

# Illegal Wildlife Trade: Trade Flows of Wildlife Products and Facilitation Methods in the Ruaha Landscape, Tanzania

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## Abstract

Tanzania's Ruaha landscape is prominent for its potential wildlife resources, which play a key role in sustaining the economy and livelihoods of the people. However, most of these resources are illegally obtained and traded in different places within and outside the Ruaha landscape. Due to its illegal nature, most of the important information regarding the trade is poorly documented. Therefore, the current study aimed first, to explore the origin and destination of wildlife products; second, to assess the relationship between hunters and buyers or customers; third, to assess the means used to transport wildlife products; and lastly, to assess who influences people to engage in illegal hunting and trade activities. In addition, we assess the materials used in the exchange of wildlife products. Semi-structured questionnaires and face-to-face interviews were used to collect information from 123 respondents. Social network analysis was used to indicate the origin and destination of wildlife products. The findings show that 70% of wildlife products originate from the Ruaha National Park and MBOMIPA wildlife management areas, with the remaining 30% originating from villages. The majority of respondents (65%) reported transporting wildlife products by foot and bicycle as the primary modes of transportation. Suppliers of wildlife products are reported to have close and long-term relationships with their customers and traders, with most of whom being friends and relatives. We found most poachers to be influenced by their friends and relatives in terms making decision to engage in illegal wildlife trade. In addition, crops like maize and rice were the most popular products used to exchange with wildlife products in the Ruaha landscape. Therefore, in order to combat illegal trade in wildlife products at the local

level, alternative income-generating activities need to be promoted accompanied by not only well-funded anti-poaching programmes but also more effective surveillance plans. These should entail the use of advanced techniques and skills, such as wildlife forensics.

## Keywords

Wildlife, Products, Illegal Trade, Ruaha Landscape

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## 1. Introduction

Wildlife trade is defined as the exchange or transaction of any wildlife product [1]. The trade can involve live or dead wild animals, including their parts or products such as ivory, horns, skins, meat, scales, and claws [2]. The broad use and trade in wildlife species and their products has been rising since the history of human beings on this planet [3] and is mainly associated with the increasing human population and daily livelihood requirements, which in turn results in overexploitation of these species [4] [5]. Consequently, many efforts have been made by interested parties to sustainably deal with the wildlife trade by instigating the Convention on International Trade in Endangered Species of Flora and Fauna (CITES) [6]. In an effort to regulate trade in wildlife species and their products, CITES was accepted by many states in order to assist each other outside their borders in preventing overharvesting, illegal hunting, and trade of wildlife species [6] [7]. Regardless of the significant national, regional, and international efforts to curb illegal trade in wildlife products, the world is still experiencing the growth of illegal business associated with wildlife products, which is estimated to be around \$7 to 22 billion [8] [9]. This monetary value derived from wildlife products is a massive amount, which entices masses of people to engage in the illegal hunting and trade of wildlife products throughout the world.

Illegal trade of wildlife products is sustained by the availability of markets and demand from customers [10], which, with the help of advancement in transportation networks and technology, can reach and obtain any wildlife products from every corner of the world [8]. This implies that wildlife products can be transported from the deep forest in the Amazon or Africa and reach customers in the farthest reaches of Asian, European, and American countries [11]. As such, the availability of advanced means of transportation influences the trade flow of wildlife products [12]. Meeting subsistence needs, acquisition of traditional medicines, spiritual or religious beliefs, and clothing constitute some of the major uses of wildlife products which are reported as the key driving factors in the trade flow from one location to another [3] [13].

Furthermore, studies show that major roads, airports, harbours, customs, and borders have been widely used as wildlife product transit-hubs. For example, the studies [10] and [14] indicate that large amounts of rhino horns and elephant

ivories have been transported via the East African seaports of Kenya and Tanzania. On the other hand, the available statistics of confiscated wildlife products in different places like borders and customs indicate that many wildlife products have been transported and distributed in local, regional, and international markets [10] [15]. In most cases, the flow of wildlife products does not only supply the international customers alone [10] [15] [16], but also the local customers, predominantly in the source countries [17] [18]. In addition, the illegal trade flow not only has negative effects on the wildlife population but it also reported to be a way of spreading diseases, pathogens, and invasive species [19] [20], which have significant impacts on the social, economic, and health of people and animals [20] [21].

It has been noted that the presence of advanced transportation networks increases the speed of illegal trade of wildlife products from one place to another [13] [20]. However, the abundance of facilitation methods and corruption in the transportation sectors aided the existing illegal trade in many places [10] [15]. It has been further indicated that the transportation of wildlife products involves complex systems, which include a chain of nodes and hubs [10]. The main transport could be via foot, bicycles, and vehicles. When it reaches the villages, there is another way of transporting it from the village to the local market [22]. The other products can be processed and prepared in packages to transport them to other countries or continents. The main transport methods used here are airplanes, ships, and sometimes vehicles [10] [23]. While international transportation relies on shipping companies, airports, and occasionally trains to transport wildlife products, domestic illegal trade is facilitated by bicycles, motorcycles, and vehicles [16] [22] [24]. For example, it was indicated that sometimes government officials who were involved in the illegal trade used their vehicles to carry and transport wildlife products from the source to the middle men. They used this as a way to disguise the protection officers [23].

Furthermore, the network of illegal trade is linked from international to the local areas where the products are sourced [25]. The middle men connect the poachers to the local transporters, which are mainly private vehicles, taxis, hearses, ambulances, and motorcycles. These transport the products to another station for onward transport [15] [16]. This is how the structure and the network of illegal trafficking of wildlife products occur in many places. In other ways, it is noted that to facilitate the transportation of wildlife products and distribute them to the final customers, there is the involvement of fake armies, and fake number plates for government, funeral, and wedding vehicles [8] [16]. Therefore, to maintain this complex network and illegal trade flow of wildlife products, there must be a distribution of incentives and other benefits for the actors in the chain in order to strengthen relationships among the customers and other major players in the chain [10].

