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DISTRIBUTION

Liana abundance in disturbed and undisturbed forest in Kibale National Park, Uganda

Abstract

Lianas are woody climbers common in many temperate forests and their contribution to forest abundance, diversity and structure is most substantial in tropical forests, where they contribute about 25% of plant species richness. Lianas of ≥ 1 cm stem diameter in an 78.5m² plot of disturbed and undisturbed forest of Kibale National Park in western Uganda were surveyed to study their abundance in different habitats (primary, secondary and slightly logged). Our results indicate that there is no significant difference in liana abundance and in these habitats. We encourage further research on taxonomic diversity of lianas and factors determining liana their abundance.

Thulisile P. Jaca, University of Johannesburg, South Africa

Juliana Bizzarro, University of Zürich, Switzerland

2015

Post-dispersal seed fate in an African tropical forest: secondary dispersal or predation?

Abstract

Understanding the complexity of regeneration forest has a considerable potential for future conservation of secondary forest. We selected sites composed of secondary and primary forest to determine the capacity of a forest to regenerate from disturbance. For this purpose, the influence of habitat structure, i.e. the canopy cover and the ground vegetation cover on secondary seed dispersal (by dung beetles) and seed predation were established. Our results showed an effect of the density of ground vegetation cover for seed dispersal and seed predation but none effect of the canopy cover was found. We found that dung beetles dispersed when the ground vegetation was high compare to predation.

Amandine Confais, France

Fatima Ali, Sudan

Simula Peres Maijo, Tanzania

2015

Does distance to the edge affect the abundance of galls in Kibale Forest National Park?

Abstract

The effect of the forest edge and a range of species-specific factors on gall abundance were investigated in secondary forest in the Kibale National Park. A total of 60 small plots in five different sites over three distances (0 m, 10 m and 20 m) were established. Each plant higher than or equal to 1 m height was identified and the presence of galls recorded. Areas and dry mass of leaves were used to estimate specific leaf area per species. The results indicate that distance away from the edge and specific leaf area does not influence the abundance and formation of galls.

David Ochanda, Makerere University, Uganda

Abigail Kuranchie, University of Ghana, Ghana

Joseph Mzozo, Moi University, Kenya

2011

Influence of edge and host specificity on the distribution of pteridophytes in Kibale National Park

Abstract

We investigated the effect of forest edge on abundance and species diversity of terrestrial and epiphytic ferns in Kibale National Park using four 350 m long transects and fixed tree count method respectively. Host specificity of epiphytic ferns was also investigated. Terrestrial fern abundance and richness is linearly related to distance from the edge in to the interior. Abundance and richness of epiphytic ferns increased insignificantly as distance into the forest interior increased. Epiphytic fern abundance and species richness is linearly related to host size. No obvious pattern in specificity between host species and epiphytic ferns was observed. It is possible that distance from forest edge (among other factors) influences pteridophyte abundance and species richness.

Badru Mugerwa, Mbarara University of Science and Technology, Uganda

Fabiola Monty, Friends of Environment, Mauritius

Yvonne Cakpo, Laboratory of Applied Ecology, Benin

2010

Tree species regeneration potential, diversity and distribution in the logged, unlogged, and community adjacent forest edges in Kibale National Park

Abstract

This study investigated tree regeneration potential, diversity and distribution in three sites (edge, logged and unlogged) in Kibale National Park in Uganda. Tree species density per hectare was not significantly different ($P=0.694$) implying that tree regeneration structure is almost alike in both the logged, unlogged and at the forest edge. Significant difference ($P=0.027$) between the median diversities in the three study sites was observed. There was no significant difference ($P=0.582$) in the mean individual species abundances for the three sites. The forest edge had a higher species diversity ($H'=1.503$) as compared to the logged and unlogged sites ($H'=1.195$ and 1.227) respectively. It was observed that the unlogged site had the highest density per hectare in comparison with the other sites.

Nadunga Irene, Makerere University, Uganda

Mpande Sichamba, Forestry Research, Zambia

Kakuru Orisingura Vincent, Makerere University, Uganda

2008

Success variation of *Palisota schweinfurthii* in different habitats

Abstract

In an attempt to find out how and why *Palisota schweinfurthii*, a dominant forest understorey plant, varies in its abundance and appearance, 155 *P. schweinfurthii* plants were sampled over a two-week period in different habitats types down a slope at Kibale Forest National Park. Sunlight, water and nitrate content of the habitats were estimated. With these as benchmark, the plasticity of *P. schweinfurthii* was measured. The study shows that there is a relationship between the abundance (individuals/ha) of *P. schweinfurthii* and the degree of canopy opening and a similar relationship between leaf size (plant size) and canopy opening. It could also be argued that water and nitrate are limiting on the top of slope and in the swamp respectively.

John Abraham, Forest Services Division, Ghana

Andreas Landberg, Lund University, Sweden

2004

A comparative study of tree densities and diversities in logged and unlogged areas of Kibale National Park

Abstract

A comparative study of tree densities and diversities in logged and unlogged areas was initiated in three plots in Kibale National Park. The plots were located in areas that had different logging intensities; unlogged, lightly logged and colonizing plantation. Out of the 40 tree species identified, the unlogged plot had the highest species richness of 30. The diameter size class did not show much variation. For tree density there was no significant difference found between either plots. The unlogged plot had the highest basal area of 243.26 m²/ha. No significant difference was found between the basal areas of the lightly logged & colonized areas. However between lightly logged & unlogged and unlogged & colonized plots the difference was significant.

Mariëlle Beijen, Leiden University, The Netherlands

Belinda Laryea, Kwame Nkrumah University of Science & Technology, Ghana

2003

Size and distribution of *Trema orientalis* and *Polyscias fulva* in a recently logged and secondary logged plantations in Kanyawara, Kibale National Park

Abstract

The study was conducted in Kibale Forest at two logged sites to compare the size and distribution of *Trema orientalis* and *Polyscias fulva*. The two tree species are light demanding that colonize logged and disturbed forests. We had two sample sites; the first was logged 4 years ago and the second 9 years ago. In each site, fifteen plots (10 m x 10 m) were chosen using random sampling in which all trees were counted; *T. orientalis* on the first site and *P. fulva* on the second site. Again in the first and second site all *P. fulva* and *T. orientalis* were counted in total area of 100 m x 70 m in each case respectively. The DBH and crown diameter of all trees in each plot were measured. Mean density of *T. orientalis* is greater in the recently logged than in the old logged forest while *P. fulva*

was more abundant in the old logged forest. We observed that stem size of *T. orientalis* in the recently logged forest was greater than that of *P. fulva* trees whereas the *P. fulva* trees were bigger and more common in the old logged forest.

Mhagama Musa, I-TOO Project, Tanzania

Asekenye A. Julian, Makerere University, Uganda

Eyob Getahun Made, Forestry Research Centre, EARO/ETV, Ethiopia

2003

A comparative study of the densities of living and dead trees in heavily logged and unlogged areas of Kibale National Park

Abstract

The future of tropical rain forests, such as Kibale, depends on their ability to regenerate after logging has occurred. By comparing tree densities in logged and unlogged areas, we aim to contribute to a better understanding of the impacts of logging on forest regeneration. Previous research showed that logging considerably reduced the density and basal area of living trees, and increased the density of dead trees. This study found no differences between the densities or basal areas of living or dead trees in a logged and an unlogged area of Kibale, 33 years after the logging occurred. This suggests that the forest may have a high capacity for structural regeneration, compared to other tropical forests, which can take centuries to recover.

Kowiyou Yessoufou, Université d'Abomey-Calavi, Cotonou, Benin

Catherine Butterfield, Oxford University, UK

2002

Distribution and abundance of selected tree and undergrowth plant species in relation to slope in Kibale Forest National Park

Abstract

The effect of slope on the distribution and abundance of some selected tree and undergrowth species was investigated in the unlogged forest of Kibale Forest National Park. Belt transect method was used to sample the selected tree species while the undergrowth species was sampled by line intercept method. It was found that slope ($p < 0.05$) has a contrasted effect on the distribution and abundance of *Celtis durandii*, *Trilepisium pheberos*, and *Strombosia scheffleri* while there was no effect on *Parinari excelsa* ($p > 0.05$). For the undergrowth species, *Palisota schweinfurthii*, *Dracaena laxisma*, *Marantachloa* sp., and *Mimulopsis* sp. are affected in distribution and abundance by canopy cover ($p < 0.05$) along the slope categories. Only the abundant *Palisota schweinfurthii* was varied significantly ($p < 0.05$) in between transects.

