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ANTS & TERMITES

Defence strategies in driver ants ‘Any meat they meet they eat’

Abstract

We tested whether the variable trail architecture of driver ant colonies influences the defence (soldier) allocation within a colony. The soldier abundance at different trail sites of eight statuary driver ant colonies was measured. We found an increased proportion of soldiers present 1) in open trails compared to closed trails and 2) in trails close to the nest site compared to trail sites far from the nest.

Christian Braendle, University of Basel, Switzerland

Thomas Brevig, University of Oslo, Norway

1998

Comparative foraging behaviour and prey choice of the African Stink Ant, *Paltothyreus tarsatus*, in three different habitats in Amani, East Usambara Mountains, Tanzania

Abstract

The study sought to determine the various foraging strategies and prey preference of the African Stink Ant *Paltothyreus tarsatus* in three distinct habitat conditions within Amani. A total of six different nests were sampled within the three habitats. The study findings revealed that there were no significant differences in terms of foraging patterns between the three sites. This suggested that habitat conditions do not necessarily influence the foraging behaviour of this species. However, there appeared to be a marked difference in diet composition between the three sites. This could suggest that habitat conditions influence the type of prey available and hence the prey choice of *P. tarsatus*. Our prey-choice experiment revealed that, across all sites, there was a high preference ratio of Isopteran to Lepidopteran. The study concluded that our data showed no marked differences in foraging behaviour and prey preference within the three different habitats.

Jonas Casslén, Uppsala University, Sweden

Dan Peter Omolo, Kenyatta University, Kenya

Melanie Schmit, University of Vienna, Austria

2000

The distribution pattern of *Nasutitermes* sp. nests in Amani Nature Reserve

Abstract

The distribution pattern of *Nasutitermes* sp. nests in diverse forest patches in Amani Nature Reserve was studied to find out whether some tree species preference could be related with nesting by *Nasutitermes* sp. The diameter at breast height (Dbh) of nest tree, soil pH, density, number of nests were recorded in order to test whether they could have any significant influence on their distribution. Three main sites namely, semi natural, disturbed and very disturbed forests were chosen from each site, and five plots of 10 m x 10 m were randomly selected. A plotless sampling along a transect were made. Data indicate that, in general *Nasutitermes* were indifferent with regard to tree species preference, but the distribution of *Nasutitermes* nest is highly influenced by the degree of forest disturbance.

Nana Poku, Kwame Nkrumah University of Science and Technology, Ghana

Tabitha Ndunguru, University of Dar es Salaam, Tanzania

2002

An investigation into the effect on abundance and diversity of terrestrial invertebrates of a changing environmental gradient: looking at the edge effect of primary, tropical submontane forest to monoculture tea plantation habitats

Abstract

Natural and artificial fragmentation on a variety of scales present to organisms sharp boundaries between contrasting habitat types. Altered microclimates and microhabitats occurring along such an edge ultimately impact on biota, and in environments where high endemism is continually threatened by increasing fragmentation through other land use, it is crucial to understand the extent of edge effects on organism dispersal and mobility at both the individual and species level. The study, conducted in Amani Nature Reserve, East Usambara Mountains, considered the effect of prominent forest/tea boundaries on abundance, species diversity and species similarity of terrestrial invertebrates along the habitat gradient across the edge. Abundance and diversity were found to differ significantly across the edge (ANOVA, $F_{4,45} = 3.6$; $p = 0.01$ & $F_{4,60} = 6.47$, $p < 0.001$ respectively), with similarly high values when crossing from forest to edge. Clear decreases in mean abundance and diversity by 40% and 50% respectively were observed when moving from the edge to the tea habitat. Changes in similarity in species composition showed a greater rate of decline when moving from the forest habitat to tea than in the opposite direction. It is evident from our preliminary study that even over such short distances edge effects on biotic diversity and abundance do exist. In an already heavily fragmented habitat where patches are continually being created, it is important to consider to what extent increasing fragmentation impacts on endemic flora and fauna.

