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Characterisation of Human-Wildlife Conflicts around the Kahuzi-Biega National Park, Eastern Democratic Republic of Congo

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Abstract

The history of mankind contains so many illustrations of well-classified and violent struggles against various animals over crop production in agricultural fields, attacks on human life or competition in order to have access to certain natural resources. The aim of this study is to characterise the human-wildlife conflicts that occur around the KBNP, especially with regard to primates. Surveys were carried out in 260 households selected using the snowball method. The results showed that human-wildlife conflicts around the KBNP are characterised by the destruction of crops in riparian fields by monkeys, chimpanzees and gorillas, the destruction of houses, physical attacks and zoonoses. Despite the conservation and protection measures for wildlife and local populations put in place by the Park's managers, conflicts between local populations and the Park's wild animals are still visible. These conflicts lead to the detention of wild animals by local people roaming in the villages and to poaching on the Park's boundaries. The weakness of the community management policy on the part of the park managers and the resentment of the indigenous peoples towards the restriction of their access to natural resources are the major constraints on the sustainable management of conflicts between the local populations and the wild animals in the KBNP. The strategies for the sustainable resolution of human-wildlife conflicts around the KBNP must be geared towards and integrated into a community conservation approach.

Keywords

Community Conservation, Human-Wildlife Conflict, Kahuzi-Biega National

Park

1. Introduction

The cohabitation between man and wildlife has always been conflictual, due to the occupation of land and access to natural resources caused by demographic growth in several African countries. People are occupying animal habitats around protected areas, and some farming activities are even taking place around natural parks. This puts them at risk, as they are attacked to the point of being injured or even killed by wild animals, not to mention the fields ravaged by these animals [1]. This situation is hardly sparing Africa, and is now a growing problem for conservationists [2] [3] [4].

However, these conflicts differ in their characteristics and often result in the loss of biodiversity and a significant deterioration in the well-being of animals and people [5]. One of the major challenges of protected area management in Africa in general, and in the DRC in particular, is to respect the integrity of these areas, which are located in the middle of zones occupied by human activities [6] [7]. Despite the rich biodiversity of the Kahuzi-Biega National Park (KBNP) [8] [9], they are faced with numerous problems related to the protection and conservation of the natural resources they contain.

By virtue of its location, the KBNP is situated in one of the country's most densely populated regions, with the majority of the population living in poverty and in close contact with this ecosystem [10]. It covers three provinces, including South Kivu (where most of the park is located, with a population of around 5,722,000 inhabitants), North Kivu and Maniema. In South Kivu, the KBNP includes the territories of Kabare, Kalehe, Walungu, in its high-altitude part, and Mwenga and Shabunda in the low altitude [10]. This situation exposes the park to heavy pressure on its natural resources through agriculture, livestock farming, NTFP harvesting, illegal hunting (poaching) and the illegal trade of primates and elephants, the cutting of firewood and the clearing of land to build houses in the park [11] [12] [13]. This disrupts the well-being of these wild animals in their natural environment. In the villages bordering the park, wild animals such as primates (chimpanzees, Cercopithecines, gorillas, etc.) and elephants sometimes move in from the forest, bringing them into serious conflict with the local population. Deciding whether to ignore or resolve these conflicts is therefore a key issue for managers of protected areas and wildlife.

These conflicts are generally characterised on one hand by the destruction of crops in communal fields, storage tanks and other properties of people living near protected areas by elephants, primates and carnivores to satisfy their needs [14]. For revenge reasons, field owners attack and kill certain animals that come to destroy their crops. On the other hand, due to poor management in many protected areas, wild animals are exposed to illegal exploitation by poachers

(hunters) in search of a livelihood through the illicit trade in live animals or some of their organs of particular value to human societies such as ivory, skin, internal organs, etc., leading to wildlife crime [11] [15].

In-depth knowledge of human-wildlife conflicts around the KBNP remains of great importance. Most studies focused on savannah elephants, *Loxodonta africana*, and large carnivores in the southern and eastern African savannahs [2] and on primates and hippopotamuses in the forests and savannahs of Central Africa [14] [16] [17] [18].

