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## DISTRIBUTION

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### Distribution and density of *Newtonia buchananii* in Amani Nature Reserve

#### Abstract

The study was conducted in Amani West and Monga forest to determine the size class distribution and density of *Newtonia buchananii* and further examine the micro habitat factors affecting seedlings, sapling and tree abundance. 20 m x 20 m plots were marked along existing road/trails for tree and sapling identification and enumeration, measuring diameter, slope, altitude, canopy cover as well as soil pH and moisture content. Seedling enumeration and assessment of defoliation was carried out in a 2 m x 2 m quadrat marked in each of the plots. The size class distribution of the tree species were highly skewed towards the smaller tree sizes when both study sites were considered together. The forest could not have recovered fully to large size trees from the effect of logging that stopped in 1986. High regeneration of the seedlings was observed but with a higher mortality rate of 95%. Among the factors considered to affect the abundance of the seedlings, saplings and trees, only altitude was found to account for the variability in tree numbers ( $df=0$  18,  $R^2 = 0.394$ ,  $p=.004$ ).

Charles K. Meshack, Tanzania Forest Conservation Group, Tanzania

Warui M. Harun, Kenya Agricultural Research Institute, Kenya

2000

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### Distribution and performance of *Cyathea manniana* in Amani Nature Reserve

#### Abstract

This study was carried out during the TBA course at the Amani Nature Reserve in the East Usambara Mountains located in north eastern Tanzania. The course ran from the 28/7/00 to 26/8/00, our study was carried out as a part of the course curriculum. The data was collected and analysed in approximately 10 days. We chose to address the distribution of *Cyathea manniana* throughout Amani Nature Reserve following two major questions: Which environmental factors influence the distribution of *Cyathea manniana* in Amani Nature Reserve? How do the different factors influence the performance of *Cyathea manniana* in ANR? Our results show that *Cyathea manniana* grows preferably either close to water or in higher altitude. The other parameters measured, e.g. pH, slope, soil temperature and associated vegetation showed no significant influence on the distribution or performance of *C. manniana*.

Monika Bertzky University of Bonn, Germany

Darach Lupton Trinity College, Dublin, Ireland

2000

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### **Population density of *Allanblackia stuhlmannii* in the disturbed, semi-disturbed and undisturbed areas of Amani Nature Reserve, East Usambaras**

#### **Abstract**

The study was carried out to assess the population density of *Allanblackia stuhlmannii* in three different sites as disturbed, semi-disturbed and undisturbed forest. The highest density for trees was in Monga Forest (130.56/ha), followed by Mbomole Forest (122.22/ha) and the forest near Amani village (72.22/ha). The density for seedlings and saplings showed similar pattern with (1250/ha) Monga, followed by Mbomole Forest (569.44/ha) and Amani village (97.22/ha).

Mohammed El Tahir Sir El Khatim, University of Juba, Sudan.

Devis Mlowe, Sokoine University of Agriculture, Tanzania.

2002

### **Does plant species composition vary beneath *Cinnamomum camphora* plantation trees, compared to natural forest in Amani Nature Reserve?**

#### **Abstract**

Plantations of introduced species can alter the species richness and composition of understorey plant communities relative to natural forest, by changing the biological and physical environment. In this study, the plant species beneath a *Cinnamomum camphora* plantation were compared with an adjacent natural forest. Species richness was lower in the *C. camphora* plantation than in natural forest. Samples from the two communities were 2.5 times more dissimilar than samples from within the same area. Climbers and ferns were significantly more abundant in natural forest than in the plantation. Potential reasons for species composition differences are discussed.

Lucienne de Witte, University of Basel, Switzerland

Wayne Dawson, University of Aberdeen, United Kingdom

2005

### **Vegetation composition and structure of the valley bottom and the upper slopes habitats in Amani Nature Reserve**

#### **Abstract**

The study was carried out to assess the vegetation structure and composition of the valley bottom and upper slope habitats of two sites in Kerenge valley and Mbomole valley at Amani Nature Reserve. Eight transects (four in each site) were established and three plots were aligned along each transect from the bottom, middle to the top/ridge. A total of 24 plots were established in the two sites. The parameters considered and measured were adult tree DBH, soil pH and moisture content and identification of saplings and shrubs. Trees > 5 m DBH were identified and measured, tree density and basal area overall were calculated. The results showed that the environmental factors determined had little influence in the composition, structure and distribution of plant species.

