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## ANTS

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### Foraging behaviour of *Aphaenogaster swammerdami* - are they as stupid as they look?

#### Abstract

The foraging behaviour of *Aphaenogaster swammerdami* ants from ten nests in a dry tropical forest at Kirindy, Madagascar during the dry season was investigated. The ants more commonly brought whole dead invertebrates, vertebrate faeces and fresh plant material into the nests, and brought inorganic material and dry plant material out of the nest, but all categories of items were observed to be brought in as well as out of nests. Although fruit was a minor part of the diet compared to invertebrates, the ants showed equal preference for banana peel and dead bees supplied experimentally. Most foraging activity was restricted to within 6 m of the nest entrance, and none was observed beyond 9 m. There were significant nest to nest differences in ant activity level, not due to time of day, nest hole size or canopy shading. We conclude that the diet of *A. swammerdami* is plastic and restricted by seasonal availability of different food sources. Activity level and foraging range are also highly variable and may be lower in the dry season.

Jenny Hodgson, University of Cambridge, UK

Deborah Renz, University of Basel, Switzerland

2002

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### Distribution of exotic ants *Pheidole* spp. and *Camponotus* spp., and the native *Aphaenogaster swammerdami* in Kirindy Forest

#### Abstract

This investigation aimed to quantify the threat of two invasive ant species, *Pheidole* spp. and *Camponotus* spp., in comparison with a native species, *Aphaenogaster swammerdami* in the dry deciduous forests of Kirindy, Western Madagascar. Repeated transect surveys showed *A. swammerdami* to be restricted to the forest edge, but *Pheidole* spp. to be abundant and evenly spread into the forest. *Camponotus* spp. were rare. A secondary aim was to investigate the foraging and recruitment behaviour of *Camponotus* spp. and *A. swammerdami* using an experimental design. *A. swammerdami* were found to forage up to 10 m from the colony nest and exhibit strong recruitment behaviour. *Camponotus* spp. were not found to exhibit any recruitment behaviour, however, foraging distances could not be concluded due to a lack of foraging individuals. We found out that *Pheidole* spp. have become a widespread and aggressive invasive in Kirindy Forest and it is recommended that further study be carried out regarding the exact nature of its interactions with other species.

Jane Sakwa, University of Nairobi, Kenya

Kathy Hughes, University of Aberdeen, UK

2003

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## Distribution and activity pattern of *Aphaenogaster swammerdermi* in Kirindy Forest

### Abstract

This study was conducted at Kirindy forest between the 13<sup>th</sup> and 21<sup>st</sup> November 2004 with the aim of determining which factors influence colony distribution and activity patterns of *Aphaenogaster swammerdami*. We studied whether habitat type influenced the distribution, activity and size of ant colonies. We also studied whether canopy cover had an effect on soil temperature. Transects were established in the different habitats and the number of colonies counted and observed for ant activity. Canopy cover and soil temperature measurements were also taken in the large and small trails. We found that the small trail had higher average number of colonies than the large trail while forest interior had the lowest although the differences were not significant ( $F_{2,55}=1.77, P=0.18$ ). Colony size was higher in the larger trails than in the small trails although the difference was not significant ( $t=0.96, df=11, P=0.36$ ). Soil temperature was influenced by canopy cover and this in turn affected ant activity. Ant activity was high in the morning, but dropped to its lowest point at midday and rose again in the afternoon before it dropped in the evening. We concluded that soil temperature and light intensity may determine both where the ants built their colonies and also the colony size. They also influence the level of ant activity. Canopy cover had the effect of reducing soil temperature which in turn affected ant activity, enabling the ants to remain active even during the hot parts of the day.

Catherine Rutenge, Sokoine University of Agriculture, Tanzania

Martin Mwema Musangu, National Museums of Kenya, Kenya

2004

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## How well do ants protect *Fernandoa grevei* from herbivory?

