

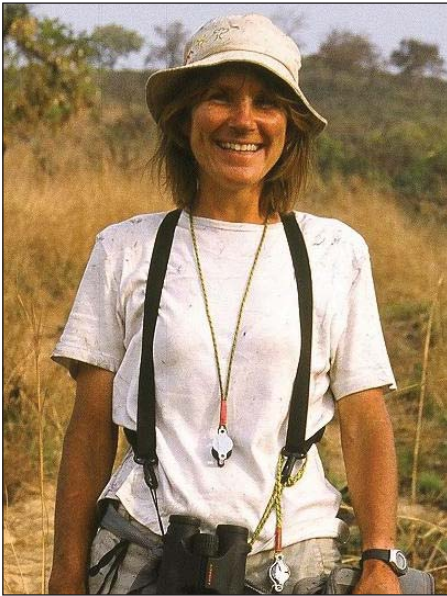
# Nigerian Montane Forest Project

*Annual Report*



06

# Introduction



**Dr Hazel Chapman**  
*Director*  
*Nigerian Montane Forest Project*

Late 2005/ 2006 has been a year of both consolidation and progress for the NMFP. The field station is complete, and thanks to the **American Woman's' Community** in Lagos and the expertise of **Babangida Kawuji** we have pumped water and both generator and solar panel power.

A 24 hour non stop paint a thon saw the building sparkling white inside, thanks to the Gashaka -Gumti team!

A herbarium and nursery have been developed, and two field assistants, **Misa Zubairu** and **Usman Usuf** have been on computer courses and are now able to input data from the field.

Three theses have been submitted (all three high of quality).

New research has tended to concentrate on seed dispersal. This means that we are becoming experts at collecting primate dumps and spits, and building up a comprehensive seed collection. We also collect seed in traps , and **Sarah Luxton** a volunteer from UC, helped establish an experiment whereby we are monitoring what seed is moved by frugivores (fruit eating animals and birds) around the forest, and more especially, into deforested areas.

On a different note our research now includes anthropology, with **Fraser McDonald** UC; carrying out an investigation into how the local community perceive conservation projects in the area.

Helping with the phenology research this year, in conjunction with the Gashaka Gumti Primate Project, has been **Mary Oluwole**, a SIWES placement from FUTY. Mary primarily helped with phenology studies, and this work experience will contribute towards her degree at FUTY.

We have had several social events at Ngel Nyaki. In December 2005 we had a party for the Yelwa Youth who had participated in the building of the field station. Alhaji Sani Mohammed Musa, the Galadema of Nguroje, was our VIP guest.

Easter 2006 was memorable with **Sarah, Steve, Austin** and **Adam Dodds, Hugh Ross** and **Robin Campbell** all visiting us from Lagos.

**Nexen** and the **A. G. Leventis Foundation** have confirmed their continuing support for 2007- for which we are most grateful!

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# Nigerian Montane Forest Project

## Mission Statement

*To promote national and international commitment to the conservation of Nigeria's montane forests by inspiring excellence in research by postgraduate students and empowering local communities through employment and education.*

## Aims

1. To combine scientific research with education at both tertiary and local community level in order to develop long term sustainable management of Nigeria's montane forests.
2. To facilitate the involvement of national and international researchers in Nigerian montane forest research
3. To involve the community in the management of montane forest ecosystems
4. To work with the community in other ways, such as developing small businesses and working with schools to develop conservation awareness.

# Partners and Sponsors

## Project Partners

Nigerian Conservation Foundation (NCF)

Nigerian National Parks

Taraba State Forestry

Federal University of Technology, Yola (FUTY)



NCF



## Major Sponsors

Nexen Nigeria

A.G. Leventis Foundation

North of England Zoological Society

DHL Nigeria



The Ngel Nyaki research team wearing their Nexen tee-shirts.

Back row Left to Right: Bobo, Usman, Augustine, Mary, Musa, Misa

Front row: Alfred Christopher, Dauda, Usman Two.

# People

The success of the Nigerian Montane Forest Project reflects the dedication and enthusiasm of its staff, students and volunteers; our sponsors are equally important.

## Full-time Staff

### Field Assistants

**Misa Zubairu** is the senior field assistant. Misa oversees staff on a daily basis and is in charge of the phenology transects and the Herbarium.

**Augustine Ntim** is in charge of the nursery, and collects the weather data on a daily basis.

**Musa Amadu** has been working on the putty nose monkey project for two years now. He is an expert in putty nose behaviour.

**Usman Usuf** is in charge of the seed trap and seed predation experiments and puts field data onto the computer.

**Hammasumo Ibrahim** assists with the phenology work.

**Alfred Christopher** specializes in collecting butterflies, and assists in seed dispersal work.

### Watchmen

**Bobo Zubairu** and **Hadija Dauda** look after the field station site 24 hours a day.

### Cook

**Usman Two** makes an excellent job of cooking and cleaning for everyone staying at the field station.

### Patrollers

Two each from Yelwa, Ddombo Ngishi and Dujere



Augustine Ntim above the field station, August 2006.

