

Exploitation of Pangolins (*Pholidota*, *Mammalia*) by Communities Living in and around the Tayna Nature Reserve (RNT) North Kivu, Democratic Republic of Congo (DRC)

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Abstract

Pangolin exploitation has recently increased in diverse forms such as bushmeat consumption; species or parts trade, medical use. This species is protected in Democratic Republic of Congo (DRC) and worldwide, unfortunately it is threatened by numerous human actions. The purpose of this study was to determine the profiles of actors using pangolins, the reasons for pangolin exploitation and its products and their use within the local community in and surrounding the reserve. We carried out surveys in the households of hunters, farmers and people practicing other professions in 12 villages, located within the Tayna Nature Reserve (RNT) and surroundings areas. Two interview techniques were used: the individual interview and the participatory diagnostic technique. During one month of data collection, 175 respondents were interviewed. Respondents had diverse profiles according to sex, age, education level and ethnicity. Men were more represented as actors in pangolin exploitation (71.70%) than women (28.30%); the most represented age interval was 20 - 30 years. The education level is distinct amongst respondents: illiterate (37%), primary school (32.4%) and graduate from university (2.9%). An average number of respondents are motivated to consume pangolin as meat obtained by hunting at 50%. The main reason for its consumption is preference (44%) and habit (33%). The scales are pangolin derivatives most recognized by local people and widely used in the pharmacopoeia. Consequently,

pangolin protection needs some rigorous measures to reinforce the current law implementation.

Keywords

Pangolin, Derivative Products, Local Community Exploitation, Traditional Medicine and Tayna Nature Reserve

1. Introduction

Pangolins are mammals attracting considerable attention in recent times, not because of their unique morphological characteristics, but for their high rank in exploitation and international trade (Soewu et al., 2012; Heinrich et al., 2017; Ingram et al., 2019). According to the IUCN Red List of Threatened Species (IUCN, 2019), pangolins are one of the most globally threatened mammal groups, all eight extant species, four in Africa and four in Asia, are listed as globally threatened. The most significant menace to pangolins is overexploitation for the uncontrolled and illegal international wildlife trade and local use, which mainly involves the meat of the animals and their scales for diverse purposes in each country (Boakye et al., 2015; Heinrich et al., 2017). The scales covering the dorsum, flanks, tail and which make them appear like a reptile, are one of the principal reasons for their high exploitation. The trade of these scales is undertaken worldwide, particularly in Asian countries for ornamental and medicinal purpose; while African countries exploit pangolins for both meat and scales, used in traditional medicine (Soewu, 2013; Brautigam et al., 1994). Pangolin flesh is known as a delicacy choice meat while the animal is believed to possess a reservoir of medicinal properties, sometimes it is cited for providing mystical power (Soewu & Sodeinde, 2015). All cited values pertaining to these *Pholidota* species increase the attraction and feasibility of their exploitation (Soewu & Ayodele, 2009).

Statistics from pangolin product seizures report that countries located in coastal position around the Gulf of Guinea are possibly a hub for pangolin products exploitation and worldwide trading. The largest number of domestic seizures was signaled in Cameroon, and with Nigeria altogether, they depict the highest exportation of pangolin products from the Gulf of Guinea to Asia (Ingram et al., 2019). During the period of 2015-2016, there were 12.3 tonnes of pangolin especially scales transported from Nigeria to Hong Kong and China (Challender & Waterman, 2017). Although all pangolin species are involved in the Convention on International Trade of Endangered Species of Fauna and Flora (CITES) Appendix I as of January 2017, and all countries to which reference has been made (located in the Gulf of Guinea) being Parties to CITES, thereby prohibiting international trade in wild-caught pangolins for both local and international commercial objectives (Heinrich et al., 2017). All eight pangolin species are threatened to extinction according to the IUCN RedList and they are supposed to be entirely protected species (Challender & Waterman, 2017). Although all eight pangolin

species are classified in Appendix I of the CITES since January 2017; the pangolins and pangolin scales trafficking is still continue around the world (Heinrich et al., 2017). Indeed, Congo basin countries have diverse regulations in pangolins protection according to their culture, habits and sometimes consideration towards wildlife. For example in Gabon, *Pholidota* species are considered as game species even though the species *Smutsia gigantea* is entirely protected, whereas in the Republic of Congo, they are fully protected, and any hunting activity cannot be undertaken. In Equatorial Guinea, three pangolin species found in the country were listed by previous laws as entirely protected but recently some modifications within that protection law, emerged (Ingram et al., 2019).

