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## ANTS

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### Prevalence of ant repellents in floral scent in Kibale Forest National Park, Uganda

#### Abstract

Many plant species attract ant guards in order to reduce herbivory. However, this bears a potential disadvantage for the plant as ants could restrict pollinator access or damage pollen and floral structures and thus reduce reproductive success. Therefore it is crucial that plants develop mechanisms to keep ants away from their reproductive parts. One of these mechanisms is the use of volatile organic compounds to repel ants. This study looks at the prevalence of ant repellents in floral scent in a number of flowering plants. Findings indicate that plant species do not differ in their effect on ants' reactions but they all have a significant repellent capacity. This suggests that ant repellence may not only be present in ant-plant interactions but may be a widely used defence in many plant taxa.

Martina Stocker, University of Vienna, Austria

Mátyás Viktor Farkas, University College London, UK

Huw Richards, University of Edinburgh, UK

2012

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### Escape behaviour in ants (sub-family Formicinae)

#### Abstract

Predation is a major threat to foraging workers of ants. We investigated the role of different stimuli in inducing escape behaviour in a Formicine species common to Kibale Forest. We found that visual stimuli are not as important as vibrational stimuli and ants can modify their behaviour depending on the intensity of vibration. This allows the workers of the species to respond appropriately to the perceived threat level.

João Pedro Pio, University of Lisbon, Portugal

Nichola Plowman, University of St Andrews, United Kingdom

2010

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### Colony structure, range size and inter-species interactions in an arboreal ant species, *Tetramorium aculeatum*

#### Abstract

*Tetramorium aculeatum* is an arboreal ant species that builds felt nests on the leaves of *Acanthus pubescens*, an invasive shrublet abundant along forest paths in Kibale National Park, Uganda. Experiments found individuals from distant nests experienced higher levels of aggression than ants

from the same bush as the focal nest when introduced to a focal nest. This contrasts with the introduction of individuals from nests on the focal bush that experienced similar levels of aggression to the control ant. Multiple queens were found in a number of nests suggesting this species is polygynous. Polydomy is therefore a likely explanation for the tolerance of individuals from nests on the same bush, with colonies covering entire bushes. DNA analysis would be required to determine relatedness between colonies. Nests of ant were found to respond more strongly and for longer to disturbances to their home branch rather than to neighbouring branches or from wafts of air. The strength and nature of responses suggests *T. aculeatum* may protect *A. pubescens* from larger herbivores, despite inconclusive evidence of any protective effect against small herbivores.

Emma Blackburn, Imperial College London, UK

Hannah Froy, University of Cambridge, UK

Michelle Nesbitt, University of Nottingham, UK

2008

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### **An investigation into the foraging strategies of *Myrmicaria* ants**

#### **Abstract**

Optimal foraging is an area of intense investigation within behavioural ecology. The foraging behaviour of ants has been particularly closely scrutinised. We studied the applicability of the ideal free distribution model to, and the effect of different food processing levels on, recruitment of foraging ants of the genus *Myrmicaria*. The use of chemical cues in their foraging trails was also investigated. Recruitment of ants to food patches of different qualities was found to approximate to the ideal free distribution model. An intermediate level of food processing attracted the highest mean number of ants; whether food pieces were presented as clumped or dispersed patches also impacted on recruitment. Pheromones were not found to play an important role in *Myrmicaria* foraging trails.

Judith Schleicher, University of Cambridge, Germany

Oliver Pescott, University of Birmingham, United Kingdom

2006

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### **Comparative foraging behaviour of ant species in primary and regenerating forest, Kibale National Park**

#### **Abstract**

In the Kirindy Forest of western Madagascar the leguminous tree *Albizia* sp. supports mealy bugs whose honeydew in turn attracts ants and stingless bees. We studied the interactions of four species of ants and stingless bees foraging on this honeydew. The ant species appeared to partition the resource in time, with two species (*Camponotus gouldi*, *Camponotus maculatus*) being nocturnal, one (*Paratrechina longicornis*) being crepuscular and one (*Monomorium destructor*) mostly diurnal. Furthermore, numbers of bees (*Liotrigona* sp) and ants on the honey dew source were negatively related, with ants increasing in density with increased distance from the main trunk of the tree and bees showing the opposite trend. In conclusion we observed both a temporal and spatial separation of the different species of social insects foraging on honeydew.

Faith Milkah Ngugi, Egerton University, Kenya

Sinead English, University of Cambridge, United Kingdom

2004

## Size structure and division of labour in driver ants (*Dorylus* sp.) in Kibale National Park, Uganda

### Abstract

Our study investigated size distribution, population structure, and composition of *Dorylus* sp. in Kibale Forest. We examined division of labour in foraging and nest-moving columns. Composition of prey was also studied. *Dorylus* columns show a size-frequency continuum, yet appear to be composed of two castes: 'workers' and 'soldiers'. The worker caste could be split visually into two size classes, small and medium. Division of labour occurs in the column: medium workers are the main prey-carriers, small workers transport most larvae and pupae during migration and soldiers defend the column. The diet of *Dorylus* sp. consists of species from a broad range of invertebrate orders.

Charmaine Uys, University of KwaZulu-Natal, South Africa

Gráinne Foster, Trinity College Dublin, Ireland

Samuel Guiton, Université Paris-Sud, France

2004

## Factors affecting prey removal in trails of army ants (*Dorylus* spp.) in Kibale Forest National Park, Uganda

### Abstract

This study was carried out in Kibale Forest to determine factors affecting prey removal in trails of army ants (*Dorylus* spp.). Trail properties were measured, then artificial pieces of prey of varying types and sizes were introduced into the trails and the responses noted. It was found that larger numbers of ants in the trail took longer to remove prey items. Increasing prey weight resulted in increasing group weight of the ants transporting it and also in an increased removal time. Finally, larger ant groups had longer removal times.

