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## DISTRIBUTION

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### Effects of soil substrate and water gradient on the natural regeneration of the endemic *Commiphora guillaumini* (Burseraceae) in the Kirindy dry forest, Madagascar

#### Abstract

*Commiphora guillaumini* is an important timber species in western Madagascar but it has a low natural regeneration. This study examined the effects of soil substrate (sandy reddish, sandy brownish and rocky) and distance to a river (near and far) on *C. guillaumini* sapling density, number and proportion of fruiting trees, and number of fruit cluster per trees in the Kirindy Forest, Menabe. Density of saplings was higher on rocky soil. The number of fruiting trees was greatest on rocky soil and sandy brownish soil and the proportion of fruiting trees was higher near river. The number of fruit clusters was higher on rocky and sandy brownish soils than on sandy reddish soil. Our findings suggest that management of natural regeneration of *C. guillaumini* should account for soil differences and distance to the river in the Kirindy Forest.

Valère Kolawolé Salako, University of Abomey-Calavi, Republic of Benin

Yvette Harvey-Brown, University of Nottingham, United Kingdom

2015

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### Comparative study of floristic composition and stand density within logged and unlogged Kirindy dry forest in Western Madagascar

#### Abstract

This study focused on the comparison of floristic composition and stand densities within logged and unlogged forest. Sampling vegetation plots were established within logged and unlogged forest. In each plot, tree species diameter at breast height (DBH  $\geq$  5 cm) and tree height were recorded with the basal area, volume, stand density, above ground biomass and carbon content estimated. The Shannon index was used to derive species richness and diversity between different types of forest. The study results show that there is different between tree density and above ground biomass between logged and unlogged forest. Unlogged forest had higher above ground carbon content than Logged forest (Mechanically logged forest and Selectively Logged forest).

Milenge Kamalebo Héritier, University of Kisangani, D R of Congo

Jatto Samuel, University of Ibadan, Ibadan Nigeria

2014

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## **Distribution of evergreen species along soil moisture gradient in Kirindy forest, Madagascar**

### **Abstract**

The dry deciduous forest is part of unique complex where the climatic pressure is a challenge for plant species to maintain their leaves in dry season. However, several ecological and environmental factors determine how evergreen species remain green throughout the year in Kirindy forest and thus how they are distributed there. This study aims to determine the distribution of evergreen species along a moisture gradient in Kirindy forest. All evergreen species were recorded and identified. The diameter at breast height of all tree species was measured. Soil samples were taken within each plot at 0 to 20 cm depth. A total of 91 evergreen species are recorded. The most dominant species are *Norhonia alleizetii* and *Strychnos decussata*. There is not significant relation, neither between the abundance nor size class distribution of evergreen plant and the soil moisture gradient. Our findings suggest that being evergreen is an adaptation of the species to the long dry season, rather than an effect of locally more moisture in the soil or other physical soil properties.

Emeline Assede, University of Abomey-Calavi, Benin

Jean Pierre Samedi Mucyo, Dian Fossey Gorilla Fund International, Rwanda

2014

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## **Effect of logging on the abundance of plants eaten by *Propithecus verreauxi* in Kirindy forest**

### **Abstract**

Anthropogenic disturbances such as logging may potentially affect forest structure and diversity even long after the perturbation has ceased. Kirindy forest reserve, which sustains a viable population of Verreaux's sifaka (*Propithecus verreauxi*), has undergone selective and mechanical logging in some compartments. Three compartments (selectively logged, mechanically logged and unlogged) were assessed for abundance, dbh and height of 12 tree species which are eaten *P. verreauxi*. There was no difference in diversity within the different forest compartments. Trees from the selectively logged compartment had a smaller dbh compared to the unlogged. Trees in the mechanically logged followed a similar trend. Regarding height, trees from selectively the logged compartment were shorter than those in the unlogged forest. On the other hand, trees from the mechanically logged compartment did not significantly differ in height from the trees in the unlogged forest area.