Christpine Safari, Institute of Tropical Forest Conservation, Uganda

Folaranmi Dapo Babalola, University of Ibadan, Nigeria

2002

Seed retention in *Marantochloa leucantha* - implications for seed dispersal strategy

Abstract

The aim of the survey was to investigate seed dispersal strategy of *Marantochloa leucantha*, a native species of East African tropical forest. We measured removal and ripening rates of fruits having different exposure to insolation and frugivory. The fruits ripened and were removed very slowly. There was no difference in proportion of ripe to green fruits between the compared localities. We suggest *M. leucantha*, a light demanding herb, has adapted to dynamic gap matrix in tropical forest by having prolonged fruiting season. Its fruit can either be taken by primary dispersers to newly created gaps, or split open by themselves. Released seeds containing arils may be dispersed within or in proximity to the parental gap by secondary dispersers like ants. Myrmecochory is rarely studied in tropical forests, which makes this finding particularly interesting.

Ingella Jansson, Umeå University, Sweden

Joanna Reszka, Jagiellonian University, Poland

2000

EPIPHYTES

Vertical distribution of epiphytic fern, *Platycerium elephantosis* in Kibale National Park

Abstract

Platycerium elephantosis epiphytes were investigated in three different forest types for their vertical distribution. Ferns occurred at lower heights in heavily-logged compared to primary and lightly-logged forests. This was probably due to the openness in heavily-logged forest. There was also a linear relationship between fern height and canopy cover, which enabled maximization of metabolic activity. Fern height and tree height in primary and lightly logged forest were significant but in heavily logged forest it was insignificant. In conclusion, heavy logging creates openness in forests which in turn influence fern vertical distribution.

Alezuyo Conslate, Makerere University, Uganda

Mekoya Mamo, Ethiopian Wildlife Conservation Authority, Ethiopia

2015

Study on the ecological factors which influence the occurrence of two macroepiphytes: *Platycerium elephantotis* and *Asplenium* spp. at Kibale Forest, Uganda

Abstract

The sensitivity of epiphyte toward microclimate variation is considered to be an indicator to climate change. So, we focused our study on the environmental parameters which can influence the occurrence of two macroepiphytes (*Platycerium elephantotis* and *Asplenium* spp.) in Kibale Forest research zone. Data collection was carried out within 2.8 ha transect along trails. Three sites which differ in their level of disturbance (open area, edge of forest or transition area and primary forest) are investigated. Parameters recorded included height of the phorophyte, position of the epiphyte,

cover, amount of mosses in the branches. We found that tree height which might indicate light availability and tree age is the most relevant factor to explain the occurrence of these two macroepiphytes. Our data confirmed that *P. elephantotis* is light demanding because it occurs mainly on the upper part of the phorophyte; and *Asplenium* spp. are shade tolerant because they occur on the lower part, even on the ground. Both do not show any host preferences.

Pascale Flury, University of Basel, Switzerland

Tokihenintsoa Andrianjohaninarivo, Conservation International, Madagascar

2009

Host preference by *Platyserium elephantotis* Schweinf. (Polypodiaceae): A case study in Kibale National Park, Western Uganda

Abstract

In this study, we investigated the host preference of the epiphytic fern, *Platyserium elephantotis*, in Kibale National Park, western Uganda, in the natural and disturbed forest. Of the 42 species sampled, *P. elephantotis* was found on 12 of them, 9 from the forest and 3 from the open area. We found that the epiphytic fern significantly prefers two species, *Ficus exasperata* in the forest site and *Erytherina abyssinica*, in the open area. The study has also shown the presence of more host range in the forest than the open site, higher abundance of the epiphyte on trees with higher DBH at both sites, and the preference of colonizing lower branches and trunks in the open area.

Desalegn Chala, Mekelle University, Ethiopia

Lekelefac Mary, University of Yaounde, Cameroon

2005

Species diversity and relative abundance of terrestrial ferns in Kibale Forest

Abstract

We compared the diversity and relative abundance of terrestrial ferns (Division Pterophyta) at three sites; undisturbed forest, regenerated forest and swamp within Kibale Forest National Park. We also investigated the influence of environmental factors such as pH, relative humidity, soil moisture content, air temperature and soil temperature on species diversity and relative abundance. The swamp showed greatest species diversity while evenness and relative abundance was highest in the undisturbed forest. The regenerated forest showed the least species diversity and density.

Margaret Mbugua, Kenya

Oyomoare Eruogun, University of Benin, Nigeria

2005

Microhabitat of the epiphytic fern *Platyserium elephatotis* Schweinf. (Polypodiaceae)

Abstract

This study attempts to determine morphological characteristics of a tree that favour the occurrence and optimum growth of epiphytic fern, *Platyserium elephatotis*. The occurrence of *P. elephatotis* on a total of 206 trees was studied in Kibale Forest National Park. *P. elephatotis* occurred on trees belonging to some families more than the others. Several aspects of the morphology of the host tree influence the distribution of the fern. The number of ferns per tree does not seem to have a relation with percentage of canopy openness. A tree with more branches seems to have more *P. elephatotis*. Trees with rough bark and more moss cover are shown to have higher occupancy of *P. elephantotis*.

and are perhaps better sites for the establishment of the fern spores.

Paulos Tesfaye, Ethiopian Agricultural Research Organization, Ethiopia

Halima Ramadhani, Sokoine University of Agriculture, Morogoro, Tanzania

2003

FIGS

Fig wasp communities in *Ficus natalensis* species in Kibale National Park

Abstract

The taxonomic grouping referred to as *Ficus natalensis* is one of the most widespread of all the *Ficus* species. The group contains species that support the most diverse fig wasp communities in the world. This study examined one of these communities in the Kibale National Park in Uganda. The study sort to examine the relationships and differences in dominance patterns between the most dominant members of these communities with particular reference to the Agaoninae (pollinators). These relationships were examined by comparing species richness within communities dominated by different pollinator species. This study also examined the incidence of three pollinator species on a single fig species, and is only the second recorded instance of such an occurrence given the high degree of specificity between most fig species and their pollinators. In order to confirm the presence of three pollinator species, germination trials were carried out on figs containing only one of the species.

Keith Grehan, University College Dublin, Ireland

2004

An investigation into the spatial distribution of male and female plants in the dioecious fig *Ficus asperifolia*, in Kibale Forest

Abstract

The genera *Ficus* is extremely diverse in terms of habit, growth and morphology, and these plants play an important role in forest ecosystems. The aim of this project was to investigate the spatial distribution of male and female plants of the dioecious Fig *Ficus asperifolia*. Whilst it was not possible to determine the sex ratio of populations of this shrubby plant, interesting findings concerning the pattern of reproduction were revealed during the course of the study. Examination of the root systems of each sex revealed extensive vegetative reproduction, via both suckering and shoot layering. This raises questions about the relative importance of sexual and asexual modes of reproduction in this species, and whether vegetative reproduction occurs in other *Ficus* species.

Lisette Coiffait, University of Newcastle, UK

Kizito Masinde, Egerton University, Kenya

Fanambinantsoa Rasoarisela, University of Antananarivo, Madagascar

2003

Interaction between interactions: Are *Ficus* seed dispersers dispersing fig wasps?**Abstract**

Ficus spp. are dependant on specific wasps for pollination. The colonisation of a new site and the establishment of seedlings does not ensure its future reproduction unless that particular wasp species is also present in this new site to guarantee the pollination of the syconia. We address the question of whether seed dispersers act also as wasps dispersers by focusing on whether seed dispersers consume the fruits at stages where wasps are still present in the seeds. Wasps were only found in yellow and orange figs. Frugivores preferred fruits but consume yellow and orange figs in smaller proportion. We suggest that wasps are capable of emerging as fully developed adults from the endocarp when removed from the fig.

Roos Veeneklaas, Groningen University, The Netherlands

Silvia Lomáscolo, University of Florida, USA

2001

Do figs influence tree species diversity in Kibale Forest?**Abstract**

The role of figs as keystone species which increase tree species diversity has been mentioned by some researchers because of the ability of figs to fruit throughout the year thus offering food to many frugivores during periods of food scarcity. This study tests the prediction that figs increase tree species diversity. Enumeration of tree saplings found growing under 15 pairs of figs of two species and other non-figs was carried out. No significant difference was seen in tree species diversity between figs and non-figs, probably due to the effect of other factors like proximate fruit producing trees, effect of logging and predation by rodents. However, in our work it was found that figs do not increase tree species diversity.

