A Prospection Survey of the Usala Forest and Proposed Usala (Community) Gorilla Reserve, Democratic Republic of Congo, March-April 2007.

Distribution and Conservation Status of Large Mammals with an emphasis on Grauer's Eastern Gorilla, *Gorilla beringei graueri.*

Stuart C. Nixon[1], Kamable Mufabule[2], Alfred Eliba[3, 4] & Ignacio Manubo Patule[3, 4]

[1]The Dian Fossey Gorilla Fund International, [2]UGADEC (Union des Associations de Conservation des Gorilles pour le Développement Communautaire à l'Est de RDC) [3]Tayna Centre for Conservation Biology , North Kivu, DRC, [4] Usala Gorilla Reserve, North Kivu DRC.

Table of Contents

7   **CONCLUSIONS**

8   **RECCOMENDATIONS**

9   **ACKNOWLEDGEMENTS**

10   **REFERENCES**

1. Introduction

The African great apes and forest elephants are in the grip of a serious conservation crisis. Gorillas chimpanzees and bonobos are experiencing a severe decline across their entire distributional range due to habitat destruction, bushmeat hunting, ebola epidemics, increasing human population densities, and capture for the exotic pet trade. As well as facing many of the survival threats faced by the great apes, forest elephants have been heavily targeted by ivory poachers and are also experiencing a sharp and precipitous reduction in numbers throughout Central Africa.

Since 2003, the Dian Fossey Gorilla Fund International (DFGFI) has been engaged in a major landscape-wide program aimed at protecting the unique fauna and flora of eastern Democratic Republic of Congo (DRC), where ape and elephant declines are believed to be severe. This program has included the rehabilitation of the previously neglected Maiko National Park (MNP), and the development of the first state recognized community based faunal reserves in DRC – the Tanya Nature Reserve (TNR-formerly the Tayna Gorilla Reserve) and the Kisimba- Ikoba Nature Reserve (KINR).

Encompassing the entire range of Grauer's eastern gorilla, *Gorilla beringei graueri* and once believed to support some of the highest forest elephant, *Loxodonta africana cyclotis* densities in Central Africa the eastern DRC landscape has seen seven years of civil war and a long term economic depression that has resulted in an explosion of uncontrolled mining activities and settlement in remote forested areas. An assessment of the impact of these activities on populations of great apes, elephants and other important flagship species such as the endemic okapi, *Okapia Johnstonii* and Congo peafowl, *Afropavo congensis* is clearly a global conservation priority and an essential step in formulating long term population monitoring and species survival plans for eastern DRC
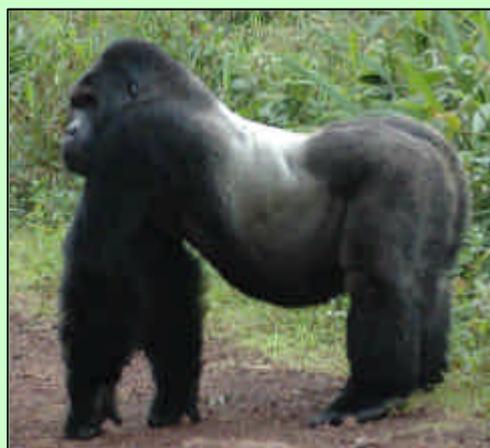

Adult male Grauer's gorilla, Kahuzi-Biega, National Park, DRC.

Although the post-conflict status of eastern DRC's biodiversity remains largely unknown recent collaborative surveys in the MNP (and adjacent forests) and the TNR by DFGFI, the ICCN (Institut Congolais pour le Conservation de la Nature) and UGADEC (Union des Associations de Conservation des Gorilles pour le Developpement Communataire), have identified important faunal populations in these regions including two major populations of Grauer's gorilla (previously though to be extinct or at best negligible) that together probably number in the region of 1000 individuals (www.gorillafund.org). Furthermore, results from these preliminary surveys have identified that today forest elephants are rare and in the MNP at least, have suffered a precipitous decline during the last 15 years (Hart & Sikubwabo 1992). In light of these findings we suspect that elephants throughout eastern DRC are in serious danger of extinction.

   As an extension of these recent and important surveys, during March and April 2007 we conducted a preliminary reconnaissance survey of the eastern and central parts of the remote and previously undocumented Usala forest. Geographically located between the officially protected

MNP, TNR and KINR, the Usala forest encompasses one developing UGADEC community reserve, the Utunda-Wasa Gorilla Reserve (REGOUWA) and one proposed community reserve the Usala Gorilla reserve (RGU) (see figure 1). The remoteness and geographic location of the proposed RGU within the Usala forest offers an unprecedented and unique opportunity to develop a community based biological corridor between the MNP and the Tayna region, (a principal objective of the DFGFI Congo program) making it's exploration a priority.

This report provides an overview of the Maiko-Tayna and Usala regions; survey methods used and provide a summary of the field results, including survey coverage, distribution of faunal indices and human activity. An initial assessment of the relationship between faunal abundance and human activity levels provide a basis for some initial conclusions concerning the conservation status of the Usala survey block and recommendations for its protection.
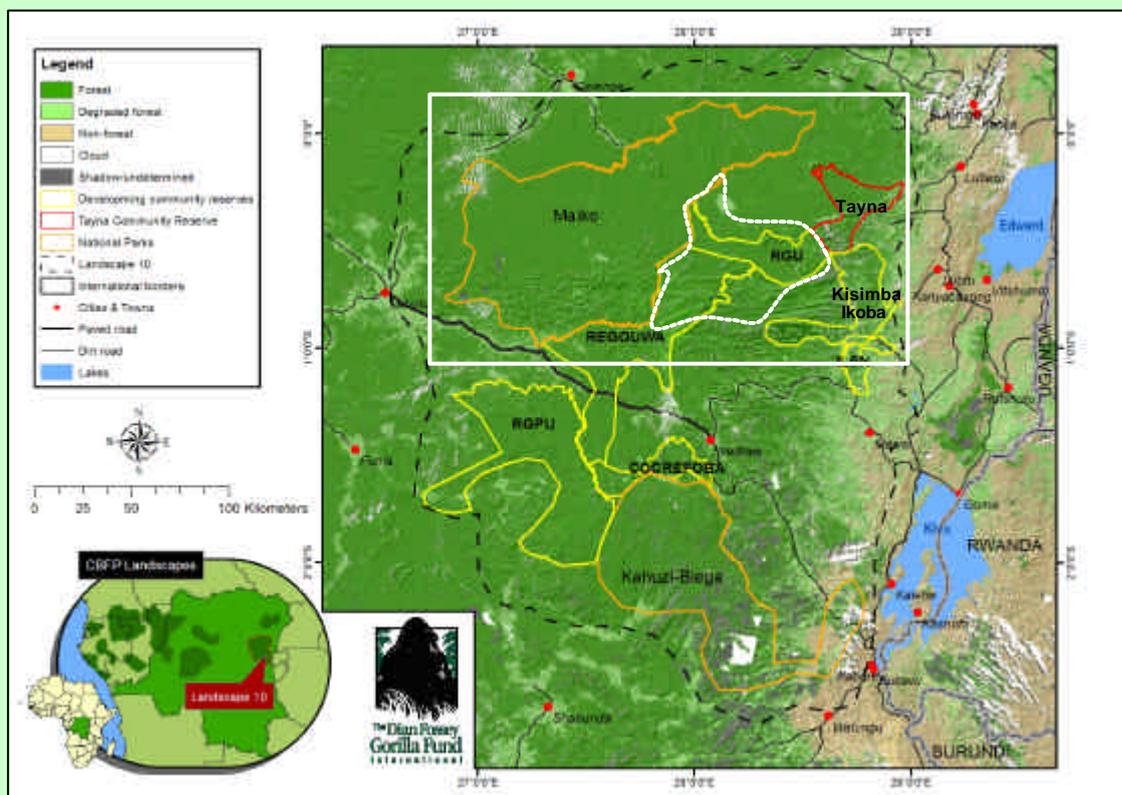
Figure 1. Location of the Maiko-Tayna region (solid white outline) and the Usala forest (dashed white line) in eastern DRC

Objectives

1. Collect baseline data on the distribution and conservation status of great apes, forest elephants and other large mammals in the western and central region of the Usala forest
2. Assess human activity levels and their impact on mammal abundance and distribution throughout the survey region.
3. Provide essential field survey training and capacity building exercises for UGADEC field personnel.

2. Overview of the Study Region

Location and Legal Status.