Domoina Rabarivelo, University of Antananarivo, Madagascar

Cynthia Mapendere, National University of Science and Technology, Bulawayo, Zimbabwe

Margaret Wambua, Egerton University, Kenya

2014

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## **Leaf litter invertebrate diversity of the deciduous dry forest of Kirindy – Does bamboo matter?**

### **Abstract**

Leaf litter invertebrates are a vital part of forest ecosystems. In the dry deciduous forest of Kirindy, Madagascar, litter dwelling invertebrate diversity has been found to increase towards the riparian strip, while leaf litter ant diversity, specifically, decreases towards the river. However, two types of habitat are present in this riparian zone: bamboo and non-bamboo forest. We investigate interacting effects of humidity and forest type on the leaf litter invertebrate diversity in riverside forest using pitfall traps. We

found that the earlier findings concerning low ant diversity close to the river are very questionable as we found four times more ant species. Additionally, we did not find an effect of bamboo forest type on species richness and community composition of both leaf litter invertebrates and ants in particular. This suggests that humidity, not forest type is the dominant factor concerning leaf litter invertebrate diversity in this ecosystem.

A. Andry Ny Aina Rakotomalala, University of Antananarivo, Madagascar

Hugo Loning, Wageningen University, Netherlands

Dominic Martin, University of Zurich, Switzerland

2014

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### **Regeneration in logging trails in comparison to the adjacent lightly logged forest in Kirindy: the case of *Strychnos decussata* as a focus species**

#### **Abstract**

The operation of silviculture, despite selective timber felling, has impacts on a forest and its ability to recover. The ability to recover can be assessed for example by the faculty of the regeneration of the forest. Using a paired transect sampling methodology we investigated the differences of tree regeneration between logging trails and adjacent lightly logged forest. Our focus on *Strychnos decussata* enabled us to further analyse a specific tree species to assess the regeneration and its ability to colonise the gaps created by logging trails. Results indicated there was a statistically significant difference between the logging trails and lightly logged forest in terms of environment, excluding stem count. There was no significant difference between the stem counts of the logging trails and lightly logged forest. Ring count analyses of harvested *Strychnos decussata* found that saplings under the height of 0.5 m were aged less than 10 years old indicating new regeneration. This age analysis equation was applied to the *Strychnos decussata* found within the paired transects. Regeneration is more favourable in lightly logged forest than logging trails indicating the impact of past forestry operations on regeneration rates.

Percy Yvon Rakoto, University of Antananarivo, Madagascar

Samantha Alison Hook, University of Salford, UK

2013

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### **Forest structure on a soil gradient in Kirindy Forest (Menabe region, Madagascar)**

#### **Abstract**

Though the dry deciduous forest of Kirindy has been studied, little of this research has drawn attention to how significant the role of evergreens is within the forest structure. Field observation suggested not only that evergreen plants are an important component of the vegetation but also that the forest structure changed across different soil types. With this project, we found a significant relationship between the soil type and the frequency of deciduous and evergreen plants and average height of canopy. We are however unable to identify this relationship as dependency or correlation with unstudied factors.

George Percival, National University of Ireland Galway, Ireland

Nuno Veríssimo Pereira, Georg-August-Universität Göttingen (Germany), Portugal

Tendai Musvuugwa, University of Cape Town (South Africa), Zimbabwe

2009

## Forest structural variables and evergreen tree composition along the Kirindy river

### Abstract

The structural variables (height, dbh  $\geq 10$  cm, density) and evergreen species composition of trees of the riparian forest were investigated across the Kirindy river. 20 transects were set up perpendicularly to the river to sample the vegetation. There was variation in the dbh, tree density and species composition only within twenty metres. This is probably because the river has an influence only within twenty metres over the vegetation of the riparian forest. Probably more transects and other components such as soil types and degree of humidity have to be studied during the rainy season to clearly establish the influence of the river on the vegetation.

Djomo Nana Eric, University of Yaounde, Cameroon

Chabi A.M.S. Djagoun, University of Abomey-Calavi, Benin Noelikanto

Ramamonjisoa, University of Antananarivo, Madagascar

2009

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## Distribution of *Commiphora guillaumini* in Kirindy Forest

### Abstract

The 25 ha area of CS5 in Kirindy Forest, divided into 400 plots of roughly 25 x 25 m<sup>2</sup> was investigated, the DBH and spatial location of the population of *Commiphora guillaumini* were collected. A total of 195 individuals including 18 planted *C. guillaumini* were recorded. 38% of the non-planted trees were bearing fruits. The result of the data grouped into 100 sampling units of roughly 50 x 50 m<sup>2</sup> and analysed using Excel and Statview shows that *Commiphora guillaumini* is randomly dispersed in CS5. This result also indicates the lack of natural regeneration of this species which cannot be precisely linked to the logging activities which took place in 1980s in this area.