## Students and Projects

Degree and University	Student	Start date of field research	Project	Appendix
†MSc (FUTY)	<b>Ihuma Jerome</b>	Oct 2004	The role of frugivores in seed dispersal from forests to fragments.	x
PhD (FUTY)	<b>Stephan Gawaisa</b>	Dec. 2004	How important are putty nosed monkeys ( <i>Cercopithecus nictans</i> ) in montane forest seed dispersal?	
†MSc (UC)	<b>Arne Mattheus</b>	Oct 2004	Testing the Janzen Connell hypothesis in a West African Montane Forest	
†BSc Hons (UC)	<b>Josie Beck</b>	Oct 2004	Using chimpanzee nests to estimate population size in Ngel Nyaki forest	x
MSc (UC)	<b>Fraser McDonald</b>	Feb 2006	Community perception of 'conservation' of Nigel Nyaki forest	
PhD (FUTY)	<b>*Ihuma Jerome</b>	Nov. 2006	The effectiveness of different species of frugivores as seed dispersers of montane forest endemics	
PhD (FUTY)	<b>*Justus Omijeh</b>	Nov 2006	Effect of land use changes on the species composition of Mambilla riverine fragments	

\* new research; † submitted during 2006

## Associate Supervisors and Collaborators

Dr Akosim (FUTY) Wildlife management  
 Dr Jenny Brown (UC) Maths and Statistics  
 Professor Dave Kelly (UC) Plant Ecology  
 Dr Tella Iyiola (FUTY) Ecology  
 Associate Professor Patrick McAllister (UC) Anthropology  
 Dr Richard Vokes (UC) Anthropology  
 Dr John Lovett (University of York) Climate change and montane forest diversity  
 Dr Peyman Zawar-Reza (UC) Geography

## Volunteers 2007

Josie Beck (UC) Chimpanzee survey

# Research Projects



Mistletoe in flower.

## Phenology (Annual cycle of fruiting and flowering) Appendix Three

Our phenological study was initiated in 2003, and was set up in such a way as to provide information which is specifically useful in asking questions about what drives phenological patterns in tropical forests.

We now have 3 years phenology data analysed (Appendix x), and are in the process of writing it up for publication in *Biotropica*.

In collaboration with Dr's Jenny Brown and Marco Reale from the Maths and Statistics Department at UC we are developing the use of Graphical Modeling for the analysis of phenological data. This idea took us through in 2006 to the second round of the prestigious Marsden awards. We shall try again in 2007.



Setting out to sites with seed traps.

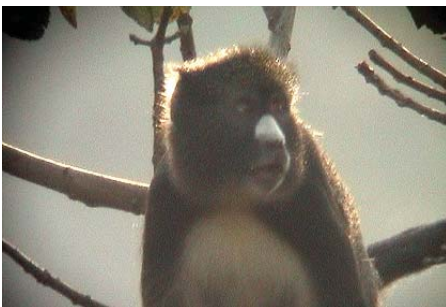
## Seed trap and seed dispersal data

During November and December 2005 **Sarah Luxton**, a volunteer from UC, helped establish an experiment to investigate the role of birds and primates in the dispersal of seed from the forest into degraded areas nearby.

We have 5 sites, each with 30 seed traps (Figure X). The experiment has four components:

1. The traps are monitored on a weekly basis. All seed in the traps is identified and counted, or collected for identification.
2. Observations of frugivores (fruit eating birds or primates) in the sites are recorded from daily observations two days a week.
3. Seed predation is monitored by 'planting' 3 seeds of a single species each month, near each trap (a total of 150 traps), and recording the number of days it takes for the seed to be removed.

The experiment will run for a year before all the data is analysed.



Putty nose monkey.

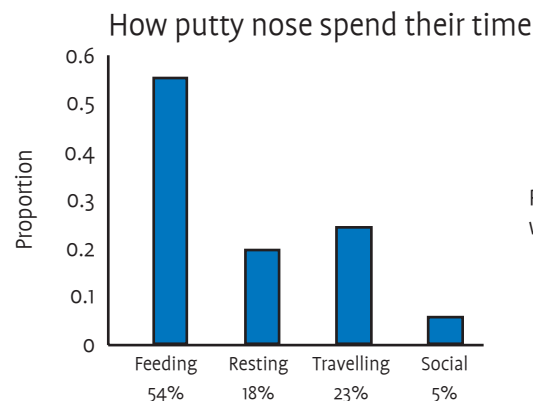
## How important are putty nosed monkeys (*Cercopithecus nictans*) in montane forest seed dispersal?

Stephen Gawaisa, working with Musa Amadu now has two years of data collected five days a week on feeding behavior of putty nose. In particular he is interested in:

1. which plant species the monkeys prefer
2. which part of the plants they eat (fruit, leaves, twigs etc)
3. how diet varies over the year
4. how seed is dispersed (in dung or through spitting).

Data on where seed is dropped and its fate is being collected.

Seed germination trials are underway to determine how handling by monkeys affects the germination of seed.



Preliminary data based on 10 months work from October 2005-July 2006





## Testing the Janzen-Connell Hypothesis in a West African Montane Forest

Arne Mattheus

MSC University of Canterbury, Submitted June 30th 2006

Arne Mattheus has had two field seasons at Ngel Nyaki (2004/2005, and 2005/2006) carrying out experiments to test the Janzen-Connell hypothesis. Never before has this explanation for seed dispersal away from parent trees been tested in an Afromontane forest.

The first field season was spent designing and setting up experiments, and collecting preliminary data. This involved much hard work, as research plots were set up throughout the forest. A temporary nursery was also built in order to germinate seedlings for some of the experiments.

Arne spent the rainy season at UC, analyzing data with help from Professor Dave Kelly. Several different, and quite sophisticated, statistical models were used, as there was a wide range of data to analyze.

Back at Ngel Nyaki data was collected from the experiments on a regular basis by Usman Usuf, who did a wonderful job of measuring and recording under very difficult cold/wet conditions.

