areas. This finding supports the hypothesis that communities, which receive more wildlife-related benefits, are more likely to support conservation efforts. This observation corroborates other previous studies conducted in Africa [e.g., Tanzania (Gillingham and Lee 1999; Holmes 2003), Kenya (Gadd 2005) and Uganda (Archabald and Naughton-Treves 2001)]. In addition to access to game meat, the positive attitude toward the protected areas among the SRCP villagers may be enhanced by regular contacts with the project staff and expectations raised. This observation concurs with Holmes' (2003) findings that increased personal contact carried out in good faith was a critical factor to the development of understanding and trust between wildlife staff and local residents around Katavi National Park, Tanzania.

Socio-demographic variables

Of the socio-demographic factors examined (age, gender, education, wealth, household size and residency status), only wealth (in terms of livestock number) and education were important predictors of the relationship between local communities and protected areas. Those with more livestock were more negative to protected areas than those with less. This should not be surprising because people with more cattle are more likely to interact with the protected areas in a negative way through restrictive, prohibitive and punitive laws. They are likely to be arrested and fined if found grazing or watering their livestock illegally in the protected areas. More livestock also implies an increase of workload since the owners are compelled to migrate seasonally in search of water and pasture. Kaltenborn et al. (1999) also noted that in Norway negative attitudes toward the large carnivores were correlated with ownership of livestock. They predicted that a decrease in proportion of livestock producers in Norway would expose fewer people to negative attitudes toward large carnivores and, consequently, result in reduction in negative attitudes as time passes.

Results also indicate that, people with higher level of education supported the current status of protected areas. This is in accordance with other studies. While this may be attributed to high level of understanding of the importance of wildlife conservation among the highly educated people (Kalternborn et al. 1999; McClanahan et al. 2005; Røskaft et al. 2004; Røskaft et al. in press), the role of education as a key to better opportunities for employment and, therefore, a route for alternative livelihood strategies may also explain this result. As in other parts of Africa, people with higher education in Tanzania have more access to formal employment in government and private sectors such as education, tourism, health and wildlife. This may diminish their direct dependency on resources from the protected areas. Those with higher education may be minimally affected by conservation interventions. This supposition corroborates the findings by Kalternborn et al. (1999) and McClanahan et al. (2005) linking occupational differences to stakeholders' conservation attitudes. However, education may also increase

opposition to conservation initiatives. For example, Songorwa (1999) found that people with more formal education in Selous Game Reserve were more likely to oppose the community conservation program. This suggests that level of education may not necessarily benefit conservation strategies. Meaningful support may be a function of many factors including sincerity and sufficiency in addressing people's expectations.

Contrary to other studies (e.g., Kaltenborn et al 1999; Kaltenborn and Bjerke 2002), gender had no effect on attitudes on the relationship with protected areas. This scenario can be attributed to the fact that the costs of recent creation of the protected areas have affected both women and men. Seasonal migration with livestock reduces the manpower for agricultural activities. Women, who often remain at home, have to shoulder responsibilities, which were previously carried out by men. Furthermore, both men and women are victims of arrests, harassment and fines from wildlife rangers. The risk become obvious to men if found grazing or watering livestock inside the Game Reserves while women may be arrested upon entering the protected areas to collect firewood. Some women around Kijereshi Game Reserve admitted entering into the Game Reserve during the dark hours to avoid arrest by rangers, but risking attack by dangerous animals.

Implications for conservation

The fact that conservation attitudes were more positive towards Serengeti National Park than the recently established Game Reserves, and the proposition that the age of the protected areas could account for this disparity suggest that local people can support conservation efforts as long as their interests are not threatened. This further suggests that while in the past forced relocation may have guaranteed success in conservation, the recent ecological, social and political changes render the strategy less feasible. Unlike during the colonial times, awareness of democracy and human rights has increased and people can question and disagree with the decisions likely to affect their livelihoods. Use of force to achieve conservation objectives may increase unpopularity of conservation to local people and erode the government credibility. Human and livestock populations have also increased, resulting in scarcity of land and associated resources. An attempt to put more areas under protection translates into more social and economic costs and, consequently, conflicts and minimal social acceptability toward the protected areas. This underscores the need for genuine participation of the key stakeholders in pursuing the conservation strategies likely to affect people's livelihoods. In this process the needs and interests of local people should receive adequate priority. Through participation, alternative livelihood strategies should be developed to overcome the sanctions that conservation strategies will impose on local people in terms of access to resources. For instance, the problem of water for livestock can be solved by construction and maintaining the bore holes in the village lands.

As the present study indicates, a benefits-based approach is an important motivational factor in securing local support to conservation. However, several authors have pointed out some potential flaws that may limit the effectiveness of the approach in securing the long-term goals of conservation (Barrett and Arcese 1995; Hackel 1999; Songorwa 1999; Wells and Brandon 1992). If success in conservation work is to be realised some challenges are worth addressing. First, replication of the

benefits to other villages is imperative, as it is illogical to expect success by changing the attitude of just a fraction of communities. Second, the benefits should be sufficient enough to offset the direct costs resulting from conservation and indirect costs of forgoing the ecologically destructive activities that local people perceive to be economically profitable. Third, the benefits should also be equitably distributed and their future access should be well guaranteed. However, economic, ecological and political factors may undermine the achievement of these ambitions. The most pragmatic solution to long-term success depends on improvement of local people's living standards by alleviating poverty. Provision of benefits to local people will hardly deter them from illegal activities if they cannot meet their resource demands for survival. While protected areas can only minimally contribute to this goal, other sources should be secured locally and globally.

Education also needs an emphasis, both as a way of creating awareness and changing attitudes and directing people to alternative income-generating activities that will relieve the pressure on conservation area resources. The focus should be on young people. The fact that people with high numbers of livestock were more negative to conservation suggests that attempts to solve human-wildlife conflicts should target this group of people. It may be well worth to create incentives that will motivate and assist them to convert their livestock into alternative forms of capital, which has less impact on the environment.

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