



Nigerian Montane Forest Project
Montane Forest Conservation Initiative Nigeria

Annual Report



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Introduction



Anastasios (Tasso) Paul Leventis - Patron



Phil Hall (Chair)



John Adeyemi Adeleke



Roger Wilkinson



Danladi Umar



Hazel Chapman

“Highly industrious staff with eloquent commitment and bound with love”

-One comment of many in our visitors book.

It is a pleasure to introduce the 2015 NMFP Annual Report. I can say with confidence that the Project is thriving. Manager, Misa Zubairu and his deputy, Usman Abubakar are doing an admirable job and they are backed by a team of committed and enthusiastic field assistants. Support from the community including leaders such as His Royal Highness the Chief of Gembu, the Galadema of Ngaroji, the Waikili of the Fulani and the Jauro of Yelwa remains invaluable.

The members of our Advisory Board continue to provide the guidance, connections and support that are so necessary to keep the project running smoothly. We are very fortunate to have them.

The establishment and first census of the 20 ha T.Y. Danjuma CTFs-ForestGeo is now complete. This has been a major undertaking and with Smithsonian backing and ForestGEO guidance, our plot will link with the other 62 ForestGEO sites around the world, feeding information into a global data set that will further our understanding of Earth's forests and changing climate.

This year almost 8 km of fencing have been erected to prevent grassland along the forest edge being burnt and grazed by cattle. In this way we hope to re-establish forest and thereby increase the area of our special Afromontane forest.

Postgraduate research this year has included three new PhD projects, two funded by T.Y. Danjuma, with several more due to commence in 2016. Sadly New Zealand students are still unable to travel to Nigeria for security reasons; I am hoping that the introduction of flights from Abuja direct to Taraba State (Jalingo), which began operating 7th Dec 2015, may change things.

Industrial Training undergraduate student numbers are up, with 11 this year from Taraba State University, Gombe State University and Jalingo Agricultural College.

Of course none of this is possible without the assistance of our sponsors whose continual support is hugely appreciated.

As usual a big 'thank you' to Matt Walters who is responsible for the high quality of this Annual Report.

Hazel Chapman

Director, Nigerian Montane Forest Project

Our values

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.

Our networks

Project Partners / Collaborators

A.P. Leventis Ornithological Research Institute, Jos, Nigeria (APLORI)
Chester Zoo, England
Federal University of Kashere, Nigeria
Gashaka Biodiversity Project, England/Nigeria
Gombe State University, Nigeria
Lincoln University, New Zealand
Mayfield Community Ecology Laboratory, The University of Queensland, Australia
Nigerian Conservation Foundation (NCF)
Nigerian National Parks (NNP)
Professor Pierre-Michel Forget, Natural History Museum, Paris, France
Royal Botanic Gardens, Kew, England
Smithsonian Tropical Research Institute-ForestGEO®, USA
Taraba State Government, Nigeria
Taraba State University (TSU), Nigeria
University of Canterbury, New Zealand (UC)
California Academy of Sciences, San Francisco, USA

Project Funders

A.G. Leventis Foundation
Chester Zoo
Direct Aid Program (DAP) – Australian High Commission Abuja.
Gombe State University
Nexen Nigeria; Nexen Inc.
Taraba State Government
T.Y. Danjuma
T.Y. Danjuma Taraba State Community Fund

Academic Supervisors

Prof Jennifer Brown (UC)
Assoc Prof Hazel Chapman (UC)
Dr Alexander Christianini (Federal University São Carlos, Brazil)
Prof Pierre-Michel Forget (Natural History Museum, Paris, France)
Dr William Godsoe (Bio-Protection, Lincoln University, NZ)
Dr Marie Hale (UC)
Prof Jon Harding (UC)
Assoc Prof Alex James (UC)
Prof Dave Kelly (UC)
Prof Mike Lawes (Charles Darwin University, Darwin, Australia)
Dr Daniel Gerhard (UC)
Dr Shiiwua Manu (APLORI)
Dr Elena Molchanova (UC)
Prof David Norton (UC)
Dr Ulf Ottosson (Leventis Conservation Institute, Aplori, Nigeria)
Assoc Prof Anton Pauw (Stellenbosch, South Africa)
Dr Mike Plank (UC)
Assoc Prof Peyman Zawar-Reza (UC)

Research Highlight: Monitoring for long term success

Thanks to the generous funding from retired General T.Y. Danjuma Ngel Nyaki is now internationally linked to over 60 CTFs- ForestGeo plots worldwide.

The Center for Tropical Forest Science and Forest Global Earth Observatories (CTFS-ForestGEO) are a global network of forest research plots and scientists dedicated to the study of tropical and temperate forest function and diversity. The multi-institutional network comprises over 60 forest research plots across the Americas, Africa, Asia, and Europe, with a strong focus on tropical regions. CTFS-ForestGEO monitors the growth and survival of approximately 6 million trees and 10,000 species that occur in the forest plots. CTFS-ForestGEO also supports initiatives in the forest plots to monitor climate, carbon flux, vertebrates, insects, soil microorganisms, and much more.