Boaz Mwesigwa, Makerere University, Uganda

Rehema Shoo, Sokoine University of Agriculture, Tanzania

2007

### **What plant species prefer gaps? A baseline study of Mbomole and Monga Forest in Amani Nature Reserve, Tanzania**

#### **Abstract**

Gaps either naturally occurring or induced by human activity are an inherent component of forest ecology. Gap ecology or gap dynamics are complex in nature and the role they play in tropical

forest ecology is little understood. The study was carried out to determine the plant species that prefer gaps to enhance their growth across two sites in Amani Nature Reserve, Mbomole and Monga Forests. Our findings indicate that species richness is similar between gap types however gap types differ in plant species diversity where we found species which occur exclusively in forest gaps.

Brian Mongan, National University of Ireland Galway, Ireland

Caroline Lumosi, Ecological Society for Eastern Africa, Kenya

Habibu Aliyu, Ahmadu Bello University Zaria, Nigeria

2011

### **The impact of footpaths and seed removal on the density and distribution of *Cephalosphaera usambarensis* in Amani Nature Reserve, Tanzania**

#### **Abstract**

*Cephalosphaera usambarensis* (Warb.) is among the valuable timber species found in Amani Nature Reserve. Initial studies indicated that seed and seedling densities were not related to local density of mature trees capable of producing seeds. Preliminary field observations also indicated that more seeds and seedlings occurred along the foot paths than far from paths. We conducted a study to establish if variations in seed, seedling and sapling numbers could be due to variation in seed removal by rodents such as giant rats (*Cricetomys gambianus*). We confirmed that more seeds, seedlings and saplings occur within 5 m than 10-15 m away from the paths. We put seed piles across various sites to monitor rates of seed removal. However, no seeds were removed.

Odera George Joshua, Moi University, Kenya

Rayfield Jusper Chateya, Midlands State University, Zimbabwe

2012

## **ECOLOGY**

### **Herbivore response to leaf damage in two herbaceous species**

#### **Abstract**

Herbivore response to damage of two early successional herbaceous species was measured. A generalist herbivore was used in choice chamber experiments over a period of 6 days. Damage to leaves was found to have no effect on herbivory. This result was not affected by day or chamber. The relative amount of leaf eaten differed significantly between species and the reasons for this are discussed in relation to defense strategies and leaf characteristics.

Sarah Harding, University of Liverpool, UK

Anna Grace Kyoma, Tanzania National Parks, Tanzania

1998

### **Assessing diversity, how species distance curves can be used for the ecological evaluation of tropical rainforests**

#### **Abstract**

Ecosystems facing the threat of degradation require a rapid technique to assess their value in order that they can be protected. Where expertise is limited to undertake a comprehensive inventory of the communities at risk, volunteers can be trained to record data that can be collected quickly and efficiently. This project was conducted to see if species accumulation over distance was a suitable ecological method for measuring species richness in the rainforest. I propose that accumulation of plants over distance or time using Operational Taxonomic Units provides a measure of species

richness that can be used as a means of assessing diversity without the need for continuous expert botanical support.

Rachel Remnant, University of Liverpool, UK

2000

### **A comparison of invertebrate herbivory on native and introduced plant species in Amani Nature Reserve**

#### **Abstract**

In order to test the hypothesis: "Native plant species are predated more heavily upon by invertebrate herbivores than introduced species of the same family", we chose nine pairs of plant species and laid transects with random quadrats through the respective habitats and individuals of both species of the pair were examined for predation. Analysis of the field work data demonstrated that native species had a significantly higher overall rate of predation than their introduced equivalents and also a significantly higher rate of fungal infection, as fungal infection was found to be positively correlated with predation. Controlled feeding experiments with two of the species pairs however, failed to consolidate these results, most likely due to an unrepresentative selection of herbivores used in the experiments. This study shows that spreading of invasive plant species in a new environment may be helped by the smaller herbivore load. The effects of secondary plant metabolites and other plant defences in both introduced and native plant species remains to be studied.

D. Kernott, University of East Anglia, UK

E.J. Sayer, University of Bern, Switzerland

2000

### **Extent of herbivory in patches of three flowering plant species**

#### **Abstract**

This study investigate the relationship between the extent of herbivory and both patch size and distance to neighbour patches of three common plant species in the East Usambara Mountains. Significant positive correlations were detected between patch size and degree of herbivory in all three species. No correlation was found, in any of the species, between herbivory and distance to other flowering patches either of the same or different species. The results are interpreted in terms of the availability and detectability of plants by herbivores, and it suggests that further studies on this field are necessary.

Mariana Carvalho, University of Lisbon, Portugal

Thomas Niebuhr, University of Copenhagen, Denmark

2000

### **Predation and dispersion of *Allanblackia stuhlmanii* seeds in the East Usambara Mountains**

#### **Abstract**

In this study seed dispersal and seed predation on *Allanblackia stuhlmannii* seeds was studied. The aim of this study was to test the escape hypothesis by Janzen (1970), which says that seed predation is higher close to the parent tree and when the density of seeds are higher. This would explain the even distribution and coexistence of many different tree species in the tropical forests. Our findings show that Janzen's hypothesis does not apply to *A. stuhlmanii*. In this study distance and abundance does not affect predation rates and the trees are clumped. The effect on seed size and seed burial was also tested but these parameters do not affect rates of predation by rodents.