The DRC hosts three species of pangolins with different conservation status. The giant pangolin (*Smutsia gigantea*, Illiger 1815) is fully protected at national level while the two other (the white-bellied pangolin: *Manis tricuspis*, Rafinesque 1821 and Long-tailed pangolin: *Manis tetradactyla*, Linnaeus, 1766), have been partially protected since 1982 (Ministry of Environment, Nature Conservation and Tourism MENCT, 2006). For the actual interpretation of this decree-law, partially protected animals can be hunted and exploited, given that the methods of hunting, the size of the catch per hunting activity, the season and the trade are regulated. However, this would no longer be the case for the pangolin in DRC, since the eighteenth conference of the parties to which it is a signatory, all four African species are included in the IUCN red list and accordingly they are supposed to be entirely protected species (Challender & Waterman, 2017). Currently, in general the exploitation of pangolin in Africa and particularly in DRC is getting more and more a scientific concern as well as a threat to species conservation since the quantity of scales seized in diverse countries is continually increasing. Therefore, at international level the trade of pangolin specimens and their confiscated derivative parts bring out an indication to the estimates of the number of lost individuals. This international trade has been listed having a high clandestine nature since the exploitation data are unknown and often become the basis of issues in quantification of precise volume of exploited specimens due to the species status.

The report on the exploitation of pangolins from seizures of individuals' parts has been invoked in DRC. The possibilities of the scales trade and their use in traditional medicine and the consumption of pangolin as bushmeat, recorded particularly in surrounding villages of different Protected Areas and forest zones are evident. Nevertheless, the local exploitation of pangolins and the use of their derivatives in the surrounding villages of the RNT where these facts often been reported, have not yet been studied and the specific details of exploited species in this area remain to be studied. Whence, we carried out this study with the main goal to document the exploitation of pangolins and use of their derived products by communities living inside and outside the RNT, located in East DRC, within the integral part of the Congo Basin forest. When trying to answer the question of "what is the purpose of hunting pangolins by the inhabitants in the RNT, we wanted specifically: 1) to document the profiles of different actors included in

the pangolin hunting and use of its products; 2) to determine the reasons of the pangolins exploitation by the local population; and 3) to identify pangolin products and their utilization within the culture of the local communities living in the reserve and surroundings areas. This study will present to readers a highlight of the threats of worldwide pangolin and will particularly emphasise on pressures that the pangolin population of the RNT is undergone through its exploitation.

2. Methods

2.1. Study Area

This study was conducted in the Tayna Nature Reserve (RNT), in the East part of the Democratic Republic of Congo (DRC) and covers more or less 900 km² (Figure 1). This Protected Area is located at 350 km northwest of Goma, the capital city of the province of North Kivu. It remains an integral part of the “Maiko-Tayna-Kahuzi Biéga Landscape”, a hotspot of worldwide known due to its importance of fauna and flora. This landscape shelters a rich mammalian fauna of Elephants (*Loxodonta africana cyclotis*), Okapi (*Okapia johnstoni*), Buffalo (*Syncerus cafer nanus*), many species of primates the Eastern lowland gorilla (*Gorilla beringei graueri*), chimpanzee (*Pan troglodytes*), the eastern black-and-white (*Colobus guereza*) the Hamlyn’s monkey (*Cercopithecus hamlyni*), the red-tailed monkey (*Cercopithecus ascanius*), three species of pangolins: the giant pangolin (*Smutsia gigantea*), the white-bellied pangolin (*Manis tricuspis*) and the long-tailed pangolin (*Manis tetradactyla*), and a high diversified avifauna. The vegetation is the equatorial forest since the reserve is located in the Congo basin forest bloc, where it rains the whole year. The area is constituted by a monotone population as only three tribes are represented. These tribes remain the autochthones population of this area.