The difficult job of surveying the plot was complete by the end of January, 2015. The surveyors demarcated the 507 20 x 20 m² quadrats within the 20 ha plot and produced maps showing both quadrat layout and topography. Since then the first census of the plot by the Ngel Nyaki team (Figs 3 & 4) lead by Iveren Abiem is now complete. This includes subdividing each of the original 20 X 20 m² quadrats in to 10 x 10 m² and the 5 x 5 m² quadrats to allow accurate mapping within each quadrat. Every tree of 10 mm or greater diameter at breast height (DBH) is labelled, identified to species level, its DBH measured and the tree location in the quadrat mapped. This represents 97 tree species and more than 40,000 individual trees. All these data create a huge data set.

In order to manage these data and to ensure they are part of the ForestGeo network of plot data, Hazel attended the 10 day Smithsonian CTFS-ForestGeo African data management workshop held in Washington DC in October 2015. Through the workshop it became clear how our Ngel Nyaki data will link with ForestGEO sites around the world, feeding information into a global data set that will further our understanding of Earth's forests and changing climate.

Figure 2. African ForestGeo plot managers in Washington, D.C. From left to right: Paul Musili (Mpala, Kenya), Pulcherie Bissiengou (Rabi, Gabon), Alexander Mengnjo (Korup, Cameroon), David Kenfack (Korup, Cameroon; Mpala, Kenya; Ngel Nyaki, Nigeria) Amani Ngoma (Ituri, Rep. of Congo), Hazel Chapman (Ngel Nyaki, Nigeria), and Suzanne Lao. Suzanne and David ran the workshop.

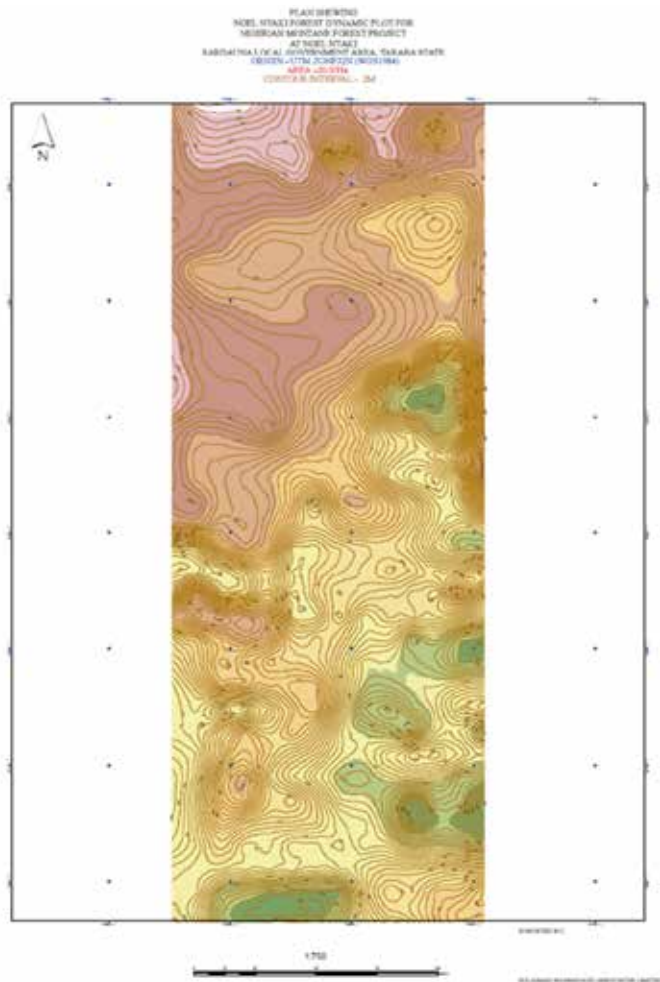


Figure 1. Topographic map of the ForestGEO plot.





Figure 3. The CTFS ForestGeo team - from left to right Abubakar Musa, Comfort Moses, Enoch Zachaeus, Helen Andrew, Dahiru Zubairu, Helen Abel, Aliyu Dabo, Ahmadu Salihu.



Figure 4. Collecting plot data.

A snapshot of our science



Figure 5. Shedrach Kongvong and Yusuf Tongbuin monitoring fruit removal from *Psychotria*.

Science coordinator

Shedrach Kongvong is our new Tasso Leventis sponsored science coordinator. Shedrach ensures good communication between supervisors, students and field assistants. He also helps the IT students with their research projects.

As part of his own research Shedrach is investigating the frugivore fauna of Ngel Nyaki to determine which frugivores disperse the seeds of which tree species and how. For example he has shown that turacos feed on *Syzygium*, moving seeds far away, while in contrast, *Allophylus* seeds mainly fall to the ground uneaten and are then move away from the parent plant by rodents. This knowledge will feed into conservation management plans for the forest reserve.

Phenology measurements

The timing of key events in a tree's annual cycle—such as the production of new leaves, flowers and fruit—underpin much of our research. For example variations in abundance and timing of fruit production influence rodent densities which can, in turn, affect recruitment patterns. Fruit production can also influence primate behaviours; fruit availability can influence group size and levels of feeding competition.



Figure 6. Field assistants Hammasumo and Ali collecting phenology data from a *Syzygium* tree.

