

Full Length Research Paper

Communal knowledge and perceptions of African wild dog (*Lycaon pictus*) reintroduction in the western part of Serengeti National Park, Tanzania

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This study assessed communal knowledge and perceptions regarding the reintroduction of the African wild dog (*Lycaon pictus*). Questionnaires were employed to acquire information from 216 randomly selected respondents within six villages. Our results indicate that gender differences exist among respondents; more males than females correctly identified wild dogs from photo cards. Males also wanted the species to be of high conservation priority. Moreover, because of their education, more males suggested that the wild dog population should increase after being released into the Serengeti National Park (SNP). Finally, gender and education level significantly explained the variation of the outcome of answers with respect to wild dog reintroduction to SNP. The study recommends that conservation authorities should incorporate communal knowledge and perceptions during implementation of the wild dogs' reintroduction programmes.

Key words: Gender, education, conservation priority, protected areas, reintroduction.

INTRODUCTION

Worldwide, most communities living close to protected areas are knowledgeable about wildlife behaviour (Gandiwa, 2012; Lagendijk and Gusset, 2008; Thorn et al., 2011; Lescureux and Linnell, 2010) and management (Uddin and Faisal, 2007; Ogada et al., 2003; Mills, 1991; Lagendijk and Gusset, 2008; Kideghesho et al., 2007;

Kaltenborn et al., 2006; Inskip et al., 2016). Previous studies have shown that communal knowledge has been widely applied by scientists and policy makers as source of ideas for ecosystem management and ecological restoration (Folke, 2004; Gadgil et al., 1993; Hayward et al., 2007; Gusset et al., 2006; Gusset et al., 2010;

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Sjölander-Lindqvist et al., 2015). Therefore, indigenous knowledge has been used by researchers to evaluate wildlife interactions with their environment (Scholte, 2011; Gadgil et al., 1993; Mwakatobe et al., 2012; Kideghesho et al., 2007; Holmern et al., 2007; Lembo et al., 2008).

Previous studies have shown that information focused on communal knowledge of protected area management and predators are well recognized by decision makers (Kaltenborn et al., 2006; Tessema et al., 2010; Kideghesho et al., 2007; Lindsey et al., 2005; Sjölander-Lindqvist et al., 2015; Smith et al., 2014). Studies addressing such people's perceptions of large carnivore management are well documented in several ecosystems in Tanzania (Goldman et al., 2010; Koziarski et al., 2016; Dickman et al., 2014). Therefore, it is essential from both a scientific and conservationist perspective to understand communal knowledge on wildlife conservation (Taylor, 2009; Kideghesho, 2008).

Studies have shown that both positive and negative human perceptions are affected by gender and education level (Røskaft et al., 2007; Conforti and de Azevedo, 2003; Andersone and Ozolinš, 2004; Røskaft et al., 2003). Having that in mind, conservation authorities have taken into consideration different suggestions in undertaking species-appropriate conservation measures (Andersone and Ozolinš, 2004; Okello et al., 2011; Abram et al., 2015; Koziarski et al., 2016). Several studies have reported that negative perceptions of carnivores in the local community land are due to conflict with farmers or human attack (Gusset et al., 2008; Lescureux and Linnell, 2010; Inskip et al., 2016). Thus, scientists have been incorporating human perceptions into approaches for managing biodiversity (Gandiwa, 2012; Gusset et al., 2010; Okello et al., 2011; Caruso and Pérez, 2013; Gadgil et al., 1993).

The study by Okello et al. (2011) suggested that sustainable animal species conservation and management requires routine knowledge of species interaction with the community and ecosystem functions. Most educated people living around protected areas have been shown to play a central role in managing carnivore species because of their better understanding on the importance of natural resources protection in protected as well as open areas in community land (Gusset et al., 2006; Legendijk and Gusset, 2008; Lindsey et al., 2005). Management of large carnivores is a difficult task, which requires good governance and thorough understanding of human interactions with wildlife species and habitats (Sjölander-Lindqvist et al., 2015; Jacobsen and Linnell, 2016; Megaze et al., 2017; Redpath et al., 2013). Studies have shown that the African wild dog (*Lycan pictus*) can be successfully managed as a metapopulation through the involvement of ranch owners and bordering communities (Gusset et al., 2008; Lindsey et al., 2005). Despite these findings, studies on communal knowledge and perceptions of wild dog conservation in the western

Serengeti ecosystem are scant. Wild dog packs have not been sighted inside the Serengeti National Park (SNP) since its local extinctions in the early 1990s (Ginsberg et al., 1995; Holmern et al., 2007). Since Tanzania holds large populations of large carnivores (Riggio et al., 2013; Dickman et al., 2014), the African wild dogs have received high protection status due to its recent decline (TAWIRI, 2009). Reintroduction of African wild dogs is necessary in the SNP due to its high tourism potential. Also, such reintroduction will reduce human-wild dog conflicts in Loliondo Game Controlled Area and improve the protection of this species in the area. Because of its wide-ranging behaviour, conserving wild dogs requires integrating community knowledge and perceptions due to the ability of wild dogs to live in human-dominated landscape.

