SCIENTIFIC EXPEDITION REPORT
RELICT, REFUGE and FRAGMENTED ALTITUDE FOREST: FAUNA AND FLORA INVENTORY, and ECOLOGICAL NOTES ON AN ISOLATED CHIMPANZEE POPULATION (*Pan troglodytes schweinfurthii*)

Djugu Territory, Ituri Province, Democratic Republic of the Congo

30th July – 6th September 2016

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ABSTRACT

The RedList of Threatened species for the DRCongo reports a total of 349 species of which 36 Mammals, 37 Birds, 7 Reptiles, 10 Amphibians, 93 Fishes,43 Molluscs,10 Other Invertebrates, and 113 Plants (UICN, 2016) illustrating the relevance of preforming biodiversity inventories in unexplored regions**.** This report presents the methods, databases content and general results of a third mission aiming at documenting mammalian and botanical biodiversity in fragmented forests of the Lake Albert escarpment (in short RAFALE) down the Lendu plateau in the Ituri province, Democratic Republic of Congo.

The general objectives of this third mission were to perform line transects and nests counts in order to estimate the density and – combined with camera trap surveys from March till August 2016 – the size of a recently identified isolated eastern chimpanzee population (*Pan troglodytes schweinfurthii* Giglioli, 1872). We made a first inventory of mammals – mostly primates and rodents -by means of direct and indirect observations along the transects and describe the vegetation, human acitvities and landuse in and around three altitude forest fragments surveyed (800m – 2000m). A total of 5 transects (500 to 1400m) were traced with respectively 2 transects in bloc FG1 and FG2 and 1 transect in FG3 while two random recce in search for new chimpanzee nests were also carried out in FG3 and the south eastern part of FG3 (arbitrarily named FG4). The later was done in order to collect more hairs and faeces - hence genetic material - and estimate the local nest decay rate. Systematic botanical inventories, habitat decription, human activities, nest counts, direct and indirect observations were carried out along 4 of the transects ; rodent trapping was done on 3 main transects, one in each bloc.

A total of 85 perpendicular distances were recorded and ±52 additional nests off the transects (data analysis ongoing) were described to document the preferred tree species on which the local chimpanzee population build their nests. The height of the nest, the state of degradation (fresh or dry), theDBH, and host trees (or support) on which the nests were observed were identified and voucher specimens of selected flora were collected. Besides landuse, and habitat description the level of human activities was also recorded on each transect. Signs and tracks, as well as dung were collected for phylogenetic analysis, diet description and zoonotic infectious agents screening. Camera traps (N=27) were recovered and the images collected to proceed to a general mammalian inventory based on presence/absence of species in the different forest blocks and assess density of a selection of species per hectare. The images will also allow for the recognition of individual chimpanzees and to compare the number of individuals with the density estimate based on nest counts. In first approximation, a total of at least 26 chimpanzees with 3 unweaned juveniles could be identified in the 25km² area monitored since March 2016. We estimated a chimpanzee density in the RAFALE as follows : 14.25 individuals/km² in FG1, 17.81 individuals/km² in FG2 and 20.82 individuals/km² in FG3 showing an increase in population density as the population density, settlements, and anthropic pressure decreases. One of the camera trap showed a group of 17 chimpanzees patrolling in FG3 block with various specific mutilartions (hand cut or twisted) and facial depigmentation that evokes a skin disease. The faeces and hairs collected from this group could yield an answer as to the condition they suffer. This pioneering work in a remote scientifically neglected area demonstrate the specific diversity and richness of these relict forests and the urgent need for their management and conservation. Inventories and comments on other wildlife species captured by the camera traps and documented in this report demonstrate the richness of these relict forests in the western strip of the Albertine Rift and demonstrate the urgent need for sustainable management, supported by the people and government of Ituri, and conservation measures for these threatened forests.

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ACRONYMS

CIFOR	Center for International Forestry Research, Boghor, Indonesia
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CRC KMDA	Royal Zoological Society of Antwerp (vzw), Belgium
CDC	Center for Disease Control, Atlanta, USA
CSB	Biodiversity Monitoring Centre, Kisangni, DRCongo
FFN	National Forest Fund, DRCongo
ICCN	Congolese Insitutue for Nature Conservation, DRCongo
IRD	Research and development Insitute, Montpellier, France
ISPT	Superior pedagogical and technical Insitute, Rethy, DRCongo
IUCN	International Union for the Conservation of Nature
JBM	Meise Botanical Garden, Brussels, Belgium
MECENT	Ministry of environment
MNHN	National Museum of Natural Sciences, Paris, France
MTA	Material transfer agreement
OSFAC	Satelital Observatory of Central African Forests, Kinshasa, DRCongo
RBINs	Royal Belgian Institute of Natural Sciences, Brussels, Belgum
RFO	Okapi Fauna Reserve, Epulu, DRC
RMCA	Royal Museum for Central Africa, Tervuren, Belgium
UA	University of Antwerp, Belgium
UNIKIS	University of Kisangani, DRCongo
WWF	World Wildlife Fund

A. CONTEXT

In October 2015, during a case contro study on epilepsy and Onchocerciasis in Rethy area (Djugu territory, Ituri province), several villagers mentioned the presence of baboons and chimpanzees in forest fragments of the Albert lake escarpment down the Lendu plateau in the DRC. At the end of the day, while climbing uphill, we heard the chimpanzees and the waypoint recorded. Our guide, also informed us on the fact that in the years 1970-1980, the Rethy mission welcomed a series of Amercian citizens one of whom was hunting chimpanzees in the valley and a picture of the time was found on a website dedicated to the period where the mission was actively supported by US citizens. Dr Laudisoit and the UNIKIS team planned and performed two exporatory expeditions in the area in March 2016 and June 2016 to document the relevance of the site for Primate and mammalian research and gather evidence of chimpanzee presence in the area by means of direct (observations, nest counts) and indirect observations (camera traps, tracks, dung).
In August 2016, convinced about the importance of the area, the CRC and Antwerp Zoo as well as the University of Antwerp sent Dr Jacob Willie – a renowned primatologist based in Dja in Cameroon – and two Master students to join the team and proceed to systematical density estimates of the fauna while Joseph Omatoko replaced Justin Asimonyio for the botanical inventories.

This report summarizes the methods and data collected during this 3rd mission and give in each appropriate section the current and future contributions of several partners invovled in this project.

B. OBJECTIVES

The main objectives of this first mission are to describe a relict fragmented forest, its genesis, and make inventories of the flora and fauna with a special accent on chimpanzees. This area is located in the Province of Ituri - classified as red zone in terms of security – and has not been explored previously by scientific teams. The forest fragments were selected especially given the reported presence of chimpanzees during a research trip on epilepsy and onchocerciasis in October 2015 (see §Context). Therefore, the mission was also aiming at raising awareness in the community to the sustainable management and protection of the forest by explaining the consequences of deforestation and forest degradation, and also tried to identify the major threats.
The specific objectives were to i) describe the botanical characteristics of the fragmented altitude forests ii) obtain behavioral sequences (sequence analysis of camera traps) of wildlife by focusing on chimpanzees (*Pan troglodytes cfr schwenfurthii*) iii) collect material and DNA (collection of faeces and hairs) for species confirmation, parasite and zoonotic agents detection iv) estimate the size and diversity, as well as the rate of reduction of the forest by combining groundtruthing of vegetation communities and remotely sensed images processing v) record local / indigenous knowledge on wildlife (especially non-human primates and two endemic bird species), flora and threats to local forests by interviewing chiefs, notables, scientists and villagers living in the prospected region vi) provide perspectives of research, conservation and management of this unprotected area.

C. CALENDAR

General details

The CIFOR/UNIKIS team core left Kisangani by road 30th July 2016 while Dr Anne Laudisoit took off the 1st August to head directly from Bunia to Rethy. The 2nd August the team went to meet the two Master students of the University of Antwerp (Pierre Huyghes and Tiffany Scholier) and Dr Jacob Willie from CRC-KZA/UGhent at the DRC/Uganda border in Mahagi. The 3rd August, Dr Jacob Willie gave a seminar to the whole team. In the afternoon, the team headed to Kpandruma to buy food for the first week in Ndeke 3 and organize and recruit guides, cooks and porters for the trip.

Specific details

NDEKE 3 – CAMP 1 – FG1									
NDEKE	TRAP	CT	TR TRACING	NEST COUNT	OBS IND	HUMAN ACTIVITY	OBS DIR	INV BOT	HIKE or REST
4/8/2016									HIKE
5/8/2016			X (300m)		X	X		X	
6/8/2016	X		X (700m)	X	X	X		X	
7/8/2016	X		X (1250m)	X	X	X		X	
8/8/2016	X								REST
9/8/2016	X		X (500m)	X	X	X	X	X	
10/8/2016	X			X		X			
11/8/2016				X					
12/8/2016									REST
NZERKU– CAMP 2 – FG2									
NZERKU	TRAP	CT	TR TRACING	NEST COUNT	OBS IND	HUMAN ACTIVITY	OBS DIR	INV BOT	HIKE or REST
13/8/2016									HIKE
14/8/2016	X	X	X(650m)	X	X	X		X	
15/8/2016	X	X	X(1100m)	X	X	X		X	
16/8/2016	X								REST
17/8/2016	X		X (1400m)	X	X	X		X	
18/8/2016	X		X	X			X	X	REST
19/8/2016		X							
DZOO– CAMP 3 – FG3 AND FG4									
DZOO	TRAP	CT	TR TRACING	NEST COUNT	OBS IND	HUMAN ACTIVITY	OBS DIR	INV BOT	HIKE orREST
20/8/2016		X							HIKE
21/8/2016									REST
22/8/2016	X	X	X (1000m)	X	X	X		X	
23/8/2016	X		X (1100m)	X	X	X		X	
24/8/2016	X			X				X	
25/8/2016	X			X					
26/8/2016				X	X				
27/8/2016									HIKE

Table 1. Specific details of the activities performed on a daily basis in each forest bloc/camp. Legend : TRAP, rodent trapping; CT, camera trap collection/placement; TR TRACING, transect tracing; OBS.IND., indirect observations; OBS.DIR, direct observations and INV BOT, botanical inventories.

The whole team left the third base camp, in Dzoo locality, 27th August and walked back to Ndeke 3 (base camp 1) the same day. The 28th August the team climbed back up to Koda dam and arrived safely in Rethy mission. On 31st August, a small team left again from Koda to the upper end of transect 1 in FG1 to recover the 2 last camera traps left in this fragment. The UNIKIS core team left Rethy 2nd September and arrived in Kisangani 4th while Dr Anne Laudisoit spent the weekend in Bunia and arrived in Kisangani 5th September.

D. BUDGET

The difference in estimated (±7000$) and real expenses (±9000$) are due to :

*a clear underestimation of the amount of extrawork and need for manpower and logisitics that was required to employ nearly permanently around 10 guides in order to collect all the data along the transects. The underestimation is due to the fact that the transect line method was heavier than previous recce explorations and required more staff every day as well as porters and assistant to carry the gear.

Figure 1. Moving from one camp to the next.

As such, the amount of people to maintain and feed in the camps, associated with the load of wrok in harsh conditions (8h/day on average 20% slopes under the rain for 1 week among other things ; Fig. 2) and the amount of porters required to move all the equipment between the camp and the forest and between camps.

Figure 2. Field conditions after the rains, on the transects on steep slopes, and after a landslide

The fact that the sites are not accessible by road is also an issue as all products need to be prushased and carried on people's back/heads for 3 to 5 hours to reach the camp. We also paid 1000FC each respondants for the interview for their time.

Each transect required a minimum number of 10 people daily. During the transect tracing lasting between 1 to 4 days depending on the field, slope and obstacles at least two "machetteurs", one compass holder, one "chaineur were required. Inorder to perform the scientific data recording and collection the following tasks and people were necessary ; namely one scientist and one local guide to record the human activities, one scientist and one local guide to record the animal sings and tracks (indirect observations), one scientist and 2 local guides to spot the nests and measure the perpendicular distance to the transect, one scientist and 2 local guides to perform the habitat decription and botanical inventories, 2 scientists and 2 local guides to perform the rodent trapping and laboratory analysis.

**donations to the community in terms of drugs for the health structures. We bought sufficient basic drug (amoxicilline, paracetamol, quinine) for the three health centers located in the communities where the field work is performed (500 of each drug / center). We also equipped the last health center was also equipped with a solar panel that was not included in the estimated budget. Those actions are also a token of community trust as only a few members do actually get hired to work with the team ; by providing the whole community a little provision of drugs helps guarantee that the people welcome us and warn us in case of problems.

The forest is not a private domain and camera traps could have been stolen but this did not happend due to the level of invovlement of the team (solar panel and drugs for the whole village).

The University of Antwerpen funded besides the flight ticket and VISAS, 3927$ for the Master's students and Dr Jacob Willie expenses, UNIKIS assistant per diem (2, P. Baelo and B. Ndjoku), paid the bill for the material hired at CSB (490$) as well as shipment fo the samples to Belgium (465$) and an extra 500$ to keep recording the nest decay rate until december 2016 and will pay for all the genetic analysis of the samples of the three missions.