Katharine Bradley, University of Liverpool, UK

Frederik Seelig, University of Bonn, Germany

2003

## Interaction between ants and *Macaranga schweinfurthii* in three habitats of KNP, and its effects on herbivory

### Abstract

Ants involved in mutualistic relationships with plants often protect their hosts from herbivory. In order to investigate whether this was the case with the ant *Crematogaster* and *Macaranga schweinfurthii*, leaves and stems from four plants in each of three habitat types were collected and analysed for herbivory, ants and herbivores. We found that herbivory differed significantly between plants and habitats, with plants in the river showing 1.75 times the herbivory found in the swamp and 3.41 times that in the garden. Total number of *Crematogaster* ants was however not significantly related to the herbivory level, with most ants encountered in the river valley. A number of possible explanations as to why this may be the case is put forward, such as that ants may be providing benefits other than protection from herbivory to the plants.

Lubna Tagelsir Karamalla, University of Khartoum, Sudan

Lucia Scodanibbio, University of Cape Town, South Africa

2002

## **Colony density, predation rates and other observations on *Dorylus wilverthi* in Kibale Forest National Park**

### **Abstract**

We estimated and mapped the colony density of *Dorylus wilverthi* in a 1 km<sup>2</sup> plot in Kibale Forest National Park. The estimated density is 24 colonies/km<sup>2</sup>. Migration and raiding patterns of single colonies were also observed and mapped. A simple method for determining whether ants belong to the same or to different colonies was developed and tested. Recognition and response to pheromone trails by *D. wilverthi* was tested in an experiment, showing that soil with trails of both colony members and ants from different colonies was preferred to untreated soil. Feeding rates were calculated using empirical and theoretical methods and gave a conservative estimate of 74.16 g dry wt/hr/colony to 148.32 g dry wt/hr/colony (empirical).

Martin Wildenberg, Vienna University, Austria

Andrew Jackson, Trinity College Dublin, Ireland

2001

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## **Plant-ant interaction in *Psydrax subcordata* (Rubiaceae) and *Crematogaster***

### **Abstract**

Ant-plant symbioses have been developed by an intricate co-evolution over a long time. It probably started as a parasitic relationship and is based on the ability of the ants to live on the plant. Often the plant provides cavities in branches where the ants might tend Homoptera or even breed. In Kibale National Park we investigated the particular relationship between *Psydrax subcordata* (Rubiaceae) and *Crematogaster* ants. The predominantly descriptive study revealed that *P. subcordata* provides the cavities in which the ants tend Homoptera but *Crematogaster* does not seem to have any benefit for the plant. We hypothesise that this relationship might be parasitic and has arisen either as an evolutionary young relation on an intermediate level of symbioses or due to a host shift or de novo colonization of the genus of *Crematogaster* ants. Further studies on the distribution of both species and the *Crematogaster* host specificity would be needed to decide on this matter.

Ashenafi Assefa, Addis Ababa University, Ethiopia

Alexandra Ley, University of Bonn, Germany

Dirk Louis Schorkopf, University of Vienna, Austria

2001

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## **Ant foraging on the Bottle Brush Tree (*Callistemon subulatus*) – Its effects on the plant and other visitors**

### **Abstract**

Bottle brush trees (*Callistemon subulatus*) with predominant incidence of ant foraging were sampled for investigation. Some inflorescences of the sample trees were selected and completely covered to prevent all visitors from reaching the nectar. Other inflorescences were covered in such a way that only ants could reach the nectar. Ant foraging effect on plants was seen to be very significant in the amount of nectar the ants consumed. However, ant foraging did not seem to have a significant effect on the rate of nectar production.

Charles Boamah, University of Science and Technology, Ghana

Joana Rodrigues, Lisbon University, Portugal

1998

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## Gourmet ants or greasy spoon ants?

### How do colonies of *Cyphoidris* sp. react to foods of different quality?

#### Abstract

The recruitment dynamics of *Cyphoidris* sp. (Myrmicinae) were investigated in a man-made forest clearing in Kibale N.P., Uganda. Two experiments were carried out on 2 and 4 nests respectively. In experiment 1, sucrose solution baits of different concentration (plus a water control) were offered at equal distances from the nests. Ant numbers in contact with the bait were recorded every minute and these data were used to plot recruitment curves for each bait. A recruitment rate constant ( $r$ ) and carrying capacity constant ( $K$ ) were calculated for each bait. Mean values of these constants for each bait concentration were compared. In experiment 2, one bait plus a control was offered to each colony. Different bait concentrations were used in successive replicates. In a similar manner to experiment 1, mean  $r$  and  $K$  values for each bait, were compared. The results show that recruitment rate,  $r$ , is independent of food quality whereas equilibrium number at the bait,  $K$ , increases with food quality. The  $K$  values for each bait concentration did not differ between nests, suggesting that food sources of this type have an “intrinsic”  $K$  value for the local population. Two hypotheses are discussed to explain these findings. The first, proposes that a foragers’ decision to feed at a bait depends on bait quality and number of ants already there. The second proposes that foragers stay longer at higher quality baits, but recruit other workers in higher numbers.

Ian Donohue, Trinity College Dublin, Ireland

James Randerson, University of Cambridge, UK

1998

## Interspecific food competition in ants

#### Abstract

The aim of this study was to investigate if a competitive dominance hierarchy exists within species of ants feeding at a food source. It concentrated on attempting to establish if one species was ultimately dominant when direct interspecific conflicts arose at a food source.

Peter Korsten, University of Groningen, The Netherlands

Christian Wilson, University of Sussex, UK

1998

## Response of army ant columns to disturbance

#### Abstract

The aim of the study was to examine whether disturbance influences columns of *Dorylus* spp. and if so, if they differ between two levels of disturbance. Therefore we examined 20 columns and recorded their responses. We found that ants do respond to disturbance, both in an increase of soldiers and in total number of individuals. However, their response does not differ between the two levels of disturbance and they did not change the proportion of castes. The colony thus sends more individuals when disturbed, but does not send relatively more soldiers. The post-disturbance column-width increased with the level of disturbance, which was mainly attributed by a larger number of guards.