The Usala forest is embedded in the 25,000 km² Maiko-Tayna region of eastern DRC which forms the northern sector of the USAID funded Central African Regional Program for the Environment's (CARPE) Maiko, Tayna, Kahuzi-Biega Conservation landscape (also known as CARPE landscape #10.) Bordered by the Lindi, Bilate, Mesa and Mandaye rivers the Usala forest covers approximately 3500km² in the Walikale district of the North Kivu province, and is among the most remote regions in the entire MTKB landscape. Unlike the MNP, TNR and KINR no part of the Usala forest receives any official protection and limits for the proposed RGU (approximately 1400km²) presented in this report are preliminary and provided by local stakeholders, land owners and traditional dignitaries during recent discussions with UGADEC.
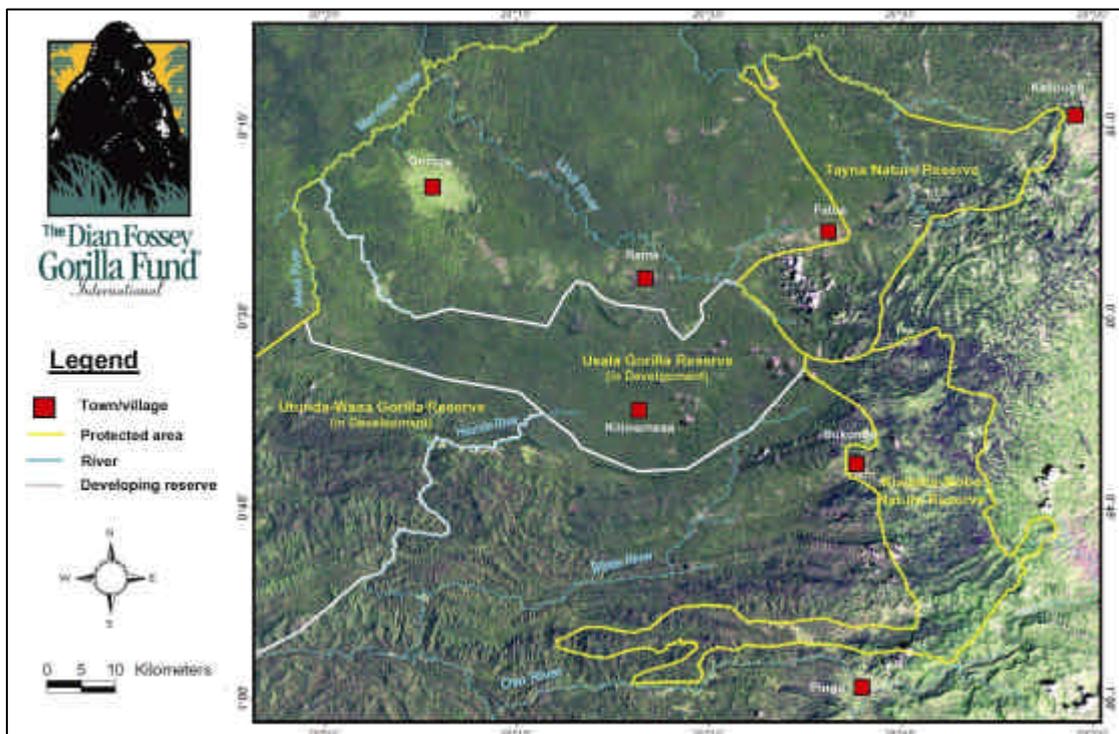
Figure 2. Overview of the Usala Forest

Altitude, topography and vegetation

Altitudinal variation throughout the Maiko-Tayna region is high, varying significantly from over 2,500 m in the east along the Albertine rift escarpment to 500 m at the western boundary of the Maiko NP. Topography is similarly diverse with the majority of the northern, central and western sectors of the region (including Usala) being typified by a gently undulating peneplane (mean altitude - 850 m) with the southern and eastern regions typified by a chaotic jumble of steep sided mountain chains (mean altitude - 1400 m). Due to this high variation in altitude and

geomorphologic topography, the Maiko -Tayna region contains a diverse set of vegetation types. Dominant vegetation is typified by mixed mature afromontane, transitional and lowland tropical forest formations, although other habitats found within the region include riverine and swamp forests, mono-specific stands of *Gilbertiodendron dewervrei* and *Uapaca sp.*, broken canopy *Marantacea* forest, *Raphia* swamps and *Cyperaceae* rich forest clearings (*edo's*). Regenerating secondary formations are found throughout the region at sites of ancient or abandoned human settlements (villages, fields, colonial-era mines, etc.) or in mountainous regions with a high incidence of natural trees falls. The Maiko-Tayna region has never been commercially logged and forest cover is almost 100% across its expanse making it one of the largest unbroken tracts of forest remaining in Central Africa.
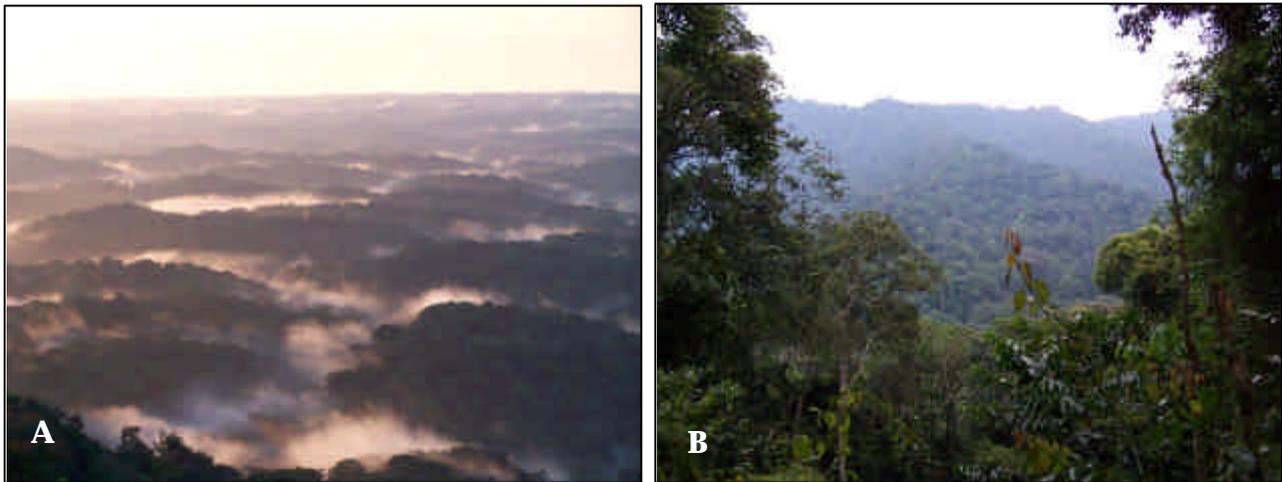
Topography and vegetation in the Maiko-Tayna region
a) Lowland forest, Usala and b) Montane forest, Tayna

Apes and elephants in the Usala region

Although gorilla, chimpanzee and elephant presence was widely reported by reliable local informants prior to these survey historic records are sparse. Emlen and Schaller (1960 supplementary notes) provide anecdotal reports from local chiefs and colonial administrators that gorillas were perceived to be "Common on both sides of the Lindi (river)" which today forms the western boundary between the TNR and the proposed RGU. In addition the Tervuren Museum in Brussels houses within its eastern gorilla collection a single adult male skull collected by Belgian mine prospectors near Kilimamesa circa. 1935. In the most recent landscape wide assessment of Grauer's eastern gorilla by Jefferson Hall and colleagues (1998 a) the forests east of the MNP and encompassing Usala, TNR and KINR are omitted from their analysis due to a lack of knowledge about the area. Historical records of chimpanzees, elephants and other flagship species such as the okapi appear to be non-existent for the Usala region.

Accessibility

The Usala forest is highly inaccessible and among the most remote regions in eastern DRC. Although rudimentary roads were constructed across the central part of Usala during the Belgian colonial period (linking mining operations in what is now MNP with regional administrative and economic centres at Lubero and Butembo) these roads were swiftly abandoned and today are completely overgrown and impassable. Although Usala is bordered by several major rivers (Lindi, Mesa, Bilate and the Mandaye) these are strewn with numerous rapids and cataracts that make them almost impossible to navigate for long distances, thus the only major access to the Usala region is by foot westward from Kasough or Muhangha, from Pinga in the south walking northwards or by traversing the MNP central sector walking south from Angumu via Oninga. All foot distances exceed 75km in length.

Survey team traversing the Lindi River

Human population, local amenities and economy

Despite the remoteness and inaccessibility of the Usala region it supports a relatively large human population in a narrow and discontinuous settlement zone that borders the route of the abandoned Belgian road for some 80km between Fatua and Oninga. Accurate data on socio-economy and human population density is presently unavailable for the Usala region, although at the time of the survey the population was estimated at 7,000-9,000 individuals by local chiefs. Local economic and administrative centres are located at Fatua, Rama and Oninga.

Like most of rural DRC, local amenities are almost non-existent. Healthcare and education facilities are few and suffer from a severe lack of financial resources and equipment. No mains electricity or piped water facilities exist in the Usala area. The local economy is based primarily around artisinal mining of gold and diamonds and the foot cargo of mined materials and other forest products from local economic centers Oninga and Rama, via Kasough to Butembo. The shifting agriculture of rice, manioc and bananas, fishing and bushmeat hunting further support the local economy.

A) Impoverished health clinic, Rama   **B) Slash and burn agriculture, west of the Lindi**

Security

The Usala forest is situated in an area that MONUC (United Nations Peace Keeping Mission for Congo) recognises as amongst the most logistically difficult and insecure areas in the country. Until recently the Usala area was under the full control of Mai-mai militia but during 2006, rebel groups residing in the area were successfully demobilised and incorporated into the national army (FARDC). Prior to this survey we held several key meetings with military officials from and adjacent to the Usala survey block and full support was given for our work. Throughout the survey field teams were provided with an armed military escort and no security problems were encountered, however by the end of the survey security had deteriorated significantly and unexpectedly south and east of the survey block due to a renewed effort by the DRC government and MONUC to demobilise former Interahamwe dissidents (FDLR) and rogue Mai-mai elements. Despite these security problems adjacent to the block all teams finished the planned survey and exited the region safely and on schedule.

3.Training

Immediately prior to the commencement of the Usala survey, between the 21st and 24th of March three designated data collectors were provided with three days of intensive training in the adjacent Tayna Nature Reserve by DFGFI field scientist S.Nixon, and UGADEC scientific director K.Mufabule. Both trainers have significant experience conducting biological surveys and are familiar with data collection protocols used by the DFGFI Congo program. Field data collectors received training in GPS usage, data collection techniques, field logistics and field security. Following the training sessions field teams left for Usala under the supervision of K.Mufabule, accessing the target survey area from the east (via Fatua). Local guides, trackers and porters were hired at Rama (the local seat of traditional governance) and briefed on survey etiquette and logistics/security prior to the debut of fieldwork. During the field survey 3 resident RGU field agents received basic training in field data collection and recording from K.Mufabule bringing the total number of field personnel receiving training to 6. In total this survey provided temporary employment for a total of 46 local inhabitants.