E. SCIENTIFIC REPORT

I.INTRODUCTION

The current Ituri province has experienced dark days during the ethnic wars of the 2000s and border conflicts that have marked its recent history. It is also perforated and polluted by the miners and - given its cooler climate -provides with vegetables the town of Bunia, while its lowland forests is fuelling uncontrolled and illegal cross-border timber trade. Moreover, the rapid conversion of the mountain forests, especially on Mount Aborro, into agricultural area has disfigured the Lendu plateau; its slopes plunging into Lake Albert today are the last refuges of a diverse fauna and flora once abundant throughout the region. The Lendu plateau and the slopes descending towards Lake Albert are classified as IBA or important bird biodiversity area. The alleged fauna and flora diversity of the current fragmented gallery forests therefore result from the combination of recent deforestation and removal of animals in the rugged areas most difficult to access. The erosion of biodiversity is closely linked to deforestation, fragmentation and degradation of all the natural habitats. The DRC also hosts many primate species whose populations are declining and fragmented by the aforementioned disturbances. Wild chimpanzee populations and specialized birds face extinction in all their distribution range and their conservation requires a multi and interdisciplinary approach. In particular, fragmented populations or relictual chimpanzees and bonobos populations have been found in areas of the country where their presence had not been reported before the 2000s (Kawamoto et al, 2013). During a mission in Ituri, a chimpanzee population was spotted in a high altitude area of the region Rethy - between 900m and 2000m - while no current distribution map as well as the latest predictive models inform of their presence there (Plumptre et al, 2011). The chimpanzees should theoretically be linked genetically to the North Western population of the *Pan troglodytes schweinfurthii* such as those encountered in the provinces of the Ubangi, Uélé and Ituri. This population is characterized by a larger skull, a long face, and skull and broader zygomatic arches than southern populations (Maniema, Uganda, and Marungu) (Groves, 2005). No article on mammals in theses forest fragments could be found by combining various search MESH terms in French, Spanish and English in the classical scientific web sites. It therefore appears that the empirical evidence on diversity and the presence of mammals and the perception of their presence by local people is unprecedented. The uniqueness of this site hosting at least 15 species of sympatric and syntopic non-human primates isolated in relict forest fragments makes it an ideal study site that requires urgent attention in order to issue protective measures to establish a Forest Management Community Managed Forest and attract support from national and international insitutions.
This project also aimed at gathering historical data on the area, and on the fragmentation of its primary forests to estimate the direct threats related to the reduction of forest cover (examination of a time series of satellite images of the study area).

II. MATERIAL AND METHODS

2.1. Research Site: general situation

The explored region is located in the Democratic Republic of Congo, Ituri province, Djugu territory, Rethy health zone (population: 149 472 inhabitants) and Linga health zone (144 179 inhabitants). The area is on the edge of the Lendu Plateau, a large mass of 410 000 ha, with altitudes ranging between 1700 and 2455m, and located at the northern end of the Albertine Rift, west of Lake Albert in the northeast of the DR Congo. The study site is located between the shores of the Albert Lake (700m) and the plateau (2000m) and has been named the relict altitude forest of the Albert Lake escparment or RAFALE to distinguish it from the Lendu plateau itself. It is bordered to the north by Uganda, while its oriental part is punctuated by a series of mountain of which Mount Aboro (2455m) is the highest and located in the Linga health zone (Fig. 3).

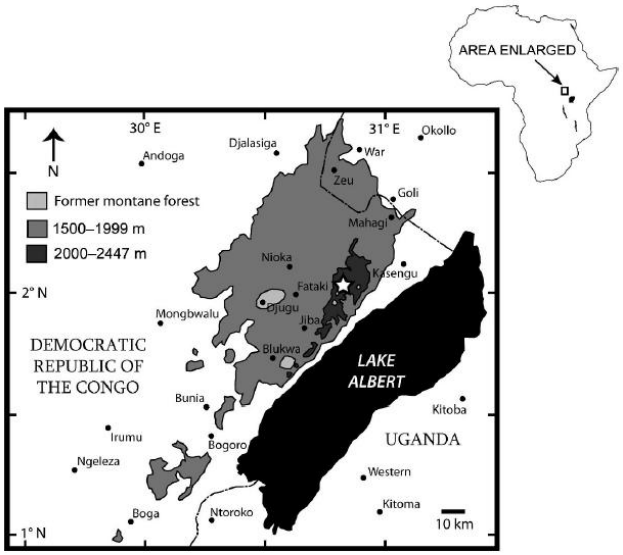

Figure 3. Lendu plateau and historical forest cover reproduced from Vrijdagh, 1949 (Source : Greenbaum et al, 2012).

The Lendu plateau is now totally deforested and mostly covered with agricultural land and grassland with scattered trees; it was covered till the late 50s by a dense mountain forest above 1500 m. The large human settlements in the region especially in Rethy, Kpandruma, Ndrele or Logo, is the basis of intense deforestation of the remaining forests representing the major threat of both flora and wildife. The average temperature ranges from 18-25 ° C. Periods of heavy rainfall are observed in the month of April, September and October. The relatively dry season is between the months of December and February. Rainfall studied by INERA (National Institute for Agronomic Study and Research) at Nioka range from 1100mm to 1400mm per year.

Soils are typically sandy, sandy and sandy-clay and threatened by erosion; landslides and floods are frequent. The presence of oil in the region is documented and constitutes a real threat to the conservation of natural resources of this part and impact studies are urgently needed to prevent and minimize the dangers of probable pollution in case of geological, human or ecological accidents.

The study site : RAFALE or Relict Altitude Forests of the Albert Lake Escarpment

Based on the previous missions (see Laudisoit et al, 2016a and b), the RAFALE constitute a school case study of relict fragmented altitude forest being mostly clustered around rapid flowing rivers froming dense riverine forest galleries (800-2000m). The characteristic species of these forests are among other *Alstonia sp., Chrysophyllum sp., Monodora myristica, Pycnanthus angolensis, Canarium shweinfurthii, Strombosia shefflerii.* The slopes are mainly converted into agricultural land where cassava, peanuts, beans, maize, and sorghum are the main cash crops; and as such the landscape is mostly dominated by active farmland or fallow. The valley bottom is characterized by wetlands, cropland and agricultural wasteland and by oil palm plantations. Marshes are used to grow rice . When planning the third expedition, based on previous missions and after meeting with the OSFAC office staff in Kinshasa in July, we arbitrarily divided the various forest fragments of the RAFALE into 3 main blocs as FG1, FG2 and FG3 (and FG4 as the southeastern part of the FG3 bloc ; Fig. 4), designed a 200mx200m grid based on the digital terrain model and calculated an overall gross surface area of the forest fragments of 26km² (1.5km² for FG1 and 24.5km² for FG2 and FG3).

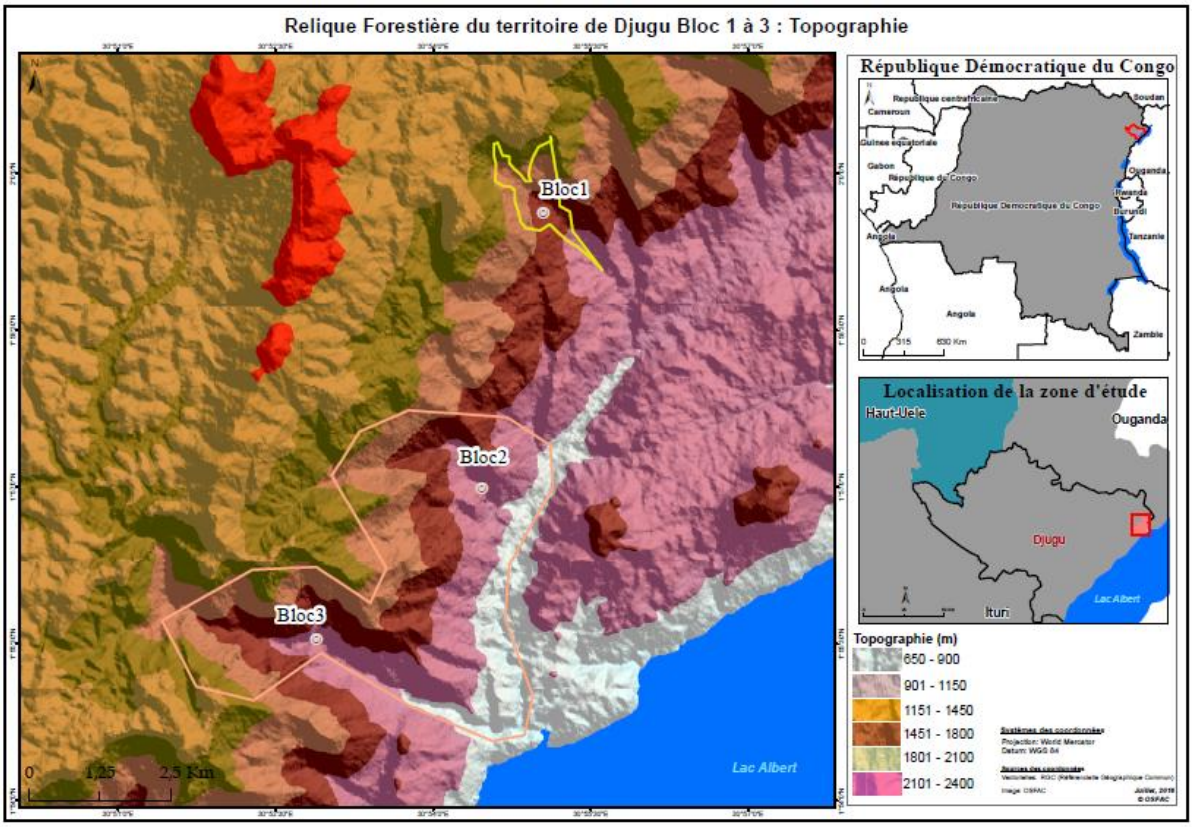

Figure 4. General location of the area and vital domain preliminary estimation (Mauwa, OSFAC)

The FG1 block is located in the village of Ndeke 3, in the Rethy health zone and the FG2 and FG3 blocks are located in Nzerku and Dzoo localities respectively in the Linga health zone. At the administrative level, the explored area is shared between two population groups, the Ndeke and Buba who speak Kibale or Lendu.

VITAL DOMAIN, DEFORESTATION RATE AND CHRONOLOGY OF THE FRAGMENTATION

Contacts have been established with 1) OSFAC, Kinshasa, DRCongo, 2) Nathalie ANDRIES, RMCA, Tervuren, Belgium and 3) Pf Sophie VanWambeke, UCL, Louvain La Neuve, Belgium to access satellite images, shapefiles, and aerial photographs of the study area. Indeed, the RMCA-Tervuren has photographs that may be usefull to estimate the speed at which the forests fragmented in the study area as aerial picutres were taken early 1953 (Fig. 5), and are probably the oldest records for the area.

Pf S. VanWambeke will assist the two master students to calculate the deforestation rate in the region based on current and historical forest cover. This work is planned between December 2016 and June 2017 date of Master thesis deadline at the University of Antwerp.

Other sources of GIS and population data include :

https://data.humdata.org/

https://data.humdata.org/organization/ocha-dr-congo

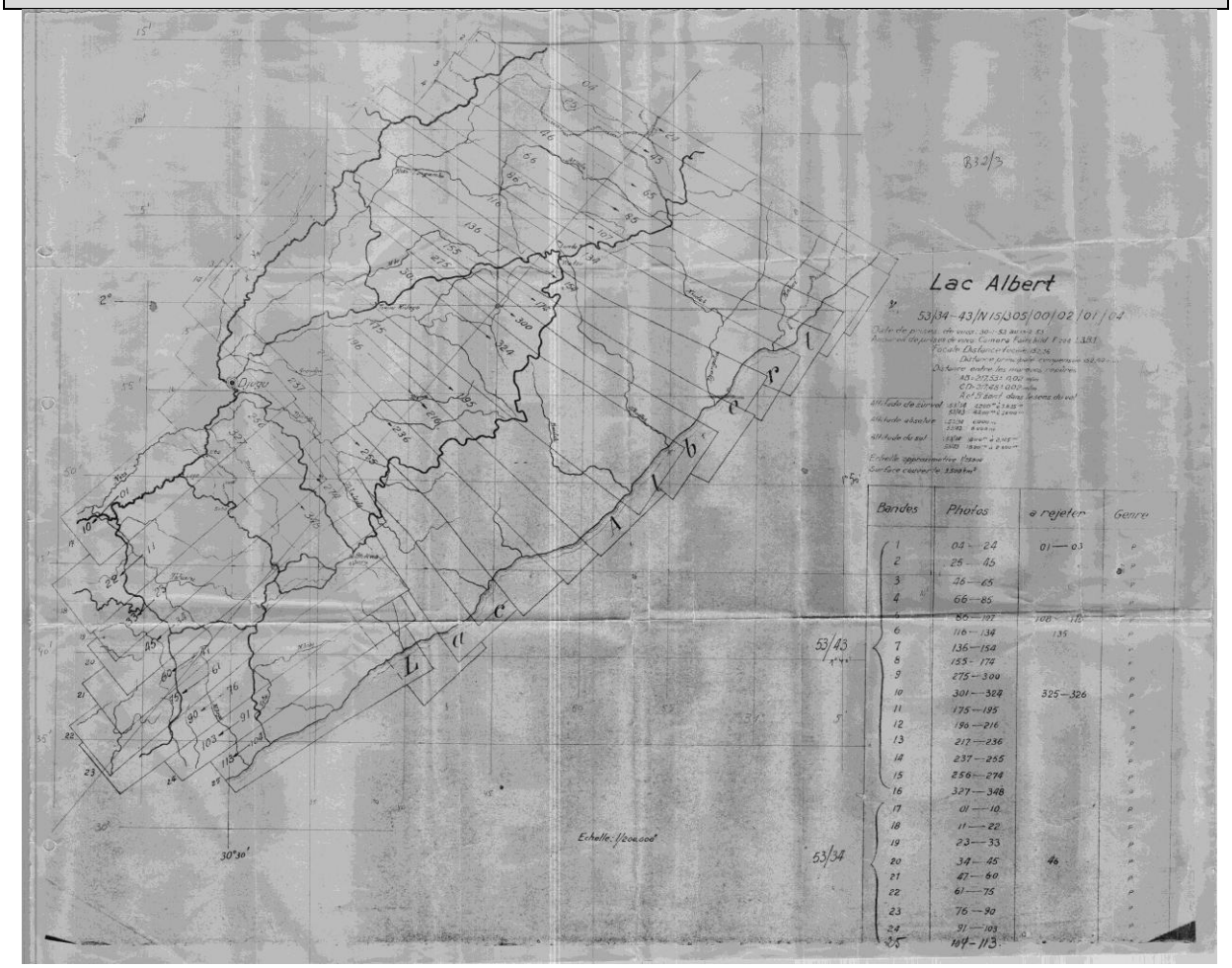

Figure 5. Lake Albert territory maps and coding related to the available aerial photographs stored at the RMCA Tervuren.