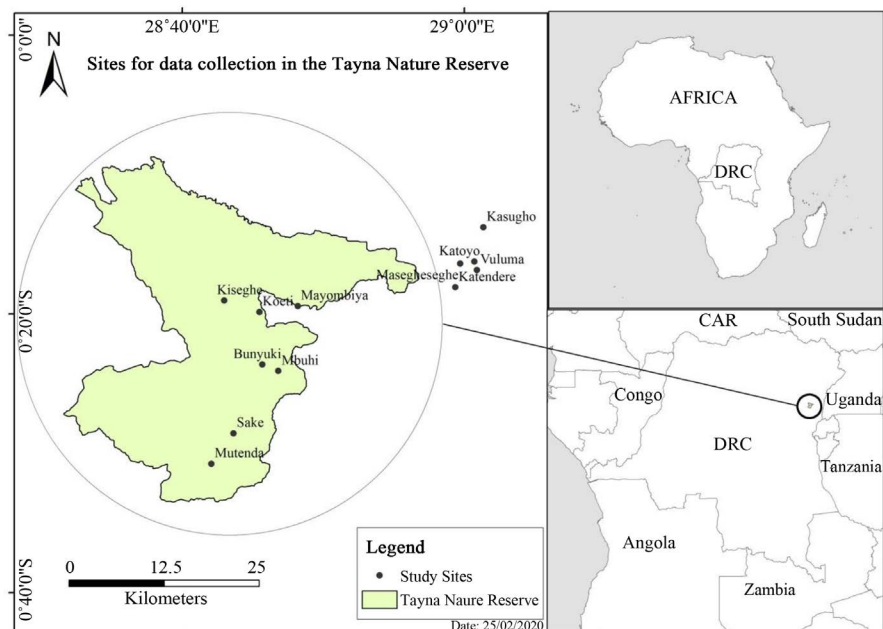


Figure 1. Study area and the location of sampling sites (villages) within the RNT.

2.2. Sampling Methods

Community-based surveys (individual interview and focus groups surveys) were conducted in the villages located inside and outside the RNT. A full list of villages was obtained from the Reserve administration authority, and we randomly selected 12 villages to conduct our investigations. After determining the number of households to be surveyed in each village or stratum with the help of local chiefs, the choice of households to survey was made randomly. The villagers' houses being arranged in a linear fashion on either side of the path or the road, the households to survey were chosen at the interval of 3 (sampling fraction), thus we were investigating each time the third household from the first chosen. Men, women and different socio-professional categories had the same chance of being interviewed (equiprobability sample). Children and teenagers below 18 year were not interviewed. To ensure independence of responses one respondent only was interviewed per household, and respondents of both genders exerting any kind occupation were interviewed.

2.3. Data Collection and Techniques Used

We used two techniques: 1) the Interview survey with a survey questionnaire and 2) a documentary technique used by a literature review to understand and define the theoretical framework of our study. The survey questionnaire was completed during the meeting by discussions with the target population. We used individual interviews and the participatory diagnostic technique which was carried out in the focus groups (**Figure 2**). The Focus-Group allowed gathering the opinions of people in small groups (e.g. Bahige, 2009) about pangolins exploitation. After developing the survey questionnaire, we translated in local language (Swahili). The survey form was administered in the villages, Monday to Saturday from 4:00 p.m. to 6:00 p.m. and Sunday from 8:00 a.m. to 5:00 p.m. We chose these hours because most farmers and hunters had already returned from the fields at that time and were resting at home. A standard questionnaire was used for all interviews, individual and participatory diagnosis that is carried out in the focus groups. Open questions about the species' specific characteristics were asked to allow respondents to discuss their personal beliefs, attitudes and opinions towards the pangolin. After collecting actors' profile information, we particularly put attention to the pangolin exploitation topics (reasons, methods of gathering pangolins, use of its products in different tribes and products always used).

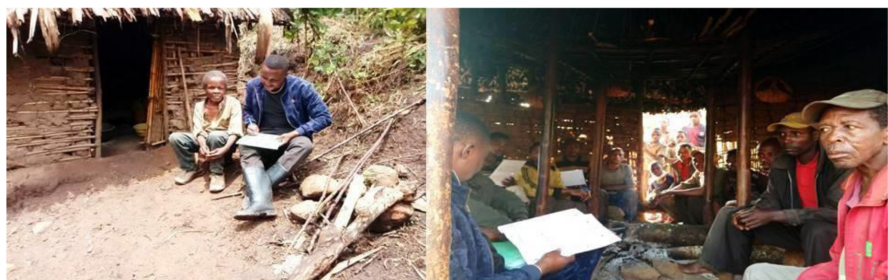


Figure 2. Data collection using the survey questionnaire (interview and Focus Group) with the local people in the RNT and surroundings villages about pangolin exploitation.

2.4. Data Analysis

To document category of people related to respondents' profile, proportions of pangolin parts used, reasons & methods to acquire pangolin products and cured diseases & pangolin parts used in traditional medicine; we computed the frequency using the equation:

$$\% = (n/N) \times 100. \quad (1)$$

Equation (1) is the frequency formula which % is percentage or frequency, n represents the category of the sample and N is the total number of the whole gathered sample.

To bring out differences in respondents' responses such as testing if the exploitation reasons of pangolin meat are fairly distributed; to test the efficiency of methods used for gathering pangolin and their products; to test if living in a specific village and belonging to a specified tribe could influence the use of pangolin derivatives, we used Chi-square tests with the R software with its R-STUDIO interface.