Hammasumo and Ali monitor almost 2000 individual trees every month for the abundance and timing of new leaves, flower buds, flowers, immature and mature fruits. The trees are along transects throughout the forest. In order to ensure the data they collect is not lost the data sheets are scanned and copies sent to UC. In addition the field assistants enter the data they collect onto excel data sheets for analysis.

Permanent photo points

The 11 permanent photo points detailed in the 2014 report are proving very useful. Since 2005 there is clear documentation of forest restoration and increased grass growth. The photos, because they are taken at 360° at each point also document changes in plateau land use more generally. For example the spread of the weedy daisy *Guizotia*, new buildings and maize plots.



Figure 7. Usman Abubakar taking a picture at photo point 1. To ensure consistency Usman takes the photos himself every year.



Figure 8. 2005 - Photo point one, looking across from the field station onto the hill.



2015 - the effect of protection from burning and grazing for ten years illustrating the rate of forest regeneration

Improving natural forest regeneration

The NMFP has several long-term research projects investigating ways in which to encourage and hasten natural forest regeneration. An obvious impediment to tree seedling regeneration is the thick, tall grass sward that quickly establishes when burning and grazing are prohibited.

One of our experiments involves a multi-factorial design comparing seedling establishment under a light burn, cutting grass with a scythe, introducing perches for birds and doing nothing but protect the grassland from fire and grazing.

Preliminary results indicate that the grass sward is so thick and competition so high that only cutting grass with a scythe helps promote tree seedling establishment. Perches do attract seed dispersing birds but the seeds are either predated or seedlings are out-competed by grass. Burning (even a light burn) destroys forest tree seedlings.



Figure 9. Carrying out the treatments. Cutting and burning are undertaken every year.

Permanent vegetation plots

In order to document the changes occurring in the fenced-off grassland, in 2012 we established twelve 10 m² permanent vegetation plots which are censused every other year. This year, as well as surveying them, we have updated the taxonomy of all the herbs and grasses. This has been a team effort, Mr Elisha Emmanuel Barde from Aplori provided updated species names and the TSU IT students with Usman and Idriss (the latter taking botanical photographs) have collected to date 39 botanical specimens for the herbarium. From this work it is now clear that the genera *Schizatarium* and *Hyparrhenia* are the most common tall grasses replacing *Sporobolus* after the grassland is protected from burning and grazing.



Figure 10. TSU students collecting grasses for identification from a permanent vegetation plot. Some grasses are forming dense swards which compete with tree seedlings trying to establish. Usman training Nelly and Dennis, while Idriss takes the botanical photographs.

BirdTrack

Ngel Nyaki has joined APLORI in contributing to Bird Track. An exciting project, Bird Track uses data collected by citizens to map migration movements and distributions of birds. Notes and records of all birds observed are entered into a specially designed web site. BirdTrack software, designed by the British Trust for Ornithology (BTO) provides facilities for observers to store and manage their own personal records as well as using these to support species conservation at local, regional, national and international scales. Daily, species lists are updated by the BTO computer to produce current maps and species distributions.



Plant Checklist grows following visit to Royal Botanic Gardens, Kew

During June-July Matt Walters took up his UC Vice-Chancellors Study Award to visit RBG Kew. He worked alongside a range of botany experts to learn additional taxonomy and herbarium skills whilst focusing on the plant specimens collected from Ngel Nyaki Forest Reserve.

The Project's 378 herbarium specimens at Kew, collected over the past 10 years, now have tentative identifications and specimen information has been added to a database. Twenty additional species were found and added to the illustrated checklist on our website which now covers 294 species across 101 families.

Support from experts at Kew with confirming identifications included Martin Cheek (many African families), George Gosline (Annonaceae, Olaceae), Martin Xanthos (Poaceae), Gwilym Lewis (Fabaceae), all recognised as world experts in their fields.

The specimens can now be added to the Kew catalogue, allowing other researchers access to the data and specimens. This will be an advantage to the Project and may lead to additional collaborations.

Matt also met with Dr Neil Brummitt and Ms Lucia Lopez Poveda from the Natural History Museum, London, who are working on the International Union for the Conservation of Nature (IUCN) Sampled Red List Index for Plants in Africa and aim to fill this gap by providing a baseline for global plant conservation. Matt was able to update them on progress and opportunities at Ngel Nyaki and share the checklist data he has compiled.



Figure 11. TSU IT students collecting data for Bird Track. The students are trained in bird identification by Shedrach Konvong from APLORI.



Figure 12. In the herbarium at RBG Kew comparing a specimen from Ngel Nyaki, Nigeria (right) to two named specimens.

Postgraduate students



Figure 13. Jen with Thomas and IT students preparing seeds to be used in an experiment exploring the role of ants in seed dispersal in Ngel Nyaki forest. Removing the fruit coat allows us to determine whether it is the fruit or the seed that the ants are interested in.

Jennifer Agaldo TY Danjuma Scholar

Field assistants Thomas Patrick and Musa Bawuro

The role of ants in seed dispersal and regeneration of natural forest and degraded Afro-montane Grassland in Ngel Nyaki Forest Reserve, Nigeria.

In some forests (for example in the Neo-tropics and Australia) ants can play an important role in seed dispersal, particularly when large primary dispersers become rare or locally extinct. Yet we know almost nothing about the potential for montane forest ants to aid in forest regeneration or restoration.

