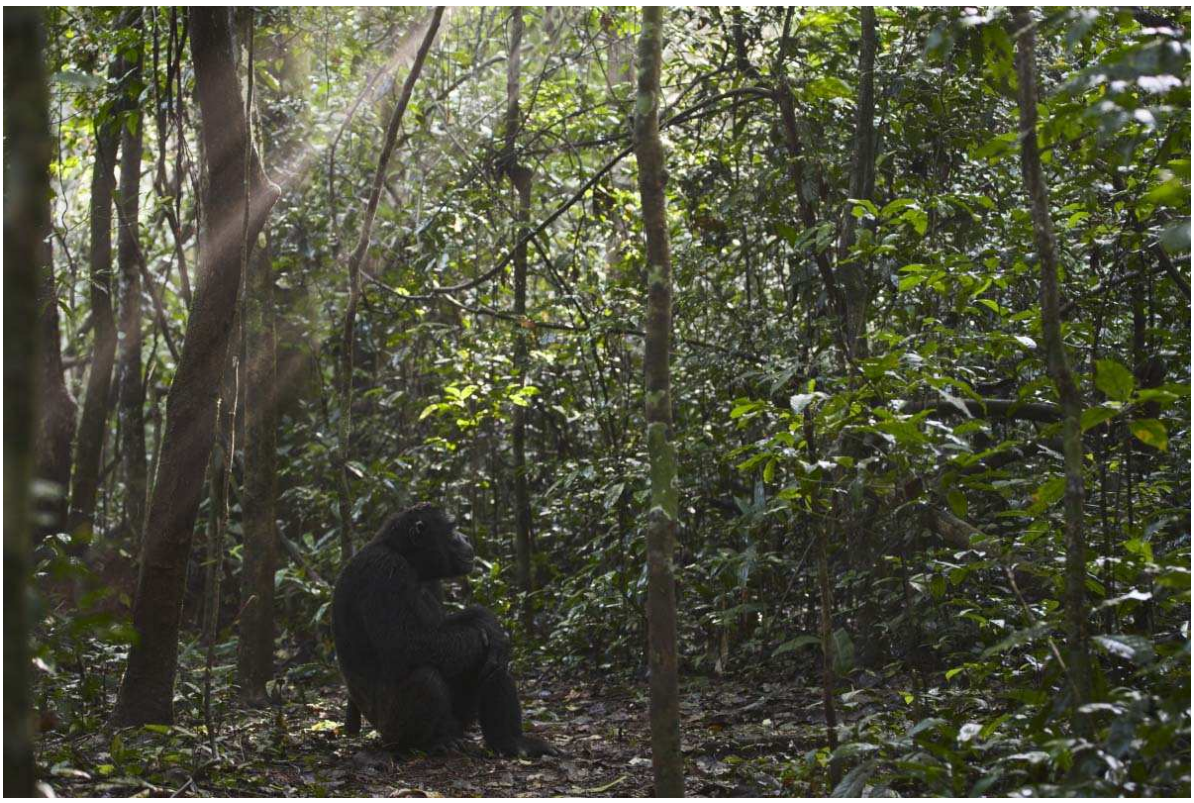
The Chimpanzees of Wambabya Forest Reserve, Uganda: Ecology, Behavior and Conservation

Preliminary research accomplishments and suggestions for future research and conservation actions



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Justification of project

As a result of continuing anthropogenic loss of forest habitat, fragmentation science has received considerable attention by primatologists and has become an important discipline of its own (Marsh 2003). It is often argued by primatologists that behavioral and ecological research carried out in fragments or disturbed habitat is not as robust as work in primary or continuous habitat (Marsh 2003). However, comparative data of primates in degraded habitats or habitats suffering from human pressure are critical for assessing the survival chances of the species and the carrying capacity of its habitat. Such information will also form the basis for formulating sound species-specific conservation initiatives.

This project is aimed to enhance the rudimentary knowledge of chimpanzees in fragmented forests. Specifically, we intend to gain information on their adaptive capability, different behavioral strategies and cultural variants between communities, effects on the genetic variability, to investigate what attributes corridor must have and for conservation management. Understanding the behavioral ecology of such a community is essential in order to reduce human-wildlife conflict, which is highlighted by the International Union for Conservation of Nature (IUCN) and the Wildlife Conservation Society (WCS) as a fundamental challenge for conservation in the 21st Century (Hill et al. 2002), and for the establishment of connectivity between forests. The findings of this study will also provide critical information for other corridor projects and thereby aids in the conservation of our closest relative in equatorial Africa.

Relevance of this project for primate conservation

Chimpanzees (*Pan troglodytes*) are disappearing rapidly throughout their range across equatorial Africa because of widespread habitat loss, commercial hunting and epidemic disease (Butynski 2001, Walsh et al. 2003). The species is classified as endangered (IUCN 2002) and thus legally protected in Uganda, as elsewhere. Uganda is an important country for the conservation of the eastern subspecies (*Pan troglodytes schweinfurthii*) with approximately 5'000 chimpanzees left in the wild. The population distribution is mainly restricted to 12 isolated national parks and forest reserves with varying degree of protection (Plumptre et al. 2003). Outside of such areas chimpanzee habitat has been cleared for agricultural fields and human habitations. One of the larger fragments is the Wambabya Forest Reserve which is 3'429 ha (NFA 2005) and lies at the north-eastern border of Bugoma Forest Reserve, a 365 km2 medium altitude semi-deciduous forest (Howard 1991) located in Hoima district. Wambabya Forest Reserve has a population of around 120 chimpanzees (Plumptre et al. 2003). The chimpanzees in Wambabya are vulnerable not only by its small number but also by the increasing pressure of the intensified farming, a consequence of rapid human population growth. As proposed by the national chimpanzee action plan (Plumptre et al. 2003), the Wildlife Conservation Society (WCS) and the Jane

Goodall Institute (JGI), are planning connectivity between the Bugoma Forest Reserve and the Budongo Forest Reserve. In order to interconnect those two forests three smaller Forest Reserves (Wambabya, Bujawe and Mukihani) need to be connected in between. The long-term goal is to stabilize the chimpanzee population in Uganda for the future. The first step will be to establish a corridor between the viable chimpanzee populations in the Bugoma Forest Reserve with the small population in the Wambabya Forest Reserve. Data on behavioral aspects, feeding ecology, range use and population genetics will provide information that is relevant for the design and implementation of the corridor. This study will also yield information on the adaptive capacity of chimpanzees since the findings will be comparable with data from the Budongo Forest (the Sonso community and the Kaniyo Pabidi community).