### Abstract

Plants use different defence mechanisms for combating herbivory; one of which is producing extrafloral nectaries to attract ants. This study investigates to what extent ants protect the plant *Fernandoa grevei*, a nectar producing plant occurring in the dry deciduous forests of Madagascar. We found no significant difference of chewing marks, eggs found and eggs removed on either branches that ants could visit or branches on the same study plant, from which ants were experimentally excluded. Older plants were demonstrated to be less predated by herbivores. We found no correlation between ant numbers and the amount of herbivory. Ant species are shown to visit plants according to plant size and number of nectaries, respectively. Smaller ant species tended to visit smaller plants with many nectaries, larger ant species were found on larger plants with less nectaries. Leave damage mimicked by artificial clipping plants did not lead to higher amounts in nectar production in comparison to untouched plants.

Bruktawit Abdu, Addis Ababa University, Ethiopia

Silke Heucke, University of Vienna, Austria

2007

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## Nectar production, number of ants, and herbivory in relation to leaf position on *Fernandoa grevei*

### Abstract

Study was carried out on the *Fernandoa grevei* to determine the relationship of leaf position on (1) nectar production, (2) number of ants and (3) herbivory. Forty eight plants were identified for the study. Analysis of the results shows that there is significant relationship between the number of ants and the nectar production. However, there was no clear relationship between herbivore and nectar production on leaf position. From our results we also found out that plant can influence where the ants go through nectar production.

Joseph Mbelle, Limbe Botanic Garden, Cameroon

Happiness Jackson, Sokoine University of Agriculture, Tanzania

2007

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### Activity patterns of ants at the extrafloral nectaries of *Fernandoa* spp. in Kirindy Forest

#### Abstract

This study investigated the activity patterns of ants at the extrafloral nectaries of *Fernandoa* trees. Eighteen trees were sampled for ants patrolling and the number of extrafloral nectaries on the leaves was counted. Other factors such as temperature were also considered. Generally it was found that the ant activity was greatly influenced by temperature variation in three different times of the day: morning, noon and evening. Factors such as leaf age contributed greatly to the amount of nectar production whereby young leaves were found to produce more nectar than old ones.

Charles Leonard, Tanzania Forest Conservation Group, Tanzania

Loboniaina Andriambelo, Université d'Antananarivo, Madagascar

2008

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### Density and habitat preferences of *Aphaenogaster swammerdami*

#### Abstract

It is often said that ecology and conservation biology suffer from a vertebrate bias. Humans choose to study organisms such as birds and mammals that experience the world as humans but ants live and interact with in parts of the environment that are in many ways foreign to man (Kaspari, 2000). The study was carried out on *Aphaenogaster swammerdami* which a higher density in the light bamboo had showed the least preference for dense bamboo. No relationship was found between these ants and bamboo, medium and large trees however, small trees showed a high correlation with colony size and decreasing as colony size decreased. Similarly soil samples and soil pH did not show any relationship with and nest and colony sizes respectively.

Caroline Kurgat, Moi University, Kenya

Zainab Adeiza, APLORI, Nigeria

2008

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### Is intra-specific competition for food affected by the relative activity rate of neighbouring colonies of *Aphaenogaster swammerdami*?

#### Abstract

We selected local pairs of *Aphaenogaster swammerdami* nests and placed food at the midpoint, in order to investigate intra-specific competition between the colonies. We observed 29 pairs of nests, although both nests succeeded in finding the food in only 19 cases. We hypothesised that the most active nest of each pair would be the most successful at finding and exploiting the food. Our results showed that whichever nest found the food first exploited a significantly greater proportion of it, but there was no significant difference between the competitive ability of the most active and least active nest.

Tolojanahary Richard Anderson Andriamalala, University of Antananarivo, Madagascar

Ahmed Alnazeer Mergani, University of Khartoum, Sudan

Sophie Persey, University of Oxford, UK

2008

### **Effect of habitat on the activity pattern of *Aphaenogaster swammerdami***

#### **Abstract**

We assessed the impact of habitat on the behaviour of *Aphaenogaster swammerdami* under open and closed canopies in Kirindy Forest. We found that the ants were more active in nests under closed canopy than in nests under open canopy. A limited optimal temperature range in the morning resulted in shorter activity period than in the afternoon. Similar shade and temperature conditions meant there was no significant difference in foraging success between the two habitats in the morning. More pronounced differences in shade and temperatures in the afternoon resulted in a significant difference in foraging success. Different levels of interactions with other species in the ecological community were observed with predators, prey and competitors.