Jennifer has had her first field season at Ngel Nyaki and has identified two ant species (of many) which appear to be important seed dispersers. She is identifying species dispersed, dispersal distances and following the fate of dispersed seeds in forest, edge and regenerating forest habitats.



Figure 14. Jen and her field assistants Musa and Thomas.



Figure 15. Biplang with his team setting out a grid for the rat traps.

Biplang Yadock TY Danjuma Scholar

Field assistants Adams Hassan, Ibrahim A. Umar, Yusuf Tongbuin
 Dispersal efficiency of the African giant pouched rat (*Cricetomys*) in a degraded Afrotropical montane forest landscape. Biplang is carrying on from Aliyu Babale's work on the role of the pouched rat in the dispersal of large seeds. His four main aims are as follows:

1. To determine the density and home range of *Cricetomys* in the main habitats of Ngel Nyaki forest reserve; core forest, riparian fragments and grassland using capture mark recapture and spatially explicit capture recapture (SECR) method.
2. To determine how the dispersal ecology of *Cricetomys* (seed preference; seed removal rate, and dispersal distance) affects seed fate. This will be carried out using seed removal experiments of different species and sizes under different conditions
3. To determine whether *Cricetomys* preferentially moves seeds into safe sites. This will be carried out using telemetric thread tags to monitor directed dispersal.
4. To determine the role of *Cricetomys* in restoring grasslands of Ngel Nyaki into forest. This will be carried out by using seedlings (In grassland) observation data in combination with GIS tools.

From two years seed removal data Biplang has shown that removal rates and distances moved of different species are different, but are unrelated to seed size. Further investigation by answering the objectives above will elucidate the importance and effectiveness of *Cricetomys* in forest restoration conservation of tree diversity in Ngel Nyaki forest.



Figure 16. The African giant pouched rat.



Figure 17. Collecting specimens of mistletoe DNA for subsequent analysis at UC

Daniel Andrawus GSU

Field assistants Yakubu Vugeh, Alfred Christopher

Daniel is working on the taxonomy and systematics of mistletoes at Ngel Nyaki reserve. He has identified five species which occur in the reserve and from these has collected leaf samples for DNA analysis at UC. Daniel's aim is to combine morphometric studies with pollen identification and molecular analysis to better understand their taxonomy and conservation genetics.

Daniel is currently waiting for TETF funding for a PhD at UC but has started doing his field work at Ngel Nyaki already.

Auwal Abdullahi PhD UC.

Auwal is working with Drs Alex James and Mike Plank from UC to develop models in order to predict seed removal rates by rodents from the forest floor and subsequent seed fate.

This work will be extremely useful in predicting dispersal kernels over time with land use change. We are especially interested in the potential for dispersal rates to increase following the loss of large frugivores.

The models are based on data collected from Babale Aliyu's work on secondary dispersal of the large seeded *Carapa oreophila* in Ngel Nyaki forest.



Figure 18. Auwal, Murna Tella and Babale Aliyu



Figure 19. Murna is studying ecosystem services provided by birds who depend on small forest fragments amongst the agricultural land on Mambilla Plateau, such as the one seen in this photo.

New PhD Students 2016

Murna Tella

Murna is a lecturer at Gombe State University and is studying towards a PhD at UC funded by a NZAid scholarship.

Her research topic is investigating the ecosystem services provided by birds in Ngel Nyaki forest and surrounding agricultural lands. She is collaborating with Dr Shiiuwa Manu of Aplori.

Iveren Abiem

Iveren is a lecturer at the University of Jos and is currently waiting for TETF funding for a PhD at UC.

Her research will focus on using the CTFS-ForestGeo plot (of which she is the manager) to understand forest regeneration and seed rain.

She will set up seed traps within the forest plot to monitor seed rain and explore the contributions of abiotic and biotic factors in seedling recruitment.

Susinya Habila

Susinya is a lecturer at Gombe State University and his admission to UC is waiting on TETF funding to come through.

His PhD research is on the ecophysiology of light and shade tolerant seedlings in Ngel Nyaki forest - in collaboration with Prof Matthew Turnbull at UC.



Figure 20. Murna Tella and Iveren Abiem.

Industrial Training students



Figure 21. Abdul Wahab Yusuf, Kokina Ayebuga, Oladeinde Taofeek (Dennis), Nelly Azege, Joshua David Kaka, Elizabeth Peter.

11 undergraduate students have spent six months at the NMFP during 2015.

This year we have had three students from Gombe State University (GSU) at the field station between May and October 2015. These were all excellent students and their projects were:

1. Enoch Ishaku - reproductive ecology of *Psycotria peduncularis*
2. Maurice Suwange- seed dispersal in mistletoes
3. David Shegaboar- How pot size affects the agronomic performance of *Parkia filicoides*

In addition we have had six students from TSU who arrived in October and will be here until March 2016.

Abdul Wahab Yusuf; Oladeinde Taofeek (Dennis); Kokina Ayebuga; Elizabeth Peter, Nelly Azege; Joshua David Kaka.