Steven Glynn, National University of Ireland, Galway

Christina Ritzl, Uppsala University, Sweden

2000

### **A survey of regeneration patterns and spatial distribution of *Cephalosphaera usambarensis*, in Amani Nature Reserve, East Usambara Mountains**

#### **Abstract**

This study sought to determine the effect of altitude and seed predation on the regeneration pattern and spatial distribution of *Cephalosphaera usambarensis*. The study was conducted in Mbomole and Zigi, two sites of different altitudes within Amani Nature Reserve. The survey was carried out on 10 mother trees with 5 nearest neighbours on each tree in both sites. The parameters measured were tree, seed and seedling density, canopy cover and seed predation. It was observed that Mbomole site agreed with the Janzen and Connell hypothesis of seed predation by host specific predator which produced a low density and uniform dispersion of adults, whereas in Zigi there was no seed predation with high density and random dispersion of adults.

Chekuimo Tagne Georges Herbert, University of Dschang, Cameroon

Francis Omondi Oleche, Kenya Wildlife Service, Kenya

Harison H Randrianasolo, University of Antananarivo, Madagascar

2000

### **The effect of canopy cover on the regeneration pattern and distribution of *Newtonia buchananii***

#### **Abstract**

*Newtonia buchananii* is a dominant native montane forest tree species of Amani Nature Reserve, with a particular ecological significance to the site. Repeated observations on the regeneration patterns of the species in the forests of Amani initiated this preliminary study. Five forest sites were considered for the study with five transect plots of size 50 m x 4 m (non-trees) and 50 m x 10 m (trees) each. Parameters such as height, diameter, associated canopy trees and percentage canopy cover were collected for each individual of *N. buchananii*. Regression analysis showed that there is no relation between canopy cover and individual size. This shows that the species is not shade demander, but tolerant. A G-test for goodness of fit showed that there is high variation in the distribution/regeneration pattern of the species among sites. *Maesopsis eminii* is found to be the major tree species that grew in association with *N. buchananii*. High mortality of the tree species was also observed.

Elsharif Yasir M., University of Khartoum, Sudan

Katumba B.M., Makerere University, Kampala, Uganda

Yohannes Adane, Ethiopian Agricultural Research Organisation, Ethiopia

2001

### **Levels of herbivory on three ecological categories of trees in the Amani Nature Reserve**

#### **Abstract**

The aim of this research was to test if gap-colonizing tree species (*Anthocleista grandiflora*, *Macaranga capensis*) were more susceptible to herbivory than emergent tree species (*Allanblackia stuhlmannii*, *Cephalosphaera usambarensis*). Therefore leaf damage was estimated for each tree species. In addition, leaf damage was estimated for the invasive gap-colonizing tree species, *Maesopsis eminii*. Significant relationships were found between leaf damage and these three different types of tree species. Relative abundance of both leaf-chewing insects and ants were measured for each of the tree species in order to test whether there was a correlation with the amount of leaf damage. No correlation was found.

Matthijs van der Geest, University of Groningen, Netherlands

Donald Mc Gann, National University of Ireland, Ireland

2001

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### **A study of the leaf decomposition rate and amount of leaf litter of two gap and two emergent tree species in the Amani Nature Reserve**

#### **Abstract**

Decomposition of leaf litter is an important source of nutrients in tropical rain forest ecosystems. It is thought that leaves of light demanding tree species will decompose faster than leaves of emergent tree species due to the higher quality of these leaves. It was found, over 10 days, that the leaves of the gap species, *Maesopsis eminii*, decomposed faster than the leaves of the other three species studied. Shallower organic layers were found beneath the gap species, *Maesopsis eminii* and *Macaranga capensis*, compared to the emergent species. The wet/dry ratio for the litter biomass found beneath each species was found to be lower for *Macaranga capensis* than for the other three species.

