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Community Attitudes and Knowledge on Conservation of Rothschild's Giraffes in Ruma National Park and Mwea National Reserve in Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The attitude and conservation knowledge of Rothschild's giraffe ecosystems by host communities is critical in sustainability of parks and reserves in Kenya. This study was conducted in two different giraffe habitats, namely Ruma National Park and Mwea National Reserve in Kenya. The objective of the study was to assess the attitudes and wildlife conservation knowledge of the local community towards the adjacent protected area. A descriptive research design that involved administering of closed ended questionnaires in the survey was used to obtain data from the local Community. Binary logistic regression was applied on statistical data to ascertain the relationship between independent variables and the dependent variables of the study. To ascertain the intensity of attitudes and knowledge, a likert scale was used. In addition, a statistical significance ($p \leq 0.05$) was used to ascertain inferences from the results. The results indicate that, the community's perception of wildlife conservation Knowledge was moderate χ^2 (1,315) =31.641, p=0.000. Their attitude score based on the rating of the future of the Park and Reserve was low (F (4, 275) = 11.104, p = 0.000). However, the majority of the community (90%) felt the need to be involved

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further in the process of decision making in matters pertaining to conservation of the park and the reserve. Based on the findings, the study recommends that, Kenya Wildlife Service should involve the community in the decision making and management of these protected areas. In addition, the host communities should be capacity built on wildlife conservation approaches in Ruma National Park and Mwea National Reserve.

Keywords: Conservation knowledge; community attitude; binary logistic regression; wildlife; rothschild's giraffe.

1. INTRODUCTION

Conservation of wildlife in Kenya has to deal with socio-economic and ecological issues that are complex and most of the time overwhelming. One issue that is of major concern in Kenya, is the rampant snaring of wildlife species including giraffes by the local communities during the dry seasons due to inadequate food supply [1,2]. According to Ariya [3], two million metric tons of bush meat is harvested annually in Africa [4].

Giraffes are classified in the mammalian order, Artiodactyla meaning even toed animals that contains over 180 species which are the most diverse of large mammals. Artiodactyla order consists of 10 families that includes; pigs, camels, hippopotamus, cattle, deer, goats, sheep, antelopes and giraffes [5]. However, giraffe sub-species is a center of debate under Giraffe Conservation Foundation (GCF), with the participation of the Senckenberg Biodiversity and Climate Research Centre (BiK-F) in Germany and other partners, is working on the long-term effort to uncover the enigma of giraffe genetics and taxonomy [6]. GCF and collaborators have acquired more than 1,000 samples of DNA from all main African giraffe populations [7].

Wildlife poaching and hunting is another conservation concern proliferated by human leading to population decline of the harvested species [8]. It is also regarded as a human livelihoods issue as it leads to loss of wildlife which is a resource that local communities depend on. Communities that live adjacent to these protected areas have lost connections with their national government and therefore most of them lack adequate income if any at all [9]. The abject poverty experienced by most of the local communities is the driving factor that leads them to bush meat harvesting and consumption [10,11,12]. In Ruma National Park and Mwea National Reserve the situation is worsened by the fact that cattle rearing and agriculture, has never been a viable source of livelihood for the communities due to a number of factors such as tsetse fly infestation, predators such as leopards and hyenas and crop raiding by primates. This aimed to assess attitudes and local knowledge of the local catchments on Rothschild's giraffe in Ruma National Park and Mwea National Reserve in Kenya.

Perceptions on the social implications of conservation are of special relevance for planning aspects, encompassing attitudes of the advantages and costs of wildlife existence. The relevance of linking community benefits with animal protection in African conservation scenarios is important especially on giraffe species [1]. There exist differences regarding attitudes, beliefs in existence, perceived advantages, demographic trends, exposure to giraffes, and cognitions about the giraffes [13]. This paper therefore aimed at assessing the Community Attitudes and Knowledge on Conservation of Rothschild's Giraffes in Ruma National Park and Mwea National Reserve in Kenya.

2. MATERIALS AND METHODS

The study used a descriptive survey research design that involved administering of closed ended questionnaires. Data was collected from host communities along Ruma National Park (RNP) 0°38′36″S, 34°16′48″E; 1600 m ASL, located in South –Western Kenya, in Homabay County and Mwea National Reserve (MNR) 0°49′05″S, 37°37′19″E; 1100 m ASL, located in Embu County (Fig. 1). Data analysis was done by Statistical Package of Social Scientists where different analytical approaches were used. Application of binary logistic regression to ascertain the relationship between independent variables and the dependent variable. To ascertain the intensity of attitudes and knowledge, Likert Scale was used. ANOVA was applied through T-test to ascertain significance ($p \leq 0.05$).