The study zone was very well covered by the geologists in 1953 and the photographs of the area will be scanned for our convenience by the RMCA. The first priority (scanning) is given to the area closest to the study site along a band between 2°00'7.55" and 1°50'33.31" north along the Lake Albert shoreline towards the west.

2.2. Georeferencing and mapping

During this third mission, the systematic transect line method was adopted (see, geographical location of villages, houses, camera-traps (CT) and other fauna and flora observations were georeferenced using GPS Garmin 60CSx and 60Cx. Plastic maps were prepared to facilitate the visualization of areas to explore, and a series of points (waypoints) were recorded in the GPS prior to the team field trip via conversion of KML files in gpx file using free softwares Basecamp © Garmin. The calculation of surfaces and the production of maps are in progress using the QGIS/ArcGIS softwares. All tracks and GPS coordinates are recorded in gpx and gdb files that can easily be converted into shapefiles.

2.3. Chimpanzees nesting behaviour and nest counts : methods, and data collection

The nesting patterns of chimpanzees was studied using 5 transects of 1.1 to 1.4 km (see results) running accross the forest blocks based on the findings of the previous missions in the area. As the area is divided into 3 major blocks separated by agricultural lands and linked together by small riverine gallery forest we chose at least one transect per block covering as much as possible all the habitat types present and added 2 more transects (one in block FG1 and one in FG2) in order to increase the number of perpendicular distances required to estimate ape densities as decribed in the UICN technical document to monitor great apes (For the full document, see : Kühl et al, 2008).
We traced and travelled each transect one time for nest counts, indirect observations, human activities census and one time for direct observations as time constraint s did not allow for more revisits. Tracks, signs (play, bite signs in bark or leaves, ripped tree trunks), hairs and faeces were sampled, measured and / or photographed with a metric scale, collected and stored if applicable (in silica gel for plants and 70% ethanol for faeces) and georeferenced.

<u>Nest survey and count</u>

The classical method to assess apes density is usually difficult to achieve as it requires to measure 60 to 70 perpendicular distances of « visible nest-to-transect», however this has been achieved despite the slopes, harsh weather and field conditions (Kühl et al, 2008). To assess the tree sepcies preference by the chimpanzees, we conducted nest counts along 5 transects (0.5 to 1.4km). We considered nests as being part of the same nest group when the maximum distance between two nests of the same age did not exceed 20m. All nests visible from transects were recorded and marked in order to avoid counting the same nest twice. The following variables were recorded:

Nest Tree selectivity

1. Tree species
2. Diameter at breast height (DBH): measured with DBH tape measure
3. Total tree height : measured from the ground to the top of the tree with a clinometers laser

Nests (Fig. 6)

1. Nest age category (1 to 6 from fresh to decaying)
2. Nest height : measured from the ground at the base of the tree to the base of the nest, with a clinometer laser.
3. Number of nests per tree
4. Perpendicular distance of the nest to the transect
5. Forest type recorded at a nest site: open canopy vs. closed canopy and understory openess

In addition, in order to estimate a local nest decay rate, nests off transects were described using the same variables as above and to collect hairs (and dung when present) for the phylogenetic analysis (see further).

Figure 6. Chimpanzee nest counts close to the ground or higher under the tree crown

Indirect observations (tracks, signs of activity, dung, hairs, feathers)

On each transect, a single reading of indirect observations was performed from 0m to the end. The characteristics and number of the constructions (nests) and activity signs of animals (tracks, holes, feathers/hairs, remains of food, eaten bark, and faeces) were systematically recorded and geolocated with the mark along the transect as well as species, canopy and understorey openness. Moreover, we opportunistically collected wild chimpanzee faecal samples and other dung found along and off transects for genetic analyses. The faeces were stored in sterile plastic bag and a label with a unique code (NDU-###) was given to each sample. Faeces are measured (cm), and general characteristics of the site recorded (time, condition fresh or dry, in a nest site, within nest site range, near a river). Back to the camp faeces were inoculated on Cary Blair culture medium for Enterobacteriaceae detection and preserved in duplicate in RNA later and ethanol 96%. The remaining material washed in clear water on a fine mesh sieve seeds and vegetation remains collected for detecting species eaten (diet) specifically by the chimpanzees (Fig. 7).

Figure 7. Indirect observations and faeces collection

Direct observations : transect reading for any animal visible from the transect

On each transect, a single reading of direct observations was performed from 0m to the end starting between 6.30 and 7.30am at a 1km/h pace. The species, number, angle and distance to the transect were systematically recorded and geolocated with the mark along the transect as well as species, canopy and understorey openness.

2.4. Habitat and botanical inventory along the transects

A systematic botanical inventory was performed every 100m along teach transect on variable size plots namely 20mx5m plots with transect crossing the middle (2.5m on each side of the transect line) for trees (>10cm DHP) and lianas (>5cm DHP), within each plot re-sampling of a 4mx4m plot for shrubs and lianas and within each plot re-sampling 2mx2m plot for grass and small herbs and trees/shrub shoots. Typical habitat assessment (Fig. 8) was carried out every 200m along the transects describing habitat characteristics, canopy and understorey openness and dominant species in the tree, shrub, liana, herbs and grass classes.

Figure 8. Typical habitats in the RAFALE

In camp 3, in Dzoo forest, the old guide was utterly knowledgeable on the tree species used and eaten by chimpanzees. He was given the task to bring to the botanist vouchers of trees/shrubs that are relevant in chimpanzees'diet. Other relevant botanical species encountered during random walks and recce were also recorded. For all the unidentified and undetermined specimens, leaves and plant organs were collected for subsequent botanical identification. Voucher specimens were stored in a press and dried *in situ* hung above a fire and others stored in silica gel. Unidentified species were coded for subsequent identification; wild coffee beans were preserved in ethanol.

For each recorded specimen , the variables associated with each line are the date, bloc, plot size, family, species, local name of the species (Lendu), number, DHP, height, presence of fruits and flowers, latitude/longitude/altitude of the plot, and use by men and chimpanzees.

BOTANICAL SPECIMEN IDENTIFICATION

The herbaria constituted will be transferred from CSB/UNIKIS to Dr Piet Stoffelen of the Botanical Garden of Meise, Belgium in November 2016. The staff of the Botanical garden will finalize the specific identification of the x vouchers that could not be detrmined *in situ*.

2.5. Human activities

On each transect, a single reading of human activities was performed from 0m to the end. The type and number of disturbance (machette cuts, clearing,...) or activity (logging, non ligneous forest products exploitation,...) were systematically recorded and geolocated with the mark along the transect as well as canopy and understorey openness (Fig. 10).

Figure 10. Human activities in the RAFALE

2.6. Monitoring of wildlife by means of camera traps

The use of camera traps (CT) is a useful tool to collect data on wildlife diversity. Using 27 CTs combined with interviews maximized the chances of getting images and videos footage, and most importantly counts and behavioral sequences of the species circulating in the RAFALE.

On the basis of information provided by respondents during interviews and informal discussions and during the recce (and taking into account the security) in March and June 2016, the field team had identified suitable areas to place 27 camera traps (Figure 11).

Figure 11. One model (out of 3) Bushnell Camera trap (CT) used during the surveys.

The devices were placed in particular in places where clear evidence of the presence of chimpanzees were recorded and where tracks and signs of activity of other terrestrial and arboreal (3 CTs in trees) were seen. The Bushnell CT (3 models) were programmed in hybrid mode with different sensitivity settings depending on where they were placed (number of consecutive images per trigger, 1080p video resolution, a picture resolution of 8 to 14 megapixels, with or without field scan) and systematic printing of the trap number, date and time. The trapnights per CT location and capture success will be calculated by the Master student 2.

2.7. Interviews, discussion and community dialogue

Fifty two formal interviews using the new question form and informal discussions were organized to 1) obtain baseline information on the presence-absence of chimpanzees, other primates and two endemic bird species and their name in the local language 2) obtain data on the location of the target species in order to identify priority areas of interest to explore and where to put the CT 3) investigate the popular attitude towards chimpanzees and use of this and other target species, in whole or in part, in the local culture and if beliefs are associated to them. The analysis and encoding of the forms has not yet started (Master 1) and are thus not treated herein.

2.8. Active trapping : small mammals inventory

In order to assess the functional biodiversity along the transects and to contribute to the small mammal inventory of fallow lands at the ecotone between cultivatefields and the forest, rodent trapping was carried out using 2 main types of traps. In each forest block ±40 to 50 Sherman livetraps were placed every 5 m along the transect (between position 0 and 700m according to the habitat diversity), the remaining traps were placed in fallow land near cultivated fields. A line of 20 pitfalls with a drift fence and buckets spaced every 5m was added at the ecotone between forest and fields to increase the probability of catching shrews.

In each forest block, traps were placed for 5 consecutive days (4 nights), checked every morning between 7.30am and 10am, and rebaited everyday with plam nut flakes or a mixture of cassava flour and peanut butter. A couple of each rodent/shrew species were removed, combed for parasite collection (preserved in ethanol 70%), sacrificed and preserved in formol after sampling a piece of each vital organ in both ethanol (96%) and RNA later in duplicate, a piece of the spleen was also placed in caryblair preservation/transport medium for further *Salmonella* isolation (Fig. 12). Any additional specimen trapped and belonging to an already sampled species were released *in situ* after.

Figure 12. Field laboratory and selected specimens received from villagers (left) or trapped (right)

A series of small mammals or part of some specimens (tail, head, skin) were sometimes brought to the camps by villagers who are using traditional snares (NA: Probably responsible as well of the chimpanzee mutilations observed on CT sequences) in the forest blocks surveyed.

The received specimens were processed as described above. The skulls of the squirrels and giant rats were further cleaned and bleached to be included in an ongoing study of the squirrels (Pascal Baelo) and *Cricetomys* spp. diversity (based on Cytb/Fgb sequences) in Africa (Erik Verheyen, in collaboration with Matthew R Mauldin (CDC/OID/NCEZID) and Violaine Nicolas of the MNHN, Paris).

2.9. Beetle collection

Beetles were hand collected or using mowers nets. The collected insects were classified according to the type of habitat, labeled (code: ETE - ### from 001 to 1000), and stored in 96% ethanol. The databases are being developed with colleagues from the CSB / UNIKIS (Johnatan Kosele and Corneille Kahandi). The specimens were shipped to the RBINs in Brussels to be further sent to the University of Memphis in the USA to contribute to the phylogeographical study of pan-African beetles. Genetic studies have the advantage of allowing to trace the evolutionary history of species or groups of species but also to understand the history and evolution of habitats where they are. Furthermore, the sequencing can detect potentially new species and - if new species are included in the batch - they will be described with researchers of the team that collected them and the institutions that funded the missions acknowledged in any publications using the material.

2.10. Laboratory methods

2.9.1. Biodiversity using molecular markers

Using DNA sequences as "barcodes" of taxa, we will be able to identify all the faecal samples collected in this study. The DNA barcode data of UA and RBINS contains sequences of more than 70 species for the following two genetic markers: mitochondrial cytochrome oxidase (COI) and cytochrome b (cytb). Species will be initially identified using blast (BLAST), a comparison algorithm information from biological primary sequence, such as DNA nucleotide sequences, in order to compare our sequences with the DNA databases available. Haplotype analyzes will be performed with the help of the Antwerp zoo specializing in the genetics of small populations. The ultimate goal of these sequencing is able to deduct if the mammal populations are reduced to a level where there is no more genetic mixing and therefore are subject to a risk of extinction. The conclusions of these analyzes combined with estimates of the densities of nest counting method will then contribute to issuing conservation measures suited to the target species.