Throughout the trade chain, linking main key players such as hunters, middlemen, and final consumers is widely exposed by many studies [26] [27], show-

ing strong links and relationships among the members of the illegal chain of wildlife products [10] [28]. Some links are very multifaceted, involving large numbers of people. For instance, the illegal trade of elephant and rhino products such as ivory and horns is always dominated by a complex network involving many people playing different roles to facilitate the transportation of the products [10] [28]. In most parts of Africa, the majority hunt wildlife and conduct illegal trade, mostly for subsistence and other livelihood reasons [19] [29]. In such cases, there is a well-established relationship between illegal hunters and their customers [22] [26]. Further, a similar study by [26] revealed that the relationship may be based on benefits each party obtains, like money, alcohol, clothes, and, in some cases, romantic relationships. The persistence of these relationships makes the illegal trade of wildlife products intense and complex to disrupt in many areas with these resources, including Tanzania.

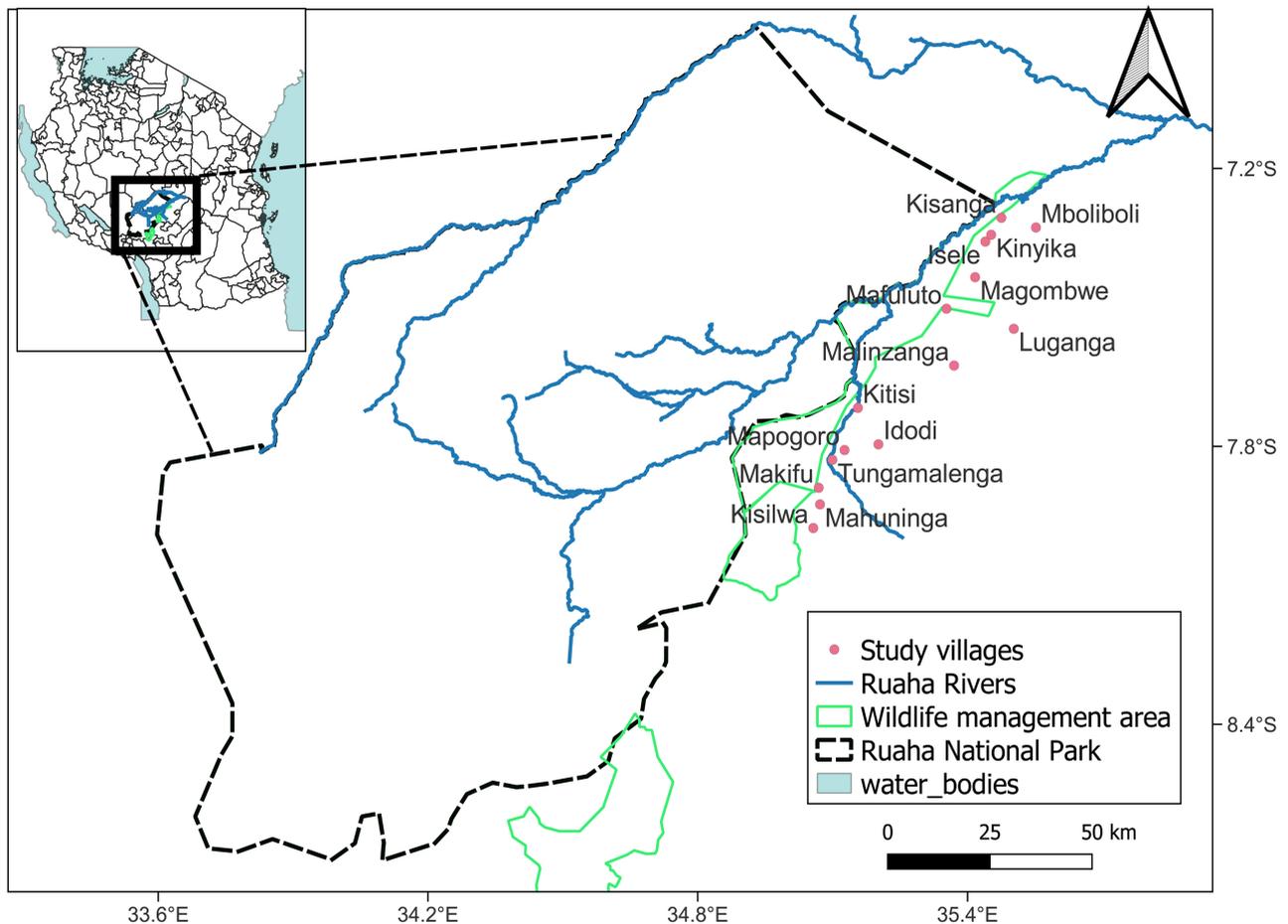
Tanzania has a distinct and rich diversity of mega fauna and flora ecosystems that play an important role in the conservation of natural habitats and the provision of goods and services to millions of people [30]. In the midst of this wealth, the country is under great strain from unsustainable resource extraction in many of its protected areas, such as the Ruaha landscape in central Tanzania [31] [32]. The landscape is one of the important ecosystems harboring important wild species of mammals, birds, reptiles, and amphibians, which has national and international conservation importance [33] [34]. The existence of several socioeconomic activities in the vicinity of protected areas in Ruaha has an impact on the existing threat to this protected area [35]. Intensive human-wildlife conflicts, the presence of diseases, and long-term poaching and poor areas [31] [36] are all identified as key obstacles to the protection of these resources in this landscape. Aside from the aforementioned research, nothing is known about the illegal trade movement of wildlife products from the source to the destination. As a result, this study attempts to fill in the gaps in knowledge by mapping the sources and destinations of wildlife products; assessing the methods utilized in transportation them; and evaluating hunter-gatherer-trader-buyer interaction. The finding from this study will inform government policies and strategies to balance conservation and sustainable utilization and management of wildlife products in the Ruaha landscape and in similar ecosystems around the globe.