Peter O. Alele, Mbarara University of Science and Technology, Uganda

Mary Mwololo, University of Nairobi, Kenya

Marta Marialva, University of Leiden (The Netherlands), Portugal

2009

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### **The impact of distance on the level of between colony aggression in the ant *Aphaenogaster swammerdami* in Kirindy Forest, Madagascar**

#### **Abstract**

*Aphaenogaster swammerdami* is a commonly occurring ant species in Kirindy Forest. Due to the high density of colonies, they face high intra-specific competition which can lead to aggressive interactions between colonies. The effect of distance between colonies on aggressive behaviour was studied and a non-linear relationship was found. The highest levels of aggression were found to occur between colonies that were 10 to 30 meters apart and little aggression was found beyond 30 meters. A further experiment showed that there were fewer aggressive interactions between individuals from different colonies when encounters were staged in a neutral arena, rather than at a nest entrance.

Alice Baranyovits, University of Edinburgh, UK

Bernadette Arakwiye, Karisoke Research Centre, Rwanda

Marie Voillemot, Lund University (Sweden), France

2009

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### **Resource partitioning between ants and bees, a descriptive study on ecological associations of *Albizia* sp.**

#### **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.

Ciara Corcoran, Trinity College Dublin, Ireland

Marlotte Jonker, Wageningen University, The Netherlands

Hauke Koch, ETH Zurich (Switzerland), Germany

2009

## Ant scavenging behaviour as a sampling tool

### Abstract

In conservation biology there is a ready need for swift, easily deployable and cost effective monitoring tools. It is in this context that we have developed and tested a method which uses *A. swammerdami* as a sampling tool to determine small scale differences in habitat across a fragment of what is ostensibly dry deciduous forest at Kirindy Reserve, Western Madagascar. Using a measure of biomass and composition of refuse surrounding thirty nests across different microhabitats we found significant differences between the biomass and composition of debris at each forest type. Further to this we found notable trends in the replacement of leaf litter to the surroundings of the nest entrance. It is our hope that this method may be developed further as a part of a larger monitoring scheme.

Sarah Stow, University of Lisbon, Portugal

Simbarashe Mudyazhezha, University of Zimbabwe, Zimbabwe

George Parkes, Trinity College Dublin, Ireland

2010

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## BUTTERFLIES

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### Spatial distribution of butterflies at the water point of Kirindy Forest

#### Abstract

Groups of butterflies were observed to congregate at the surrounding areas of a water point, part of the fragmented river in Kirindy Forest in the Menabe region of Western Madagascar. The butterflies could be extracting minerals from the substrate around the water pond. Observations on species diversity and abundance revealed a temporal activity pattern where the most dominant species (blue/black, yellow/black, orange) occurred in two abundance peaks, in the morning and in the afternoon. The pond was divided into sections. Sandy sections were visited at a higher frequency than others with different substrate such as leaf litter, rocks and vegetation, which is possibly due to more favourable conditions. Plastic cover of the most highly visited section resulted in a shift of individuals towards other less preferred sections, though these were still the sections with some sand. The butterflies gathered in certain group formations. Blue/black individuals tended to assemble in few larger groups mixed with some yellow/black butterflies. Orange butterflies occurred in smaller, clumped arrangements. In order to determine if the same individuals returned to the pond, capture and marking were done with blue/black and orange butterflies. Only few individuals returned suggesting there is a high turnover rate of butterfly species.