2.9.2. Pathogen screening

By PCR or chain reaction polymerase (PCR)

The faecal and hair samples DNA will be tested for the presence of several pathogens such as *Onchocerca*, leprosy and simian foamy virus among others. These samples will be transferred to various laboratories mentioned in Laudisoit et al, 2016b.

By direct culture

Swabs were inoculated feces in Cary Blair medium allowing the preservation and cultivation of Enterobacteriaceae. The project is interested in hemorrhagic Salmonella is based in UNIKIS and supported by VLIR project of the University of Leuven (KUL) in Belgium. In the laboratory of Pediatrics Faculty of Medicine (UNIKIS), swabs were inoculated on selective agar medium DCA agar and incubated at 37 ° C. Forming bacteria transparent colonies on this medium were harvested to perform biochemical tests (Diatabs) and antibiotic resistance (discs and galleries API) to identify the strains. The isolated strains were stored at UNIKIS/Faculty of Medicine in a bank of bacterial strains and will be sequenced as they represent interesting phenotypes.

III. DATABASES AND GENERAL RESULTS

In this section we decribe the available data collected and databases that have been built or are currently being elaborated by the different team members. We also report and comment on the general results. The detailed GPS coordinates on each transects are available as gpx or gbd files and associated with each observation in the different databases elaborated ; namely : indirect observations, direct observations, nest observations, botanical inventories, human activities and trapping ; as well as each household interviewed. For each transect the various data are available at a fine scale (every 100m mark) but are here pooled for a first overview of the available data to be treated.

3.1. Transects characteristics

As mentioned above, in total 5 transects were actively opened during this third mission.The details of each transect (forest bloc, start/end coordinates and altitude, mean slope, and length) are given in the table below (Table 2).

		START			END					
Bloc	TR	lat (deg.dec)	long (deg.dec)	Alt. Start (m)	lat (deg.dec)	long (deg.dec)	Alt. End (m)	Average slope (%)	Length (m)	Speed (km/h)
FG1	1	N1.99026	E30.91658	1402	N2.00122	E30.91676	1571	23.5	1300	0.39
FG1	2	N1.99230	E30.91845	1285	N1.99781	E30.91866	1420	21.9	500	0.38
FG2	1	N1.94156	E30.90071	1281	N1.95179	E30.90767	1047	25	1300	0.23
FG2	2	N1.94156	E30.90071	1281	N1.95165	E30.90765	1038	18.1	1400	1.03
FG3	1	N1.92449	E30.89625	1173	N1.92025	E30.88838	962	21	1100	0.4

Table 2. Transects characteristics; TR: transect. The T2 FG1 was 500 m long because of critical topography. The beginning of T2 in FG2 heading west is also the beginning of T1 in FG1 heading east.

3.2. Chimpanzee density and nesting behaviour

The most common tree (N nests >5) used by chimpanzees per bloc and along each transect were Monodora myristica (24%), *Chrysophyllum gorungosanum* (14.1%), *Pseudospondias microcarpa* (8.2%) *and Celtis tesmanii* (8.2%); however i) differences were observed between forest blocs and along transects as the suitable habitats and tree species availability differed and 2) nests were observed on 27 trees or lianas species. The general characteristics of the nesting behaviour per bloc and along each trasnect are given in table 3 ; all the details are available in the databases which presents also the additional nests (N=±52) described off the transects.

TRANSECT	V nests	NV nests	Dominant category* (%)	Dominant type** (%)	N trees used	Typical tree used	Average DHP (cm)	Average Nest height (m)
T1FG1	33	1	4 (60)	S (82.8)	12	*Monodora myristica*	29.9	12.0
T2FG1	8	0	6	na	na	na	na	na
T1FG2	13	2	5 (46.7)	S (80.0)	9	none	22.7	7.6
T2FG2	8	1	4 (36.3)	S (63.6)	8	none	25.6	12.6
T1FG3	23	0	6 (50)	S (79.1)	14	*Chrysophyllum sp.*	22.4	9.6
SUMMARY	**85**	**4**	**4 and 6**	**S**		**varia**	**26**	**10.7**
* from 1 (fresh) to 6 (decayed) with gradual decomposition and change in leaf colour and frame structures								
**S = side, T = top, L=liana ; different types can be combined if the nest is built using different trees								

Table 3. Nesting behaviour characteristics per transect.

Using the Kibale National Park chimpanzee data and coefficients (Kühl et al, 2008), we estimated a chimpanzee density in the RAFALE blocs as follows : 14.25 individuals/km² in FG1, 17.81 individuals/km² in FG2 and 20.82 individuals/km² in FG3 showing an increase in population density as the population density, settlements, but paradoxically with increasing anthropic activities (based on human activities data ; see further).

3.3. Indirect observations along and off the transects : tracks, dungs and signs

A total of 68 indirect observations of vertebrates, mostly mammals were recorded in the 3 blocs with a higher number of overall animal signs, Primate and rodent signs along the T1 in FG2 (Table 4).

INDIRECT OBSERVATION	T1FG1	T1FG2	T2FG2	T1FG3	TOTAL
RODENT/SHREW BURROW		12	2	1	15
PRIMATE FOOTPRINTS	1		5		6
RODENT/SHREW FOOTPRINTS			1	1	2
ARTIODACTYLA FOOTPRINT				1	1
PRIMATE FAECES	4	1	1		6
RODENT FAECES	1	1			2
FEATHER		1			1
BIRD NEST		1			1
DEAD BIRD	1				1
PRIMATE FORAGING SIGNS	3	1	1		5
RODENT/SHREW FORAGING SIGNS	1	5	2		8
PRIMATES HAIRS			2		2
MONKEY SKELETON	1				1
UNGULATE TRACK				1	1
RODENT/SHREW TRACK		2		2	4
PRIMATE TRACK		5		7	12
TOTAL	12	29	14	13	68
N obs/km	9.2	22.3	10.0	11.8	13.3

Table 4. Indirect observations along each transect in each bloc.

Most of the indirect observations off the transects are represented by faeces and only the general number is presented herein. In total, during this third mission, 92 faeces were collected; 20 of unidentified species and 56 (60.8%) at least from chimpanzees. All the faeces will be included in the molecular analysis for the identification of the species and screening of selected pathogenic agents. The same applies to the hairs (±56) collected in chimpanzee nests.
The nature and number of the other indirect observations off the transects are available in the general meta database.

3.4. Direct observation along and off the transects

A total of 104 direct observations of vertebrates, mostly mammals were recorded in the 3 blocs with an increasing encounter rate of species groups with increasing remoteness (FG1➔FG2➔FG3). However the two FG2 transects are pooled and decreasing human stellements. The details per bloc and species are given in the table below (Table 5).

Order	Genus species	FG1	FG2	FG3	N obs.
Bird	*to be identified on picture*		2		2
Bird	*Bycanistes subcylindricus*			3	3
Primate	*Cercopithecus ascanius schmidti*	6	3		9
Primate	*Cercopithecus mitis*	6	4	12	22
Chiroptera	*unidentified bat sp. 1*		1		1
Rodentia	*Heliosciurus cfr ruwenzorii*	1			1
Primate	*Lophocebus albigena*		8	19	27
Primate	*Pan troglodytes schweinfurthii*	1			1
Primate	*Papio Anubis*	4	31	2	37
Bird	*to be identified on picture*			1	1
	N observations/bloc/transect	**18**	**49**	**37**	**104**
	N obs/km	**13.80**	**18.1**	**33.60**	**20.6**

Table 5. Details of the direct observations along the transects per bloc (T1 and T2 pooled for FG2) and the overall encounter rate/km.

The nature and number of the other indirect observations off the transects are available in the general meta database and are currently being extracted from the GPS records, pictures and videos taken by all the team members.

3.5. Biodiversity inventory : camera trap data and results

Of the 22 species recorded on the camera traps between June and August 2016, 1 is listed as near threatened (NT), 2 as endangered (EN) and 2 as vulnerable (VU) on the IUCN Red List. Those are listed in table 6 as well as their IUCN status and population trends.

Order	Genus	Species	English name	N seq.	UICN status	Pop. Trend
Artiodactyla	*Cephalophus*	*rufilatus*	Red-flanked Duiker	13	LC	decreasing
Carnivore	*Genetta*	*servalina (Fig. 13)*	Servaline Genet	11	LC	unknown
Carnivore	***Bdeogale***	***sp.cfr jacksoni***	**Jackson mongoose***	**2**	**NT**	**decreasing**
Carnivore	*Herpestes*	*sp. cfr naso*	Lon-Snouted mongoose*	2	LC	decreasing
Pholidota	***Manis***	***tricuspis***	**White-bellied Pangolin**	**4**	**VU**	**decreasing**
Pholidota	***Uromanis***	***tetradactyla***	**Long-tailed Pangolin**	**8**	**VU**	**decreasing**
Primate	*Cercopithecus*	*mitis doggetti*	Doggett's Blue Monkey	64	LC	decreasing
Primate	***Pilicolobus***	***tephrosceles (Fig. 14)***	**Ashy Red Colobus**	**3**	**EN**	**decreasing**
Primate	*Cercopithecus*	*ascanius schimdti*	Schmidt's Red-tailed Monkey	11	LC	unknown
Primate	*Galagoides*	*thomasi*	Thomas's Dwarf Galago	1	LC	stable
Primate	*Lophocebus*	*albigena*	Grey Cheeked mangabey	2	LC	decreasing
Primate	***Pan***	***troglodytes schweinfurthii***	**Eastern chimpanzee**	**86**	**EN**	**decreasing**
Primate	*Papio*	*anubis*	Olive Baboon	147	LC	increasing
Rodentia	*Cricetomys*	*sp. cfr emini*	Forest Giant Pouched Rat*	88	LC	stable
Rodentia	*Hystrix*	*cristata*	Crested Porcupine	2	LC	unknown
Rodentia	Murid rodents	3 unidentified sp.	Na	22	na	na
Rodentia	*Heliosciurus*	*cfr ruwenzorii*	Ruwenzori Sun Squirrel*	1	LC	unknown
Insectivora	*Sylvisorex*	*sp. cfr johnstoni*	Johnston's Forest Shrew*	8	LC	unknown
Insectivora	*Crocidura*	*sp.*	Na	16	na	na

*Table 6. General inventory of fauna caught on CT with sequence number.*To be confirmed.*

Figure 13. Genetta servalina, bloc FG3

The appearance of a *Pilicolobus* (red colobus) on the camera trap placed in block one in a tree (13m) triggered a lot of discussion and called for expert advice. Upon return Tom Struhsaker (https://evolutionaryanthropology.duke.edu/people/thomas-t-struhsaker), the expert (NA : He wrote an entire book on red colobus), was contacted and CT pictures/videos and other videos shot during live observation in FG3 were transferred to him. He commented that « given only the face, arms, and shoulders, it looks like Pilicolobus tephrosceles of Uganda and Western Tanzania. However, the juvenile on the direct picture seems to have whiter cheek whiskers than *P. tephrosceles* (grey rather than white), suggesting a different taxon. However, the *P. oustaleti* is very close to P. tephrosceles and highly variable in color. Moreover, it is possible that the hybrid swarm area extends further north than previously thought. Whatever the correct answer is both of these would be a locality new to science for this taxon ».

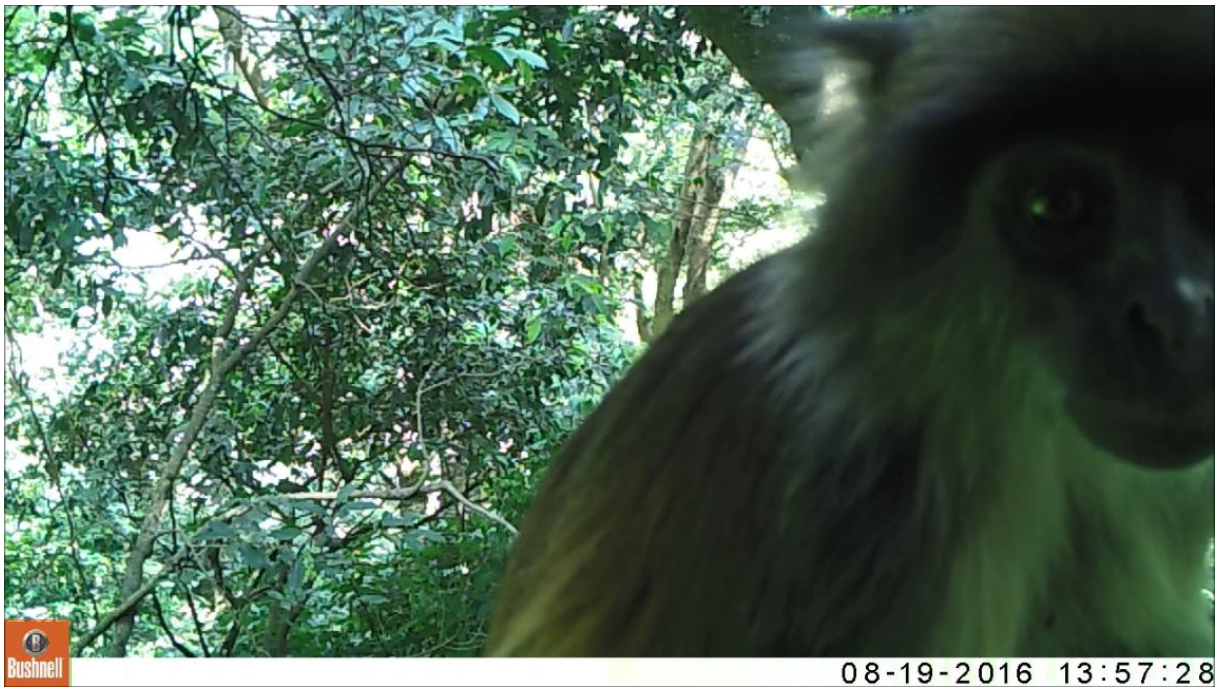

Figure 13. Snapshot of a video caught in FG1, on a CT placed 13m high.