K. Mufabule providing training session at Tayna

4 Survey Design

For this preliminary survey, efforts were concentrated on the central and eastern regions of the Usala forest between the Lindi, Bilate and Hounde rivers. In preparation for field activities a quadrat survey grid was designed and overlaid on LANDSAT images of the survey region in order for field teams to record survey coverage and absence /presence of faunal and anthropogenic observations by 5.6 x 5.6 km survey quadrats. Survey routes were planned to pass through as many survey quadrats as logistically possible in the given timeframe.
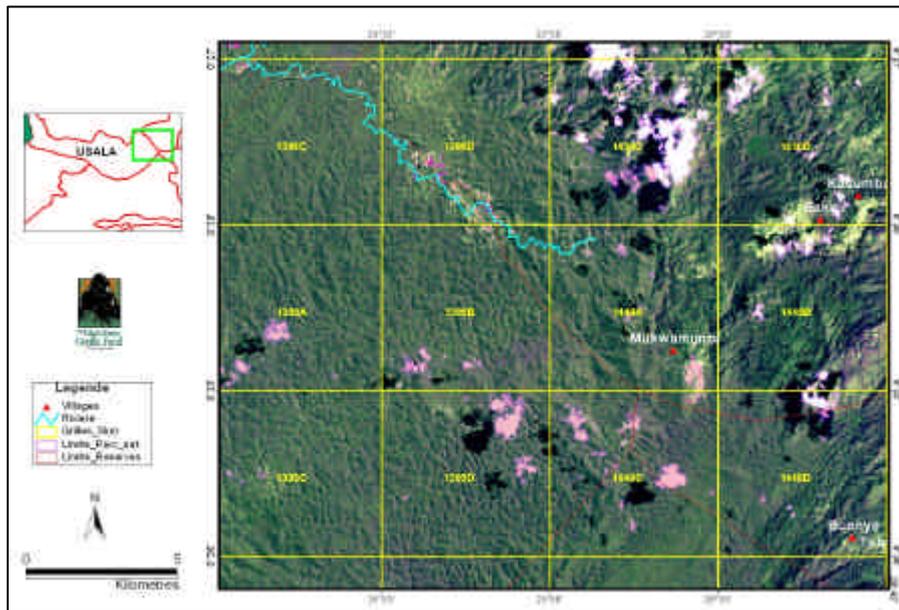
Figure 3. LANDSAT image of the eastern Usala forest showing overlaid quadrat survey grid.

Data Collection
The primary data collection technique employed during the Usala survey were forest reconnaissance walks (recces) that followed a path of least resistance (PLR) on a general compass bearing. A PLR methodology allows teams to move quickly across remote survey regions using existing human paths, animal trails, ridge tops and watercourses whilst assessing animal distributions, human activity levels and gaining a broad overview of vegetation type. Due to the expanse of the site survey routes were chosen to cross through areas of reported gorilla presence and/or where faunal densities were reported to be high. Wherever possible trajectories that crossed major drainage features were chosen.   All data was collected by two field teams that included two trained observers and two local guides (aiding with the interpretation of trail sign wherever necessary). All foot survey distances were recorded and measured using a hipchain and thread. Field observation teams   recorded and geo-referenced all direct (sightings and calls) and indirect (tracks, feeding sites, dung and night nests) faunal observations, sites of human activity (snares,

passages, settlements, mines and camps) and pertinent landscape features. Data was recorded in data books using established DFGFI protocols. Additional data on vegetation and habitat types was recorded systematically at regular intervals. As this survey represents a preliminary assessment of the region, socio-economic data (settlement and population size, age of settlement, agriculture levels, local amenities and economy, forest resource use and bushmeat utilization) was collected opportunistically when passing through villages, settlements etc.

Post Survey Analysis

Following collection in the field, data was entered into a prepared database, and then mapped and visualized using GIS software. Indices of relative abundance for faunal and anthropogenic activities were calculated for each recce as encounter rates of sign observed per survey km. encounter rates are only calculated from formalized recce walks and not from observations made while traveling to/from or between recce sites.

.

4 . Financial Details

The total *field* cost for the Usala survey was $21,866 of which the Busch Gardens generously provided $10,000 (47%). Financial details are given in figures 4a-4c. The inaccessibility of the Usala forest and logistical difficulties associated with fieldwork in post conflict DRC are reflected in the high cost of transport costs and field salaries (porters local guides etc.), which together accounted for 44% of all field costs. In total this survey provided temporary employment for 46 local people.

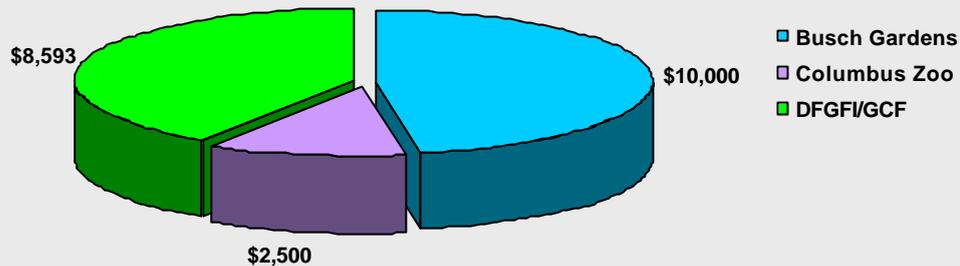**Figure 4a. Financial contributions to the Usala Survey**

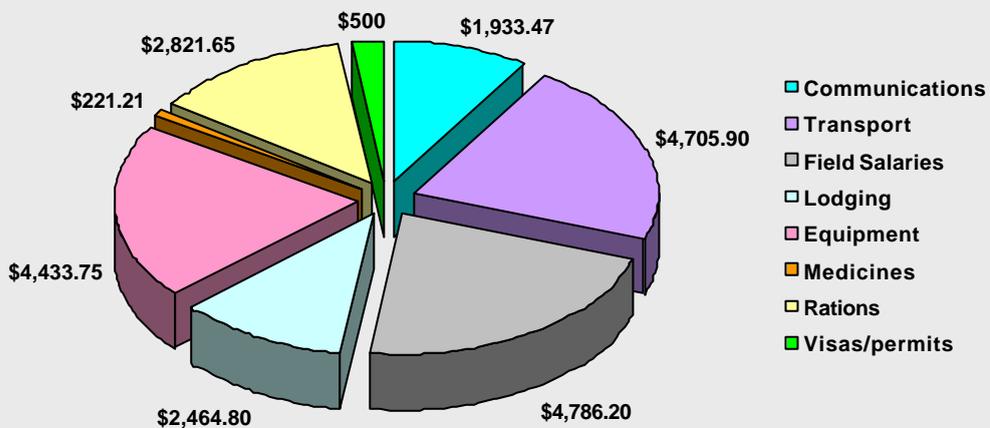**Figure 4b. Financial breakdown of total field expenditure**

Figure 4c. Financial breakdown of Busch Gardens contribution

5. Results

Survey Dates, Coverage and Effort

Data collection was conducted between the 29 march and the 24 of April 2007 by two field teams over a total 52 data collection days. During this period a total of 32 formalised recce walks were completed with a total linear distance of 204km (mean length= 6.6km, SD= 3.6) entering a total of 28 survey quadrats over an area of approximately 847km². Survey coverage is shown in figure 4.

Figure 5. Survey coverage by 5.6 x 5.6 km quadrat

Faunal Observations

During the survey we identified the presence of at least 25 mammal species and made a total of 425 faunal observations, of which 368 (87%) recorded consisted of mammal observations (figure 5). The overall mean composite encounter rate for mammal observations throughout the survey region was 2.25 sign/km (standard deviation=1.64)

Figure 6. Mammal observation frequencies

*All small mammal (rodents etc.) combined ** Ape trail sign (feeding sign, tracks etc.) difficult to assign to species.*

Great Apes

Our efforts confirm the presence of both Grauer's gorilla *Gorilla beringei graueri* and the eastern chimpanzee *Pantroglodytes schweinfurthi* in the eastern and central region of the Usala forest. Species-specific details are presented below.

Gorillas

Overall, gorilla sign was the most commonly encountered large mammal accounting for 22% of all observations. Details of gorilla observations are presented in table 1. In summary we found gorilla sign on 22 of 33 recce walks over a total area of approx 344 km². Overall mean nest site encounter rate was 0.25/km. Within the survey region a major zone of continuous distribution covering 313 km² was identified in the northern and central regions of the survey block with concentrations of gorilla sign concentrated over an area of 151 km² in the north of block. An additional nest site (comprising 7 nests) was also recorded in the south of the survey block on the north bank of the Hounde River. Throughout the survey region overall mean nest group size was seven (range = 2-28, standard deviation = 5.2) with 22 % (n=11) of all nest sites constructed by solitary adult males. 51% of all night nests recorded were arboreal with all group nest sites having at least one terrestrial nest In addition to nest and dung observations we also recorded 29 observations of feeding trail that were difficult to assign to gorillas or chimpanzees. These observations were recorded simply as "ape". These unassigned observations were all recorded in quadrats where one or both species of ape were positively recorded by nest, dung or call.

Table 1. Gorilla observations

	Sign counted			
Call	Dung	Nest sites	Nests (indiv.)	Nest sites/km
3	30	50	300	0.25

Figure 7. Distribution of gorillas and nest site observations

14

During the survey we received reports from reliable local informants that additional gorilla populations also exist in the mountainous regions directly south and west of the Hounde River (REGOUWA) where they were described as "numerous". Additional populations were described towards the Mesa river in the west of the Usala forest region adjacent to the MNP boundary and both east and west of the Bilate river near it's confluence with Tatako river (see figure 7) Although we were unable to confirm these reports they indicate that gorillas may be more widespread than identified during this preliminary survey.