Achille Baudelaire Momo, University of Yaounde I, Cameroon

Evelyn Asante-Yeboah, Kwame Nkrumah University of Science and Technology, Ghana

2008

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## Abundance and establishment success of *Strychnos mostueoides* in Kirindy Forest

### Abstract

Kirindy Forest is a dry deciduous forest in the Menabe region, western Madagascar. It has been used for logging between 1978 and 1984. We studied the effects of the logging by measuring the establishment success of one plant species, *Strychnos mostueoides*. To do so, we compared logged and landing areas, and logged and unlogged areas with regards to: 1) absolute abundance and 2) relative abundance of *S. mostueoides* size classes. Logged areas had more individuals than both landing and unlogged areas. Of the four size classes, the saplings were the most widespread in all three habitats. However, the difference between the saplings and the three other size classes was the most striking in the logged areas. *S. mostueoides* appeared to be least established in the landing places, where the level of disturbance due to logging activities was the highest.

Dragana Trivic, Lund University, Sweden

Godwin Ndemeere, Makerere University, Uganda

Julie Marsaud, Université Pierre et Marie Curie, France

2007

## Spatial dispersion of plants and animals along a transect in tropical dry deciduous forest

### Abstract

The aim of our study was to investigate if pollinators and seed dispersers affect the spatial distribution of two plant species in a dry deciduous forest in western Madagascar. We used the T-square method (Ludwig and Reynolds 1988 in Behler and Böhning-Gaese 2001) along a transect to investigate if distribution differed from random. The method was also used to assess the spatial dispersion of animals. The results showed no effect of pollinator on plant distribution as both species showed a random pattern, whereas animal distribution was clumped. We consider this method to be a proper tool for both plant and animal distribution analysis.

John Kvarnäck, Lund University, Sweden

Theresa Heitzlhofer, University of Vienna, Austria

2004

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## The effects of logging roads on tree composition, structure and species diversity

### Abstract

The effects of logging, including consequent edge effects, are well understood in tropical rainforest, but much less so in tropical dry forest like Kirindy forest, western Madagascar. Kirindy has a history of selective logging and is highly threatened by current illegal logging activity. This study used four transects, placed perpendicular to a main logging road at least 200 m apart, to consider whether there were changes in forest structure and composition with distance from the road (perhaps attributable to edge effects) and also whether there were differences between transects. On each transect, six 5 x 5 m quadrats were created at 0, 5, 10, 15, 20 and 100 m from the road. Within these, each woody individual was identified (if not with the species name, with a species number) and the circumference measured if it was more than 4 cm in diameter.

No evidence emerged for edge effects of the road on forest structure or diversity, probably because Kirindy, being naturally dry and open, is less vulnerable to such effects. However, some species showed patterns of changing frequency away from the road, suggesting some effect on composition; further investigation is required. It was found that large trees did decrease in frequency nearer the road, but this is probably a direct effect of selective removal rather than an edge effect. Large trees also decreased in frequency further from the camp, between the transects, possibly because of increasing intensity of illegal logging. Species diversity and composition also varied between transects, indicating spatial heterogeneity on a scale of hundreds of metres.

David Lekeaka, University of Dschang, Cameroon

Eloise Phipps, University of Cambridge, UK

2003

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## Distribution and regeneration of *Adansonia rubrostipa* in Kirindy Forest

### Abstract

A population of *Adansonia rubrostipa* was assessed for spatial distribution and regeneration within an area of 168,125m<sup>2</sup>. It was found that the individuals in the area are significantly aggregated and that there are few small individuals. Seeds were proven to be viable and germination success depended on the treatment received. These findings are informative concerning the conservation status of *A. rubrostipa*. We conclude that the population is still regenerating; however it is doing so at a low rate.

Jennifer Helps, Oxford University, England  
Lisa Kernegger, University of Vienna, Austria

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2002

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## PLANT ECOLOGY

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### Dispersion of *Hildegardia erithrosyphon* in Kirindy Forest: a preliminary study

#### Abstract

Wind dispersal of seeds in tropical forests appears to receive less attention than other dispersal methods in the scientific literature. Here, we investigated the dispersion patterns of a common deciduous tree species, *Hildegardia erithrosyphon*, in Kirindy Forest, Western Madagascar. We found that *H. erithrosyphon* shows a clumped distribution and that distance of treelets from parent trees had a significant effect on fruit and treelet density and treelet growth characteristics. These findings show some agreement with the Janzen-Connell hypothesis and we also suggest that logging has an impact on dispersion patterns in dry deciduous forests.