The second field season was mainly spent collecting and analyzing data, and completing a final experiment looking at tree species dispersal.

A paper with all results is about to be submitted to *Biotropica*.



## Ngel Nyaki Chimpanzee Survey

Josephine Beck

Part Fulfilment of BSc Hons Biology  
University of Canterbury  
To be Submitted October 31st 2006

During the dry season of 2004/5 Josie Beck came to Ngel Nyaki as a volunteer to help with a chimpanzee survey based on nest abundance (see 2005 annual report). Since then Josie has analyzed the data and used this as the basis of her BSc Hons project.

The work has been written up and submitted to the journal ORYX. Details are given in the paper, but a summary appears in Appendix Two.

Josie has since been awarded a highly competitive Summer Scholarship from UC, and will be coming out to Ngel Nyaki again in November 2006, for more work on primate seed dispersal. Our thanks to ... from the Department of Conservation (NZ) for help with Distance analysis.

## The Influence Of Frugivore Communities On Forest Fragment Regeneration In Ngel Nyaki Forest Reserve, Taraba State, Nigeria.

Ihuma Jerome Obo.

M.TECH / FR/ 04/ 368.

Submitted September 2006

As part of his MSc research Jerome Ihuma has spent a week every month over the past year at Ngel Nyaki. He has built up a large amount of knowledge about the frugivores (seed eating animals) in the forest and surrounding fragments. Jerome's focus has been on seed dispersal from the main forest to surrounding fragments.

The thesis was submitted in September 2006, and Jerome was highly commended by his examiners. The abstract is given in Appendix One, and two papers are in preparation for submission for publication, one for Ostrch on the white crested Turaco, and one for The African Journal of Ecology.

How important are putty-nose monkeys....

The broad aim of this study is to investigate the interactions between *Cercopithecus nictans* and plants in a montane forest ecosystem.

The specific objectives are..

- 1) To determine the status and distribution of Putty-Nosed monkeys in the study area.
- 2) To identify feeding patterns of Putty-Nosed monkeys including plant species used, parts used and the temporal variation in the use and availability of food resources.
- 3) To investigate daily ranging patterns of Putty-Nosed monkeys and microsites where ingested seeds are deposited.
- 4) To assess the contribution of Putty-Nosed monkeys to the natural process of montane forest regeneration.

To this end Stephen, working field assistance from Musa Amadu, now has two years data on the feeding ecology of Putty-Nosed monkeys at Ngel Nyaki. 2006 saw the start of experiments to determine how handling of monkeys affects seed germination, and to understand the fate of defecated vs. spat seed in the forest.



Mouse bird



Double toothed barbit



## Community perception of 'conservation' of Ngel Nyaki forest

Fraser McDonald

BA University of Canterbury  
To be submitted December 2006

### Overview of Research

The research that I am undertaking for my Masters degree in anthropology concerns the dynamics of the interactions that have taken place and continue to unfold between conservationists and the local communities in and around the Ngel Nyaki Forest Reserve, which lies in Taraba State, eastern Nigeria. My enquiry is centred on two main themes. Firstly, the research is concerned to explore how the protection of the Ngel Nyaki Forest Reserve, a process that commenced in 1969 and which has intensified in the last decade, has affected the lives of the people who formerly depended on it for their livelihoods. The second and closely related theme that I will explore is how these local people have gone about adapting to the changes produced upon their lives as a result of the Ngel Nyaki Forest Reserve being protected. In order to acquire information that would allow me to adequately examine these themes, I conducted three months of fieldwork in the area, which I will now describe.

### Fieldwork

Earlier this year, from February until May, I conducted three months of anthropological fieldwork at the Ngel Nyaki Forest Reserve. This involved living in a number of villages that currently fringe the boundary of the reserve and getting information from their inhabitants concerning how their lives have been affected by conservation and how they have adapted to these effects. When I initially arrived at Ngel Nyaki I stayed for a couple of nights at the NMFP field station in order to regain some energy and mentally prepare myself for what awaited me; I had done very little international travel before, so the prospect of going to live for three months in a rural African village was rather daunting. The first village I travelled to was Dujire, a small village at the top of the reserve, whose population mainly come from the Ndola ethnic group and who are farmers. Here I met my field assistant who was going to help me with my research for my time in the field as well as other people who belonged to the NMFP, all of whom made me feel very welcome. I stayed in Dujire for around a week just getting a feel for the area and talking to people about the main issues in their lives, of which the reserve was definitely one. However, through these conversations I came to learn that the people who had experienced the most significant interactions with conservationists were not in Dujire but inhabited a more remote village named Ndombo Ngishi, in particular, the inhabitants of two of the village's constituent hamlets, Gidan Musa and Tudun Haske. After making a day trip to Gidan Musa and speaking briefly with the headman, I organised to stay here for a few weeks. Whilst here I attempted to participate in the everyday lives of these people as best I could, going out to their farms with them, 'hanging out' with them upon their return and talking as much as I could with them about their history, society and customs. After a few weeks at this hamlet I then went and stayed at Tudun Haske for two weeks again attempting to implement the anthropological research technique of participant-observation. From here it was back to Dujire for a week to conduct some final interviews with the head of the village and then I made my way back to the top of the reserve where I rejoined those working for the NMFP at the field station. After conducting a couple of additional interviews with the head of Yelwa, a village situated approximately an hour's walk from the station, it was time for me to begin my journey homeward. Leaving Ngel Nyaki and Yelwa I travelled directly to the local government headquarters of Gembu, a trip that had two purposes, namely, to conduct an interview with a government official and also to relax. With these aims both fulfilled I then made my journey home proper, travelling through Jalingo to Yola then onto Makurdi and Abuja, before flying to Lagos and then out of the country. My fieldwork in Nigeria was undoubtedly one of the highlights of my life thus far and I hope to return there as soon as possible.