Anna Liggat, University of Aberdeen, UK

Ciara Mellett, University College Dublin, Ireland

2001

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### **Comparative study of herbivory and herbivore diversity on two plant species of the genus *Piper* (Piperaceae), *Piper nigrum* and *P. umbellatum* in Amani Nature Reserve**

#### **Abstract**

Leaf herbivory and diversity of herbivores on the native *Piper umbellatum* and the introduced spice plant, *Piper nigrum* were studied at seven different sites in the Amani Nature Reserve. Samples of each 20 leaves of both species at each site were randomly collected to measure leaf herbivory. All herbivorous arthropods and molluscs of 30 *P. umbellatum* and 10 *P. nigrum* were collected from each site using a beating tray. Herbivores could be assigned to 46 morpho-species, and for abundant herbivores feeding experiments were conducted. Herbivory was significantly higher on the native species. Average faunal overlap for both plant species between sites were of 30% and no significant correlation to distance of sites could be found. Only each two species of Lepidoptera larva and Gastropoda feed on the leaves during the feeding experiments only on the native species. No shift of herbivores from the native to the introduced species could be found.

Janice Oduro Dwomoh, University of Cape Coast, Ghana

Yonas Meherehu, Addis Ababa University, Ethiopia

2003

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### **A study of the relationship between size of tree and density of fruits, and the influence of light on fruits density of *Allanblackia stuhlmannii* in Amani Nature Reserve**

#### **Abstract**

The main objective of this study was to look at the relationship between fruit density and the size of tree of *Allanblackia stuhlmannii*, in relation to soil composition and canopy cover. The study was carried out from the 14<sup>th</sup> to the 25<sup>th</sup> of September 2003 in three different forest areas: farmland (disturbed forest) in Shebomeza village, semi-disturbed forest in the Monga Forest of the Amani Nature Reserve and an undisturbed forest at the foot of the Mbomole Hill. Thirty-five plants in each site were sampled randomly, with their corresponding soil samples collected and analysed. There was a significant increase in the number of fruits of a tree as tree size increases in all three sites.

Canopy cover (shade) had a negative influence on the number of fruits produced by a tree. This was evident from the fact that more fruits were observed in the farmland with very low canopy cover, followed by semi-disturbed forest, finally the undisturbed forest where trees had a very small number of fruits yet had very high canopy cover. A comparison of soil ionic concentration, soil pH, and soil moisture content among all three sites revealed that there were no significant differences.

Motutu Elinge, Limbe Botanic Garden, Cameroon

Joël Ndayishimiye, University of Burundi, Burundi

2003

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## Effects of tree fall gaps in vegetation composition

### Abstract

Tree fall gaps are important habitats for tree species regeneration in any type of forest, hosting a high amount of canopy tree species during earlier stages of growth. Disturbance induced by tree fall therefore acts as a vital mechanism for maintaining the dynamic and equilibrium of forest ecosystem. Naturalized alien plant species tend to become invasive in disturbed habitats. Gaps play an important role in providing habitats for the invasion of non-native species. Amani Nature Reserve in the Usambara Mountains, Tanzania, is a hot spot of species diversity, inhabiting a high number of endemic and threatened species. This unique biodiversity is threatened due to human pressure by forest fragmentation, the biggest threat however, is the introduction of alien species, which are becoming invasive. The objective of this study was to investigate the effects of tree fall gaps on tree species diversity of adult trees, saplings and seedlings. Species diversity of gaps, edges and forest plots were measured in three forest sites with different management intensities, in order to determine the controlling factors for their vegetation composition. Furthermore, the effect of gaps and different management impact on the invasiveness of alien species was studied by comparing the occurrence of non-native plant species in three submontane forests in Amani Nature Reserve. The results of this study indicate greater differences in vegetation composition between sites than between the plot types. Highest tree species diversity and highest number of families and tree species were found in the forest site with lowest human disturbance impact. Edge plots showed higher species richness than forest and gaps. Invasive plant species were determined to be more common in sites with higher human disturbance impact.

Elzemieck Geuverink, University of Groningen, The Netherlands

Fatima Diaz-Bejar, University of Wales Bangor, Spain

Sigrid Drage, University of Vienna, Austria

2007

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## Do natural floral path-edges act as wildlife corridors through the tea plantations of Amani Nature Reserve?

### Abstract

The forests of Amani Nature Reserve are particularly fragmented, with one of the main causes being the cultivation of tea as a cashcrop. This study investigates whether the natural flower growth along path-edges through the tea plantations can act as insect wildlife corridors between these forest fragments. The results showed that bees and wasps were significantly more abundant on the paths than within the tea. Diptera, Orthoptera and the ants seemed more tolerant of the tea-matrix and occurred at similar numbers in both. Of the five butterfly families identified, Lycaenidae, Papilionidae and Pieridae were more abundant on the paths than in the tea. Flowers on the paths had significantly higher visitation rates, which was attributed to their higher floral diversity and density. Generally the results suggest that it is of great importance to encourage floral corridors for insect abundance throughout fragmented landscapes such as that of tea plantations of Amani.