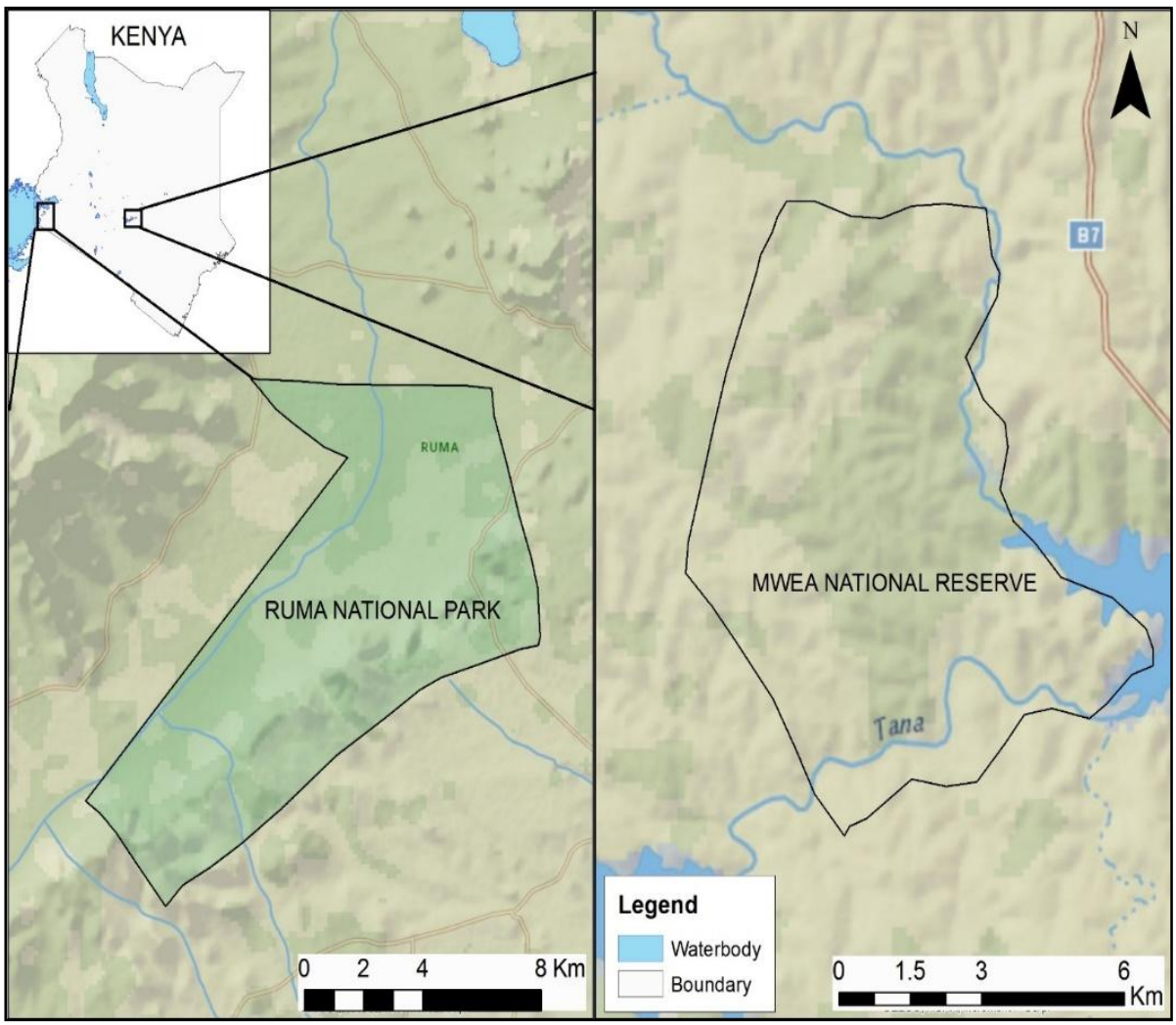

Fig. 1. Map showing the two study areas, RUMA NP and Mwea NR., adopted from nubian giraffe survey report, 2017

3. RESULTS AND DISCUSSION

3.1 Communities' Attitudes and Indigenous Knowledge on Giraffes

The respondents' attitudes were measured using a five-point Likert Scale that was ranging from strongly agree poor (1) to excellent (5). This ended up generating an ordinal scale data which was used in statistical analysis for the attitude levels. Table 1 shows the results of the items that were used to collect data on the attitudes of community members toward the park and the reserve.