From the Jalingo College of Agriculture we have Abubaker Bauru and Elija Nicodemus



Figure 22. Enoch Ishaku, Maurice Suwange and David Shegaboar, IT students from GSU



Figure 23. Abubaker Bauru and Elija Nicodemus, IT students from Jalingo College of Agriculture,



Figure 24. Aliyu Usman with field assistants setting up an exclusion experiment on *Psychotria*. The aim of the experiment is to determine what is pollinating *Psychotria*- birds, bats or insects. The netting excludes all pollinators and lets us know if *Psychotria* flowers are able to self pollinate. Wire cages, not shown, exclude birds and bats but allow insects to pollinate. The production of fruit indicates pollination.



IT projects start of long term research

Update from a 2014 IT student, who like several others, are carrying on their IT projects started at Ngel Nyaki and making them their Honours projects at TSU.

Ali Usman (TSU) Field assistant George Godson, Thomas Patrick

I am an undergraduate student from the Geography department, Taraba State University (TSU) Jalingo. I am interested in seed dispersal studies, general ecology and conservation. At the moment, I am working on a project titled "The reproduction ecology of Psychotria in Ngel Nyaki Forest Reserve, Taraba State". So far I have collected the data on pollination and seed/fruit set of Psychotria. I am currently collecting data on the seed dispersal of Psychotria. Overall, it has been a very interesting and challenging experience. I am optimistic that results obtained from my project will add to the pollination and seed dispersal network currently being studied in Ngel Nyaki Forest reserves.

Figure 25. Flowers and fruit of *Psychotria peduncularis*, a common species at Ngel Nyaki.

Outputs



Denise Arroyo - PhD



Kelly Hutchinson - MSc



Charles Nsor - PhD

Completed Theses

- Denise Arroyo PhD: Frog diversity and population genetics at Ngel Nyaki Examined April 2015
- Kelly Hutchinson MSc: Feeding ecology of Putty nose monkey September 2015
- Charles Nsor PhD: Sunbird tree pollination network November 2015

Peer-reviewed articles:

1. Knight, A.; Chapman, H. M.; Hale, M. (2015) Habitat fragmentation and its implications for Endangered chimpanzee *Pan troglodytes* conservation.. *Oryx* : 1-4. <http://dx.doi.org/10.1017/S0030605315000332>.
2. Dutton, P.A. and Chapman, H.M. (2015) New tools suggest local variation in tool use by a montane community of the rare Nigeria-Cameroon chimpanzee, *Pan troglodytes ellioti*, in Nigeria. *Primates*56(1): 89-100.<http://dx.doi.org/10.1007/s10329-014-0451-1>.
3. Dutton, P. and Chapman, H.M. (2015) Dietary preferences of a submontane population of the rare Nigerian-Cameroon chimpanzee (*Pan troglodytes ellioti*) in Ngel Nyaki Forest Reserve, Nigeria. *American Journal of Primatology* 77(1): 86- 97. <http://onlinelibrary.wiley.com/doi/10.1002/ajp.22313/full>.
4. Adewoye, R., Huettich, C. Schullius, and C., Chapman H.M. (2015) Estimating Aboveground Biomass of the Afromontane Forests of Mambilla Plateau Using Quickbird and in Situ Forest Inventory Data. *Journal of Remote Sensing Technology* 3: 1-8.<http://dx.doi.org/10.18005/JRST0301001>
5. Barnes, A., Emberson, R.M., Thoorsten-Krell, F. and Didham, R. (2014) The Role of Species Traits in Mediating Functional Recovery during Matrix Restoration. *PLOS ONE* 9(12):1-19

6. Grassham, A.M.; Kunz, B.; and Chapman, H.M. (2015) Dispersal of forest seed into grassland matrix by the tanzania monkey in a Nigerian montane forest: implications for forest restoration. *Journal of Tropical Ecology*. (African Primates October issue).
7. Thia, J, Hale, M., Stouffer, D., Chapman, H.M. (2015) Limited dispersal into appropriate microhabitats likely explains recruitment failure in a chimpanzee-dependent tree species. *African Journal of Ecology* In Press – October issue)

Papers submitted and currently under review:

- Dutton, P. and Chapman, H., Molanchova, E. Nesting ecology of the Nigerian /Cameroon chimpanzee, *Pan troglodytes ellioti* in the small montane population of Ngel Nyaki forest reserve, Nigeria. (submitted *American Journal of Primatology*).
- Thia, J. A. Y. W., Hale, M. Stouffer, D. B. & Chapman, H. M. Chloroplast SSR loci reveal limited genetic diversity in three tree species in montane Nigeria (Under review *African Journal of Ecology* submitted January 2015!)
- Knight, A.; Hale, M. & Chapman, H. M. (2014) Sex biased dispersal in the Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*). (We have decided to look for more evidence and have gone back to the lab on this)

Conference presentations:

- Charles Nsor - Differential contribution of sunbird species to the structure of a sunbird-tree flower visitation network predicts species survival and network stability. ATBC 2015 Honolulu, Hawaii 12-16th July
- Hazel Chapman - Factors influencing the dispersal /predation balance in a montane