The team of Dr Tom Struhsaker at Duke University and Dr Kate Detwiler (Florida Atlantic University, USA) have some fecal samples of red colobus from Mahale and Ntakata and it should then be possible to look at the relationships among the fragmented *P. tephroceles* populations and assess the diversity across the species range. The faeces DNA will be extracted in Belgium (UA) and any sequences that would belong to the targetted taxon would then be transferred to Dr Struhsaker team hoping to gain more insights into the phylogenetics of this rare taxon and its evolution.

3.6. Botanical inventories along the transects

The botanical inventory database along the four transects contains entries (associated with the series of recorded variables listed in the methods) for 556 specimens of tree, shrub, liana, herbs or grass. The general number per bloc, plot size and transects are summarized in Table 7.

BLOC/PLOT	T1FG1	T1FG2	T2FG2	T1FG3	TOTAL
FG1	**175**				**175**
2X2	65				65
4x4	62				62
5x20	48				48
FG2		**94**	**126**		**220**
2X2		21	50		71
4x4		31	43		74
5x20		42	33		75
FG3				**161**	**161**
2X2				49	49
4x4				66	66
5x20				46	46
TOTAL	**175**	**94**	**126**	**161**	**556**

Table 7. Number of specimen collected along each transect per plot and per forest bloc.

Trees and shrubs made up 78.7% (438) of the records, grass/herbs 17.6% and lianas 2.9%. At least 121 species belonging to 38 families were recorded. Fifteen families were represented by more than 10 specimens and the dominant species (>30 records) belonged to the Myristicaceae, Sapotaceae Rubiaceae, Annonaceae and Euphorbiaceae (Table 8).The 10 most common tree species were by decreasing importance *Pycnanthus angolensis, Monodora myristica, Chrysophyllum gorungosanum, Pseudospondias microcarpa, Drypetes sp., Piptadeniastrum africanum, Trichilia sp., Celtis tessmannii, Pandanus pacificus and Pseudomussaenda stenocarpa*. These common species and families are known to be either exploited for nest building by chimpanzees or as aliment in the diet of several primates. Other abondant species that were present along the transects close to chimpanzee nest sites were *Phoenix reclinata, Olyra sp.* and *Landolphia owariensis*.A total of 54 unidentifed specimens (genus and species unknown) and 56 undetermined species for which genus was attributed have been collected, dried and placed in the herbaria which will be sent to the Botanical Garden of Meise, Dr Piet Stoffelen).

VEGETATION DIVERSITY AND STRUCTURE

The diversity, community structure along the transects, and presence/absence of useful species exploited by Primates will be included in the Master students thesis.

FAMILY	T1FG1	T1FG2	T2FG2	T1FG3	TOTAL
CLUSIACEAE	1				1
COSTACEAE	1				1
FLACOURTIACEAE				1	1
LAMIACEAE	1				1
MARANTACEAE	1				1
MUSACEAE			1		1
OLACACEAE	1				1
RUTACEAE		1			1
ASPLENIACEAE	1		1		2
BURSERACEAE	2				2
EBENACEAE		1	1		2
LEACEAE			2		2
PIPERACEAE	1		1		2
PROTEACEAE	2				2
CANABACEAE	2			1	3
AGAVACEAE			4		4
ARALIACEAE		2	2		4
DENNSTAEDTIACEAE	3		1		4
ZINGIBERACEAE		1	3		4
STERCULIACEAE	2	1		2	5
COMMELINACEAE	1	2	2	2	7
ACANTHACEAE	5			3	8
ARACEAE	5		7	1	13
ANNACARDIACEAE	2	6	5	4	17
FABACEAE	15		2	1	18

Table 8 (part 1). Summary of the number of plant per family recorded along the transects.

FAMILY	T1FG1	T1FG2	T2FG2	T1FG3	TOTAL
ULMACEAE	1	11	3	4	19
APOCYNACEAE	8	3	5	7	23
MORACEAE	4	5	6	8	23
ARECACEAE	10		7	8	25
ASTERACEAE	13		12	1	26
POACEAE	8	7	9	2	26
MELIACEAE	9	9		12	30
ANNONACEAE	17	4	7	11	39
EUPHORBIACEAE	13	1	7	18	39
RUBIACEAE	21	6	5	10	42
SAPOTACEAE	9	20	8	12	49
MYRISTICACEAE	15	10	14	15	54
UNIDENTIFIED	1	4	11	38	54
TOTAL	**175**	**94**	**126**	**161**	**556**

Table 8 (part 2). Summary of the number of plant per family recorded along the transects.

3.7. Human activities along the transects

Among human activities recorded along the 4 transects in the RAFALE chimpanzee area, tree logging with hand saw or machete, timber board/poles and trapping were the most common activities recorded (Table 9).However the distribution of the activities and their intensity was not homogenous along the transect with increasing traps and decreasing cuts as one progressed into the open secondary forests. No human activities were either observed in the dense shrubs or in the last 300m of FG2.

Activity	T1FG1	T1FG2	T2FG2	T1FG3	TOTAL
Abandoned tools, plastic,…	2	2			4
Barked tree	2				2
Burnt field				2	2
Burnt tree(s)	4			1	5
Campfire	1	2			3
Clearing			1		1
Cultivated field	1		2		3
Cut trees/shrubs (chainsaw)	**2**				**2**
Cut trees/shrubs (hand)	**6**	**28**	**25**	**38**	**97**
Local traps	**1**	**3**	**4**	**5**	**13**
Machette cuts	**1**	**5**		**16**	**22**
Meeting with hunters	1				1
Sawn timber boards	**1**	**11**		**1**	**13**
Temporary shack (old)		2	2		4
Villager track	1		4	4	9
TOTAL	**29**	**52**	**38**	**66**	**185**
Encounter /km	22.3	40.0	27.1	60.0	36.3

Table 9. Human activities recorded along the 4 transects in the RAFALE.

The encounter rates of human signs are 20 times higher than in protected regions such as in Sebbitoli in Uganda (1,84 signs/km ; Bortolamiol et al, 2013) ; however the total length of the combined transects on which human signs were recorded (5.1km) may overestimate the general anthropic activities in the whole forests (25km²).

3.8. Small mammal diversity : active trapping

In total 109 small mammals were actively trapped during 1176 trap nights (260 trap nights with pitfalls ans 916 with Sherman traps) making up an overall capture rate of 9.2% (Table 10). The trapping success was two times higher in bloc FG1 (12.1%) and FG2 (13.1%) compared to FG3 (6.4%).The trapping success, hence the rodent density, was the highest in the old secondary forest of FG1 (19.1%) and the young fallow land of FG2 (18%) while in FG3 the trapping success in both habitat was lower than in the two other blocs (5.1% to 7.7%).

	Genus	**FG1**	**FG2**	**FG3**	**TOTAL**
RODENT	*Arvicanthis*	2	6	3	11
	Grammomys	1			1
	Hylomyscus	4	1		5
	Lemniscomys	1			1
	Lophuromys	7	8	1	16
	Malacomys	5			5
	Praomys	13	12	12	37
INSECTIVORE	*Crocidura*	9	11	8	28
	Scutisorex	2	2		4
	Sylvisorex		1		1
	TOTAL*	44	41	24	109

*Table 10. Summary of the trapped rodents and insectivores per bloc. *Total of the small mammals actively trapped by the team*

One micro shrew species (N=5) was caught only in the FG2 bloc and had a mean weight of 3gr ; a 5gr gestating female with 2 fully developed embryos was also caught. So far, the species has puzzled all the local experts of CSB/UNIKIS ; however it may as well be *Myosorex babaulti* (VU-decreasing). Two of the specimens were preserved in vials in ethanol *in toto* and have been shipped to UA awaiting for expert advice at the MNHN, Paris.

Two species of *Malacomys* sp. may have been caught as one harboured systematically a white spot in the middle of the forehead as well as white “socks”(extremities of the legs from elbow/knee to hand/foot ; N=5). A taenia was also recovered from the gut of one specimen of the putative second nominal M. longipes species while one had a malformation of a hind leg. Several species and specimens were added to the collection either given or prushased to villagers and are available in the database as indirect observations off the transects.

Outside the three forest blocks

1) In the valley bottom, in the Kakoy river, one colleague studying Simulid flies and crabs - Michel Komba/CSB - caught a juvenile of the giant otter shrew (*Potamogale velox* LC-decreasing)in a crab basket. The specimen has been preserved *in toto* and samples of organs taken as decribed in the method section. It may as well be the Ruwenzori otter shrew (*Micropotamogale ruwenzori ;* LC-unknown) but its distribution range is not documented to Albert lake.

2) In 2007, Dr Anne Laudisoit carried a study on rodents carriers of the plague bacterium, *Yersinia pestis*, during her phD fieldwork. The rodent samples are to be included in the biodiversity survey of the Lendu plateau and Albert Lake escarpement fragmented forests.

From the surveyed forest blocks
1) In June 2016, the Master student Claude Mande collected bats in FG1 and FG2 and those will also be included – some are already sequenced - in the final master thesis on the biodiversity of the surveyed area (Mande, 2016).

2) In FG1, one *Mormopterus* sp. bat , 3 unidentified *Heliosciurus* sp. squirrels and one *Anomalurus cfr pusillus* (LC-unknown) skin were brought by a local hunter and sold to the team ; tissues were preserved as described in the methods. 3) A skeleton (vertebrae, hip, bones, skull) of a small *Colobus/Pilicolobus* monkey was found near the area of high chimpanzee nest density around mark 1250m of the first transect in FG1; bones were preserved dry.

3) In FG2, pangolin dry skins and tail of small carnivores (cfr *Genetta/Nandinia*) were brought to the team and one *Cricetomys sp.* cfr *emini* (LC-stable) was caught in a snare and given to the team by the hunter ; specimen was treated as described in the methods.

4) In FG3, one *Phataginus tetradactyla* (VU-decreasing) pangolin was caught in a snare and given to the team by the hunter ; treated as described in the methods.
5) In two houses adjacent to FG3/FG4 bloc, the interviews revealed that the owners possessed an adult skull and some vertebrae of two chimpanzees ; samples were taken and preserved in ethanol.

DNA EXTRACTION OF SMALL MAMMAL and other WILDLIFE TISSUER SAMPLES
The Master student of the University of Antwerp, Tiffany Scholier, is currently proceeding to the DNA extraction of all the mammal tissues and to the sequencing of specific molecular marker (Cytb and COI ; see Methods) as part of her Master thesis on the biodiversity of the Lendu forest.

3.9. Screening for *Salmonella*
The results of the direct coproculture on selective *Shigella* and *Salmonella* media found 0 positive primate faeces, but 2/85 analysed (2.4%) were *Salmonella* positive. One originated from an unidentified carnivore (to be determined with DNA sequencing) found on the path from Ndeke to Nzerku, and from the spleen of a chocolate rat, *Lophuromys* sp., caught in Nzerku. The primate faeces screened so far have thus no active infection with pathological *Salmonella*.

IV.PERSPECTIVES

4.1. Local nest decay rate

Great ape populations' size estimates have almost always relied on counts of sleeping nests built by weaned individuals. Quantifying auxiliary variables is not a simple task, since there is no static relationship between ape nest density and ape density. Nest decay rate and nest construction rate show high spatiotemporal variability.Therefore, ape surveys that rely on rates taken from the literature instead of site- and temporally-specific rates, are likely to produce large biases (Kühl et al, 2008). The rate of nest decay varies greatly between sites and seasons, so ideally surveys should incorporate a locally-derived and seasonally-appropriate estimate of nest decay rate.
While a year decay rate hasn't been estimated for the current study site, nest decay rate for chimpanzees range from 73 to 221 days (Kühl et al, 2008). The nearest and more similar site is Kibale on the Uganda Lake Albert shore could be and will be used as a first proxy namely 111 days. However the climatic conditons as well as the nest position in relation to the ground and rivers are among the variables that influence the speed at which chimpanzee nests decay.