3. Results

3.1. Respondents' Profiles

The result of our study relates to the profile of the interviewees, the reasons for exploitation, the manner of obtaining pangolin bushmeat by the communities and different products derived from pangolins and their uses. A total of 175 people were investigated. The men were more represented (71.70%) than women (28.30%) in all villages. By age group, around 60% of respondents are under the age of 50, of which 30.1% are between 20 and 30 years, followed by 18.5% between 40 and 50. Only 7% of respondents are over the age of 60 years. According to the tribe of respondents, the majority of respondents are Nande in all villages, except in Biakili, where 100% of respondents are Piri and in Mutenda more than 80% are Nyanga. The education level results depicted a large proportion of illiterate (37%), followed by respondents who were limited only to primary school (32.4%). On the other hand, a small proportion of respondents (2.9%) are graduated from university, particularly in Katoyo and Vuluma, each representing 13.3%. The main professions are agriculture (53%) and hunting (28%). Other professions are present at small scales such as masonry, gold mining and livestock activities. Regarding the seniority of respondents in all sampled villages, the large proportion of respondents is made up of natives (78%), followed by 9% of those remained in the village during 10 to 15 years, when particularly in Katoyo this proportion was 33%.

3.2. Reasons of Pangolin Exploitation and the Methods in Gathering Pangolins

Our findings revealed that 97% of our respondents eat pangolin as bushmeat and only 3% confirm that they do not eat it for various reasons such as repulsive animal, with a strange smell and resemblance with Reptiles each represented by 1%.

The preference of pangolin meat is the main reason for eating pangolin meat (44%), successively followed by habit (33%) and health care (19.3%) according to our surveys (Figure 3). The amulet as another reason to eat pangolin meat is hardly represented by (2.8%). The chi-square test of adequacy indicates that the frequencies of responses on the reason for the exploitation of pangolin meat are not fairly distributed (p -value < 0.01), thus the surveyed population mainly consumes pangolin meat by preference and habit.

Among the whole sample, 47% recognized hunting as the method of obtaining pangolin meat followed by the collection by chance in the forest at 33.1% and purchasing at 19.9% (Figure 4). The adequacy test with the distribution of staff (p -value < 0.01) shows that hunting is the most widely used method to acquire the pangolin.

Referring to the trade of pangolin in the RNT, 96% of respondents do not recognize the solicitation of people from other places to request pangolin or its derivatives, while 4% of respondents confirmed that people from elsewhere always request pangolin or its scales. These people come from the province of Tshopo.

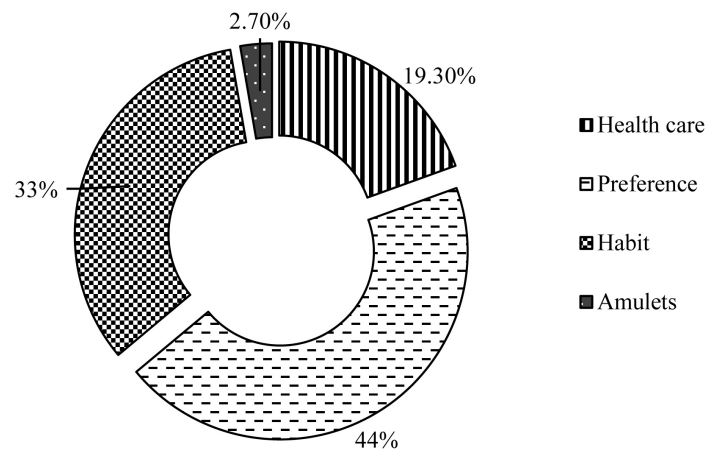


Figure 3. Documented reasons for pangolin consumption by local people of the RNT.

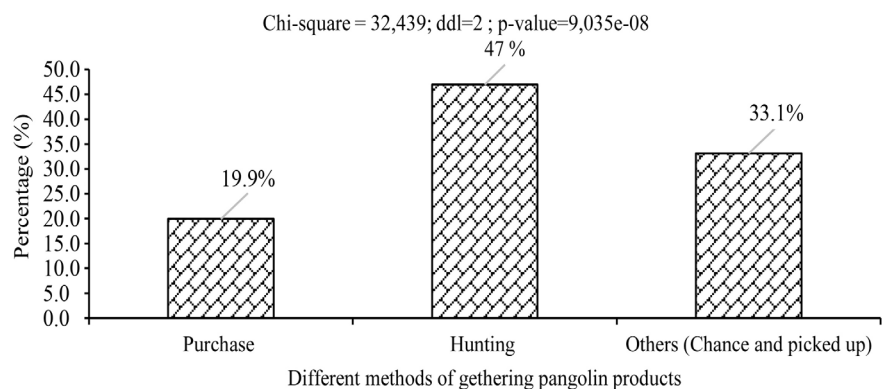


Figure 4. Methods for gathering pangolins and its derivatives products within the RNT.