Therefore, this study hypothesized that communal knowledge and perceptions of African wild dog reintroduction and conservation would be influenced by gender and education levels in the study area.

MATERIALS AND METHODS

Study area

The study was conducted in western Serengeti focusing on eastern part of the Simiyu region, which covers an area of 23,808 km² bordering Maswa Game Reserve (MGR) and SNP, between latitudes 2° and 4° S and between 33° and 35° E (Figure 1) (URT, 2013). The area is characterized by high human population, totaling 2 million people, with an annual growth rate of 2.8%, due to increased birth rates and immigration, of which Sukuma tribe is dominant (Nuno et al., 2014; NBS, 2012; Sinclair et al., 2008). Communities' main economic activities include farming crops such as maize, sorghum, cotton and cassava, and livestock keeping (NBS, 2012; Meertens et al., 1995). There are fewer wildlife species remaining adjacent to MGR due to habitat destruction (Songorwa, 2004), while the area inside the SNP has a high diversity of wildlife including herbivores, carnivores and birds (Sinclair et al., 2002, 2008). The topography of the area is characterized by flat, gently undulating hills and low hills, sparse vegetation, with some places covered with miombo woodland (URT, 2013). Rainfall usually starts in October and ends in May, and the rainfall ranges from 600 to 900 mm (URT, 2013) and is influenced by Lake Victoria through tidal rhythms generated by temperature differences between the lake and the land (Campbell and Hofer, 1995; Norton-Griffiths et al., 1975). The temperature ranges from 18 to 31°C annually (URT, 2013). The soils are dominated by heavy black soils with areas of red loamy and sandy soil (Meertens et al., 1995).

Data were collected in August 2012 from six villages, namely Nyamikoma, Matongo, Nyawa, Halawa, Ihusi and Mwasinasi, and were purposively sampled (Figure 1) at gradient distance of 0 to 10 km from the park boundary. Prior to the interview, researchers explained the main purpose of the study to the village authorities. Permission for conducting interviews was then granted. For this study, the household was regarded as a sampling unit. Respondents above 18 years old were assigned numbers obtained from the village register book. Each number was written on a piece of paper, folded and placed inside a box from which 36 respondents were randomly picked for interview. Randomized face-to-face semi-structured interviews, using both open and closed questions, were