Lucy Deho-Quarshie, Forestry Department, Ghana

Arsema Tesfaye, Ethiopia Kim Boje,

University of Aarhus, Denmark

1998

FOREST ECOLOGY

Assessing liana abundance with topographical variation and light environment**Abstract**

Lianas are defined as woody climbing plants, which rely on other plants for structural support. Despite being an important structural and functional component of tropical rain forests, lianas have often been overlooked in ecological research. Recently, studies have reported an increase in liana abundance and biomass in forests around the world. However, there is still a lack of understanding of the factors that determine liana abundance. Here, through adopting a plot sampling approach, we investigated the effect of topographical variation and light environment on liana abundance in a

primary, tropical forest. Our results showed that liana abundance and basal area (BA) did not differ with variation in steepness of forest slopes. Liana abundance however did increase significantly with greater canopy cover, in contrast to previous studies conducted in secondary growth forests that greater light availability leads to higher liana abundance. Lianas have now been recognized as key components of tropical forests and thus further research into the abiotic and biotic factors that determine its abundance is crucial for future forest conservation and management.

Julian Baur, University of Zurich, Switzerland

Telma G. Laurentino, Lisbon University, Portugal

Takuji Usui, University of Edinburgh, U.K

2015

Carbon accumulation rate in plantations of three tree species in villages around Kibale National Park, Western Uganda

Abstract

This study was conducted to estimate the rate of carbon stock increase in plantations of three tree species *Maesopsis eminii*, *Eucalyptus grandis* and *Pinus caribea*, of different ages around Kibale National Park because forest plantations play an important role in sequestration of atmospheric carbon dioxide globally due to the woody biomass storage. In this context, carbon stock in plantations of different age of three species was measured to compare the rates of carbon accumulation carbon stock. The study indicates that there is a significant difference in accumulation rate of carbon in tree biomass between the three species.

Anibariki Ngonyoka, University of Dodoma, Tanzania

James Omifolaji, University of Ibadan, Nigeria

Jovan Baryamujura, Chimpanzee Sanctuary & Wildlife Conservation Trust, Uganda

2012

Effect of forest logging practices on carbon stock recovery in Kibale Forest National Park, Kanyawara, Uganda

Abstract

Reducing carbon emissions from deforestation and degradation (REDD+) as a mitigation strategy in developing countries is of central importance if humanity is to combat climate change. Understanding the effect of different logging practices on carbon stock recovery is therefore important if credible REDD+ investments are to be made. This preliminary study sought to find out differences in carbon stocks between differently managed forests after 43 years of regeneration in the Kanyawara area of Kibale National Park, Uganda. The study was done in 9 plots in three differently managed compartments: K15 (Heavily logged), K14 (Lightly logged), and K30 (Pristine forest). Carbon stock was the highest in the pristine forest, followed by lightly logged forest and heavily logged forest respectively; however, there was no significant difference in the carbon stocks of the different compartments. The results indicate that previously logged regenerated forests have considerable carbon stocks that should also be considered in the REDD+ financial incentive schemes for developing countries.

Brenda Nagasha, National Forestry Authority, Uganda

Herman Chege, University of Nairobi, Kenya

2012

Flowers and butterflies: the relationship between nectar production, abiotic factors and visitation on *Lantana camara*

Abstract

Lantana camara is an invasive species introduced to Kibale Forest National Park, Uganda. It is a major source of nectar for butterflies which have been found to enhance pollination success and hence increase rate of spread and invasive effectiveness. In this study, we investigated the influence of abiotic factors (temperature, humidity and shade) on the nectar production of *L. camara*. Our results showed that *L. camara* has an autonomous rhythm of nectar production, not influenced by external factors. We also investigated the effect of abiotic factors and nectar production on visitation to *L. camara* by visitation counts. Our findings demonstrated that visitation is highly affected by sun, temperature, humidity, nectar volume and sucrose concentration of the nectar.

Cecile Benjemia, University of Lausanne, Switzerland

Hannah Nicholas, Frankton Council, Australia

Elisa de Veen, Wageningen University, Netherlands

2011

Competition for nectar and fruit visitors in exotic *Lantana camara* and indigenous *Lantana trifolia* species in Kibale Forest National Park, Uganda

Abstract

Lantana camara (exotic species) and *Lantana trifolia* (indigenous species) are perennial, aromatic shrubs that grow in conditions of high light intensity. These plant species are very often visited by a number of organisms including butterflies, bees, ants, birds and many other small insects. Many visitors seem to prefer *L. camara* to *L. trifolia*. This study aimed to determine the abundance and diversity of visitors to *L. camara* versus *L. trifolia* at different time intervals of the day. The results show that the number of flowers per inflorescence for *L. camara* is significant high than *L. trifolia*. Also, the volume of nectar is significantly higher for *L. camara* "Yellow flower" than other flowers. For all visitors we recorded 239 and 217 visitors respectively for *L. camara* and *L. trifolia*. The major visitor and presumed pollinators in both species are the butterflies. The dispersal mechanism of *L. camara* is suggested to be mouse birds, common bulbuls and baboons which feed on the fruits.

Getachew Gidey Kidanu, Mekelle University, Ethiopia

Martial Kiki, University of Abomey-Calavi, Benin

Wilson Maanga, Tanzania National Parks, Tanzania

2011

Dead wood stocks and arthropod communities in Kibale National Park, Uganda

Abstract

This study aims at investigating the influence of abiotic and biotic factors that contribute to dead wood decomposition, specifically the relationship between soil fertility and decomposition rate and the specificity of arthropod dead wood communities for wood of different tree species. By estimating the dead wood stocks within compartment K30 in Kibale Forest National Park, we test the hypothesis that the fertile soils within the park lead to low stocks. This trend was observed for Amazonian forests, but data on dead wood stocks in African forests is lacking. We address the specificity of arthropod communities by analysing arthropod assemblages in dead wood samples of four different tree species

and running multivariate analyses (DCA). We present (one of the) first estimates of dead wood stocks for African forests, which at 24.59 Mg ha⁻¹ (SE = 2.37) falls within the range of low estimates for Amazonian forests on fertile soils. We suggest that further studies should be undertaken to find out why decomposition rates seem higher on more fertile soils. We found no significant differences in arthropod abundance on dead wood of different tree species and the DCA shows that the communities are rather generalist on the tree species tested. Broadening the assessment with more different tree species is recommended.

Deous Mary Ekyaligonza, Makerere University, Uganda

Erik Koenen, Wageningen University, the Netherlands

Rindra Randriandimbimahazo, Antananarivo University, Madagascar
2011

Influence of forest disturbance and tree features on parasitisation by *Loranthus* species in Kibale National Park, Uganda

Abstract

In this study we investigated the distribution, influence of forest disturbance, host tree features especially the bark structure, latex and DBH on parasitisation by *Loranthus* species in Kibale National Park. A total of thirty rectangular plots each of 25 m by 10 m were randomly established in Kibale National Park. Ten plots each were laid in two described vegetation types, herein referred to as regenerating forest and mature forests. The results indicated that the parasite species had wider range of host tree species which included both indigenous and exotic tree species. Individual *Loranthus* spp found on host tree species generally decreases with increasing over-storey density. This study has generally provided information on the ecological factors limiting distribution of *Loranthus* sp. in tropical forest habitats and the extent of spread in Kibale National Park.

Ignas Safari, University of Dodoma, Tanzania

Jean Didier Akpona, Laboratory of Applied Ecology, Benin

Prosper Kwame Antwi, Arocha, Ghana
2001

Tree species composition: A case study of lightly logged, heavily logged and heavily logged arboricide-treated forest sites in Kibale National Park, Uganda

Abstract

A comparison of tree species composition was carried out in Kibale National Park in July 2009 in three forest sites (K-14, K-15 and K-13) which were selectively logged between the period of 1968 and 1969. K-14 was lightly logged, K-15 was heavily logged and K-13 was heavily logged + arboricide. Fifteen transects of 25x5 m were laid in each study site using systematic sampling method and the distance between transects was 25 m. All tree species within the transects were identified, and measurements of height and DBH \geq 5 cm were taken. The results showed differences in tree species diversity between sites, with high species richness and tree density in lightly logged, high basal area in heavily logged, highest canopy cover in heavily logged and highest number of trees with DBH < 10cm found in lightly logged.

Augustine Gbagir, University of Ibadan, Nigeria Florence

Akwatulira, Makerere University, Uganda

2009

Biodiversity of water-filled tree holes in Kibale Forest, a fragmented Ugandan tropical moist forest

Abstract

Water-filled tree holes are important temporal ecosystems for a number of different aquatic and semi-aquatic organisms. In this study we tried to assess the biodiversity of these habitats and the abiotic factors that determine this diversity. The results showed high values for Simpson biodiversity index and Shannon evenness at family levels. Furthermore the investigated biotic and abiotic factors including hole volume, depth, temperature, pH, mass of detritus as well as tree dbh and canopy cover explained the species numbers and family assembly of the majority of holes. Against expectations the dissolved oxygen levels do not have any impact on community structures.