Statement of objectives and research accomplishments by June 2010

1 Schedule

Field work was initiated in early January 2009 in Budongo Forest where we did the census. Fieldwork in Wambabya Forest started in February 2010.

2 Habitat assessment

2.1 Habitat types

Habitat types in Budongo Forest and Wambabya Forest were assigned based on forest structure rather than species composition. This was primarily because it would have been impossible to train census team members to accurately identify trees. A classification based on structure allows identification of different habitats in the forest and shows to what extent they may have been modified by man in areas where human activity is recorded. One of the following habitat types were noted at each 200m point for Wambabya and 250m point for Budongo Forest, respectively:

1. Closed Tropical High Forest (>50% canopy closure, trees taller than 15m)
2. Open Tropical High Forest (<50% canopy closure, trees taller than 15m)
3. Closed young/secondary forest (>50% canopy closure, trees shorter than 15m)
4. Open young/secondary forest (<50% canopy closure, trees shorter than 15m)
5. Open woodland (Trees widely spread and with grass below them – tree cover less than 40%)
6. Closed woodland (Trees closer but still with grass below – tree cover greater than 40%)
7. Grassland (greater than 20m radius area of grassland with no trees)
8. Swamp/waterlogged (Forest where the soil is obviously waterlogged at certain times of year)
9. Bush or shrub vegetation – low stature bushes with no trees.
10. Shamba – cleared forest for cultivating crops

2.2 Distribution of habitat types for Budongo Forest and Wambabya Forest

Closed tropical high forest was the dominant habitat type (Table 1). The result in Budongo Forest is similar to Plumptre *et al.* (2001) estimate of 73.6%. However, it should be noted that a significant proportion of Budongo Forest Reserve in the north is under grassland. During this survey we did not establish transects in the grassland section, consequently the results indicated in Table 1 are not representative of the whole forest. To determine habitat preference by primates we calculated the percentage of objects observed in each habitat type. For chimpanzees, nest counts were included. In addition to the closed tropical high forest habitat being the most dominant, most primates were found in this habitat type (Table 2).

Table 1: The percentage of points at 250 meter (Budongo Forest Reserve) and 200 meter (Wambabya Forest Reserve) intervals along census transects for each habitat type, respectively

Habitat type	**Percentage coverage (%) (Budongo N = 828)**	**Percentage coverage (%) (Wambabya N = 172)**
Closed high forest	73.3	59.3
Open high forest	18.7	16.3
Closed secondary forest	2.4	8.7
Open secondary forest	1.2	1.7
Closed woodland	0.8	7.6
Open woodland	1.4	1.7
Bushland	1.4	0
Swamp	0.5	0
Grassland	0.1	1.7
Shamba	0	2.9

Table 2: Percentage distribution of primates in the different habitat types in Budongo Forest. Chimpanzee (*Pan troglodytes*), Blue monkey (*Cercopithecus mitis*), Red tail monkey (*Cercopithecus ascanius*), Black and white Colobus monkey (*Colobus guereza*)

Habitat type	***P. troglodytes***	***C. mitis***	***C. ascanius***	***C. guereza***
Closed high forest	93	76.4	80.2	80.6
Open high forest	5.1	20.4	17.8	17.4
Closed secondary forest	1.5	0	0	0
Open secondary forest	0.3	0	0	0
Closed woodland	0	2.1	0	1.3
Open woodland	0	0.5	1.0	0
Bushland	0	0	0	0.6
Swamp	0.1	0.5	1.0	0

The assessment of the habitat to species composition has not been started yet. For that we will need a student either from Makerere University or University of Zürich. The search for a student is in process. The Jane Goodall Institute USA just got funding for 3 years to do mapping, carbon feasibility assessment, private forest land registration and carbon education in the Bugoma-Budongo area. So we will coordinate all the activities between the two projects.

3 Feeding ecology

The assessment for feeding ecology has not been started. We will need a student to do that work. The search for someone is in process. The two topics assessment of the habitat to species composition and feeding ecology could even be combined in one master thesis.

4 Nesting behavior

Mean nest height (preliminary result) is 7.2 meter for Wambabya Forest Reserve. This is 4.9 meter lower than for Budongo Forest Reserve with a mean nest height of 12.1 meters for night nests (Brownlow et al. 2001). This finding is not supporting the hypothesis that chimpanzees in Wambabya nest higher in the trees than in Budongo Forest as a result of human pressure. As we can see from Table 3 chimpanzees build their nests preferably in closed tropical high forest habitat. The percentages were similar for both Budongo and Wambabya Forests. In order to understand this finding we need data on tree species composition for the different habitat types and data of the tree species that are used by chimpanzees as nesting trees. So far we could not find any ground nest in Wambabya Forest as it was reported from Budongo Forest (Reynolds 1965, McVittie 1998, Brownlow et al. 2001). Figures for Wambabya Forest are preliminary results as the census was not finished at the time of writing.

Table 3: Percentage distribution of chimpanzee nests in the different habitat types

Habitat type	**Budongo**	**Wambabya**
Closed high forest	93	92.1
Open high forest	5.1	7.9
Closed secondary forest	1.5	0
Open secondary forest	0.3	0
Closed woodland	0	0
Open woodland	0	0
Bushland	0	0
Swamp	0.1	0

5 Ranging patterns and habitat utilization

5.1 Methods

5.1.1 Transect layout Budongo Forest

Using the DISTANCE program, 41 transects each measuring 3 km were systematically placed to cover the entire forest. However, out of 41 transects we were able to locate and establish 27 transects running from north to south (Figure 1). We were not able to establish all 41 transects due to inaccessibility of some transects in addition to some transects lying outside the forested area. During this survey, we also located and surveyed the 29 (averaging 2 km each) transects that were established in the 1992/2000 (Plumptre *et al*. 2001) surveys.