Based on the findings, as indicated in Table 1, it is evident that most of the respondents around Mwea National Reserve do not believe that the reserve makes their lives better in any way. Majority of them (65.1%) claimed that the management of the park does not involve them in the decision-making process. This is an indication that the locals of the area feel left out in the management of this resource. More than 90% of the respondents stated that they would like to be involved in decision making process in matters involving the reserve and its management. It was, however, fascinating to note that most of the respondents still felt a sense of attachment to this reserve and the giraffes despite them not being involved in its day to day running. In addition to most of them stating that the giraffes make a difference in their life, they also claimed that the absence of giraffes in the reserve would affect the number of visitors that visit the reserve hence affecting tourism business.

Table 1. Community members' attitudes toward Mwea national reserve

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
The park/ reserve makes my life better	42	20.9	40	19.9	16	8.0	0	0.0	29	14.4	201	100
The park/reserve management involve me in decision making	70	34.8	63	31.3	11	5.5	54	26.9	3	1.5	201	100
I would like to be involved in the park's/reserve's decision making	3	1.5	9	4.4	7	3.4	86	42.2	99	48.5	204	100
I feel a sense of attachment to the park/ reserve	8	3.9	25	12.4	33	16.3	80	39.6	56	27.7	202	100
I feel that the giraffes in the park make a difference in my life	18	8.7	32	16.3	28	14.3	70	40.3	39	19.9	196	100
I feel a sense of attachment to the giraffes in this park/reserve	17	8.5	38	18.9	29	14.4	73	36.3	44	21.9	201	100
My activities affect the survival of the park/reserve	92	45.8	49	24.4	12	6.0	32	15.9	16	8.0	201	100
The park/reserve would benefit from me	14	7.1	18	9.2	15	7.7	85	43.4	64	32.7	196	100
The giraffes make the park/reserve better	3	1.5	1	0.5	26	13.3	97	49.7	68	34.9	195	100
The park/ reserve would receive no visitors without the giraffes	103	52.0	40	20.2	21	10.6	34	17.2	0	0.0	198	100

Just as it was with the community around Mwea National Reserve, the residents around Ruma National Park also confirmed that they felt that the park did not also make their life better in any way, this agrees with Ariya and Momanyi [14], who indicated that the community derive no benefits from the park and hence the negative attitude towards it. But, unlike in Mwea National Reserve, a good number of residents claimed that they were involved by the management in decision making process. This was a good thing since majority of them (98.6%) stated that they would like to always be involved in the decision-making process concerning the park and its management. 53.4% of the interviewed residents around Ruma National Park, expressed the feeling that the giraffes in the park make a difference in their lives. Nonetheless, majority of them (54.7%) claimed that they feel the activities that they are involved in also affect the park negatively, particularly the farming activities. More than 90% of the respondents believe that giraffes make the park more appealing to tourists and other guests. In addition, 52% of the respondents also believed that the park will receive no visitors without the giraffes.

In order to develop a variable that could measure the attitude of the respondents using the Likert scale. The researcher generated an attitude percentage score based on the responses that were provided by the respondents on the items shown in Table 3. A higher score indicates positive attitude towards the park or reserve while a lower score indicates a negative attitude

towards the park or reserve. The summary of the attitude scores is shown in Table 3.

As it is shown in Table 3, the mean attitude score of respondents in Ruma National Park (M=66.09) is higher than that of Mwea National Reserve (M=63.19). Moreover, the result shows that the attitude score for the respondents around Ruma National Park has a lesser variation (SD=9.271) compared to that of the community around Mwea National Reserve (SD=10.868). These findings imply a likelihood of the attitudes of the communities in the two sites being significantly different from each other. To assert this claim, a t-test was conducted and the output (Table 4) was generated.