## 2. Materials and Methods

### 2.1. Study Site Location

The Greater Ruaha landscape covers about 50,000 km<sup>2</sup> and is one of the most important hotspots for the diversity of wildlife species [33]. The landscape has a large abundance and a rich diversity of wild species [34] [37]. The area has been estimated to hold over 10% of the lion population [34] [38], and has the largest population of elephants in East Africa [39]. This area has exceptional biodiversity and species endemism and is named as the key area for biodiversity conservation [33]. Ruaha landscape has been reported to have high poaching pressure,

particularly on elephants, especially from 2006 to 2015 [40]. This landscape comprises a range of different land uses which include Ruaha National Park, several game reserves, a game controlled area, a wildlife management area and village land [34]. The main economic activities in the Ruaha landscape include pastoralism, agro-pastoralism, wildlife hunting, and photographic tourism [31] [41]. Due to its importance, this area has been selected as a focal area for this study, specifically the Idodi and Pawaga divisions, as shown in the figure below (Figure 1).



**Figure 1.** Map showing study area location. The redpoints show villages where interviews were conducted.

## 2.2. Data Collection

The study covers two divisions, which are Idodi and Pawaga in rural Iringa district. In each division, eight villages were selected. A semi-structured questionnaire that was pre-tested and refined with experts was used. Data and information gathered included demographic information, experience of being involved in the hunting and trade of wildlife derivatives, and an overall perspective on the methods and trade flow patterns of wildlife derivatives. A chain referral (snow ball technique) was applied by asking interviewed respondents to provide additional contact names for new potential interviewees. The study intended to gath-

er data on legal and illegal hunting of wildlife derivatives. However, it was difficult to obtain legal data from the government. Therefore, this study explored illegal wildlife products and trade flows in villages found adjacent to the south-eastern part of the Ruaha National Park.

### 2.3. Data Analysis

All analyses in this study were performed using R software [42]. Social network analysis was used to map and indicate the origin and destination of wildlife products. The frequently mentioned villages or the source areas from which wildlife products were obtained were recoded and linked to show the flow of the products from the source to the destination as well as the magnitude of the products and the paths used. Relationships among hunters and customers, motivation, and exchange categories were analysed using descriptive statistics.