Figure 1: Map of Budongo Forest showing the new transects established for the 2009 survey. Transects marked with an 'X' were not surveyed due to inaccessibility or transects were lying outside the forested area.

5.1.2 Transect layout Wambabya Forest

Using the DISTANCE program, 21 transects each measuring 1 km were systematically placed to cover the entire forest. However, we were able to establish all the 21 transects but the length had to be changed from situation to situation. Some of the transects were shorter because they stopped at the river and we expanded the transect on the other side of the river into the next transect. Therefore we established transects in the range from 490 – 1.794 meters (Figure 2). According to NFA (National Forestry Authority) the size of the Wambabya Forest Reserve is 34.29 km^2, which includes also part of

grassland, scrubland and stretches of riverine forests (NFA 2005). To set up the transects we only covered 14.61 km² of forested habitat, which is the main part of the forest.

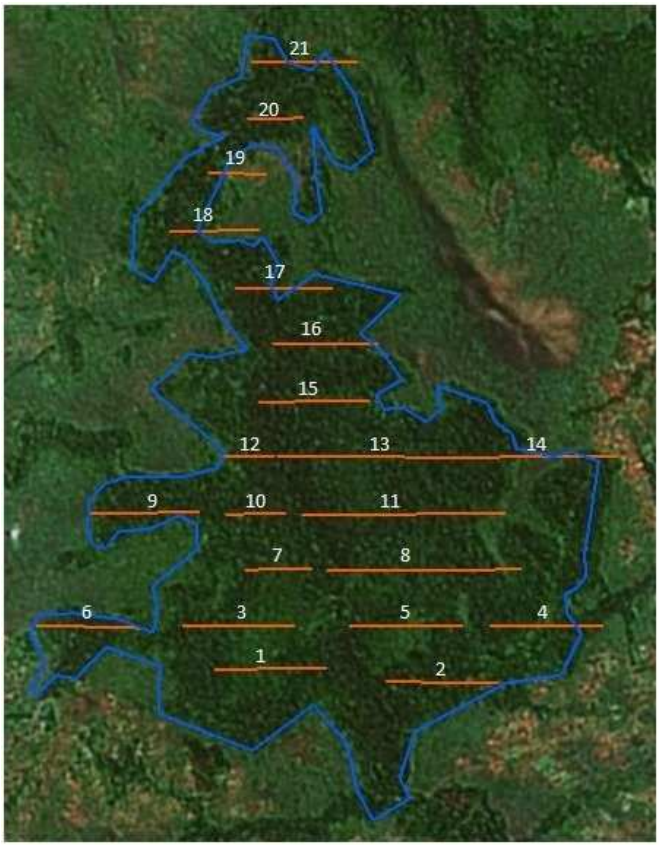

Figure 2: Map of Wambabya Forest showing transects established for the 2010 survey.

5.1.3 Animals

The following animal sightings were recorded. Whenever an animal group was seen, a count of all individuals visible was noted.

1. Primates – all monkey groups were identified to species
2. Chimpanzee nests – any nests found were counted and aged as: New (solid nest with green leaves), Dry (leaves mostly dry but intact) or Very old (leaves dead and often holes in the nest cup)
3. Ungulates – all ungulates observed were identified to species
4. Dung – the number of piles of bush pig dung was recorded. Antelope dung was not recorded because of the difficulty of separating species.

5.1.4 Human signs

Any evidence of human use of the forest was recorded as follows:

1. Pitsaw sites – the number of pits are counted
2. Huts: number of huts for poachers or pitsawyers
3. Snares and pitfall traps– number observed

4. Beehives – number observed
5. Paths that were obviously made by humans
6. Cut trees for timber – number of trees
7. Firewood cutting – number of piles
8. Cut poles – number cut trees
9. Cut rattan – number of bundles
10. Fireplaces – number of sites
11. Poachers seen – number of men
12. Porters seen in the forest – number of men

5.1.5 Transect counts of mammals and human impact

The location of the start and end points of each transect were recorded with a GPS and every 250 meters for Budongo Forest and every 200 meters for Wambabya Forest from the start of the transect fix was taken. Transects were walked approximately every three weeks for 4 months. All animals and human signs were recorded and forest type was recorded along transects every 250 meters and 200 meters respectively. Repeated walks of transects were made to count the number of chimpanzee nests that were constructed over a determined time interval. All nests seen were marked with a ribbon and a stake below the nest with the top shaved to make it more visible. This marked nest count technique does not need a measure of nest decay rates and is more accurate (Plumptre and Reynolds, 1996). The perpendicular distance from the transect to the object being measured was taken using a range finder that could measure accurately up to 75 metres (beyond this distance objects were not recorded).

5.2 Analysis

5.2.1 Density

Encounter rates (number of each animal/human sign recorded per kilometer walked) were calculated for all transects. The perpendicular distance data for transects were analysed using the computer package DISTANCE to obtain estimates of object density with associated standard errors per km^2 (Buckland *et al*. 1993). Dung counts were used to calculate densities of bush pigs and nest counts were used to estimate chimpanzee population, by calculating the density of dung/nests produced over the four months period of the census. The densities of dung/nests need to be divided by a production rate per day to obtain an animal density and the following production rates were used from the literature; bush pig 7 per day and chimpanzee nests 1.09 per day (Plumptre and Harris 1995, Plumptre and Reynolds 1997).

5.2.2 Spatial distribution

Encounters of each object recorded were mapped spatially using the GIS computer package ARCGIS. Relative abundance in different areas of the forest was represented using different sized circles. This

enables the spatial distribution of objects to be analysed visually and makes it easier to assess where the main threats to the forest are occurring or the main concentrations of particular species occur. Correlations of encounter rates of the objects were performed as well.