3.3. Pangolin Products and Their Use in the Study Sites

Overall, it emerged from surveys that the majority of respondents (65.35%) recognized the scales of pangolin as the main derivative used mainly in traditional medicine, and 23.25% of respondents talked about pangolin meat as another product used for medicine purposes (Figure 5).

Nevertheless, both products (scales and meat) are used in different proportion by villages (Table 1) and in Kaseghe scales are the most used than elsewhere (81.82%) and Mutenda represented the highest proportion of used meat in their medicine (46.43%). Abstention was highly represented in Kasugho (56.25%) and the lowest (0%) was in Bunyuki, Mutenda and Sake. Apportioned according tribes (Table 2), scales and meat are respectively used mostly by the tribe of Piri (77.78%) and Nyanga (44.44%), which depicted also the lowest abstention (0%).

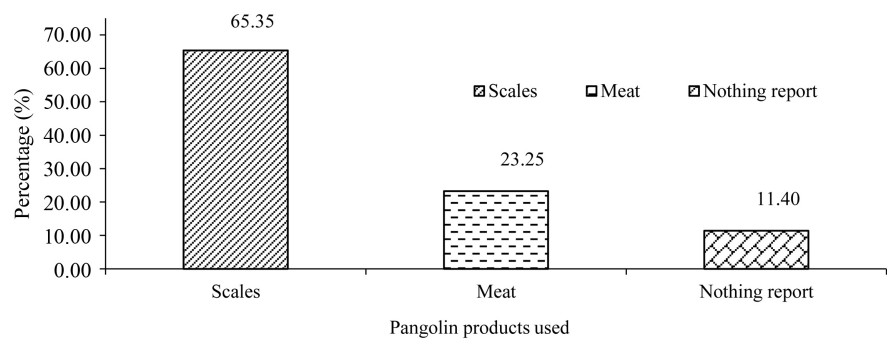


Figure 5. Pangolin derivatives used in traditional medicine in the RNT and surrounding villages.

Table 1. Proportion of pangolin products used in traditional medicine according to surveyed villages in the RNT and surrounding villages.

Product (%)	Bunyuki	Kasugho	Katendere	Katoyo	Kiseghe	Koeti	Masegheseghe	Mayombiya	Mbui	Mutenda	Sake	Vuluma
Scales	78.95	37.50	77.78	63.16	81.82	73.68	57.89	73.68	66.67	53.57	65.22	62.50
Meat	21.05	6.25	16.67	21.05	9.09	21.05	21.05	21.05	28.57	46.43	34.78	6.25
Nothing reported	0.00	56.25	5.56	15.79	9.09	5.26	21.05	5.26	4.76	0.00	0.00	31.25
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Result of test	$\chi^2 = 11.688$, $df = 11$, $p\text{-value} = 0.3875$ Fisher's test: $p\text{-value} = 0.4973$											

Table 2. Proportion of Pangolin derivatives used in traditional medicine according to the tribe of respondents in the RNT and surrounding villages.

Product Used (%)	Nande	Nyanga	Piri
Scales	62.59	55.56	77.78
Meat	21.77	44.44	16.67
Nothing reported	15.65	0.00	5.56
Total	100.00	100.00	100.00
Result of test	$\chi^2 = 11.688$, $df = 11$, $p\text{-value} = 0.3875$ Test de Fisher: $p\text{-value} = 0.4908$		

The Chi-square or Fisher's independence test shows that neither the village nor the respondents' belonging to a tribe has any influence on the use of a derivative pangolin product (p -value > 0.05); implying that almost 90% of surveyed villagers recognized that products derived from pangolin (scales and meat) are used in traditional therapy.

Based on respondents' declaration, the encephalitis, the rheumatism and brittle bones in babies' skull are the most common diseases cured by pangolin derivatives (61% in general) with respectively 28.02%, 18.84% and 13.77% of cited cases (**Figure 6**).

Recall that even spiritual issues were cited, yet by the lowest proportion with stuttering both at 0.24%. Cases of abstention were represented by 6.04% (these people when interviewed didn't state any disease cured by pangolin products).