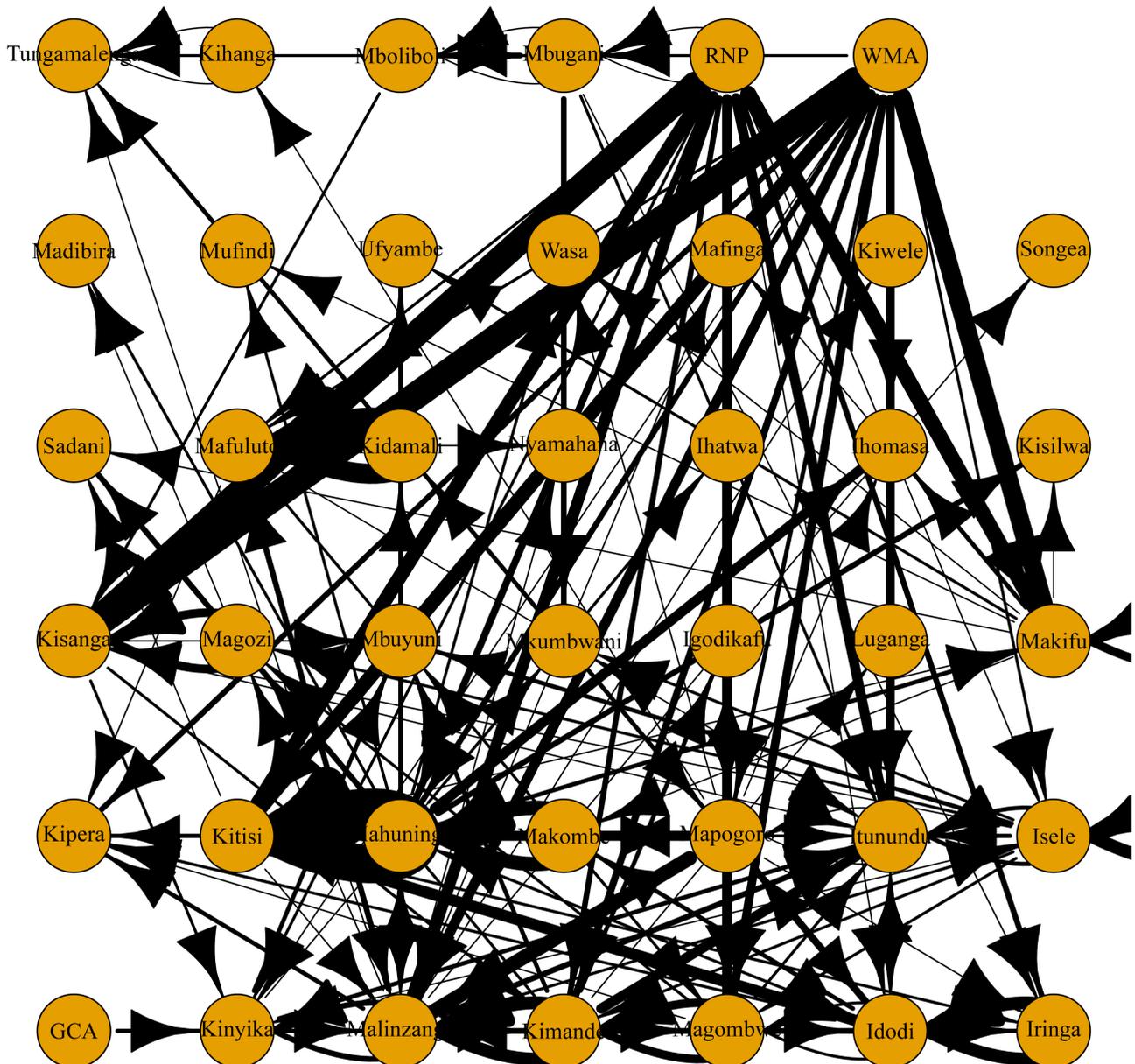
## 3. Results

### 3.1. Demographic Information

The study collected the socio-demographic characteristics of the respondents, which included age, sex, tribe, religion, level of education, and occupation. This demographic information was considered an important part of this study because it has an influence on the illegal hunting and collection of wildlife products in the Ruaha ecosystem [43] [44]. This study interviewed 123 respondents, of whom (98.40%) were males. This implies that males in the Ruaha ecosystem were the main individuals who went for hunting. Also, it was reported that due to their masculine nature, males can work and are involved in hard and risky jobs like illegal hunting [44]. The tribes of the respondents were Hehe (45.53%), Maasai (9.77%), Gogo (8.13%), Barabaing (8.13%), Sangu (8.13%), Mbulu (4.88%), Bena (4.07%), Kinga (2.44%), Sukuma (2.44%), Sagara (1.63%), Luguru and Ndegeleko both represented 0.81% each. The main economic activities conducted on the study site were crop cultivation (66.90%) and pastoralism (13.7%). Other identified activities are employment, crop and pastoralism. Pastoralism and crop cultivation together represent 3.20% of the respondents. On the other hand, crop cultivation and employment represented 2.40%. About 77.40% of the respondents had primary education, while 9.70% were identified to have informal education, and others included secondary education 8.10%, certificate 1.60%, degree 1.60%, and diploma 0.80%.

### 3.2. Mapping Flows of Wildlife Products from the Source to the Destination

There were 168 edges (connections) of wildlife product flows from the source to the destination site, and the number of vertexes was 46. Similarly, about 35% of outward networks were from the Ruaha National Park and 35% from the MBOMIPA Wildlife Management Area (Figure 2). This implies that 70% (N = 46, n = 32) of wildlife products originated from the national park and wildlife



**Figure 2.** Source and destination of wildlife products in the Ruaha landscape. Arrow head indicate the destination of the product, while tail indicate source of the product. Arrow width indicate extent (magnitude) of the product from the source to the destination involved in the trade flows.

management area, while the other proportion originated from the village lands. The interconnectivity analysis showed the furthest apart in the network was from Isele village to Ihatwa village, which constitutes 2 vertices with a distance of 5. Similarly, Malinzanga village had the highest out-degree vertices (27 vertices), which implies that Malinzanga village is one of the mai suppliers of wildlife products to other areas or villages in the study region.

The four largest cliques that show the maximum number of actors who have all possible ties present among themselves as the source, distributor, and consumer of wildlife products involved in the trade flows were generated for the

Pawaga and Idodi divisions separately (Figure 3). In these cliques, the Wildlife Management Area and Ruaha National Park (Figure 3) were the main sources of the product for both the Pawaga and Idodi divisions. In the Idodi division, villages that had direct and highest ties to hunting or harvesting wildlife products from the wildlife management areas and national park were Mapogoro, Malinzanga, Idodi, Tungamalenga, Kitisi, and Mahuninga villages (Figure 3), while in the Pawaga division, villages that had direct and highest ties to hunting or harvesting wildlife were Itunundu, Kimade, Kinyika, Kisanga, and Isele (Figure 3).