Jenna Robinson, Deakin University, Australia

Rachel Dolan, University of Leeds, UK

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2014

### The ecology of *Adenia firingalavensis* (Passifloraceae) in Kirindy Forest, Central Menabe, western Madagascar

#### Abstract

Once a widespread ecosystem across the whole of western Madagascar, the dry deciduous forests today are islands of remaining biodiversity and last harbours for many unique and specially drought-adapted species. One of these remarkably adapted species is *Adenia firingalavensis*. The ecology of this species remains largely unknown despite its recently received attention due to the proposed inclusion into the CITES list of international trade endangered species. This study gives a basic introduction into the ecology of *A. firingalavensis* found in the dry deciduous Kirindy Forest of western Madagascar. We found striking difference in population structure, possibly related to logging history. Further, this study shows strong evidence for *A. firingalavensis* being specialized on night pollination, a fact that has not been previously reported. This seems to be an important adaptation to the hot and dry environment during its flowering period in the dry season. The examination of the ecological role of *A. firingalavensis* shows strong interactions with many of the native plant and animal species, making it an important part of the ecosystem.

Tobias Hofmann, Gothenburg University, Sweden

Elizabeth Pleskun, University of New England, Australia

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2014

## Effects of environmental variables and time of the day on the visitation patterns to the Neem tree (*Azadirachta indica*) in Kirindy forest, Madagascar

### Abstract

The visitation frequencies to Neem (*Azadirachta indica*) in relation to environmental variables and time of the day were studied in Kirindy Forest, Madagascar. From the scan and focal sampling, the number of visitors present on a patch of flowers and their behaviours were recorded. Significant differences in the number of visitors throughout the day were observed with a clear bimodal activity pattern; one peak in the morning and another in the evening. Time spent on flowers and number of flowers visited differed between visitors. High fruit production and long floral life were also observed. *A. indica* is an introduced species in the study area and the results obtained suggest a high potential of becoming invasive in the future. It is recommended that further planting of *A. indica* outside its native range should be done with caution.

Manqoba Zungu, University of KwaZulu-Natal, South Africa

Jennifer Konadu, Kwame Nkrumah University of Science and Technology, Ghana

2013

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## Hungry caterpillars – herbivory in a dry, deciduous tropical forest (Kirindy Forest, Madagascar)

### Abstract

Herbivory on plants by phytophagous insects in dry, deciduous forests is relatively understudied compared to tropical rain forests. Here, we present a preliminary investigation into different aspects of herbivory on a locally abundant understory shrub (*Erblichia* sp., Turneraceae) at two sites in the seasonally-arid Kirindy Forest of western Madagascar. Both the distance from a path ('edge effect') and leaf biomass appeared to affect the level of herbivory on individual plants; by being further away from a path and being larger increased escape from herbivory. We found that there was no effect of the level of herbivory on the ability of the plant to produce flowers. Our single point in time for data collection may obscure any effect, and further investigation should look at the change of herbivory and flower production over the course of wet season start. *Erblichia* appears to be a species adapted to the dry, deciduous forest because the plants respond rapidly to the onset of rain, flush leaves synchronously, and the flowers are short lived.

Aidan Vey, University of Portsmouth, United Kingdom

Vera Hoffmann, University of Cape Town, South Africa

2012

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## Janzen-Connell effects, seed predation and fruit dispersal in the baobab *Adansonia rubrostipa*

### Abstract

Dispersal of seeds and seedling establishment are important drivers of tropical forest dynamics and strongly related to the progenies' distance from the maternal tree. Our study aims to assess whether patterns of seed predation and potential dispersal gradients in *A. rubrostipa* are in accordance with the Janzen-Connell model describing this pattern. The amount of fruit declined with distance from the maternal trunk and dispersal distance from the tree did not exceed canopy width. Fruit condition roughly showed an equal distribution along the distance gradient. Seed predation by curculionid

beetles occurred in more than half of the assessed fruits, indicating that these weevils are the main seed predators. Predation did not differ significantly over distance. Seedling recruitment in *A. rubrostipa* might be severely constrained by the absence of an effective disperser. Production of larger fruits seems to be a way to ensure a higher number of viable seeds, which allows more intact seeds to survive seed predation due to predator saturation.

