

Propose Strategies to Enhance the Biodiversity Status and Traditional Knowledge Systems Relevant for the Conservation of *Pan Troglodytes Elliotti* in the Kimbi-Fungom National Park and Kom-Wum Forest Reserve

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Abstract— This study entitle propose strategies to enhance the biodiversity status and traditional knowledge systems relevant for the conservation of *Pan troglodytes ellioti* was undertaken in the Kimbi-Fungom National Park (KWFR) and Kom-Wum Forest Reserve (KWFR) Northwest region of Cameroon. The main objective was to investigate sustainable tactics that will contribute to trim down pressure on *Pan troglodytes ellioti* and other flagship species around the study areas. Data collections were undertaken with the help of interviewed administered questionnaires, informal interview using interview guide, group discussion and direct observations activities. Following interviewees response, sixty eight (68%) of the respondents were confident that they could take up effective management of the K-FNP and K-WFR. Equally, 92% of respondents agreed to the fact that increasing population, poverty increment, insufficient modern health facilities, influx of new cultural activities due to loss of traditional taboos and totemic beliefs, remains greater threat to chimpanzees in the study areas. Most of the interviewees (74%) agreed that updating of knowledge on the abundance and distribution of chimpanzee, identifying location of all human activities especially huts, farms, shortcuts and illegal market in the park/reserve through regular patrols with eco-guards to reinforce order and ensure a better protection for chimpanzees is vital. Much more, 95% of respondent accepted the fact that old and new traditional knowledge of conservation such as taboos/law, totemic beliefs, sacred forests, royal species, automatic spiritual sanction, harvesting seasons should be revived and encourage through traditional institutions/council to better protect chimpanzees. Furthermore, 85% of

interviewees accepted the suggestion that to get rid of poor traditional practices that uses chimpanzee's body parts/meat for medicine and rituals, can be replace with goats, sheep, pig, fowls body parts/meat. To reduce over dependent and conflicts on chimpanzees products and other natural resources, 97% of the respondents were in favour that income generating micro-projects such as fish farming, animal rearing, and market gardening should be promoted. Providing jobs through ecotourism activities such as forest clearance and excursions, construction of adequate and equip infrastructures were highly welcome by 99% of interviewees. To attain all these, regular conservation educational programmes in schools, meeting places and in "ngumba" houses should be promoted to well sensitize population on chimpanzee's conservation.

Keywords—Biodiversity conservation sensitization, Conservation educational programmes, Ecotourism activities, Income generating micro-projects.

I. INTRODUCTION

The Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*) is one of four currently recognized subspecies of chimpanzee. It has the lowest estimated total population size (3,500–9,000 individuals in the wild) of any of the chimpanzee subspecies (Morgan *et al.*, 2011), currently classified as Endangered on the IUCN Red List (Oates *et al.*, 2008a) and given its restricted distribution, particularly in Northwest region of Cameroon, as well as the increasing degree of threats to its long-term survival (Doumbé, 2014), it is imperative that strategies should be put in place to rescue the remaining individual in this region (Chuo and Tsi, 2017a). Latest surveys within the

Northwest Region have indicated that healthy populations of *Pan troglodytes ellioti* existed in many areas remote from human settlements (Doumbé, 2014; Tsi and Chuo, 2016; Chuo, 2018). However, despite the fact that villages around the K-FNP and K-WFR has one of the lowest human population densities of any closest town, *Pan troglodytes ellioti* in this region are today in dramatic decline (Chuo and Tsi, 2017d). This is largely because of increased commercial hunting, the conversion and loss of habitat. These threats are exacerbated by the continuing growth of human populations within the range of *P. t. ellioti* and the development of the economies of the areas (Morgan *et al.*, 2011). Hunting of chimpanzees to supply the bush meat trade highly demanded in unsustainable restaurants and as special meals for primitive traditional festivals/celebration and the rampant demand of body parts/meat for uses in traditional medicines/rituals (Chuo and Tsi, 2017e), is almost certainly the greatest threat to the survival of most *P. t. ellioti* populations. Habitat loss which result as forest within the range of *P. t. ellioti* continues to be lost, fragmented, and degraded; converted through agriculture, logging, grazing and fire (Morgan *et al.*, 2011). Population fragmentation due to the combination of loss of habitat and hunting has been gradually fragmenting populations of *P. t. ellioti*, so that many of the remaining populations are now small and isolated; they are therefore at increased risk of extinction from disease and other unpredictable events (Morgan *et al.*, 2011). Awareness of these threats, combined with the recognition that the extinction of our closest living relatives would be an inestimable loss, has driven the creation of many NGOs such as ERuDeF, COMAID, CIRMAD and SEKAKOH. In addition, there are many site based, national and international projects that work to conserve great apes in this region and around the nation. Despite all this, the continuing rapid decline of *P. t. ellioti* within the region indicates that past efforts are not sufficient, and that more is needed. In particular, successful protection of *P. t. ellioti* requires a more concerted and collaborative effort to establish priorities, and to identify partners and donors with which to implement and monitor such strategies. The following proposed action plan details such a strategy for protecting *P. t. ellioti* and other flagship species in the study areas. It is the result obtains from the study areas, where key players in great ape conservation were made to assist developed strategy for *P. t. ellioti* conservation. The aim was to investigate sustainable tactics that will contribute to trim down pressure on *Pan troglodytes ellioti* and whose potentials provide vital support to biodiversity conservation and partnership with all institutions for the benefit of the population, villagers in particular and Cameroon in general. To attain this, a strategic plan of

action for a five years period was proposed with specific objective to;

- ❖ To reduce the rate of habitat loss in the study areas
- ❖ To reduce the rate of poaching in the study areas
- ❖ To reduce over dependence on non forest timber products in the study areas
- ❖ To promote ancient and new traditional taboos relevant for conservation processes
- ❖ To enforce the implementation of wildlife and forestry norms in the study areas

These objectives were focused on five main areas:

- ❖ Updating knowledge on the abundance and distribution of chimpanzee and other primate species by carrying out regular patrols in study areas in order to ensure a better protection of these species and sustainable management of their natural habitats.
- ❖ Promoting ecotourism activities and implementing income generating micro-projects in order divert local people attention from hunting, grazing, and farming
- ❖ Working out education, awareness and communication programs on natural resource conservation for local population living around study areas
- ❖ To integrate traditional institutions, taboos/laws, knowledge and practices in sustainable management of the study areas for biodiversity conservation
- ❖ Empowering legal and institutional department for the enforcement of laws by carrying out seminars with an aim of reviewing and proposing laws in favor of chimpanzee conservation in the study areas.