Rebeca Beber, University College London, United Kingdom

Anna Scherer, Stockholm University, Sweden

2004

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### Characteristics of the activity patterns and morphological traits of male *Danaus chrysippus* in Kirindy Forest

#### Abstract

The isolated population of *Danaus chrysippus* in Kirindy forest, Madagascar offers a unique opportunity to study characteristics of a species that would normally experience a high level of gene flow between populations. This study focuses on two phenomena: the apparent difference in activity patterns observed between male *D. chrysippus* and other butterfly species, and the morphology of the sex brand possessed by males in relation to other morphometric features. The activity pattern of

*D. chrysippus* differed significantly from that of other species. While the activity of *D. chrysippus* increased in the late afternoon all other species observed declined. This is likely to be due to the fact that *D. chrysippus* aggregate to roost but no other species present share this behaviour. Astonishingly only male butterflies were observed at the observation sites. Sex brand size was shown to be correlated to the overall size of the individual. Thus developmental factors and not sexual selection appear to be responsible for sex brand size in this population.

Becky Scott, University of East Anglia, England

Olivia Rickenbach, University of Fribourg, Switzerland

2006

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### Community composition and behaviour of butterflies at a permanent water point in Kirindy Forest

#### Abstract

Community composition and behaviour of 21 butterfly species in five families was recorded at the permanent water point in Kirindy Forest, Madagascar. Papilionidae was the most common family observed, whilst Hisperiidae was the least common. Species richness and abundance were found to be significantly correlated and peak at between 10.00 and 11.00am. There was a significant difference amongst species behaviours, though no correlation was found amongst behaviours. Feeding in groups was observed in a number of species, though it was highest in *Graphium sp.* Feeding in groups for this species may be related to both resource availability and predation avoidance strategies.

Mary Mbenge, Nature Kenya, Kenya

Dorothea Pio, Lausanne University, Switzerland

2007

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### Butterfly activity relative to canopy openings in the Kirindy dry forest, Madagascar

#### Abstract

Activity of butterflies and the directionality of flight were compared for gaps in forest canopy of various size and shape and for unbroken canopy. Nineteen butterfly “morphospecies” were observed in three days of observation at the end of the dry season in Kirindy dry forest. The number of butterflies seen per minute of observation was highest in late morning. Activity was significantly lower in unbroken forest canopy than in various types of forest gap. Most individuals were engaged in forward flight; few were perched, feeding, or hovering. These latter behaviours were observed most frequently at the wet pond. Courtship was observed, but oviposition was not. In gaps associated with roads, the dry riverbed, and a wet pond, most forward flight was parallel to the long axis of gaps or back-and-forth coursing that kept individuals within the gap. In contrast, individuals mostly flew directly across gaps associated with dry ponds or narrow forest trails. Forest gaps appear to be important landscape features that concentrate butterfly activity at the end of the dry season, perhaps because they serve as sunny courtship arenas. This hypothesis could be addressed in future studies of sex ratio at the end of the dry season, and seasonal patterns in the distribution of butterfly activities.

Mary Price, University of California and University of Arizona, USA

2009

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## OTHER INVERTEBRATES

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### Trap effectiveness and spacing behaviour in ant-lions larvae

#### Abstract

Pit digging ant-lions are very common in Kirindy forest. Observed local crowding suggests that competition for space arises in the most suitable habitats. We investigated the distribution patterns of ant-lion larvae in experimental plots. Three preliminary assumptions were checked - i) Trap efficiency is related to its size; ii) diameter of the pit is limited by its depth; iii) pit diameter is related to ant-lion size. In order to test ideal free distribution and ideal despotic distribution models in ant-lions, we introduced larvae in sand plots with two patches of unequal sand depth. Our results contradict the ideal free distribution predictions and partly fit despotic distribution predictions.

Ana Margarida Santos, University of Lisbon, Portugal

Thomas de Cornulier, CEBC-CNRS, France

2002

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### Aspects of feeding habits in ant lions

#### Abstract

Feeding strategies of ant lions of different sizes in two different habitats were investigated. Study was done in Centre de Formation Professionnelle de Morondava (CFPPF) in a deciduous dry forest of Western Madagascar (Kirindy forest). The study hypothesis was that ant lions distribute themselves according to food availability and that they build larger and new cones in absence of food. Results show that colony size, diameter of cones and number of ants eaten vary between forest and camp habitat. Capture success increases with cone size. Size of ant lions had no influence on the results.