Alfred Burian, University of Vienna, Austria

Marco Katzenberger, University of Lisbon, Portugal

2008

Impact of gap size on tree regeneration in the Kibale forest

Abstract

The study was conducted to determine the impact of gap size on tree regeneration. Seven large gaps, seven small gaps and seven understorey areas were studied. Our results showed that gap size has a significant influence on tree regeneration. Tree density/sapling density and the proportion of the plant community consisting of trees all showed a decline with increase in gap size, most likely due to an increase in the height of ground vegetation with increase in gap size, which tended to impede tree regeneration. Tree seedlings were tallest in the small gaps due to the relatively increased availability of light compared to the understorey.

Olajuyigbe Samuel, University of Ibadan, Nigeria Osei-

Tutu Paul, Kwame Nkrumah University of Science and Technology, Ghana

2006

Plant leaf adaptation in gaps and understory areas of Kibale Forest

Abstract

This work compared leaf surface area, internode length, specific leaf area and leaf water content as adaptations of plants to light in nine plant species of three different life forms (grasses, herbs and trees) in two light environments, the gap and understory areas. The investigations were carried out in the Kibale Forest in August 2006. Plants in the understory area had longer internodes and higher leaf water content than those in the gap area. However, leaf surface area did not differ significantly between plants growing in the gap and understory areas. Life form was a significant effect on all parameters and young and mature leaves responded to light availability in similar ways.

Gladys Odey Quaye, Nature Conservation Research Centre,

Ghana Keddy M. Mbindo, Division of Forestry Research,

Zambia Collins Sebuwuufu, Mbarara University, Uganda

2006

Plant species diversity in natural forest versus *Eucalyptus* woodlot: A comparative case study in Kibale National park

Abstract

Eucalyptus plantations are widely distributed in many parts of the world. They are adaptable to a wide range of environmental and soil conditions. They grow exceptionally fast, but consume prodigious quantities of water. This lowers the water table and deprives other plants of water supply. Some studies have shown that their leaf litter produces toxins which inhibit other plants from growing beneath them. This study investigated the plant species diversity in natural forest versus *Eucalyptus* woodlot in the Kibale National Park, Uganda. The natural forest had higher diversity of trees. Highest and lowest indices of evenness were recorded for climbers and herbs respectively in the natural forest. In the Eucalyptus woodlots, trees and herbs had the highest and lowest indices of evenness. With respect to the number of species and individuals, the natural forest had a higher plant species diversity (0.887) than Eucalyptus woodlot (0.811). Number of trees and shrubs in the natural forest was higher than in the Eucalyptus woodlot. However the Eucalyptus woodlot had a greater diversity of herbs. This might suggest that Eucalyptus woodlot suppress the growth of trees and shrubs.

Hayal Desta Yimer, Addis Ababa University, Ethiopia

Kawana Munalula, Livingstone Museum, Zambia

2005

Insect herbivory on leaves of *Aframomum mildbraedii*

Abstract

The effect of herbivory depends on the scale considered. This was considered for a chrysomelid beetle and non-chrysomelid insects feeding on *Aframomum mildbraedii*. No effects were found at the population scale, however significant effects were found at the plant and leaf level. Non-chrysomelid damage affected a greater proportion of both individual plants and leaves. Larger plants had a greater proportion of leaves damaged for non-chrysomelids. Most relationships were stronger at the leaf level. Older leaves were more likely to be damaged by all insect species studied. Longer leaves were more likely to be damaged in the case of chrysomelids only. Of the damaged leaves, a negative linear relationship was found between leaf size and proportion of the leaf damaged.

Laura Harrison, University of Oxford, UK

Tiia Taipale, University of Oulu, Finland

Helen Wheeler, University of Cambridge, UK

2004

Impact of gap size on tree species regeneration in different locations in Kibale Forest

Abstract

The impact of gaps on tree species regeneration was assessed in two different forest locations (the rocky-hilly and mid-slopes) in Kibale where 31 gaps were studied. The gaps in the mid-slopes are larger in area (140 m²) than rocky-hill gaps (100 m²), and number of regenerating species increases with gap area. The composition of tree species regeneration was the same both in crown and bole zones. There was no significant difference in frequency and heights of regeneration in older and younger gaps. Overall, the density of the 11 most important

regenerating woody plants was 7.78 plants/m² and the mean height was approximately 1.8 m. *Diospyros* (4.5 plants/m²) and *Coffea* (1.06 plants/m²) were the most abundant regenerating species and there was no abundant pioneer species in the gaps studied although *Trema orientalis* was found in gaps.

Bolaji Adekola Adeniji, University of Ibadan, Nigeria

Kinfe Tesfaye Kahissai, Ethiopian Agricultural Research Organization, Ethiopia Alex

Wilbard Kisingo, College of African Wildlife Management, Mweka-Tanzania

2004

Edge effects on vertical stratification in a differentially logged forest in East Africa

Abstract

The vertical stratification of a tropical rainforest in Kibale National Park, Uganda, was investigated using replicated edge-interior transects. The aim of the study was to assess possible edge effects, as well as differences in the vertical stratification profile, of sites that had been logged at varying intensities in the past. We found edge effects on the foliage density in the understorey and overstorey in a lightly logged forest site. We also found differences in the foliage density between sites subjected to different logging intensities for both understorey and overstorey. We go on to discuss gap dynamics as a masking factor for edge effects in the study sites chosen.

Sandra Correa, University of Florida, USA Jon

Nicklin, University College of London, UK

2003

Effect of selective logging on tree mortality using dead standing trees as an indicator in Kibale Forest

Abstract

This study considered the impacts of logging on dead standing trees in Kibale Forest. The forest was stratified into areas that were heavily logged (HL), lightly logged (LL) and unlogged (UL) forest. The study concentrated on the density and the distribution of dead standing trees. It further compared the diameters of dead trees within the three forest habitats. In each forest type 16 plots were randomly chosen, within these plots dead trees were recorded measured and canopy cover determined. Statistical analysis revealed that there were no significant differences in the amount and diameter sizes of the dead trees between the three forest types. The canopy cover was found to have very little influence on tree mortality. Variations were mainly found to be a result of clustering within plots, rather than forest habitats suggesting other causal factors.

Patrick Pyttel, Albert Ludwigs University, Germany

Asiimwe. B. Paul, Makerere University, Uganda

2003

A comparative study of the distribution and effects of vines on *Trema orientalis* and *Polyscias fulva* pioneer tree species in secondary forest of Kibale

Abstract

We evaluated the morphological differences and the occurrence and abundance of vines on two pioneer tree species (*T. orientalis* and *P. fulva*) in a secondary forest at Kibale National Park. T.

orientalis and *P. fulva* showed significant differences in terms of their morphological characteristics and in the amounts of vine occupancy. *P. fulva* had a reduced amount of vine load compared to *T. orientalis*. This could be inferred to be due to the differential morphological characteristics such as height to the first branch and leaf type exhibited by the two trees. To get the significant differences, T-test and G-test were used for morphological characteristics and vine loads respectively. The results of this study support the hypothesis that some trees are best suited to shed and avoid vines than others, a phenomenon that could lead to a competitive advantage in terms the rate of tree establishment and growth in secondary succession.

Booker Ouma Ogutu, Kenyatta University, Kenya
2002

A comparative study on structural composition in lightly logged and heavily logged forests in Kibale National Park and its implication on the lower understorey vegetation

Abstract

The study was conducted to compare canopy structure and its implication on understorey vegetation in Kibale National Park, Uganda. The forest was subjected to different levels of selective logging, which is expected to cause different ecological changes, therefore the needful of this study. The study also aimed at determining the patch sizes. Six transects, 3 for each forest type with 5 plots each were laid down for data collection. Canopy cover, percentage herb coverage, number of tree saplings and shrubs were recorded. The canopy structure in heavily logged was more heterogeneous than that in the lightly logged forest. Shrub density did not differ between the two areas. Canopy openness was more in the heavily logged areas and sapling densities were higher in the lightly logged forest. There was high relationship between the degree of canopy openness, herbs coverage and the number of tree saplings. It was observed that the heavily logged forest, 40 years post-harvest still deviates from the lightly logged forest in terms of structure and composition.

Dos Santos A. Silayo, Sokoine University of Agriculture, Tanzania

John Kamau Wambugu, National Museums of Kenya, Kenya

2002

Field survey of a frugivore-plant network in Kibale National Park

Abstract

In many ecosystems animals have an essential role as seed dispersers. Many plants produce berries or fruits to be consumed by frugivores, thereby facilitating seed dispersal. In this study we investigated how different factors affect frugivore abundance and distribution in a tropical rain forest. We found fruit size to be positively correlated to average and minimum size of birds feeding on the fruits. We did not find any correlation between fruit size and total number of visiting frugivore species, or between crop size and visitation rate. The total number of visiting frugivore species did not differ between habitats, but was correlated with the visitation rate. We also investigated the composition of specialists and generalists in the frugivore-tree network to evaluate the structure and robustness of the network as a whole. The network was found to be a 'small-world network' with strong connections between species, indicating a high resistance towards disturbance on system function.