II. MATERIAL AND METHODS

2.1. The location of the study areas

The K-FNP is situated in the North West region of Cameroon where it covers a total area of 95380 hectares. It is located between latitude 6° N and 7° N and longitude 9° E and 10°E. It has an altitude of about 900m to 2140m above sea level in the mountains and about 200m to 600m in the valleys (COMINSUD, 2014). It was created by prime ministerial decree number 2015/0024/PM of 3 February, 2015. The northern section of the park runs along the Cameroon-Nigeria border, while the Eastern, southern and Western parts of the park are within Cameroon territory (Tata, 2015). It equally share boundary with the Dumbo Cattle Ranch in the north eastward site The main rivers flowing through this

area are the rivers Ivin, Menchum, and Kimbi. All of these join the Kasina-la, which flows into Kasina-la State, Nigeria. This national park was realized after the merging of two reserves; the Fungom Forest Reserve (created in 1936) and the Kimbi Game Reserve (created in 1964 and situated in the Western High Plateau region of Cameroon and falls within the Mount Cameroon chain of volcanic mountains range that extends from Mount Cameroon (4,095 metres altitude) on the coast, through Mount Oku (3,011 metres altitude) to the Adamoua plateau, (Tata, 2011).

The K-WFR is situated in the North West region of Cameroon where it covers a total area of 17000 hectares. It is located between latitude 6° N and 7° N and longitude

9° E and 10°E. It has an altitude of about 500 and 1,500m above sea level in the mountains and about 200m to 600m in the valleys (Morgan *et al.*, 2011). It was created in 1951 and was followed by reforestation initiatives that were implemented (but later neglected) by the National Forestry Fund. The K-WFR extends towards the western boundary of the region which stretches along the international border between Cameroon and eastern Nigeria. The main rivers that flow through this area are the rivers Ivin, Menchum, Nzele and Kimbi. All of these join the Kasina-la, which flows into Kasina-la State, Nigeria. It is presently managed by the Fundong and Wum councils. Figure 1, shows the map allocation of the study areas in NW Region of Cameroon.

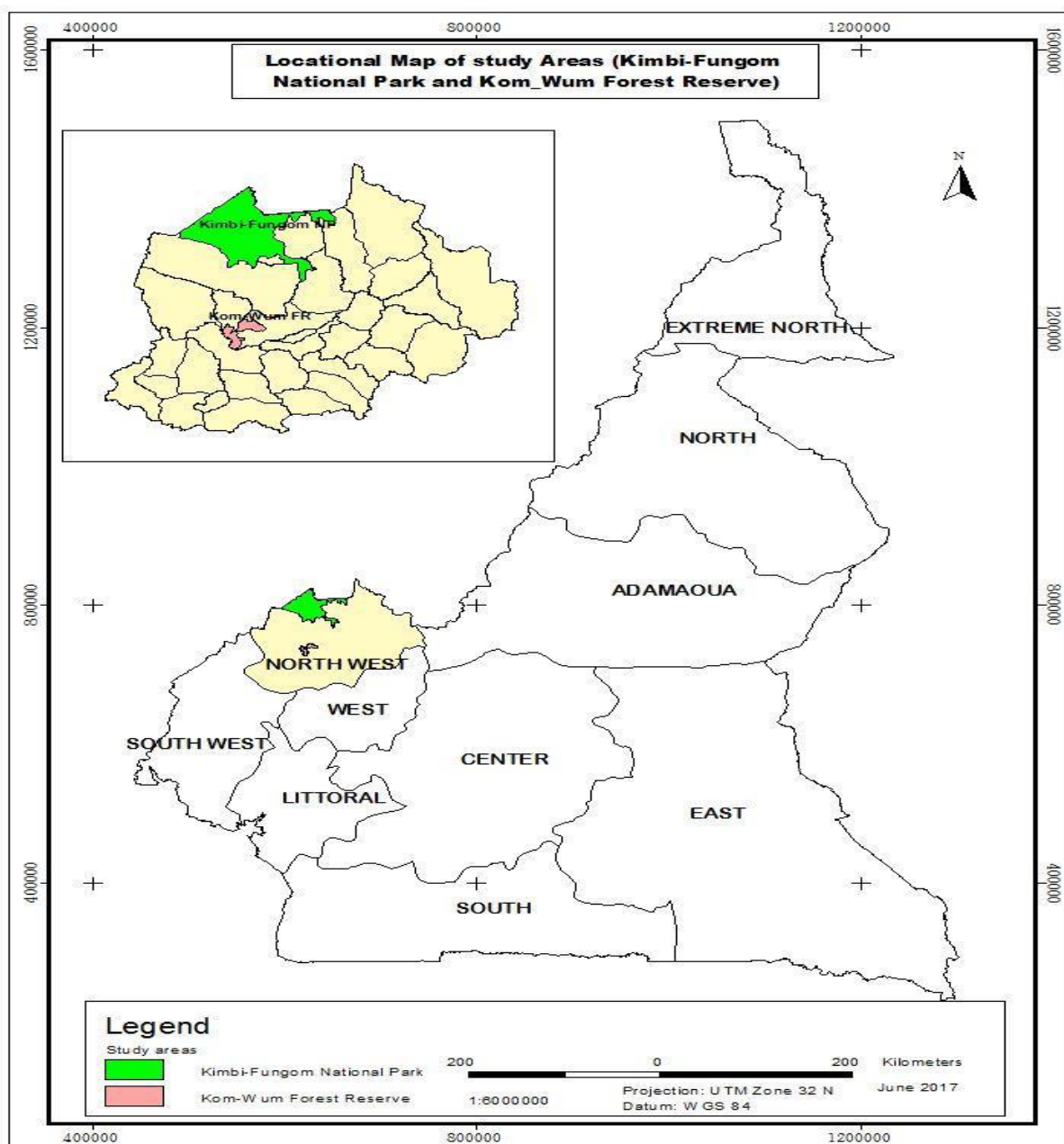


Fig.1: Map of Cameroon showing location of the K-FNP and K-WFR in NW, Cameroon.

