Determinants of Local Residents' Attitudes and Perceptions Towards Wildlife Conservation in Rimoi National Reserve, Kenya

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ABSTRACT

Local residents' attitudes and perceptions about protected areas are among the key factors that determine the success of conservation efforts. This paper examines determinants of local residents' attitudes and perceptions towards wildlife conservation in Rimoi National Reserve (RNR) and its surroundings in Kenya. The study used household surveys, questionnaires, focus group discussions (FGDs), and Key Informant Interviews (KIIs) to collect data from local residents bordering RNR, local leaders and Kenya Wildlife Service (KWS) staff. Questionnaires consisting of closed and open-ended questions were distributed to 20 randomly selected heads of households in seven administrative locations giving a total of 140 respondents. In addition, 30 key informants were purposely selected from among KWS staff (5), local leaders (10), leaders of self-help groups (7), religious leaders (3), and village elders (5). Results showed that local residents' perceptions were primarily associated with education level, occupation, forms of land use, crop and livestock invasion by wildlife from RNR, benefit-sharing and interaction between RNR staff and the local community. Logging (28%) and charcoal burning (25%) were the major illegal activities in RNR ($\chi 2=50.60$, df=6, $p<0.001$). Slightly over thirty percent of the respondents (32.4%) strongly agreed that RNR is a useful resource to be conserved. Efforts geared towards fostering more positive attitudes and perceptions of local residents towards wildlife and conservation in RNR should be promoted. For conservation goals to be achieved, there is need for involvement of local residents in conservation programs, promotion of wildlife conservation awareness, increased benefit-sharing and adoption of sustainable enterprise programs to alleviate poverty and illegal activities.

Keywords: Wildlife conservation, Attitudes and perceptions, Illegal activities, Benefits, Protected areas, Rimoi National Reserve

INTRODUCTION

Local communities living adjacent to protected ecosystems play a pivotal role in the success of any conservation undertaking (Simasiku et al., 2024). Hence, understanding how people perceive and relate to their natural environments is indispensable to conservation action. While perceptions can be harnessed for positive conservation engagement (Costa et al., 2013), it has been documented that both attitudes and perceptions are critical issues in people's lives since they reflect their values and thoughts, help develop knowledge, improve overall welfare, and change their reality (Usman et al., 2023). Understanding how people perceive and relate to their environment have proven very useful aspects in environmental education programs because they help to carry out a process of evaluation that identifies the needs in each area for the planning of suitable goals and aims (Rodney et al., 2003; Tessema et al., 2019). However, traditional knowledge has been poorly documented and therefore neglected in many conservation programs over the years.

Attitudes and perceptions provide valuable insights into people's tolerance for wildlife or willingness to accept the costs of living with wildlife (Merz et al., 2023). Studies on the relationship between human societies and

their environment should include economic, social and psychological factors (Holmes et al., 2017). As such, understanding the factors that affect people's attitudes toward living with wildlife is necessary to design better policies aimed at promoting human-wildlife coexistence (Kansky & Knight, 2014; Gross et al., 2021). Despite this, social and cultural analyses have not been considered in most discussions about sustainable wildlife

management in developing economies (Cooney et al., 2028; Mogomotsi et al., 2020). However, the present valorization of these factors is viewed as a paradigm shift whereby traditional knowledge has become essential to development (Senanayake, 2006).

Authorities and many conservationists have designed policies and programs based on the assumption that local residents' response to human-wildlife conflicts is directly linked with the amount and frequency of wildlife damages, and that reducing damages increases support for wildlife conservation (Merz et al., 2023). Accordingly, conservationists have focused on reducing crop destruction, livestock predation, and human injury and/or death by wildlife (Gross et al., 2021). However, these interventions are not always effective and can increase intangible costs such as reduced school attendance by children to guard farms, time and money spent on conflict mitigation efforts, and loss of sleep worrying about wildlife (Ogra, 2008). Consequently, attitudes associated with economic usage of resources have altered the environment, damaging ecosystems that sustain the basic needs of populations (Garekae et al., 2016; Asaye et al., 2024; Katuwal et al., 2024).

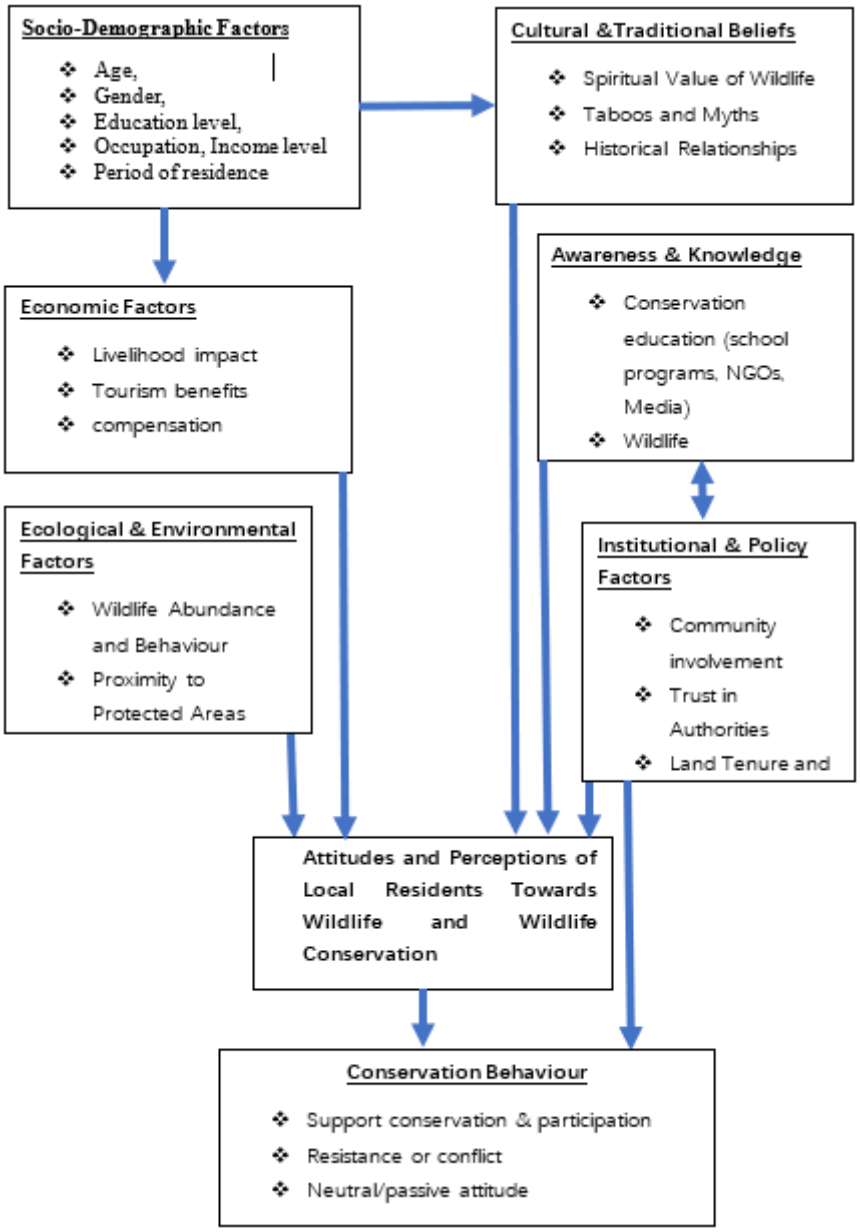
The creation of protected areas has often been considered a foreign concept and outgrowth of western conservation needs and values by local communities in developing countries (Shibia, 2010; Ariya, 2015; Mangu, 2018). The concept was introduced to developing countries by colonial administrations and is presently being adopted and promoted by developing nations as a commitment to various international conventions. In Kenya and other parts of Africa, many protected areas among them Rimoi National Reserve have been established based on this concept. However, due to the livelihood implications caused by protected area establishment, local residents perceive it as a liability (Shibia, 2010) since their establishment often transforms the area from primary provision of subsistence resources for local use to provision of aesthetic benefits. Further, the establishment of protected areas often denies local people access to traditional resources and also disenfranchises them of their indigenous access and use rights (Mamo et al., 2018). As a consequence, local residents living in close proximity to protected areas have over the years developed either negative or antagonistic attitudes towards these areas and their wildlife resources, as well as protected area management authorities.