Ulrike Karpfen, Vienna University, Austria

Awatif Khidir Omer, Khartoum University, Sudan

Heidi Savelli Soderberg, Lund University, Sweden

1998

## **BEETLES**

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### **Interactions between rolling and burrowing dung beetles in an African tropical forest: competition, facilitation or neither?**

#### **Abstract**

Dung beetle communities are expected to exhibit intense competition for the dung resource. Many species of dung beetles are specialised to the dung pats of large herbivores. An experiment was carried out in Kibale Forest National Park to test for competitive or facilitative interactions between dung beetles. Exclusion treatments were used to prevent one guild of beetles from removing resources while un-hindering the actions of the other group in acquiring the resource. Dung was allocated equally to one of three treatments to test for competition in dung beetles: 1, exclusion of tunnelers; 2, exclusion of rollers and 3, a control where no beetles were excluded. Samples were left for 48 hours. The control had a far higher volume of dung removed (0.437 l) than either the fence (0.224 l) or plate treatments (0.237 l). There was no difference between the volume lost in the control and the combined total volume lost from the fence and plate treatments indicating the interaction between guilds is additive. Therefore neither competition nor facilitation between the two guilds of dung beetles exists in the tropical forest ecosystem studied. Maintaining diversity and abundance of dung beetles is essential for preservation of functional processes such as nutrient cycling and indirect seed dispersal.

Aoife Leonard, Queen's University Belfast, Ireland

Beryl Makori, Karatina University, Kenya

Michael Jardine, University of Edinburgh, Scotland

2015

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### **Assessment of dung preferences in Kibale National Park, Uganda**

#### **Abstract**

Dung beetles are an important group of insects performing many varied roles within the environment. In this study we looked at how different dung types affected numbers of individuals and species and measured other environmental parameters. We found that the baboon dung attracted a higher number of individuals and showed a higher species abundance than cow, bushbuck, duiker or elephant. We felt this result was due to the omnivorous diet of the baboon attracting a high number of generalist species. We did not collect any specialist species during the study period but felt this could be due to the difficulties in collecting fresh dung on a daily basis.

Christella Suavis Iradukunda, University of Rwanda, Rwanda

Sophie Morgan, University of Salford, UK

2014

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### **Dung and nutrient preferences of dung beetles in Kibale National Park, Uganda**

#### **Abstract**

The study was carried out in Kibale National Park, western Uganda from 18<sup>th</sup> to 26<sup>th</sup> July 2012 to investigate which dung types attract more individual/species of dung beetle and to identify their nutrient requirements. Different dung types and nutrients were used to test their preference. The results show that primate dung is more attractive than herbivore dung and that calcium and nitrogen are the nutrients most chosen by the dung beetles. Primate dung has the high nitrogen content compared to herbivore dung. This study also shows that the beetles can shift between the herbivore and omnivore dungs.

Alemneh Amare, Addis Ababa University, Ethiopia

Lotte Mens, University of Leiden, Netherlands

Lovasoa Rakotozafy, University of Antananarivo, Madagascar

2012

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## **A study of edge effects and dung preference in dung beetles in Kibale Forest National Park**

### **Abstract**

Dung beetles have been classified as keystone species and are often adversely affected by fragmentation. The African continent has a unique dung beetle fauna, thus making it an ideal area for the study of dung beetle ecology. This study used dung baited pitfall traps to examine edge effects and dung preference of dung beetles in Kibale Forest. Primate dung attracted significantly more individuals, species and total biomass compared to elephant dung. A weak edge effect was detected; beetles on primate dung appeared to be more negatively affected than those on elephant dung.

Emma Siddall, Trinity College Dublin, Ireland

Kyra Hoevenaars, Wageningen University &amp; Research Centre, The Netherlands

2004

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## **Comparison of the richness of Coleoptera (Arthropoda, Hexapoda) families between lightly logged and unlogged forest in Kibale National Park**

### **Abstract**

A comparative study was conducted to determine the richness of Coleoptera families on dead wood between unlogged and lightly logged areas in Kibale Forest National Park. Simple random sampling was employed. Twenty samples of dead wood at different decomposition stages; Stage 1- very hard to crumble by hand, stage 2- not easy to crumble by hand and stage 3- easy to crumble by hand were sampled for Coleoptera. The above stages are used to describe the first, second and third ecological succession stages of dead wood respectively. The first stage therefore represents dead wood that has yet to or has just begun to undergo succession, the second stage represents dead wood that is still undergoing succession, while the third stage represents logs at the advanced succession stage. No significant difference in family richness was found between the lightly logged and unlogged areas. The study revealed that deadwood dwelling and deadwood visiting Coleoptera families could be classified under three categories as per their ecological functions. These are: wood borers; pests and moss-eaters; and predators.

Cynthia Brenda Awuor, Tropical Biology Association, Kenya

Alia Idris, University of Khartoum, Sudan

2003

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## **Insect succession on herbivore dung with reference to Coleoptera**

### **Abstract**

Insect succession was studied in Kibale Forest on cow pats to find out if there were any changes in diversity and abundance. Arthropods arrive at the dung at different times. There was a significant change in the abundance of insect orders between times of day and day. Diptera dominated the dung on the first observed day while the number of Coleoptera increased steadily with time. The study shows

that there was no variation in diversity of coleopteran families between morning, afternoon and night. However, a significant difference between the days was observed. These changes on the dung in terms of diversity and abundance with time proves the concept of succession in a microhabitat.