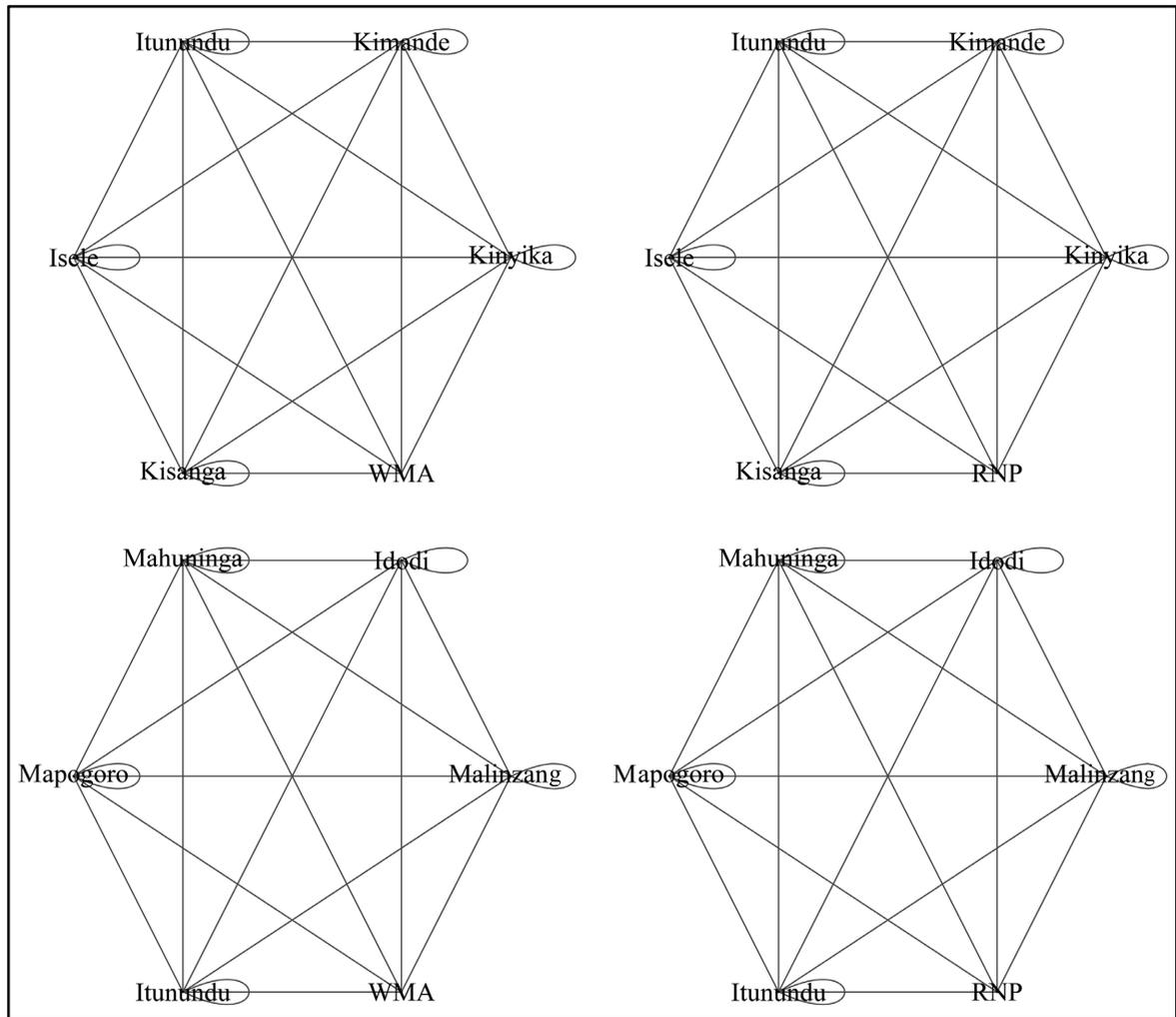
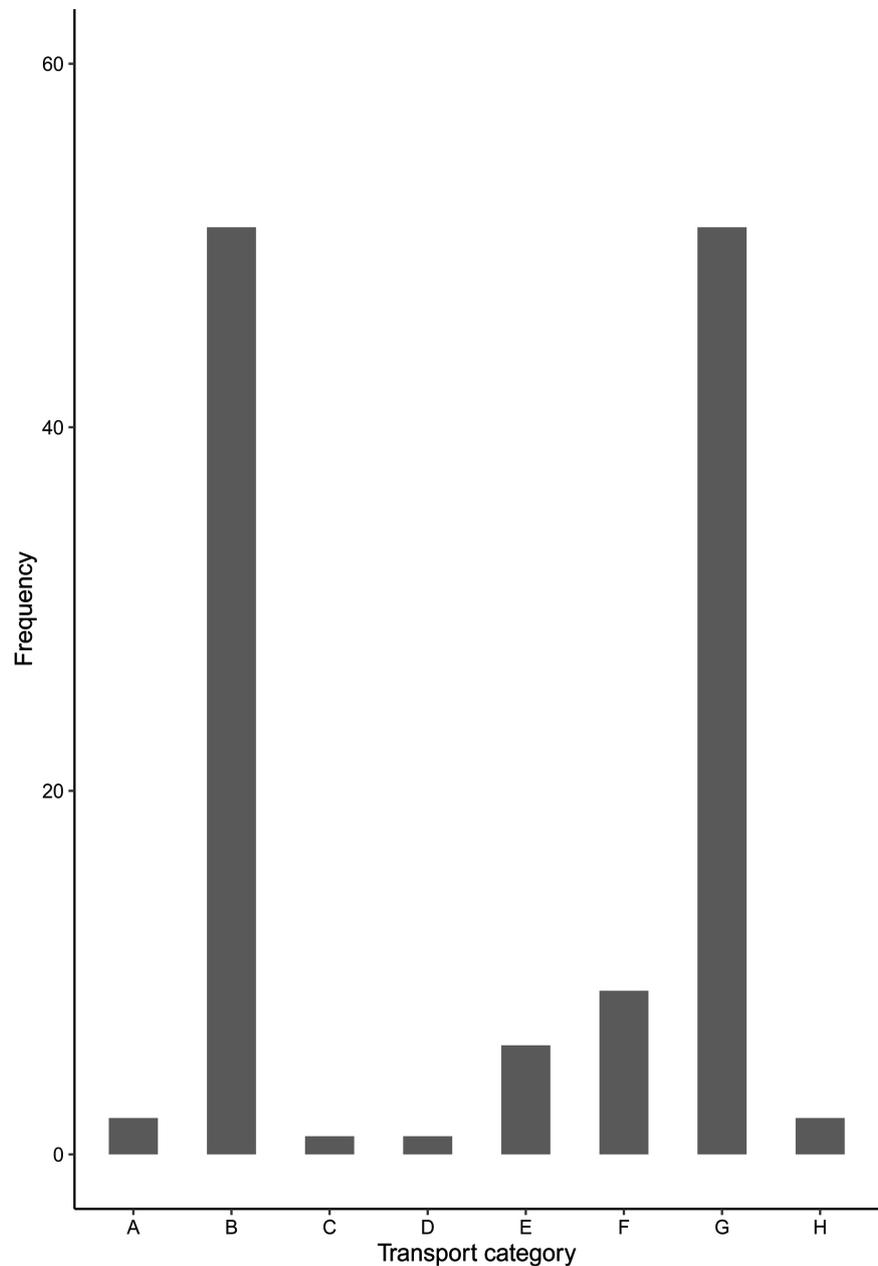


Figure 3. Cliques showing villages and protected areas (Ruaha National Park and Wildlife Management Areas) that had high level of ties as source, distributor, and consumer of wildlife products in the study area.