A lack of congruence between conservation initiatives and local perceptions on conservation areas of concern and actions for their protection has been found in many protected areas (Costa et al., 2013; Raycraft, 2022; Obradović et al., 2023). A study by Kansky et al., (2014) reported that intangible costs were the best predictors of attitudes toward wildlife. Similar studies have found that local community's socio-demographic factors such as gender, age, occupation, education, ethnicity, religion, form of land use, and period of residence, potential and realized costs of living with wildlife, restricted access to natural resources owing to the creation of PAs, disagreements over wildlife management decisions, and knowledge of wildlife can influence attitudes toward wildlife and wildlife conservation (Selemani, 2020; Estrada et al., 2022; Galley, 2023; Muchapondwa & Ntuli, 2024).

Rimoi National Reserve in Kenya which is managed by Kenya Wildlife Service in collaboration with county government of Elgeyo-Marakwet, is among the protected areas experiencing serious conservation challenges and needs critical interventions to develop and strengthen mutual relationship between local residents and the reserve. Destruction of habitats, especially in the past years has been the prime cause of reduction of the range and number of elephants and other wildlife species, in and around Rimoi National Reserve. Reports of poaching and devastating human and wildlife conflicts by elephants and other wildlife had been on the rise, prompting the local media to raise alarm after fact-finding excursions. Accelerated conflicts have had implications on local residents' attitudes and perceptions thus culminating in hostility and resentment towards Rimoi National Reserve and its wildlife (Boit et al., 2024).

Therefore, in this study we sought to determine the attitudes and perceptions of the local residents towards wildlife conservation in Rimoi National Reserve, assess the influence of selected socio-demographic factors (gender, age, occupation, period of residence, form of land use, distance from reserve) on local residents' attitudes and perceptions towards wildlife conservation, and determine the effects of wildlife conservation benefits, problematic wildlife species, illegal activities and relationship of local residents with Kenya Wildlife Service staff on attitudes and perceptions towards wildlife conservation.

CONCEPTUAL FRAMEWORK



RESEARCH METHODS

Study area

Rimoi National Reserve is located in Kerio Valley 13km off the spectacular Iten-Kabarnet road (Figure 1). It is situated in the western half of the Kerio Valley, on the lower side of Keiyo escarpment between 35.60314, 0.945406 and 35.55566, 0.539439. Kerio River divides Rimoi National Reserve and Lake Kamnarock National Reserve (LKNR). The two reserves lie parallel to one another and they function as one ecosystem for the animals that occupy them. Lake Kamnarock, Kerio River and the surrounding aquatic ecosysteem enhance the biodiversity of Rimoi National Reserve, providing essential water sources for wildlife, especially during dry

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seasons, and support aquatic species such as fish and amphibians. Rimoi National Reserve was established in February 1983 and the main attraction is about the 300 elephants. Other wildlife found within the National Reserve includes warthogs, antelopes, giraffes and unique indigenous plants like acacia trees. The reserve also supports a diverse bird population, with over 50 bird species. These include both resident and migratory species, adding to the ecological richness and biodiversity of the area. Birds such as raptors, waterfowls, and songbirds inhabit different vegetation zones of the reserve. The Reserve is small, averaging 66km^{2,} set at bottom of the Great Rift Valley in Elgeyo-Marakwet County. It is protected by the Kenya Wildlife Service with support from the County Government of Elgeyo-Marakwet. Within the reserve are numerous hills where camping sites can be developed for viewing the elephant population as they come to drink water along River Kerio.

The general climate of Keiyo district is a warm to hot tropical climate. The annual mean temperatures on Keiyo escarpment and the Kerio valley ranges from 25°C to 28°C, while on the highland annual mean temperature ranges from 18°C to 22°C. The erratic rains experienced in the area limit both agricultural and livestock production. Due to the nature of the climate, poor soils and rugged terrain, 60% of the people live below the poverty line. This has led to overexploitation of natural resources in and around the Reserve putting a strain on them hence the need to develop alternative sources of livelihood, like ecotourism for which the area has a lot of potential. Keiyo and Marakwet are the major ethnic groups inhabiting the region, with a few Tugen immigrants.

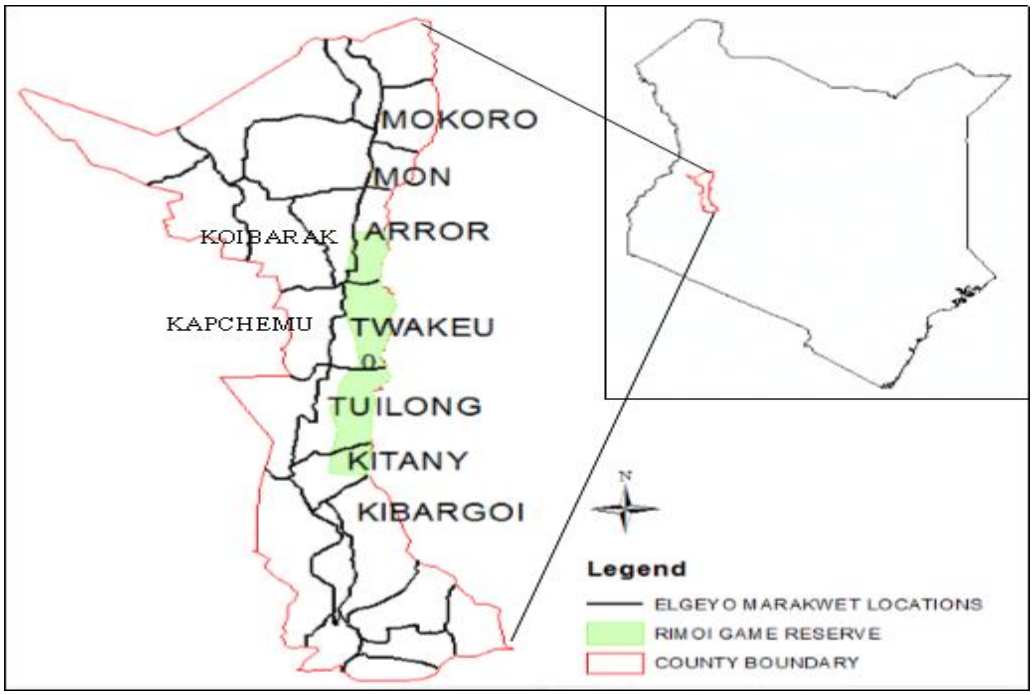

Fig. 1 Rimoi National Reserve and bordering administrative locations

Research design

The study employed a descriptive research design whereby opinions of local residents on various aspects of the reserve were investigated, explored, examined and described to determine their attitudes and perceptions, as well as factors that influence them.