Several mechanisms for transforming human-wildlife conflicts have been developed in the DRC to transcend these conflicts, but these mechanisms are proving ineffective given the resistance of these conflicts. Park managers are faced with exponential population growth in the surrounding communities, particularly among farmers, who see the plundering of crops as a major reason for opposing protected areas and wildlife conservation. This cause of direct conflict with human populations brings negative impacts on livelihoods that could undermine current conservation efforts through a lack of support for conservation strategies and an inability to enforce existing wildlife and protected area laws [19]. The conservation-sensitive conflict resolution approach was developed by the International Institute for Sustainable Development (IISD) and piloted in protected areas by the Wildlife Conservation Society in the DRC. Unfortunately, this approach did not take into account the reality of human-wildlife conflicts experienced by people living around the KBNP [20].

The aim of this study is to contribute to the sustainable management of wildlife in the KBNP by characterising the human-wildlife conflicts that occur around the KBNP, especially with regard to primates. Specifically, the aim was to identify the types of threat posed by wild animals to households living near the KBNP, to determine the impact of these threats on the daily lives of households, and to analyse the constraints of the measures put in place by KBNP managers to manage human-wildlife conflicts.

2. Methodology

2.1. Study Area

This study was carried out in eight villages in three high-altitude areas of the Kahuzi-Biega National Park (KBNP) in February 2023. The villages were chosen on the basis of their proximity to the park, the population's dependence on the park's forest resources and the presence of victims of threats in neighbouring villages. The villages were Chombo, Kafulumae and Kamakombe in Kabare territory, Bitale Kanigi and Bushaku in Kalehe territory and Cirarangwa and Kaniola in Walungu territory (**Figure 1**). The snowball method enabled us to select 260 households for this study.

2.2. Data Collection

The information was collected using survey questionnaires incorporated into

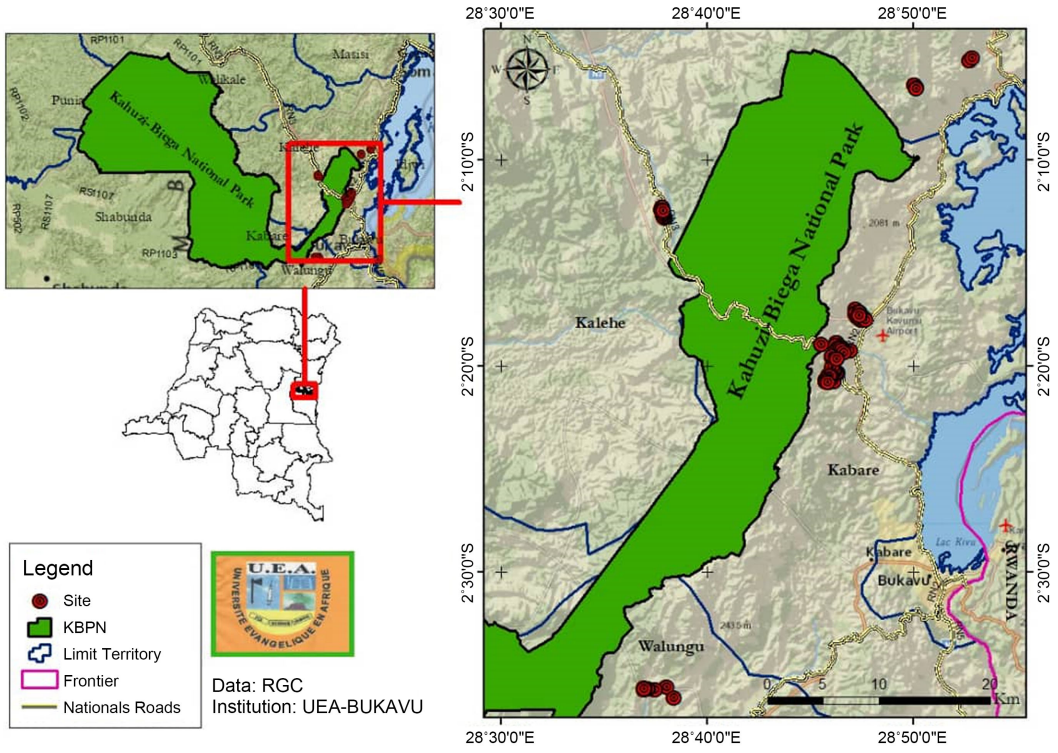

Figure 1. Location map of the study area.

kobocollect. These questionnaires were submitted directly to the population living near the KBNP for primary data collection. These were mainly people who had suffered direct and/or indirect aggression/damage from wild animals in the KBNP. The survey questionnaire was accompanied by an interview guide addressed to park managers, KBNP eco-guards, village chiefs and leaders of local biodiversity conservation organisations in the respective villages [12] [20]. The data covered the socio-economic characteristics of the respondents, the types of threats caused by wild animals in the KBNP that local people face, their repercussions on household income, social, political, legal levels, and the mechanisms put in place by managers to transform human-wildlife conflicts around the Kahuzi-Biega National Park.