# Accomplishments in 2006

## Herbarium

We have established a herbarium in the field station so that now we have a record of many of the trees in the forest. Species we have been unable to identify are at the Royal Botanic Gardens, Kew, where Dr Martin Cheek is helping with identification.

Throughout the year specimens are being added to the collection as they come into flower or fruit

The herbarium underpins all the ecological work we do, and directly helps in the conservation of the forest through student projects and work by visiting researchers.



Awaiting ID.



*Ochna* sp.

## Nursery

A nursery has been established in order to:

- grow seed of native forest tree species for forest restoration
- learn how best to germinate seed of different species
- build a seed bank for seed identification

We currently have over 500 seedlings of a range of species growing in pots for restoration work. In addition we have an experiment with 40 seeds each of 22 tree species. For each species, half the seed has been scarified, and half not. The length and width of each fruit/seed and the date of first leaf appearance has been recorded. Fruit /seed are collected on a monthly basis, so the experiment will increase in size over time.

Fruit and seed of each species is photographed, and this photo collection will contribute to our herbarium.



## Solar Panels and Water Pump

Solar panels for the computer laboratory and office are being installed and will be functional by mid October 2006. This will allow us to work in a much more sustainable manner, without the cost of fuel or the noise of the generator.

The introduction of pumped water means no more carrying of jerry cans for over 500m for every drop of water we use.

Babangida Kawuji, third from left, was responsible for installing this new technology.



## Computer Course

Two field assistants (**Misa Zubairu** and **Usman Usuf**) have been on a computer course. They are now able to input all the data they collected from the field on a daily basis. This has transformed the efficiency of data analysis, as files can now be sent back electronically to UC or FUTY.



## Patrollers

The patrollers are continuing to do a good job, and their work is now coordinated with the NCF / RSPB group who are based in Yelwa as part of a DFID funded poverty alleviation / community forestry project for Taraba State. The rangers are definitely making an impact on reducing hunting in the Reserve.



## Woman's group basket business

The American Woman's Community (AWC) in Lagos continued their sale of Mambilla baskets. They are very keen that some women from Yelwa visit Lagos to sell their own baskets at the 2007 Trade Fair.



# Butterfly Collection

During November and December 2005 the NMFP started collecting butterflies under the guidance of D.P. Knoop. Robert and Malcolm Warren made a start at butterfly collecting at Ngel Nyaki during Easter 2005. A list of all species collected so far is given in Appendix Four.

Highlights include:

Homeosis in *Mylothris sulphurea* Aurivillius, 1895, Torben B. Larsen [2 May 2005]

This is a male of *Mylothris sulphurea* from Ngel Nyaki. It will immediately be seen that the left hindwing has been imprinted with the entire pattern of the forewing. This very rare phenomenon is known as homeosis.



Another interesting find was *Acraea orestia* (below left, query r; below right, query v). Two more rare butterflies, *Acraea prenna* and *Graphium alamansor*, were collected in April 2006.



Using the Plonk method to catch butterflies.



# Visitors 2006

**Alex Hipkiss** (RSPB) is heading a participatory forest management/poverty alleviation project for Taraba State, with project patrollers NCF and Taraba State Forests.

**Dr Tella Iyiola** (FUTY) is Head of the Department of Forestry and Wildlife Management at FUTY.

**A. G. Leventis** and **Phil Hall** (The A. G. Leventis Foundation) visited to bird watch during April 2006.

**Georgina Mwansat** (Jos Conservation Institute)

**Sara and Steve Dobbs, and family** (American Womans Community, Lagos) as well as **Hugh Ross** and **Robin Campbell**, (Nigerian Field Society, Lagos) visited to see how the project was going and to visit the Mambilla Plateau.



'The Team', Easter 2006.

# Outputs 2006

## Completed Theses

**Josie Beck:** BSc Hons UC  
Ngel Nyaki chimpanzee survey  
Submitted October 2006 (Award pending)

**Arne Mattheus:** MSc UC  
Testing the Janzen – Connell Model For Species Diversity in a West African Montane Forest.  
Submitted June 2006 (Award pending)

**Ihuma Jerome Obo:** MSc FUTY  
The Influence of Frugivore Communities on Forest Fragment Regeneration in Ngel Nyaki Forest Reserve, Taraba State, Nigeria.  
Submitted August 2006; Awarded September 2006

## Invited Speaker

Hazel Chapman has spoken to:

- Leventis Ornithological Conservation MSc class in Jos April 2006
- University of Gombi April 2006. Whole University.
- University of Lagos November 2005. Third year Botany students.
- British International School, Lagos.

At UC Josie Beck has spoken on the Ngel Nyaki Chimpanzee and Arne Mattheus has spoken about the Janzen-Connell Hypothesis in West Africa.

## Poster

Models in Nigerian Montane Forest Phenology. Jason Bentley Supervisors J. Brown H. Chapman M. Reale Department of Mathematics and Statistics, University of Canterbury, Christchurch.

## Publications under review and in preparation

Chapman, H. M. Ecology and biogeography of African montane forests-A review. Under review *Biotropica*.