Freddie Sayi Siangulube, Natural History Department, Zambia

Claudia Kasper, University of Vienna, Austria

2002

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### **The impact of small-scale habitat fragmentation on the abundance and movement patterns of carabidae (Coleoptera)**

#### **Abstract**

The construction of logging roads through pristine forest habitat can have considerable and little studied consequences for resident small invertebrate species. We investigated the abundance and movement patterns of Carabid beetles in tropical forest neighbouring a logging road. Beetle abundance decreases with increasing proximity to the road. Marked individuals released in undamaged forest move away in a random fashion, whereas individuals released at the roadside move away from it into the forest. These findings are explained with reference to reduced canopy cover and ground litter cover at the road edge. Habitat fragmentation resulting from the construction of logging roads can have an impact on small invertebrate populations, and this should be considered in future conservation planning.

Christopher Kaiser, Bonn University, Germany

Chris Sandbrook, University of Cambridge, UK

2001

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### **A comparison of three sampling methods in Coleoptera diversity in logged, unlogged and pine plantation in Kibale Forest**

#### **Abstract**

Three sampling methods were used to determine the Coleoptera diversity in logged, unlogged and pine plantation in Kibale National park. The efficiency of sweepnet, beating and pitfall which were used during sampling were compared. Coleoptera abundance and diversity was also correlated with vertical and horizontal habitat diversity. 425 individuals belonged to 19 Coleoptera families were sampled. 14 families were sampled using sweepnet and only 7 using pitfall. 17 families were sampled in logged habitat whilst 9 in pine plantation. Chrysomelidae was the most abundant family collected. A positive and significant correlation between vertical habitat diversity and Coleoptera diversity was observed ( $R= 0.987$ ,  $P=0.0407$ ). However, the positive horizontal habitat diversity was not significant. The number of individuals collected using sweepnet, beating and pitfall were significant ( $F=6.805$ ,  $P=0.015$ ). Our results suggests that sweepnet is more effective in Coleoptera which occur on vegetation above the ground, and correlation of habitat diversity and Coleoptera diversity should be done according to the habitat of the individuals to be collected using appropriate method.

Innocent Zilihona, Tanzania Forestry Research Institute, Tanzania

Cornelio Ntumi, Eduardo Mondlane University, Mozambique

1998

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## **DISTRIBUTION**

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### **Comparison of arthropod abundance in two secondary forest types in Kibale National Park, Uganda**

#### **Abstract**

A comparative study of insect abundance in two secondary forest types (former pine plantation and selectively logged forest) was undertaken. Whereas it would be expected that insects are uniformly distributed in a forest ecosystem, differences were observed in the abundance of insects in the four orders considered for study, and in the abundance of the insects belonging to other orders. Overall, the former pine plantation had a higher abundance of insects than the selectively logged. Significant differences were observed in the abundance of insects in the Order Hymenoptera ( $P = 0.002$ ) and in the abundance of insects belonging to other orders other than those specified ( $P < 0.001$ ). Site specific differences in the abundance of insects were minimal as were the differences in tree species preference by insects.

Joseph Mukasa Ngubwagye, Makerere University, Uganda

Phumlile Simelane, University of Swaziland, Swaziland

Fortunes Felix Matutu, Forestry Commission of Zimbabwe, Zimbabwe

2015

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### **Species richness, biodiversity and litter preference of litter-living Invertebrates**

#### **Abstract**

The study was conducted, due to the high impact of leaf litter invertebrates on a functional, healthy ecosystem. The study contains comparisons of natural species richness and biomass in 0.5m<sup>2</sup> area of leaf litter of Primary forest (no human influence), Secondary forest (logging) and Banana Plantation (Monoculture). It also contains an experimental assay to test for preferences of leaf litter invertebrates for leaf litter of the above habitats and if the preference is dependent on the habitat type using 190g of leaf litter. Results showed significantly higher natural species richness in the primary and secondary forest compared to the banana plantation; however the natural biomass was not significantly different. The experimental results showed no preference for leaf litter types and. There was also no preference for leaf litter type depending on the habitat except in the secondary forest where there was significantly higher species richness in the primary litter compared to the other litter types. We conclude that the species richness of the primary forest is higher. Logging and monoculture therefore had influence on litter-living invertebrate community in general. The non-preference for litter type indicates that these invertebrates are mainly generalists. Nevertheless, studying invertebrate communities in the leaf litter layer should be extended in terms of conservation, due to their important role in forest ecosystems.

Alexander Ries, University of Vienna, Austria

Bridget Ogolowa, University of Jos, Nigeria

2015

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### **Insect biodiversity of understorey vegetation in areas of varying logging intensity in Kibale Forest, Uganda**

#### **Abstract**

This study compared the understorey arthropod biodiversity and biomass in unlogged and logged areas of a tropical moist forest. The expectations were that lightly logged areas would have a higher biodiversity than

unlogged areas whereas heavily logged areas should have a lower diversity. Furthermore, an overall decrease in specialist species by logging was expected. The results showed that both lightly and heavily logged areas had higher arthropod diversity and biomass than unlogged areas. Some of the effects of logging were indirect: logged forests tended to be more open and canopy coverage had negative effects on biomass and species richness. Furthermore, the relative abundances of taxonomic groups differed between logged and unlogged forests suggesting different food webs and possibly lower abundances of specialist species in logged areas. Logged areas were thus more diverse and had a higher productivity than unlogged areas. However, as rare specialist species might be more abundant in the undisturbed areas, more research on specialist species is needed in case selective logging is accepted as a technique for increasing diversity.