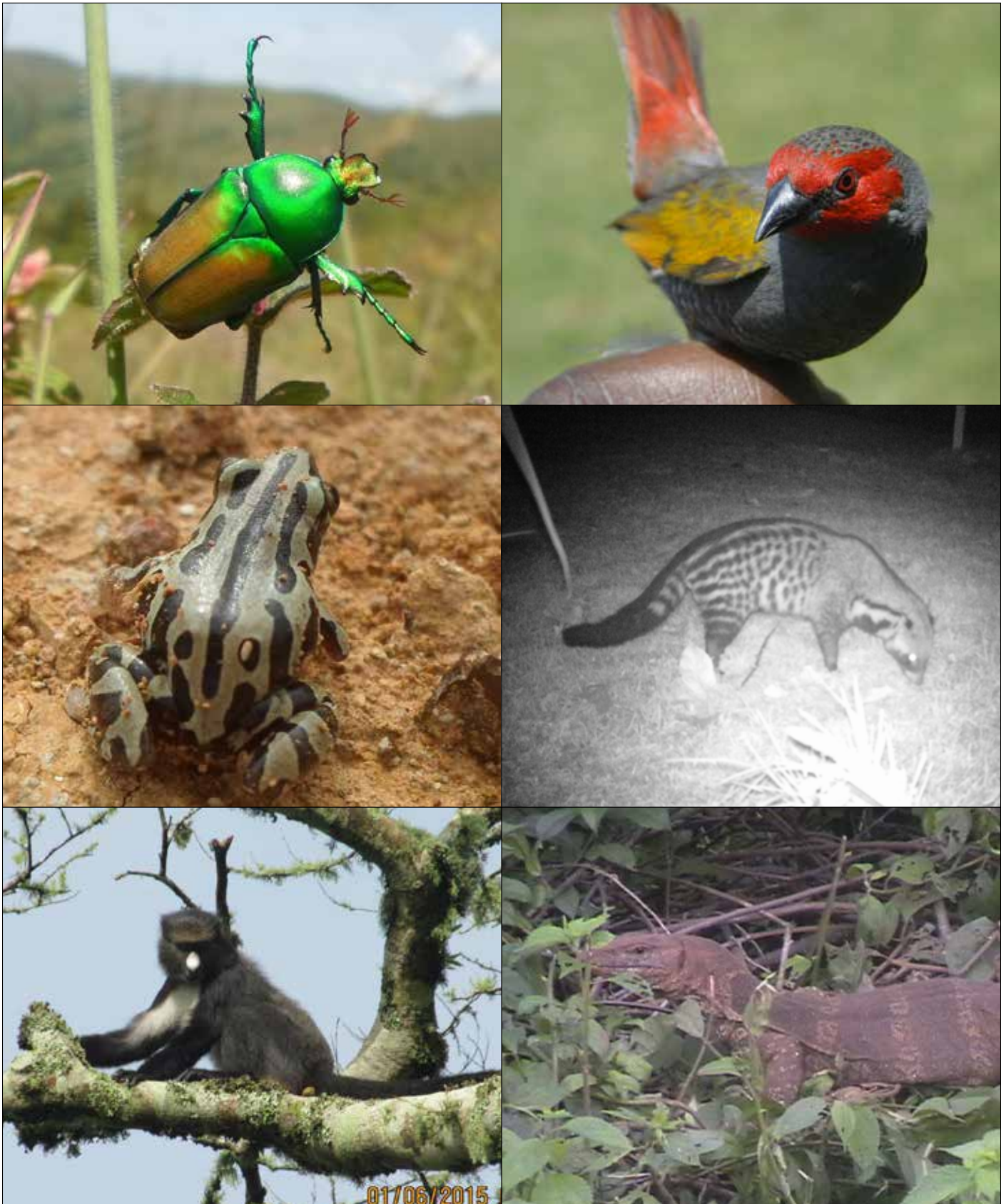
population of the African Giant Pouched rat, *Crysetomys* sp. ATBC 2015 Honolulu, Hawaii 12-16th July

- Hazel Chapman - Seed dispersal in a changing world Sapienza University Italy September 8th 2015
- Kelly Hutchinson - Putty nose monkey ecology Annual Biology Conference UC Conference, October 22nd 2014
- Abby Grassham - Tantalus monkeys: implications for forest restoration. Nelson Botanical Society August 17th 2015
- Hazel Chapman - The Nigerian Montane Forest Project University of the 3rd Age, Christchurch, NZ. July 2014.

Posters

- Jos Thia et al. Conservation of disturbed Afromontane forest: *Cordia millenii* in south-east Nigeria. ATBC 2015 Honolulu, Hawaii 12-16th July
- Charles Nsor et al. Sunbirds as pollinators in a fragmented Afromontane Landscape ATBC 2015 Honolulu, Hawaii 12-16th July

Figure 26. We have a vast array of wildlife at the biodiversity hotspot of Ngel Nyaki Forest Reserve. Below are a few photographed by staff and students.



Conservation Highlight: Community Restoration and Conservation



Figure 27. Planting out seedlings which have been grown in the nursery from locally sourced seed.

Australian High Commission DAP grant

The overall aim of our grant was to:

1. Use men and women from the local communities to help in the restoration of Ngel Nyaki Forest Reserve and to teach them about restoration methods, including monitoring restoration progress
2. Strengthen and improve our conservation club for young people from local communities.