Olivia Norfolk, University of Nottingham, UK

Brittanie Broughton, University of Salford, UK

Sadiki Lotha Laisser, Ministry of Natural Resources and Tourism, Tanzania

2009

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### **The effect of *Maesopsis*, *Macaranga* and *Cephalosphaera* on diversity of soil decomposer fauna in Amani Nature Reserve**

#### **Abstract**

The Amani soil decomposing fauna was shown to be highly variable, between areas, sites, tree species, and even replicates of a single tree species. Springtails (Collembola) showed to be the dominant order, present in large numbers (55% of the total arthropod fauna), and this order showed a preference for more acidic soil, and slope areas. The soil decomposing fauna under *Maesopsis* trees in the valley sites showed a remarkably high similarity. Indices of *Macaranga* and *Cephalosphaera* differed less between the topographic areas, although samples in the valley tend to be more diverse for these species.

Esmat Elhassan, Wildlife Research Centre, Sudan

Jeroen van Leeuwen, Wageningen University and Research Centre, The Netherlands

2009

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### **Exotic versus indigenous trees: The current and future composition of forests in Amani Nature Reserve**

#### **Abstract**

This study assessed the current status of indigenous and exotic species and aimed to predict the future composition of the forest in Amani Nature Reserve. Seedling communities were mostly dominated by *M. eminii* while *A. stuhlmannii* dominated sapling communities suggesting that *M. eminii* is recruiting poorly probably due to its failure to survive under shade. It was concluded that shade-tolerant species will have a much higher chance of dominating the future composition of the forest.

Festo Semanini, University of the Witwatersrand, South Africa

Geoffrey Bundotich, Kenya Wildlife Service, Kenya

2010

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### **Leaf production in relation to damage of seedlings in Amani Nature Reserve**

#### **Abstract**

This study was carried out in Amani Nature Reserve (ANR), Tanzania and focused on leaf production and its response to simulated leaf damage of seedlings on four fast growing species: *Leptonychia usambarensis*, *Chostas spiras*, *Piper capense* and *Macaranga kilimandscharica*. A total of six study sites were selected in the forest gaps. Overall, the effect of damage on leaf production was strongest in *Macaranga kilimandscharica* where the rate of leaf growth decreased with increase in damage. This implies *Macaranga kilimandscharica* is more sensitive to damage since its growth rate slows down when damaged. The results from this study suggest that the different species had different rates of shoot growth, leaf growth and leaf production. *Macaranga kilimandscharica* had the highest rate of leaf growth, second highest rate of shoot growth and the highest rate of leaf production. There was also no significant difference in the level of herbivory between leaves of different ages. Similar studies on leaf production in relation to damage of seedlings can be carried out on fast growing canopy species, such as *Macaranga kilimandscharica* in generating up to-date information so as to enhance further understanding of plant-animal interactions.

Fredrick Ssali, Mbarara University of Science and Technology, Uganda



Ernestine Mefor Halle, University of Buea, Cameroon

Nancy Gikonyo, National Museums of Kenya, Kenya

2010

### **The effect of floral manipulation on the behaviour of visitors of *Helianthus* sp. and *Thunbergia alata***

#### **Abstract**

This study investigated the effects of partial or complete removal of natural attractants (petals) on the behaviour of flower visitors of *Helianthus* sp. and *Thunbergia alata*. Some flowers of *Helianthus* had their number of petals doubled (producing a super normal visual stimulus) while others had theirs completely removed (much reducing the visual cue); these flowers had highest and lowest numbers of visitors respectively. In *Thunbergia alata*, artificially manipulated asymmetric and reduced flowers did not gain as many visits as the natural flower and a handled flower control. *Apis mellifera* was the most frequent visitor to *Helianthus* while small solitary bees were the most abundant visitor to *Thunbergia alata*.

Zouliatou Nkakene Njoya, University of Yaounde, Cameroon

Soafara Raonizafinarivo, University of Antananarivo, Madagascar

2011

### **Anthesis and reproductive phenology of *Dictyophleba lucida***

#### **Abstract**

*Dictyophleba lucida* (Apocynaceae) is a liana native to Amani Nature Reserve in the East Usambara Mountains, Tanzania. Flower phenology and pollination ecology was investigated for the species by assessing the rate of flower opening, nectar volume and concentration and pollinator visits over time. We found that the rate of flower opening peaked between 18:15 and 18:20 and shading of flower cuttings suggested that light is an important trigger for anthesis. Both nectar volume and concentration significantly increased with time after anthesis and decreased the day after; however, no significant difference was found between buds and flowers of different ages.