Christopher Dowson, University of Edinburgh, UK

Fons van der Plas, University of Groningen, Netherlands

2008

## Edge effects on ground arthropod diversity in Kibale Forest, Western Uganda

### Abstract

Comparison of ground arthropod number and diversity in the forest floor and its edge were made over 5 day periods in the Kibale Forest (plot K 14), western Uganda. Sampling method was daily pitfall trapping (150 pitfalls trap). 1997 arthropods were trapped within 13 taxa; Diptera and Hymenoptera (Formicidae) were the most abundant. Taxa composition in edge habitats was largely similar to that of the forest, but desiccation near edge probably lowers population density. In both habitats, low correlation was observed with the percent vegetation coverage. The study examined a “soft” edge where edge effects were not pronounced but this should not distract from the importance of limiting the construction of logging tracks in protected areas of high conservation importance such as Kibale forest.

Andrinajoro Rianarivola Rakotoarivelo, University of Antananarivo, Madagascar

Gaspard Banyankimbona, University of Burundi, Burundi

2005

## Fig wasp species richness and abundance in three different *Ficus* species of Kibale Forest

### Abstract

Kibale Forest harbours a high richness of *Ficus* species, the majority of which have not yet been assessed for species richness of fig wasps. A survey of the fig wasp faunal assemblage associated with three *Ficus* species (*F. ottoniifolia lucanda*, *F. cyathistipula pringsheimania*, *F. chirindensis*), allowed determination of fig wasp abundance for each species and estimation of species richness parameters. Forty-three new species previously unrecorded from these host figs were collected (*F. chirindensis*: total of 19 species, 15 new species; *F. cyathistipula*: total of 16 species, 14 new species; *F. ottoniifolia*: total of 17 species, 14 new species). A sample size of 106 figs was shown to be a sufficient sampling effort to record the associated fig wasp species for *F. cyathistipula*, as the species accumulation curve reached an asymptote. However, in the other two species further sampling was required. The pollinating fig wasp species dominated the community in two of the species, whereas the faunal assemblage in *F. chirindensis* was dominated by a non-pollinating fig wasp. Gall makers generally had a higher abundance than parasitoids.

Jacinta Abalaka, Ornithological Research Institute, Nigeria

Bonnie Blaimer, Forstzoologisches Institut, Germany

2005

## **A comparison of arthropods in Kibale Forest and adjacent cultivated fields**

### **Abstract**

A comparison of arthropod fauna abundance between Kibale Forest and bordering cultivated fields was carried out from 17 to 27 Sep 2004 at Makerere University Biological Station. Data collection involved three methods: pitfall traps, on plant census and aerial census. The same procedures were applied to the two habitats. The arthropod groups collected by each method were identified to Order level. The Bray and Curtis model was used to determine the similarity of the arthropod orders from the two habitats.

**Kamara Mohamed Ismail, Unverity of Sierra Leone, Sierra Leone**

**Makatta Angelingsi Akwilini, Ministry of Natural resources & Tourism, Tanzania**

**Katebaka Raymond, Makerere University, Uganda**

**2004**

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## **Application of a new method for determining the density of ground-dwelling arthropods in forest and grassland in Kibale National Park**

### **Abstract**

In many studies, such as pest control or population viability analyses in nature, calculating the density of the ground arthropods is critical. So a new procedure using the pitfall traps was created. It is based on the concept that the numbers trapped depend on a species population density and on its locomotory activity. But this method was never evaluated in the field, so this project tested its effectiveness in grassland and mature forest in Kibale National Park. We found that this method was not appropriate for the field data, perhaps it depends on uniform environment. Density estimates could only be calculated for three species. Their density was negatively correlated with the mean weight and positively correlated with the mean body length. This could be explained by the different body shapes presented in nature.

**Sara Saeed, University of Khartoum, Sudan**

**Federica Pinto, University of Rome, Italy**

**2004**

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## **Important factors influencing the faunal composition of puddles**

### **Abstract**

The theories of colonisation, establishment and biogeography can be of use to study the community compositions found in habitats. An analysis of 15 puddles in Kibale National Park showed that depth, habitat and surface area were the factors that greatly affected species richness. Six artificial puddles were made in the open and another six in the forest to further investigate the importance of habitat and examine colonisation over time. Colonisation occurred in the forest puddles first but by the fourth day species richness was greater in the open habitat.

**Thea Johnstone, The University of Liverpool, UK**

**Mohammed Mustafa Elgilani, University of Khartoum, Sudan**

**2004**

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## **Insect biomass as an index of forest regeneration**

### **Abstract**

Logging has a severe impact on ecosystems, yet its effects are hard to measure. We evaluated the regeneration success of logged forest by comparing insect biomass and body length between different restoration stages and

primary forest. We expected the older (or the more regenerated) the forest, the higher the insect biomass. We found the same body length in every regeneration stage, but an increase in insect biomass with the age of the forest. Therefore, regeneration of logged areas to a primary forest biomass potential seems to be possible.

Mario Rauth, University of Vienna, Austria

Silvia Rauch, University of Fribourg, Switzerland

2004

### **The effects of forest structure on the diversity of Orthoptera, Coleoptera and Hymenoptera (Formicidae) in Kibale Forest, Western Uganda**

#### **Abstract**

The effect of forest structure on insect diversity in the forest floor vegetation in the primary forest and an adjacent secondary forest in Kibale forest, western Uganda was studied. Altogether 75 species of insects were trapped. Daily insect collections using the pit fall method were carried out for a period of 6 days. Our study showed the importance of the responses of species richness to habitat change. A higher species richness of orthopterans and coleopterans was found in the secondary forest. No orthopterans were restricted to primary forest; five species of Formicidae were restricted to primary forest and could not live in the secondary forest, they could be considered as indicator species of the primary forest in our site. Larger sized orthopterans and coleopterans were trapped in the primary forest.