In order to refine the density estimates based on local nest counts and nest decay rate the 2 major local guides in Rethy were given a lump sulm of 500$ (UA) to keep following the 20 fresh nests spotted on 25th August. They are also in charge of collecting new faeces when they encounter them and to try to gather more hairs in case they find fresh nests. The first nest decay rate follow up mission took place around 24th-26th September and the second one was scheduled 24th-26th October.

4.2. Master thesis, publications and broadcasting

4.2.1. Planned Master thesis

Thes two proposed topics constitute stand-alone research articles that are innovative enough. The students are not obliged to consider all the questions listed in these topics, but all of them will be addressed either

1) Pierre HUYGHES

Master topic 1: The chimpanzee population of the RAFALE : density, spatial distribution, habitat use, and implications for conservation

Objectives:

-evaluate the size and density of the chimpanzee population;
-identify and describe the species and habitats used by chimpanzees for nest building;
-determine the spatial distribution of chimpanzees in relation to human settlements, suitable habitat availability and topography;
-assess the influence of ecological and anthropogenic factors on chimpanzee abundance.
-extraction, analysis and summary of the useful data and indigenous knowledge on chimpanzees from the interviewees (52)

Master topic 2: Assessing wildlife diversity and density in the RAFALE with etho-ecological notes on target species (based on CT sequences)

Objectives:

-inventorize the vertebrate species of the RAFALE by means of molecular sequencing, camera trap surveys and direct/indirect observations

-study the activity patterns of a selection of target species based on CT sequences, time, moon, weather condition and temperature

-describe the phylogenetic position of the mammal species by means of sequencing the DNA extracted from hairs, scales, skins, organs and faeces

-determine the functional structure of the vegetation in relation to wildlife presence and community composition

-evaluate wildlife community integrity and suggest relevant measures for conservation.

4.2.2. Publications planned in collaboration with Dr Jacob Willie, John Hart 1 and John Fa2

At least the following have been discussed and are ongoing :

- a short note paper on the RAFALE and the presence of an isolated chimpanzee population
- One master thesis : “The chimpanzee population of the RAFALE : density, spatial distribution, habitat use, and implications for conservation” (from Master 1)
- One Master thesis “General and specific biodiversity analysis of the RAFALE in realtion to deforestation and conservation (from Master 2)”.
- Three reports from the March, June and August 2016 field missions.

4.2.3. TV/MEDIA

The belgian TV program « Le Jardin extraodrinaire » that is to be broadcasted on 8/3/2017 was shot on 10/10/2016 and will briefly show some of the Primate Lendu research.

4.2.4.IUCN SSC Pangolin Specialist Group

The database of all camera trap locations and pangolin observations has been sent to Dr Claire Buchan in charge of a project aiming at to collating data from camera trapping studies to understand more the pangolin species range and suitable habitats. The CIFOR support (funding and scientific) will be acknowledged when using the data ; and Dr Anne Laudisoit/CIFOR will be invovled as coauthors in any publications making use of the data.

[1] John Hart has always been supportive in helping putting in touch the team with experts and is willing to collaborate in designing guidelines and conservation suggestions for the site.

[2] Dr Anne Laudisoit met John fa during the One Health EcoHealth workshop in Brussels (6-7th october) and asked him for help in analysing, reading and writing papers on the area.

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First and foremost, we would like to heartly thank Dr. Jacob Willie for his trainging in performing ape surveys and spending the whole trip and spare time teaching us all ; his weight loss at the end of the trip showed how much he was active during this trip ! We also thank the students of the University of Antwerp, Tiffany Scholier and Pierre Hughes for their contributions, drawings, jokes, cooking and the good time spent together in the area despite harsh field conditions on steepy and slippery slopes. We are grateful to “Mr Multi tasking” our logisitician, translator, secondary cook, compass bearer, etc....“Oti”, and to Sylvie, Love, guides, porters and all the Lendu people for welcoming us in their homes, fields and forests, for taking care of our equipment and for sharing their indigenous knowledge with us, to Mrs Françoise Nyisi, the ISPT / Rethy staff and Protestant mission clercs, and to our driver for their help and constant support despite harsh field conditions. The governor vice gorvernor of the Ituri province, scientific institutions (WWF, OSFAC, WCS) and renowned conservationsists (Dr Tom Struhaker, Dr John Hart in particular), Dr Erik Verheyen and Dr Herwig Leirs, Dr Nikki Tagg from CRC/Antwerp zoo are here acknowledged and thanked for their trust, financial, logistical and/or scientific support.

ANNEX 1. CSB bill paid by the University of Antwerpen

REPUBLIQUE DEMOCRATIQUE DU CONGO
UNIVERSITE DE KISANGANI
CENTRE DE SURVEILLANCE DE LA BIODIVERSITE
« CSB »

Kisangani, le…../……. /2016

FACTURE N° CSB/UNIKIS/KIS/…../2016

PROJET : Université d'Anvers, Département des Finances Middelheimlaan 1

2020 Anvers

tva: BE 0257216482

Durée: 37 jours

Effectif: ……. personnes .

chercheurs: ……Belges/…….Congolais)

Doit pour ce qui suit,

1.matériels scientifiques, équipements

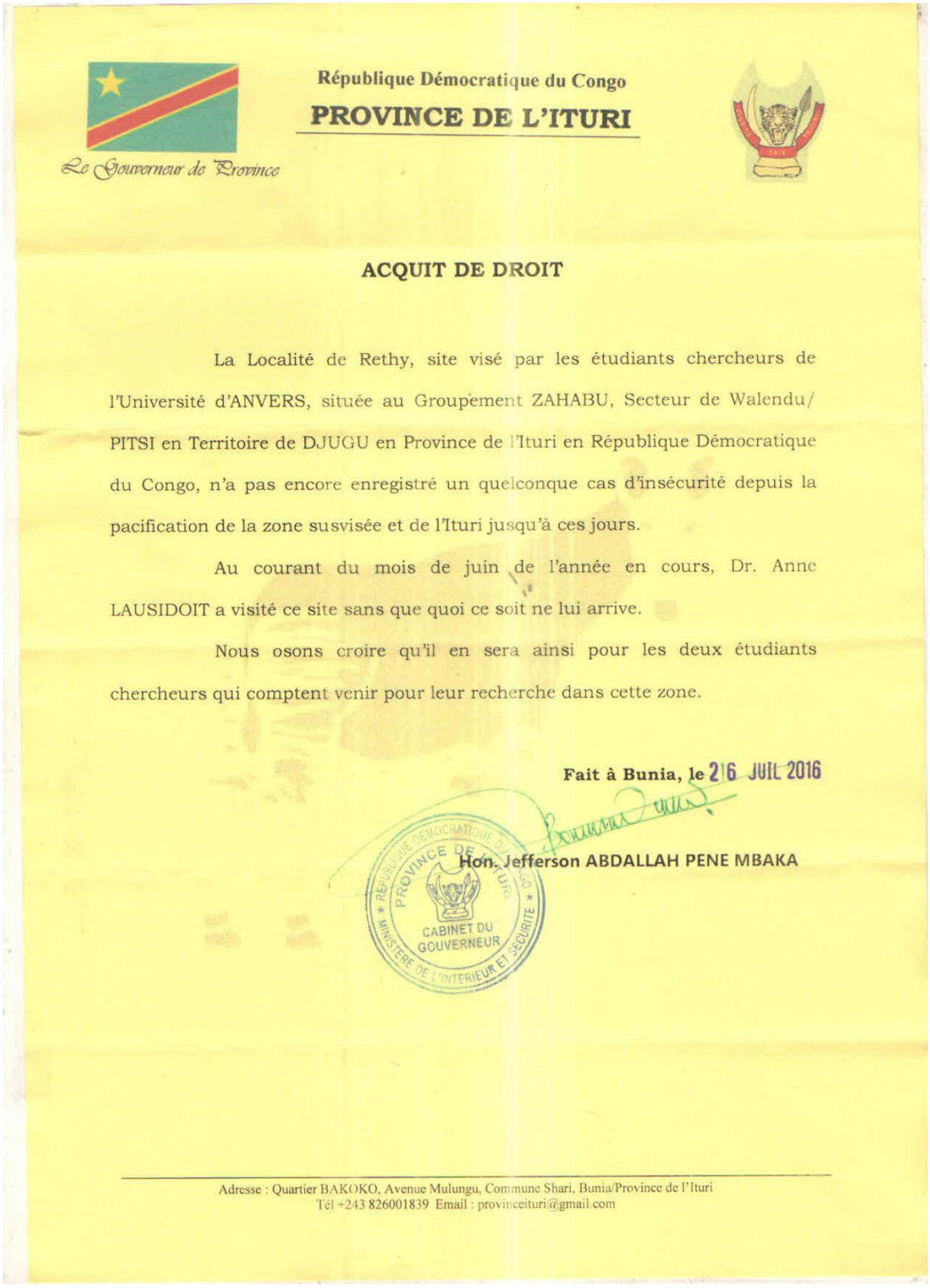
Désignation	**Unité**	**nbr de jrs**	**Qté**	**P. U. $**	**P.T. $**
Location diamond lampe(tête) spot	pièce	37	2	0.13	9.62
Location couchette (thermarest matelas)	pièce	37	6	0.63	139.86
Location tente	pièce	37	3	0.63	69.93
Location couteau victorinox	pièce	37	2	0.38	28.12
Digital dictaphone Olympus	pièce	37	1	0.38	14.06
Achat tube d'eppendorf 1000	pièce	1	1	25	25
Achat Alcool 96%	litre	1	6	10	60
Achat formol	kg	1	0.5	70	35
Location touque de 50 litre	litre	1	2	0.2	0.4
Location pistolet taggeur	pièce	37	1	0.5	18.5
Achat ouatte	pièce	1	1	10	10
Location piège pitfall(20)	pièce	1	1	20	20
Location materiel de grimpage	kit	1	1	30	30
Bache (achat)	pièce	37	2	15	30
TOTAL (1)					**490.49**

Nous disons dollar américain quatre cent nonante point quarante neuf

Le Directeur du Centre,

Dr. DUDU AKAIBE
Professeur Ordinaire

ANNEX 2. Invitation letter from the governor of Ituri



République Démocratique du Congo

PROVINCE DE L'ITURI

Le Gouverneur de Province

ACQUIT DE DROIT

La Localité de Rethy, site visé par les étudiants chercheurs de l'Université d'ANVERS, située au Groupement ZAHABU, Secteur de Walendu/ PITSI en Territoire de DJUGU en Province de l'Ituri en République Démocratique du Congo, n'a pas encore enregistré un quelconque cas d'insécurité depuis la pacification de la zone susvisée et de l'Ituri jusqu'à ces jours.

Au courant du mois de juin de l'année en cours, Dr. Anne LAUSIDOIT a visité ce site sans que quoi ce soit ne lui arrive.

Nous osons croire qu'il en sera ainsi pour les deux étudiants chercheurs qui comptent venir pour leur recherche dans cette zone.

Fait à Bunia, le 26 JUIL 2016

Hon. Jefferson ABDALLAH PENE MBAKA

RÉPUBLIQUE DÉMOCRATIQUE DU CONGO PROVINCE DE L'ITURI CABINET DU GOUVERNEUR MINISTÈRE DE L'INTÉRIEUR ET SÉCURITÉ

Adresse : Quartier BAKOKO, Avenue Mulungu, Commune Shari, Bunia/Province de l'Ituri
Tél +243 826001839 Email : provinceituri@gmail.com

ANNEX 3. Various field forms used along the transects

Fiche de collecte des données d'inventaire botanique – arbres, raphias (DHP ≥ 10 cm) et lianes (DHP ≥ 5 cm) – Parcelles de 25 x 25 m

Chercheur.....

Assistants.....

Date.....

Cellule N°.....

Végétation.....

Longitude.....**Latitude**.....

N°	A/L/R	Espèce	DHP (cm)	Hauteur (m)	Commentaire

A= arbre ; L= liane ; R= raphia

Fiche de collecte des données d'inventaire botanique –arbustes, raphias (h ≤ 1 m) et herbacées
Parcelles de 2 x 2 m

Cellule N°.....

N°	Espèce	A//R/H	Nombre d'individus	Observation

A= arbuste ; R= raphia ; H = herbacée

Fiche de collecte des données d'inventaire botanique – arbustes, raphia (DHP < 10 cm ; h > 1 m) et lianes (DHP < 5 cm) – Parcelles de 4 x 4m

Cellule N°.....