Chediel Mrisha, Tanzania Wildlife Research Institute, Tanzania

Evalyne Muiruri, University of Cambridge, United Kingdom

Fidel Chiriboga, University of Gothenburg, Sweden

2011

### **Ant attendance and nectar production in male and female plants of *Lagenaria sphaerica***

#### **Abstract**

Plants have developed many strategies to deter herbivores in order to protect their photosynthetic structures. Instead of continuously producing chemical deterrents some plants employ a form of —biological control|| which uses other organisms to defend their leaves and flowers. Ant-plants such as the vine *Lagenaria sphaerica* make use of this mechanism by attracting ants with a high energy reward in the form of extra-floral nectar (EFN) from various glands on the leaves and flower sepals. In Amani Nature Reserve, the two sexes of this plant have been found to attract two separate species of ants exclusively. This study is trying to determine the sex difference as well as investigate general plant characteristics, nectar production and how these affect ant visitation. There were remarkable differences in the leaf dimension and number of laminar glands between the genders as well as slight differences in nectar production with time. On average however, male and female plants followed similar trends. A clear reason for the attraction of different species of ants could not be established other than the obvious fact that male and female plants were found

exclusively in two different habitats which might also have contributed to the differences seen in the plant characteristics and nectar production.

Lisa Becker, University of Aberdeen, Scotland, UK

2011

### **Assessment of ant relationships on *Thunbergia grandiflora* flowers**

#### **Abstract**

This study was conducted to assess ant relationships on *Thunbergia grandiflora* flowers. We looked at whether the presence of ants influence potential visitors and the interest of ants on the flower. Three experiments were carried out. Experiment one was code name ant exclusion using petroleum gel, experiment two, amount of visible nectaries around a flower bud before and after ants introduction and the third experiment was total time spent by ants on flower with or without nectaries. From our results, we realised that the presence of ants does not influence other potential visitors, like olive sunbird, honey bee and black bee. We also realised that the amount of nectaries around the flower bud before introducing ants were high as compare to the other flower bud without nectaries. Again the total amount of time spent by ants on buds with nectar was high. In conclusion we realised that the presence of ants did not affect the flower.

Faustina Adu-Boahene, University of Ghana, Ghana

Maajabu Juma, Sokoine University of Agriculture, Tanzania

2012

### **Influence of *Maesopsis eminii* on the recruitment of other tree species in Amani Nature Reserve**

#### **Abstract**

The effect of *Maesopsis* trees on the recruitment of other tree species within its stands was investigated. A series of plots (10 m x 5 m) with different numbers of mature *Maesopsis* trees were selected for this study. The number of *Maesopsis* seeds in the plots was used as an indicator of the density of the tree species in the sample area and the number of mature *Maesopsis* trees was also used. To quantify the effect on recruitment of other tree species, counts of seedlings and saplings of other species in the plot were made taking into account the species diversity as well as richness within each plot. Increase in *Maesopsis eminii* density decreased biodiversity in the area from the lower Shannon-Wiener index values in plots with more mature *M.e* trees and/or seeds. However there was a positive effect in a significant increase in number of seedlings and saplings with higher *M.e* seed density. These effects should be considered in the management and control of the species.

Angela Muthama, Moi University, Kenya

Herbert Nyombi, Makerere University, Uganda

2012

### **Effects of removing other trees on population structure of the Tanzanian rainforest endemic *Cephalosphaera usambarensis***

#### **Abstract**

The Tanzanian endemic canopy tree *Cephalosphaera usambarensis* is a valuable timber species and a native element of biodiversity in montane rainforest. Here we assess results of a small-scale manipulation in which mature trees of species other than *C. usambarensis* were removed from an area in the Amani Nature Reserve in the East Usambara Mountains. We compared stage/size structure of trees circa 25 years after removal to structure in three nearby "control" areas where other trees had not been removed. The removal area contained slightly higher density of reproductively-mature individuals, but was noticeably depauperate in newly-dispersed seeds,

seedlings, saplings, and smaller trees relative to control areas. Removal of potential interspecific competitors therefore does not appear to enhance growth and biomass yield of *C. usambarensis*. Indeed, this approach appears to sacrifice not only local forest biodiversity, but also future yield of the target species, by suppressing recruitment of new individuals into the population.

Nickolas M. Waser, USA

Mary V. Price, USA

John Richard Mbwambo, Tanzania

the TBA Amani Forest Consortium

2012

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## EPIPHYTES

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### Investigation of factors influencing the species richness of macro-epiphytes in Amani Nature Reserve

#### Abstract

The Amani Nature Reserve contains areas of lowland and submontane forest which differ in altitude and, as a consequence, in annual precipitation. This study investigated the effect of this difference in humidity and of other parameters on the species richness and distribution of epiphytes. The results show clearly that the species richness of epiphytes increases with the altitude. Furthermore, it gives evidence that canopy closure, branch width and roughness of the bark are responsible for the occurrence or absence of epiphytes on certain tree species.