Andoniaina Andrianaivoarivelo, University of Antananarivo, Madagascar

Onafuwa Anuoluwapo-Olabisi, Onabanjo University, Nigeria

2004

### **Resting site selection and predation in nocturnal insects**

#### **Abstract**

Camouflage is in many insects the primary defence against predation. It is therefore of great importance to insects to select for a rest site where they are hidden. The aim of our study was therefore to investigate whether or not insects attracted to a mercury vapour bulb are able to select a cryptic resting site, and how their choice of resting site affects their risk of predation. After one week observing insects on a sheet with 32 dark and light squares we found no background preference and no difference in predation risk for correct and incorrect insects in our set up. We did find that predation risk increased significantly with size and differed between insect shape classes.

Ed Butcher, University College London, UK

Riek van Noordwijk, Rijks Universiteit Groningen, The Netherlands

Tom Fayle, University of Cambridge, UK

2003

### **Comparison of the soil fauna diversity on hills and valleys in Kibale Forest National Park**

#### **Abstract**

The study was carried out to analyse the effect of humidity on the distribution and abundance of soil fauna on the hill and in the valley areas in Kibale Forest National Park. According to our research we found five groups of invertebrates were present such as Oligochaeta, Monoplacophora, Arachnida, Myriapoda, and Insecta. The most common and abundant group in both areas was the class Insecta. In addition, we found that humidity did not affect the distribution and abundance of soil fauna because there was not any significant difference

between the two study areas.

Christian Soppo, University of Yaounde, Cameroon

Aimable Munyampeta, National University of Rwanda, Rwanda

2002

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## **Zooplankton species composition, abundance and distribution in a Ugandan papyrus swamp**

### **Abstract**

Zooplankton composition, relative abundance and diurnal distribution were studied in Rwembaita swamp in Kibale Forest National Park, Uganda. The swamp exhibited a marked diurnal temperature variation and low oxygen concentration. There was no significant variation in zooplankton densities between the bottom and surface waters. The overall zooplankton density shows a peak between 13:00 h and 15:00 h. Concerning species diversity, during the sampling, six distinct taxa were recorded. One protozoan species dominated with a relative abundance of 65%. Protozoans and rotifers showed the highest densities. Rotifers, water mites and cyclopoids accounted for over 90 % of the zooplankton biomass. The zooplankton diversity in the swamp is probably related to the oligotrophic state of the water and diversity of microhabitats created by the dense papyrus vegetation. The zooplankton community in the swamp is more diverse than the community in the Nkuruba crater lake which is dominated by the cyclopoids. However, the biomass of the eutrophic lake was markedly higher than that of the swamp.

David O. Chiawo, Kenyatta University, Kenya

Christiane Trierweiler, University of Groningen, Netherlands

2002

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## **The diversity of ground invertebrates in different Kibale Forest habitats**

### **Abstract**

Forest ground invertebrates play an essential role in forest ecosystems especially in the decomposition and recycling of nutrients. Despite this, invertebrate species diversity is very poorly known in tropical moist forests. This study compares the diversity of ground invertebrates in the different forest habitats of Kanyawara Kibale forest. The highest species richness was found in leaf litter. It is suggested that factors such as heterogeneity in distribution between different habitats, favourable physical factors, interaction with other organisms and co-evolution with other organisms will be responsible for this finding.

George Ochieng, National Museums of Kenya, Kenya

Rivo Rabarisoa, Peregrine Fund Project, Madagascar

1998

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## **OTHER INVERTEBRATES**

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### **Composition of Odonata species in Kibale Forest National Park and adjacent localities: Effects of habitat variables on species composition and Relative abundance**

#### **Abstract**

The majority of the world's species of Odonata are found in tropical forests. Odonates are habitat specialists with limited dispersal abilities. Our study aimed to assess the species composition and relative abundance of species of Odonata. A range of habitats were sampled; as well as the  $\alpha$ -diversity and  $\beta$ -diversity of sites within these habitats. We investigated the effect of habitat variables on Odonate assemblages. Odonates can be used to assess ecosystem integrity as they are sensitive to changes in habitat structure. We measured ecological integrity using a Dragonfly Biotic Index. We found that the composition of species varied greatly between different habitats. The main habitat variables that triggered distance amongst habitats were width, depth and conductivity, dragonfly communities were largely triggered by shadiness, canopy cover and stream width.  $\beta$ -diversity was highest in streams and lowest in lakes. A total of 63 species were recorded. The highest DBI was recorded in most rivers and stream habitats.

Esther Toloa, Makerere University Zoology Museum, Uganda

Jack Corscadden, Trinity College Dublin, Ireland

Rija Andriamifidy, University of Antananarivo, Madagascar

Simon Lubega, World Wide Fund for Nature, Uganda

2014

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### **Weapon of mass construction – Elephant (*Loxodonta africana*) footprints as habitat for aquatic macroinvertebrate communities**

#### **Abstract**

In this study we assessed the importance of elephant footprints in creating habitat for aquatic macroinvertebrate communities. We sampled natural footprints and several abiotic factors that could influence their species composition. We found a total of 66 morphospecies among 27 families/orders. Species composition seems to be influenced by both environmental variables, like age and conductivity, and predator-prey interaction. Additionally, we created artificial footprints within different sets of distances from the water source, to study the colonization process of these habitats. After 5 days, 417 specimens were collected and we found higher species richness in artificial footprints near the water source.

Isabella Schaberl, University of Graz, Austria

João Gameiro, University of Lisbon, Portugal

Wolfram Remmers, University of Koblenz-Landau, Germany

2014

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### **Predation and herbivory: The effects of trails on population dynamics in the Kibale National Park, Uganda**

#### **Abstract**

Trail systems are often considered useful, if not necessary, in tropical forests to facilitate human activities. This study aims to determine the impact of trails on the herbivore-predator relationship by using model caterpillars at varying distances from the trail. Three main results were found: 1) there is a

light gradient from the edge of the trails in to the forest; 2) the herbivory activity was higher at the edge of the trails than deeper in the forest; 3) more predation was observed at the edge of the trails than further in to the forest. Those three observations were expected and are related: the trails create an artificial openness of the canopy, providing more light. This induces production of more young leaves which are preferred to older leaves by herbivores. More young leaves attract a higher number of herbivores and this in turn attracts more predators. Hence, a reduction in trail numbers could minimise the artificial disturbance to the herbivore-predator relationship.