Target population

The study targeted local residents living within 10km perimeter from Rimoi National Reserve boundary who included local farmers, pastoralists, Kenya Wildlife Service employees and local leaders around the Reserve.

Sampling technique

A list of all households in the seven locations bordering Rimoi National Reserve namely Kitany, Tuilong, Twakeu, Kapchemu, Koibarak, Mon and Arror was developed with the assistance of the village elders. The study employed systematic sampling technique in choosing households where every 20^{th} household in the list of every sampled location was selected for questionnaire administration. The first household was selected randomly from the first 20 households and thereafter every 20^{th} household was automatically included in the sample (Kothari, 2004). The study targeted a sample size of 140 households in total, 20 households from each of the 7 Locations. In addition, 30 key informants were purposively selected from among Kenya Wildlife Service staff, Self Help Groups and local leaders. In total, 170 respondents were selected for the study.

Data collection and analysis

We utilized questionnaire surveys, focus group discussions and key informant interviews. We distributed questionnaires to local community members drawn from sampled households to gauge their attitudes and perceptions towards wildlife and wildlife conservation. The questionnaires which consisted of both closed and open-ended questions were administered to 140 respondents of whom 20 were drawn from sampled households in each of the seven administration Locations bordering Rimoi National Reserve. This was considered to be sufficient to minimize the sampling error. The heads of households responded to the questionnaires. In their absence, any member of the household aged 18 years and above was interviewed. During the interview, the questions were verbally translated to Kiswahili language and Kalenjin dialect whenever it was deemed necessary. We carried out pilot testing on a sample of 20 respondents drawn from Kabulwa, Kitany, Biretwo and Arror, to determine the reliability and validity of the research instruments.

To systematically collect data from Focus group discussions, 10 participants from randomly selected households were chosen to form a focus group discussion group. In total, 18 out of the 30 planned focus group discussions were held. Twelve Focus group discussionss failed to take place due to lack of quorum occasioned by communication challenges. Every effort was however, made to ensure that the membership of the groups encompasses representatives across gender, age, education and occupation. In addition, the study also purposively selected and interviewed 30 key informants drawn from Kenya Wildlife Service staff (5), local leaders (10), self-help groups (SHG) (7), village elders (5) and religious leaders (3).

All statistical analyses were conducted using R software, version 4.3.2. The following R packages were utilized in the analysis: dplyr (Wickham et al., 2023) for data manipulation, ggplot2 (Wickham 2016) and ggpiestats (Patil 2021) for data visualization. Descriptive statistics in form of frequency and percentage were used to analyze the respondent's socio-demographic characteristics using the psych package. A five-point Likert scale method ranging from strongly disagree to strongly agree was used to analyze attitudes of local residents towards wildlife conservation. The polr function was used to perform logistic regressions. Diagnostic tests for multicollinearity and heteroscedasticity were conducted using the car and emmeans packages. Binary logistic regression was also used to analyze the influence of socio-demographic factors on the importance of Rimoi National Reserve conservation and involvement of the local community in conservation. Nominal logistic regression was used to analyze data on the usefulness of Rimoi National Reserve, problematic wildlife species, illegal activities, benefits accruing from wildlife conservation and other related variables. Peason's chi-square test was also performed to test relationship between variables. In all cases, significance was considered with a 95% confidence interval.

RESULTS

Socio-demographic Characteristics of respondents

The majority of the respondents (59%, n=139) comprised of males, 57% were aged above 36 years and 43% were aged between 18 and 36 years. Most of the respondents (79%) had formal education, with 42% having attained certificate of secondary education, and thus the majority was fairly informed of their environment. The

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unemployed local residents constituted the highest respondents (63.0%). A high percentage of respondents (78%) were residents by birth and a majority (72%) resided within 4 km from the reserve boundary and this may explain the rampant cases of human-wildlife conflicts in the study area. Sixty percent of the respondents had stayed in the study area for more than 25 years. Most of the respondents (61%) were mixed farmers followed by those practicing pure agriculture (31%), whereas 4% practiced livestock keeping and 3% engaged in other forms of land use such as quarrying.

Local residents' attitudes and perceptions towards wildlife conservation in Rimoi National Reserve

Slightly over thirty percent (32.4%) of the respondents strongly agreed with the statement that Rimoi National Reserve is a useful resource, 27.3% agreed with the statement while 15.8% disagreed with the statement, or strongly disagreed (23%). The responses differed significantly ($\chi 2=40.17$, df=4, $p<0.001$, Figure 2).

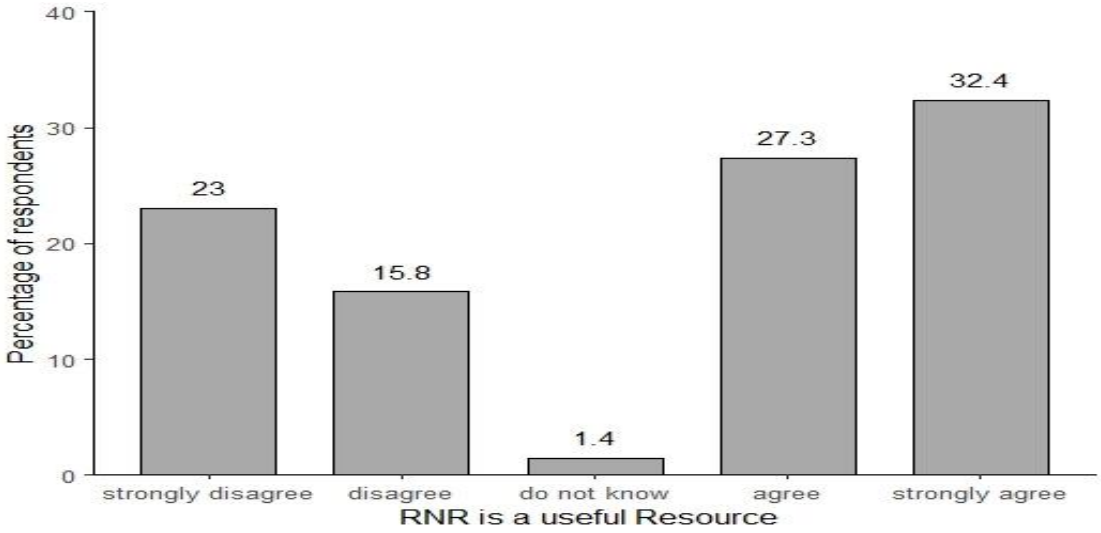

Fig. 2 Opinion on Rimoi National Reserve being a useful resource

Additionally, 38.8% of the respondents strongly disagreed that their lives could have been better if Rimoi National Reserve was not there, followed by those who strongly agreed (27.3%) and lastly those who agreed with the statement (2.9%) (Figure 3).