5.3 Results Budongo Forest

5.3.1 Chimpanzee density in Budongo Forest

The previous census conducted in 2000 estimated the chimpanzee density to be 1.36 chimpanzees km^{-2} giving a chimpanzee population of 584 (95% confidence limits 356 - 723) for the whole Budongo Forest Reserve. For this census we estimated the chimpanzee density to be 1.81 individuals km^{-2} while considering the old census transects only (Table 4). This represents an increase of 0.45 chimpanzees km^{-2}. This increase may be a representation of an increase in chimpanzee density in the Budongo Forest.

Similarly, the density estimate from the old and new lines combined indicates an even higher population of chimpanzees in Budongo Forest than previously thought (811 chimpanzees for the whole Budongo Forest, Table 4). The different population estimates might be an indication of an increase in chimpanzee population between 2000 and 2009. However, given that the sampling design was different for the two surveys, the difference in chimpanzee densities observed could also be due to the sampling methods. During this survey, we attempted to establish transects throughout the entire forest whereas in the previous surveys transects were established in a stratified manner.

Table 4: Estimates of chimpanzee population size with 95% confidence limits for Budongo Forest surveyed with transects in 2009.

Forest area	Distance walked (km)	Density (no km^{-2})	Population in Forest area	95% confidence limits
Old Transects only (Kaniyo Pabidi and main Budongo)	182.1	1.81	773	550 – 1,086
New Transects only (Kaniyo Pabidi and main Budongo)	241.4	1.54	658	416 – 1,040
All Transects (main Budongo)	354.0	1.56	624	462 – 842
All Transects (Kaniyo Pabidi)	69.5	6.43	180	104 – 311
All Transects Total	423.5	1.89	811	629 – 1,046

An extraordinary high density (6.43 chimpanzees per km^2) was found in Kaniyo Pabidi the northernmost part of Budongo Forest. Kaniyo Pabidi covers an area of only 28 km^2, but we found 278 new nests on 52.1 km transects and only 245 new nests on 236.0 km transects in the main Budongo block which consists of 400 km^2 forested area. Two chimpanzee communities are known to exist in

Kaniyo Pabidi. One of the groups was habituated for tourism. This tourist group consists of at least 90 identified members, according to the guides from the Budongo Forest Ecotourism Sites. The numbers of the second group in the area is unknown. Assuming the same number of chimpanzees in the second group, our population estimate of 180 chimpanzees in this area may be reasonable. However, it is not clear why this part of the forest has an extraordinary high density. This survey further revealed that chimpanzee nests were found in most parts of the forest (Figure 3).

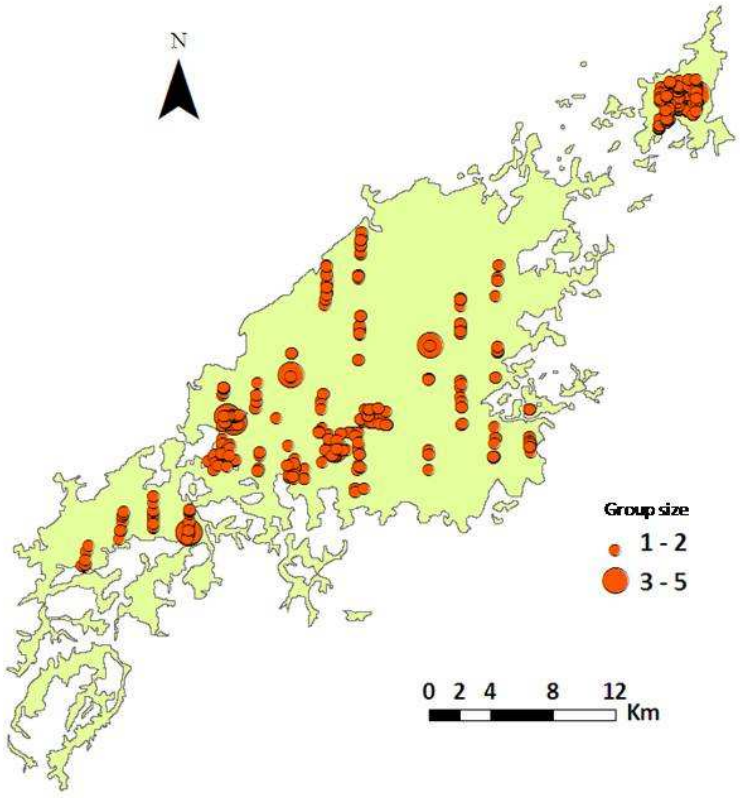

Figure 3: Spatial distribution of chimpanzees in the Budongo Forest.

5.3.2 Densities of other primates in Budongo Forest

Similar to the higher population of chimpanzees observed during this survey, we observed higher densities of the other three primate species surveyed (Table 5) in 2009 compared to the 2000 (Table 6).

Table 5: The group and total animal densities for different primates in Budongo Forest Reserve surveyed in 2009

Species	Sample size	Group density (No km^{-2})	Animal density (No km^{-2})	Population size	95% confidence limits for total population
C. guereza	155	10.4	42.12	18,027	14,441 – 22,671
C. mitis	191	15.1	50.74	21,717	15,632 – 26,316
C. ascanius	101	7.9	28.36	12,138	9,159 – 16,225

Table 6: The group and total animal densities for different primates in Budongo Forest Reserve surveyed in 2000

Species	Sample size	Group density (No km^{-2})	Animal density (No km^{-2})	Population size	95% confidence limits for total population
C. guereza	217	6.38	28.11	12,090	9,590 – 15,270
C. mitis	250	8.85	36.33	15,620	12,280 – 19,880
C. ascanius	167	5.97	27.69	11,910	9,110 – 15,560

As we see in Table 7 increasing the distance walked reduces the CV of group density in primates in Budongo Forest Reserve because it increased the number of groups encountered. The numbers of groups found in Kaniyo Pabidi were too small to provide a reasonable CV. But what is of interest here is that the CV remained fairly high (10-15%) for the Budongo compartment of the forest even when the distance walked was large (230+ km). Hence, to detect this degree of change in primate populations in Budongo Forest Reserve, it is necessary to walk at least 230 km.