4. Discussion

4.1. Profile of Actors of Pangolin and Its Derivatives Exploitation

The age of pangolin operators is variable. The youngest are in the interval of 20 - 30 years, the middle class is between 40 to 50 years, while the oldest are in an age class of 60 and over. The age range in which operators are active is defined as 20 to 50 years representing 60% of respondents. This is the period when men take on responsibilities as heads of households and providers of the family (Vitekere, 2015; Kyamakya et al., 2018). Caspary (1999) showed that men over the age of 15 years were reported to be hunters in Côte d'Ivoire. The age group between 21 and 40 represented 52%, which was lesser than our case. The context varies according to the environment and particularly the socio-economic and socio-cultural aspects which interfere with the motivations for hunting. Our result confirms Ayaya (2012) with regard to the most active age in hunting for Bandisende in the

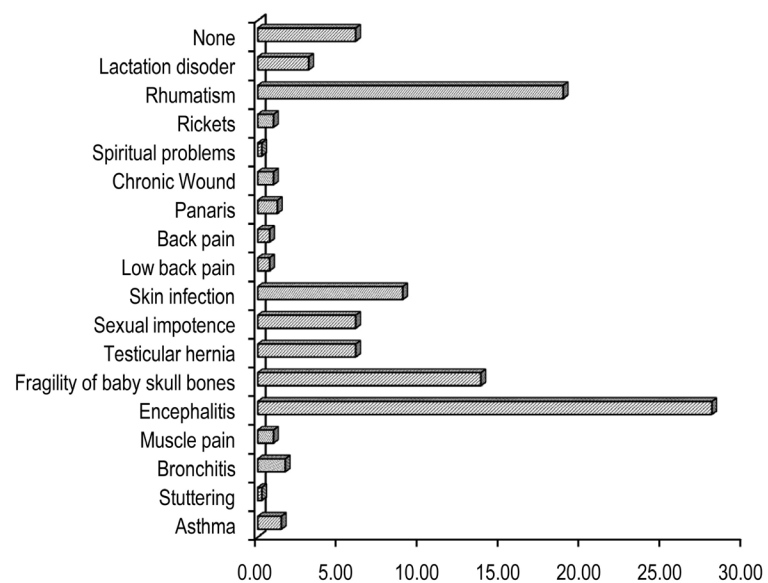


Figure 6. Different diseases cured by pangolin products as used by communities in the RNT and surroundings villages.

Okapi Wildlife Reserve in DRC. Our surveys have revealed different levels of education. Illiterates presented the majority, when an average proportion (32%) reached the primary school and surprisingly graduated from university were found even if it was only 2%. The less educated is the population, the more they engage in the exploitation of nature resources as van Vliet et al. (2012) reported that the rural population in Central Africa in general and hunters are not educated. Yet a small proportion is graduated from university as found in Ituri road (in two villages: Bafwaboli and Baegofuma) by Vitekere (2015). The population of the Tayna Nature Reserve and its surroundings appeared to be heterogeneous, characterized by a great diversity of tribe with varied customs. The different ethnic groups showed great motivation for the exploitation of pangolin and the use of pangolin products in diverse way according to different traditional customs; as all three tribes declared using pangolin products at 77.78%; 62% and 44% respectively for Piri, Nande and Nyanga. Our results do not corroborate the findings of Sanda (2012), since we revealed three tribes, but her findings globalized the population of the RNT without any specific precision about tribes even though they are all almost well known within the DRC.

4.2. Reasons of Pangolins Exploitation and Gathering Methods within the RNT

The great majority exploits the pangolins for consumption purposes (97%) when only the remaining handful of minority denied eating pangolin meat for various reasons (repulsive animal, its strange smell and resemblance to Reptiles). The consumption of pangolin meat is spread in this species' distribution areas, despite the protection measures implemented in most of these countries, as found also in Ghana (Boakye et al., 2015). Colyn et al. (1987) were the first to highlight the qualitative importance of the consumption of small and medium-sized *mammalian* game in the forest environment of the DRC. They also stressed that certainly not all taxa are exported to urban markets. Our findings support their opinion that the *Pholidota* particularly the pangolin and other small or medium size species of game (Carnivores, Hyracoidea, Macroscelididae, Rodents, Squamata and Tubificidae) are mainly consumed in rural areas. Nonetheless, in other parts of Africa (Zimbabwe), findings demonstrate that pangolins have been harvested or hunted not only for bushmeat but for cultural purposes including traditional medicine (Shepherd, et al., 2017; Soewu & Sodeinde, 2015). The consumption of pangolin bushmeat is an integral part of the preferences and eating habits of the inhabitants of the RNT and its surroundings, and it has been revealed that local people use pangolin derivatives for medicinal and spiritual intents (protection or talisman).