To date we have

- Trained field assistants and other local community members in nursery and propagation techniques
- Expanded our nursery and built a watering system
- Collected and planted into polypots over 6000 seeds of local forest tree species
- Raised over 6000 seedlings
- Planted 6000 seedlings into fenced off grassland around the forest edge
- Consolidated the conservation club and run regular meetings



Figure 28. These are our youngest conservation club members and some of the most inquisitive.

A snapshot of our conservation initiatives

Fencing for forest restoration

An increase in fenced-off areas of grassland and forest is protecting more land from burning and grazing and allowing forest regeneration.

In January 2015 there was a concerted effort to increase the area of land already fenced-off around the reserve from burning and grazing. Now, approximately 8 km of fencing has been established along the edge of the forest north and south of the field station. Most importantly, the southern fencing protects the forest and grassland associated with the ForestGeo plot.

In order to ensure that no cows or fire penetrates these fenced-off grasslands, fire breaks have been made all around the fence edge and also a patchwork of fire breaks within fenced off areas. The fire hazard mainly comes from *Schizatarium* and *Hypparrhenia* grasses which have established huge swards within a year, which are clearly a potential fire hazard.

In addition the NMFP has employed four watchmen to ensure the fences are not compromised in any way.

Thanks to a DAP grant from the Australian High Commission we were able to use about 15 youth from the local community to help us enlarge the nursery, plant seeds and grow over 6000 more tree seedlings. Between June to August the forestry patrollers and NMFP staff planted the seedlings into the grassland. Most of these are pioneer species such as *Anthonotha*, *Polyscias*, and *Trema* which we already know do well when planted into grassland.

The sites planted include the large area of grassland around the field station, and new areas farther away (see map above). In addition, as an experiment, approximately 1600 *Anthonotha* seeds were sown directly into the grassland. At the time of writing these are doing very well and have germinated faster than the nursery propagated seedlings.

Previous planting, going back to 2006, have been largely successful so that forest is already establishing well in the field station surrounds. Particularly impressive are *Polyscius fulva* trees which are now over 3m tall.

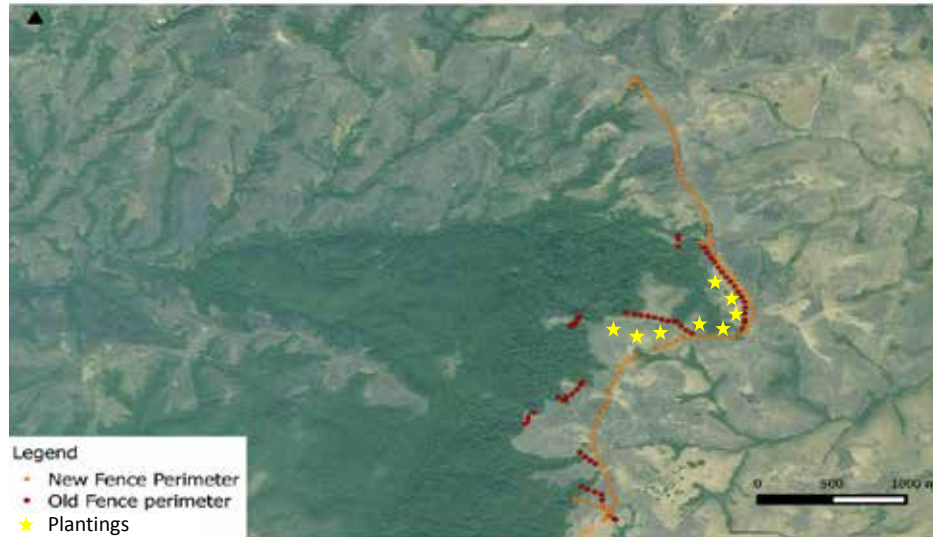


Figure 29. Map showing fenced off areas round Ngel Nyaki reserve. The red lines are areas fenced since 2006 while the orange represents 2015 fencing.



Figure 30. Fences being constructed



Figure 31. Augustine Ntim who manages the nursery standing beside a young *Trema* tree which was planted as a seedling in 2014.

Project news



Figure 32. Undergraduate students from Federal University of Kashere visiting the Project.

Undergraduate field trips

Each year the NMFP is visited by literally hundreds of undergraduate students from Universities as far away as Gombe and even Lagos States. The students are typically biologists or geographers and spend time at the field station learning about the science we do and the forest management and conservation issues faced by Ngel Nyaki Forest Reserve. Shedrach Kongvong (science co-ordinator) and Misa Zubairu (project manager) typically lecture to the students who also explore the forest with our field assistants and their lecturers.

This July we hosted three separate undergraduate field trips, during which between 30 to 140 undergraduate biology students stayed two nights at the field station. The students were from TSU accompanied by staff members Dr Delphine and Dr Ted, GSU (with Prof. Ezra and Dr Babale Aliyu) and the Federal University Kashere accompanied by Ahmad I. Galadema and Kolawole Saheed.



Figure 33. Eighty four Taraba State University students causing congestion in Yelwa village on arrival.



Figure 34. Gombe State University biology students experiencing the at times misty and cold conditions of Mambilla Plateau.



Figure 35. Chester Zoo visitors Adriana Lowe , Scott Wilson and Stuart Nixen with Prince Umar. from the Project.