Table 7: The number of groups seen, distance walked and coefficient of vatiation (CV) for three monkey species in the two different compartments in Budongo Forest Reserve.

Species	Compartment	Number of groups	Distance walked (km)	Density (groups km^{-2})	CV (%)	95 % confidence limits	
Colobus guereza	Budongo	143	236	10.9	11.6	8.7	13.7
Black and white	Kaniyo Pabidi	12	52	3.8	46.3	1.5	9.8
Colobus monkey							
	Total Budongo	155	288	10.4	11.4	8.3	13.1
Cercopithecus mitis	Budongo	189	236	16.1	13.1	12.4	21
Blue monkey	Kaniyo Pabidi	0	52	-	-	-	-
	Total Budongo	189	288	15.1	13.1	11.6	19.6
Cercopithecus ascanius	Budongo	91	236	8.3	14.8	6.8	11.1
Red-tail monkey	Kaniyo Pabidi	9	52	3.1	47.2	1.1	8.3
	Total Budongo	100	288	7.9	14.5	14.5	10.6

The average densities of primates in the two compartments of the Budongo forest are presented in Table 8. Interestingly the density of chimpanzees is negatively correlated to the four primate species in the forest. The number of monkeys was calculated by a mean group size multiplied by the density of groups. Mean group size was calculated from the number of animals seen in the groups. The real animal density is even higher since we counted only animals that we could identify to species levels, therefore some members of the groups have been missed.

Table 8: Average density of primate species (no. km^{-2}) for the two forest compartments in Budongo Forest Reserve. Where a species is at low density it occurs as "low".

Compartment	*P. troglodytes*	*C. mitis*	*C. ascanius*	*C. guereza*	*P. anubis*
Budongo	1.56	54.10	29.80	44.15	low
Kaniyo Pabidi	6.43	low	11.13	15.39	low
Total Budongo Forest	1.89	50.74	28.36	42.12	low

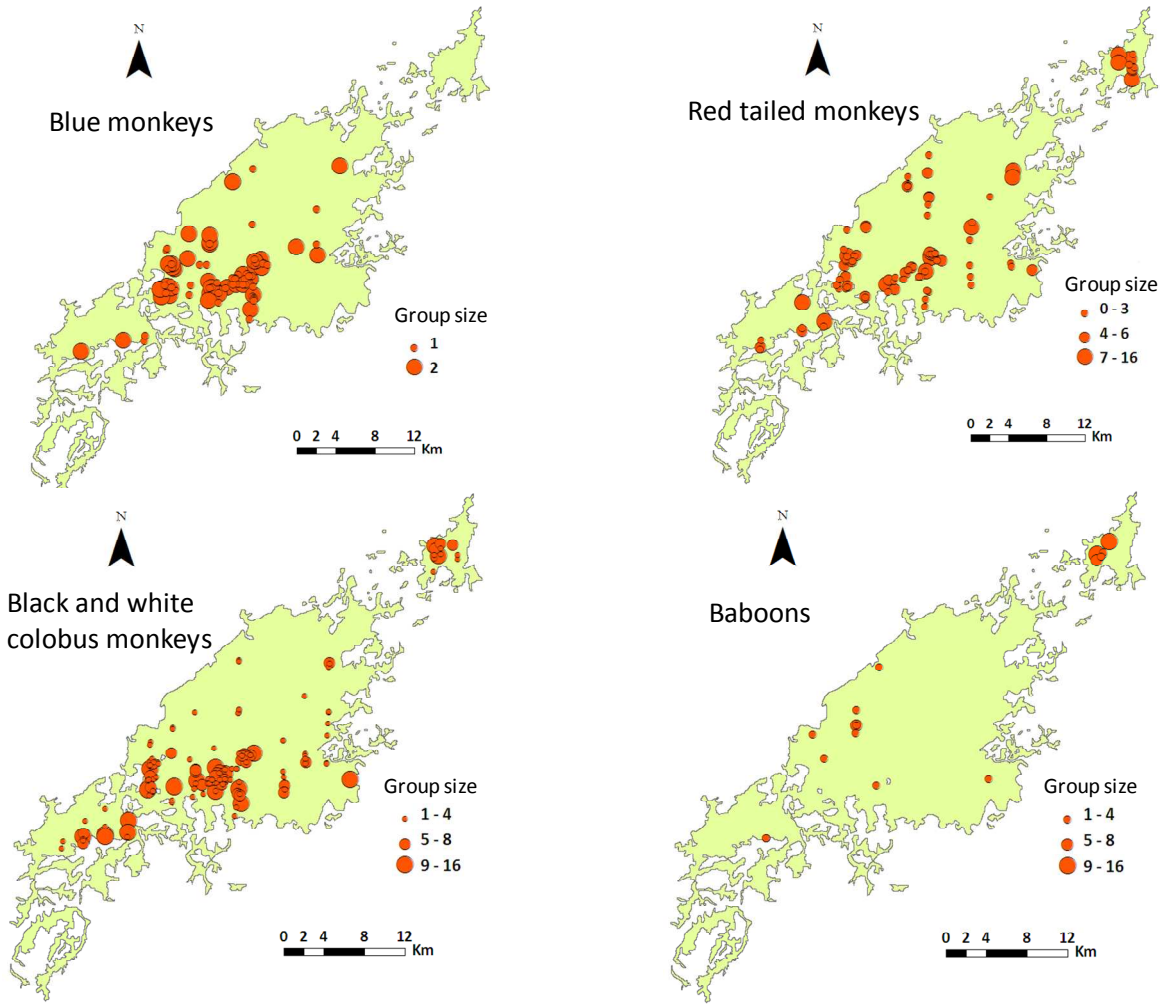

Figure 4: Spatial distribution of four primate species in the Budongo Forest.