Beck, J & Chapman H.M. Nesting preferences of the Nigerian Chimpanzee in a West African montane forest, Nigeria. Submitted *Oryx*.

Mattheus A., Chapman H.M. & Kelly D. Testing the Janzen – Connell Model For Species Diversity in a West African Montane Forest. In prep for *Oikos*.

Chapman H.M.; Bentley, J. & Brown, J. Fruiting phenology in forest vs fragments; implications for frugivores behavior. In prep for *Biotropica*.

Ihuma J.O.; Chapman H.M.; Tella, I. & C. Akosim Frugivores and fragments in a West African Montane Forest. In prep for *African Journal of Ecology*.

Ihuma J.O.; Chapman H.M.; Notes on the White Crested Turaco (*Tauraco leucolophus*) in a West African Montane Forest, Nigeria. In prep For *Ostrich*.

## Popular Articles about NMFP

Canterbury Magazine (below)

UC Chronicle

Two Press articles





# The Future

## **New Students (2007) pending Funding, Applications Submitted**

Tenidayo Osinubi PhD (UC) UC & NZAid scholarships Ornithology

Adams Chaskda PhD (UC) UC & NZAid scholarships Ornithology

Aline Taylor MSc (UC) Anthropology NZAid Field Study overseas grant

## **Tree Identification Guide For Ngel Nyaki**

Matt Walters and Hazel Chapman are collaborating with researchers from the Royal Botanical Gardens Kew, and the Department of Plant Sciences, Oxford, to develop a photographic tree guide to the montane forest trees of Nigeria. To help in this Matt is visiting both Kew and Oxford to gain experience and ideas on making photographic guides, before visiting Ngel Nyaki in November 2006.

## **Field Course for FUTY MSc Wildlife Students**

Dr Tella Iyiola, Dr C. Akisim and Dr Hazel Chapman are running a week long postgraduate field course based at Ngel Nyaki during November 2006. The students will participate in on-going research projects, and think about experimental design and data analysis.

Hazel Chapman now has visiting lecturer status at FUTY.

# Appendix One

## The Influence Of Frugivore Communities On Forest Fragment Regeneration In Ngel Nyaki Forest Reserve, Taraba State, Nigeria.

Ihuma Jerome Obo.

M.TECH / FR/ 04/ 368.

Submitted September 2006

### Abstract

In this study, seed movement by five frugivore taxa (birds, primates, ungulates, rodents and bats) among four different sites (the main forest and riverine fragments A, B and C) was investigated in Ngel Nyaki Forest Reserve, Taraba State, Nigeria. The fragments are located at increasing distances from the main forest (MF) and form a corresponding gradient in increasing degradation and decreasing size. A list of all frugivores and the sites in which they were found is given in Table 1. Some of the frugivores identified in the sites are potential seed dispersers among the sites, the most common of which are the white crested turaco (*Tauraco leucolophus*), the African green pigeon (*Treron calvus*), the double-toothed barbet (*Lybius bidentatis*) and tentalose monkeys (*Cercothecus aethiops*).

Investigation into differences among the four sites in terms of vegetation and frugivores composition was carried out using correspondence analysis (CA), species frequency data from plots and numeration using the Point Centre Quarter method. The MF was more species rich than all of the other three sites (fragments A, B and C), for both frugivores and plant species. Evidence of seed dispersal from the MF to the fragments would be the presence of seedlings or saplings in the fragments of woody adult species only found in the MF. However none were found. Instead, most of the regeneration in the fragments was of pioneer species, many of which are uncommon in the MF. This is most probably because even if seeds are moved among sites, germination of such seeds is highly unlikely because of deteriorated microsites. For example in fragment C, a high incidence of illegal grazing, wildfire and cutting down of trees are some of the human activities preventing the likelihood of regeneration within this highly degraded site. To these effects, artificial regeneration of the degraded site, stiffer penalties on illegal grazers, a public enlightenment campaign, fencing of the fragments, and further research are recommended for the maintenance and restoration of this fragile ecosystem.

Table1: Frugivores identified in the MF and fragments A, B and C.