Jesse Erens, University of Wageningen, Netherlands

Anita Freudmann, University of Vienna, Austria

Ewa Komar, University of Warsaw, Poland

2012

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### **The relationship between the length of liana and the size of succulent stem of *Adenia firingalavensis***

#### **Abstract**

This study was conducted on *Adenia firingalavensis* in the dry deciduous forest of Kirindy, Madagascar during the end of the dry season. A clear relationship (allometric scaling) was found between the parameters of the succulent stem (volume, surface area, and diameter) and the length of the liana; increasing size of these characters scale with increased length of the liana. The succulent stem is assumed to have roles in photosynthesis and water retention as adaptations to the extended dry season.

Asimenye Nthakomwa, University of Malawi, Bunda College, Malawi

Solonombana Koly Vitantsoa, University of Antananarivo, Madagascar

2012

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### **Variation in nectar volume and sugar concentration in the nectar of *Chadsia flammea* in Kirindy Forest**

#### **Abstract**

Plants limit the production of nectar to the needs of the pollinators. *Chadsia flammea* in particular which is pollinated by sunbirds is no exception. The study investigated the variation in volume of nectar produced by *Chadsia* and the sugar concentration of the nectar during the day. It also investigated the variation between young flowers and older flowers. There was a significant difference between sugar concentration and time of the day and the age of the flower.

Lauren Kelly, University of Salford, UK

Sarah Lehner, University of Graz, Austria

Sandy Oduor, National Museums of Kenya, Kenya

2012

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### **Fate of the baobab seed, *Adansonia rubrostipa***

#### **Abstract**

This study aimed to investigate whether or not the Malagasy giant jumping rat, *Hypogeomys antimena*, was involved in the dispersal of one of the endemic Madagascan baobab species, *Adansonia rubrostipa* after what was considered its primary disperser - the Archaeolemur - went extinct with the arrival of humans. Whilst there were no clear results in this respect, observations over nine days in Kirindy Forest revealed an interaction between *H. antimena*, *Macrotarsomys bastardi* and the experimental *A. rubrostipa* seeds. Novel interactions with *Aphaenogaster swammerdami* were also observed, indicating that this ant may be able to carry greater weights than recorded for the

majority of ant species.

Jayaneesh Namah, University of Mauritius, Mauritius

Alexandra Cole, Swansea University, UK

2011

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## **How does a rare understorey species survive in a dry deciduous forest? – A case study on *Uncarina leandrii* in Kirindy Forest, Madagascar**

### **Abstract**

In investigating the survival strategies of a little researched rare species of shrub, *Uncarina leandrii*, in a highly seasonal habitat it was necessary to focus on a number of factors, including: the demographic distribution and dispersion, morphological aspects, phenology, pollination syndrome and reward for pollinators. This study showed that *U. leandrii* is self-incompatible, relying on visitation by bee pollinators for development of fruits. While the number of inflorescences correlates with plant height and diameter at breast height (DBH), fruit production does not. Nor does it correlate with near neighbour distances. The demographic survey indicates a normally distributed population within Kirindy. The spatial distribution shows that while some individuals are found in clumped patches, others have been dispersed widely in isolation. The above findings suggest that the strategies of this rare plant are working.

Emmanuel Olabode, University of Ibadan, Nigeria

Sarah O'Loughlin Irwin, National University of Ireland, Galway, Ireland

2011

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## **The adaptations of plants in fire-prone ecosystems: savanna and dry deciduous forest of Kirindy, Western Madagascar**

### **Abstract**

In fire-prone ecosystems we can find particular adaptations of the plants to resist several environmental stresses and first of all the fire. In this study, we documented post-burn re-sprouting response of the woody plants in a savanna vs. a dry deciduous forest. We measured bark thickness in relation to plant size in forests and savanna trees as a key fire survival trait. We found that most of the savanna trees have relatively thick bark, especially in the juvenile stages, re-sprout vigorously and grow tall rapidly post-burn. Forest trees were thin-barked, with high mortality and slow regrowth of the few small surviving plants after a forest fire. To understand the origin of savanna we compared the proportion of endemic plants in both habitats, characterised the soils and used other additional bio-indicators. The savanna is of edaphic origin and contains both endemic and non-endemic fire-tolerant woody species.