According the consumption reasons, the assessment indicated that all reasons (preferences, habits, health issues and talisman purposes) are proportionally revealed, yet with preferences and habits mostly cited. This consumption represents an important source of proteins for households as bushmeat is the main protein sources for African forest people (Ringuelet et al., 2010; Vheiyee et al., 2011; van Vliet & Mbazza, 2011; Challender & MacMillan, 2014) and contributes in the

populations' therapy for various diseases. However, bushmeat is also consumed in great cities (van Vliet et al., 2015) as a luxury meat. There is a real attachment of the forest populations of the Congo basin to their traditional diet; they are therefore in a state of dependence on a nurturing environment which also constitutes their capital (Willcox & Nambu, 2007). In the whole Africa and abroad, pangolin meat was once considered as an additional source of protein. Recently, it is now considered as a delicious dish consumed by the wealthy people in China and Vietnam which pangolin meat was available in the high luxury restaurants, and was the most expensive meat, with 89% of consumers (Christina & Challender, 2015). Another study depicting similar findings carried out in Nigeria (Soewu & Adekanola, 2011), revealed the high market value attributed to this species' derivatives was regularly found. Indeed, this regularity reflects the expected benefits for actors in the pangolin exploitation, therefore an intense pressure always been exerted on pangolin population for traditional African medicinal practices based on the belief that this species has a reservoir of medicinal properties, magic or mystical (Brautigam et al., 1994).

The methods to acquire pangolin meat and its derivatives depend to their availability. In the RNT, the half of actors confessed that hunting is the most used for acquirement of these products, as hunting is a common activity in forest people of the Congo basin (Caspary, 1999; Vitekere, 2015). On the other hand, Soewu and Ayodele (2009) brought out that the principal way to acquire pangolin products in Nigeria was hunting and pangolin individuals can be purchasing from hunters or consumers undertake their own hunting activities. Since pangolin is a slow species for walking, it can be sometimes found by chance in the forest and this method of acquirement was not highly represented within this study (17%) when for Soewu and Ayodele (2009) it was 10%. Nevertheless, in both cases, the same method is well represented, and it stressed that species habits or physical aspect would also represent a source of threats.

4.3. Pangolin Products and Their Use in the Study Sites

People in the RNT and surroundings seemed to be less aware of outside pangolin products demand. A small number of our respondents (4%) confirmed that people from elsewhere come to apply for pangolin derivatives in this Protected Area. Only one village (Masegheseghe) out of 12 surveyed is always receiving non local people purchasing pangolin meat and other products. It should be due to, on the one hand, its location close to the bordering part of Tshopo province which facilitates this fact since these stranger purchasers were from Kisangani. On the other hand, the fact of being in the development zone of the RNT and giving access to the reserve could also be the second cause. Certainly, this study revealed that, as we progressed through the integral conservation zone, this information was no longer mentioned by the inhabitants.

The use of pangolin products in traditional medicine is common in Africa countries such as Nigeria (Sodeide & Adedipe, 1994; Soewu & Ayodele, 2009; Soewu et al., 2012), Benin (Akpona et al., 2008), Côte d'Ivoire (Caspary, 1999),

Tanzania (Soewu & Sodeinde, 2015), Guinea (Ingram et al., 2019). Terrestrial vertebrates are used as a source of medicines, especially in Africa, East and South-east Asia, where many parts are included in the traditional pharmacopoeia (van Vliet & Mbazza, 2011; Bahige, 2009). In fact, most often, there is no clear dividing line between consumption for food and that for medicinal purposes, some species being consumed for their “tonic” properties. The scales were signaled as the major pangolin derivative (65.35%) before pangolin meat (23.25%) used in traditional medicine. In Tayna, a big range of diseases (lactation disorder, rheumatism, rickets, chronic wounds, panaris, back pain, low back pain, skin infection, sexual impotence, testicular hernia, brittle skull bones in infants, encephalitis, muscle pain, bronchitis, stuttering and Asthma) are treated with pangolin derivatives. This fact is consistent with findings of Soewu and Ayodele (2009) in a study conducted a decade ago in Nigeria reported that a higher number of pangolin (178 specimens) were sold to traditional African medicine practitioners for a third of the month for treating almost 47 different diseases for the Awori tribe. Two years later, 64 pangolins used in medicine were documented to 40 traditional doctors in a month, an average of 1.6 pangolin used per doctor per month (Soewu & Adekanola, 2011). The pangolin scales, in whole or powdered are not only used in Africa, since the traditional Chinese medicine used them also treating various medical conditions, including psoriasis, infertility, improve blood circulation, asthma, even Cancer (Duckworth et al., 2008).