2.3. Data Processing and Analysis

Descriptive analysis, using R software coupled with Excel, were used to determine frequencies and standard deviations in order to elucidate the socio-economic characteristics of households and the extent of the threats posed by wildlife to the riparian population. The comparison tests were used in R software to explain the differences observed in the variables [21]. Qualitative analyses based on the respondents' accounts enabled us to determine the effectiveness of the measures put in place by park managers to manage human-wildlife conflicts, and the role of local riparian population in this management method.

3. Presentation and Discussion of Results

3.1. Results

3.1.1. Socio-Demographic Characteristics

Table 1 shows the socio-economic characteristics of people surveyed in the various villages covered by this study.

Table 1. Socio-economic characteristics of respondents.

Variables		Kabare			Kalehe			Walungu		p-Value
		Chombo	Kamakombe	Kafulumaye	Bitale	Kanigi	Bushaku	Kaniola	Cirarangwa	
Population	Aboriginal	95%	72%	33%	69%	95%	100%	98%	60%	*<0.001*
	Bantu	2.5%	28%	67%	31%	5%	0%	2%	40%	
	Nilotic	2.5%	0%	0%	0%	0%	0%	0%	0%	
Age		39.0 ± 12.1	45.3 ± 12.9	45.9 ± 14.9	30.9 ± 9.48	30.9 ± 8.38	35.1 ± 5.90	46.4 ± 13.9	48.0 ± 10.6	-
Distance between home and park (hours)		0.67 ± 0.39	0.08 ± 0.027	1.26 ± 0.539	1.86 ± 0.599	1.99 ± 0.472	1.20 ± 0.398	0.45 ± 0.16	3.00 ± 1.41	-
Household size		8.32 ± 2.94	6.94 ± 2.54	10.5 ± 4.14	6.58 ± 2.78	7.95 ± 2.04	7.50 ± 2.15	6.90 ± 2.11	6.60 ± 1.52	•
Study level	None	72%	9.4%	49%	31%	55%	59%	2.5%	80%	*<0.001*
	Primary	18%	50%	40%	27%	40%	36%	38%	20%	
	Secondary	7.5%	34%	9.3%	38%	5%	4.5%	55%	0%	
	University	0%	3.1%	0%	4.4%	0%	0%	5%	0%	
	Professional training	2.5%	3.1%	2.3%	0%	0%	0%	0%	0%	
Profession	Farmer	35%	38%	81%	80%	25%	59%	52%	40%	*<0.001*
	Retailer	2.5%	22%	12%	18%	45%	18%	38%	40%	
	Forestry operator	62%	25%	2.3%	2.2%	0%	0%	5%	20%	
	Hunter	0%	0%	0%	0%	30%	23%	0%	0%	
	Public administration	0%	3.1%	0%	0%	0%	0%	5%	0%	
	Eco-garde	0%	6.2%	2.3%	0%	0%	0%	0%	0%	
Source of income	Agriculture	92%	75%	81%	82%	55%	82%	55%	60%	*<0.001*
	Trade	5%	9.4%	9.3%	8.9%	25%	9.1%	7.5%	0%	
	Breeding	0%	12%	7%	2.2%	0%	0%	25%	40%	
	Hunting	2.5%	0%	0%	2.2%	20%	9.1%	0%	0%	
	Teaching	0%	0%	2.3%	4.4%	0%	0%	7.5%	0%	
	Public administration	0%	3.1%	0%	0%	0%	0%	5%	0%	
House type	Non-durable materials	82%	41%	23%	82%	95%	91%	57%	20%	*<0.001*
	Semi-durable materials	18%	59%	77%	18%	5%	9.1%	25%	80%	
	Sustainable materials	0%	0%	0%	0%	0%	0%	18%	0%	

Based on the criteria of residing around the Kahuzi-Biega National Park, pertaining to the indigenous peoples' community or one of the communities bordering the KBNP, 260 persons were surveyed. Table 1 shows that the majority of respondents were indigenous people, with 95% in Chombo, 72% in Kamakonde and 33% in Kafulumaye in Kabare territory; 69% in Bitale, 95% in Kinigi and 100% in Bushaku in Kalehe territory; and 98% in Kaniola and 60% in Cirarangwa in Walungu territory. However, the highest proportion of Bantus was found in Kafulumaye (67%) in Kabare territory. This population is predominantly young (40 - 45 in Kabare and 30 - 35 in Kalehe). In Walungu, they are mostly older but still have much more physical strength to meet household food needs (45 - 50 years).