Morgan Garon, University of Edinburgh, Scotland

Sylvain Diserens, University of Fribourg, Switzerland

Japheth Roberts, Ghana Wildlife Society, Ghana

2012

### **The rich invertebrate community in tropical epiphytes: a survey of the microhabitat of the Elephant Ear Fern (*Platyserium elephantotis*)**

#### **Abstract**

This study presents a survey of the microhabitat of the epiphytic fern *Platyserium elephantotis*. A total of 18 samples (individual plants) were randomly taken from several different host tree species in Kibale National Park, Uganda. Epiphytes were sampled according to three different height categories: low, medium, and high. Epiphytes were taken apart and all macroinvertebrates on and within the suspended soil of the epiphyte were collected and assigned morphospecies. Results show that the microhabitat is highly diverse and very variable between individual plants. Most common taxa were ants (five ant nests encountered), spiders, beetles, millipedes, and isopods, and included a large number of larval and pupal stages. No significant relationship was found between diversity and weight or height of the epiphytes. We estimate that this fern species is host to about 362 macroinvertebrate morphospecies.

Lea van de Graaf, University of Leiden, Netherlands

Carolina Madeira, University of Lisbon, Portugal

2012

### **General ecology of Clive's bee\*: a solitary hypogeous anthophorid in Kibale National Park, Uganda**

\*Authors note: Clive's bee is the working title of the bee as the species is not yet identified

#### **Abstract**

The diurnal activities, nest site characteristics and general ecology of a species of hypogeous bee (Fam. Anthophoridae) species were examined using a combination of focal sampling, pollen analysis, nest site descriptions and burrow excavations. Following a pre-flight warm up, the bees foraged for pollen between 10:30 and 14:30. This foraging period is likely to be dictated by the dehiscence of the pollen resource; during the study period, the bees visited a single plant from the family Compositae. Nest sites were on bare, sun-baked and compact silty soils which are thought to provide stable and favourable microclimates within the nests. Each nest consisted of a single tunnel ended in a pollen store and was inhabited by one adult female. To our knowledge, this is the first study of ground-nesting bees in Uganda.

Amy MacLeod, University of Amsterdam, Netherlands

Marc Pluch, University of Vienna, Austria

2011

## Intra-specific agonistic interactions between hypogeous anthophorids in Kibale National Park

### Abstract

Several aggregations of an anthophorid bee of unknown identity in Kibale National Park were observed engaging in agonistic interactions. To determine the nature of this interaction, a number of bees were trapped, marked and released, and subsequent interactions were observed. Ownership of the hole did not affect the outcome of the interaction, but being in the hole significantly improved chances of winning. The fights won by the dragging bee were significantly shorter than those won by the bee occupying the hole, while duration was also positively correlated with time of day. These interactions may be the result of nest parasitism or poor hole recognition.

David Fisher, University of Liverpool, UK

Julian Melgar, Lund University, Sweden

2011

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## Host fidelity and palatability of moth bugs (Family Flatidae)

### Abstract

Host fidelity and palatability of moth bugs was investigated in Kibale Forest, Uganda. Field observations were made to understand host–moth bug interactions and activity patterns. Palatability of the moth bugs was tested by administering feeding trials of moths (poisonous and non-poisonous) and moth bugs plus their nymphs to the resident African pied wagtails (*Motacilla aguimp*). Host preference was shown to *Pristimera* vine species with significant host–moth bug fidelity. The wagtails avoided the poisonous moths and the moth bugs. The study shows that moth bugs are selective to host plants and may be potentially poisonous

Imran Ejotre, Islamic University in Uganda, Uganda

Chris Nall, University of Edinburgh, UK

2009

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## Host selectivity by cicada for final stage of moulting

### Abstract

This study was carried out to find out the factors that might influence cicada choice of substrate for its final moult. The factors considered included DBH of the trees, plant height, type of plant, plant species and canopy cover above final moult area. Thirty five plots were sampled in an area of 875 m<sup>2</sup> in Kibale Forest, Uganda. The number of cicada skins found on each plant species of the site was recorded. The characteristics of the plant species (height and DBH) and the canopy cover of the plots were also measured. It was found that cicadas have a higher affinity to sites with high canopy cover, plants of height less than 1.5 m and tree saplings of DBH less than 10 cm for the final stage of their moulting. The highest number of cicada nymph skins were found on *Palisota* sp., however it was concluded that this observation did not translate into cicadas having a high selectivity to *Palisota* sp. for the final stage of moulting. It was thus concluded that cicadas do not have a preference on where to carry out their final moult on emergence from the soil but rather climb up the first plant they encounter.

Nana Yaw Darko Ankrah, University of Ghana & Nature Conservation Research Centre, Ghana

Noon Bushra Eltahir, University of Khartoum & National Centre for Research, Sudan

2009

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## The secret life of Derbidae or why to aggregate

### Abstract

This study aimed to describe the distribution pattern of zebra-bugs on *Setaria caudula* in relation to their ecology and tried to examine the factors influencing their aggregation behaviour. Our investigation comprised both an observational and an experimental approach. Distributions of zebra-bugs were monitored and plant morphology measured. Aggregations were monitored following experimental disturbance, marking and manipulation of leaf orientation. Zebra-bugs aggregate on higher, longer leaves on larger plants. Aggregations are maintained on the same leaves over time, but their size varies and there is turnover of individuals within these groups. Aggregations do not reform following disturbance. Zebra-bugs show preferences for cover and leaf surface during day and night, respectively. Aggregations may form as a result of individuals' similar preferences for resources, in response to predation risk or to enhance mating access. Zebra-bugs do not necessarily aggregate with the same individuals over time.