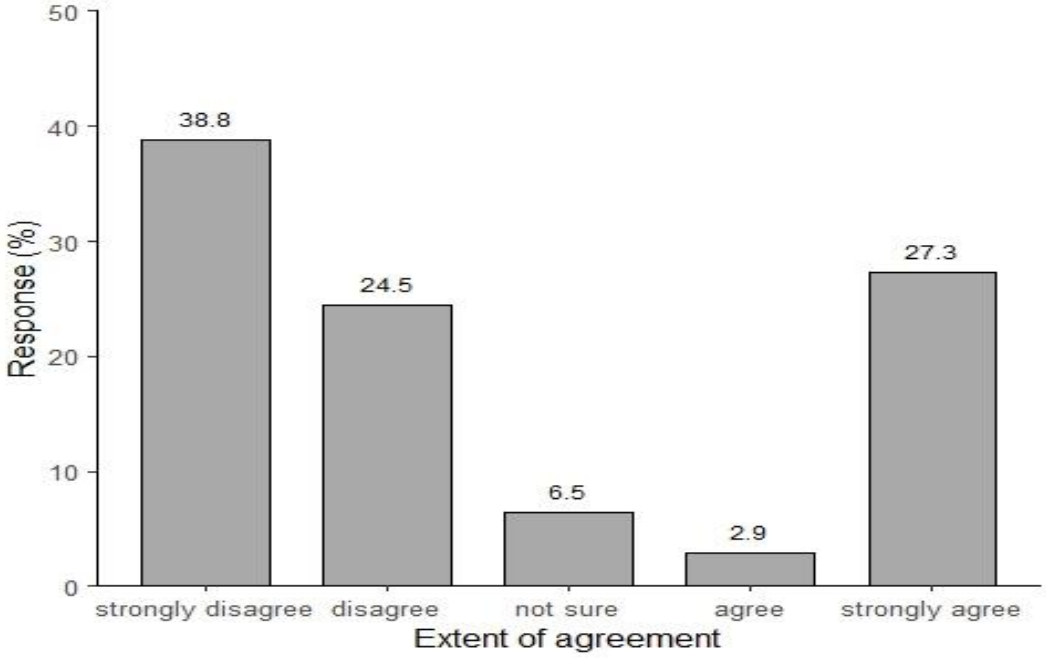

Fig. 3 Views on the statement that life could have been better if Rimoi National Reserve was not there

Results showed that 76% of the respondents indicated that they supported conservation of wildlife in Rimoi National Reserve while (24%) did not. For those who indicated that they did, 47.5% pointed out that they did so because the reserve supported tourism, followed by 43.4% who supported wildlife conservation for future generation. For those who did not support conservation of Rimoi National Reserve, 54.3% indicated it was due to human-wildlife conflicts followed by lack of benefits accruing from conservation (45.7%).

The majority (81%) of the respondents indicated that they had never been involved in any conservation activities in and around Rimoi National Reserve, while a few (19%) indicated that they did and the responses differed significantly ($\chi 2=51.98$, df=1, $p<0.001$). Of the respondents who indicated that they had been involved in conservation activities, majority (81%) were involved in tree planting, while a few (11%) were involved in fencing the park and reserve cleaning (7%) (Figure 4a). Of the respondents who indicated that they had never been involved in any conservation activities in and around Rimoi National Reserve, the majority (56%) indicated that they were not aware of any conservation activities, a few (29%) did not know why they were not involved and 15% had never been given an opportunity to carry out wildlife conservation activities (Figure 4b). The study found out that there were no community-based conservation programs established around Rimoi National

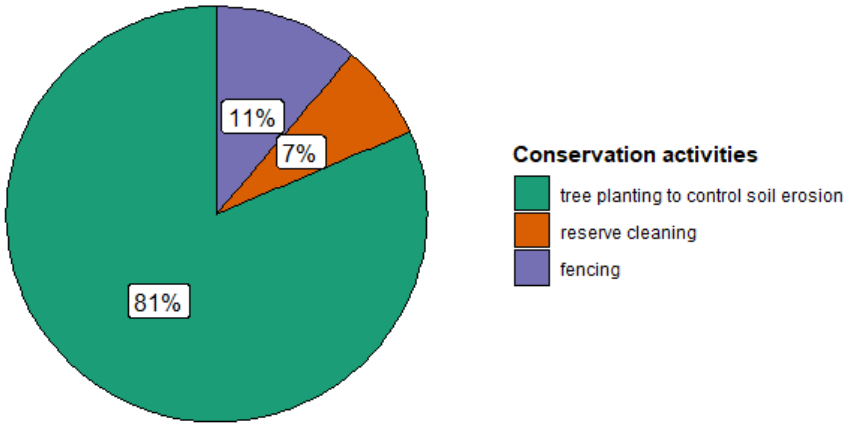

Fig. 4a Conservation activities in Rimoi National Reserve which involve local residents

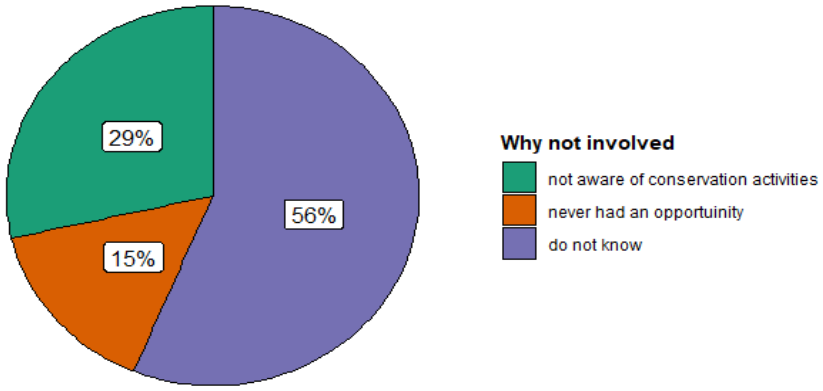

Fig. 4b Opinions why respondents are not involved in conservation activities in Rimoi National Reserve

Influence of socio-demographic factors on local residents' attitudes and perceptions towards wildlife conservation in Rimoi National ReserveEducation, forms of land use and period of residence influenced local

respondents' attitudes and perceptions towards wildlife conservation in Rimoi National Reserve. Results further revealed that education ($\chi2=61.423$, df=4, $p<0.001$), forms of land use ($\chi2=18.627$, df=4, $p=0.001$) and period of residence ($\chi2=11.908$, df=3, $p=0.008$) had a significant difference with the respondents' level of agreement that Rimoi National Reserve is a useful resource as shown in Table 1. All local residents who had attained tertiary and university level of education (100%) strongly agreed that Rimoi National Reserve is a useful resource. Over half (58%), who had attained primary level education agreed with the statement that Rimoi National Reserve is a useful resource while 46% of those who indicated that they strongly disagreed with the statement did not have any form of formal education. Lastly, while 50% of the respondents who practiced livestock keeping disagreed with the statement that Rimoi National Reserve is a useful resource, 40% of the respondents who practiced pure agriculture strongly disagreed, and only 17% of the livestock keepers strongly agreed with the statement. Shorter-term local residents agreed more than the longer-term residents that Rimoi National Reserve is a useful resource. Eighty seven percent of the respondents who had resided in Rimoi area for 5-10 years agreed that Rimoi National Reserve is a useful resource, while 57% of those who had resided for 11-16 years agreed with the statement. Of the residents who had stayed for more than 25 years, 51% agreed that Rimoi National Reserve is a useful resource (Table 2).

Table 1 Results on respondents' views whether Rimoi National Reserve is a useful resource across socio-demographic characteristics

Variable	Chi.sq value	DF	P
Gender	2.869	1	0.090
Age	2.656	4	0.620
Education	61.423	4	<0.001
Occupation	4.835	2	0.090
Residence	1.031	1	0.310
Residence period	11.908	3	0.008
Forms of land use	18.627	4	0.001

Note: Significant p values <0.05 are indicated in bold

Table 2 The influence of education, forms of land use and period of residence on the respondents' response on whether RNR was a useful resource

Variable	Category	Is RNR Useful Resource?				
		Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
Education	None	4	21	4	25	46
	Primary	9	58	0	6	27
	Secondary	37	22	2	22	17
	Post secondary	100	0	0	0	0
	University	100	0	0	0	0
Forms of Land use	Agriculture	30	26	0	5	40

	Bee keeping	0	0	0	67	33
	Livestock keeping	33	17	0	50	0
	Mixed farming	35	31	2	18	14
	Others	0	0	0	0	100
Period of Residence	5-10 years	88	12	0	0	0
	11-15 years	57	43	0	0	0
	16-20 years	27	27	6	15	24
	> 25 years	25	26	0	20	29

From the results in table 3 below, the level of education had a significant influence on the respondent's level of agreement that life could have been better if Rimoi National Reserve was not there ($\chi 2=86.554$, df=4, $p<0.001$). Respondents who had not attained formal education strongly agreed (35.7%) that their lives could have been better if Rimoi National Reserve was not there while those who had attained secondary education (59.3%) strongly disagreed with the statement (Table 4). Further, respondents without formal education preferred the reserve be converted into farming land since it was fertile.