Family	COMMON NAME	SPECIES+	No. sighted out of 5 days				
			MF	A	B	C	
<b>PYCNONOTIDAE</b>							
	Western mountain greenbul	<i>Andropadus tephrolaemus</i>	4	2	1	1	
	Slender billed greenbul	<i>Andropadus gracilirostris</i>	3				
	Common bulbul	<i>Pycnonotus barbatus</i>	5	5	5	5	
	Simple leaflove	<i>Chlorocichla simplex</i>	1	3	5	4	
<b>PHASIANIDAE</b>							
	Double-spurred francolin	<i>Francolinus bicalcaratus</i>	1	3	5	4	
<b>COLUMBIDAE</b>							
	African green pigeon	<i>Treron calvus</i>	4	1	1	3	
	Tambourine dove	<i>Turtur tympanistris</i>	2	1	1	1	
	Blue-spotted wood dove	<i>Turtur afer</i>	1	2	1	1	
	Cameroon olive pigeon	<i>Columba sjostedti</i>	4	2	1	1	
	Red-eyed dove	<i>Streptopelia semitorquata</i>	5	5	5	5	
	Adamawa turtle Dove	<i>Streptopelia hypopyrrha</i>	2	1	3	5	
<b>CAPITONIDAE</b>							
	Naked-faced barbet	<i>Gymnobucco calvus</i>					
	Double-toothed barbet	<i>Lybius bidentatis</i>	5	5	5	5	
	Yellow-rumped tinkerbird	<i>Pogoniulus bilineatus</i>	5				
	Yellow-spotted barbet	<i>Buccanodon duchaillui</i>	4				
<b>TURDIDAE</b>							
	African thrush	<i>Turdus pelios</i>	3	2	5	5	
<b>SYLVIIDAE</b>							
	Garden warbler	<i>Sylvia borin</i>	5	5	5	5	
	Willow warbler	<i>Phylloscopus trochilus</i>	5	5	5	5	
<b>TURACOS</b>							
	<b>MUSOPHAGIDAE</b>						
	Great blue turaco	<i>Corythaeola cristate</i>	1				
	Green turaco	<i>Tauraco persa</i>	5				
	White-crested turaco	<i>T. leucolophus</i>	1	4	4	4	
	Western grey plantain eater	<i>Crinifer piscator</i>				2	
<b>BUCEROTIDAE</b>							
	Piping hornbill	<i>Bycanistes fistulator</i>	5				
<b>PLATYSTEIRIDAE</b>							
	Common wattle-eye	<i>Platysteira cyanea</i>	4	2	1	1	
<b>PLOCEIDAE</b>							
	Bannerman's weaver	<i>Ploceus bannermani</i>	2	4	4	5	
	Baglafaecht weaver	<i>P. baglafaecht</i>	2	5	5	5	
	Black-necked weaver	<i>P. nigricollis</i>	1	1	1	1	
<b>FRINGILLIDAE</b>							
	Oriole finch	<i>Linurgus olivaceus</i>	3	3	1	1	
<b>WHITE-EYE</b>							
	<b>ZOSTEROPIIDAE</b>						
	Yellow white-eye	<i>Zosterops senegalensis</i>	1	3	1	1	
<b>MOUSEBIRDS</b>							
	<b>COLIIDAE</b>						
	Speckled mousebird	<i>Colius striatus</i>	4	5	5	5	
<b>Mammals</b>							
<b>UNGULATES</b>							
	<b>ANTELOPINAE</b>						
	Blue duiker	<i>Cephalophus monticola</i>	2				
	Red flanked duiker	<i>C. rufilatus</i>	1	1	1	1	
<b>Squirrels</b>							
	<b>SCIURIDAE</b>						
	Sided-striped tree squirrel	<i>Funisciurus anerythrus</i>	5	5	5	5	
<b>BATS</b>							
	<b>PTEROPODIDAE</b>						
	Bat	<i>Tadarida spp</i>	1	1	1		
<b>PRIMATES</b>							
	<b>ERCOPITHECINAE</b>						
	Olive baboon	<i>Papio anubis</i>	4				
	Putty-nosed monkey	<i>Cercoptes nicitans</i>	4				
	Tantalus monkey	<i>C. aethiops</i>	5	5	5	4	
	Mona monkey	<i>C. mona</i>	2				
	Black and White colobus monkey	<i>Colobus guereza</i>	2				
	<b>HOMINIDAE</b>						
	Nigerian Chimpanzee	<i>Pan troglodytes vellerosus</i>	1				
<b>Total</b>			<b>40</b>	<b>119</b>	<b>81</b>	<b>83</b>	<b>84</b>

+ = Bird nomenclature after (Borrow 1998).

# Appendix Two

## Ngel Nyaki Chimpanzee Survey

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Part Fulfilment of BSc Hons Biology  
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To be Submitted October 31st 2006

### Summary

#### Introduction

Chimpanzees (*Pan troglodytes*) belong to the genus *Pan*, endemic to equatorial Africa (?). The only other member of the genus is the Bonobo (*P. paniscus*) (Inskipp 2005). *P. troglodytes* is further divided into four subspecies: *P. t. troglodytes* (central Africa), *P. t. schweinfurthii* (east Africa), *P. t. verus* (west Africa) and *P. t. vellerosus* (east Nigeria/ west Cameroon) (Caldecott and Miles 2005). Numerous wild populations have been studied throughout Africa, however, relatively few long-term studies exist, particularly in the case of the Nigerian-Cameroon chimpanzee which has not been the subject of any long-term research (Goodall 1994, Caldecott and Miles 2005). The newly recognised and unstudied subspecies of chimpanzee (Gonder et al. 1997) is known to be endemic to eastern Nigeria. Only a few populations are known, and in 2000, the World Conservation Union (IUCN) categorized *P. troglodytes* as Endangered, with a very high risk of extinction in the near future (Caldecott and Miles 2005).

One site where *P. troglodytes vellerosus* occurs is Ngel Nyaki; a montane forest (forests above +/- 1500m) of approximately 8km<sup>2</sup> is situated in Taraba State, eastern Nigeria. However Ngel Nyaki has suffered a dramatic decrease in wildlife since the 1970's (Chapman et al., 2004), and undoubtedly the chimpanzee population is under threat. These findings highlight the need for urgent conservation action to be put into place. Continued habitat destruction, fragmentation and degradation will likely lead to a further reduction in chimpanzee numbers, and thus genetic diversity, ultimately resulting in the disappearance of this unique satellite population.

Knowledge of the demography and population genetics is fundamental when considering whether a population is threatened with extinction; this community information can then be used to aid in the planning of conservation efforts (Merenlender and Dobson 1990). According to Oates (2006) species conservation should endeavour to preserve as much ecological, morphological, behavioural and genetic diversity as possible, drawing attention to the requirement for the conservation of individual subspecies. Yet there is an extreme paucity in the existing data for the comparative behaviour and ecology of *P. t. vellerosus*; furthermore, *P. t. vellerosus* is recognised as the most underrepresented subspecies in national parks prior to this study, the chimpanzee community of Ngel Nyaki had never been censused (Oates 2006).