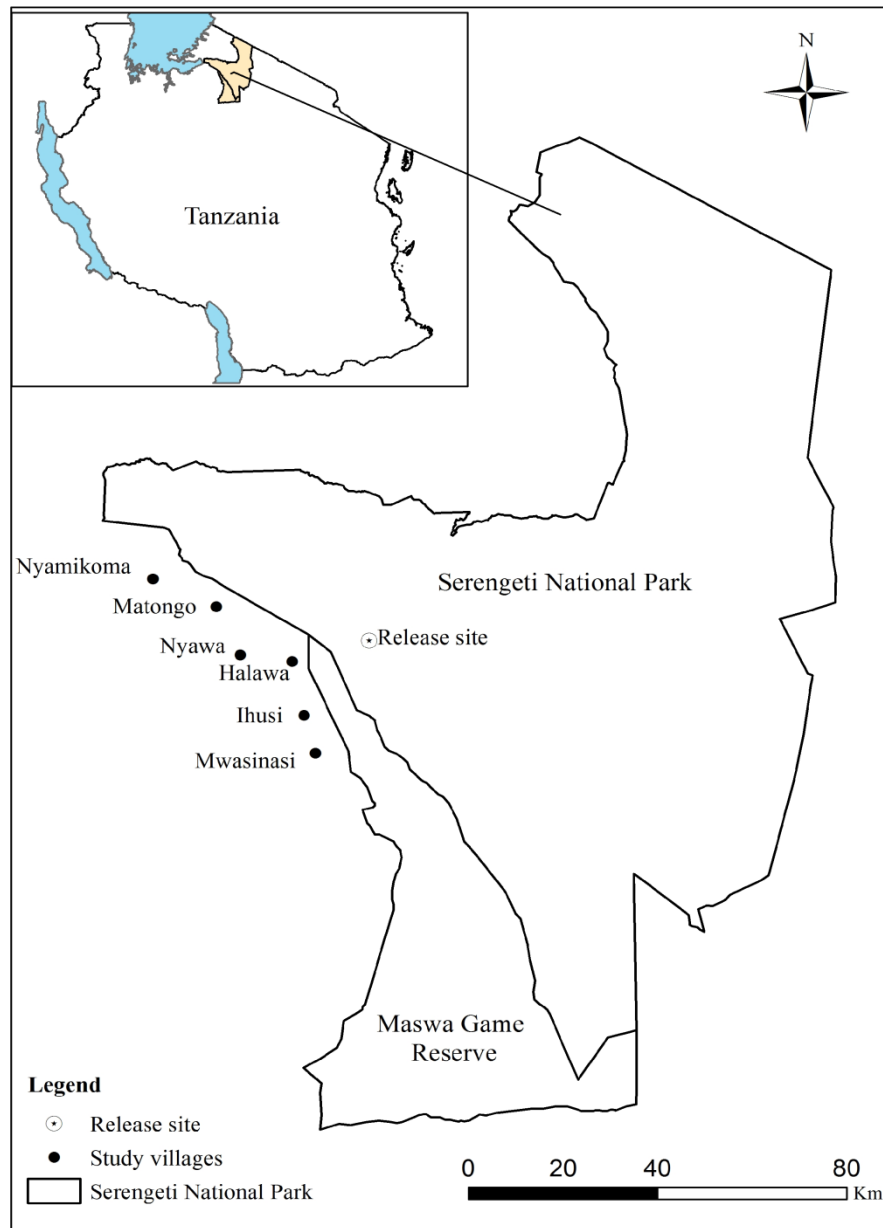


Figure 1. Map of Tanzania showing the study area and surveyed villages in the Western part of the Serengeti National Park (SNP).

then conducted with 216 respondents. The researchers interviewed each respondent by asking open-ended questions that allowed respondent to answer freely. In addition, close ended questions with limited answers (yes or no) were also used. The researchers developed clear judgments on respondents' (his/her) understanding regarding the asked question. The language used to interview people was *Swahili*, and where necessary it was translated to the *Sukuma* language with the help of a local field assistant with a secondary education background. Before the interview, each question was explained to the respondent in order to obtain meaningful answers. The following questions were asked to the respondents to capture the required information about their

knowledge of and perception towards African wild dog reintroduction in the western Serengeti ecosystem: (i) Do you know the animal species shown on the photo (yes, no)?, (ii) What is your level of conservation priority for African wild dogs? (high, medium, do not know and low), (iii) What is your opinion about African wild dogs reintroduction into the SNP from Loliondo Game Controlled Area (LGCA), where are they currently occurring? It will increase (pack sizes will increase in numbers and they will reproduce), no opinion (no suggestion of either increase or decrease in pack numbers) and it will decrease (packs will die or move outside the park after being reintroduced), and (iv) "What are the outcome of conserving wild dog packs in the SNP?" (it will be a stronger

Table 1. Numbers and percentages of respondents who were able to identify African wild dogs from a photo in the Western part of the Serengeti National Park (SNP) in relation to gender.

Identified animal shown on the photo	Gender		Total N (%)
	Men N (%)	Women N (%)	
Yes	105 (70.5%)	20 (29.9%)	125 (57.9%)
No	44 (29.5%)	47 (70.1%)	91 (42.1%)
Total	149 (100%)	67 (100%)	216 (100%)

Table 2. Numbers and percentages of respondents regarding the level of conservation priority status that should be given to wild dogs in relation to gender.

Conservation priority	Gender		Total N (%)
	Men N (%)	Women N (%)	
High	81 (54.4%)	23 (34.3%)	104 (48.1%)
Medium	11 (7.4%)	7 (10.4%)	18 (8.3%)
Don't know	26 (17.4%)	26 (38.8%)	52 (24.1%)
Low	31 (20.8%)	11 (16.4%)	42 (19.4%)
Total	149 (100%)	67 (100%)	216 (100%)

protection of the species, it is a dangerous animal that should be removed from human-dominated areas and I do not know). Socio-demographic variables including gender, age, job status and education level were used to assess respondents' knowledge and perceptions with respect to the above questions.