Table 2. Community members' attitudes toward Ruma national park

Statement	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
The park/ reserve makes my life better	75	50.7	19	12.8	6	4.1	38	25.7	10	6.8	148	100
The park/reserve management involve me in decision making	45	30.4	27	18.2	5	3.4	68	45.9	3	2.0	148	100
I would like to be involved in the park's/reserve's decision making	2	1.4	0	0.0	0	0.0	57	38.5	89	60.1	148	100
I feel a sense of attachment to the park/ reserve	20	13.8	14	9.7	26	17.9	50	34.5	35	24.1	145	100
I feel that the giraffes in the park make a difference in my life	22	14.9	21	14.2	26	17.6	61	41.2	18	12.2	148	100
I feel a sense of attachment to the giraffes in this park/reserve	5	3.4	3	2.0	14	9.5	24	16.2	102	68.9	148	100
My activities affect the survival of the park/reserve	49	33.1	32	21.6	53	35.8	14	9.3	0	0.0	148	100
The park/reserve would benefit from me	1	0.7	25	17.4	45	31.3	32	22.2	41	28.5	148	100
The giraffes make the park/reserve better	5	3.4	0	0.0	3	2.0	73	49.3	67	45.3	148	100
The park/ reserve would receive no visitors without the giraffes	62	41.9	15	10.1	20	13.5	49	33.3	2	1.4	148	100

Table 3. The attitude scores of respondents in Ruma and Mwea

	Area	N	Mean	Std. Deviation	Std. Error Mean
Attitude score	Ruma	148	66.09	9.271	.762
	Mwea	208	63.19	10.868	.754

Table 4. T-test for attitude score between RNP and MNR

		Levene's Test for Equality of Variances		t-test for equality of means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference
Attitude score	Equal variances assumed	2.479	0.116	2.637	354	.009	2.902	1.101

The T- test for equality of variances showed that the variances in attitude score of community around Ruma National Park and community around Mwea National Reserve were nearly equal; F (2,353) = 2.479, p = 0.116. Hence using the equal variance assumption, an independent t-test was performed. The test finding showed that the attitude score for the respondents around Ruma National Park (M=66.09, SD=9.271) was statistically higher than that of the respondents around Mwea National Reserve (M=63.19, SD=10.868); t (354) =2.637, p = 0.00450. These results indicate that the residents neighboring Ruma National Park have a higher positive attitude towards the park and the giraffes compared to the attitude of residents around Mwea National Reserve to the giraffes and their reserve.

The study also wanted to establish if the respondents were exposed to any formal conservation education through trainings or awareness workshops as shown below, Table 5.

Of the 315 respondents, 247 (78.4%) acknowledged to have had some formal education or knowledge on wildlife conservation. Mwea National Reserve community had a higher number of the respondents (90.5%) that indicated to have some formal knowledge on wildlife conservation compared to community around Ruma National Park (64.4%). The chi-square results shows a significant association between the sites and possession of formal education on conservation of wildlife. This result is comparable to those indicated in Table 5 which shows that Mwea National Reserve had more knowledgeable residents as compared to Ruma National Park community. Shibia, [15], in his study on the attitude of residents of Marsabit towards Marsabit National Reserve, revealed that a majority of the respondents had negative attitudes towards the reserve. The negative attitudes were attributed to high levels of illiteracy, low participation in conservation awareness programs and past experience of human wildlife conflicts. In a study conducted in Rungwa Game Reserve of Central Tanzania, Hariohay et al., [16] found that the factors influencing the attitude of local people toward wildlife in the area, included age, distance to the protected area, education level, and the variety of sources of income. Depredation and crop damage negatively influenced people's attitudes towards the invading animals.

The future of Ruma National Park and Mwea National Reserve is vital for sustaining this rare sub-species of giraffe, the Rothschild's giraffe. It was important for this research to find out the opinion of the respondents on the future of Ruma National Park and Mwea National Reserve were tabulated below (Table 6).

Mwea National Reserve recorded a higher majority of residents (85.5%) who ranked the future of their national reserve as good, very good or excellent compared to that of Ruma National Park (71.7 table (4.34). Chi-square test results also confirmed that the site has an influence on the rating of the future of the park and the reserve. Where the residents perceived the future of the Park and Reserve positively

Table 5. Community possession of wildlife conservation knowledge

		Ruma		Mwea	
		N	%	N	%
Possess formal education/knowledge on wildlife conservation	Yes	94	64.4	153	90.5
	No	52	35.6	16	9.5

$X^2(1,315) = 31.641, P = 0.000$

Table 6. Residents' rating of the future of park and reserve

		Site			
		Ruma		Mwea	
		N	%	N	%
Future of park/reserve	Very poor	4	2.9	2	1.4
	Poor	35	25.4	19	13.2
	Good	79	57.2	79	54.9
	Very good	18	13	42	29.2
	Excellent	2	1.4	2	1.4

$\chi^2(4, 282) = 14.886, p = 0.005$

Since most of the respondents around Ruma National Park and Mwea National Reserve expressed their optimism of the future of their park and the reserve, it was vital to check whether their positive attitude of the future of the park and the reserve was related to their conservation knowledge in order to address the poaching of giraffes that was going on in the park and the reserve. Their responses were cross tabulated as shown in Table 7 below.