2.1.2. Data Collection and Analysis

Data collection started with the reconnaissance survey intended to obtain information on the socio-cultural background of the people of the study area. A visit was made to the Fundong, Wum, Zoa, Furu-wa, Funfuka and Ako councils where literature reviews were obtained, personal interviews and discussions were held with officials and staff. The Chiefs/Fons of villages and locally employed village eco-guards were encountered to gather vital information about the study area and to relate the important of the research. These interactions assisted in the selection of the twenty two villages, in which sixteen villages (Gida-Jikum, Sabon-Gida, Kimbi, Su-Bum, Cha, Fungom, Mashi, Mundabili, Nkang, Nser, Badji, Turuwa, Sambali, Lutu, Kwept and Esu) from K-FNP and six (Moghom, Mbengkas, Biaso, Mentang, Mbongkesu and Bu) for the K-WFR. The villages were selected based on their close locations, activities within the proximity of the forest and high levels of dependence by the local people for livelihood within the forest. The pertinent information obtained from the visits, were employed to build up interview administer questionnaires aimed to explore respondents' knowledge toward the building of the proposed strategy action plan and attitudes toward. Questions such as;

- Are you confident that you can undertake effective management of the park/reserve if given the opportunity?
- Is it increasing population, poverty increment, insufficient modern health facilities, and influx of new cultural activities that push people to hunt chimpanzees?
- Do you agree to the fact that updating of knowledge on the abundance and distribution of chimpanzee, knowing the location of all human activities especially huts, farms, shortcuts and illegal market in the park/reserve can promote the protection of chimpanzees?
- Do you know that old and new traditional knowledge of conservation such as taboos/law, totemic beliefs, sacred forests, royal species, automatic spiritual sanction, harvesting seasons if revived and encourage through traditional institutions/council will better protect chimpanzees?
- Can it be possible to get rid of poor traditional practices that use chimpanzee's body parts/meat for medicine and rituals by replacing them with those of goats, sheep, pig, fowls and other domestic animals?
- Will you stop your over dependent on chimpanzee's products and other NFTP, if you are promoted to income generating micro-projects

such as fish farming, animal rearing, and market gardening?

- Will you cherish the idea of providing jobs through ecotourism activities such as forest clearance and excursions of tourist, construction of adequate and equip infrastructures?

During inventory proper, data were collected from multiple units of enquiry for this study through interviewed administered questionnaires, interview guide and direct observations and field notes taken. The interviewed administered questionnaires were used to solicit information from the household's heads while the interview guide, informal interview using unstructured script, helped collect data from the heads of the institutions (wildlife officials/wildlife division staffs, the agricultural development unit, locally employed eco-guard, and non-government organizations) and the traditional authorities. A total of 384 questionnaires were attempted and only 288 valid household heads responded to complete interviewed administered questionnaires within the 22 villages. Households along village paths were randomized by sampling every second household encountered as the interviewers moved through the village. Adult men, women, and youths were targeted. In sampling the population of each household, the interviewed was attributed to the older family member and any other contribution from family members were considered same for that interview. Data analysis recorded from people's perception began by decoding data sheets and information obtained from respondents during interviewer administered questionnaire survey were entered into Microsoft excels and analyzed in line with the objective. Based on the research questions, themes were identified from the data and given meaning. Finally, field data results were presented in the form of table, figure, frequencies, and percentages.

III. RESULT AND DISCUSSION

3.1. Demographic factors of the interviewees

Figuring out the age, sex, education and livelihood activities of interviewee's shows that about 52.3% of the respondents surveyed were males while 47.9% were females. With respect to the age structure, majority 87% of the respondents were within the economic active group (20-59) and the old (60+) constituted 13%. As such, the improper distribution of human resources to accommodate the needs of the increasing population has made the study areas susceptible to poaching by the local communities for survival. The educational status of the interviewees was also computed for the survey. Result indicates that 35.5% of the respondents did not have any form of formal education. While 48.5%, 18.5 % and 2.5%

had elementary, secondary and tertiary level of education respectively. The survey also revealed that the people lack the requisite education and required occupational skills that would enable them to compete effectively for different types of jobs or alternative livelihood activities. The main sources of livelihood activities were farming (94%) was the major occupation as most of the other activities; hunting (74%), logging (24%), traditional healing (24.5%) gathering NTFP (35.5%) and others

(10.5%) like artisan works and constructions were reported being undertaken alongside farming.

3.2. Interviewees aspiration toward the building of a proposed strategic action plan

During data collection, questions were designed to find out if respondents were confident that they can partake in the effective management of the K-FNP and K-WFR if given the opportunity. Figure 2 shows the percentages of respondents confident to partake in the management of the study areas.

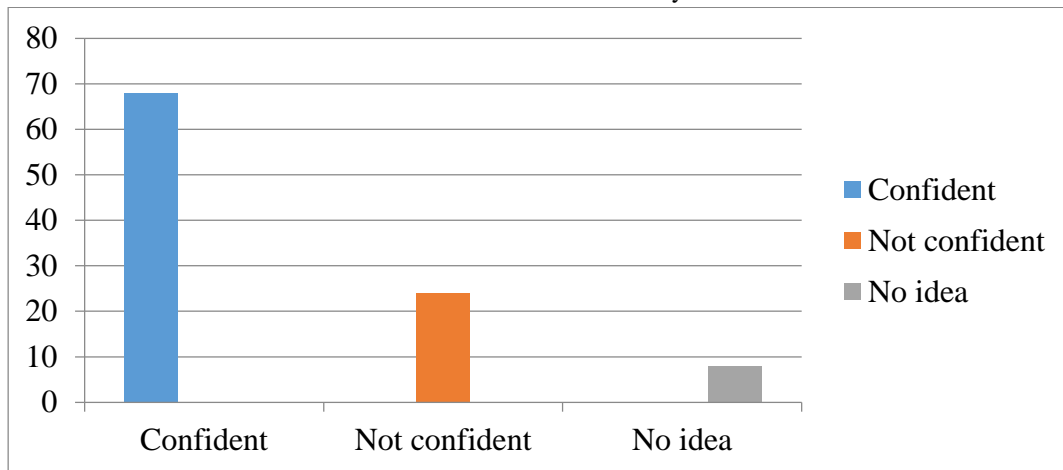


Fig.2: Percentages of respondent confident to partake in the management of the study areas.

Figure 2, shows that 68% interviewees were confident that they could partake effectively in management of the K-FNP and K-WFR, 24% said that they could not while 8% had no idea. Therefore, the majority of the local forest resource users believed that the management of the study areas would be best in the hands of traditional institutions/councils while the state would simply be an overseer. Whereas those who had no confidence believe it is dully the state that decides what to do, where to do, how to do and the time to do. One of the respondents went further to say during the creation of the K-FNP; they were not part of it neither was their chief

invited. It was only after the creation of the park, that the chiefs and his elite were inform that part of their land made up the national park.

Equally, questions were designed to find out if the hunting of chimpanzees was due to increasing population, poverty increment, insufficient modern health facilities, and influx of new cultural activities due to loss of traditional taboos and totemic beliefs that push people to hunt chimpanzees. Figure 3 shows the percentages of respondents to factors that influences the hunting of chimpanzees in the study areas.