Iben Hove Sørensen, Aarhus University, Denmark

Johan Eklöf, Stockholm University, Sweden

2002

Influence of pine plantation logging on the regeneration of trees in Kibale Forest

Abstract

The effects of logging on the regeneration of the understorey of a pine plantation has become an important issue in the Kibale Forest. The study tests the prediction that the species that are in the understorey of the pines will be the same ones that become established in the secondary forest. A study of three areas pine plantation, 1 year and a 7 year logged plots gives us an idea of regeneration in an area. The 7 year plot supports more established trees (> 11m high) and a higher species diversity greater than the 1 year plot and the pine. We found that the species that regenerate are not the ones that were originally there in the pine plantation.

Gauden Nantale, Makerere University, Uganda Caroline

Kerubo, University of Nairobi, Kenya

2002

Is the extent of edge effect affected by neighbouring matrix?

Abstract

This investigation examined whether the nature of the matrix (habitat abutting the forest edge) determines the depth of the edge effect. We used point sampling along transects laid perpendicular to the edge to compare the depth of edge effect for forest bordered by secondary forest (soft edge) and forest bordered by open ground (abrupt edge). Understorey biomass and canopy openness, to a lesser extent, were affected by proximity to the edge, and the effect was stronger at the open (abrupt) edge than the soft edge (secondary forest). Basal area and woody stem numbers did not appear to vary with proximity to edge. For Kibale National Park, further studies are recommended based on plant and animal responses to edge creation to formulate recommendations and strategies for conservation.

Hadijah Magala, Islamic University, Uganda

Prosper Uwingeli, Karisoke Research Centre, Rwanda

2001

Insect damage (herbivory) on the leaves of *Uvariopsis congensis* and *Tabernaemontana odoratissima* in Kibale National Park

Abstract

The study examines the insect herbivory on two tree species in Kibale forest, *Uvariopsis congensis* and *Tabernaemontana odoratissima*. Eight random transects were set and insect damage was assessed for the three different size classes (seedlings, saplings and adults). There was no significant difference in insect damage between age classes of the two tree species. Whereas 75% of *T. odoratissima* seedlings close to each other have lower than 10% insect damage, a similar percentage of *U. congensis* seedlings have more than 10% insect damage for the seedlings which are far from each other. The percentage damage of adults and canopy cover showed a highly significant relationship. We recommend that the chemistry and insects damaging the two tree species should be further examined.

Gerald Kairu, Makerere University, Uganda

Chanja Z. Mwombela, University of Dar es Salaam, Tanzania

2001

An investigation of the occurrence and function of leaf domatia in woody species of the Kibale Forest

Abstract

Leaf domatia are small specialised structures on the underside of leaves of many dicotyledonous plant species. They are associated with predaceous and/or fungivorous mites, this interaction being essentially a protective mutualism. Of the 82 abundant woody plant species (in 32 families) sampled in the Kibale forest, 18 (22%) possessed domatia. The presence of domatia is positively correlated with prominent leaf venation and specific leaf area (SLA). There is no correlation between domatia possession and leaf pubescence and also phenol concentration. Blockage of domatia of *Euclinia longiflora* caused mite numbers to be significantly higher on control rather than treatment leaves. No difference in leaf damage between treatment and control was observed.

Barney Davies, University of Cambridge, UK

Vivian Uchenna Onianwah University of Agriculture Abeokuta, Nigeria

2001

Leaf morphology and herbivory of successional stages

Abstract

Leaf morphology studies were made for three successional stage categories of trees in Kibale forest to compare possible ecological strategies among these categories. Herbivory intensity was analysed as a function of leaf morphology and successional type to establish the degree of anti-herbivore investments in the three classes of tree species. Leaves were chosen at random for each individual plant and measured in the lab for different morphological parameters. Analysis of variance and regression statistics were used to test correlation and significance of associations. There was a significance correlation between successional stage and leaf thickness, size and herbivory while there was none between herbivory and successional stage. Significance of the results, methodological, and study limitations of this work are discussed in the text.

Daniel Njaga, Kenya Wildlife Service, Kenya

Rita Wania, University of Vienna, Austria

1998

Preliminary assessment of seedling recruitment in *Uvariopsis congensis* in Kibale Rain Forest

Abstract

Eighteen *Uvariopsis congensis* Robyns & Ghesq adult tree individuals in Kibale rain forest were randomly selected to study the seedling recruitment behaviour around them. Seedlings were counted, height estimated and the amount of leaf "damage" from herbivores or fungi estimated on 1m² plots. Local seedling density was significantly negatively correlated with distance from parent tree; mean seedling height was not significantly correlated with distance. Leaf area "damage" was significant negatively correlated with distance from the parent and positively correlated with local seedling density. These results are being further explained by the Janzen-Connell model.

Joseph N. Kirathe, Moi University, Kenya

Gabriel Alban, Universidade Eduardo Mondlane, Mozambique

1998

Relationship between herbivory and plant defence strategies

Abstract

Studies were carried out to investigate relationships between herbivory levels in 3 herbaceous species of plant and habitat, and leaf age. In addition, a generalist herbivore was used in feeding choice experiments to determine whether these species produce defence chemicals in response to loss of tissue. Significant relationships were found between leaf age, habitat, geographic location and damage and these are discussed in view of nutritional content of leaves, defence strategies of plants and habitat qualities.

Jessica Ratcliff, University of Sussex, UK

Stefan Weichselbaumer, University of Vienna, Austria

1998

INVASIVE PLANTS

Effects of *Cestrum nocturnum* on the germination success and regeneration of indigenous plant species in Kibale National Park Uganda

Abstract

The study aimed at determining whether *C. nocturnum* has allelopathic effects as well as the shading effect from the thickets it forms, on the germination and growth of indigenous plants species of Kibale Forest. A comparison was done on the species diversity and abundance in the natural forest and under the *C. nocturnum* thickets in 30 sample plots. Soil samples were collected from these sample plots from topsoil and sub-soils and germination tests were carried out in the lab and in the *Cestrum nocturnum* field (under shade and unshaded plots) on millet and beans. Generally, a better proportion of germination was observed for millet grown in forest soils to *Cestrum nocturnum* soils, beans however showed poor germination rates under most conditions. Beans and millet performed better in light as compared to shade conditions in germination and growth.

Baguma Brian James, Institute of Environment and Natural Resources Makerere University Kampala, Uganda

Fomengia Dominic Nkenglefac, University of Dschang, Cameroon

Machingambi Netsai, Mutare Museum, Zimbabwe

Lita Jackson Joseph, WCS-Southern Sudan Program-Juba

2010

Does isolation influence herbivory, seed set and flower visits in the spread of *Lantana camara*? A test in Kibale National Park, Uganda

Abstract

Lantana camara, an abundant exotic plant in Kibale National Park, has been reported as an invasive with a suppressive (allelopathic) effect on surrounding indigenous plant species. This study assessed influence of isolation on herbivory, seed set and flower visitation in the spread of *L. camara*. We found no difference in the level of herbivory between isolated and non-isolated plants, nor was there any difference in inflorescence number and flowers per inflorescence. Nectar concentration was found to be significantly higher in isolated plants, while the volume was higher

in non-isolated plants. However, number of fruit per patch was higher in the isolated plants; this, together with differences in visitor behaviour, may underlie the successful spread of the plant.

Barnabas Haruna Daru, AP Leventis Ornithological Research Institute, Nigeria

Degytnu Tilahun, University of Addis Ababa, Ethiopia

Isaac Osei-Bonsu, University of Ghana, Ghana

Reem Tambal, University of Khartoum, Sudan

2008

Investigation of species diversity in the patches of *Lantana camara* and *Acanthus pubescens* in Kibale National Park

Abstract

The comparative study of species diversity between exotic/invasive and indigenous plants species has received little attention from many biological researchers. This study was aimed at investigating the species diversity of both flora and fauna in different patches of *L. camara* and *A. pubescens*, with a close examination of characteristics that may enhance the invasiveness of *L. camara*. A total area of 750 m² was sampled using nested sampling technique. The results in this study indicated similar levels of plant species diversity between patches of *L. camara* and *A. pubescens*. *Lantana camara* had more fruits/drupe and flowers/inflorescence than *A. pubescens*, which may underpin its success as an invasive plant.