The results show that there is no association between an individual's knowledge on giraffes and conservation, poaching and their rating of the future of the park and the reserve, in Ruma National Park; $\chi^2(4, 138) = 1.945, p = 0.746$ and in Mwea National Reserve $\chi^2(4, 137) = 4.380, p = 0.357$. From the results, despite being aware that the giraffes in their neighborhood reserve are being hunted, a good number of the respondents from Mwea National Reserve still believed that the future of the reserve was good and very promising in terms of wildlife and tourism. This can be interpreted as lack of the understanding of the significance of giraffes in the reserve. The communities' awareness of poaching activities was independent of their perceptions of the future of the two protected areas. Hence their perception was not significantly influenced by awareness of poaching.

Table 7. A cross tabulation of the awareness of giraffe poaching against rating of the park/reserve's future

Area			Are giraffes hunted				Total	
			Yes		No			
			N	%	N	%	N	%
Ruma	Future of park	Very poor	0	0	4	3.1	4	2.9
		Poor	2	25	33	25.4	35	25.4
		Good	6	75	73	56.2	79	57.2
		Very good	0	0	18	13.8	18	13
		Excellent	0	0	2	1.5	2	1.5
	Total		8	100	130	100	138	100
	$\chi^2(4, 138) = 1.945, p = 0.746$							
Mwea	Future of park	Very poor	1	1.2	1	1.9	2	1.5
		Poor	11	13.1	5	9.4	16	11.7
		Good	44	52.4	31	58.5	75	54.7
		Very good	28	33.3	14	26.4	42	30.7
		Excellent	0	0	2	3.8	2	1.5
	Total		84	100	53	100	137	100
	$\chi^2(4, 137) = 4.380, p = 0.357$							
Total	Future of park	Very poor	1	1.1	5	2.7	6	2.2
		Poor	13	14.1	38	20.8	51	18.5
		Good	50	54.4	104	56.8	154	56
		Very good	28	30.4	32	17.5	60	21.8
		Excellent	0	0	4	2.9	4	1.5
	Total		92	100	183	100	275	100
	$\chi^2(4, 275) = 8.996, \quad p = 0.061$							

Intrinsically, the rating of the future of the park and the reserve is a closely related aspect to the attitude that one has towards the park or the reserve. In order to establish if this claim was based on the collected data, an analysis of variance using attitude score as the response variable was conducted to provide the output in Table 8.

The results indicate that the mean attitude score for individuals who rated the future of the park/reserve were significantly different from at least one group of individuals ($F(4, 275) = 11.104$, $p = 0.000$). To establish which group of respondents had a significantly different attitude toward the park and the reserve, a comparison (Table 9) below was generated.

The mean attitude score of individuals who said that the future of the park/ reserve is very poor (M=42.67, SD=12.94) was significantly different from all the other categories, $p = 0.000$. The mean attitude score for the respondents who rated the future of the Ruma National Park or Mwea National Reserve as poor (M=62, SD=9.679) was found to be significantly different from the rest of the categories except for those who said it will be excellent (M=60, SD=4.899). Evidently, those who rated poor or very poor at the future of the park/reserve had a relatively low attitude score towards the park. These findings are consistent with the findings made by Treves et al. [17] on human attitude towards wildlife and they remark that attitude can result to human-wildlife conflict. Sekhar [18] noted that the attitude of locals towards protected areas had a significant role in determining their participation for conservation. In his research, Sekhar [18] established that the involvement of the locals in the development of the parks and sharing direct benefits of parks with the local communities significantly influences their attitude towards these protected areas.

In order to investigate which location influenced various variables in this study, a logistic regression model was fitted (Table 10).

