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DISTRIBUTION

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 168,125 m². 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

2002

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

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

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

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 m² 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 m² 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

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 Verissimo 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 ≥ 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

PLANT ECOLOGY

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

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

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

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.

Piotr Łukasik, Jagiellonian University, Poland

Todd Johnson, Livingstone Museum, Zambia

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.

Isabelle Olivia Baumgartner, University of Zurich, Switzerland

Kate Elizabeth McNutt, University of East Anglia, England

2004

Seed predation of *Adansonia za* and *A. rubrostipa* in Kirindy Forest

Abstract

A population of *Adansonia za* and *A. rubrostipa* were assessed for differences in seed predation and invertebrate species composition. Twelve groups of invertebrate were found in the fruits of *A. rubrostipa* and only one in *A. za*. Weevils were the primary invaders with percentage frequency of 14.34%. Black beetle were detected as secondary invaders causing complete destruction of the pulp and seeds. Bright red and black hemipterans also invade the fallen fruits of both species; these are members of the family Pyrrhocoridae, which seem to eat the dry pulp around the seed destroying the pulp and seeds. Viability of the damaged seed was also determined but none of the seeds planted germinated.

Halima Abdillahi, National Museums of Kenya, Kenya

Tahiry Andrianilana Raveloarison, University of Antananarivo, Madagascar

2006

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 Taponjrou Nkonmeneck, University of Yaoundé I, Cameroon

2010

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

POLLINATION

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 km² 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

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

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 Simões, University of Aveiro, Portugal

Elizabeth Koppenaal, Rijksuniversiteit Groningen, the Netherlands

Graham Wall, University College Dublin, Ireland

2006

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