Lucha Celestine Fonyikeh, University of Dschang, Cameroon

Ibrahim Sidie Aruna, Sierra Leone Ben

Belden Mugula, Makerere University Uganda

2007

Pollination mechanism of *Lantana camara*

Abstract

In this study, the pollination and pollinator attraction in *Lantana camara* was investigated. Butterflies and bees appeared to be the most important pollinators because they made more frequent visits for nectar foraging. There was a significant relationship for the colour preference of the pollinators; yellow flowers were more visited than pink flowers. Small butterflies (Hesperiidae) spent significantly more time on inflorescences during nectar foraging bouts. Time of day, temperature and humidity were found to have an effect on the visitation rate of the pollinators of *Lantana camara*.

Olufunso Somorin, University of Ibadan, Nigeria Mijaso

Andriamarovololona, University of Antananarivo, Madagascar

2005

Production of allelopathic substances in an invasive plant species, *Lantana camara*, as a means of out-competing other plants in a bush-fallow: Kibale Forest National Park, Western Uganda

Abstract

Lantana camara was investigated for possible allelopathic effects as mechanisms for

dominance within plant communities. Line transects and quadrats were used for data collection. There was a significant difference between the number of plant species found in *Lantana* and non-*Lantana* patches. There was a negative correlation between litter depth and number of species. The same correlation was also seen between percentage cover and number of plant species. A bioassay was set up with different concentrations of *L. camara* leaf and soil extracts to determine potential allelochemical effects on germination and seedling elongation. There was a significant difference in potential allelopathic effect between *Lantana* and Non-*Lantana* extracts as observed in the dry leaf, fresh leaf and soil samples. Allelopathy provides a potential explanation for the ability of *L. camara* to form monospecific thickets.

Sipho N. Matsebula, University of Swaziland, Swaziland

John Richard, Tanzania Forestry Research Institute, Tanzania

2005

Factors affecting species richness of *Lantana camara* and *L. trifoliata*: A case study of Kibale National Park

Abstract

Lantana camara and *Lantana trifoliata* belong to the family Verbanaceae. The two species have limited distribution in Kibale National Park. Of the two species, *Lantana camara* is the most abundant. Both species have ornamental and medicinal value. The plant species are very often visited by a number of organisms such as bees, butterflies, ants, birds, wasps and many other organisms. It is believed that these organisms visit the plants to get nectar and fruits, which they use as food. The general objective of this research study is to determine the factors affecting species richness in *L. camara* and *L. trifoliata*. Therefore, this study provides baseline ecological and economic information for determining possible factors affecting the abundance and distribution of the two species. The results of this study shows that the mean number of pollinators (17 pollinators/day) visiting *L. camara* is significantly different from the mean number of pollinators (5pollinators/day) visiting *L. trifoliata*. The mean number of fruits (278) per patch of *L. camara* is significantly different from *L. trifoliata* (159). Further, the amount of sugar in *L. camara* is significantly higher (5.11 moles) than in *L. trifoliata* (3.01 moles). On the other hand, there is no significant difference in the mean volume and the mean sugar concentration in the nectar of both species. It is concluded that the number of pollinators, the mean number of fruits per patch and the amount of sugar concentration in the nectar play an important role in the relative abundance of *L. camara* as compared to *L. trifoliata*.

Frank Tetteh-Kumah, Ghana

Jamestone Simon Kamwendo, Malawi

2004

Spatial distribution of major exotic plants at Kanyawara in Kibale National Park (KNP) with emphasis on *Lantana camara*

Abstract

The major exotic woody plants species at Kanyawara, Kibale National Park were identified with emphasis on *Lantana camara*. Line transects and quadrats were the main methods used for data collection. There was a significant difference in the number of exotic species on the road and in trails. The colonization of *Lantana camara* and *Datura suaveolens* affect undergrowth of indigenous species. We observed that the leaf size of *Lantana camara* was

bigger in the trail than at the road edge. The significant difference of leaf size between the road and in the trails was positively correlated with the canopy cover. We suggest that, in order to maintain natural feature of the National Park, eradication of invasive species such as *Lantana camara* and *Datura suaveolens* is necessary.

Tatien Masharabu, University of Burundi, Burundi

Zakia Hassan, Sokoine University of Agriculture, Tanzania

2004

A study to determine the visitation rate of potential pollinators (butterflies, bees and moths) on *Lantana camara*

Abstract

Little has been done on the pollination of *Lantana camara* in Kibale National Park. This study determines the visitation rate of butterflies, bees and moths as the potential pollinators of *Lantana camara*. The study showed that large patches, high temperature and morning hours attracted more visitors.

Julius K. Nguku, National Museums of Kenya, Kenya

Everlyn E. Besong, Nigeria

2001

MORPHOLOGY

Growth structure, distribution and coppicing behaviour of *Chaetacme aristata* Planch. (Ulmaceae)

Abstract

Chaetacme aristata Planch. is a wide-spread African small multi-stemmed tree that shows high variability in morphology and growth structure. This study compares size structure, growth structure and coppicing behaviour of *Chaetacme aristata* in four types of forest habitats with different levels of disturbance. The species showed high variability in diameter, clump girth, crown area, health of the main stem and coppicing behaviour between the sites. Coppicing, usually prolific, occurred in all mature individuals, an unusual trait in the moist tropics, and vegetative propagation, in the form of layering, was even observed.

Charles Jose Kilawe, Sokoine University of Agriculture, Tanzania

Magdalena Mair, Ludwig-Maximilians-University, Germany

2009

Does leaf morphology reflect a plant's water management? A comparative study of three life forms found in a secondary growth in Kibale Forest National Park

Abstract

The aim of our study was to prove the hypothesis that different morphological adaptations of leaves have an effect on water relations. Therefore leaves of seven species representing three different life forms (trees, vines, herbs) found in a secondary growth were analysed with focus on the following

parameters: Leaf size, specific leaf area, water content, leaf thickness, rate of water loss and amount of hair. Useful results showing correlation were gained for water loss vs hair cover (negative correlation), water loss vs. SLA (positive correlation) and water loss vs. leaf area (positive correlation) whereas the analysis of water content did not provide any useful information.

Ulrike Petschacher, University of Vienna

Lara Salido, University of Edinburgh

2002

Impact of big trees on the basal area of local trees in Kanyawara, Kibale Forest

Abstract

We investigated the impact of big trees on the basal area (B.A.) of the surrounding trees with a diameter at breast height (dbh) greater than 10 cm. Twenty plots each 400 m² were centred around a big tree (dbh > 75 cm) as well as a corresponding control plots without a big tree. Plots containing a big tree were further divided into two circles 0-8m and 8-11.3m from the big tree respectively. The control plots were not stratified. Analysis of the paired sample plots using t-test indicated higher B.A value for the 0-8 m radius plot as compared to the 8-11.3 m, although it was not statistically significant. Comparing the total B.A. of the big tree plot (without the big tree) and the total B.A. of the control area also showed no significant difference. However, when the total B.A. of the big tree plot were with the total B.A of the control plot, there was a significant difference in BA between the plot The result shows that big trees have negligible effects on the basal area of the local trees. There is therefore no competition or suppression by the big trees of the resources.

Churchill Nok-Rach, Makerere University, Uganda

Reuben Ottou, Ghana Wildlife Society, Ghana

2001

Spinescence in Kibale Forest

Abstract

In this study we investigated the relationship between spinescent and non-spinescent tree species in terms of their proportion, abundance, nutrient quantity and height. Also the ontogenetic changes are investigated. Our results showed a very low proportion of spinescent species and a low abundance. Nutrient levels did not seem to correlate with the presence or absence of spinescence. Furthermore the results indicated that non-spinescent species are taller than spinescent ones although this trend was not significant. The ontogenetic differences show that different spinescent species protect different parts of the plant.

Sara Hellen Kaweesa, Makerere University, Uganda

Monique van Alphen Kwezi, Leiden University, Netherlands

2001

Patterns of buttress development in three tree species in Kibale Forest

Abstract

75 individuals of three forest tree species in Kibale Forest National Park were measured in order to investigate patterns in buttress development. Buttresses are apparent in several different families of plants and are thought to have developed several times suggesting that buttresses have some kind of adaptive value. We investigated whether buttress development in relation to the height of the tree

was allometric. We found a correlation between tree height and buttress development in all three species, but were not able to identify allometric growth relationships. We also found correlation's between height of trees and number of buttresses for the three species. Investigation into the possible differences between species in terms of buttress development revealed no major differences. This similarity indicates convergent evolution of buttress development strategies.