A) Fresh gorilla dung and B) gorilla ground nest observations made during the survey

Chimpanzees

Although chimpanzees were widely reported as abundant by local informants prior to this survey chimpanzee sign was encountered rarely (accounting for only 7% of all large mammal observations) and discontinuously over a total area of 219km², primarily in the north of the survey block (figure 8) . Details of chimpanzee observations are presented in table 2. In summary we observed 13 nest sites throughout the region (0.06 nest groups/km) with a mean nest group size of 6.5 individuals (range = 2-13, standard deviation=3.73) with 51% of nest sites constructed by solitary individuals. All nest sites consisted solely of arboreal nests and were all accompanied by additional diagnostic sign (of a similar age) such as dung or feeding remains. Although chimpanzees were not directly observed during the survey their calls were heard on 4 occasions. As already discussed above for gorillas, 29 observations of feeding trail difficult to assign to either ape species were also recorded. These additional rather ambiguous observations suggest that chimpanzees may have a wider distribution than that identified by this preliminary survey.

Table 2. Chimpanzee observations

Sign counted				
Call	Dung	Nest sites	Nests (in div.)	Nest sites/km
4	9	13	46	0.06

Figure 8. Chimpanzee distribution
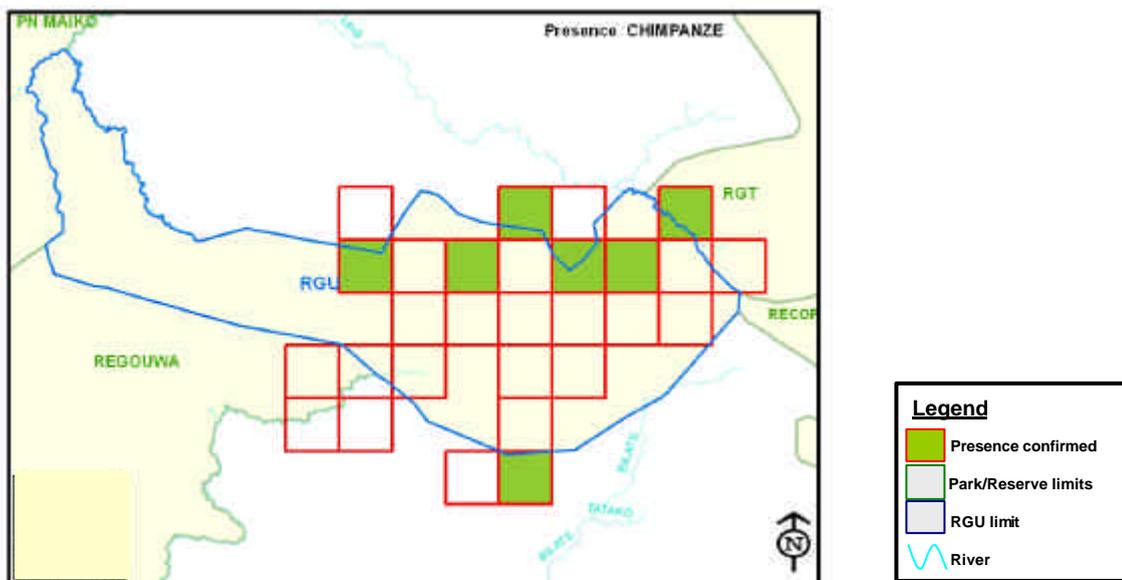
Elephants

Evidence of elephant presence was encountered very rarely during this survey and only 8 instances of elephant sign were recorded (2% of all large mammal observations,) of which 3 observations (2 tracks and 1 dung piles) were made within the 3 months previous to the survey. Overall encounter rate for elephant sign was 0.04 sign/km. Although widespread elephant poaching was reported to have occurred during the conflict we encountered no direct evidence of this illegal activity during this survey

Table 3. Elephant trail observations

Sign counted			
Dung	Track	Rub	Sign/km
1	7	1	0.04

Figure 9. Elephant distribution
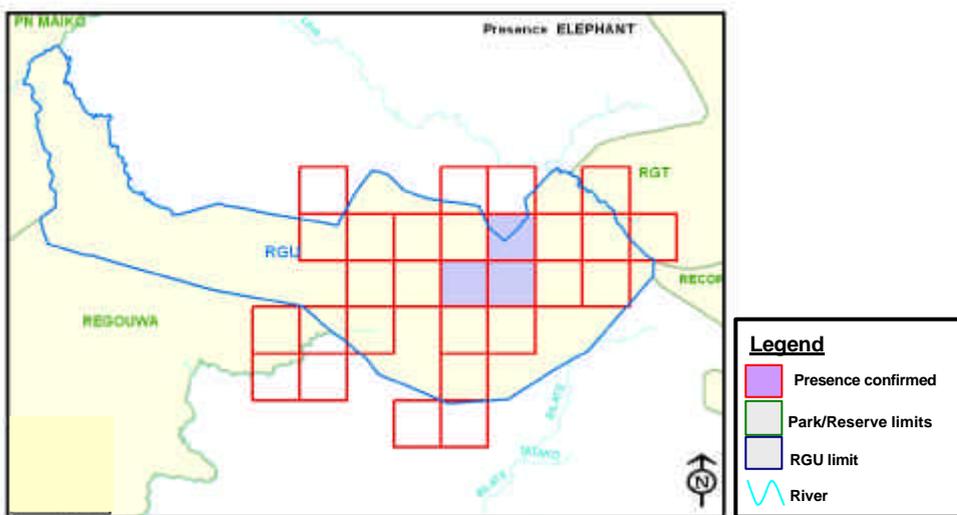
Ungulates

During this the survey we positively identified at least 9 ungulate species and in composite ungulate observations accounted for 42% of all mammal sign recorded. Figure shows the observation frequency (%) of all ungulates observed.

Figure 10. Ungulate Observation Frequencies (%)
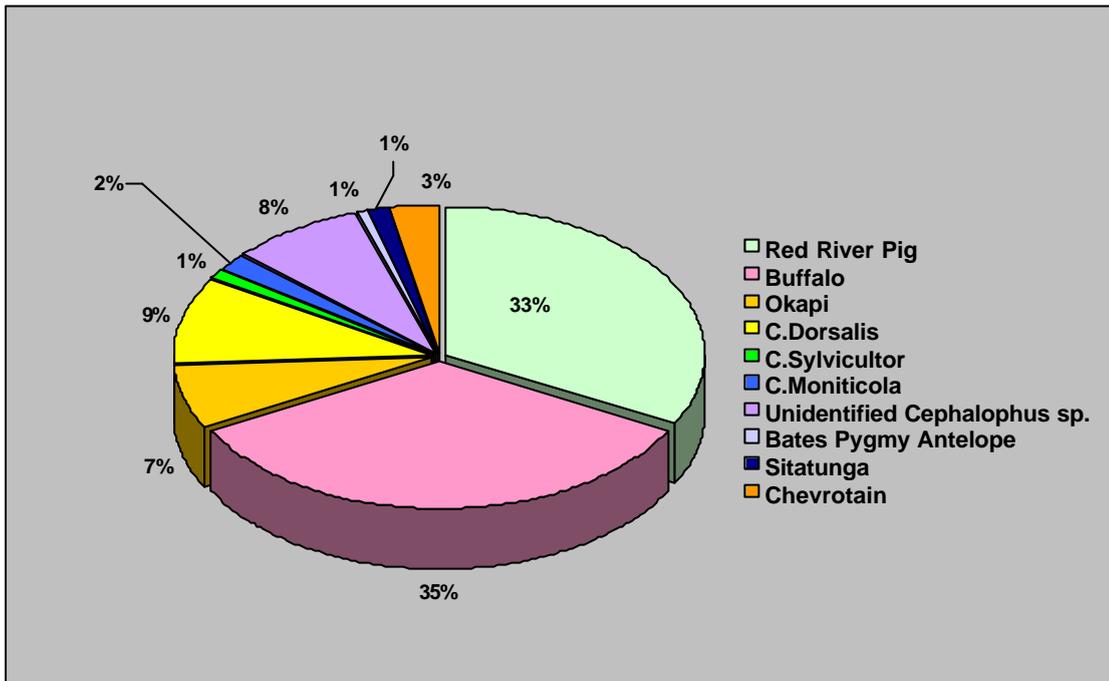
Large Ungulates

3 species of large ungulates were recorded in the Usala survey area: forest buffalo *Syncerus caffus nanus*, okapi *Okapia johnstonii,* and sitatunga *Tragelaphus spekii.* Together these species account for 42% of all ungulate observations. Details of large ungulate distribution, observations and encounter rates are presented below.

Table 4. Large Ungulate Observations

Species	Track	Dung	Observed	Heard	Total	Sign/km
Okapi	7	4	1		12	0.06
Buffalo	37	14	2	1	54	0.26
Sitatunga	2				2	0.005

Okapi

Our survey confirms for the first time the presence of the Okapi in the Usala region. Overall trail sign was encountered infrequently (0.06 sign/km) and accounted for 3 % of all mammal observations. Our results suggest that okapi, although present are currently rare throughout the central and eastern region of Usala.
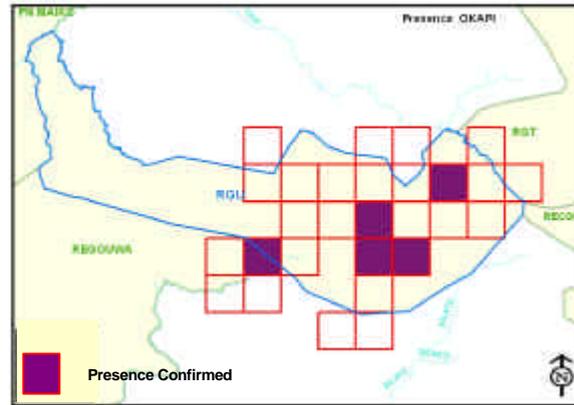

Figure 11. Okapi distribution

Buffalo

Buffalo were the most frequently encountered of all ungulates during this survey (0.26 sign/km) and accounted for 14 % of all mammal observations and 35% of all ungulate observations. Our results suggest that Buffalo are widely distributed and relatively common throughout the survey region
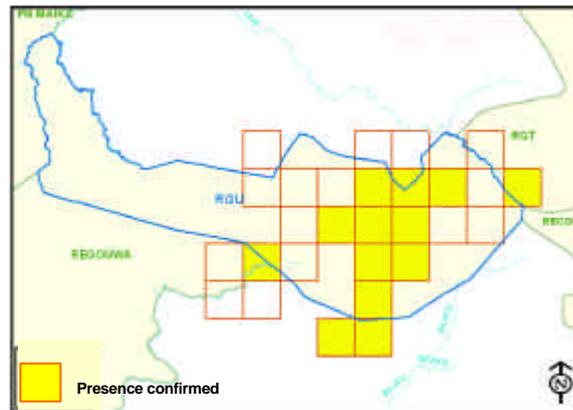
Figure 12. Buffalo distribution