Fanomezana M. Ratsoavina, University of Antananarivo, Madagascar

Kate Henson, University of St. Andrews, UK

2003

The nesting behaviour of *Eutermes* sp. (Isoptera: Termitidae) in Amani Nature Reserve, Tanzania

Abstract

Nests of the termite genus *Eutermes* were studied in Amani Nature Reserve, Tanzania. The termites tend to build nests approximately halfway up tree trunks, and do not discriminate between trees of different heights or different species. Density of trees only limits nest density where conditions are apparently favourable; elsewhere environmental or biotic factors are more important. Predation by ants is not a significant influence on nest density, but it may influence the ratio of soldiers to

workers present in the tunnels. Temperature does not affect activity of termites, and the effect of humidity on activity is only small. Nest size is linked to the ratio of soldiers to workers. Choice of food substrate was not determined satisfactorily.

Malgorzata Grzesiuk, University of Warsaw, Poland

Emily Murfitt, University of Liverpool, UK

2003

Benefits and benefactors: who reaps the rewards in an ant-scale insect interaction?

Abstract

Occurrences of interactions between ants and honeydew producers such as scale insects (Coccidae), are widespread. As well as providing mutual benefits, there may be advantages for the host plant. This study investigated an interaction between ants (Myrmicinae ssp.) and scale insects on *Harungana madagascariensis*. Levels of herbivory related to ant presence and number, and defence response times in reaction to an artificial herbivore and leaf damage, were recorded. Herbivory was less on branches where ants were present. Defence response time was lower where scale insects and ants were many, though the presence of a response was not the norm.

Kirsty MacLeod, University of St Andrews, UK

Henry Karanja, Egerton University, Kenya

2009

Factors influencing nest site selection by arboreal termites in the Amani Nature Reserve

Abstract

Termites are major detritivores in tropical regions. The species of the subfamily Nasutitermitinae commonly occur in arboreal nest sites in the Amani Nature Reserve. In this study the relationship between termite nest site selection and tree characteristics was investigated. These characteristics were tree species, tree height, dbh, canopy structure and density of epiphytes. Canopy structure proved to be the most influential factor. However, this was only representative of tree selection on a micro scale in a disturbed forest but not on a macro scale in the Amani Nature Reserve as a whole.

Patrick Garvey, NUI Galway, Ireland

Emmi Roukala, University of Fribourg, Switzerland

2010

BUTTERFLIES & MOTHS

Investigation of butterfly diversity and abundance in open agricultural land and in forest edge in Amani Nature Reserve

Abstract

An investigation of butterfly diversity and abundance in open agricultural land and in forest edge in Amani Nature Reserve, Tanzania was done from the 16th to the 20th of September 1998. Two distinct habitats were looked at, Agricultural land and Forest edge, with seven replicates sampled in both habitats. The results suggest that there was a significant difference in the numbers of butterfly individuals between the two sites but the statistical analysis showed that the species diversity between the two habitats was not significantly different. The species found at the Forest edge habitat were more typical of those usually found in open land. Further similar studies could be carried out in which the sites penetrated further into the forest to better represent a different habitat to the Agricultural land.

Godwell Elias Ole Meing'ataki, Tarangire National Park, Tanzania

Catherine McCarney, University College Dublin, Ireland

1998

Butterfly feeding behaviour around *Lantana camara*

Abstract

A study was undertaken into the feeding behaviour of butterfly species around *Lantana camara* of Amani, Tanzania. A total of 12 hours of sunny weather on six days were spent observing the feeding behaviour of butterflies that visited large and small bushes. In addition 10% of inflorescence buds were monitored to assess the rate of flower opening and subsequent pollination. Sixteen butterfly species were recorded which overall showed preference towards feeding on yellow flowers as opposed to pink ones. The large and small patches were visited without discrimination and the butterflies were observed to be more active around the midday of sunny days. There was no flying during cold, cloudy and rainy times.