There was a higher density of blue monkeys, red tailed monkeys and black and white colobus monkeys in the southern section of Budongo Forest compared to the northern section (Figure 4). The three species have been noted to respond positively to logging with higher densities observed in

logged areas compared to unlogged (Plumptre and Reynolds 1994). Over the years, logging in Budongo Forest has been predominantly in the southern section leading to an increase in mixed forest type that favours primate populations.

5.3.3 Encounter rates of threats in Budongo Forest

Encounter rates per kilometer walked were calculated for all signs of human activity. Encounter rate associated with pitsawing, pole and tree cutting, camp sites, charcoal sites, fire places, firewood cuttings, huts, loggers, rattan cane cuttings, timber harvesting and animal trap/snares were summed to provide a measure of the relative abundance of these threats. The average rate for the entire forest was estimated to be 1.01 illegal activities per kilometer. Over 80% of illegal human activities encountered were associated with timber and/or building pole cutting. Charcoal burning was observed in the western part of the forest only. Nonetheless, we cannot conclude that tree cutting was the most dominant illegal activity in Budongo given that other illegal activities such as snare setting are less visible than tree cutting.

These illegal human activities were observed mainly in the main Budongo Forest whereas none were observed in Kaniyo Pabidi which is considered to be better protected due to its proximity to Murchison Falls National Park and long distance from the local settlements. Within the main Budongo Forest, most illegal activities were observed in areas close to human settlements in the southeastern and southwestern parts of the forest reserve (Figure 5). Among the transects whose illegal human activity encounter rate was greater than one, it was observed that 50% and 25% of these transects lay in the southwestern and southeastern parts of Budongo Forest respectively. The zone around the Budongo Conservation Field Station research area (between lines 14, 19 and 20 in Figure 1) had a low illegal activity encounter rate of less than one per kilometer. This further emphasizes that the presence of researchers plays a key role in deterring illegal activities in tropical forests.

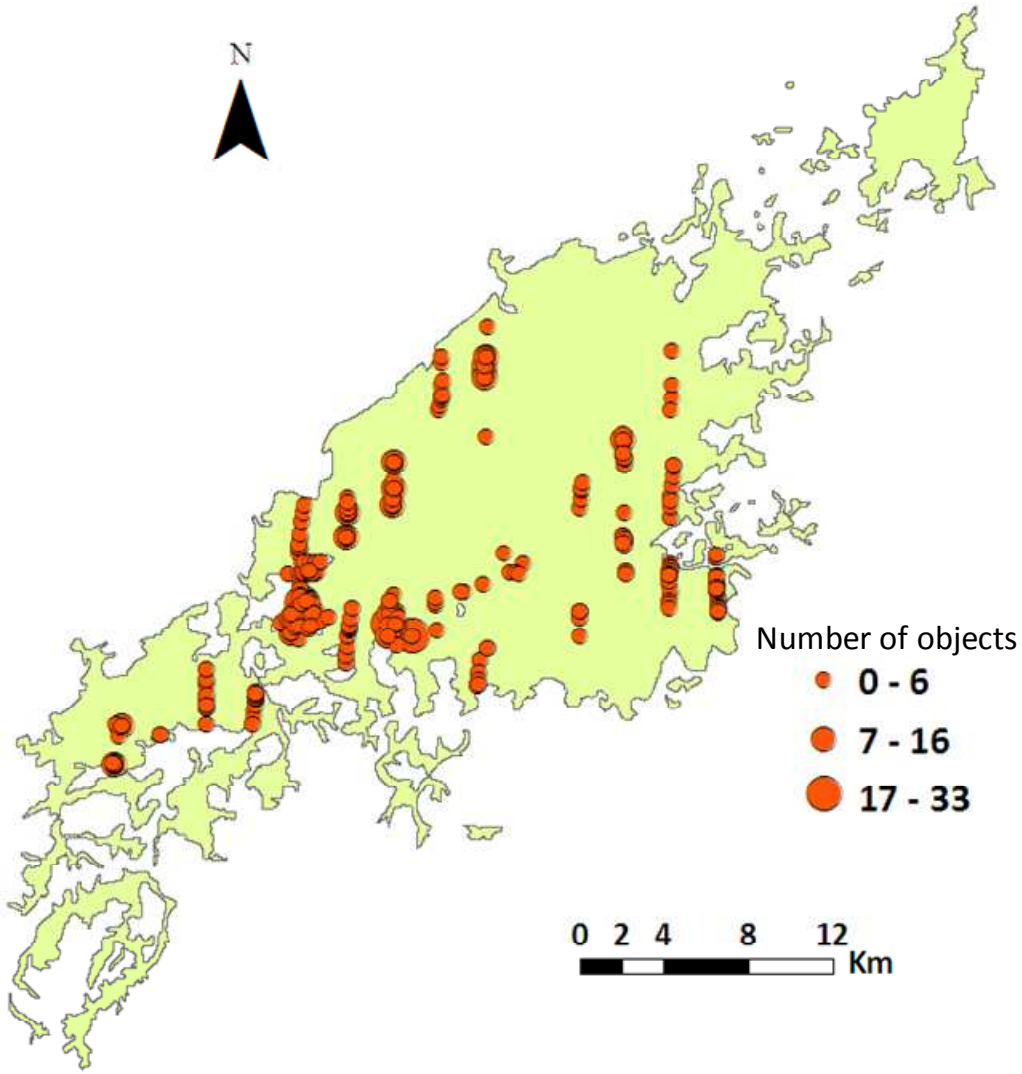

Figure 5: Spatial distribution of human illegal activities in Budongo Forest.