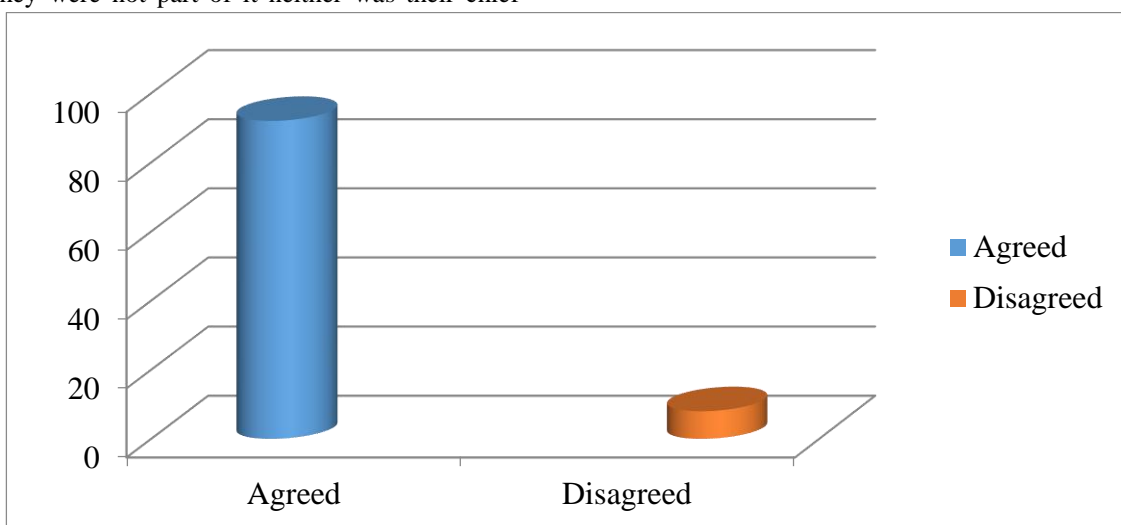


Fig.3: Percentages of respondents to factors that influence the hunting of chimpanzees in the study areas.

Form the result, 92% agreed these factors were the main force to the hunting of chimpanzees. While on the other hand, 8% did not totally agree that these factors could be the only reasons for hunting chimps. For instance, one of them said before the coming of modern social way of living, certain ancient tradition secretly permitted even in the presence of deathly taboos which automatically sanction defaulters the hunting of chimpanzees. The chief priest who had the power of auto cleansing will send out one of his elite to hunt a chimpanzee for a particular ritual known only by them to avoid spilling human blood. Chuo and Tsi (2017b) in their study around Mbengkas village reported the same kind of issue in which chimpanzees are secretly hunted and sacrifice for village cleansing. Furthermore, interviewees were question on updating of knowledge on the abundance and distribution of chimpanzee areas,

identifying and reporting location of all human activities especially huts, farms, shortcuts and illegal market in the park/reserve to assist eco-guards through regular patrols to reinforce order and ensure a better protection for chimpanzees. Up to 74% of the interviewees agreed that they were ready to constantly release information concerning chimpanzees status, 20% did not abide to it as they think it will implicate them or their fellow brothers and 6% remain neutral.

Much more, respondents were question if they belief that old and new traditional knowledge of conservation such as taboos/law, totemic beliefs, sacred forests, royal species, automatic spiritual sanction, harvesting seasons if revived and encourage through traditional institutions/council will better protect chimpanzees. Figure 4 shows the percentages of respondent traditional knowledge of conservation.

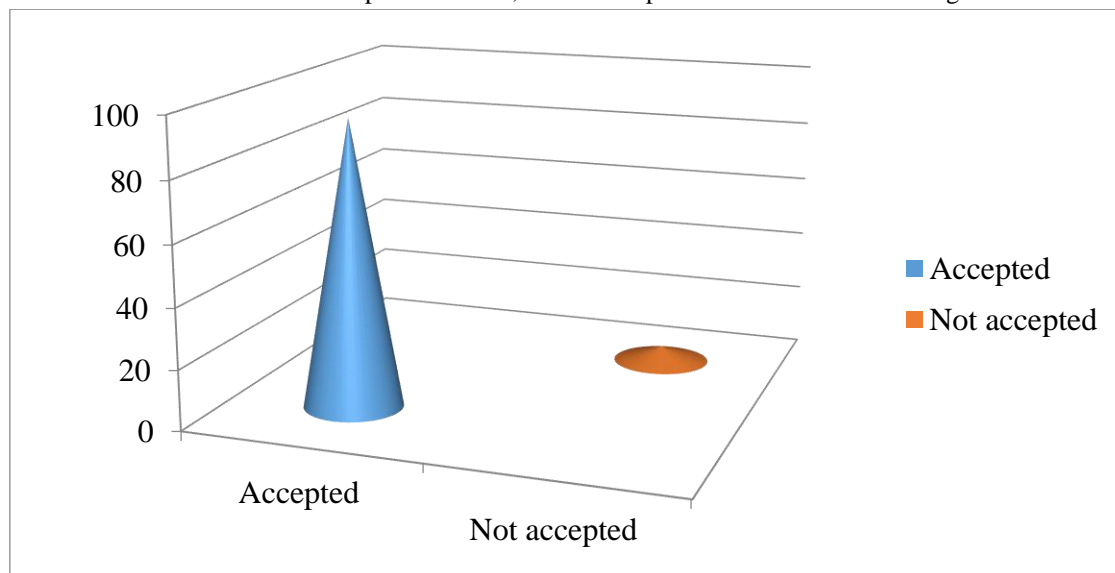


Fig.4: Percentages of respondent to traditional knowledge of conservation.

Respondent (95%) accepted the fact that old and new traditional knowledge of conservation such as taboos/law, totemic beliefs, sacred forests, royal species, automatic spiritual sanction, harvesting seasons if revived and encourage through traditional institutions/council will better protect chimpanzees. While the remaining 5% were those who were ignorant of such traditional knowledge of conservation. Respondents were question if it is possible to get rid of poor traditional practice that uses chimpanzee's body parts/meat for medicine and rituals by replacing them with those of goats, sheep, pig, fowls and other domestic animals. Many of the interviewees 85% accepted the replacing of chimpanzee's body parts/meat for medicine/ rituals with those of goats, sheep, pig, fowls and domestic animals. However, 15% interviewees did not abide with the replacement of chimpanzee's body parts/meat with those of other animals. For instance, one of them said tradition is tradition and it should be given it

place and another respondent said this is so dangerous and expensive as those who are involve may risks lives or even die if not approve by the gods and he ended saying they can't accept that. Chuo and Tsi (2017), in their study in this same study areas reported cases like this that resulted to conflicts and recommended that this kind of situation should be handle with great caution in order to fully convince the affected party.