Jacob Andersen, University of Copenhagen, Denmark

Chloë Snook, University of Oxford, UK

1998

POLLINATION

Pollination ecology of *Thonningia sanguinea*

Abstract

Floral morphology, bright reddish coloration, geoflory and nectar abundance are some of the characteristics of *Thonningia sanguinea*, a tree root parasite in Kibale forest (Uganda). These features seemed to match with rodent pollination. Visits from ants and flies (especially Calliphoridae family) have also been reported, however their role in pollination became eclipsed by the finding of olive sunbirds feeding on the nectar of *T. sanguinea* inflorescences. It seems that the inflorescences offer a perfect morphology and adequate nectar quantity for this sunbird. Some patterns as feeding time, feeding position preferences and pollination strategies are explored. The aim of this study is to provide an overview for *Thonningia sanguinea* ecology.

Eléonore Genzoni Ducommun, University of Lausanne, Switzerland

Elena Quintero Borrero, Universidad Autónoma de Madrid, Spain

2014

Activity pattern of pollinators and pollination ecology of *Crassocephalum montuosum*: weed species in logged Eucalyptus plantation in Kibale Forest National Park

Abstract

Crassocephalum montuosum is one of the dominant weed species in logged *Eucalyptus* plantation in Kibale National Park. We assessed whether its pollination ecology constitute to its success. We measured the number of visitors, pollen availability and environmental variables at five time periods, (thirty minutes each) for five days. Pollen dehiscence was also scored for different stages of flower development. Results revealed significant variation in the number of visitors across time periods and pollen availability across different flower stages. Temperature was a contributing factor for observed variation trends in the number of visitors. From the findings we conclude that *C. montuosum* is a generalist species in terms of pollination agents which may explain its success in the disturbed environment.

Asha Damoah, Kwame Nkrumah University of Science and Technology, Ghana

Mulubrhan Balehegn, Mekelle University, Ethiopia

Stephen Mwiu, Kenya Wildlife Service, Kenya

2009

Relationship between nectar secretion and visitor diversity of *Lantana camara* at Kibale Forest National Park

Abstract

This study was aimed at investigating and relating the nectar characteristics of *Lantana camara* with its visitor diversity, flower colour and environmental parameters. Nectar characteristics and visitor diversity were seen to vary with time, temperature and relative humidity and flower colour with all observed species showing preference to flower colour. Yellow flowers were more visited than the pink flowers. Butterflies were observed to be the most important visitors of *Lantana camara*.

Yong Nazaria, University of Dschang, Cameroon

Joseph Mutahi, Moi University, Kenya

2009

Size matters – Pollinator effectiveness on *Desmodium setigerum*

Abstract

We studied the pollinator effectiveness on *Desmodium setigerum* in Kibale National Park, Uganda. We collected 176 flowers visited by 17 different insect species and counted the pollen deposit on each flower. We found significant differences in the pollen loads of flowers visited by pollinators of different size classes (<10, 10-20 and >20 mm) and a visiting ‘pollen thief’; indicating that the size of the pollinator has an effect on pollination success in *D. setigerum*.

Emma Sandler Berlin, Lund University, Sweden

Tiina Piironen, University of Joensuu, Finland

2009

Functional ecology of colour change and breeding biology in *Desmodium setigerum* (E. Mey.)

Abstract

Floral colour change has been documented in 450 species in 78 families. It often acts as a signal to pollinators showing the flower has already been visited, improving pollinator efficiency. *Desmodium setigerum* (Leguminosae) is a species that exhibits floral colour change and requires floral tripping to expose reproductive parts and release pollen. However, the causes of this change have previously not been studied. In this study we looked at the causes of colour change, pollinator response to flower change, flower tripping rate, visitors/pollinators and seed set in *D. setigerum*. We confirm that colour change in *D. setigerum* occurs by tripping and not pollen recognition. Both colour and morphological change caused by tripping are signals to pollinators. Tripping rate of flowers has a marked peak during the day, coinciding with the amount of open flowers and indicating a peak in pollinator activity. *D. setigerum* requires visitation to set seed which confirms the usefulness of pollinator efficiency aided by floral signalling.

Dara Stanley, Trinity College Dublin, Ireland

The influence of nectar characteristics on potential pollinators in six species of flowering plants in Kibale National Park, Uganda

Abstract

We examined the relationship between nectar characteristics, environmental factors and potential pollinators in six species of flowering plants in Kibale National Park, Uganda. Nectar volume and concentration was measured from flowers of *Erythrina abyssinica* (Papilionaceae); *Spathodea campanulata* (Bignoniaceae); *Datura* sp., *Desmodium* sp. (Papilionaceae); *Acanthus pubescens* (Acanthaceae); and *Barleria* sp. (Acanthaceae) over five one-hour observation periods distributed throughout the day. Both nectar concentration and volume was generally influenced by environmental factors, but they did not influence the numbers of potential pollinators in most of the species examined. The general pattern of flower-pollinator relationship may be a function of several factors other than nectar characteristics.

Geoffrey Mwangi, National Museums of Kenya
Banda Marton, Zambia Wildlife Authority, Zambia
Inas Hamed, University of Khartoum, Sudan

2007

The role of nectar and nectar guides in visitor attraction of *Hypoestes triflora* (*Acanthaceae*) in Kibale National Park, Uganda

Abstract

Owing to the nectar guide markings on the upper lip of *Hypoestes triflora* flower, this study investigates the role of nectar and nectar guides in attracting visitors from three insect guilds (Papilionoidea, Hymenoptera, Diptera). 12-pseudo flowers were attached onto buds equally distributed onto a study plant. Of these, 6 had purple nectar guides and 6 were blank. A drop of 24% sugar solution was added using a 5ml syringe to 3 of the flowers with nectar guides and 3 of the blank flowers. Our results showed that butterflies are the most frequent visitors to natural flowers as well as all types of pseudo flowers and suggest that olfactory and visual cues interact, creating a complex mosaic of factors that together act as attractants to the various insect visitors.

Hannah Griffiths, University of East Anglia, UK
Margaret Owuor, Kenyatta University, Kenya
Rasamison Andrianarivelosoa Solohery, Antananarivo University, Madagascar

2006

Pollination ecology of *Barleria* sp. in Kibale National Park

Abstract

The effects of time, temperature and relative humidity on the activity pattern of visitors to *Barleria* sp. were examined. Measurements were taken to discover if the floral reward (amount of pollen and nectar produce by the flower) had any influence on visitor activity. We tested the hypotheses that the activity pattern of visitors (species, frequency of visit, abundance of pollinators) would not differ according to the time of the day. It was found that pollen and nectar determine the activity pattern of visitors in *Barleria* sp; these in turn, were greatly affected by the time of the day and the environmental characteristics i.e. temperature and humidity. Visitors to *Barleria* sp. were mainly

insects (Lepidoptera, Hymenoptera, Diptera), and included potential pollinators, nectar robbers and predators.

Caroline Baus, Universite Libre de Bruxelles, Belgium

Sarah Muriithi, Moi University, Kenya

2005

Phenology and pollination of the shrub *Euadenia eminens* (Capparidaceae)

Abstract

The phenology and pollination of the widespread, albeit uncommon shrub of *Euadenia eminens* Hook. f. (Capparidaceae) is poorly known. Given the unique *Euadenia* flower structure, we might expect a remarkable plant- pollinating insect- relationship to occur. In this study we present evidence for two possible pollinating moths (Superfamily Noctuoidea) of *E. eminens* and unique data on its phenology. Flowers take at least one month to reach a mature stage and there is some asynchrony in flowering within tree and between trees.

Ana Duarte, University of Lisbon, Portugal

Martina Koller, University of Vienna, Austria

2003

A study to investigate the potential pollinators of *Vernonia wollastonii* (Asteraceae)

Abstract

This research showed that butterflies, hoverflies, and bees are the major potential pollinators of the herbaceous plant *Vernonia wollastonii* in Kibale National Forest, Uganda. The time of day and the patch size had a significant effect on the number of total visitors. Afternoons had more visitors than mornings suggesting that the pollinators became active as the day warmed up. Large patches attracted more visitors as compared to small patches.

Bizeck Sakala, Livingstone Museum, Livingstone, Zambia

Haidar Abd AlGadir Moh, University of Khartoum, Sudan

2003

An investigation into the pollination mechanism of *Cestrum nocturnum*

Abstract

This study was carried out in Kibale Forest National Park to identify the insect species that pollinate *Cestrum nocturnum* and its breeding system. It was also done to determine whether there is a relationship between the amount of nectar produced, nectar sugar concentration and insect species visitation at different times of the day. The result showed that the plant is partially selfing and out crossing. It was further revealed that all flower visitors were moths (nine species). The visitation was only during night time which coincided with the time flowers are open and producing a strong sweet scent. A regression analysis showed that nectar production and sugar concentration of the flower was significantly related to time of the day.