Fetrarimalala Randriatsara, University of Anatanarivo, Madagascar

Cristian Trani, University of Trieste, Italy

2011

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## **Do the soil characteristics influence the vegetation type? A study of a dry deciduous forest in Madagascar**

### **Abstract**

The vegetation formation in Madagascar is influenced by different factors. The soil is part of those main factors. Our study was carried out in the forest of Kirindy, a dry deciduous forest growing on a sandstone soil. Kirindy is located in the western coast of Madagascar. It is characterised by three

types of forest: dry forest, deciduous forest and evergreen forest. The aim of the work is to study the effect of the soil in the different vegetation in Kirindy. We sample the vegetation and the soil to analyze the interaction between the soil and vegetation. We found that the characteristics of the three types of the forest are different but the soil characteristics are not determinatives to explain this difference.

Lovanomenjanahary Marline, University of Antananarivo, Madagascar  
Walter Paulin Tapondjou Nkonmeneck, University of Yaoundé I, Cameroon

2010

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### Seed dispersal by wind in Kirindy Forest: relationships between wing loading, seed shadows and tree heights

#### Abstract

The objective of this study was to investigate how the traits of wind dispersed propagules relate to dispersal distance within a species (intraspecific) and between different species (interspecific). Between species, we hypothesised that tree species face a trade-off between canopy height and wing loading, mass per surface area of the seed. We measured seed shadows and seed traits of six wind dispersed tree species. We found that time of descent (TOD) was negatively related to wing loading, intra and interspecific. Within a seed shadow, there were no differences in wing loading and TOD. However, wing loading seems to affect the shape of the seed shadow of a tree species. We didn't find evidence for an interspecific trade-off between wing loading and tree height, although there is a tendency.

Froukje Postma, Groningen University, the Netherlands  
Rence Randrianindrina, University of Antananarivo, Madagascar  
Sendi Baptista, Catholic University of Angola, Angola

2010

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### Fate of baobab (*Adansonia rubrostipa*) fruits in dry deciduous forest of Kirindy

#### Abstract

A population of *Adansonia rubrostipa* was assessed for reproductive potential, faunal fruit predation and invertebrate species composition and interactions within fruits. Most of the trees in the study area were found fruiting, producing on average 30.0 fruits. However, due to faunal predation, few of the seeds will have a chance to germinate. Only 21% of examined fruits did not have external openings; vertebrates accounted for destroying 34% of fruits, and insects – for opening 42%. As traces of insect feeding were also detected in many vertebrate-opened, crack-opened or even unopened fruits, insects were the most important baobab fruit predators. *A. rubrostipa* fruits are important microhabitats for a number of invertebrate species. 32 species, belonging to 4 classes and 11 orders, were detected inside the fruits, linked with 11 interactions in terms of co-occurrence. Their preferred habitat characteristics were also recorded. The results enabled us to suggest a general pattern of invertebrate fruit invasion, leading to complete destruction of pulp and seeds.

Isabelle Olivia Baumgartner, University of Zurich, Switzerland  
Kate Elizabeth McNutt, University of East Anglia, England

2004

## **Vertebrate dispersal and predation processes of seeds and seedlings in a species of *Strychnos* in a dry deciduous forest in western Madagascar**

### **Abstract**

We investigated the effects of distance from a species of *Strychnos* on seed predation and fruit dispersal by vertebrate fruit eaters. Seed and fruit number and condition were analysed in quadrats placed near and far to 25 parent tree canopies. Fruit trapping was used to investigate seed dispersal by arboreal vertebrates dropping fruit whilst feeding, and groups of seeds near and far from 30 parent canopies were monitored to examine predation rates by terrestrial vertebrates. We postulate that diurnal vertebrates, particularly *Eulemur fulvus*, are especially important in seed dispersal and that both diurnal and nocturnal vertebrates, although especially the latter, act as seed predators.