Notwithstanding, questions were posed if respondents will stop their over dependent on chimpanzee's products and other NFTP's, if they are promoted to income generating micro-projects such as fish farming, animal rearing, and market gardening. Looking at the responses, 97% of the respondents said it will be effective and interesting if income generating micro-projects such as fish farming, animal rearing, and market gardening are promoted. However, 3% of the informant did not see this as a possibility as one of them

exclaim, we have bad road to ease transportation of products to city markets since our people are poor and solely depend on hand to mouth products which they themselves produce. Finally, interviewees (99%) were very much happy and excited when asked if they cherish the idea of getting jobs through ecotourism activities such as forest clearance and excursions of tourist into the forest, constructing and equipping infrastructures for them to promote chimpanzee conservation. One of the informants so excited said if this is done considered all the chimpanzees in this forest protected. While 1% of the informant did not see this as a possibility pointing it clearly that our government is poor for such kind of activities to be establish in their villages.

3.3. Proposed strategic action plan for the conservation of chimpanzees in the study areas

To produce the proposed strategic action plan presented in table 1, resulted from all the information gathered during interviewed administer questionnaire

Table 1: A proposed strategic action plan for the conservation of chimpanzees through the sustainable management of the K-FNP and K-WFR

from indigenous people and those obtained from experts like protected areas managers, government officials and representatives of national and international non-governmental organizations were group to give reliable ideas that aided to produce this action plan and a strategy for its five years renewable implementation. This action plan identifies priorities for *Pan troglodytes ellioti* and their populations, indicating the measures required and the means to address them. It is hope that this work will provide a clear investment plan for researchers, conservationists, and donors and, most importantly, will assist governments in developing strategies for the conservation of *Pan troglodytes ellioti* and other flag ship species. Table 1, shows a summary of the proposed strategic practical intervention measures for the conservation of chimpanzees and the sustainable management of the K-FNP and K-WFR as proposed by key respondents.

OBJECTIVES	INTERVENTION LOGIC	INDICATORS	SOURCES OF VERIFICATION	Chronogram (years)					RISKS AND ASSUMPTIONS
				1	2	3	4	5	
General objective	To contribute to reduce the continuous decreasing populations of Chimpanzees and the over dependent on natural resources in the KFNP and KWFR.	-Encounter rates of chimpanzee increased by 90% as the encounter rate of anthropogenic activities decrease by 90% in the study areas -Proportion of traditional institutions who are aware of the traditional taboos/beliefs and are respecting it increased by 90% -Proportion of dependent on NFTP's reduce	Inventory reports Meeting reports and attendance lists from the palace,	x	x	x	x	x	-Availability of funds, -political stability -Collaboration by all stakeholders
Specific objective 1	1.Reduce the rate of habitat loss deforestation, fragmentation and degradation in the K-FNP and K-WFR	- Rate of deforestation reduce -Number of bushfires reduce - Number of fragmented	Ecological survey reports, field visits, radio programs, Observations,	x	x	x			-Collaboration by all stakeholders willing to give up negative attitudes -Availability

		<p>habitats drop</p> <ul style="list-style-type: none"> -Percentage of area reforested - Proportion of land area covered by intact forest -Annual rate of habitat fragmentation reduce - Change in species status -Number illegally exploited species reduce -Number of energy substitutes (stoves, solar panels, electricity) adopted by the population. 							of funds, -Political stability
Result 1	1.Illegal exploitation of forest and NTFPs reduced by 90%	<ul style="list-style-type: none"> -Number of trees exploited reduce -Number of species of trees exploited -Number of inventory and ecological monitoring increase. -Number of seminars/worksh ops organized 	Inventory and monitory reports	x	x				
Activities 1	<p>1.1.1.Establish a baseline inventory study of all K-FNP and K-WFR</p> <p>1.1.2 Establish the socio-economic study of the K-FNP and K-WFR</p> <p>1.1.3Implement a detailed mapping study of K-FNP and K-WFR</p> <p>1.1.4 Implement an environmental and social impact study for K-FNP and K-WFR</p>								

<p>Result 2</p>	<p>1.2.Farmlands and Cattle ranches encroachment and destruction of critical wildlife corridors reduced</p>	<ul style="list-style-type: none"> - Number of individual Farms inside the K-FNP and K-WFR - Number of cattle (dung, track, and footprint) encountered -Percentage of farmed & grazed areas - Percentage of area encroached -Number of daily patrols and check points established on the roads 	<p>Palace reports , field visits</p>	<p>x</p>	<p>x</p>				
<p>Activities 2</p>	<p>1.2.1. Develop and implement an effective micro-zoning plan of the K-FNP and K-WFR 1.2.2. Limit the number of Resources exploitation zone 1.2.3. Reinforce follow up around the K-FNP and K-WFR 1.2.4 Identify and rehabilitate deforested fragile zones 1.2.5. Train grazers on modern grazing techniques which confine animals</p>								
<p>Result 3</p>	<p>1.3.Agricultural practices improved and consequences on biodiversity loss is reduced</p>	<ul style="list-style-type: none"> -Percentage of farmers trained on sustainable agricultural practices -Number of training centers -Proportion of women and youths trained on income generating activities -Proportion of farms from trainers -Income 	<p>Reports, interviews, field visits Observations.</p>			<p>x</p>	<p>x</p>		<ul style="list-style-type: none"> -Availability of funds, -political stability -Collaboration by all stakeholders

		generated from livelihood activities.							
Activities 3	1.3.1. Train women and youths on alternative income generating activities. 1.3.2. Train farmers adjacent on improved seed multiplication. 1.3.3. Train farmers on domestication of some species of animals and crops e.g. cane rats 1.3.5. Train farmers on improved bee farming 1.3.6. Build capacity on improved farming techniques					x	x	x	
Result 4	1.4. Rate of loss and degradation of natural habitation decreased	-Natural resources conservation policies exist -Percentage of famers educated							
Activities 4	1.4.1 Educate farmers on best natural resources conservation methods 1.4.2 Sustain production of medicinal plants and materials 1.4.3 Improve the livelihood of surrounding communities			x	x	x	x	x	
Specific objective 2	2. Reduce the rate of poaching in the K-FNP and K-WFR	-Quantity of bush meat in local markets. -Number of poultries, goats, pig, sheep within the community -Number of hunting tools (guns, wire traps) seized - Quantity of bush meat seized. -Number of species poached -Number of poachers	Field surveys, Reports	x	x				Availability of funds, -political stability -Collaboration by all stakeholders