The categorisation of resource persons gives enough evidence that the main source of income for the targeted population of this study is agriculture (with an average of 82.6% in Kabare, 73% in Kalehe and 57.5% in Walungu), followed by livestock rearing (32.5% in Walungu, 6.3% in Kabare and 2.2% in Kalehe) and hunting (15.65% in Kalehe and 2.5% in Kabare). Other activities such as trading in goods (14.3% in Kalehe, 7.9% in Kabare and 7.5% in Walungu), teaching (7.5% in Walungu, 4.4% in Kalehe and 2.3% in Kabare) and public administration (5% in Walungu and 3.1 in Kabare) also contribute to household economy. However, these activities do not require in-depth knowledge of any particular discipline, as shown by the respondents' level of education. Many had not attended school (43.46% in Kabare, 48.33% in Kalehe and 41.25% in Walungu), and those who had were limited to either primary school (36% in Kabare, 34.33% in Kalehe and 29% in Walungu) or secondary school (55% in Walungu, 16.93% in Kabare and 15.83% in Kalehe).

Despite the income-generating activities, the means of the respondents are still insufficient to meet the needs of their households, even though the size of the households is not negligible. This inadequacy can be seen in the materials used to build their houses. In Kalehe, most houses are made of non-durable materials (89.33%), compared with 51.33% in Kabare and 52.5% in Walungu, which are made of semi-durable materials. The poverty and/or vulnerability of the population in this area is influenced by a high population density, low soil productivity due to erosion caused by intensive deforestation and the persistence of conflicts [10] [13].

3.1.2. Impact of Threats from Wild Animals on the Population around the Park

1) Types of threats posed by animals to the riparian population

Table 2 shows the types of threat posed by wild animals to people living near the park.

Table 2 shows that people living near the KBNP are threatened by wild animals either directly or indirectly. A significant difference was observed between the distance of respondents' homes with respect to the park and the presence of threats from wild animals, depending on the village ($p < 0.001$). This situation is dictated by the close proximity of the villages to the park, which facilitates the movement of wild animals towards households in riparian villages.

Table 2. Threats on the population from wild animals.

Variables		Kabare			Walungu			Kalehe		p-Value
		Chombo	Kamakombe	Kafulumaye	Bitale	Kanigi	Bushaku	Kaniola	Cirarangwa	
Destruction of agricultural fields (threat to the village)	None	0%	0%	0%	0%	0%	0%	97%	0%	*<0.001*
	Partial loss of crops	50%	78%	17%	100%	100%	100%	0%	100%	
	Total loss of crops	50%	22%	83%	0%	0%	0%	0%	0%	
Animal threats in the village	No	68%	28%	28%	58%	85%	77%	100%	0%	*<0.001*
	Yes	32%	72%	72%	42%	15%	23%	0%	100%	
Direct threat	No	57%	50%	44%	90%	75%	55%	100%	80%	*<0.001*
	Yes	42%	50%	56%	9.5%	25%	45%	0%	20%	
Type of threat	Physical aggression	63%	44%	23%	49%	42%	40%	69%	20%	*<0.001*
	Destruction of fields	19%	56%	77%	43%	58%	60%	31%	80%	
	Zoonoses	11%	0%	2.9%	5.7%	0%	0%	0%	0%	
	Destruction of homes	7.4%	0%	0%	2.9%	0%	0%	0%	0%	

These were physical attacks and zoonoses. The majority of physical assaults were observed in the villages of Chombo in Kabare and Kaniola in Walungu, at 63% and 69% respectively. In Bitale, Kamakombe, KInigi and Bushaku, the figures were 49%, 44%, 42% and 40% respectively; and lower in Kafulumaye and Cirarangwa (23% and 20%). It should be noted that these physical attacks are often accompanied by injuries. Zoonoses are less common. They were observed in Chombo (11%), Bitale (5.7%) and Kafulumaye (2.9%). Threats are identified indirectly through the destruction of crops in people's fields (the most frequent threat), which is often partial, and the destruction of houses. The destruction of crops in people's fields is much more common in the villages of Cirarangwa (80%), Kafulumaye (77%), Busahku (60%), Kanigi (58%) and Kamakombe (56%), causing the victim households to lose income through an average loss of more than 25% of their harvests (tomatoes, groundnuts, maize, etc.).