Data analysis

Statistical analyses were conducted using Statistical Package for Social Sciences (SPSS version 21, Chicago, USA) to analyze the data. Descriptive statistics were used to summarize the questionnaire response data. Since most of our data were categorical, Pearson's Chi-square analyses were performed to determine the differences in the independent variables that explain communal knowledge and perceptions. Furthermore, linear regression analysis was used to determine the factor that contributed most to statistical significance. All statistical tests were two-tailed and significant level was set at $P < 0.05$.

RESULTS

Respondents' general information

Of all interviewed respondents ($n = 216$), 69% were men and 31% were women. Eighty percent were between 18 and 45 years, 14% were between 46 and 60 years, and 6% were older than 60 years. Fewer respondents, approximately 16%, had secondary education and above, 24% had never been to school and the majority, 60% had

primary education. Majority of the respondents were farmers (87%), while the remaining 13% were businessmen, government employees and students.

Knowledge about African wild dogs

Majority of the men correctly identified African wild dogs from the photo card, when compared with the women ($\chi^2 = 31.27$, $df = 1$, $P < 0.001$; Table 1). Conversely, age ($P = 0.360$), education level ($P = 0.547$) and job status ($P = 0.241$) had no effect on respondents' ability to recognize African wild dogs. Furthermore, statistically significantly, more men than women suggested that African wild dogs should be given high conservation priority status ($\chi^2 = 13.59$, $df = 3$, $P = 0.004$) (Table 2).

Respondents' perceptions of African wild dogs reintroduction into the SNP

Respondents had different opinions regarding what will happen to the wild dogs after the reintroduction into SNP. Generally, 72.5% of the men believed that the wild dog population would increase after being reintroduced into SNP, while statistically significantly, fewer women did ($\chi^2 = 7.18$, $df = 2$, $P = 0.020$) (Table 3). Furthermore, women had significantly different opinions from men about the

Table 3. Numbers and percentages of what respondents believed would happen to the African wild dog population after release into the Serengeti National Park (SNP) in relation to gender.

After African wild dog release, the species will	Gender		Total N (%)
	Men N (%)	Women N (%)	
Increase	108 (72.5%)	38 (56.7%)	146 (67.6%)
No opinion	25 (16.8%)	22 (32.8%)	47 (21.8%)
Decrease	16 (10.7%)	7 (10.4%)	23 (10.6%)
Total	149 (100%)	67 (100%)	216 (100%)

Table 4. Numbers and percentages of respondents' opinions on the outcome of African wild dog reintroduction to the Serengeti National Park (SNP) in relation to gender.

Opinion about release of wild dogs into SNP	Gender		Total N (%)
	Men N (%)	Women N (%)	
It will be a tourist attraction	48 (32.2%)	14 (20.9%)	62 (28.7%)
A stronger protection of the species	44 (29.5%)	4 (6.0%)	48 (22.2%)
It is a dangerous animal that should be removed from human-dominated areas	16 (10.7%)	10 (14.9%)	26 (12.0%)
I do not know	41 (27.5%)	39 (58.2%)	80 (37.0%)
Total	149 (100%)	67 (100%)	216 (100%)

outcome of reintroducing wild dogs into the SNP ($\chi^2 = 26.04$, $df = 3$, $P < 0.001$) (Table 4). Additionally, respondents with no education had significantly different opinions on the potential outcome of the reintroduction to SNP than educated people ($\chi^2 = 22.61$, $df = 6$, $P = 0.001$) (Table 5). Conversely, respondents with primary education suggested that tourism would increase ($\chi^2 = 22.61$, $df = 6$, $P = 0.001$) (Table 5). Using a linear regression model with method enter to the questions, "what are your opinions about reintroducing wild dogs back to SNP" as dependent variable and gender and education level as independent variables was statistically significant ($F = 11.096$, $df = 2$ and 213 , $P < 0.001$, $r^2 = 0.092$). Both gender ($t = 3.981$, $P < 0.001$) as well as education level ($t = -2.145$, $P = 0.033$) were statistically significant demographic independent variables in explaining this variation.