		prosecuted -Number of control points on roads							
Result 1	2.1. Forest hunting routes reduced.	- Number of patrol executed/month -Number of defaulter captured /month.					x	x	
Activities 1	2.1.1.Sensitize hunters on wildlife laws 2.1.2. Organize weekly patrols along hunting routes. 2.1.3.Identify and record all guns owners and notorious hunters 2.1.4. Integrate poachers in patrol teams.		Inventory and monitoring Reports	x	x	x	x		
Result 2	2.2 Alternative source of protein provided.	-Number of domestic animals killed for food. - Number of fish ponds constructed -Number of qualified fish farmers trained - Number of qualified bee farmers trained -Numbers of qualified cane rat farmer trained -Number of qualified poultry and piggery farmers trained. -Number of new jobs created by K-FNP and K-WFR management.		x	x	x	x	x	
Activities 2	2.2.1. Provide start up animals to trainees. 2.2.2. Construct fish ponds. 2.2.3. Train farmers and poachers on improved fish farming. 2.2.4. Build capacity on improved bee farming								

	techniques. 2.2.5. Train qualified farmers on cane rat domestication. 2.2.6. Train farmers on intensive livestock rearing.								
Specific objective 3	3. Decrease pressure on NFTP's exploitation and chimpanzees	-Number of individual, sustainable exploiting NFTP's -Number of natural resources and human-chimpanzee conflicts observe and mitigated -Number of medical health centers and individual using modern drugs -Percentage of individual who are Christians	Reports of conservation and monitoring committees	x	x	x			-Availability of funds, -political stability -Collaboration by all stakeholders
Results 1	3.1.1. Conflict on natural resources exploitation and on human-chimpanzees decreased	-Percentage of individual depending on alternative sources of livelihood -Number of chimpanzees present in the study areas -Number conflicts observed and mitigated -Number of persons trained on conflict mitigations	Reports of conservation and monitoring committees						
Activities 1	3.1.1. Carry out inventory on conflict identify areas 3.1.2. Organize workshops and train local population on how to mitigate conflict 3.1.3. Educate villagers to avoid farming						x	x	

	<p>near/inside the study areas</p> <p>3.1.4. Assure Protection of Communities members and their properties</p> <p>3.1.5. Train local population on animal rearing</p> <p>3.1.6. Establish effective patrolling system to discourage defaulters</p>									
Result 2	3.2. chimpanzee habituation promoted	<p>-Number of chimpanzee habituation programs</p> <p>-Number of pilot study undertaken</p>	<p>Reports from the palace, Field visits</p> <p>Observations,</p>					x	x	<p>-Availability of funds,</p> <p>-Traditional rulers and authorities are willing to give up negative traditions</p>
Activities 2	<p>3.2.1. Carry out survey to identify ecology of chimpanzees and the various groups existing</p> <p>3.2.2. Assess the possibility to undertake chimpanzee habituation</p> <p>3.2.3. Initiate a pilot program of chimpanzee habituation to the villagers</p>			x	x					
Results 3	3.3 Eco-tourism improved	<p>-Number of touristic promotions organized yearly</p> <p>-Income generated from tourism</p> <p>-Proportion of local communities visiting the K-FNP and K-WFR</p>	<p>Reports from the palace, Field visits</p> <p>Observations,</p>							<p>-Availability of funds,</p> <p>-Traditional rulers and authorities are willing to give up negative traditions</p>
Activities 3	<p>3.3.1. Develop chimpanzees watching programs</p> <p>3.3.2. Promote forest excursions</p> <p>3.3.3. Construct adequate and equip infrastructures</p> <p>3.3.4. Facilitate</p>							x	x	

	Community Tourism Initiatives								
Specific objective 4	4. To strengthen traditional leadership through traditional knowledge system	-Traditional research committees encouraged and empowered -Percentage of activities on sustainable traditional practices in the communities -Number of criminal cases handled by traditional committees							-Availability of funds, -Traditional elites and authorities are willing to give up negative traditions
Result 1	4.1. Traditional leadership is strengthened	- Traditional laws/taboo revised and implemented -New sustainable traditional practices suitable for biodiversity conservation introduce -Number of poor traditional practices identify and eliminated -Number of defaulters sanction by traditional council -Number of criminal cases handled by traditional institutions	Reports, field visits, Testimonies,						-Availability of funds, -Traditional rulers and authorities are willing to give up negative traditions
Activities 1	4.1.1. Sensitize villagers on traditional taboos/laws suitable for biodiversity conservation 4.1.2. Teach villager on wildlife laws through workshops 4.1.3. Train and equips village local eco-guard			x	x	x	x	x	

	<p>to carry out frequent patrol around the forested areas</p> <p>4.1.4.Engage village youths to ensure that traditional taboos /beliefs are effective</p> <p>4.1.5. Help villagers to engage on alternative sources of livelihood</p> <p>4.1.6. Employ villagers undertake boundaries clearance to avoid wild bush fires</p> <p>4.1.7. Encourage villager to act as guards against poachers/grazers encroachment</p> <p>4.1.8. mobilise villagers to carry out local inventory on all short cut created by defaulters</p> <p>4.1.9. Recruit and encourage hunters to locally map out and report areas of chimpanzees concentration</p>								
Results 2	<p>4.2 Women traditional council committee encourage and empower with chairladies represented in decision making in traditional village committees</p>	<p>-Number of women committees establish and encourage</p> <p>-Number of women in decision making positions.</p> <p>-Number of village women engage in research project</p> <p>-Number of women engage in natural resource exploitation (NFTPs)</p>	<p>Reports, field visits radio programs Observations,</p>						<p>-Availability of funds,</p> <p>-Collaboration by all stakeholders.</p> <p>-Men are willing to share power.</p>
Activities 2	<p>4.2.1 Train women on decision making and leadership processes relating to natural resource management</p> <p>4.2.2 Organize campaign schools for</p>			X	X	X	X	X	

	potential women leaders to assist in natural resource management 4.2.3.Sensitize women on the importance of traditional taboos/beliefs in conservation 4.2.4. Train and assist women on alternative sources of livelihood								
Results 3	4.3.Incorporate non protected areas that harbors chimpanzees as sacred forest under the protection of traditional village council	-Number of non protected areas that harbors chimpanzees incorporated as sacred forest/local protected areas -Laws revised and implemented -Percentage of this local protected areas with local management plan	Reports from the palace, Field visits court judgments Observations,			x	x		-Availability of funds, political stability, -Collaboration by all stakeholders
Activities 3	4.3.1.Train and recruit local eco-guard to promote sustainable uses of natural resources around non protected areas/sacred forest 3.3.2.Produce local management plans to facilitate patrol				x		x		
Results 4	4.4 Conservation development programs promoted within traditional councils	-Percentage of villagers aware of biodiversity conservation -Number of job opportunities and facilities created for villagers	Reports from the palace, Field visits Observations,						Availability of funds,
Activities	4.4.1 Develop sense of ownership among villagers 4.4.2 Develop skills and the know-how and awareness for villagers 4.4.3 Develop partnership connective routes for villagers						x	x	