5.3.4 Relationship between the distribution of human signs and animal densities in Budongo Forest

Most animal species did not show a significant correlation with signs of human activity. Bush pigs *Potamochoerus porcus* showed an increased with reduced human activity encounter. The largest number of bush pig encounters was around the Budongo Conservation Field Station research area and Kaniyo Pabidi. This observation could indicate a direct relationship with hunting pressure. Moreover, other animal species often hunted (blue duiker *Cephalophus monticola* and red duiker *Cephalophus weynsi*) show a similar negative correlation with human encounter signs, although this correlation is weak and not significant (Table 9).

Table 9: Pearson correlation coefficients between animal encounter rates and human activity encounter rates in Budongo Forest Reserve

Species	Correlation coefficient (r)	Probability (P)
Pan troglodytes	-0.23	ns
C. guereza	-0.1	ns
C. mitis	0.14	ns
C. ascanius	0.21	ns
Cephalophus monticola	-0.17	ns
Cephalophus weynsi	-0.18	ns
Potamochoerus porcus	-0.33	$P < 0.01$

5.4 Results Wambabya Forest

5.4.1 Chimpanzee density in Wambabya Forest

The previous census conducted in 2000 estimated the chimpanzee density to be 3.62 chimpanzees km^{-2} giving a chimpanzee population of 124 (95% confidence limits 117 - 156) for the Wambabya Forest Reserve. Plumptre et al. (2003) found a correlation between encounter rates obtained from reconnaissance walks adjacent to transects and densities obtained from those transects for 34 sites for Uganda. Using this regression an equation could be derived to estimate chimpanzee density from encounter rates. Using this technique they were able to estimate chimpanzee densities in the forests where they were unable to use transects. Wambabya is one of those forests where they only used reconnaissance walks to measure the population.

For this census we estimated the chimpanzee density to be 2.57 individuals km^{-2} from the standing crop nest count. This density gives a population of 88 (95% confidence limits 33 – 239). This represents a decrease of 1.05 chimpanzee km^{-2}. This decrease may be a representation of a disturbed and destroyed habitat during the last 10 years, since according to several farmers chimpanzees have not been seen in many parts of the forest for the last couple of years. As we can see from the confidence limits the range of population size is quite large compared to the census from 2000, but this time we have real data from transects and not only an estimate from calculation of encounter rates. In order to get more accurate data we need do cut more transect in the forest or we will get more data from the marked nest count which is still in progress by the time of writing.

Another method to get more accurate data on chimpanzee density is to count chimpanzees at night while they are in their nests. We will go at night in the forest and walk the transects and check for nests with a thermal infrared imaging camera. With this equipment we will be able to see chimpanzees in their nests and can count them directly. A pilot study is planned this year, so we will

test the method with habituated chimpanzees in Budongo Forest. The test will show us how accurate we can detect chimpanzee nests in complete darkness.

5.4.2 Densities of other primates in Wambabya Forest

We have not analyzed the data for primates in Wambabya Forest yet, since the marked nest count census is still in progress by the time of writing. What we see in Table 10 are the encounter rates of the different primates that supposed to occur in Wambabya Forest after we walked the transects twice. Interestingly we have found the only primate known to be endemic to Uganda, the Uganda mangabey (*Lophocebus ugandae*). Groves has described this species in 2007 as a new species and not as a subspecies of the grey-cheeked mangabey (Groves 2007). We have found the first evidence that *L. ugandae* occurs in Wambabya Forest, this will mark the northernmost distribution of the species, since there is no evidence that this Mangabey also occurs in Budongo Forest.

Table 10: Number of individuals and encounter rate for different primates in Wambabya Forest Reserve surveyed (preliminary results)

Species	No of individuals	Distance walked (km)	Encounter rate (No km^{-1})
C. guereza	22	43.6	0.50
C. mitis	-	43.6	-
C. ascanius	10	43.6	0.23
L. ugandae	9	43.6	0.20

5.4.3 Encounter rates of threats in Wambabya Forest

After walking the 21 transects for the first time we have found four pitsaw sites and one cut tree. Only one of the pitsaw sites looked fresh. It seems that selective logging is not a major problem in Wambabya Forest. A huge problem is that farmers clear forest for their fields inside borders of the Forest Reserve and along waterways of the different rivers running through Wambabya Forest.

6 Conservation genetics

The project to analyze phylogeografic relationship and genetic differentiation between the populations has not yet been started. It is not possible to climb trees and collect hair samples while doing the census since it is too time consuming. We had a meeting with two specialists in tree climbing from BBC who did a shooting of chimpanzees in their nests at night at Kibale National Park where some chimpanzee communities are habituated. This team also went to Wambabya to shoot some footages for a documentary about chimpanzees in fragmented forests and what we are doing to give them

access in the future to other chimpanzee communities. The BBC team was very impressed about our corridor project and they went to the riverine forest, where we already started tree nurseries and tree planting. Together with those people from BBC and the Jane Goodall Institute Uganda we will initiate a workshop for 2-3 research assistants to learn the techniques to climb trees with ropes in order to get access to nests to collect hair samples.
Therefore we will create a separate team lead by a student to do that work. The search for someone is in process. As soon as we have someone for that part of the project he or she can start to collect hair and fecal samples and analyse them at the Evolutionary Genetics Group EGG at the Anthropological Institute and Museum, University of Zürich.

7 Local professional development

With Nebat Kasozi we have a field assistant who has a bachelor degree in environmental science from Makerere University, Uganda. Nebat will have the possibility to do his master thesis within the project starting by 2011.
Additionally 2-3 research assistant will be trained in rope techniques to climb trees in order to access chimpanzee nests. This team will also be hired by the Jane Goodall Institute Uganda for their chimp rescue team. Chimpanzees get from time to time caught in snares or mantraps. The Jane Goodall Institute Uganda has a team of veterinarians who go out and rescue those chimps. In order to remove the snare/mantrap they have to anesthetize the chimpanzee. Sometimes the chimpanzees climb trees with the snare or the mantrap and stay even anesthetized in the trees. Someone would need to climb up and secure the chimpanzee and let them down with a rope.