DISCUSSION

Respondents' knowledge on African wild dogs

The findings suggest that men are more knowledgeable than women in identifying African wild dogs and also proposed a higher conservation priority status for the species. This is probably because in agro-pastoral communities, more men have formal education than

women (URT, 2010), and the former are also more powerful in the society, while the latter are not allowed to provide information in the presence of men (Assenga et al., 2016). Furthermore, it was noted that in the Sukuma tribe, men are engaged in social activities, such as listening to the radio, dancing and watching television programs which may increase the exchange of ideas from one person to another. The results are consistent with earlier studies that have suggested that gender differences exist in levels of conservation knowledge (Dickman et al., 2014; Lyamuya et al., 2016; Kaltenborn et al., 2006; Nombo et al., 2015; Clamsen and Røskoft, 2013; Allendorf and Allendorf, 2012). Males may have suggested high conservation priority status for the species because of awareness of reporting on local extinction of African wild dog in early 1990s within the Serengeti ecosystem (Ginsberg et al., 1995; Burrows et al., 1994). Therefore, the findings support our hypothesis that gender is an important demographic factor explaining communal knowledge about African wild dog conservation.

Respondents' perceptions of African wild dog reintroduction into the SNP

Furthermore, the results suggested that males believe that the African wild dog population would increase after

Table 5. Numbers and percentages of the respondents' opinions on the outcome of African wild dog reintroduction to the Serengeti National Park (SNP) in relation to education level.

Opinion about release of wild dogs into SNP	Level of education			Total
	No education	Primary education	Secondary and above	
Tourist attraction	9 (17.0%)	43 (33.3%)	10 (29.4%)	62 (28.7%)
Stronger protection of the species	6 (11.3%)	32 (24.8%)	10 (29.4%)	48 (22.2%)
It is a dangerous animal that should be removed from human-dominated areas	7 (13.2%)	19 (14.7%)	0 (0.0%)	26 (12.0%)
I do not know	31 (58.5%)	35 (27.1%)	14 (41.2%)	80 (37.0%)
Total	53 (100%)	129 (100%)	34 (100%)	216 (100%)

reintroduction into the western part of the Serengeti ecosystem, where presently the species is rarely seen. This is probably because of high diversity of prey species in the park, which is influenced by resource distribution (McNaughton and Georgiadis, 1986; Fryxell et al., 2005; Sinclair, 2003; Sinclair et al., 2008) that would reduce the incidence of wild dogs moving outside the park. These authors pointed out that lack of human-wild dog conflict in the area was because wild dogs have not been sighted for several decades (Holmern et al., 2007). The community in western Serengeti would wish to see the African wild dogs in their area probably due to lack of experience of human-wild dog conflict. These findings are also in support of the previous studies (Lindsey et al., 2005; Nilsen et al., 2007; Smith et al., 2014).

Majority of the respondents, independent of gender and education level, acknowledged that they did not know the outcome of the released wild dog packs into SNP. The study findings, suggest that respondents are not fully involved in the management of natural resources. Contrary to this observation, studies elsewhere have reported that local residents living close to protected areas are aware of ongoing conservation activities conducted by authorities in the protected areas (Yen et al., 2015; Mcgovern and Kretser, 2015; Piédallu et al., 2016; Caruso and Pérez, 2013; Inskip et al., 2016; Gandiwa, 2012; Megaze et al., 2017). Concurrently, the data also suggest that educated respondents acknowledged that the presence of more wild dog packs in the SNP, following release, will lead to an increased tourist attraction. Likewise, other studies have suggested that education level plays an important role in people's perceptions about wildlife conservation (Legendijk and Gusset, 2008; Conforti and de Azevedo, 2003; Megaze et al., 2017; Redpath et al., 2013). Given this fact, it is important to sensitize and conduct more research on large carnivores in this part of the Serengeti ecosystem. Hence, the community expressed positive opinions about the conservation of African wild dogs in their area as they anticipate wild dogs are important as a source of economic incentives in the future. The respondent's

opinions will form the baseline information for management authorities of the wild dogs in the area after reintroduction. These findings support the hypothesis that communal perceptions of African wild dogs' conservation are mostly influenced by gender and education levels.

CONCLUSIONS AND RECOMMENDATIONS

The study concludes that both gender and education level are significant in explaining variations between community knowledge of and perceptions towards wild dog reintroduction and conservation in the western Serengeti ecosystem because they supported the release of wild dogs in the area. Moreover, because of their knowledge, males believed the African wild dog should be given a high conservation priority in the area. The study recommends that conservation authorities should incorporate communal knowledge and perceptions of local people during implementation of the wild dogs' reintroduction programmes. Future studies should be directed towards this part of the ecosystem to explore the large carnivores' presence and local peoples' attitudes towards the future existence. Additionally, it is recommended that after the reintroduction exercise has ended, the same community should be interviewed to evaluate the increase of awareness and knowledge of African wild dogs.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interest.

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