N°	A/L/R	Espèce	DHP (cm)	Hauteur (m)	Commentaire

A= arbuste ; L= liane ; R= raphia

Vegetation survey – Inventaire de la végétation

Date……
Researcher……
Assistants……
Site……
Transect……
Location along transect……
Description location n°……
GPS point……**Latitude**……**Longitude**……
Elevation……**Slope**……
Vegetation type……

Description criterion	Results	Comments
Soil type [1]		
Number of rock outcrops		
Signs of past disturbance [2]		
Indicator species [3]		
Horizontal visibility (m)		
Understory density [4]		
Number of light gaps		
Canopy openness [5]		
Dominant canopy height (m)		
1 – 3 most common dominant tree species [6]		
DBH range of dominant tree species		
Intermediate canopy height (m)		
1 – 3 most common intermediate tree species [7]		
DBH range of intermediate tree species		
Shrub layer height (m)		
1 – 3 most common shrub species [8]		
DBH range of shrub species		
Woody liana abundance [9]		
1 – 3 most common liana species [10]		
DBH range of liana species		
Terrestrial herbaceous vegetation abundance [11]		
1 – 3 most common herbaceous species [12]		

[1] *Terra firma*, Riparian, or Swamp
[2] Old village site, Old farm, Selectively logged forest, Heavily logged forest, Burned forest, etc.
[3] Write species names if present
[4] Thick, Average, Open
[5] Open, Average or Closed
[6] Write species names; if no species is more common put 'mixed'
[7] Write species names; if no species is more common put 'mixed'
[8] Write species names; if no species is more common put 'mixed'
[9] Many, Few, None
[10] Write species names; if no species is more common put 'mixed'
[11] Dense, Average, Sparse
[12] Write species names; if no species is more common put 'mixed'

Recensement des chimpanzés le long des transects à largeur fixe

Date…………………………Temps…………………………Bloc………Transect………… Numéro GPS…………
Altitude début………………Altitude fin………………Latitude début…………………Latitude fin…………………
Longitude début………………Longitude fin……………Pointeur……………………Assistants……………………
Autres personnes……………………………………………………………………………………………………
Heure de début……………Heure de fin…………Périodes d'arrêt……………………………………………………

Code du site de nids	Cat. d'âge du site de nids	Code du nid	Position (m)	Latitude	Longitude	Numéro point GPS

Recensement des chimpanzés le long des transects à largeur variable

Date………………………..…Temps…………………..……………Bloc…………………Transect………………… Numéro GPS……………………………
Altitude début……..….Altitude fin………….Latitude début…………………Latitude fin.……………..…Longitude début…..……………...Longitude fin…………
Pointeur…………………………Assistants………………………………………………Autres personnes…………..…………………………………………
Heure de début…………………Heure de fin…………………Périodes d'arrêt……………………………………………………………..……………………...

Code du site de nids	Cat. d'âge du site de nids	Code du nid	V/ NV	Position (m)	G/D	Dist. Perp. (m)	Ø nid (cm)	Type de nid	Hauteur nid (m)	Hauteur arbre (m)	Espèce d'arbre	DHP (cm)	Fruits	Type de vég.	Ouverture canopée	Ouverture sous-bois	Visibilité (m)	Latitude	Longitude

Direct observations of monkeys and other animal species – Data collection sheet

Date……..…Temps……...……Bloc……Transect…… Numéro GPS……
Pointeur……..Assistants……

Location along transect (m)	Local name of the animal species	Number of individuals	Distance of observation[1] (m)	Angle of observation[2]	Vegetation type	Canopy openness	Understorey openness	Visibility (m)	Latitude (UTM)	Longitude (UT M)

[1] Distance between the observer and the centre of the animal group. [2] Angle measured in the direction observer – animal group.

Fiche de collecte des données des activités humaines dans les transects

Date…….. Bloc……Numéro GPS……Transect……

Pointeur……Assistants……..

Autres personnes……..……..

Position le long du transect (m)	Type d'activité humaine	Type de végétation	Latitude	Longitude	Numéro point GPS

Surveys of dung, footprints and other animal signs within strip transects – Data collection sheet

Date…….. Bloc……Numéro GPS……Transect……

Pointeur……Assistants……..

Autres personnes……..……

Loca-tion along transect (m)	Type of animal sign*	Local name of the animal species	Vege-tation type	Canopy open-ness	Under-storey open-ness	Visi-bility (m)	Latitude (UTM)	Longitude (UT M)

*footprint, dung pile, urine, feeding remain, sleeping site, etc. If the dung pile is spread, various portions of dung can be assigned to the same dung pile based on aspect, size and age.

Suivi de la décomposition des nids de chimpanzés

Pointeur.....**Assistants**.....
Bloc……**Transect**.....**Latitude du nid**……**Longitude du nid**……..
Numéro point GPS……**Numéro GPS**……

Nid N°	Position	G/D	Visibilité (m)	Type de nid	Type de vég.	Hauteur du nid (m)	Diamètre du nid (cm)	Dist. Perp. (m)	Espèce d'arbre	Hauteur arbre (m)	DHP (cm)

Date	Etat du nid*	Commentaire

* marquer catégorie 1,2,3,4,5 ou 6. Au-delà de la catégorie 6, marquer DISPARU

Fiche de collecte des données du régime alimentaire des chimpanzés

Pointeur……………….......Assistants……………………………………Autres personnes…………………

Date	Numéro de la crotte	Espèce retrouvée dans la crotte	Forme	Quantité	Commentaire

ANNEX 5. Instructions to fill the various field forms (from Dr Jacob Willie)

INSTRUCTIONS POUR LE REMPLISSAGE DES FICHES DE COLLECTE DES DONNÉES

Fiche de collecte des données de recensement des chimpanzés le long des transects à largeur variable

Entête

- **Date :** noter la date du jour.
- **Temps :** il s'agit de la météorologie. Noter « ensoleillé », « nuageux » ou « pluvieux ».
- **Bloc :** noter le code du bloc (FG1, FG2 ou FG3).
- **Transect :** noter le numéro du transect (valeurs de 1 à n, en fonction du nombre de transects dans le bloc).
- **Numéro GPS :** noter le numéro ou code du GPS utilisé.
- **Altitude début :** noter l'altitude au début du transect.
- **Altitude fin :** noter l'altitude à la fin du transect.
- **Latitude début** : noter la latitude au début du transect.
- **Latitude fin :** noter la latitude à la fin du transect.
- **Longitude début** : noter la longitude au début du transect.
- **Longitude fin :** noter la longitude à la fin du transect.
- **Pointeur :** noter le nom de la personne remplissant la fiche.
- **Assistants :** noter les noms des guides en charge du comptage des nids.
- **Autres personnes :** noter les noms des autres personnes participant à l'inventaire des nids.
- **Heure de début :** noter l'heure à laquelle le recensement commence.
- **Heure de fin :** noter l'heure à laquelle le recensement finit.
- **Périodes d'arrêt :** noter toutes les périodes d'arrêt (par exemple quand l'équipe s'arrête pour récolter les données dans un site de nids ou pour quelque raison que ce soit) quelle que soit la durée. noter les périodes successives (par exemple 10h30 – 10h35 ; 11h02 – 11h09 ; 14h50 – 15h01 ; etc.).

Corps de fiche

- **Code du site de nids :** pour le premier site de nids de chimpanzés découvert au transect 1 du bloc FG1 le code complet sera **$S_1FG_1T_1$**. De même, le second site du transect 1 sera **$S_2FG_1T_1$**
- **Cat. d'âge du site de nids :** il s'agit de la catégorie d'âge du site de nids. Les nids d'un même site doivent en principe avoir la même catégorie d'âge. Noter 1, 2, 3, 4, 5 ou 6.
- **Code du nid :** si le premier site de nids de chimpanzés découvert au transect 1 du bloc FG1 comporte un seul nid, le code du nid sera **$S_1FG_1T_1N_1$**. Si le second site de nids du transect 1 du bloc FG1 comporte deux nids, les codes seront **$S_2FG_1T_1N_1$** et **$S_2FG_1T_1N_2$**, respectivement.
- **V/NV** : pour chaque nid directement visible à partir du layon, noter V. Pour les nids qui n'ont pas pu être détectés à partir du layon, noter NV.
- **Position (m)** : Il s'agit de la position le long du transect (les positions varient de 0 à n, en fonction de la longueur du transect).
- **G/D** : pour chaque nid, noter la position. Si le nid est à gauche du transect, marquer G, et s'il est à droite, marquer D.
- **Dist. Perp. (m)** : il s'agit de la distance perpendiculaire de chaque nid visible (V) au transect. Les distances perpendiculaires des nids non visibles (NV) à partir du transect ne sont pas nécessaires pour calculer la densité sur la base des nids individuels. Cependant, elles peuvent s'avérer utiles pour la détermination de la distance perpendiculaire du site de nids. Elles devront donc être mesurées. Pour les nids situés au « centre » du transect, il faut éviter de noter 0. La distance perpendiculaire peut être de quelques centimètres si le centre du nid est légèrement à gauche ou à droite de l'axe du layon.

- **Ø nid (cm)** : il s'agit du diamètre du nid. Estimer ou mesurer la plus grande dimension.
- **Type de nid :** marquer T, L, S, TT, TS, TL, SS ou SL.
- **Hauteur nid (m)** : estimer la hauteur du nid.
- **Hauteur arbre (m)** : estimer la hauteur de l'arbre.
- **Espèce d'arbre** : noter le nom local de l'arbre.
- **DHP** : mesurer la circonférence de l'arbre à hauteur de poitrine (à 1,30 m au-dessus du sol).
- **Fruits**: noter 0 (pas de fruits dans l'arbre où se trouve le nid), 25 (peu), 50 (moyen) ou 100 (abondants).
- **Type de végétation** : Noter le code (voir fiche Anne).
- **Ouverture canopée** : noter 0 (fermée), 50 (à moitié ouverte) ou 100 (ouverte).
- **Ouverture sous-bois** : noter 0 (fermé), 50 (à moitié ouvert) ou 100 (ouvert).
- **Visibilité (m) :** estimer la visibilité horizontale.
- **Long. :** il s'agit de la longitude du nid.
- **Lat.:** il s'agit de la latitude du nid.

Fiche de collecte des données de recensement des chimpanzés le long des transects à largeur fixe

1. **Entête :** semblable à la fiche des transects à largeur variable.
2. **Corps de fiche**

- **Code du site de nids :** semblable aux codes des sites des transects à largeur variable.
- **Cat. d'âge du site de nids :** Noter 1, 2, 3, 4, 5 ou 6.
- **Code du nid :** semblable aux codes des nids des transects à largeur variable.
- **Position (m) :** position le long du transect.
- **Longitude :** longitude du nid.
- **Latitude :** latitude du nid.
- **Numéro point GPS :** noter le numéro du GPS utilisé.

Fiche de suivi de la décomposition des nids de chimpanzés

- Utiliser cette fiche pour les nids frais (catégories 1 et 2).
- Une fiche par nid.
- Prendre soin de remplir l'entête.
- Corps de fiche 1 : * Nid N° : marquer un numéro (1, 2, 3….)

* Les autres paramètres doivent être collectés comme décrit précédemment

- Corps de fiche 2 : * Date : noter la date du jour de description du nid
  * Etat du nid : c'est la catégorie d'âge (de 1 à 6)
  * Description : décrire le nid tel qu'il se présente

NB : le corps de fiche 2 doit être rempli tous les mois. Il faut toujours noter la nouvelle date de description. Si un nouveau nid frais est découvert le mois suivant, utiliser une nouvelle fiche.

Fiche de collecte des données d'inventaire de la végétation

1. **Entête :** semblable à la fiche des transects. Mais ajouter le type de végétation (voir fiche Anne) et la position le long du transect.
2. **Corps de la fiche :** indications données en bas de fiche.

ANNEX 6. Catégories d'âge des nids de chimpanzés et de gorilles (*Nest age categories*)

Catégorie **1** : Nid frais, très récent (quelques jours), avec présence des crottes fraîches, poils, urines et/ou odeurs.
Catégorie **2** : Nid frais dont toutes les feuilles demeurent vertes. Il n'y a plus d'odeur, et les crottes, si présentes, sont dégradées.
Catégorie **3** : Nid en état de décomposition intermédiaire, avec des feuilles vertes et maronnes.
Catégorie **4** : Nid présentant un feuillage complètement marron, mais dont la structure demeure intacte.
Catégorie **5** : Nid présentant un feuillage complètement marron, une structure déformée, et/ou des trous. Le nid est en état de dégradation avancé.
Catégorie **6** : Nid presqu'entièrement décomposé et difficilement reconnaissable.

Types de nids construits au sol (*Ground nest construction types*)

Type Zéro (**Z**) : Le gorille ou le chimpanzé a directement dormi au sol sans construire de nid.
Type Minimum (**Mm**) : Nid sommairement construit. Le gorille ou le chimpanzé a juste plié quelques tiges.
Type Herbacé (**H**) : Nid bien tissé et construit entièrement à l'aide du matériel herbacé.
Type Mixte (**Mx**) : Nid bien tissé constitué d'un mélange de matériel végétal et ligneux.
Type Ligneux **(L)** : Nid constitué uniquement du matériel ligneux. Les constituants ne sont pas détachés/déplacés.
Type Ligneux détaché (**Ld**) : Nid constitué uniquement du matériel ligneux. Les constituants sont déplacés de leurs emplacements d'origine.
Type Tronc (**Tr**) : Nid de construction quelconque posé sur un tronc d'arbre couché.