Sitatunga

Sitatunga trail was the most rarely encountered (0.06 sign/km) of all large mammal observations throughout the survey area. Only two instances of sitatunga tracks were recorded, both directly adjacent to Raphia swamps in the central section of the survey region. Although the species was reported to be more widely distributed by knowledgeable locals our results suggest that sitatunga are currently rare throughout the region surveyed.
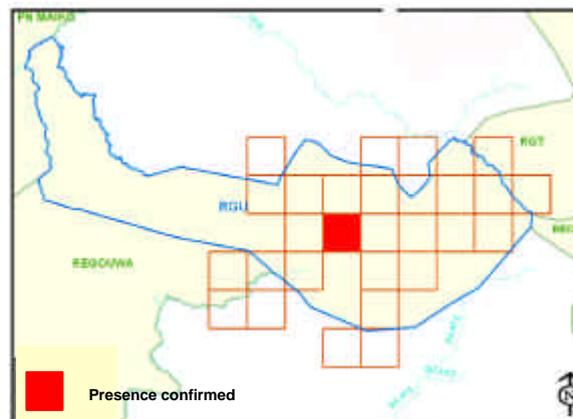
**Figure 13. Sitatunga distribution**

Small /medium sized ungulates and pigs

This survey positively identified five species of small ungulate, including 3 species of duiker (bay duiker *Cephalophus dorsalis*, blue duiker *C. monticola* and yellow backed duiker *C. Sylvicultor*), the water chevrotain *Hysochemus aquaticus*, Bates's pygmy antelope *Neotragus Batesei* and the Red river pig , *Potamochoerus porcus* .

Table 10. Small/medium ungulate observations

Species	Tracks	Dung	Observed	Total
P.Porcus	43	8	1	52
C.dorsalis	8	5	3	16
Ceph.sp	11	12		13
C.sylvicultor		1	1	2
C.monticola	2	2	1	3
H.Aquaticus	4		1	5
N.Batesii			1	1

The red river hog *Potamochoerus porcus* was the most widely distributed (figure 12) and frequently encountered of the smaller ungulates (0.26 sign/km) accounting for 33 % of all ungulate observations. Duiker species were widespread (figure 13) with *C.dorsalis* being the most frequently recorded duiker species (0.06 sign/km) accounting for 9% of all ungulate observations. When all duiker observations (including those to difficult to assign to one species or another) are combined they have a composite encounter rate of 0.16 sign/km (including unidentified species) accounting for 12 % of all ungulate observations and 10% of all mammal observations. Although the presence of the giant forest hog was widely reported prior to this survey we were unable to confirm its presence of this species during the survey period.
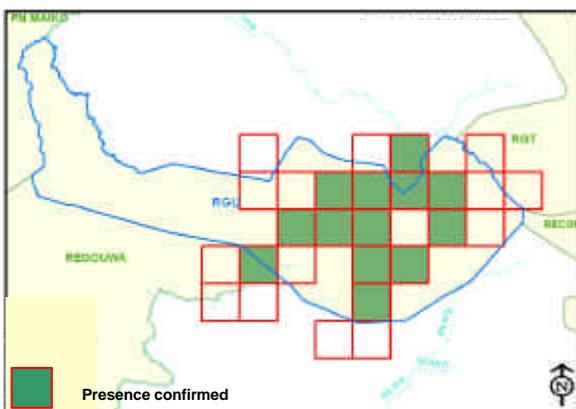

Figure 14 . Red river pig distribution
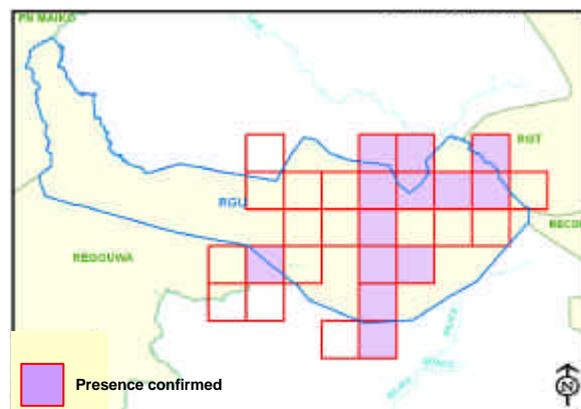
Figure 15. Composite duiker distribution

Leopard

Leopard sign was encountered infrequently throughout the survey area (0.07 sign/km) although most sign was encountered in the far east of the survey block . Fresh leopard tracks were the most commonly encountered sign (n=9) although 3 dung piles and 3 kill sites (one duiker, one L'hoests monkey and one tortoise) were observed. In addition one nocturnal cry was heard in the southern extreme of the survey area

Table 12. Leopard observations

|	Sign counted			
Track	**Scat**	**Kill**	**Call**	**Sign/km**
9	3	3	1	0.05
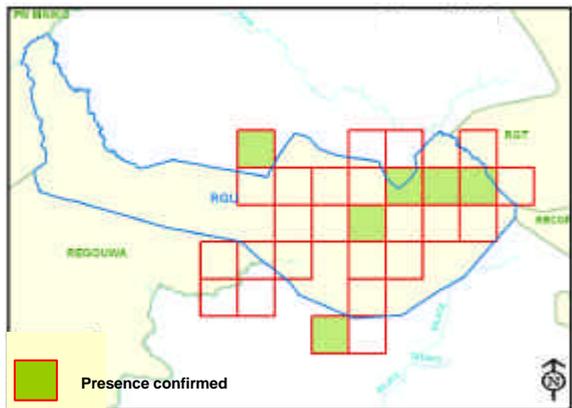
Figure 16. Leopard distribution

Leopard Scat with duiker hair

Monkeys and other (non ape) Primates

During this survey primate groups (identified by direct observation and call) were widespread but encountered infrequently (0.1 observations/km) however teams identified the presence of least 9 monkey species; Red tailed guenon (*Cercopithecus ascanius*) L'Hoests monkey, *(C.l'hoesti)* Dent's monkey *(C.denti),* Hamlyn's owl faced monkey *(C.hamlyni),* blue monkey *(C.mitis),* black and white colobus *(Colobus guereza)* gray cheeked mangabey *(Lophocebus albigenia),* red colobus *(Piliocolubus ousatletti)* and the olive baboon *Papio anubis.* The presence of 1 galagoide species Demidoff's galago (*Galago demidoffii*) was also identified by nocturnal calls. Observation frequencies for primate group sightings and calls are presented in Figure 17.

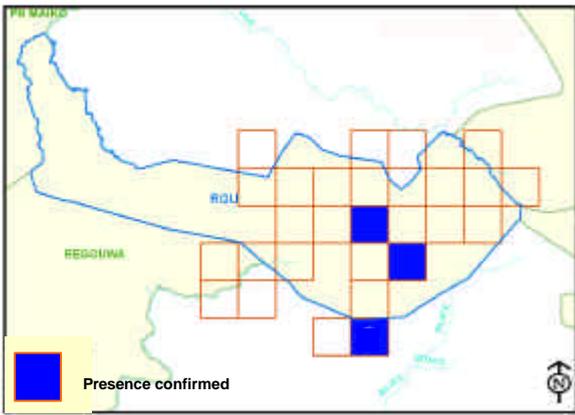**Figure 17. Monkey observation frequencies**
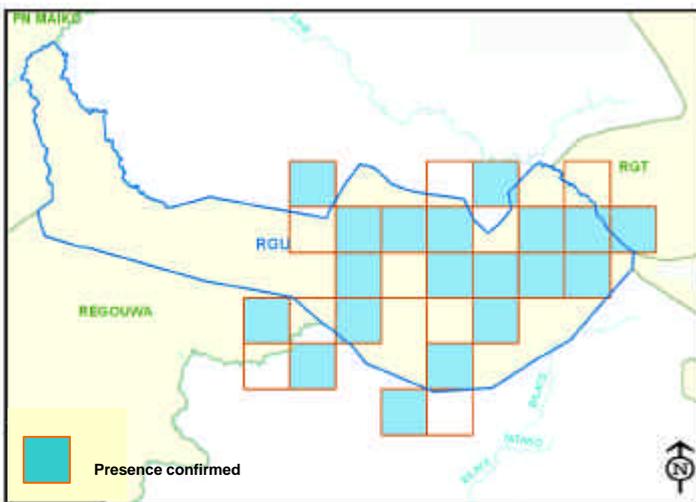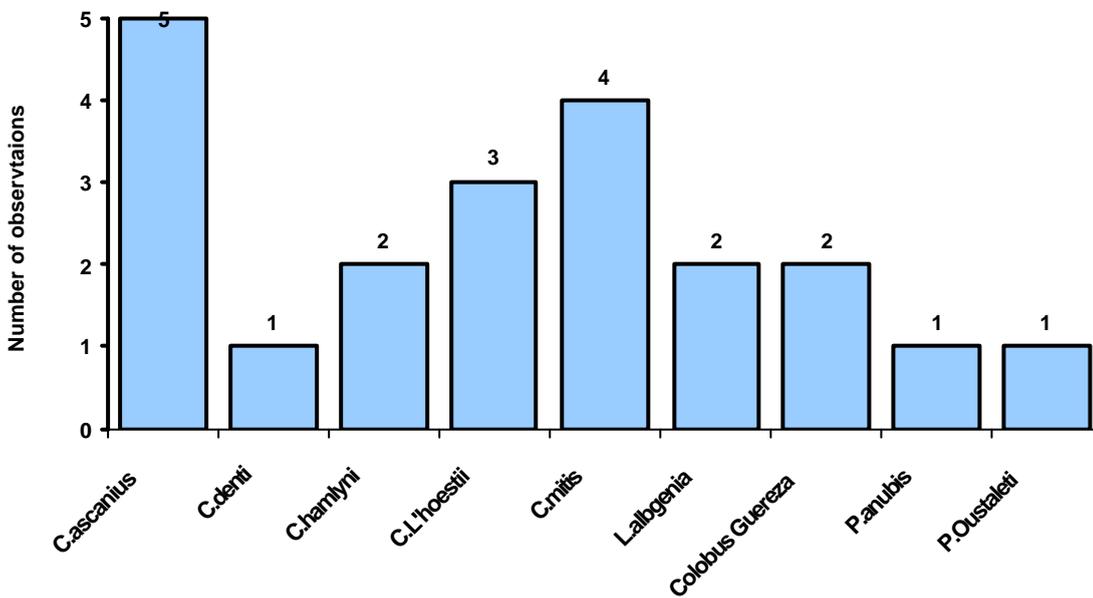
**Figure 18. Composite monkey distribution**