8 Involvement of local people

Local people have been hired as research assistants, trail cutters, cooks or guides. Some of them for a short period of time during the establishment of transects others for several months to help collect data during census (Figure 6). We also have created a permanent job for a caretaker and guard at the newly established research site between Wambabya Forest and Bugoma Forest. In the future there will be even more jobs available at the research site like cooks, assistants and for other functions.

Figure 6: Camp in Budongo Forest during census. Photo: Daniel C. Hänni

9 Education and public information

Parallel to this project we have started to establish a Forest Education Centre. The purpose of the Forest Education Centre is to provide an Environmental Education facility that pupils can visit to learn more about the forest environment, its importance and what people can do to help protect it. Half-day Environmental Education (EE) programmes are developed to be delivered from the centre. The staff at the centre is trained to deliver the program. The centre is not yet equipped with the necessary resources required for the program, so we are still looking for aditional funding of 14'000 US Dollars which we would need for transport of the children from 8 schools with a total of more than 3000 kids, information material and solar power for the center. The half-day EE program will consist of a short forest walk and a number of activities inside and outside the education centre. In Busingiro, adjacent to Budongo Forest, we have already such a Forest Education Centre and thousands of kids have gone through our environmental education program. The Jane Goodall Institute Uganda has already developed an Environmental Education Teachers Guide for Primary 5, 6 and 7 which integrate environmental education within the Uganda Primary School Curriculum (UPSC).

With Edna Angucia we have a teacher that has the necessary education and experience to run that program. With the science club of the primary school in Kigaaga she has already started a tree planting lesson, where she taught about the chimpanzees and about the forest and its importance to protect the watershed. Later every child of that class was able to plant a tree (Figure 7).

Figure 7: Children of the Science class of Kigaaga Primary planting their trees. Photo: Daniel C. Hänni

10 Conservation

We recorded all witnessed human activities in the forest. Compared to Budongo Forest where illegal selective logging is a major problem Wambabya has very little selective logging. We only found one pitsaw site that looked recently build. The major threats in Wambabya are the clearing of forest along the borders or within the borders of the Forest Reserve. We found several shambas (cleared forest for cultivating crops) within the forest, most of them close to one of the rivers. At the west side of the forest lives a family that argues with NFA (National Forestry Authority) that it is their land and not the land of NFA (Figure 8). The farmer had been arrested already four times and there is a case in court at the moment about this issue.

Another problem is a group of three men who betray poor farmers. They pretend to have a paper from the government to sell forest. Poor immigrant farmers from DRC (Democratic Republic of Congo) who are desperately looking for land are paying their last money for it and start slashing forest and cultivate crops. Together with the responsible person in charge from NFA for Wambabya Forest we have found several farmers adjacent or within the Forest Reserve. NFA explained them the situation and showed them also the marks of the Reserve. We also confiscated a panga (a machete) and an axe from a farmer that was illegally cutting trees in the Forest Reserve. At another location two

farmers who were cultivating crops within the reserve were forced to help to renew the marks, a ditch of 3 meters in length, of the borders. One farmer has also cleared some scrubland within the borders of the reserve for his cattle. We took several pictures of farmers, shambas, cattle and illegal logging for the directors of NFA to have evidence for cases in court.

Figure 8: Family who cultivates crop within Wambabya Forest Reserve. Photo: Daniel C. Hänni

Hunting seems not to be a major threat to the animals in the forest, although hunting is carried out from time to time. On the other side we have not seen evidence of duikers or bush pigs in Wambabya Forest. One farmer told me that he got money some years back from NFA to help protect and monitor part of the forest. He told the hunters not to hunt in that part of the forest and according to him they agreed.

A large part of the riverine forest between Wambabya Forest and Bugoma Forest is cut and converted to farmland to cultivate crops (Figure 9). Unfortunately this riverine forest doesn't belong to NFA but to private people. Although it is a law in Uganda that at least 50 meter left and right along a river the forest is protected it is not enforced by law and farmers don't even know it. None the less some farmers have already started to plant trees within the clearings along the riverbanks. The Jane Goodall Institute has organized a workshop with all stakeholders of the villages between Wambabya Forest and Bugoma Forest to start a three year program to restore regional forests and waterways, to improve livelihoods and to implement environmental education and engagement activities.

Figure 9: Destroyed riverine forest between Wambabya Forest and Bugoma Forest. Photo: Daniel C. Hänni

In August 2009 a workshop was held in Kampala, Uganda, to develop a vision and goal for an action plan to save the East African Chimpanzee (Plumptre et al. 2010). This conservation action plan was developed with the collaboration of scientists involved in research or conservation of chimpanzees, protected area authorities from each of the range states for this subspecies, and also representatives of Conservation NGOs. Over 22,000 GPS locations were used in a Range-wide Priority Setting analysis (RWPS) that mapped historical distribution and current knowledge of chimpanzee presence in the last 10 years, identified contiguous chimpanzee populations, and agreed on 16 Chimpanzee Conservation Units (CCU), which, if successfully targeted, could conserve about 96% of known chimpanzee population (about 50,000 individuals) across most of the ecoregions where they occur. Their conservation would therefore capture the range of ecological and, we hope, cultural variation that exists within this subspecies.

For Uganda we identified 5 CCUs using the following criteria:

I. an area currently known or believed to contain a population of at least 100 breeding-age chimpanzees and adequate habitat; or

II. an area of containing fewer than 100 breeding-age chimpanzees, but with sufficient habitat such that chimpanzee numbers could increase if threat were alleviated; or

III. an area or habitat important for connectivity (for example, a habitat corridor) potentially suitable for chimpanzees to move between areas with resident populations.

For the region Budongo-Bugoma we were able to identify 3 CCUs, Budongo Forest, Budongo-Bugoma corridor and Bugoma Forest, respectively. Wambabya is therefore an important forest to help protect the chimpanzees between the larger forest in the north (Budongo) and the forest in the south (Bugoma). We selected key projects for Uganda to focus on. The objectives of the projects are health monitoring, habitat loss, promotion of conservation, community support and financing. Within this project we have already started on some of those objectives.

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