### 3.3. Wildlife Product Transport Methods

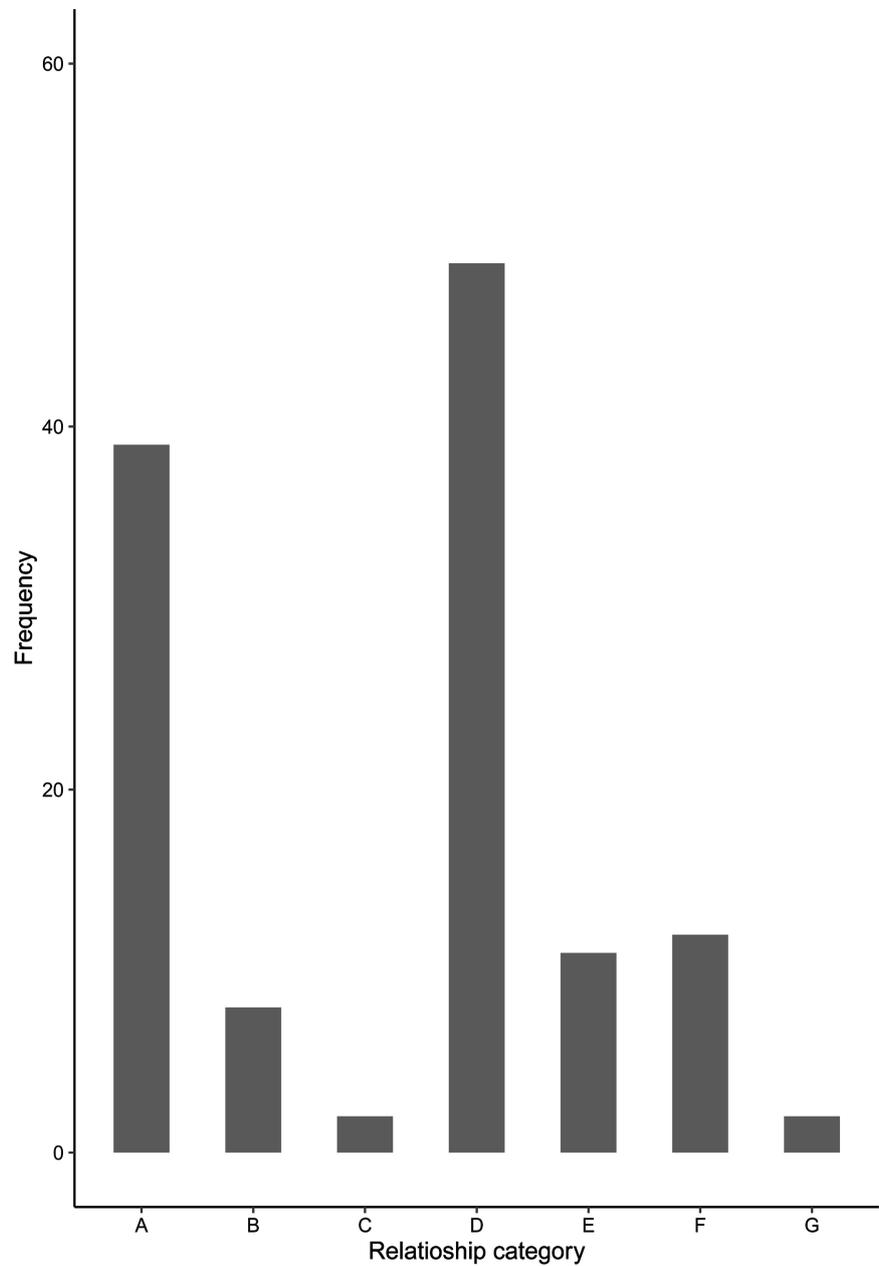
When moving wildlife products from hunting grounds, the majority of wildlife hunters transported the wildlife products either on foot or by using bicycles. (Figure 4). However, motor bicycle was rarely mentioned as the means of transportation used to move wildlife products to market destinations located in distant villages and in towns.



**Figure 4.** Frequency per transport method as used by wildlife hunters. Expression of letters denoted on this figure are as follows; Letter “A” = bicycle; “B” = bicycle and feet; “C” = bicycle and motorcycle; “D” = bicycle, feet, and airplane; “E” = bicycle, feet, and motorcycle; “F” = bicycle, feet, motorcycle, and vehicle; “G” = feet; “H” = feet and motorcycle.

### 3.4. Relationships between Hunters and Wildlife Product Buyers

The majority of respondents reported selling wildlife products to their friends, neighbours, and to their fellow hunters (**Figure 5**). In most cases, hunters sell their wildlife products with cash. However, sometimes it happens that buyers do not have cash on hand, and to avoid the risk of being caught by wildlife managers, exchange of the product with non-cash products occurs.



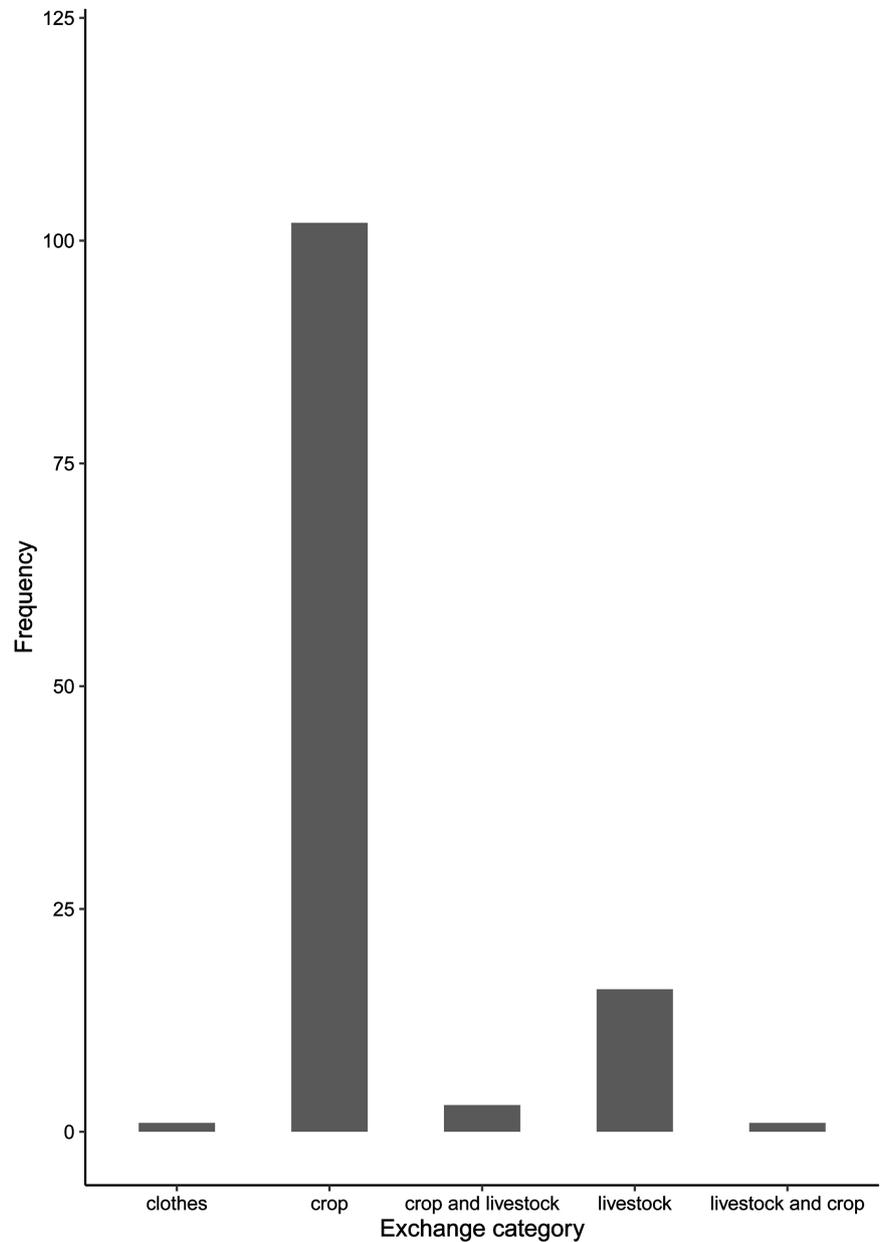
**Figure 5.** Frequency per hunter relationships with wildlife product buyers. Expression of letters denoted on this figure are as follows; Letter “A” = friends; “B” = friends and hunters; “C” = friends and neighbours; “D” = friends, neighbors, and hunters; “E” = hunters; “F” = neighbours; “G” = neighbors and hunters.