Piotr Łukasik, Jagiellonian University, Poland

Todd Johnson, Livingstone Museum, Zambia

2004

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## **Is a green bark character an adaptation to dry conditions in Kirindy Forest?**

### **Abstract**

Green bark trees are common in Kirindy dry forest. The green bark trait is common among different families and most have no leaves during the dry season. This suggests that green bark in trees is likely to be an adaptation to the dryness. Observations under the microscope revealed that strata of green cells are just beneath the strata of dead cells. This may suggest the photosynthetic role of the bark in absence of leaves in most trees. Thus from our study we could be able to suggest that green bark assumes the role of leaves in dry season.

Assogba Gbedande, National University of Benin, Benin

Aloysius Shija, Sokoine University of Agriculture, Tanzania

2003

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## **The fate of the seeds of *Cordyla madagascariensis***

### **Abstract**

The predation and dispersal of *Cordyla madagascariensis* has been studied. The predation rate under the canopy and on the tree of 12 individuals was investigated. Furthermore, a predation experiment was carried out with natural seeds and fruits, as well as with seeds treated in two ways a) boiled and b) boiled and testae removed. Additionally, the distribution of the *Cordyla madagascariensis* individuals was investigated, both around the study trees and in another area was investigated. The predation rate was higher on the forest floor than on the tree. Seeds or fruits were not dispersed by this type of predation. Seed dispersal seems to be important because of intraspecific competition: the girth of trees increased with increasing distance from an adult tree. The tree distribution was random, which indicates seed dispersal. The disperser could be *Eulemur fulvus rufus*, which predated the fruits on the tree.

Rindra Ramanankirahina, University of Antananarivo, Madagascar

Maaïke de Vlas, University of Groningen, The Netherlands

Beatrice Vonlanthen, University of Fribourg, Switzerland

2002

## Assessment of dispersal and predation of *Strychnos decussata* fruits and seeds by frugivorous tree visitors in Kirindy Forest

### Abstract

The study was conducted in the dry forest of Kirindy, Madagascar to observe frugivorous tree visitors, quantify seed predation and fruit dispersal rates for *Strychnos decussata* (Loganiaceae). Ten individual trees were investigated for five days using quadrats (1 m x 1 m). Four located near (1 m) and four far (5 m) on each tree. A total of 80 quadrats were established for the 10 trees. The Lemur, *Eulemur fulvus rufus* was the only frugivorous visitor observed during the period. From daily collections of fruit from beneath the canopy, a significant difference was observed on the fruit condition with over 70% of fruits damaged by mammals compared to intact fruits and those damaged by insects. Also, a significant effect of distance was observed as most damaged fruits dropped within 1 m from the tree than five metres away. For seed predation and fruit dispersal, more seeds (76%) and fruits (66.6%) were removed further (10 m) than near (1 m), 24% for seeds and 33.3% for fruits showing a strong significance.

Ambe Julius , University of Buea, Cameroon

Geoffrey Soka, Sokoine University of Agric., Tanzania

Susan Imbahale, University of Nairobi, Kenya

2002

## POLLINATION

### Pollination ecology of *Adenia olaboensis* (Passifloraceae) in the dry deciduous forest of Kirindy, Madagascar

#### Abstract

Investigation into pollination interactions in the threatened dry deciduous forest of Western Madagascar is important due to high rates of biodiversity and endemism and local direct dependence. This observational study investigates the pollination ecology of an endemic liana: *Adenia olaboensis*. We investigated floral development, nectar secretions, pollination, adaptive accuracy and population structure of *A. olaboensis*. We found that *A. olaboensis* was predominantly bird pollinated by the Souimanga Sunbird and Common Jery. The majority of pollination occurred in the early hours of the morning, coinciding with high rates of nectar secretions and likelihood of flower opening. We contextualized our results by comparing the pollination ecology of *A. olaboensis* to that of a sympatrically occurring close relative and competitor: *Adenia firigalavensis*. *A. olaboensis* is an important component of the threatened dry deciduous forest of Western Madagascar, and this study provides an excellent and useful insight into its role.

Amelia Hood, The University of Cambridge, UK

Notahinajahray Rasaminanana, University of Antananarivo, Madagascar

2014

### Structural specialisation and pollination ecology in two Malagasy species of *Dalechampia* (Euphorbiaceae)

#### Abstract

We compared structural features of the blossoms and aspects of pollination ecology for the Madagascan endemic vines *Dalechampia bernieri* and *D. subternata*, characterised by specialised

and generalised pollination, respectively. We measured bract aperture and length, visitation rate of the blossoms and the amount of pollen on female flowers. As expected, *D. subternata*'s bract angle was stable during the day while *D. bernieri*'s bract angles changed daily, becoming more widely open when its specific buzz-pollinating bees were active. Contrary to expectations, *D. subternata* flowers were minimally pollinated, while the amount of pollen on *D. bernieri*'s flowers decreased when they were visited by specialist pollinators together with more opportunistic ones.