Table 8. ANOVA of the attitude score based on the rating of the future of the park and reserve

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4259.487	4	1064.872	11.104	.000
Within Groups	26372.956	275	95.902		
Total	30632.443	279			

Table 9. Multiple comparison table

Dependent Variable: Attitude score						
(I) Future of park	(J) Future of park	Mean Difference (I-J)	Std. Error	Sig.	95% confidence interval	
					Lower bound	Upper bound
Very poor	Poor	-19.333*	4.218	.000	-27.64	-11.03
	Good	-22.607*	4.074	.000	-30.63	-14.59
	Very good	-25.733*	4.193	.000	-33.99	-17.48
	Excellent	-17.333*	6.321	.007	-29.78	-4.89
Poor	Very poor	19.333*	4.218	.000	11.03	27.64
	Good	-3.274*	1.556	.036	-6.34	-.21
	Very good	-6.400*	1.846	.001	-10.03	-2.77
	Excellent	2.000	5.078	.694	-8.00	12.00
Good	Very poor	22.607*	4.074	.000	14.59	30.63
	Poor	3.274*	1.556	.036	.21	6.34
	Very good	-3.126*	1.486	.036	-6.05	-.20
	Excellent	5.274	4.958	.288	-4.49	15.04
Very good	Very poor	25.733*	4.193	.000	17.48	33.99
	Poor	6.400*	1.846	.001	2.77	10.03
	Good	3.126*	1.486	.036	.20	6.05
	Excellent	8.400	5.057	.098	-1.56	18.36
Excellent	Very poor	17.333*	6.321	.007	4.89	29.78
	Poor	-2.000	5.078	.694	-12.00	8.00
	Good	-5.274	4.958	.288	-15.04	4.49
	Very good	-8.400	5.057	.098	-18.36	1.56

Table 10. Logistic regression of location against some independent variables

Variables in the equation						
	B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
Giraffe Invasion (1)	-3.629	0.422	74.020	1	0.000	0.027
Park involves me in decision making			18.350	4	0.001	
Park involves me in decision making (1)	-4.046	1.462	7.659	1	0.006	0.017
Park involves me in decision making (2)	-2.614	1.440	3.296	1	0.069	0.073
Park involves me in decision making (3)	-3.426	1.574	4.739	1	0.029	0.033
Park involves me in decision making (4)	-2.618	1.440	3.305	1	0.069	0.073
Giraffes makes a difference in my life			4.812	4	0.307	
Giraffes makes a difference in my life (1)	1.403	0.680	4.264	1	0.039	4.068
Giraffes makes a difference in my life (2)	0.173	0.582	0.089	1	0.766	1.189
Giraffes makes a difference in my life (3)	0.158	0.547	0.083	1	0.773	1.171
Giraffes makes a difference in my life (4)	0.414	0.468	0.781	1	0.377	1.513
Conservation education (1)	-2.005	0.455	19.419	1	0.000	0.135
Constant	5.507	1.539	12.806	1	0.000	246.313

A binary logistic regression was fitted to ascertain the relationship between giraffe invasion, education on wildlife conservation, community's benefits from the park and the reserve and the involvement of the community in park issues with the likelihood of being either in Ruma National Park or Mwea National Reserve. The logistic regression model was statistically significant $\chi^2(10) = 171.16, p < 0.05$. The model explained 57.7% (NagelKerke R^2) of the variations in area with 80.1% of the cases correctly classified. According to the model, giraffe invasions were 97.3% less likely to occur in Ruma National Park compared to Mwea National Reserve. In Ruma National Park, an individual is 86.5% less likely to be educated on wildlife conservation compared to one from Mwea National Reserve.

4. CONCLUSION

The attitude and knowledge of host communities on wildlife habitats is critical in conservation of Rothschild's giraffe ecosystems in Kenya. The results from Ruma National Park and Mwea National Reserve show the disparity of the community in decision making. In addition, conservation model should take a circular model rather than a linear model that is based on conservation entities, yet host communities are equally stakeholders in wildlife resources conservation in Kenya.

Sustaining the rare sub-species of giraffe, the Rothschild's giraffe, critically depends on the future of Ruma National Park and Mwea National Reserve, where both the local communities and Kenya Wildlife Service should play part. By involving the local community in the development of the parks and sharing direct benefits of parks with the local communities significantly influences their attitude towards these protected areas. It is therefore beneficial to engage local communities holistically on conservation approaches in Kenya, for the future thrive of delicate wildlife protected areas.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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