Table 3 Results of respondents' views on the statement that life could have been better if Rimoi National Reserve was not there across respondents' socio-demographic characteristics

Variable	Chi.sq value	DF	P
Education level	86.554	4	<0.001
Forms of land use	16.035	4	0.003
Gender	3.203	1	0.070
Occupation	9.516	2	0.010
Period of residence	18.491	3	<0.001
Distance from reserve	8.863	4	0.060

Note: Significant p values <0.05 are indicated in bold

Table 4 The influence of education, forms of land use, period of residence and occupation on the respondents' response on whether life could have been better if RNR was not there

Variable	Category	Could life have been better if RNR was not there?				
		Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
Education	None	35.7	7.1	14.3	21.4	21.4
	Primary	48.5	0	0	33.3	18.2

	Secondary	13.6	3.4	6.8	16.9	59.3
	Post secondary	0	0	0	70.0	30.0
	University	44.4	0	11.1	0	44.4
Forms of Land use	Agriculture	48.8	4.7	4.7	30.2	11.6
	Bee keeping	33.3	0	0	0	66.6
	Livestock keeping	0	0	16.6	0	83.3
	Mixed farming	16.5	2.4	7.1	24.7	49.4
	Others	100	0	0	0	0
Period of Residence	5-10 years	0	0	0	25.0	75.0
	11-15 years	28.6	14.3	7.1	21.4	28.6
	16-20 years	39.4	0	3.0	39.4	18.2
	> 25 years	25.0	2.4	8.3	19.0	45.2
Occupation	Employed	23.5	0	23.5	41.2	11.8
	Un-employed	32.2	4.6	5.7	18.4	39.1
	Self-employed	17.1	0	0	31.4	51.4

Forms of land use had a significant effect on the respondent's level of agreement that life could have been better if Rimoi National Reserve was not there ($\chi 2=16.035$, df=4, p=0.003) (Table 3). In cross tabulation with various forms of land use, majority of those who strongly agreed with the statement that life could be better if Rimoi National Reserve was not there practiced pure agriculture (48.8%), while 11.6% strongly disagreed with the statement. Whereas 16.5% of those who practiced mixed farming strongly agreed with the statement alluded above, 49.4% strongly disagreed with the same statement (Table 4).

The period of residence had a significant influence on the respondent's level of agreement that life could have been better if Rimoi National Reserve was not there ($\chi 2=18.491$, df=3, p<0.001) (Table 3), with those who had lived for a shorter period around Rimoi National Reserve disagreeing more than those who had lived there for a longer period. Of the respondents who had lived around Rimoi National Reserve for 5-10 years, 75% strongly disagreed with the statement that their lives could have been better if the reserve was not there (Table 4).

Over forty percent (41.2%) of those that had formal employment disagreed with the same statement alluded to above while the majority 51.4% of those who were self-employed strongly disagreed that their lives could have been better without the existence of the reserve. The majority (57.5%) of the unemployed respondents disagreed with the statement that their lives could have been better if Rimoi National Reserve was not established, while 36.8% of the unemployed respondents felt that Rimoi National Reserve should not have been established due to the Human Wildlife Conflicts (HWCs) they experienced (Table 4). The unemployed respondents also felt that the authorities were more concerned with wildlife than human welfare.

Influence of benefits accrued on local residents' attitudes and perceptions towards wildlife conservation
Slightly over 50% of the respondents (51.1%) strongly disagreed with the statement that money from Rimoi

National Reserve has helped many schools in the study area followed by 16.5% who disagreed with the statement leading to a significant difference between responses ($\chi 2$= 87.01, df=4, P <0.001) (Table 3). Eighty-three (59.7%) respondents strongly disagreed with the statement that many students around Rimoi National Reserve have benefited from scholarships through wildlife conservation in Rimoi National Reserve compared to those who strongly agreed (2.9%) while (9.4%) were not sure and these responses were significantly different ($\chi 2$= 155, df=4, P <0.001) (Table 3).

Regarding the statement that wildlife conservation has provided employment to local residents, 58 respondents (41.7%) strongly disagreed while 26(18.7%) strongly agreed, leading to a significant difference between those who agreed and those who disagreed with the statement given ($\chi 2$= 43.48, df=4, p<0.001) (Table 3). Findings from Key Informant Interviews and Focus Group Discussions revealed that local residents felt that they were given a low deal on employment opportunities. They expressed dissatisfaction with the fact that Rimoi National Reserve management comprises of people whose origin is from outside Rimoi.

Eighty-two respondents (59.0%) strongly disagreed with the statement that money from Rimoi National Reserve has helped develop health facilities around Rimoi National Reserve, followed by those who disagreed (24.5%) leading to a significant difference between those who agreed and those who disagreed with the statement given ($\chi 2$= 150.96, df=4, P <0.001) (Table 3).

Table 3 Benefits that accrue to the local community from wildlife conservation in Rimoi National Reserve

Statement	Strongly agree		Agree		Not sure		Disagree		Strongly disagree	
	F	%F	F	%F	F	%F	F	%F	F	%F
Money from RNR has helped many schools in this area.	10	7.2	17	12.2	18	12.9	23	16.5	71	51.1
Many students around RNR have benefited from scholarships from wildlife conservation in RNR.	4	2.9	6	4.3	13	9.4	33	23.7	83	59.7
Wildlife conservation has provided employment to local residents.	18	12.9	26	18.7	22	15.8	15	10.8	58	41.7
Money from RNR has helped develop health facilities around RNR.	6	4.3	8	5.8	9	6.5	34	24.5	82	59.0

Effects of problematic wild animals on attitudes and perceptions towards wildlife conservation

Most of the respondents (65.5%) pointed out that wild animals were problematic, 30.2% disagreed with the statement and 4.3% were undecided (Figure 5). Most of those who regarded wild animals as problematic constituted those that had their homesteads and farms close to Rimoi National Reserve boundary and those that lived along the elephant migratory corridor.