2) Keeping of wild animals by local people around the KBNP

Table 3 shows the number of people living near the park who keep wild animals.

Table 3 shows that most respondents do not keep wild animals in their homes, and those who do that, it is for feeding. These include primates such as gorillas, monkeys, chimpanzees and cercopithecines; reptiles (snakes) and rodents (woodpeckers). Some of these animals, such as monkeys and snakes, are captured when they wander into villages in the vicinity of the park, as it is the case in Bitale and Cirarangwa, where wild animals go to villages without the inhabitants even coming into direct contact with the park. Chimpanzees are sometimes caught in the vicinity of the park, but are often bought from poachers. Wild swines and cercopithecids are caught in the park.

Table 3. Frequency with which local residents keep wild animals.

Variables		Kabare			Walungu			Kalehe		p-Value
		Chombo	Kamakombe	Kafulumaye	Bitale	Kanigi	Bushaku	Kaniola	Cirarangwa	
Distance between home and park (hours)		0.67 ± 0.39	0.08 ± 0.027	1.26 ± 0.539	1.86 ± 0.599	1.99 ± 0.472	1.20 ± 0.398	0.45 ± 0.16	3.00 ± 1.41	*<0.001*
Frequency of primate encounters in the park/month		40.2 ± 23.6	7.12 ± 10.3	5.19 ± 7.02	1.62 ± 3.74	5.30 ± 3.81	5.18 ± 2.56	0 ± 0	8.00 ± 8.37	-
Frequency of access to the park/month		4.75 ± 10.8	30.8 ± 87.4	13.7 ± 7.35	0 ± 0	0.250 ± 0.444	0.818 ± 0.795	0 ± 0	0 ± 0	-
Direct contact with primate	No	75%	41%	12%	76%	5%	0%	100%	20%	*<0.001*
	Yes	25%	59%	88%	24%	95%	100%	0%	80%	
Keeping primates at home	No	98%	84%	84%	100%	75%	41%	100%	100%	*<0.001*
	Yes	2.5%	16%	16%	0%	25%	59%	0%	0%	
Practicality of the road	No	100%	0%	2.3%	100%	55%	68%	100%	40%	*<0.001*
	Yes	0%	100%	98%	0%	45%	32%	0%	60%	

3) Human-wildlife relation around Kahuzi-Biega National Park

Since the dawn of time, local people had a strong relationship with KBNP forest resources, including the wild animals. However, this relationship is no longer the same, due to the inaccessibility of the park to local population. Though for the pygmy indigenous population, the Park is an ideal environment in supplying them with food, medicines for health care and for increasing their income.

The following quotation proves this point:

"*Our relationship with the animals in the park has changed since we were evicted.*" Interview with a Pygmy in the village of Chombo, Friday 03/02/2023.

3.1.3. Analysis of the Constraints Linked to the Mechanisms for Preventing Threats from Wild Animals around the KBNP

1) Political, legal and socio-economic impacts of the threats

- **Political and legal impacts of the threats**

At the political level, the resource persons demonstrated that there is a weakness in the management policy of the KBNP, given that wild animals often escape the control of the eco-guards and threaten the population in the surrounding area.

"*Animal threats have really increased. If the state could control the places where the wild animals come out, they could be properly managed by the park rangers without harming the population.*" (Interview with Alexis in the village of Kamakonde on 3/02/2023)

To this, the indigenous people add that there is little collaboration between them and the park rangers in stopping threats from wild animals, because the indigenous people consider that they are in better control of the park than anyone else, including the park rangers. A Pygmy added: "*Threats from animals have destabilised the KBNP policy and its partners, as we no longer collaborate*

closely with them. Since we were expelled from the park, there have always been disagreements between us and the government." (Interview with a Pygmy in the village of Chombo, Friday 03/02/2023)

From a legal point of view, there is a reversal of reality within the community living near the park, with regard to the risk of being imprisoned as a result of keeping animals protected by law. For all the people interviewed**,** keeping wild animals in the park entails the risk of imprisonment. People who keep wild animals in their homes are afraid of ending up behind bars because the animals in their possession have been kept illegally. In fact, animals, like all sentient living beings, and the recognition by law of the rights of animals by virtue of their nature is of vital importance.