### 3.5. Exchange Category

For those accept exchange of products, most of hunters reported to exchange wildlife products with crops (Figure 6).

### 3.6. Motivations for Wildlife Hunting

Majority of the respondents revealed they were motivated after learning from relatives and friends that caused them to be attracted to hunt and trade on

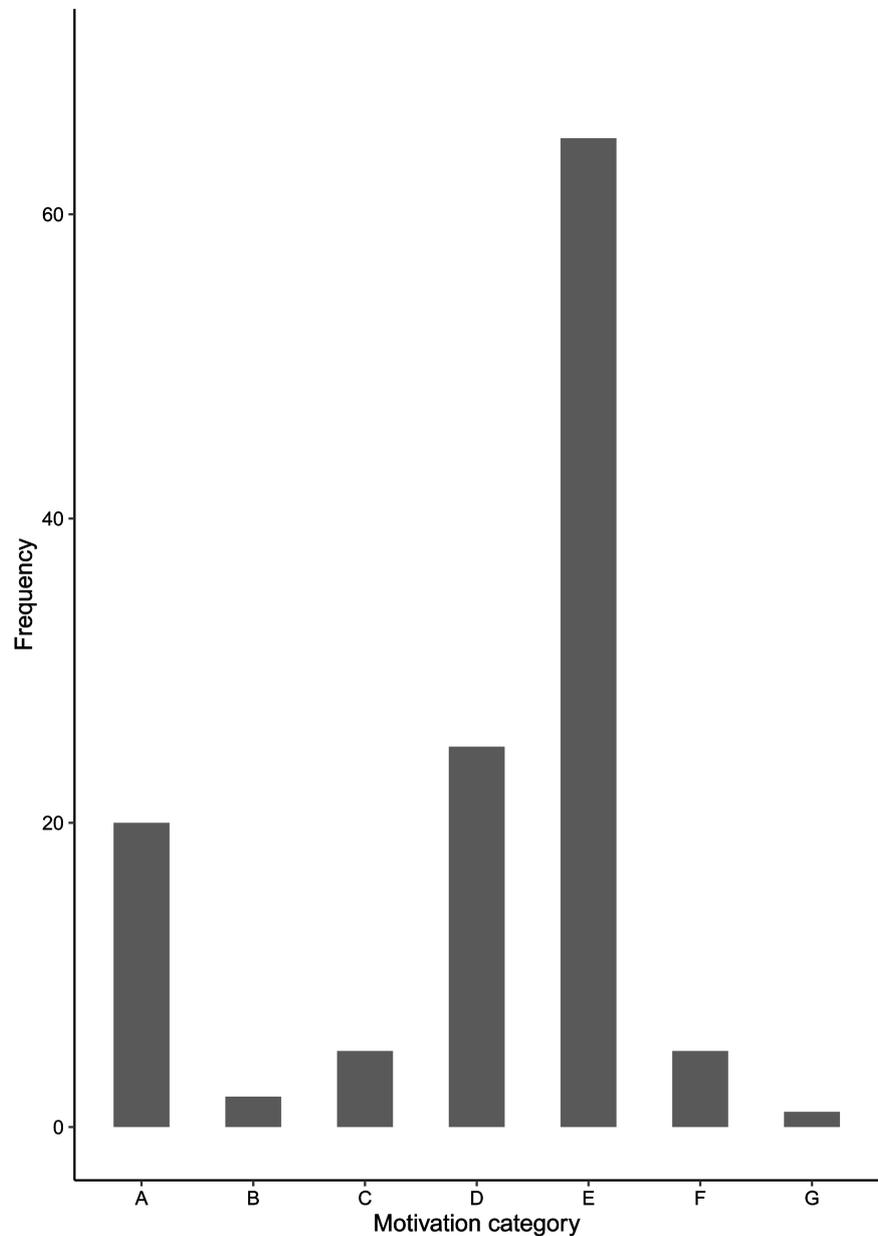


**Figure 6.** Frequencies of products exchanged with wildlife products between wildlife hunters and buyers.

wildlife products (**Figure 7**). Most people learn to engage in illegal hunting after being motivated or influenced by their close friends and relatives.