Red tailed Monkey (*C. ascanius*),

Other species of interest

During the survey field teams recorded the presence of two other endemic species particularly worthy of note, the Congo peafowl and the little known aquatic genet (*Genetta aquaticus*). The Congo peafowl was identified by the presence of nocturnal calls on two separate occasions in the central sector of the survey area and feeding trail (terrestrial scratch marks) reported by local guides to be that of the same bird was observed in the far south of the survey block near the Bilate river (Figure 19). The aquatic genet was identified by a single direct observation along the banks of a small river bordered by *Gilbertiodendron dewevrei* forest (their preferred habitat) in one survey quadrat in the center of the survey block (Figure 20).


Figure 19. Congo peafowl distribution
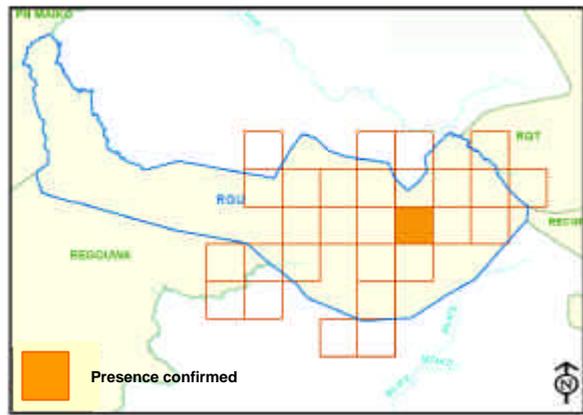
Figure 19. Aquatic genet distribution

Human Activities

Evidence of ancient, recent and active human sign was widespread and encountered throughout the survey area. (Figure 17) Observation frequencies by category are presented in Figure 20. The overall mean encounter rate for all human activities recorded throughout the survey region was 0.49 sign/km although 57% of all sign observed was ancient or abandoned.

Figure 20. Distribution of human activities
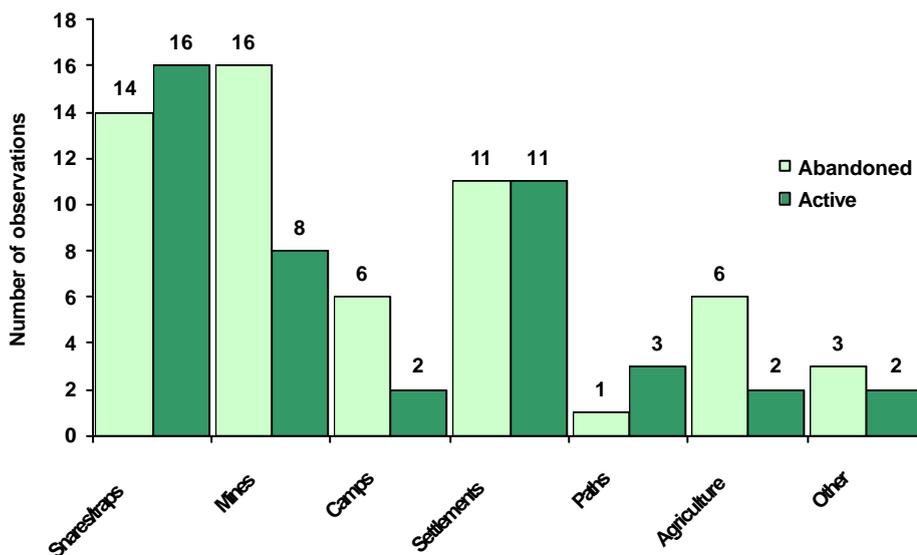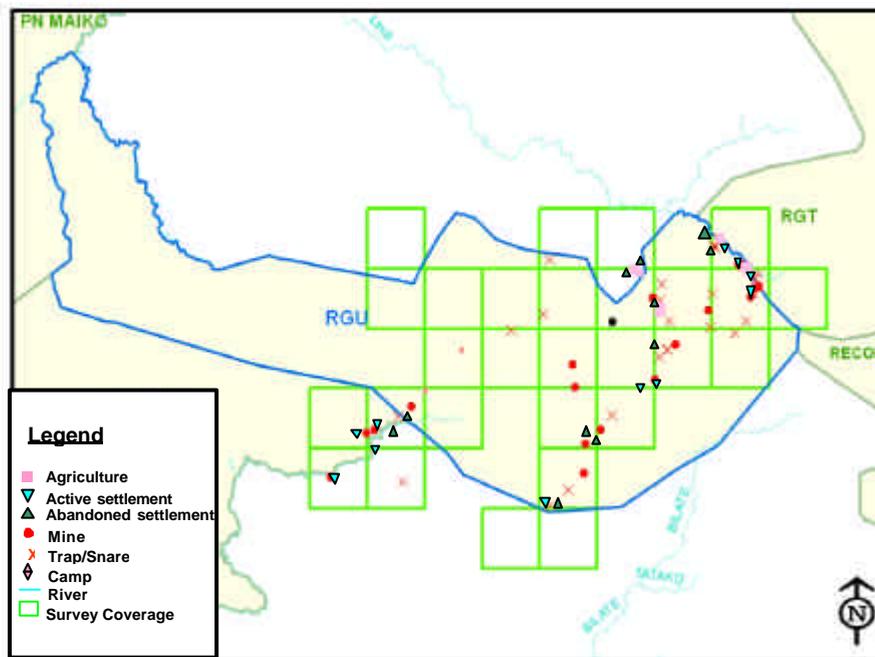
Figure 21. Human activity observation frequencies

Snares/traps and hunting

Snares and traps were the most frequently recorded of all human activities (0.15/km) and accounted for approximately 33 % of all activities observed. All snares observed were constructed from wood and fine wire cables and depending on design, placed to target rodents (porcupine and pouched rat) duikers or monkeys. No traps designed specifically for larger mammals such as buffalo or apes were observed. 53% of all snares recorded were active or recently constructed. During the survey we did not encounter any spent shotgun cartridges or bullet casings although automatic weapons and locally fabricated shotguns were observed at Rama and Fatua. In addition to snare and trap observations the hunting and consumption of several small and medium sized mammal species (duiker, monkey, giant pouched rat, porcupine and aardvark) was confirmed by the identification of various skeletal remains within active and abandoned settlements visited within and adjacent to the proposed reserve limits. No direct evidence of the hunting of larger mammals was observed during the survey. Domestic livestock (Goats, pigs and chickens) were observed rarely and were completely absent from villages within the interior of the survey area suggesting that bushmeat is the principal protein source.

A) **Snared blue duiker** *Cephalophus monticola* **(South of Rama) and B) Porcupine** *Atherius africanus* **(west of the Lindi river)**

Mines

24 mining sites (0.12/km) were recorded during the survey and accounted for approximately 24% of all recorded human activities. All mines observed consisted of small artisinal operations (<20 miners) predominantly for gold extraction though two small abandoned sites for coltan were recorded. At the time of the survey all mining operations were inactive with 66% of mines having been abandoned for at least 18 months.

Camps

Small camps or overnight shelters associated with hunting or mining were observed on eight occasions during the survey of which two were believed to have been used within the 3 months previous to the survey.

Settlements

Outside of the principle Oninga-Rama-Fatua settlement zone, in the interior of the proposed reserve limits, field teams recorded a total of 22 permanent settlements of which 50% were abandoned and 50% inhabited. All active settlements were of a small size and of very basic construction with the largest consisting of 14 houses with 36 inhabitants and the smallest consisting of three houses and 9 inhabitants. Active or developing settlements were concentrated along the northern bank of the Hounde River in the southwestern corner of the survey region and bordering the Lindi River in the northeast. Evidence of larger recently abandoned settlements (consisting of up to 20 houses) were identified at several locations bordering the Lindi river in the east of the survey block and two large ancient settlements (abandoned >15 years ago) consisting of at least 15 houses each were identified at the now abandoned village/mine of Kilimamesa. Although a thorough socio –economic survey is clearly needed for the region we estimate that the current total population size within the interior of the survey block is low and is unlikely to number more than 500.


Typical rural village west of the River Lindi

Agriculture

Agricultural clearings and gardens were encountered infrequently (0.029/km). Of the eight clearings observed six had been abandoned for at least 18 months. Principal crops cultivated included manioc (cassava) bananas, rice, beans, sweet potatoes, sugar cane and amaranthus. Large areas of secondary forest containing numerous banana plants around Kilimamesa suggest that relatively extensive gardens and fields existed in this region at the time of human occupation.

Relationship between Human activities and mammal abundance/distribution

Figure shows the correlation (spearman rank) between composite mammal encounter rates and composite human activity encounter rates for each recce walk conducted. From this analysis we can see that the two are highly inversely correlated (RS=-0.33; P<0.001) suggesting that as expected human activites have a negative impact on local faunal abundance. (I.e. as human activities levels increase faunal abundance falls.)