Dawit Mamushet Yifru, Forestry Research Center, Ethiopia

Ahimbisibwe Henry, Makerere University, Uganda

Nectar robbery in *Erythrina abyssinica* flowers: Effects and implications for pollinators

Abstract

Nectar robbing is a process in which nectar is taken out from the nectaries without contact with any sexual parts of the flowers. Nectar robbing affects the pollination success of the flowers by reducing the numbers of visits by sunbirds which are believed to be genuine pollinators of *Erythrina abyssinica* flowers. Two categories of robbers were observed which included primary and secondary robbers. Volumes and concentrations of nectar from robbed and unrobbed flowers were measured using micro-pipettes and hand refractometer respectively. We also observed visitation to flowers of seven trees by sunbirds recording the number of visitations and time spent on the flowers. The results showed that sugar-ants and carpenter bees were responsible for making holes (primary robbers) and honey bees, flies and black ants were responsible for using the pre-existing holes (secondary robbers). The mean volume and concentration of nectar also decreased with the increase in robbery. We observed that increased rates of robbery equally decreased the number of legitimate visits by sunbirds and the total time spent feeding.

Oketch Lazzarus, Makerere University, Uganda

Youssoufa Bele M., University of Buea, Cameroon

2001

Pollination and pollinator attraction in *Hypoestes triflora* (Acanthaceae)

Abstract

In this study, pollination and pollinator attraction in *Hypoestes triflora* was investigated over a ten day period. *Leptosia hybrida somereni* appeared to be the most important pollinator because it made the most frequent visits and carried a lot of pollen. There was no significant correlation between its proboscis length and the corolla tube length. *Hypoestes triflora* appeared to be mainly geitonogamous although xenogamy may also occur. The main attractant of *Leptosia hybrida* s. to the flowers was the purple coloured markings on the upper petal, which also acted to guide the proboscis to the nectary. *Tabanus* sp. also appeared to play an important role in the pollination of flowers of *Hypoestes triflora*.

Mark Otieno, Kenyatta University, Kenya Thomas Reed,

National University of Ireland, Galway, Ireland

2001

A study of the pollination mechanism of *Euclinia longiflora* (Rubiaceae)

Abstract

Euclinia longiflora has a remarkable flower whose features indicate that the flower may be pollinated by a sphingid moth (Faegri *et al.* 1966). In particular, they produce a night scent and have an exceptionally long corolla tube (up to 24 cm). This study measured morphological and behavioural characters of both *E. longiflora* and sphingid moths. We discuss likely pollinators in the absence of direct observation and ask questions about the co-evolution of the *E. longiflora* and its pollinators.

S. Ramiliarijaona, Madagascar

D. Morrish, UK

2001

SHRUBS AND UNDERSTOREY

Diversity of shrub species in logged, lightly logged and unlogged areas in Kanyawara, Kibale National Park

Abstract

The potential of tropical rain forests such as Kibale depends on their ability to regenerate after logging has occurred. Shrubs are often known to colonise disturbed areas easily. We compared shrub diversity in logged and unlogged areas. Results show an increase in diversity of shrub species after a disturbance. Post-logging forest conditions seem to support increased abundance and diversity of shrub species in tropical moist forests such as Kibale National Park.

Olugbenga Ifedayo Akinyooye, University of Ibadan, Nigeria

Davina Philomena Kawuma, Makerere University, Uganda

Elizabeth Amo Esiromo, Kenya Wildlife Service, Kenya

2007

The effect of light on the abundance and growth structure of *Acanthus pubescens* (Acanthaceae) in two forest sites in Kibale Forest National Park

Abstract

We studied the effect of light on the growth and abundance of *Acanthus pubescens* in Kibale National Park. Two sites in the forest were compared; a closed canopy forest and a regenerating forest. Our results showed that *A. pubescens* was more abundant in the regenerating forest than in the closed canopy forest, because of the high intensity of light and the low canopy cover. We also found that light had a significant effect on both the height and flowering of *Acanthus pubescens* hence its growth structure.

Mohamed Elkhawad, Agricultural Research Corporation, Sudan

Allen Meeme, Makerere University, Kampala, Uganda

2005

Inhibition of regeneration in Kibale Forest by an early successional plant, *Brilliantaisia nitens*

Abstract

Forest gaps provide an environment of intense competition for light, a limiting resource for most forest plants. *Brilliantaisia nitens*, an early successional plant species, may be able to monopolise resources within forest gaps. This study found that significantly fewer species and non-*B. nitens* individuals were present in *B. nitens* patches than in adjacent sites lacking *B. nitens*. Above a threshold patch size, *B. nitens* is effectively monodominant. Soil pH, litter depth and light availability were eliminated as possible inhibitory mechanisms. Evidence of allelopathic inhibition of shoot elongation, suggests that allelopathy potentially forms part of *B. nitens* competitive strategy for monodominance, suppressing the process of forest regeneration within gaps.

Purity Kagure Karuga, Moi University, Kenya Tabitha

Innocent, University College London, UK

How does water and light availability affect ecological and morphological traits of an understory plant, *Palisota schweinfurthii*?

Abstract

This study investigated the effect of water and light levels on the ecology and ecophysiology of the understory plant *Palisota schweinfurthii*. We hypothesised that plants in wetter environments would have a greater leaf size and lower root: shoot ratio, while plants in higher light would have higher specific leaf area, more leaves, and greater reproductive effort. Systematic sampling along a range of water availability showed that soil moisture has a negative influence on leaf size and number of leaves and a positive effect on specific leaf area, while canopy openness seems to have no effect on these parameters. Interestingly, root: shoot ratio is apparently unaffected by either resource in the area studied.

Bakolinantenaina Andrianaivoravelona, University of Antananarivo, Madagascar

Josephine Tucker, Cambridge University, UK

2003

Effects of decay of logs on the distribution and species diversity of wood decay fungi in a natural forest in Kibale

Abstract

Fallen logs were surveyed for fruiting bodies of fungi in Kibale forest to determine their density and distribution. Of the 105 fungi collected, 37% were Ascomycetes and 63% Basidiomycetes. *Xylaria* spp. was the most common taxa. On average one log was every 19m² and about 30% had fruiting bodies. There was a significant relationship between the diversity and the degree of decay of wood with Basidiomycetes being found disproportionately on logs in an advanced stage of decay. There was also a significant relationship for presence/absence of fungi in the logs encountered with density of logs without being greater than the density with fruiting bodies.

Eshiamwata George W., Ornithology Dept, National Museums of Kenya Mbom

Richard, Society for the Protection of Animal Life and Environment, Cameroon

2002

Investigations into the ecology and morphology of a root parasite *Thonningia sanguinea* in Kibale Forest Reserve

Abstract

This study was conducted in Kibale Forest Reserve to investigate aspects of the ecology and morphology of the root parasite *Thonningia sanguinea*, a member of the Balanophoraceae family. The Balanophoraceae are considered to have a scattered distribution and are rare in Africa and are not known to be host specific. A grided area in Forest reserve compartment 14 was used to determine *T. sanguinea*'s host preferences, host root and tuber size relationships, pollinators and phenology. Results of these investigations demonstrated that *T. sanguinea* showed a preference for *Markhamia platycalyx* as a host species. The most constant host root, tuber size relationship was found on *M. platycalyx*. Ants, flies and beetles were the apparent pollinators of *T. sanguinea*. Phenology investigations revealed that male flowers are slightly smaller than female flowers and that whole male flowers senesce at a faster rate than their female counterparts. Flowers of *T. sanguinea* appear to arise from the new "exploratory roots" instead of tubers as reported. The

significant result from this study is that *T. sanguinea* has explicit host preferences in Kibale. Further investigative work is needed to see if this is a feature of *T. sanguinea*'s ecology in Africa.

Rokiman Letsara, University of Antananarivo, Madagascar Noeleen

Smyth, Trinity College, Dublin, Ireland

2001

Is the level of gall parasitism in *Acanthus pubescens* influenced by habitat?

Abstract

The aim of this project was to determine if the level of gall parasitism in *Acanthus pubescens* varies with different habitat types. Using random sampling, data were collected in Kibale Forest National Park from open areas, regenerating forest and forest edge types of vegetation structure. The density of *Acanthus* was found to vary significantly between the habitats, with regenerating forest having the highest density. At the level of individual plants, gall parasitism was found to decrease with increase in density of *Acanthus*. By contrast, the density of parasitic infestation at the level of the leaf increases with density of the host plant. One proposition to explain this result is that the parasitising insect tends to favour egg laying on the leaves of *Acanthus* plants growing in a clump. This behaviour is compatible with energetic efficiency and minimisation of risk through exposure to predator.

Amadu Fornah Koroma, University of Sierra Leone, Sierra Leone

Tatiana White, University of Sussex, UK

2001