Caroline Muriuki, Moi University, Kenya

Ursina Tobler, University of Zurich, Switzerland

2003

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### Occurrence of the snail *Achatina fulica* along Kirindy River and around Kirindy Forest camping site

#### Abstract

Kirindy Forest is found on the western side of Madagascar in Morondava region. *Achatina fulica* is an introduced snail species to Madagascar that is believed to be out competing the native snails and has been found feeding on three seedlings in Kirindy forest. To study the occurrence of *Achatina fulica* in the Kirindy forest, two areas were considered: One from Kirindy river into Kirindy forest and another around Kirindy forest camping site. The study was aimed at establishing the distribution of *Achatina fulica* in Kirindy forest and how Kirindy River influences it. Systematic sampling was used with quadrats of 25 m by 25 m at 50 m from each other for both regions. Data were collected on number of *Achatina* shells per quadrant. Mass, length and widest diameter were also measured for each shell. The data were analysed using Statview and the dispersion determined by the index of dispersion. Most shells were found to have lengths between 120 mm and 140 mm. The mean number of shells per quadrant along Kirindy River was 6 and around the forest camping site 5. Kirindy River was found to have no significant effect on the distribution of *Achatina fulica* in Kirindy forest. In both study areas (along Kirindy River and around Kirindy forest camping site) the distribution was found to be aggregated.

Tahiana Andriaharimalala, University of Antananarivo, Madagascar

Daniel Muyingo, Makerere University Kampala, Uganda

2003

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### **Water flicking behaviour in two species of dragonflies**

#### **Abstract**

A study concerning water-flicking behaviour in dragonflies was conducted in Kirindy forest. A pond on the dry bed of Kirindy River was selected as the study site and the two most abundant dragonfly species as the study organism. The objective of the study was to compare the water flicking behaviour between the two species of dragonflies. Data concerning temporal and spatial usage of the pond by females was registered. Male abundance at the pond was also recorded. Overall the results suggest that species A is more selective than species B in terms of when and where flicking activities are carried out. Spatially species B uses more sites around the pond, visits more sites during each visit, and spends less time per visit than species A.

Méabh Boylan, Trinity College Dublin, Ireland

Vânia Proença, University of Lisbon, Portugal

2003

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### **Ant lions in Kirindy Forest: spatial distribution, habitat choice, and pit structure variation**

#### **Abstract**

Ant lion larvae (Neuroptera; Myrmeleontidae) inhabit a variety of habitats in Madagascar; colonies are aggregated at large scales but at smaller scales there appears to be a trade-off between number of individuals in limited space and individual competitive ability. Thus, there may be an optimal pit density in a certain area, which may depend on several factors, such as; resource availability, habitat suitability, and size of individuals. This study focuses on: a) how ant lion larvae are dispersed spatially; b) whether they actively choose from a range of habitat types; and c) how pit structure varies. It was found that ant lions tend to distribute themselves uniformly under both natural and experimental conditions, and they have no substrate preference but do demonstrate a preference for shaded areas. Finally it was found that although pit dimensions are not affected by substrate type, limiting soil depth alters depth of the pit, but not its diameter.

Debbi Pedreschi, University College Dublin, Ireland

Felix Whitton, University of Nottingham, UK

2007

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### **On the relationship between the invasive snail *Achatina* sp and moisture gradient in Kirindy Forest**

#### **Abstract**

The relationship between distance away from the river which was used as the source of moisture and the invasive snail *Achatina* sp. was investigated. It was hypothesised that the abundance of snails will decrease as one move away from the river because moisture is decreasing as well. Our results revealed no relationship overall suggesting that other microhabitat might be more important in providing moisture during dry season. Analysis of live specimen showed that *Achatina* sp. is only found up to 75m away from the river. This suggests some physiological constraints and we strongly suggest that this aspect be further investigated. Ground and tree hole appeared to be major refugia for *Achatina* sp. during dry season, therefore eradication plans must target these microhabitats.