Markus Hartl, University of Vienna, Austria

2000

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### Distribution patterns of epiphytes in Amani or epiphytes - spirits of the rainforest

#### Abstract

We investigated the factors influencing the abundance and diversity of epiphytes in Amani Nature Reserve. We found that most of the variation of abundance and diversity was explained by the tree species, the girth of the tree and the light penetrating the canopy. For the diversity, we saw that the roughness of the bark is an important factor, but it does not explain the unspecific cover of epiphytes. We also noticed that different epiphytic fern species have different requirements for the host tree.

Christophe Bonetti, University of Basel, Switzerland

Miguel Porto, University of Lisbon, Portugal

2001

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### Abundance and diversity of epiphytes in native versus non-native tree species in Amani Nature Reserve

#### Abstract

Epiphytes play a crucial role in the tropical forest ecosystem. They are notable not only for their high biodiversity value, providing nectar, pollen and habitat niche but also for their importance in the hydrological cycle of a forest. Invasion of non-native species is one of the serious threats to biodiversity. The proximity of Amani Nature Reserve to the Amani Botanic Gardens and the length of time since establishment have resulted in considerable invasion of non-native plant species throughout the region. As a consequence of this invasion the habitat for native epiphyte species might be diminished. This study investigates the abundance and diversity of epiphytes on native and non-native tree species in Amani Nature Reserve. The study revealed that native phorophytes harbour a greater number of epiphyte species than non-native phorophytes. However, when the

number of epiphyte species per individual phorophyte is considered, our results indicated that non-native phorophytes harbour on average a higher number of epiphyte species than native phorophytes. Furthermore, it can be concluded that the number of epiphytes which were found to specifically occur on the native phorophytes was greater than non-native. Additionally, native tree species have a higher probability of hosting epiphytes. The epiphyte coverage on the trees was highly variable; as a result no difference was seen between native and non-native phorophytes.

Sanne De Smet, Wageningen University, the Netherlands

Amy Jennings, Trinity College Dublin, Ireland

2008

### Distribution patterns of two epiphytic fern species

#### Abstract

Epiphytes' distribution depends on many different factors. The aim of this study was to find out whether amongst others, light requirements could be a key factor differentiating the distribution of two macro-epiphytes, *Asplenium* sp. and *Drynaria volkensii*, both found in Amani Nature Reserve. Samples were taken in two habitats with a different light gradient. Both *D. volkensii* and *Asplenium* were more abundant in open areas, but the heights at which they were found were different, with *D. volkensii* being in high and relatively well-lit positions in the closed forest, *Asplenium* sp. in lower and more shaded positions. Our findings suggest that the two species differ in their light requirements.

Eude Goudegnon, University of Abomey-Calavi, Benin

Diane Mukundwa, National University of Rwanda, Rwanda

Anna-Katherina Schoenenberger, University of Zurich, Switzerland

2012

## POLLINATION

### Am I attractive or not? A case study of *Thunbergia grandiflora* in Amani Nature Reserve, Tanzania

#### Abstract

This study was used to determine the usefulness of *T. grandiflora* as a resource to floral visitors. Two patches of *T. grandiflora* were used to observe the floral visitors; data was collected on the frequency, time of visitation and the presence of nectar. All the insects and other animals, which visited the flowers, were identified. The study revealed that the needs of the floral visitors varied among different groups. The most frequent was family Drosophilidae. Among the floral visitors recorded was the pollinator of this plant, *Xylocopa* spp. which was previously thought to be absent locally, since the plant was an introduced species.

Malgorzata Golub, University of Warsaw, Poland

Mao Angua, Moi University, Kenya

2002

### Plant-insect interactions in a liana species: A case study of *Thunbergia alata* at the Amani Nature Reserve in East Usambara, Tanzania

#### Abstract

Flowers attract insects for a multiplicity of reasons. In this study, we sought to establish the insect orders that visit the flowers of *Thunbergia alata* to determine the potential pollinators, investigate the relationship in number of insects visiting to the time of day and temperature and to analyse flower use differentiation by the visitors. The results indicate that temperature has a positive relationship to visitation by Hymenoptera and an inverse relationship to visitation by Diptera and

Mollusca. Variation in use of flower by the different insect orders ranging from breeding, nectar collection to herbivory were observed. Evidence from the study suggests that Hymenoptera is the likely potential pollinator of *T. alata* plant. Special attention was paid to the close relationship between highly specialised flower breeding *Drosophila* (Sub-genus *Hirtodrosophila*) which appeared to exploit *T. alata* flowers as a main breeding site. Four levels of adaptive changes were observed as compared to fruit breeding *Drosophila*: special tarsial features in both males and females; modified egg morphology (lack of respiratory filaments); modified ovipositor morphology in females; and modified pharyngeal structure in larvae.