#### Objectives

The primary objectives of this study were to firstly to conduct the first survey of the current population densities for *P. t. vellerosus* within the Ngel Nyaki montane forest reserve, and secondly, to begin preliminary investigations to provide some insight into the population's behavioural ecology, including their potential importance as large seed dispersers. Nest densities are commonly used to assess ape population size and distribution (Plumptre and Reynolds 1997, Johnson et al. 2005, Plumptre and Cox 2006). Line transect surveys of nests are currently the preferred technique for determining the density of unhabituated or cryptic animals (Whitesides et al. 1988, Buckland et al. 1993). Thus, nesting behaviour of chimpanzees allow a valuable means by which to gather population status data, with the added advantage of providing this information in a relatively short period. Nests are commonly utilized as a means of estimating density but can also be studied as entities in their own right (Fowler, unpublished); however, to date, few studies have utilized this information (Fruth and Hohmann 1996) (Fowler, unpublished). This approach allows further assessments to be made about the population, without requiring direct observations. The study of nests and nest groups can determine which variables, such as proximity to water, nest height and tree species, are important in typifying nest construction and location. Additionally information on nest groups can be used to determine the size of individual foraging parties. Results detailing observed trends associated

with nest building also allow further comparative studies to be made among populations (Fowler, unpublished). In particular, similar primate work recently undertaken in Gashaka Gumti National Park provides an exemplary opportunity for such comparisons.

## Methods

### Population census

Approximately 10 km (n=8) of straight line transects, were cut within the Ngel Nyaki primary forest (7.5 km<sup>2</sup>), positioned 500 meters apart using Global Positioning System (GPS) navigation. Each transect was walked five times at two week intervals in opposite directions to minimize the chance that nests were missed, particularly those directly above the transect. All nests visible and within 30 meters of transects were recorded, measuring the perpendicular distance from directly below the nest to the transect (Plumptre and Reynolds 1996).

### Nest data analysis

The computer software package DISTANCE (Ref) was used to calculate chimpanzee nest density. This software models the decreasing probability of nests seen with increasing distance from the transect, fitting a detection function to the observed distribution of recorded nests (Buckland et al. 1993). In this study, different models were fitted, and the Akaike Information Criterion (AIC) was used to select the best model for the data, based on the Kullback-Leibler “distance” between two distributions (Buckland et al. 1993). An average estimated density from the top competing model was then converted into an estimate of the chimpanzee population density within Ngel Nyaki. Using the marked nest count, it can be assumed that all nests old nests were marked before the counts started, reducing the bias in determining age decay (Matthews and Matthews 2004). Therefore, the total nest density estimate was divided by the time in days between the first walk of the transect and the last. This is possible provided that each subsequent transect walk occurs before the minimum time taken for nests to decay (Plumptre and Reynolds 1996).

### Nest site selection statistics

Pearson’s Chi-squared test and Pearson’s Chi-squared test with simulated p-value (based on 2000 replicates) were employed to determine whether chimpanzees demonstrate any nest-tree species selectivity. Nest-tree species data from the present study was compared to phenology data of trees 2.5 m either side of all 8 transects (species = 113) (Chapman, 2005 unpublished). A multiple regression model was used to investigate the effect five environmental variables: diameter at breast height, lowest branch, and total height of nesting tree; nesting tree species; and lastly, forest environment, on chimpanzee nesting height. All five variables were incorporated into the regression model and the insignificant variables were rejected based on the Akaike Information Criterion (AIC).

### Comparative studies

Similar research recently undertaken on chimpanzee populations within Gashaka Gumti National Park (Fowler, unpublished) subsequently allowed a cross-population comparative analysis of the observed preferences for determining nest site selection.

## Results

Results are in a paper submitted to *Oryx*.

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# Appendix Three

## Phenology

The phenology transects are located so that we can reduce the effects of several factors which are thought to influence phenological patterns, by comparing phenology among transects. Some transects are located along the forest edge and across forest fragments, where trees are relatively short and exposed to wind, and where primate (major frugivores) communities are absent. Other transects run across the centre of the forest where trees are taller, denser and more sheltered, and are in prime primate habitat. In this way the influence of tree size, tree density, wind and frugivores on tree phenology can be taken into consideration.

At Ngel Nyaki one data set of monthly records of phenological phases is measured as scores (categorical data), and another data set comprising fortnightly records, is recorded as continuous data.

- i) The first set of ten transects comprise 8 km in total length, and are located across the Ngel Nyaki forest. To assess the periodicity and intensity of phenological events, monthly data observations are carried out on a selection of trees along the transect with a diameter at breast height (DBH) of >2 cm. A total of 67 species, represented by 868 individuals, are sampled, with the sample size ranging between 1 and 65 trees per species. Sampling methods follow those of Sun et al., 1996.
- ii) The continuous data comes from a pair of 2 km long transects across the forest. Along each transect, within 2 m of the centre line, all trees (1000/transect) with a DBH >2 cm are scored fortnightly for phenological events. This method follows the Primate Research Network who are carrying out comparative studies in lowland forests in Nigeria, the Congo and Cote D'Ivoire.
- iii) Weather data (temperature, rainfall and irradiance) are recorded on a daily basis from the forest edge.