Visitors

A visit from our sponsors, Chester Zoo

Scott Wilson (Head of Science Research) Stuart Nixen (Field Program coordinator at Chester Zoo and head of the Gashaka Biodiversity Project) and Adriana Lowe (PhD candidate, University of Kent) visited the Project in January 2015. They were of course very welcome and the Project sincerely appreciated their visit. An important aim for 2016 is the development of greater research collaboration between the NMFP and the Chester Zoo lead Gashaka Biodiversity Project.

Later in January and NCF delegation of Alhaji Ibrahim Inahoro and Solomon Adefolu visited the NMFP to discuss collaborations.

Nasra Ali and Peter Keuwou visited in November as part of a larger expedition for the coffee company Kaldi Africa who are looking for local growers of coffee.

The ecology group from UniLag including Michael Osundinakin a PhD student of Professor Toyin and Izu visited us in early November. Izu is currently working on the bryophyte checklist of Ngel Nyaki.



Figure 36. Izu collecting lichens with the help of Alfred (NMFP) and Oyetola (UniLag).



Figure 37. Alhaji Ibrahim Inahoro, Misa Zubairu and Solomon Adefolu.



Figure 38. The Taraba State Commissioner of the Environment, the Honourable Rebecca Manasseh visited the NMFP in December 2015. It was a pleasure to introduce her to Ngel Nyaki and the environmental initiatives underway. We hope to work more with the State in terms of conservation and environmental education in the future.



Figure 39. Our new and extremely helpful Director of Forestry for Taraba State during his visit to Ngel Nyaki Forest Reserve to discuss forest boundary issues. It was decided that it is imperative for the Ngel Nyaki forest Reserve boundary to be reestablished with stronger and more permanent markers. We are investigating funding sources for this.



Figure 40. Drs Delphine and Tedd with Misa following the Taraba State University field trip to Ngel Nyaki. The NMFP is encouraging TSU postgraduate students to carry out field research based at Ngel Nyaki, supported logistically by the Project.

Forest Reserve issues



Figure 41. Checking the location of the Ngel Nyaki Forest Reserve boundary.

As always, during 2015 Ngel Nyaki forest reserve has faced major issues in terms of encroachment into the reserve by Fulani and their cattle, as well as poaching. In an effort to try and improve the situation the NMFP lead a community initiative to inform and get action from the State on this issue.

A new committee was formed comprising the Jauro of Yelwa, Saidu Patel and five other community leaders from Mambilla Plateau. This committee travelled to Jalingo and met with the Permanent Secretary for the Environment, and the Director of Forestry to discuss the issue. From this, a working party including : Director of Forestry, Jalingo, Forest Management Officer, Gembu, Ngel Nyaki site manager, Yelwa, a representative of His Royal Highness (Chief of Gembu), a Taraba State Government surveyor, the Jauro of Yelwa, the Chairman of the Forest Management Committee, Yelwa and Misa Zubairu (NMFP) visited Ngel Nyaki Forest Reserve and surveyed part of the reserve boundary to help sort out boundary issues.

One outcome from this very positive and supportive action from the State is that it has become clear that more substantial boundary

beacons are urgently required. Previous stone beacons and even a *Ficus* fence have all been removed by people wanting access to the reserve. It is therefore impossible to state accurately where the boundary lies.

Another very important outcome was that the Permanent Secretary has now written a circular to all the cattle herders making it abundantly clear that no cattle are to enter the reserve.

During 2015 the Forestry Patrollers who are currently being supported financially by the NMFP have been a great help to the management of the reserve. The 30 patrollers have carried out regular patrols, during which time they have collected many snares and other traps. Clearly hunting is still rife and the more support the patrollers are able to receive the better.

They have also been extremely useful in helping with the forest regeneration plantings and in the making of fire traces.

Figure 42. The Forest Management Group. Jauro Saidu Bapetel and the representative for the Chief of Mambilla in the foreground.



Community initiatives



Figure 43. We'd like to thank Jauro Saidu Patel of Yelwa village for his continued support towards the Project and our community initiatives.

Conservation Club

The conservation club was funded by the Australian High Commission in 2015, we greatly appreciate their support.

Students in the conservation club are from: Esso/ NMFP Nursery school Yelwa, Primary school Yelwa, Community Secondary School Yelwa, Ngabuli Primary School Hainare and Maisamari Government Secondary School.

Members from all these school regularly visit the NMFP. Each visit is enjoyable, the students learn about the value of the forest both locally and globally. They gain insights from the Project members about forest regeneration, how to run a nursery and lots more about what goes on at the NMFP.

Bee Keepers

Afan from Aplori, a very experienced bee keeper has had his first visit to Ngel Nyaki to teach the local bee keepers about building hives and honey production. The bee keepers have permission to keep their hives in the forest fragments of the reserve. While this initiative has been slow to take off, it is proceeding well.

Nursery School

The IT students continue to teach on a weekly basis at the nursery school and the Yelwa community on its own is maintain the buildings.

Healthcare

The Project is beginning a new collaboration with Shalina Healthcare Nigeria and Osomo-Sama Nigeria Ltd in a deworming initiative for the school children on the Mambilla Plateau.



Figure 44. Community Secondary School Yelwa



Figure 45. Bee keepers discussing honey production with Afan

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