Stephanie Michler, University of Fribourg, Switzerland

Pete Newton, University of Cambridge, UK

Ciska Veen, University of Groningen, The Netherlands

2003

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## Abundance and species richness of mayfly nymphs in pools and streams within Kibale Forest

### Abstract

The study compared the distribution and abundance of mayfly nymphs (order Ephemeroptera) in pools and streams (lentic and lotic) within Kibale Forest National Park. Samples were collected from ten different streams and pools within the forest using the kick sampling technique. The mayfly nymphs were more abundant and species rich in the streams than in the pools. The pH of most of the pools was higher compared to that of the streams. Mayfly nymphs seemed to prefer a neutral or slightly alkaline water body to an acidic one. The dominance of mayfly nymphs in the stream, could be as a result of high dissolved oxygen content within the habitat, although this was not measured.

Akindele Emmanuel O., Nigeria

Philista Adhiambo Malaki, Kenya

2001

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## Can prey availability explain orb web characteristics in two different habitats?

### Abstract

This study investigates whether the densities and characteristics of orb webs spun by *Tetragnathidae* spiders in two habitats can be related to differences in prey availability. Web density was greater in the habitat where the insect abundance was higher. Larger webs were found in the habitat with lower insect abundance. Mesh size was larger in the habitat which had larger mean insect size. We conclude that prey availability may be an important factor in determining web density and characteristics. Experimental investigation is needed to confirm a causal link between variation in orb webs and prey availability.

C. Andrews, University of Cambridge, UK

O. Otti, University of Berne, Switzerland

M. Szulkin, University of Warsaw, Poland

2001

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## Aggregations of tipulid flies in tree buttresses in Kibale Forest

### Abstract

The aim of this experiment was to try to determine the purpose of the behaviour of tipulid aggregations commonly found in buttresses of trees in Kibale Forest, Uganda. Their behaviour is unusual because they tend to aggregate in groups and bounce rhythmically both when at rest and in flight, giving them the common name 'dancing flies'. Two possible hypotheses were investigated, that the behaviour was an anti-predator behaviour, and that it was connected to mating. A series of experiments were conducted both in the field and in the laboratory, including focal watches at different times of day and marking of field groups. The results support the anti-predator hypothesis in that flies were found to select buttresses according to specific criteria, and to increase their bouncing rate in response to disturbance. However the results also support the mating hypothesis in that groups were found to have a skewed male : female sex ratio. Aggregations were found to have a relatively high level of stability over several days despite breaking up at night. Overall the results provide strongest support for the anti-predator hypothesis but a limited amount of support for the mating hypothesis that could be validated by further work.

Roz Almond, University of Cambridge, UK

Judith Zbinden, University of Bern, Switzerland

Michal Scinsky, University of Warsaw, Poland

Robin Webste, University of Bristol, UK

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1998

## The distribution and diversity of tetrigids in Kibale National Park

### Abstract

Insects are probably the most abundant and species rich group of animals in the world and many of them remain undescribed. One such undescribed family is the Tetrigidae which are unresearched in Africa except for one paper published in Ethiopia [Günter, 1979]. In the following report the distribution and diversity of tetrigids in different habitats in Kibale National Park were determined using random sampling. The forest edge was the most species rich and diverse but also contained the most individuals. On the other hand in moderately disturbed grassland, natural grassland, intact forest and pine plantation no tetrigids were caught. The results were related to vegetation height and the appliance of an ANOVA to the data revealed that species richness and diversity were significantly dependent on habitat type. The potential of tetrigids to be utilised as indicators of grassland disturbance was also assessed. However, the data indicated that their potential was limited. Finally it is suggested that further research should consist of comparative studies between different areas and studies on general ecological parameters such as behaviour and interactions of tetrigids with their environment.

Rory McDonnell, National University of Ireland, Ireland

Roald van der Laan, University of Leiden, The Netherlands

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1998

## **Grasshoppers (Orthoptera) as indicators of disturbance: a comparative study between differentially disturbed grasslands in Kibale National Park, Uganda**

### **Abstract**

Grassland ecosystems have suffered severe destruction and degradation in many parts of the world especially in the tropics. This has led to loss of habitat for many species and the consequent loss of biodiversity. It has become increasingly important therefore to monitor these ecosystems using biological indicators to provide information to conservation managers on the status of these habitats to facilitate timely and appropriate intervention measures. In this study, grasshoppers which are known as good indicators of disturbance were used to measure  $\beta$ -biodiversity of three differentially disturbed grassland habitats. Grasshoppers were collected using sweep netting method along set transects. Results showed that there were significant differences in abundance between disturbed grassland and the other habitats. Species diversity was shown to be higher in natural grasslands than in more disturbed areas. Species richness and abundance were also found to be negatively correlated with grass height.

Marie Raherilalao, Ranomafana National Park Project, Madagascar

George Kinuthia, National Environment Secretariat, Kenya

1998

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## **Inclination angle and prey capture rate of spiders' webs in Kibale Forest**

### **Abstract**

Observations of 5 species of spiders in Kibale Forest were carried out to investigate whether inclination angle of webs affected their prey capture rate. Different species did have different ranges of inclination angles, but this was not related to the amount of prey they caught in 2 hours. Other factors that might affect prey capture were investigated. Spider species, height above ground and body length of spider had no significant effect on prey capture rate. Web area, however, was positively correlated with prey capture rate. Most spiders built webs parallel to the path rather than perpendicular to it. Experiments with artificial webs suggested that parallel webs might have more insects flying into them, but observational studies showed that this did not translate into a higher prey capture rate.

Amy Elizabeth Sanders, University of Bristol, UK

Karen Elizabeth Clausager, University of Aarhus, Denmark

1998

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