- **Social and economic impacts of threats**

At a social level, attacks by wild animals on the fields of local residents can be seen as a source of conflict between villagers as a result of the stereotypes associated with these threats. The results of one of the respondents showed that some people think that it is their neighbours who are responsible for destroying their crops, even when it is the animals that cause the destruction, thereby affecting social cohesion within the population. One of the farmers said: "*There are animal species that almost grazed my entire potato field but they didn't get into my neighbour's field. It was afterwards that we found out it was them* (*wild animals*), *my neighbour and I were in conflict for a long time*." (Interview with Benedi Pseudonyme in the village of Kamakombe on Friday 3/02/2023)

As well as destroying crops in farmers' fields, wild animals such as monkeys, chimpanzees and snakes physically threaten the population, causing serious injuries and loss of life. This creates a situation of fear and insecurity within the community surrounding the Park, even leading to people moving to neighbouring villages. As a result, local authorities are accused by the local population of complicity and are attacked instead of the animals. As one Pygmy explained: "*I couldn't move around anymore because I was injured. There were conflicts between these animals and myself because I started trapping them in my field so as to avoid them from coming back to threaten me and ravage my crops*." (Interview with an IP in the village of Bushaku, Friday 3/02/2023) From an economic point of view, there is a certain discouragement on the part of farmers who, after all the effort and energy expended, the animals suddenly come and destroy the crops through which the local communities find satisfaction for their various needs. According to the respondents, this situation affects both household food security and their economic situation. For most individuals, expenditure on care, food and other items is based on the harvest; once the crops have been destroyed, there is a low yield and a drop in household income. A Pygmy hunter said: "*I can no longer find food because these animals have destroyed my field, and I can no longer harvest enough in my field to sell some crops at the market*." (Interview with a Pygmy in the village of Kanigi, Friday 03/02/2023)

As a result of the increase in threats from wild animals around the KBNP, many households have lost their means of subsistence and have not benefited

from the community conservation projects set up by the Park's managers. Damage caused by animals is not compensated by the park [12]. There is also a limit to the human development and livelihoods of local people through information, education, communication and access to infrastructure and various IUCN services [11].

2) Mechanisms for preventing threats from wild animals around the KBNP

To prevent these threats, the International Union for Conservation of Nature (2010) proposes community management of conflicts around protected areas through community conservation of biodiversity as the most appropriate and effective technique for resolving conflicts, including human-wildlife conflicts. This approach advocates increasing the number of staff throughout the conservation network, improving the skills of stakeholders, marking park boundaries and drawing up a management plan for each animal.

Despite the existence of a social contract between the local populations and the managers of the KBNP, the threats from wild animals that occur around the KBNP are sufficient proof that there is a weakness in the community-based conflict management system in the reserve [12].

To overcome this problem, a number of other strategies have been proposed by local people and other communities living near the park to prevent the threat of wild animals causing loss of life, destruction of crops and zoonoses. These include: vaccinating all dangerous animals in the park, moving people away from the KBNP and giving them fields to cultivate, improving security in the KBNP and involving local people in protecting nature. Other measures include compensating indigenous populations for environmental protection, the creation of income-generating activities by the State, making village and plantation areas safe, building houses away from the park, returning Pygmies to the park to control animals, legalising hunting and the keeping of certain wild animals, and educating the population about nature conservation and reinforcing security measures.

The effectiveness of the above mechanisms depends on the State's ability to protect the Kahuzi-Biega National Park and the resources it contains. This is in the context of community conservation of biodiversity and natural resources.

3.2. Discussion

The destruction of crops is one of the most frequent forms of human-wildlife conflict around protected areas in the DRC. Primates such as chimpanzees, cercopithecines and gorillas are the main destroyers of community property, and are therefore the main cause of human-wildlife conflicts in the villages surrounding the high altitude of the park. These conflicts vary according to the seasons, which define the movements of wild animals in their habitat, especially primates [13] [22]. Stephenson *et al.* highlighted numerous episodes of conflict between communities and elephants in Selous Game Reserve (SGR) in Tanzania

and in the Campo-Ma'an National Park in Cameroon in 2004, estimating a loss of around 28.4 hectares of crops in the villages concerned and this represents $6644 USD in monetary terms. When crops are being damaged, it can lead to fields being abandoned as a result of reduced agricultural productivity around the Campo-Ma'an National Park [15]. Farmers are the most vulnerable and are rarely compensated, yet their income remains dependent on small-scale farming [23].