#### 4. Discussion

More than 70% of the wildlife products in the Ruaha landscape come from Ruaha National Park and MBOMIPA wildlife management area. Walking and cycling were the primary modes of transportation for wildlife products from these protected areas to the end users. Wildlife products, including wild meat, lion fat, skin, and ivory, were mainly sold to long-term clients who were friends,



**Figure 7.** Frequency per motivations that influenced hunters to trade on wildlife. Expression of letters denoted “A” = friends; “B” = friends and hunters; “C” = hunter; “D” = relatives; “E” = relatives and friends; “F” = relatives and hunters; “G” = relatives, friends, and hunters.

neighbours, and fellow hunters. More research discovered that wildlife products can be used in exchange with crops and livestock. Finally, the respondent admitted that friends and relatives were the primary motivators for engaging in illegal wildlife hunting.

Illegal trade in wildlife products in the Ruaha landscape was concentrated in the villages near Ruaha National Park and MBOMIPA wildlife management area. The findings show that some villages like Kitisi, Malinzanga, Kisanga, Mafuluto, and Mapogoro were mentioned as the most popular villages that received and

distributed the wildlife products in other villages. This could be due to their proximity to the source of wildlife products, namely protected areas and the high number of people who consume wildlife products such as wild meat. This scenario corresponded with the findings from Kilombero and Serengeti in Tanzania, which suggested that wild meat is harvested near protected areas and sold in large quantities in the villages close to these protected areas [22] [45]. The concentration of consumption of bushmeat in the villages near protected areas is also observed in other places [46] [47] [48]. This implies that interventions based on reducing illegal use of wildlife products should focus on the core villages that have high links to and consumption of wildlife products.

In the Ruaha landscape poachers walk by feet and they also commonly use bicycles to transport wildlife products from one place to another. This could be one of the reasons they trade and sell wildlife in their villages and close villages. However, [22] reported the similar situation in Kilombero, whereby bushmeat was sold in the villages by using bicycle as the main means of transport. In some cases, when the products intended to be sold in towns they can use motorcycles and vehicles to transport the products as also mentioned in other studies [16] [47]. In most cases, wild meat is sold as dried or non-dried meat cut into different pieces of approximately one kilogram and then distributed by hunter himself or in rare cases other member of the hunting group [26] [49]. Furthermore, poachers could mix wild meat with domestic meat and sell it together during the day without anyone recognizing it. Therefore, several and random patrols are required in order to control illegal harvesting and trade of wildlife products in these areas. Most importantly however, is the introduction of right incentives programs that would sensitize hunters and traders to shift from illegal to formal or legal practices.

Strong relationships existed among poachers, traders, buyers or consumers of wildlife products. This was revealed in the survey when interviewed poachers admitted that they only sell wild meat to recognized customers, with most of whom they have long-term relationships. These included mainly friends, neighbours, and fellow hunters. Similar findings are also noted in other studies, such as, the one conducted in Serengeti, Tanzania [50], Katavi ecosystem [51] and others done in West and Southern Africa [3] [47] [52]. Some hunters claimed that they went hunting not only to get money but also because they have romantic relationships with some of their customers who demand wild meat and other wildlife products. This also corresponds with the findings of a study conducted in Liberia, which indicated that romantic relationships with women influenced illegal hunting of wildlife species [26]. This also implies that the trade of wildlife products is maintained for the specific people who always buy and trade wildlife products [22].

This relationship helps hunters sell their wildlife products on cash. However, sometimes it happens that buyers do not have cash on hand, and to avoid the risk of being caught by wildlife managers, exchange of the product with non-cash

products occurs. For hunters who accept the exchange of products, most reported to exchange wildlife products for crops and sometimes clothes. [26] reported the exchange could involve many things such as cigarettes, clothes, batteries, and hunting gears (e.g. wire for snares). In Ruaha, crops such as maize and rice were the main products used in exchange with wildlife products. In some cases, livestock like cattle were used to exchange with wildlife products like pangolin and pangolin scales. This was mentioned by pastoralists like Sukuma livestock keepers. Therefore, conservation of wildlife needs to understand social relationships in order to combat illegal hunting and trade of wildlife products at local levels. However, best and profitable agricultural practices could help to reduce the dependence of hunters on available wildlife resources.

The benefits obtained from illegal hunting constituted one of the major reasons for most people to be involved in illegal hunting [10] [47]. But, poachers admitted that their friends and relatives were more influencing factor for them to engage in illegal hunting than the benefits per se. Just as important, many respondents admitted that illegal hunting was very risky, but they continued to do it in order to meet their important needs like money for school fees, buying clothes, buying food, and other financial contributions in their villages. This was also observed in the study by [29] [31] and [53] who found that the main motivation for people to engage in illegal hunting was a need for a living [29] [31] [53]. In other cases, the motivation of people to become hunters is rooted deep in their cultural and traditional beliefs that hunting a certain wildlife species would add value and respect to their lives [32] [35]. Further analysis of this study revealed that some pastoral societies like the Barbaig are perpetuating their cultural traditional beliefs according to which killing lions, elephants, or buffaloes will make them strong and more respected in their societies. On top of that, killing a lion was associated with receiving rewards from other members of their ethnic group, an act which is widely documented in the literature [32] [37].

## 5. Conclusion

The flow of wildlife products in the Ruaha landscape is characterized by many socio-economic factors, including the need of illegal hunters and traders to fulfil their daily subsistence needs. These factors strengthen the connectivity and networks of the illegal trade around the area. However, transportation means like motorcycles and bicycles are also widely used to distribute wildlife products in the area. High demand for wildlife products has also attracted a barter trade in the study area (*i.e.* some hunters and sellers exchange their wildlife products for crops, livestock, and clothes).

## 6. Recommendation

Understanding social interactions is essential for wildlife conservation in order to counteract localized illegal wildlife trafficking and hunting. However, educational and awareness programs on the advantages of conservation and the risks

of people being persuaded to engage in illegal hunting by their friends and relatives can help to lessen illegal hunting in the area. However, better farming techniques could assist to lessen the dependence of people on available wildlife resources. Importantly, a well regulated and legalized bushmeat trade would help to tackle the problem of illegal hunting and trade of wildlife products while at the same time allowing the local communities meet their desire for wild meat and other wildlife products.

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### Conflicts of Interest

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

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