Figure 22. Correlation between human activites and large mammal encounter rates
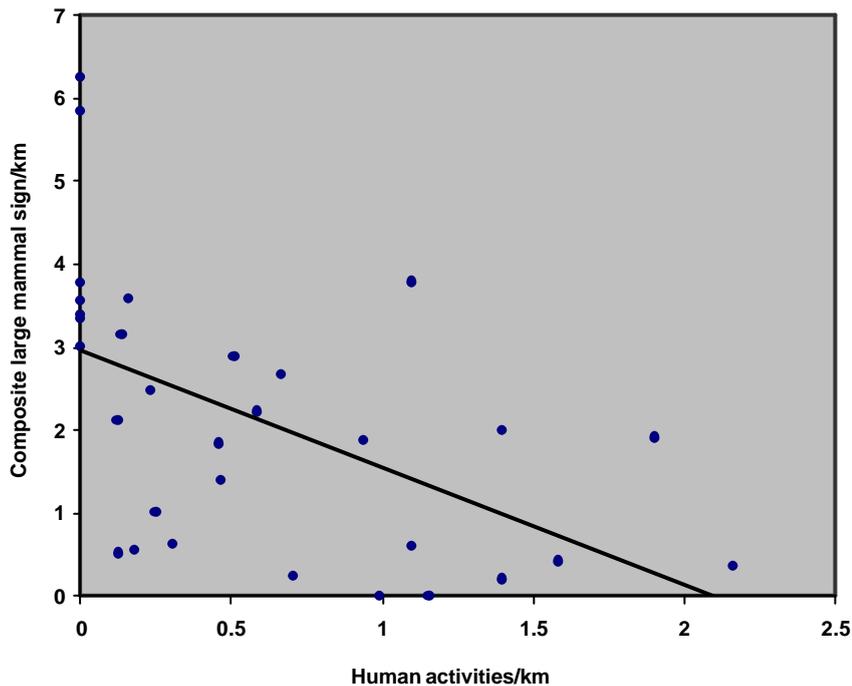
6. Discussion

Gorillas

Although the unconfirmed presence of gorillas was reported in the survey region by Emlen and Schaller (1960) this survey has confirmed for the first time since 1935 the existence of gorillas west of the Lindi River in the Usala forest. Although the techniques used in this exploratory survey make it impossible to provide a reliable estimate of population size for gorillas in the Usala region, several recent studies (White and Edwards 2000, Hall et al.1998b, Walsh et al. 2004) have shown that nest site encounter rates calculated from recces have a strong positive correlation with background gorilla densities. Table 13 Presents gorilla nest site encounter rates for the current survey with encounter rates calculated from preliminary surveys recently completed in the MNP and the TNR and suggests that overall gorilla densities in the Usala survey region are considerably higher than in the MNP southern sector and slightly lower than those observed in the TNR.

Table 13. Gorilla nest site observation frequencies in the Maiko –Tayna region

Field site	Total nest sites	Total Indiv. Nests	Survey distance (km)	Survey area (km2)	Nest sites/km
Maiko South	22	121	290	1275	0.07
Tayna NR	38	399	89	150	0.42
Usala	50	300	204	847	0.26

A simple comparison of the encounter rates presented in table 13 suggests that the Usala population has a relatively high overall gorilla density and although further research is required to calculate a reliable abundance estimate for the region and investigate unconfirmed reports of gorilla presence, we believe that the survey region alone supports a significant population of gorillas that is of considerable conservation importance.

Connectivity with other populations

Figure 18 shows gorilla presence identified by DFGFI, UGADEC and ICCN personnel by 5.6 km survey quadrat throughout the Maiko –Tayna region. Results from this survey show the close proximity of the Usala population to the Tayna population and suggests that it at least highly possible that the RGU and TNR/KINR populations may exchange individuals. In addition the widespread (and unconfirmed) reports of gorilla presence elsewhere during our survey indicate the presence of additional gorilla populations throughout the Usala forest that may form a continuum between populations in the TNR and those identified in the MNP and REGOUWA. Should these reports prove to be correct the Usala region offers enormous potential to create a biological corridor that would conserve or even promote genetic connectivity and diversity among gorilla populations throughout the region. The juxtaposition of the Usala gorilla population identified in this survey between those identified for TNR/KINR and REGOUWA/MNP indicates Clearly its strategic importance in the development of any realistic corridor project and its protection should be a conservation priority.
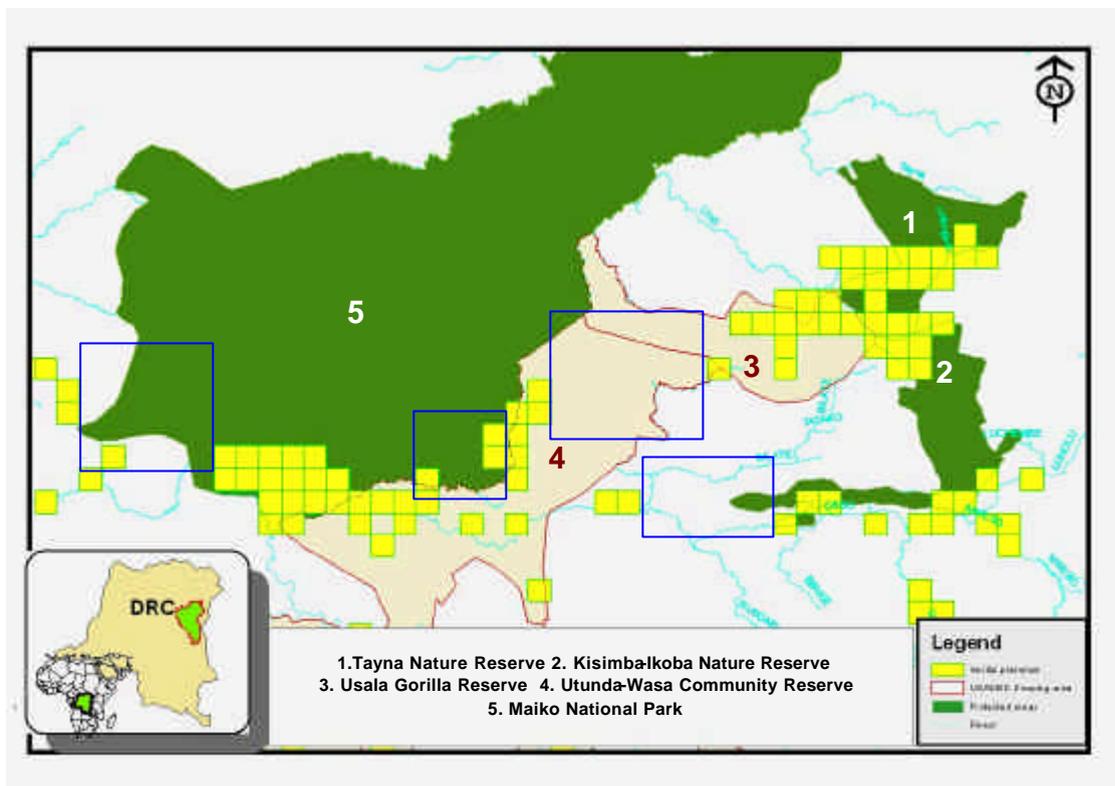
Figure 23. Gorilla distribution (by 5.6 x 5.6 km survey quadrat) identified by DFGFI, UGADEC and ICCN, in the Maiko –Tayna region.
(Solid blue outlines indicate key areas for further exploratory surveys)

Threats

Although the absence of accurate historic records renders it difficult to assess the stability of the Usala population over time, informal interviews with local chiefs and hunters in Rama indicate that gorillas are perceived to have remained common in the forest interior over the past four decades. However it was reported that several populations of gorillas living in close proximity to villages between Rama and Fatua had been hunted to extinction over a five-year period in the mid 1980's. In general the local perception of gorillas was one of a malevolent nuisance destroying crops and attacking villagers with little provocation. While this perception has almost certainly resulted in the extirpation of many gorillas over the years it is perhaps the reason that gorillas appear to be relatively numerous in the forest interior today. We were told that today gorillas are too aggressive, dangerous and distantly located to make their purposeful pursuit a worthwhile endeavor for most hunters and that gorillas were generally avoided. No cultural taboos against the killing and eating of gorillas were reported, and several interviewees claimed to have eaten gorilla during the past decade. We also received information that a lone male gorilla had been speared, killed and eaten by villagers north of the river hounde late last year and we know of at least 3 gorillas being shot and consumed over an 8 week period in late 2006 by unknown militia south west of Fatua.

Our observations that gorillas populations appear to be densest in the north of the survey region (and thus nearest to the settlement zone) suggests that this population will be become increasingly vulnerable to habitat destruction, encroachment and hunting as human population densities increase. Current human population densities along the Albertine rift region of eastern DRC are among the highest on the entire continent and land shortages continue to be a major source of

conflict. As security improves, immigration and settlement in the forests of eastern DRC is predicted to rise substantially over the next few decades. Reports form MONUC that the towns of Fatua and Oninga are undergoing a considerable population expansion should be taken as a severe warning, that gorillas in the Usala region should not be considered safe from extirpation and measures to ensure their survival should be initiated immediately.

Chimpanzees

Prior to this survey we had received anecdotal reports that chimpanzees were common in the Usala region, however our preliminary results suggest that chimpanzees occur at low relative density and have a highly localized distribution in the survey area. During the survey almost all our chimpanzee observations were made in secondary forest formations and abandoned fields in the extreme north of the survey region and were rarely encountered in the forest interior. Their absence in this region cannot easily be explained in terms of habitat suitability as it contains vast tracts of mixed mature forest (excellent chimpanzee habitat) and supports a substantial population of gorillas, which display considerable ecological overlap (and occur sympatrically) with chimpanzees in several regions of eastern DRC. During the survey we received anecdotal information that chimpanzees (in recent history at least) were rarely hunted for bushmeat being protected by a cultural taboo, which recognizes them as kin , so it seems unclear why chimpanzees may have suffered a reduction in numbers from hunting whereas gorillas are relatively common.. While it is possible that chimpanzees may be actively avoiding areas with gorillas (Walsh et al 2004) this not does not readily explain the absence of chimpanzees in survey quadrats where suitable habitat exists yet neither apes species was recorded. Clearly further work is required in the Usala region to assess the distribution, conservation status and abundance of chimpanzees.