Despite the political importance of protected areas, especially in the conservation of endangered species such as gorillas, conflicts could be raised by other species such as rodents (woodpeckers), snakes, wild swine and leopards that benefit from the Park's conservation efforts. This affects the knowledge that local communities have of conservation and the support they are willing to provide, as conservation efforts should also be directed towards other species that share primate habitat and cause direct human-primate conflicts [22] [24]. Weladji and Tchamba showed that the causes of these conflicts include ineffective land-use planning policies applied in the creation and management of protected areas in Africa, coupled with population growth around this environment [18]. The destruction of houses represents a small proportion.

This situation is altering the relationship that used to exist between local population and the Park's wild animals. These relations are becoming increasingly difficult. As a result of the destruction of crops by primates, a number of conflicts and acts of violence have arisen around the KBNP, causing divisions within the community [9]. Conflict between humans and wildlife can serve as a pretext for poaching or hunting great apes. This leads to illegal hunting, particularly by poisoning, shooting and trapping, which is the greatest threat to the survival of predators, including in protected areas [20]. Nowadays, the figures are alarming in view of the high risk of certain wildlife species disappearing. For a while now, poaching has been considered the only factor determining the disappearance and extermination of these species in protected areas, but as time goes by the animals are becoming extinct as a result of capture by local communities [10]. This produces a number of factors that increase the possibility of contact between humans and pathogens, *i.e.* micro-organisms harmful to humans that these animals may carry [25].

In the past, pygmies have had a strong relationship with wild animals of the KBNP. These animals play an important role in culture, food, health and they equally increase household income. The eating habits of Pygmy indigenous peoples are not only feeding purpose, but are also intertwined with beliefs and ways of looking after themselves. Pygmies may also use animals to increase their resources by selling them to other communities bordering the park in order to satisfy their primary needs [26]. It is believed that feeding on a monkey's head makes more intelligent, while eating a gazelle's (antelop) lungs or bladder improves its breathing capacity and cures incontinence. Moreover, feeding on insects means purification, and feeding on an elephant is a sign of power [12]. As

for Bantu communities, they often have indirect relationships linked to food. All animal species are eaten, apart from those prohibited by custom [26]. As Houngbégnon *et al.* points out, demographic growth and increasing deforestation are accompanied by changes in practices, a reduction in the share of wildlife in income and as a food source, and this leads almost to the complete disappearance of wildlife [27].

The conservation and protection of wild animals in the KBNP faces serious problems, including the poor performance of park rangers in terms of protection techniques and logistics. This staff is not adequately trained, nor do they have sufficient resources in terms of quality and quantity to carry out their task, which is increasingly leading to anthropogenic threats [28]. Indigenous Pygmy peoples held a grudge against the restriction of their access to natural resources as a result of nature conservation measures [12]. According to them, the frequency of threats from wild animals coming from the park would be reduced if the Congolese state granted them the right of access to the park. Anyone who keeps wild animals illegally is committing a transgression and proposes, there should be an initiative to create punitive laws aimed at people who keep animals illegally in their homes. This would greatly reduce the mistreatment of wild animals.

Strong and clear measures for the conservation of wild fauna of the KBNP must be taken as a matter of urgency.

4. Conclusion

Cohesion between the local community and the biodiversity of the forest on which they depend is an urgent requirement in the conservation model for protected areas and the wildlife they contain. This requires effective management of the conflicts observed around these protected areas between local communities and wildlife. This study was carried out with the aim of characterising the human-wildlife conflicts that exist around the KBNP. The results, obtained from the survey technique, showed that the population living around the KBNP is generally poor, with insufficient means to meet their needs, and is mainly made up of indigenous Pygmy population, although the household size is large. Nevertheless, this population is exposed to physical aggression, zoonoses and the destruction of cultivated crops in the fields and homes by wild animals, including primates (Chimpanzees, Cercopithecines and Gorillas), with no means of defence. This situation is altering the relationship that once existed between local people and wild animals, leading to open conflict between the two parties. Effective, integrated community conflict management measures urgently need to be put in place for the sustainable management of human-wildlife conflicts around the KBNP.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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