Types de nids construits en hauteur (*Tree nest construction types*)

Type *Top* (**T**) : Nid construit au sommet d'un seul arbre.
Type *Side* (**S**) : Nid construit sur la branche latérale d'un seul arbre.
Type Liane (**L**) : Nid construit sur uniquement sur des lianes.
Type *Top-Top* (**TT**) : Nid construit au sommet de deux arbres.
Type *Top-Side* (**TS**) : Nid reposant sur le sommet d'un arbre et sur la branche latérale d'un arbre plus grand.
Type *Top-Liane* (**TL**) : Nid construit sur une ou plusieurs lianes au somment d'un arbre.
Type *Side-Side* (**SS**) : Nid construit sur les branches latérales de deux arbres.Type *Side-Liane* (**SL**) : Nid construit sur la branche latérale d'un arbre et sur une ou plusieurs lianes.

ANNEX 7. Updated question form on chimpanzees local knowledge

DATE : ___/___/_____
Questionnaire pour l'évaluation des connaissances de la population sur les chimpanzés

ENQUETEUR : _____
CODE MENAGE (WP): _____

PE1.Nom du territoire :_____
PE2.Nom du l'Aire de santé___
PE3.Nom de la localité_____
PE4.Nom du groupement_____

PE5.DONNEES PERSONNELES REPONDANT (plus de 50 ans)
Age actuel (ans) : _____ Genre☐M☐F –
RESIDEZ VOUS DANS CE LIEU TOUTE L'ANNEE ? ☐OUI☐NON

Si OUI, nombre d'années de résidence dans ce lieu : _____

Si moins de 6 ans, où résidiez-vous avant d'arriver dans ce lieu ?
_____
Pourquoi vous êtes vous installé ici ?
☐ACTIVITE AGRICOLE ☐EXPLOITATION FORESTIERE ☐COMMERCE ☐VISITE FAMILLE ☐GUERRE ☐CONFLIT FONCIER
☐ AUTRE(S) RAISON(S)_____
Si NON, quels mois passez vous ?

J	F	M	A	M	J	J	A	S	O	N	D

Depuis combien quelle année passez vous ce temps, chaque année, dans ce lieu ? _____
Pourquoi résidez vous de manière temporaire dans ce lieu ?
☐ACTIVITE AGRICOLE ☐EXPLOITATION FORESTIERE ☐COMMERCE ☐VISITE FAMILLE
☐ *AUTRE(S)*
RAISON(S)_____
_____
_____
Tribu :_____
Lien de parenté avec le chef de ménage : ☐*chef de ménage* ☐*Époux/se* ☐*Fils / fille* ☐*Beau fils/belle fille* ☐*Père/mere* ☐*Sœur/frère* ☐*Neveu/nièce* ☐*Petit fils / fille* ☐*Autre parent (lequel):*_____
☐*Sans parenté*

PE6.Activité principale :

PE6.1.En SAISON SECHE
1ère activité

J	F	M	A	M	J	J	A	S	O	N	D

☐Chasse☐Pêche☐Agriculture☐Elevage☐Commerce☐Collecte de champignons☐Collecte de chenilles ☐Autres produits forestiers non ligneux☐Salarié ☐Scierie ☐Coupe de bois
☐AUTRE_____
2ème activité : Mois et activité principale

J	F	M	A	M	J	J	A	S	O	N	D

☐Chasse☐Pêche☐Agriculture☐Elevage☐Commerce☐Collecte de champignons☐Collecte de chenilles ☐Autres produits forestiers non ligneux☐Salarié ☐Scierie ☐Coupe de bois
☐AUTRE_____
3ème activité : Mois et activité principale

J	F	M	A	M	J	J	A	S	O	N	D

☐Chasse☐Pêche☐Agriculture☐Elevage☐Commerce☐Collecte de champignons☐Collecte de chenilles ☐Autres produits forestiers non ligneux☐Salarié ☐Scierie ☐Coupe de bois
☐AUTRE_____
QUAND ONT LIEU La ou LES SAISON(S) DES PLUIE(S) ?

J	F	M	A	M	J	J	A	S	O	N	D

QUAND ONT LIEU La ou LES SAISON(S) SECHE(S) ?

J	F	M	A	M	J	J	A	S	O	N	D

PE7.CONNAISSANCE DES CHIMPANZES

PE7.1.Présentation de l'espèce

PE5. Savez-vous ce qu'est un chimpanzé ? ☐OUI ☐NON☐NE SAIT PAS☐REFUS
Si OUI, quel est son nom dans votre langue ? _____**Langue**_____

PE6.Qu'est-ce que c'est ? Comment se comporte t il ? ***Définition ouverte, laisser la personne répondre et raconter.***
_____
_____
_____

_____
_____
_____
____

PE7.2.Caractéristiques physiques

PE7.2.1. Couleur du poil : _____ ☐**NE SAIT PAS**☐**REFUS**
PE7.2.2. Couleur des mains _____☐**NE SAIT PAS**☐**REFUS**
PE7.2.3. Couleur des pieds _____ ☐**NE SAIT PAS**☐**REFUS**
PE7.2.4. Couleur du visage _____ ☐**NE SAIT PAS**☐**REFUS**
PE7.2.5. Possède-t-il une queue ? ☐**OUI**☐**NON** ☐**NE SAIT PAS**☐**REFUS**
PE7.2.6. Excrément : connaissez-vous la forme et l'aspect des excréments des chimpanzés ? ☐**OUI**☐**NON** ☐**REFUS**
Si oui, dessinez le dans le rectangle à droite

REMARQUES SUR LES CARACTERISTIQUES PHYSIQUES DES CHIMPANZES:
_____
_____
_____
_____
_____
_____

PE7.3.Observation directe

PE7.3.1.Avez-vous déjà vu des chimpanzés lors de vos activités ? ☐**OUI**☐**NON** ☐**NE SAIT PAS**☐**REFUS**
Si OUI, QUAND ÉTAIT-CE la dernière fois ? (jour) _____ **(mois)** _____ **(année)**
Combien y a avait-il d'individus ? _____
PE7.3.2.En faisant quelle activité ?

ACTIVITE	N individu	REMARQUE
☐**Chasse** ☐**Pêche** ☐**Agriculture** ☐**Elevage** ☐**Commerce** ☐**Sciage/coupe de bois** ☐**Collecte de PFNL** ☐**Paturage** ☐**Marche de/vers le champ** ☐**Marche de/vers la forêt** ☐**Autre :**_____		

Si observé au champ, dans quel champ ? ☐**mais**☐**haricot**☐**pomme de terre**☐**manioc**☐**arachide**
☐**Autres :** _____, _____, _____,
Si observé dans la forêt, NOM DE LA FORET ou DES FORETS :

NOM DE LA FORET	N individu	REMARQUE

_____
____

PE7.3.3.Que faisait l'animal / les animaux lorsque vous l' / les avez vu ?
☐**criait**
☐**marchait**
☐**jouait**
☐**grimpait un rocher**
☐**grimpait un arbre**
☐**dormait**
Si il dormait, décrivez comment, et ou
_____
_____

☐**mangeait**
Si il mangeait, décrivez comment, et quoi (arbre, végétation, fruit,…)
_____
_____
_____

☐buvait
Si il buvait, dans quelle(s) rivière(s) (NOM)?
_____

☐était mort
Si il était mort, qu'avez-vous fait ?
☐rien ☐touché et laissé sur place ☐enterré☐brulé sur place☐ramené en entier à la maison et mangé
☐ramené en partie à la maison et mangé
☐autre :_____
De quoi pensez-vous qu'il était mort ?
_____

PE7.3.4.Pensez-vous que les chimpanzés transmettent des maladies aux hommes ?
☐OUI☐NON ☐NE SAIT PAS☐REFUS
Si OUI, lesquelles selon vous ?_____
PE7.3.5.AUTRES commentaires sur les observations de chimpanzés (à commenter):
_____
_____

PE7.3.6. Connaissez vous des gens qui ont des os ou des peaux de chimpanzés chez eux ? Nous aimerions prendre des photos et un échantillon. ☐OUI☐NON ☐REFUS. *(Préciser au répondant que nous ne sommes pas là pour le punir)*

PE7.4.Croyances et usages

PE7.4.1.Que représente le chimpanzé dans votre société ou votre culture ?
_____
_____

Y a-t-il des croyances ou légendes associées aux chimpanzés ? ☐OUI☐NON ☐NE SAIT PAS☐REFUS
Si OUI, lesquelles – RACONTEZ L'HISTOIRE (à enregistrer si longue histoire)
_____
_____
_____

PE7.4.2. Savez-vous si le chimpanzé ou des parties de celui-ci ont des vertus médicinales ou des pouvoirs ?
☐OUI☐NON ☐NE SAIT PAS☐REFUS Si oui, compléter le tableau avec les usages par organe/partie.

ORGANE	MEDICINALE	MAGIQUE	APHRODISIAQUE	Autres
POUMON				
RATE				
OS				
PEAU				
GRAISSE				
VIANDE				
CŒUR				
FOIE				
REIN				
ORG.GENITAUX.				
POILS				
LANGUE				
DENTS				
AUTRE 1				
AUTRE 2				

PE7.4.3.Selon vousdans quelle forêt les chimpanzés sont ils les plus abondants ?
☐ NYOKA FORET ☐ NDEKE ☐ NZERKU☐LONDOO
☐ AUTRE :
_____

Pourquoi selon vous sont ils plus abondants dans cette forêt/ces forêts ?
_____
_____

PE7.4.4.Pensez vous que le nombre de chimpanzés a diminué ou augmenté depuis que vous vivez ici?
☐ Augmenté pourquoi ?
_____
_____

☐Diminué pourquoi ?

_____
_____

PE7.4.5. Déterminez la fréquence d'observation de chimpanzés dans votre zone en complétant ce tableau :

Avant l'Indépendance = années avant 1960			**Temps de Mobutu = 1960-1997**		
Abondante☐	**Régulière☐**	**Rare☐**	**Abondante☐**	**Régulière☐**	**Rare☐**
Temps des Pillages/Guerres = 1997-2001			**Entre 2010 et 2016**		
Abondante☐	**Régulière☐**	**Rare☐**	**Abondante☐**	**Régulière☐**	**Rare☐**

PE7.5. Consommation et chasse

PE7.5.1. Connaissez-vous des gens qui ont chasse des chimpanzés ? ☐OUI ☐MOI-MEME ☐NON ☐NE SAIT PAS☐ REFUS
PE7.5.2.Si il s'agit d'une autre personne qui a déjà tué des chimpanzés, pourriez vous nous indiquer ou il/elle habite afin de réalise un interview ? ☐OUI ☐NON ☐NE SAIT PAS☐REFUS ; et donner son nom :
_____

PE7.5.3.Si vous avez chassé vous-même cet animal, combien au total en avez vous tué ?
☐1 ☐2☐3☐4☐5☐6-10☐11-20☐21-50☐>50
PE7.5.4.Quand était-ce la dernière fois ? (à quel âge, en quelle année + mois si il/elle s'en souvient) :
AGE _____ ANNEE _____ MOIS _____
PE7.5.5.Qu'avez vous fait de cet animal ?
_____
_____
_____

PE7.5.6. Quels sont les engins utilisés pour la chasse aux chimpanzés ? ☐NE SAIT PAS☐REFUS
☐PIEGES (TROU)☐PIEGE MECANIQUE (BOITE)☐COLLET
☐AUTRE :
_____
Armes de chasse : ☐ARC et FLECHE ☐FUSIL (C12) ☐FUSIL (AK47) ☐CHIENS
☐AUTRE :
_____

PE7.5.7. Vend-t-on du chimpanzé sur certains marchés de la région ? ☐ OUI ☐ NON☐NE SAIT PAS☐REFUS
Si oui, le(s)quel(s) ? ☐KPANDROMA☐NDRELE☐MAHAGI
☐AUTRE :
_____

PE7.5.8. Consommez-vous de la viande de chimpanzés ? ☐OUI☐NON ☐NE SAIT PAS☐REFUS
Consommeriez-vous de la viande de chimpanzés ? ☐OUI☐NON ☐NE SAIT PAS☐REFUS
Si NON , pourquoi ?
_____
_____
_____
PE7.5.9. Selon vous, quelle est la communauté (tribu) qui consomme le plus souvent de chimpanzés dans votre contrée ?
☐NE SAIT PAS☐REFUS
_____
PE7.5.10. Selon vous, les chimpanzés sont-ils des ennemis des gens, causent ils des nuisances ?
☐OUI☐NON ☐NE SAIT PAS☐REFUS
Si OUI,décrivez :_____
_____

PE7.5.11.Que pensez vous de la présence de chimpanzés dans l'environnement qui vous entoure? Est-ce positif ou négatif ?
_____
_____
_____
_____
_____
_____

PE7.5.11.D'autres ANIMAUX causent-ils des nuisances ? ☐OUI☐NON ☐NE SAIT PAS☐REFUS

ESPECE	NUISANCE
BABOUIN (ajouter nom locaux)	
-	-
-	-
-	-
-	-

AUTRES SINGES (ajouter nom locaux) - - - -	 - - - -
RONGEUR (ajouter nom locaux) - - - -	 - - - -
COCHON SAUVAGE(ajouter nom locaux) - - - -	 - - - -
ANTILOPE (ajouter nom locaux) - - - -	 - - - -
OISEAUX	-
LEOPARD	
AUTRES	

AUTRES COMMENTAIRES :

_____

_____

MERCI POUR VOTRE CONTRIBUTION.