Djuma Nsanzimana, Karisoke Research Centre, Rwanda

Donatien René Randrianjafiniasa, University of Antananarivo, Madagascar

Musa Mlambo, University of KwaZulu-Natal, South Africa

2007

## **Density and activity of tunnel-web-building spiders in Kirindy Forest – influence of arthropod abundance and microhabitat**

### **Abstract**

Spiders are generalist obligate predators that are present in almost every habitat. They occupy a top position in the food chain and constitute an important element of Malagasy forest fauna. Unfortunately, very little is known in regards to this group's biodiversity, ecology or behaviour. This work is the first one on spiders done in the western deciduous dry forest of Kirindy: its aim was to respond to basic questions concerning the ecology of a spider that builds its tunnel webs on the bases of trees. Density of this spider's webs was found to be 0.285 webs/m<sup>2</sup>. However, only 54.2% of these webs corresponded to active spiders. Spider density was assessed in three microhabitats that differed in degree of human disturbance and relative arthropod abundance, but no significant differences were found.

Catharina Odin, Lund University, Sweden

Joana Ferreira, Lisbon University, Portugal

2008

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## **Effect of human disturbance on arthropod diversity at Kirindy Forest**

### **Abstract**

The arthropod fauna of Madagascar is remarkably diverse and includes many endemic genera, yet it remains poorly documented and under increasing threat from human disturbance. Not only does the current state of Madagascan arthropod fauna deserve better characterisation, it also provides as yet unrealised potential as a powerful tool in conservation monitoring. We investigate the relationship between diversity of arthropod communities and level of human disturbance in Kirindy Forest, Menabe, Western Madagascar. We demonstrate a decrease in arthropod diversity at the order level with an increase in human disturbance. However, our assessment of individual taxonomic groups shows that the specific effect of human disturbance varies between taxa. Our results have implications for the management of Kirindy Forest reserve and possible restriction of human disturbance within the site. The study also provides strong evidence for the rapid and cost-effective nature of arthropod community assessments, reinforcing the idea that they have an important role to play in contemporary conservation efforts.

Claudia Gray, Cambridge University, UK

Evelien Jongepier, University of Groningen, The Netherlands

2008

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## **Spatial distribution of termite mounds in an area of forest in the Kirindy Reserve**

### **Abstract**

The distribution of termite mounds in the Kirindy Reserve, an area of tropical dry deciduous forest in South Western Madagascar was investigated. The area has a river course running from East to West across its southern most part. Dispersion of termite mounds within the study area, CS7 was aggregated with the densities of mounds appearing to be higher at patches in close proximity to the river flowing through the site.

Alex Caveen, University of Leeds, UK

Samuel Ivande, A. P. Leventis Ornithological Research Institute, Nigeria

2008

### **Activity patterns of two apoid wasps in the dry deciduous forest of Kirindy, Madagascar**

#### **Abstract**

This study investigated the influence of time of day on the activity pattern of two apoid wasps, their various interactions, prey preference and nest marking. Our results showed that there was a significant difference between the proportion of time spent in various activities. Intraspecific interactions were more dominant in relation to interspecific ones. Both species showed strong preference for certain prey while visual cues appeared to be important in nest location.

Scolastica Ndegwa, Kenyatta University, Kenya

Sylvain Nyandwi, Great Ape Trust of Iowa/Gishwati Area Conservation programme, Rwanda

2010

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### **Web characteristics, hunting behaviour and cooperation between conspecifics in *Stegodyphus* social spider from Kirindy Forest**

#### **Abstract**

Social spiders from the genus *Stegodyphus* are common in eastern Africa and are also abundant in the deciduous forest of Kirindy, western Madagascar. We studied number and size of individuals in relation to size of the webs they inhabit, investigated the role different sectors of web play in prey capture, and tested cooperation in hunting and web building between individuals from same and different colonies. We found that the number and size of spiders was correlated with web size and that the studied spider species was more active at night than during the day. The external 'catching web' was found to be less efficient in prey capture than 'retreat web'. We observed that artificially established groups of individuals from different home colonies do not differ significantly in web-building and hunting performance from groups of individuals originating from the same web.

Grzegorz Swierzewski, Warsaw University, Poland

Chris Steele, Bristol University, UK

2010

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