Elephants

Recent elephant sign was encountered so rarely during this survey that it is difficult to imagine that the survey region currently supports a permanent elephant population at all. Prior to the survey it had been locally reported to us that the Usala forest supported a large elephant herd, but that elephant poaching by armed militia was increasing and elephants were on the decline. Therefore we had expected to find extensive evidence of recent elephant poaching and a high incidence of ancient (trails, rub marks etc.) or recent elephant sign. On the contrary we found no direct evidence of elephant poaching and very low levels of recent or ancient elephant sign suggesting that either the forests have never supported a high density of elephants (unlikely given the vast areas of suitable habitat) or (more likely) that elephant populations have been decimated for some time. Although elephants may exist in the more remote regions of the Usala forest it is difficult to see how elephant populations can recover in the eastern region without immediate and sustained conservation activities. The development and support of the proposed Maiko-Tayna wildlife corridor would play an important role in allowing elephant populations to recover through protection and immigration into the region from the more remote and inaccessible areas of the MNP and REGOUWA should elephants have fared better in these areas.

Ungulates

Ungulates are well represented in the Usala forest and the widespread presence of several species that are highly sensitive to hunting pressure the buffalo, red river pig, and duiker is a promising indicator that the impact of hunting and other human activities has not decimated faunal

populations within the forest interior (In addition the presence of a top predator the leopard, is a good indication that small/medium ungulate communities are sufficiently large enough to support this large carnivore) . Despite the low incidence of large mammal hunting in the survey block two species of large ungulate sitatunga and okapi were rarely encountered during the survey period. Sitatunga are a semi-aquatic species that prefers riverine or inundated habitats and our two observations of sitatunga both occurred in inundated R*aphia* swamp in the forest interior, suggesting that their current distribution may be restricted by habitat availability rather than hunting pressure. The low encounter rates observed for okapi are difficult to interpret as the region contains thousands of hectares of mixed forest formations suitable for this species and no obvious barriers separate the region from the MNP where okapi are widespread and locally abundant. While we received anecdotal reports that okapi were occasionally hunted in the past for their skin our informants reported that okapi have been rare in the area for at least 3 decades, suggesting that populations in the area have either been reduced through overhunting or possibly by other currently unidentified ecological factors that may have restricted their dispersal and widespread throughout of the survey region. Further research is needed in the area to assess the distribution and conservation status of this rare and enigmatic species.

Human activities

Our results show that despite its remoteness human activities have penetrated deeply into the Usala forest and evidence of recent and ancient exploitation of forest resources is widespread. During the survey it was perceived that immigration levels into the forest are currently very low and that human activity levels are on the decline in the forest interior. The overall trend we observed was one of emigration from the interior towards the regional centers of Rama, Fatua and Oninga or along the banks of the Hounde and Lindi rivers, due to improved security in these regions. Village chiefs in Fatua and Rama informed observation teams that during the height of the conflict residents of these villages fled deep into the forest as insecurity and violence swept through the region. Now secured and under the control of the FARDC people are returning to their villages where accessibility to limited local amenities and employment opportunities are (marginally) improved. This is promising news for the Usala forest and suggests that a unique window of opportunity exists to initiate conservation activities that will protect the important reservoir of species identified in the survey region. However it must be accepted that this window is finite. Prior to this survey we were informed by MONUC and later by local administrators that Oninga and Fatua were undergoing a rapid population expansion as a consequence of intense land shortages east of the TNR. Should this settlement continue unrestricted, ultimately the site of the proposed RGU will come under increasing threat of hunting (in the absence of alternative and affordable protein sources) mining activities and additional land conversion pressures all of which will have devastating effect on it's highly important but vulnerable faunal populations.

Community conservation

With the current DRC government facing an enormous task to re-build its economic and physical infrastructure, when insecurity and economic depression continues throughout the country it is highly unlikely that they have the capacity to tackle the problem of illegal forest exploitation and hunting of internationally protected species within the Usala forest. In the absence of realistic governmental support it is important to identify and initiate alternative and sustainable conservation activities that can serve to diminish forest exploitation, reduce hunting and protect important populations of rare and endangered wildlife. The most promising solution for the Usala forest is the development and support of the community based RGU, proposed by local landowners and traditional chiefs. During the recent survey UGADEC science director K.Mufabule and RGU project coordinator Alfred Eliba held several important and key meetings with local dignitaries, administrators, military commanders and local inhabitants to open up a dialogue regarding the formation of the RGU.

Key meetings regarding the initiation of the community based RGU were held at Rama

During these meetings overall public support for the project was strong however it was stressed by local participants that conservation activities (i.e. community based monitoring patrols, hunting restrictions land use planning strategies and enforcement of wildlife protection legislation through traditional governance) should be supported with technical, logistical and financial aid from UGADEC. Additionally it was requested that additional outside agencies should provide support the development of sustainable micro projects such as protein supplementation, health clinic rehabilitation, primary school support, clean water provision and birth control education. While a considerable amount of planning and dialogue is needed to advance the evolution of the proposed RGU strong public support for this project will be the crucial factor in its establishment. Public support should be maintained by engaging in further discussion with the residents of Usala at all levels, from chiefs, administrators, land owners, military personnel and the general public, (men women children alike) to ensure that the voice of a representative cross section of the local community is heard.

7.Conclusions

The overall assessment of the Usala forest is quite positive. Despite long term insecurity, high poverty and the absence of formal wildlife protection activities the Usala survey region supports a diverse and important faunal reservoir including all of eastern DRC's charismatic flagship species, Grauer's eastern gorilla, eastern chimpanzee, forest elephant, okapi and the Congo peafowl. The presence of these species and their geographic juxtaposition between the MNP and the TNR and KINR indicates that the region has enormous potential for development as a biological corridor. Nonetheless the survey has also revealed that widespread recent and ancient human activities have had (and will likely continue to have) a negative impact on local faunal densities and that all species especially elephants should be considered highly threatened. Although settlement within the forest interior does not appear to be occurring at present, regionally expanding population densities threaten to have a negative impact on the regions fauna through habitat destruction, encroachment and unsustainable hunting practices. Public support to create a community based faunal reserve is currently strong and should be harnessed in the immediate future if the regions fauna is to survive and the Maiko –Tayna corridor to become a reality.

8. Recommendations

1. Provide financial support for existing RGU agents to contact communities in the south and western regions of the Usala forest and engage them in RGU planning discussions.
2. Provide additional financial and logistical support for the engagement of communities living within and adjacent to proposed RGU limits (including the REGOUWA, TNR and KINR border regions) through the creation of local dialogue committees.
3. Initiate base line socio-economic surveys of the Usala region between Fatua and Oninga to assess local livelihoods, education and health needs and bushmeat forest resource dependency.
4. Undertake a preliminary assessment of eco-system health and encourage local support for the RGU and Maiko-Tayna corridor project by incorporating the proposed RGU into the DFGFI Congo eco-system health program.
5. Continue biological explorations of the Usala forest and investigate unconfirmed reports of gorilla presence.
6. Provide financial, logistical and technical support for RGU agents to undertake a series of preliminary wildlife monitoring patrols in the recently completed survey region.
7. Open dialogue between UGADEC, RGU, TNR REGOUWA and ICCN Maiko NP to discuss the placement, development and management of the Maiko-Tayna corridor project.

9. Acknowledgements

10. References

Emlen, J.T., and Schaller, G.B. (1960). Distribution and status of the mountain gorilla (*Gorilla gorilla beringei*), 1959. *Zoologica* 45:41-52.

Hall, J.S., Saltonstall, K., Inogwabini, B.I., and Omari, I. (1998a). Distribution, abundance and conservation status of Grauer's gorilla. *Oryx* 32(2): 122-130.

Hall, J.S., White, L.J.T., Inogwabini, B.I., Omari, I., Morland, H.S., Williamson, E.A., Saltonstall, K., Walsh, P., Sikubwabo, C., Bonny, D., Kiswele, K.P., Vedder, A., and Freeman, K. (1998b). Survey of Grauer's gorillas (*Gorilla gorilla graueri*) and eastern chimpanzees (*Pan troglodytes schweinfurthi*) in the Kahuzi-Biega National park lowland sector and adjacent forest in eastern Democratic Republic of Congo. *International Journal of Primatology* 19(2):207-235.

Hart, J.A., and Sikubwabo, C. (1994). Exploration of the Maiko National park of Zaire 1989-1992. Working Paper No. 2. *Wildlife Conservation Society, New York.*

Nixon S.C., Emmanuel E.E., Mufabule K., Nixon F.L., Bolamba D. & Mehlman P.T. (2006) The Post-Conflict status of Grauer's Eastern gorilla (*Gorilla beringei graueri*) and other Wildlife in the Maiko National Park Southern Sector and Adjacent Forests, Eastern Democratic Republic of Congo: *Unpublished report submitted to ICCN & DFGFI*

Walsh, P.D., Lahm, S.A., White, L.J.T. and Blake, S. (2004). Methods for monitoring African apes: some cold, hard facts about bias. *(Unpublished manuscript).*

Walsh, P.D., Abernethy, K.A., Bermejo, M., Beyers, R., De Wachter, P., Akou, M.E., Huijbregts, B., Mambounga, D.I., Toham, A.K., Kilbourn, A.M., Lahm, S.A., Latour, S., Maisels, F., Mbina, C., Mihindou, Y., Obiang, S.N., Effa, E.N., Starkey, M.O., Telfer, P., Thibault, M., Tutin, C.E.G., White, L.J.T., and Wilkie, D.S. (2003). Catastrophic ape decline in western equatorial Africa. *Nature* 422(6932):611-614