Olive Imanizabayo, Dian Fossey Gorilla Fund International, Rwanda Marco  
Plebani, University of Zurich, Switzerland

2012

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## A preliminary early-season flower-visitation web for the Kirindy Forest, Madagascar

### Abstract

Tropical dry forest is an endangered ecosystem for which plant-pollinator relationships are incompletely known. We characterised a portion of the web of interactions between flowering plants and flower visitors in the Kirindy Forest. Taking a plant-centred approach, we observed individuals of five native plant species that were coming into flower at the end of the annual dry season, and recorded all identifiable flower-visitors. Taking a visitor-centred approach, we walked a network of established forest trails and listened for telltale song of the sunbird *Nectarinia souimanga*, noting the flowers visited by this common early-season visitor. The former approach revealed connections among the five early-flowering species via birds and various insects, whereas the latter confirmed these connections and added an additional plant species. Flowers of the six plant species were visited on average by 5.5 animal species, while 10 visitor species for which we had reasonable samples frequented on average the flowers of 3.3 plant species. These qualitative results agree with those reported from other temperate and tropical systems, in that interactions appeared to be relatively generalised by pollinator species and body plan (e.g., birds vs. bees). Also in agreement, the visitation web was noticeably nested, with more-specialized species tending to interact with mutualistic partners that were themselves more generalized. In addition to documenting previously-unreported interactions, therefore, this preliminary web conforms to more widespread patterns emerging for pollination systems at the community level.

N. Waser *et al.* (class exercise)

2009

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## The sugar content of nectar and the attractiveness of the flower to visitors

### Abstract

This study examined the interaction between plant nectar production and flower visitors. We focused on the relationship between the amount of sugar and visitor body size. This involved measuring sugar concentration of nectar and analysis of flower morphology. A strong correlation was found between visitor body size and amount of sugar across the plant species examined. Larger visitors have greater energy requirements and will therefore visit plant species that contain nectar with greater quantities of sugar.

Ana Rita Simones, University of Aveiro, Portugal

Elizabeth Koppenaar, Rijksuniversiteit Groningen, the Netherlands

Graham Wall, University College Dublin, Ireland

2006

### Pollination of *Uncarina paederia* (Pedaliaceae)

#### Abstract

*Uncarina paederia* produces yellow flowers that open during the day. The yellow colour combined with the fact that it has nectar guides suggests it might be insect pollinated. This project therefore asked the question: who is the pollinator of *Uncarina*? The observations were carried out during 8 days. Two species of bee (*Apis* sp.) were discovered as the efficient pollinators of *Uncarina*. Also the need of a pollinator could be proved with experiments. There were some significant differences between different areas and levels. Some flower nectar robbers and destroyers were also observed visiting the flowers.

Nivoheintsoa Rakotonirina, University of Antananarivo, Madagascar

Zsuzsanna Szocs, University of Vienna, Austria

2003

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### Distribution and success of pollination of *Vanilla madagascariensis* on the edge and within the forest

#### Abstract

The main aim of this study was to evaluate the distribution of the *Vanilla madagascariensis* in the dry deciduous forest of Kirindy (East Madagascar) and to compare the pollination success between plants along the edge of forest roads and within the forest. Pollinations were made by hand to estimate the potential success of a pollinator visiting a flower. Field observations were made to identify the pollinator(s). The vanilla is uneven distributed along forest roads and within the forest. Along 10 km of roads and 0.17 km<sup>2</sup> of forest sampled a total of 137 plants were found. They were mostly clustered, but no pattern or gradient was found. Variables like size, max. height, number of inflorescences and fruits and distance to nearest neighbour of 20 plants on the forest edge and 23 plants in the forest were measured and compared. Individuals along forest roads (edge) had a significant higher number of inflorescences and fruits. The pollinator was not found but with the observations of opening time, nectar production and floral morphology different potential pollinators are discussed.

Pascal Querner, University of Vienna, Austria

2002

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