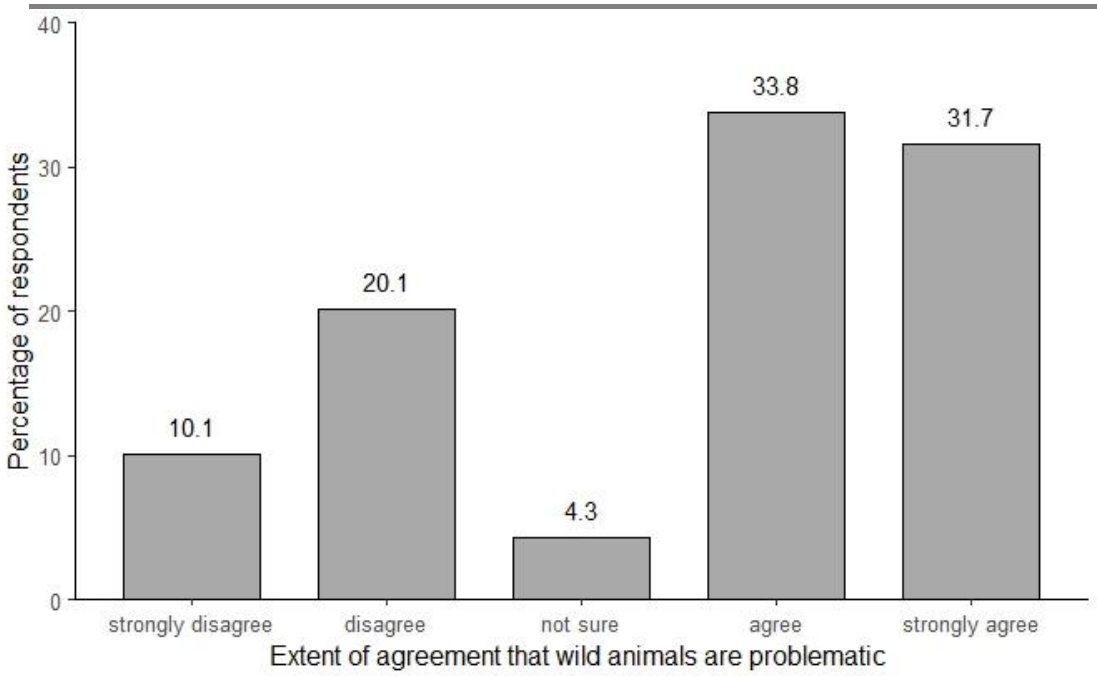

Fig. 5 Respondents' opinions on response to the statement that wild animals around Rimoi National Reserve are problematic

Forty seven percent of the respondents pointed out that elephants are the most problematic wild animals in Rimoi National Reserve followed by baboons (21%), monkeys (16%), hyenas (12%) and crocodiles (2%) (Figure 6). The responses differed significantly ($\chi 2=119.26$, df =5, $p<0.001$).

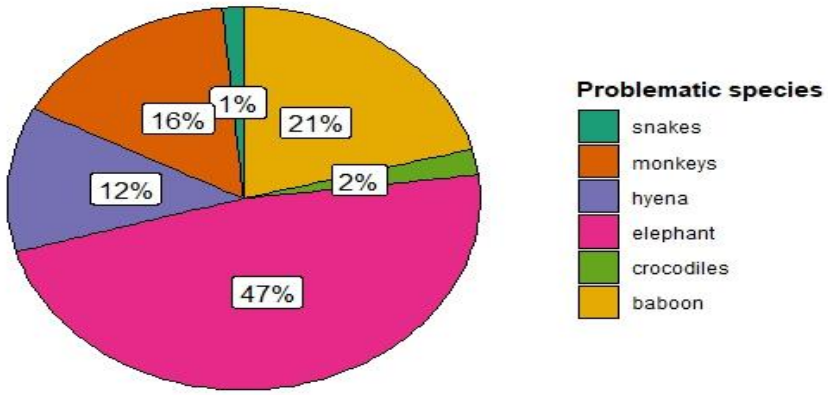

Fig. 6 The most problematic wildlife animals in Rimoi National Reserve

Regarding the question on how often respondents encountered wildlife around Rimoi National Reserve, 41.7% indicated very often, 18.7% stated always, 17% stated sometimes, 15.1% indicated that they had never encountered wildlife with the least (7%) stating rarely (Table 4). These responses were significantly different ($\chi 2=33.46$, df =4, $p<0.001$)).

Regarding the question on where the respondents encountered wild animals around Rimoi National Reserve, 49% stated on their farmlands, 36% indicated in the nearby bushes, while 12% indicated along the roads (Table 4). The majority (56%) of the respondents indicated that their encounter with wild animals was frightening, while 27% indicated that it was exciting (Table 4). The responses differed significantly ($\chi 2=54.44$, df =3, $p<0.001$). The respondents felt that the presence of wild animals posed a danger to their lives.

Table 4 Respondents' encounter with wildlife around Rimoi conservation area

Statement	Category	F	% F	Chi. sq
How often have you encountered wild animals in this area?	Never	21	15	$\chi2$=33.46,
	Rarely	10	7	
	Some times	24	17	df=4,
	very often	58	42	
	Always	26	19	p=0.001
	Total	139	100	
What was your experience during the encounter?	bad	9	7	$\chi2$=103.95,
	exciting	34	27	
	frightening	71	56	df=4,
	normal	8	6	
	very bad	4	3	p<0.001
	Total	126	100	
Where did you encounter the wild animals?	Near homestead	4	3	$\chi2$=54.44,
	Bushes	46	36	df=3,
	Farmland	63	49	
	Roadside	15	12	p<0.001
	Total	128	100	

Effects of illegal activities on attitudes and perceptions towards wildlife conservation

There was a significant difference in responses pertaining to illegal activities taking place in Rimoi National Reserve ($\chi2$= 50.60, df=6, p<0.001). Logging for construction posts and sale (28.1%), charcoal burning (25.2%) and fuel wood collection and sale (15.8%) were the major illegal activities carried out around Rimoi National Reserve (Figure 7).

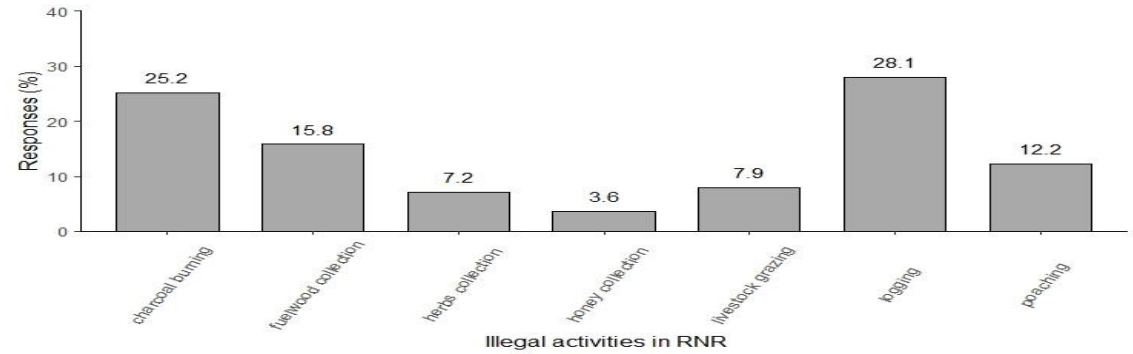

Fig. 7 Illegal activities taking place in Rimoi Conservation Area

Relationship between local residents and the Kenya Wildlife Service staff and its influence on attitudes and perceptions towards wildlife conservation.

A small proportion of respondents (28.1%) described their relationship with the Kenya Wildlife Service staff as good, followed by 25.9% who were not sure, 19.4% indicated that it was bad and 17.3% reported very bad (Table 5). The responses however, differed significantly ($\chi 2=11.045$, df=4, p=0.03). Most of the respondents (65%) stated that they had never had a confrontation with Kenya Wildlife Service officials which was significantly higher than those who indicated they had ($\chi^2=87.42$, df=2, $p<0.001$) with crop damage by wildlife (47%) being the significant cause of their confrontation ($\chi 2=31.13$, df =5, $p<0.001$). Other causes of confrontation included charcoal burning (16%), trespass (13%), logging (11%), livestock attack (9%) and firewood collection (4%).