5. Conclusion

The pangolin exploitation for consumption and medicinal purposes is intensive in the RNT and its surroundings and takes into account neither the current state of conservation of this species, nor the sustainability of this animal. Actors of this exploitation are predominantly men. The female presence has been reported because they sometimes intervene in the hunting of pangolins by chance (unexpected collection). This exploitation is maintained by three ethnic groups (Nande, Piri and Nyanga) who inhabit the Reserve. The profile elements are widely different from age, profession and education level. This activity (pangolin exploitation) is not considered as a professional one since the agriculture is the main households' activity. The consumption of animal proteins is the main purpose of pangolin exploitation, gathered mainly by hunting. This species is not only threatened in the Congo basin but worldwide because scales of pangolin are well-known in Africa and Asia to contain medicinal properties and are often used; even the pangolin meat is also consumed in both continents. To this end, we suggested to public authorities in agreement with non-governmental organizations: 1) to sensitize inhabitants of the RNT and its surroundings to be aware of the consequences of the disappearance of this species resulting from over-exploitation since it is currently the most trafficked and threatened species in the world; 2) to support and encourage in-depth scientific research on wild pangolin populations worldwide in general and particularly in DRC (RNT); 3) to reinforce the applicability of the laws on the statute and the conservation of the pangolins in DRC.

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Conflicts of Interest

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

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Appendix: Inquiry Questionnaire

Form No.: ____ Date: _____ Station: _____ Territory/Village: _____

We are students in Zoecology at the University of Kisangani. As part of our Master thesis, we are undertaking a study about the exploitation of pangolins and their products in the region. We hope that you will receive us and provide information about our survey. This form is anonymous and all information provided will be used only for the purposes of this study.

I. Identity of the interviewee

- a) Gender: Male Female
- b) Age (years)
Less than 20 20-30 30-40 40-50 50-60 more than 60
- c) Tribe/Ethnicity:
- d) Occupation:
Farmer Owner of a restaurant Hunter Pupil/student
Others
- e) Level of education:
Illiterate Primary Secondary Superior and Academic
- f) How long have you lived in this village?

II. Data on the knowledge and exploitation of pangolins

Whether you know them or not, there's no problem.

- 1) Do you know the animal called pangolin? Yes No
- 2) What is the name of this animal in your dialect (or local language)?
Answer:

Can you identify the Pangolin from these pictures?

- 3) What are the different species of pangolins you know in this vilage?
a) Giant Pangolin b) White-bellied Pangolin
c) long-tailed pangolin d) all species
- 4) What do you find this animal interesting?
Answer:

- a) Do you eat pangolin meat? Yes No
- b) If not, why not?
Answer:

- 5) If so, how do you get it? Purchase hunting other to be specified

- 6) Why do you eat pangolin meat?
a) Habit b) preference c) medical care d) Others

7) What are the prohibitions (taboos) that belong to pangolin?.....

- 8) In your custom, are there any medicinal properties that you attribute to products derived from pangolin? Yes No

9) If Yes, what are they?.....

10) What diseases are cured by these products and how to be used?.....

- 11) a) Does it happen that people from elsewhere come to ask for pangolins in this area? Yes No

b) If Yes, where did they come from?

- c) And why are they looking for them? a. For their meat b. for their scales
c. Other reason
- 12) Have you ever experienced/heard about the sold of pangolin scales?
Yes No
- 13) a) If yes, who are the buyers of these scales?.....
b) Is such exploitation permitted in the area? Yes No
c) If so, how the market is organised?
From the hunter to the client Intermediary between hunter and client
locally
- 14) How much does a kg of pangolin scales cost?.....
- 15) a) Who are the buyers? Nationals (Congolese) Foreigners
b) -If nationals, place of provenance (City or Territory or Province).....
-If foreign, From which country?.....
- 16) a) In your opinion, does the exploitation of pangolins (meat or scales) have a positive or negative impact on the socio-economic life of the local community?
Yes No
b) If yes, for what reason do you exploit it? Food Medical
For profit belief (please specify) recreational
other (to be specified)
- 17) What are the most common species of pangolins found here?
a) Giant pangolins
Abundant scarce rare
What is the method used for pangolin hunting?
Trap Rifle Hunting/dog Other (please specify)
- b) White-bellied Pangolin
Abundant scarce rare
What is the method used to hunt pangolin?
Pickup Digging the earth Hunting/dog Other (please specify)
- c) Long-tailed Pangolin
Abundant scarce rare
What is the method used to hunt pangolin?
Trap Rifle Hunting/dog Other (please specify)
18. a) Are you also aware about the protecting law of some species in the DRC?
Yes No If yes which species?.....
b) Are you aware about the nature conservation law in the DR Congo?
Yes No
19. In your opinion, is it important to protect animals?
Yes No I don't know
20. What other animals do you eat (hunt) in your community?.....
Thank you for your fruitful contribution to our work.