	4.4.4 Provide job opportunities and facilities for villagers								
Results 5	4.5.General policy and guidelines for research and monitoring improved and introduce in traditional councils	-Number of research carried out yearly with the assistance of traditional councils -Number of research committees with villagers involvement -Proportion of researchers carrying research in the study areas -Number of research results published in the internet	Research and monitoring reports						-Availability of funds -Traditional rulers and authorities are willing to give up negative traditions
Activity 5	4.5.1 Set up an advisory scientific, technical monitoring and research committee 3.5.2 Provide practical help to researchers 4.5.3 Communicate the results of Research 4.5.4 Involve a wide range of researchers								
Specific objective 5	5. To enforce the implementation of forestry laws in the K-FNP and K-WFR	Number of laws enforced.							Availability of funds, -Stable political climate -Collaboration of all stakeholders.
Result 1	5.1. Institutional capacity is reinforced.	-Number of qualified eco-guards trained and recruited. -Number of equipped and functional forestry posts. -Number of functioning village forest management	Reports, field visits Testimonies,				x	x	-Funds are available. -Cooperation of all stakeholders.

		committees -Number of functioning environmental clubs in schools around K-FNP and K-WFR							
Activities	5.1.1. Train and recruit qualified forest eco-guards. 4.1.2. Creating of more equipped and functional forestry posts								
Result 2	5.2. Governance improved	-Number of criminal cases handled. -Number of donors available. -Number of capacity building workshops/ seminars organized. -Number of sensitization meetings/trimester through radio, print media and village meetings		x	x	x			
Activities 2	5.2.1. Identify and sanction defaulters of the law 5.2.2. Develop appropriate funding mechanisms 5.2.3. opening of new environment clubs in schools 5.2.4. Organized workshops for foresters and law enforcement officers. 5.2.5. Organize sensitization meetings between all stakeholders involve.								

IV. CONCLUSION

This proposed strategic action plan to enhance the biodiversity status and traditional knowledge systems

relevant for the conservation of *Pan troglodytes ellioti* in the K-FNP and K-WFR, have identified priorities for *Pan troglodytes ellioti* and their populations, indicating the

measures required and the means to address them. It content is developed from information solicited from villagers and stakeholders encountered during field inventory. For instance, 68% of the respondents were confident that they could take up effective management of the K-FNP and K-WFR. Even though increasing population, poverty increment, insufficient modern health facilities, influx of new cultural activities due to loss of traditional taboos and totemic beliefs, remains greater threat to chimpanzees, respondents agreed that they will assist to knowledge on the abundance and distribution of chimpanzee, location of all human activities especially huts, farms, shortcuts and illegal market in the park/reserve through regular patrols with eco-guards to reinforce order and ensure a better protection for chimpanzees. Majority of respondent willingness to the fact that old and new traditional knowledge of conservation such as taboos/law, totemic beliefs, sacred forests, royal species, automatic spiritual sanction, harvesting seasons should be revived and encourage through traditional institutions/council to better protect chimpanzees. Equally, goats, sheep, pig, fowls and other domestic animals body parts/meat suggested were accepted by many of the interviewees to replace the use of chimpanzee's body parts/meat for medicinal and rituals or as means to get rid of poor traditional practices. A good number of respondents positively desire to welcome income generating micro-projects such as fish farming, animal rearing, and market gardening promoters, and to partake to jobs relating to ecotourism activities such as forest clearance and excursions of tourist and in construction works. With all this and many more put in place, gives hope that this work will provide a clear investment plan for researchers, conservationists, and donors and, most importantly, will assist governments in developing strategies for the conservation of *Pan troglodytes ellioti* and other flag ship species in/around the study areas and thus the following recommendation..

V. RECOMMENDATION

There is need for equity and fair distribution of benefits for a better collaboration among the stakeholders and villagers to ensure efficiency in the conservation of *Pan troglodytes ellioti* and in the execution of sustainable utilization of natural resources and management of the K-FNP and K-WFR. This can be achieved through;

Sensitization campaign

Wildlife officials, NGOs, conservationists and researchers should be deliberately strengthened to embark on educational activities around the villages of the park and reserve. These educational efforts should be aimed at

sensitizing the villagers, local communities and wildlife officials on sustainable forest management issues. That is;

- Undertake an awareness campaign directed at villagers, local communities and wildlife officers, emphasizing the unique and precarious nature of this chimpanzee population.
- Improve awareness on laws governing chimpanzee protection in all surrounding villages. By establishing community awareness and conservation education programme in schools and communities and increase dialogue with community groups to support conservation action. Equally, maintaining levels of villagers support for the park and reserve by introducing alternative livelihoods and the development of eco-tourism.
- Extend chimpanzees focused conservation education to workers of adjacent commercial agriculture and cattle grazers especially those of the Dumbo range and enlist their greater involvement in conservation processes.
- To educate and encourage the villagers on their ancient traditional knowledge systems and the important in reviving and implementing those taboos/cultural laws that are environmentally friendly while complementing bad traditional belief with alternative but sustainable ones to permit the continuity of their tradition and enhanced natural resource management.

Local Community Building

NGOs partners, (such as Erudef, WCS, WWF, CIRMAID, SAKAKO), communities, MINFOF and conservationists should create and made efforts to strengthen the capacity of traditional councils, groups and local government institutions to ensure a collaborative approach towards sustainable management through consultation, needs assessment, investigation, synthesis and consensus. Building among others sustainable conflict management and exploitation of natural resources to prosper utilization and management of the social and economic benefits. More precisely to;

- Establish a chimpanzee survey and monitoring programme with greater involvement of villagers. Support and build on taboos regarding chimpanzee hunting
- Recruit, train and equip a minimum of 30 additional village forestry guards to augment present staffing levels in Kimbi-Fungom National Park. Equally, increase from 10 to 20 council forestry guards by the Fundong council and encourage the Wum council to recruit from 1 to 8 council forestry guards to assure protection

of chimpanzees in the Kom-Wum Forest Reserve.