Table 5 Local residents' relationship with Kenya Wildlife Service officials

Statement	Category	F	%F	Chi. Square value
How do you describe your relationship with KWS staff?	Very bad	24	17.3	$\chi 2 =11.04$, df = 4, p = 0.03
	Bad	27	19.4	
	Not sure	36	25.9	
	Good	39	28.1	
	Very good	13	9.4	
	Total	139	100	
Have you ever had a confrontation with KWS staff?	No	91	65	$\chi 2 =87.42$, df = 3, p < 0.001
	Yes	47	34	
	No response	1	1	
	Total	139	100	
What was the cause of confrontation.	Charcoal burning	7	16	$\chi 2 =31.13$, df = 5, p < 0.001
	Logging	5	11	
	Trespass	6	13	
	Livestock attack	4	9	
	Fire wood collection	2	4	
	Crop damage	21	47	
	Total	45	100	

DISCUSSION

Attitudes and perceptions towards conservation

This study established that Rimoi National Reserve is seen as a useful resource by the local communities, despite the restrictions to the locals brought about by the designation of national reserve. This could be due to the benefits derived from the reserve such as firewood and herbs collection, ecological value, increased

business opportunity derived from tourism activities as well as employment among others. These research findings concur with those of Ellis et al., (2017) and Barthwal & Mathur (2012) who reported about local community access to benefits from conservation directly or indirectly through ecological, socio-cultural, and economic benefits among others. Despite this, the local community living around Rimoi National Reserve did not appreciate indirect benefits linked to natural resources such as ecological benefits probably due to lack of awareness coupled with high levels of poverty. Similar observations have been made about other communities living adjacent to protected areas.

This study established that wildlife in Rimoi National Reserve is perceived as problematic by the local residents. This could be attributed to crop raids, livestock attacks, and property damage by wildlife around Rimoi National Reserve. During the Focus group discussions, participants reported that farmers around Rimoi National Reserve incur great losses due to crop damage by wildlife. Crops such as maize, bananas, sorghum, millet, paw-paws, mangoes, tomatoes and other fruits, which are cultivated in most farms around Rimoi National Reserve are known to attract wild animals. More often, wild animals stray from Rimoi National Reserve and invade neighbouring farms causing great damage to crops. Despite the presence of an electric fence small animals such as baboons, monkeys, squirrels, and hares often manoeuvre through them. The elephants which cause the greatest damage to crops around Rimoi National Reserve, stray through the unfenced part of Rimoi National Reserve to the adjacent farms. The instances of farm invasion by wild animals around Rimoi National Reserve are most reported during the dry season when water and food resources scarcity intensifies. The local community around Rimoi National Reserve expressed a willingness to support wildlife conservation in Rimoi National Reserve despite the problems caused by wildlife in the area. This study also established that the local community around Rimoi National Reserve is not involved in conservation programs, thus making the local community to lack a sense of ownership and responsibility for wildlife in Rimoi National Reserve.

Influence of socio-demographic factors on local residents' attitudes and perceptions towards wildlife conservation

From the results, it was established that forms of land use, occupation, periods of residence and education level of the respondents influenced their attitudes and perceptions towards wildlife conservation. Respondents who had stayed around Rimoi National Reserve for more than 10 years expressed more positive attitudes towards wildlife and wildlife conservation in Rimoi National Reserve than those who had stayed for a shorter period. The reasons for this were not clear but could be related with greater cultural attachment and more resource utilization by longer-term residents than shorter-term residents.

On occupation, employed local residents showed more positive attitudes towards wildlife conservation than those who were unemployed. This can be attributed to the fact that employed residents are most likely to be more educated than those who are unemployed, thus, more likely to appreciate wildlife and wildlife conservation due to exposure. Unemployed local residents are more likely to be involved in charcoal production, logging, firewood collection, game hunting among other illegal activities than employed local residents. These exposes unemployed residents to more HWCs than employed residents.

Local residents who had acquired formal education showed more positive attitudes towards wildlife and wildlife conservation than those who had no formal education. This can be attributed to the fact that educated individuals can link wildlife conservation with both direct and indirect benefits that accrue from wildlife. Individuals without formal education tend to link conservation more to direct benefits. Environmental or conservation education provides learners with the opportunity to gain an awareness or sensitivity to the environment, knowledge and experience of the problems surrounding their environment, a set of values and positive attitudes, to obtain the skills required to identify and solve environmental problems and, the motivation and ability to participate (Howe, 2009). Both formal and non-formal aspects of education are critical for achieving sustainable development.

This agrees with the findings of Megaze, et al., (2017) and Sitati et al., (2003) who argued that specific factors that affect respondents' attitudes and perceptions include: social-economic and demographic characteristics of

people like age which influence the way people think; ethnicity, religion, place of residence in relation to a protected area, duration/period or length of residency, membership in conservation organizations, participation in conservation activities, type of training for example natural resources or wildlife based, past experiences for example human-wildlife conflict, relocation to create room for protected areas (PA), denial of access to traditional resources locked in PA or denial of ownership rights, and access to benefits.

As Ebua et al., (2011) puts it, when people are denied benefits and access from natural resources, they develop negative attitudes and engage in activities that are detrimental to conservation thus making the future of the wildlife uncertain especially for large mammals. Most local residents living adjacent to Rimoi National Reserve are small scale farmers, practicing mixed farming mainly for subsistence. Thus, the major crops grown near Rimoi National Reserve boundary such as maize, sorghum, millet, bananas and fruits have compounded human-wildlife conflicts in Rimoi conservation area.

The influence of benefits on attitudes and perceptions towards conservation

The amount and type of benefits received is a factor which influences the attitudes and perceptions of local people towards wildlife conservation (Msigwa et al., 2023). Local residents getting good benefits are more likely to have positive attitudes and perceptions, and poor benefits are more likely to have negative or antagonistic attitudes towards conservation, protected areas and their wildlife (Munaw 2023). The perceived benefits and a sense of ownership are critical determinants of the success of the management and conservation of protected ecosystems (Simasiku et al., 2024). For example, the majority of the respondents strongly disagreed that money from the reserve has helped local residents in the area through scholarships, development of health facilities, construction of infrastructure and other social amenities as well as provision of employment to local residents. From results of focus group discussions that were conducted, it was pointed out that only two out of the more than nine public schools in the area have benefited from funds arising from wildlife conservation in Rimoi National Reserve. This corroborates with findings of McManus et al, (2015) and Wright (2023) that many local people around conservation areas do not receive benefits and yet they bear the costs of living with wildlife.

It has been reported that a rapid decline of wildlife has been noted in areas where benefits have not accrued to the local community (Norton-Griffiths, 2000; Deryabina et al., 2015; Western & Kamanga, 2015; Selemani, 2020). This is because the community tries to engage in other land-use practices that are not only detrimental to wildlife population, but also result in increased conflicts which derails conservation efforts (Masiaine et al., 2020). Most local residents adjacent to Rimoi National Reserve are small scale farmers, practicing mixed farming mainly for subsistence. Findings of this study have shown that by denying people benefits and access to natural resources, they develop negative attitudes and engage in activities that are harmful to conservation, which concurs with other documented results (Mutanga et al., 2015; Ghaderi et al., 2022; Mutanga, 2022; Matanzima & Marowa, 2022). This leads to uncertainty in conservation especially of large mammals like elephants and a sharp decline of wildlife populations outside protected areas.