The phenology data thus far has indicated that flowerbud and flower intensity decline in the middle of the wet season, while fruit abundance appears to remain relatively constant except for a brief decline at the beginning of the dry season. Spectral analysis of the phenological time series have so far indicated cycles of annual and bi annual periodicity, which is to be investigated in more detail. Analysis of the phenological data for three different locations: forest interior, forest edge and fragments, have indicated that the behavior of the fragment is statistically different from that of the forest edge and interior which are statistically the same. This has further indicated declines in fruit abundance in the forest appears to coincide with increases in fruit abundance in fragments. The analysis is still on going and is updated as more data is available. The roles of species, climate and micro-environment have yet to be analyzed in detail, with the hopes the use of new methods such as Graphical Modeling of the time series data will yield statistical evidence of casual relationships between phenological states and climate. Methods involving the use of density weighted transformations of the time series may allow density estimation for phenological events in a given month allowing for a comparison of distributions over time.





# Appendix Four

## Butterflies

D.P. Knoop is responsible for taxonomic determinations and for convenience, nomenclature and sequence follows Carcasson.

Species confined to the Cameroon-Nigeria Afrotropical group are marked with an asterisks (\*).

ssp. a subspecies.

Lepidoptera (Rhopalocera) collected at Ngel Nyaki 11-2005

Type faces and position below Super-Family status.

PAPILIONOIDEAE	Super-Family
PAPILIONIDAE	Family
PAPILIONINAE	Subfamily
LAMPROPTERINI	Tribe
Graphium Scopoli, 1777	Genus

Systematic species list of Lepidoptera (Rhopalocera)

HESPERIOIDAE

HESPERIIDAE

1 species not identified...

PAPILIONOIDEAE

PAPILIONINAE

Papilio (Linnaeus, 1758)  
 plagiatus \*(Aurivillius, 1898)  
 zenobia (Fabricius, 1775)  
 demodocus (Esper, 1798)  
 dardanus (Brown, 1776)

NYMPHALIDAE

SATYRINAE

MELANITINI

Gnophodes Westwood, 1851  
 betsimena ssp. parmeno (Doubleday & Hewitson, 1851)  
 Bicyclus Kirby, 1871  
 mandanes (Hewitson, 1873) Riverine and lowland forest.  
 golo (Aurivillius, 1893) Montane forest.  
 ? safitza  
 ? sangmelinae

SATYRINI

Ypthima Hubner, 1818  
 albida ssp. occidentalis \*(Bartel, 1905)

COLIADINAE

Catopsilia Hubner, 1819  
 florella (Fabricius, 1807)  
 Eurema Hubner, 1819  
 brigitta (Stoll, 1780)

PIERINAE

Colotis Hubner, 1819  
 aurora ssp. evarne  
 Belenois Hubner, 1819  
 calypso (Drury, 1773)  
 aurota (Fabricius, 1793)  
 Mylothris Hubner, 1819  
 chloris (Fabricius, 1775)  
 jacksoni ssp. knudsoni (Aurivillius, 1891)

CHARAXINAE

Charaxes Ochseneheimer, 1816  
 fulvescens (Aurivillius, 1891)

NYMPHALINAE

Bebearia Hemming, 1960  
 plistonax (Hewitson, 1874)  
 sophus (Fabricius, 1793)  
 Euphaedra Hubner, 1819  
 zaddachi (Dewitz, 1879)  
 medon (Linnaeus, 1763)  
 losinga (Hewitson, 1862)  
 ? prosperina - really bad specimen  
 Aterica Boisduval, 1833  
 galene (Brown, 1776)  
 Cynandra Schatz, 1887  
 opis (Drury, 1773)

NYMPHALINI

Kallimoides Shironzu & Nakanishi, 1984  
 rumia (Westwood, 1850)  
 Protogoniomorpha (?)  
 parhassus (Drury, 1782)  
 Junonia Hubner, 1819  
 orithia ssp. madagascariensis (Guenee, 1864) Woodland and montane grassland.  
 hierta ssp. cebrene (Trimen, 1870) Woodland and montane grassland.  
 terea (Drury, 1773) Woodland.  
 Precis Hubner, 1819  
 octavia (Cramer, 1777) Woodland, Montane grassland.  
 perlarga (Fabricius, 1775) Woodland.  
 rauana ssp. omissa (Rothschild, 1918) Montane forest.  
 BIBLINI

Byblia Hubner, 1818

anvatara ssp. crameri (Aurivillius, 1894)

NEPTINI

Neptis Fabricius, 1807  
 morosa (Overlaet, 1955)

ACRAEINAE

ACRAEINI

Acraea (Fabricius, 1807)  
 viviana \*(Staudinger, 1896) Montane forest, Leinde Fadali.  
 karschi \*(Aurivillius, 1898) Montane forest.  
 pharsalus (Ward, 1871) Lowland and montane forest.  
 lycoa (Godart, 1819) Woodland and lowland forest.  
 serena (?)  
 rogersi \*(Hewitson, 1873) Montane forest.  
 bonasia (Fabricius, 1775)

Lepidoptera (Rhopalocera) collected at Ngel Nyaki 4-2006

two very good records were added to N'gel Nyaki:

- Acraea prena
- Graphium alamansor

Also:

Graphium alamansor\*  
 Hypolimnas salmacis  
 Protogoniomorpha temora  
 Junonia oenone  
 Belenois zochalia\*  
 Pseudargynnis hegemone\*  
 Charaxes etheocles  
 Neptis morosa  
 Bicyclus safitza  
 Acraea prena  
 rogersi  
 egina

Amauris damocles

\*Montane stenotypics

Both are rarely encountered within Nigeria.

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