- Create and seek legal registration of Village Forest Management Committees to support wildlife laws and foster involvement of local communities in chimpanzee surveys and monitoring.
- Investigate and develop opportunities for villagers engagement, including employment, boundary clearance, livelihood improvement, monitoring, and eco-tourism as mean to avoid conflicts and over dependence on natural resources.
- Concerted efforts should be made by the stakeholders to create a legal commission in order to provide resolution to the type, nature, level and impact of conflicts around the study areas. That is, develop a well-structured conflict management mechanism aimed at ensuring proper cooperation between managers and resource users.

Reviewing Current Park and Reserve situation

MINFOR and local councils should clearly clarify the current park and reserve boundaries and the possible buffer zones limits to the local communities. This will go a long way to ensure support for a well-structured management mechanism aimed at ensuring proper cooperation between managers and resource users as well as avoiding interest conflict. Thus it is vital to;

- Complete activities related to the establishment of the Kimbi-Fugom national park including demarcation of the boundary and finalization of the management plan in order to increase villagers knowledge of national park status and future buffer zones
- Review current boundary situation and legally gazette a new Kom-Wum Forest Reserve boundary to stop all illegal farming, logging and hunting inside the reserve.

Law Enforcement Priority Actions

It is necessary for all the stakeholders to come together and ensure that legislation is enacted to support collaborative natural resource management and *Pan troglodytes ellioti* conservation in the study areas. That is;

- Improve law enforcement, training, monitoring and supervision of rangers and provide field equipment and vehicles, and improve patrol incentives.
- Encourage coordination and awareness building amongst all stakeholders to strengthen chimpanzee conservation awareness and reduce human-chimpanzee conflict

- Develop and support law enforcement activities to curb all illegal activities and promote regular monitoring of human activities
- Campaign to stop the live trade of infant chimpanzees and sale of chimpanzee meat and body parts by identifying, monitoring and targeting illegal markets and specialist hunters and searching of suspicious homes.
- Capacity building for wildlife officials for planning and executing special operations to arrest and prosecute chimpanzee hunters
- Strengthen levels of protection by removing all hunter's and farmer's camps and prevent any re-occurrence by providing mitigating impact of enclaves and plan for their resettlement
- Promote national and international tourism, thus generating income for local villagers and for the sustainable management of the national park and the reserve.

Trans-boundary issues Priority Actions

There is also the need for MINFOR and other stakeholders to frequently holds legislative talks to effectively secure both Nigeria-Cameroon borders and easily trapped down defaulters while maintaining the overall health of the ecosystem services and conservation of endangered species. This can be done by;

- Signing of a joint inter-governmental agreement for improved collaboration between contiguous protected areas and other areas of high biodiversity value closer to Nigeria
- Improve levels of communication and coordinate conservation efforts through an annual joint planning meeting between Nigeria and Cameroon
- Encouraging joint patrols between contiguous protected areas and target illegal timber trade and the sale of endangered species
- Coordinate joint biological surveys and exchange of data
- Creating an awareness campaign targeting all trans-boundary law enforcement, customs, and immigration officials.

6.3. Areas for Future Study

Lack of sufficient base-line information in these areas, hampers adequate knowledge on the ecology and factors that limit the population of *Pan troglodytes ellioti*. For instance, many factors are taken into account when assessing conservation status: not simply the number of individuals remaining, distribution threat and traditional knowledge systems, but also the knowledge of the species' ecology and habitat range, social and behavioural characteristics, their phylogeography and

genetic structures and symbiotic fauna are of great interest. Equally their group composition, their distribution limit, their different food types and breeding success rates are also very important as well as practices and social mechanism of traditional societies. Therefore, NGOs, Universities, conservationists, researchers and Wildlife officials should be given priority to undertake constant research throughout the study areas to enable continuous data provisions to ease the possibility of improving *Pan troglodytes ellioti* and other wildlife species conservation. Great attention should be paid to;

- Surveys should be conducted to clarify the status and distribution of chimpanzees in the K-FNP and K-WFR. Equally, surveys should be carried out in non protected areas or poorly known chimpanzee's habitat in order to expand population monitoring efforts around the study areas suspected to harbour chimpanzees. This is to help in the protection of corridors linking in fragmented chimpanzee habitats.
- Conduct more extensive population genetic analyses to clarify (a) how *P. t. ellioti* is related to other chimpanzee subspecies; (b) the genetic variability within *P. t. ellioti*; and (c) the degree of connectivity between communities across the region
- Research on habitat structure should be carryout to identify tree and herb species present, and their densities to allow comparison of forest productivity and food availability across different sites.
- A phenology study should be undertaken in order to research the annual cycle and productivity of chimpanzee feeding trees species at the site to allow estimation of seasonal variation in forest productivity and food availability for chimpanzees.
- A research on the ambiance environment should be effectuated to provide annual changes in climatic variable at the sites. Daily rainfall (mm), daily minimum and maximum temperature (°c) and daily maximum and minimum humidity (%) are important variables to make cross-site comparisons.
- Research should equally be carryout to uncover new tool types, new tool techniques and distribution of tool use sites of Chimpanzee throughout the study areas. This is to permit understand chimpanzee intelligence and culture within the study areas.
- Research on chimpanzee isotope samples should be carried out to determine the diet of the chimpanzees in particular, the amount of meat or

protein consumed. The collection of samples should be correspond to trophic level, forest cover, photosynthetic pathway and other biological properties of the main dietary sources of chimpanzees.

- Research should be carryout to identify the diet of chimpanzees through faecal sample collection and analyses, and determine their nutritional status from urine samples.
- Equally, research should be undertaken to determine the genetic and pathogenic aspect of chimpanzees using faecal and other organic samples such as sperm plugs and food remains of chimpanzees. This is to obtain additionally information on their genetic structure, parasite content, sex ratio, group structure and composition, home range size, habitat use, and diet.
- A research should be conducted throughout the study areas to identify the wide use of wildlife products and research for sustainable alternatives one build on taboos regarding wildlife hunting that can replace them.
- Introduce use of Cyber tracker for recce surveys by park rangers and line transects in suspected key chimpanzee areas to ease research.
- Further research should be conducted on the socio-cultural and ecological linkages as well as their contribution to the use of traditional knowledge systems for biodiversity conservation. That is, to investigate strategies that can effectively remove human activities that has a negative impact on the preservation of biodiversity around parks and reserves.
- Further work must molecularly determine the origin of the skin and bush meat in the markets in order to assess the frequency of the species traded and assign their geographical origin.
- Finally, cultural anthropological studies specifically centered on the use and symbolic incorporation and appropriation of non-human body parts will help to understand how such practices are disseminated.

CONFLICT OF INTEREST STATEMENT

We declare that there is no conflict of interest regarding the publication of this paper.

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