Influence of problematic wild animals on attitudes and perceptions towards wildlife conservation

Research findings indicates that elephants, baboons, hyenas and monkeys were the most problematic wild animals in the area. A significantly higher proportion of respondents indicating that elephants were the most problematic wildlife species around Rimoi National Reserve could be due to several reasons. Elephants are known to cause massive destruction of property such as water pipes, water tanks and fences and also cause great damage to crops when they invade farms (De Silva & Gunasekara, 2024).

During the focus group discussions, respondents pointed out that in one instance, elephants raided and wiped out a whole banana and paw-paw plantation around Rimoi National Reserve. This forced the community to demonstrate in a bid to capture the attention of the authorities to have the elephants driven back to the reserve. When elephants raid the villages, the normal routine of the people is distracted. People will not attend to their businesses as usual and children stop going to schools fearing an attack by the elephants. Results concur with that of De Boer & Baquete (1998), Boast (2014) and Usman et al. (2023) who reported that local people incur losses and spend huge amounts of money in repairing damages caused by wild animals like elephants,

baboons, hippopotamus, mongoose and guinea fowl around conservation areas. Baboons are known to destroy house roofs and plastic water tanks and are a great nuisance as they trample on house roofs (Kariuki, 2013; Kansky et al., 2021). Incurring of costs always suffocates conservation efforts amongst people especially those who suffer from direct agricultural losses, property destruction and human injury (Katswera et al., 2025).

Rimoi National Reserve is partially fenced off leaving a migratory corridor to the north for elephants. Electric fencing is an intervention that is thought to be highly effective in mitigating human-wildlife conflicts as reported by Ferguson and Hanks (2010). Despite the presence of an electric fence, baboons are able to jump over or pass under the fence and invade the farms that are close to the park boundary causing major losses (Kariuki, 2013). The electric fence, however, is effective in minimizing losses as most large mammals are barred from moving out of the park. Despite this, the effectiveness of fences as a conflict mitigation measure, with a view to changing local people by Nyhus et al., (2005) who argues that the solution is limited because animals like elephants and baboons are known to go through the electrified fences causing havoc to farms (Kariuki, 2013).

Besides this, elephants are known to stray, through the unfenced migratory corridor, and find their way to farms, destroy crops and cause damage to property. This leads to heightened negative attitudes and perceptions by the local community towards wildlife due to the cost they bear as a result of living close to a wildlife protected area. Some communities resort in killing wild animals by spearing, snaring or poisoning them which also strains the relationship between the local community and the authorities.

Effects of illegal activities on conservation

Respondents pointed out that there were illegal activities happening in and around Rimoi National Reserve such as logging for timber and construction posts, poaching wild animals for game meat and trophy hunting, charcoal burning, as well as fuel wood collection for sale. Other illegal activities reported include honey collection, livestock grazing and collection of medicinal herbs. People found engaging in illegal activities were punished through imposition of fines, imprisonment and provision of services. Such victims and members of their families were likely to develop negative attitudes toward the reserve and its management. This finding agrees with those of a similar study conducted in Uganda by Katswera et al., (2022) that the hostility shown in the handling of victims illegally found in wildlife-protected areas by the park management negatively impacts on local people's attitudes and perceptions towards the parks and wildlife.

These illegal activities have led to habitat disturbance and destruction and sharp decline of wildlife species in and around Rimoi National Reserve. Some wild animals and birds have become locally extinct such as the leopard from the region. Moreover, the study observed that some of the Kenya Wildlife Service officials managing Rimoi National Reserve had stayed at Rimoi National Reserve for more than 3 years. The long stay could have caused too much familiarity with the environment and local residents consequently leading them to compromise on the conservation agenda.

Effect of relationship of local residents with Kenya Wildlife Service staff on attitudes and perceptions towards conservation

Findings of the study showed mixed reactions concerning the relationship between local residents and Kenya Wildlife Service staff managing Rimoi National Reserve. A good proportion of respondents was not sure how to describe their relationship with Kenya Wildlife Service officials. Residents who had experienced a confrontation with the Rimoi National Reserve managers expressed negative attitudes towards the park and its wildlife, unlike those who had not. During focus group discussions, participants pointed out that some of the Kenya Wildlife Service officials colluded with residents to carry out illegal activities such as logging and charcoal production. Probably this explains the existence of a seemingly balanced good-bad relationship between the Kenya Wildlife Service officials and the local residents.

The foregoing study findings agree with other studies among them Katikiro et al (2015), Hill et al (2015) and Zhang et al (2023) that park managers are hostile to the local people and that this has hindered local people's participation in wildlife conservation. The alleged harassment by park officials has resulted to local residents in being made to be very disenchanted about the value of the park and its wildlife. The negative relationship

increases intensity when wild animals invade farms, kill livestock and destroy their properties (Hill et al., 2015; Gulte et al., 2023). The hostility is further heightened especially if the conflict involves human injury or death.

More often the Park Authority misconstrues the chasing away of wild animals as harassing the wild animals and the authorities become very hostile to the local people (Moreto et al., 2016). This in turn aggravates the local residents' negative attitude. As pointed by Mutanga et al (2016) the relationship between the local people and wildlife conservation is depicted through behaviour, decisions, practices and actions. Whereas the reserve management may actually mean well by enforcing law, there is need to treat the local residents fairly and with respect, as they are key stakeholders in conservation and tourism development, thus promoting human-wildlife co-existence.

In some of the sampled locations Rimoi National Reserve staff managers were regarded as foreigners who were not only controlling the use of natural resources, but also enjoying the resources at the expense of the local residents. Resentment from the local residents increased when human-wildlife conflicts arose and the reserve managers failed to address them appropriately. As Gulte et al., (2023) puts it, the success of conservation programs through protected areas may depend on the ability of park managers to pacify biodiversity conservation goals with social and economic issues and to promote greater compliance of local communities with protected areas' conservation strategies.

CONCLUSION

This paper has examined determinants of attitudes and perceptions of local residents towards wildlife and wildlife conservation in RNR. The study established that socio-demographic factors particularly education level, occupation, period of residence and forms of land use influenced local residents' attitudes and perceptions towards wildlife conservation. Likewise, access to opportunities, benefit sharing and community involvement in conservation programs and decision making greatly shaped perceptions. Based on the results, it is evident that as much as the residents have innate love for wildlife, they could be disgruntled due to the cost they bear as a result of living in close proximity to the reserve, lack of benefit-sharing coupled with poor relationship with conservation officials.

Wild animals compete daily with the local community over resources and livelihoods. Poverty and lack of awareness are formidable enemies to wildlife and conservation of natural resources. A poor population adjacent to protected areas pose many challenges including unregulated exploitation of resources, engagement in illegal activities and other practices that may not be in tandem with conservation. Mitigating these challenges, requires innovative and proactive approaches (Mogomotsi et al., 2020). These include the presentation and documentation of traditional knowledge, an idea that is mostly neglected by many conservation programs.

For sustainable wildlife conservation, not only there is need to understand how people perceive and interact with their environment but also incorporate traditional knowledge in conservation programs. Park management and conservation crusaders need to focus on community livelihood improvement, economic empowerment, promotion of conservation education and awareness, and involvement of local residents in conservation programs to improve attitudes and perceptions towards wildlife conservation and protected areas.

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Ethics Statement

This research was done following clearance from the University of Eldoret, Kenya Wildlife Service (Elgeyo-Marakwet office), and local chiefs. Before administering the questionnaires, participants filled consent forms to permit their information to be used. Verbal consent was also sought from key informants and locals that participated in focus group discussions. All participants were assured of anonymity and confidentiality.

Clinical Trial Number

This declaration is not applicable.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare no competing interests.

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