Volanirina Ramahery, University of Antananarivo, Madagascar

Philip McOsano, Egerton University, Kenya

2002

### Aspects of the pollination biology of *Lantana camara* (Verbenaceae)

#### Abstract

The research showed that butterflies are the main pollinators of *Lantana camara* in Amani Nature Reserve, Tanzania. The time of the day and relative humidity had a significant effect on the number of butterflies that visited the flowers. Afternoons had more visitors than mornings suggesting that the butterflies become active as the day warms up. Flower colour and nectar sucrose concentration had a positive influence on the number of visitors. A disturbed forest edge, adjacent to farmland, showed higher pollinator visiting frequencies than a gap in undisturbed forest.

Christine Ndunge Muthoka, The University of Nairobi, Kenya

Sosdito Mananze, Eduardo Mondlane University, Mozambique

2005

### Visitor-generalist plant interactions: case studies of *Lantana camara* & *Stachytarpheta* sp. at Amani Nature Reserve

#### Abstract

The study was conducted to investigate the interaction between *Lantana camara*, *Stachytarpheta* sp. and flower visitors. Butterflies, bees and birds were observed to be the major visitors; the overall number of visitors decreased from morning to evening. There was a difference in colour preference for butterflies on *L. camara* as more yellow flowers were visited than pink flowers. Likewise, honey bees preferred to visit *Stachytarpheta* sp than *L. camara* when mixed on same site. The corolla tube lengths of *L. camara* and *Stachytarpheta* flowers were significantly different. The volume and concentration of *L. camara* and *Stachytarpheta* decreased and increased from morning to evening respectively. The weather conditions had a clear impact on the number of visitors for both plants.

Enjoh Eunice Fombad, Forests, Resources and People, Cameroon

Henintsoa Rabemananjara, University of Antananarivo, Madagascar

Samora Macrice Andrew, Sokoine University of Agriculture, Tanzania

2006

### Visitor and reward patterns in *Thunbergia grandiflora* and *Cassia floribunda*

#### Abstract

This study compared *Cassia floribunda* and *Thunbergia grandiflora* as a resource to floral visitors, the number of visitors in relation to pollen and nectar harvesting. Data was collected on visit frequency, time of visitation, production of nectar amount and its sugar concentration, pollen amount and floral structure, all of this in relation to the time of the day. The results showed that this

is the main pollinator. The study showed a relationship between visitation and reward harvesting into specialized bee pollinated plant species.

Daniel Mudavadi, Moi University, Kenya

Reem Said, University of Khartoum, Sudan

Soazara Ranivoarivelo, University of Antananarivo, Madagascar

2007

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### Comparison of butterfly diversity and nectar reward on *Lantana camara* and *Stachytarpheta jamaicensis* in the Amani Nature Reserve

#### Abstract

*Lantana camara* and *Stachytarpheta jamaicensis* are shrubs that are invasive in parts of the tropics and are common in Amani Nature Reserve. We carried out a study to compare the butterfly diversity and nectar reward in these plants. We found that the diversity of butterflies visiting both plants differed. Nectar concentration differed between the two plant species. Nectar volume was not different between the plants. Temperature and relative humidity had a significant effect on the butterfly visitation pattern.

Abena Owusu-Sekyere, K.N. University of Science and Technology, Ghana

Nivo Raharison, University of Antananarivo, Madagascar

Suzanne Mogue Kamga, University of Dschang, Cameroon

2008

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### Influence of visual attractiveness and rewards on insect flower visitation in Amani Nature Reserve

#### Abstract

This study was aimed at investigating the role of visual attractiveness and rewards on insect visitation in three flowering plant species: *Lantana camara* (Verbernaceae), *Bidens pilosa* (Compositae) and *Justicia africana* (Acanthaceae), in Amani nature reserve.

Six flower patches of each plant species were randomly selected and observed before and after flower manipulation to establish the pattern and duration of visitation. Nectar characteristics were also studied in *Lantana camara*, during morning and evening times for six consecutive days.

In *Lantana camara* there was no significant difference in the number of visits between natural flowers and yellow flowers after manipulation, contrary, there was a significant difference in visitation patterns between the yellow and pink flowers. In *Bidens pilosa* there was no observable change in visitation behaviour before and after flower manipulation. However, there was a noticeable change in flower visitation behaviour in *Justicia africana* after manipulation.

Mohamed Hassan Osman, University of Khartoum, Sudan

Emmanuel Japhet Mwainunu, Tanzania Forestry Research Institute, Tanzania

Samuel Kiboro Thiong'o, Moi University, Kenya

2008