Susan Sande, Kenyatta University, Kenya

Ishraga Mohammed A/Rhman, University of Khartoum, Sudan

2000

Behaviour and feeding preferences of three Amani butterfly species (*Acraea insignis*, *Junonia terea* and *Bicyclus safitza*)

Abstract

The study was conducted in Amani Nature Reserve to determine the variation in the behaviour and feeding preferences of three common butterfly species belonging to family Nymphalidae. The behaviour was studied in terms of feeding, flying and resting, while feeding preference was in terms of flower type commonly visited. Data were collected for seven days during which 37 individuals were located in different plots and their behavioural pattern recorded. The results indicated that the three species differed in their behaviour pattern. It was also clear from the results that the three species had different flower preferences. Temperature of the environment seemed to have no effect on the activities of the butterflies.

Dianah Nalwanga, Makerere University, Uganda

Sopher. N. Ondiaka, University of Nairobi, Kenya

2001

Assessing the learning capacity of *Salamis parhassus* and *Bicyclus safitza*

Abstract

Previous studies on the foraging responses of butterflies have demonstrated that some species of butterflies are able to learn to associate floral traits with a food reward. This ability is of adaptive value, allowing butterflies to locate the most rewarding flowers. This project aimed to assess the associative learning capacity of *Salamis parhassus* and *Bicyclus safitza* and to determine whether *Salamis parhassus* possess an innate scent preference. Our findings showed no apparent innate preference between *Lantana camara* and banana and between Amani pond water and fermented pineapple in *Salamis parhassus*. Some indications of a learning capacity in both *Salamis parhassus* and *Bicyclus safitza* were found but had no statistical support. However, it can not be concluded that *Salamis parhassus* and *Bicyclus safitza* do not have the capacity to learn but yet, that our findings may be due to an ineffective conditioning protocol.

Geraldine Schwaller, University of Fribourg, Switzerland

Lucie McGurn, University of Edinburgh, Scotland

2007

Is diversity in cryptic traits in moths consistent with past character displacement arising from search image avoidance?

Abstract

Predation acts as a strong selection pressure on prey species and favours divergence of cryptic colouration. Competitive character displacement of cryptic trait niches within moth communities may be due to the avoidance of search image formation. This theory was tested by analysing moth images for overlap of brightness and brightness variation between species in two moth communities at Amani Nature Reserve. Little to no overlap was found between species within each community, supporting niche theory. However, this was contradicted when compared with a null model constructed from a random selection of both communities. Thus we cannot conclusively refute the presence of a search image avoidance niche.

Christopher Trisos, University of Cape Town, South Africa

Holly Kirk, University of Bristol, United Kingdom

Una Nealon, National University of Ireland Galway, Ireland

2008

The effect of altitude on butterfly community visiting *Lantana camara*

Abstract

The study was conducted to investigate the effect of altitude on butterfly species composition visiting *Lantana camara*. Two distinct habitats of different altitudes were looked at: Zigi (low altitude) and Shamba (high altitude), with six sample plots in both sites. Butterfly species visiting *lantana* were observed and recorded from 9:00 am to 5:00 pm for six days. Nectar volume and concentrations in *Lantana* through the day at the two sites were also measured. The results showed that the butterfly species diversity at Zigi were slightly greater than those at Shamba, with some of the species being observed at both sites. Nectar volume and concentration of the two sites were fairly constant through the day and statistical tests showed that there were no significant difference in the volume and concentration. The weather conditions clearly had an impact on the number of butterfly visits to *Lantana*.

Dufie Adu-Pakoh, Kwame Nkrumah University of Science and Technology, Ghana

Kajenje Magessa, Sokoine University of Agriculture, Tanzania

Nancy Chepkorir, Nature Kenya, Kenya

2008

Assessing changes in butterfly communities across a forest-edge gradient within the Amani Nature Reserve, Tanzania

Abstract

Relative abundance and size distribution of butterflies outside and within forest habitats at two different sites in the Amani Nature Reserve were evaluated. Study area parameters such as flower cover and canopy openness were measured to check if these influence the number of butterflies in a given area. The number of butterflies caught within forest interiors was very low compared to the forest edges but there was no significant difference in relative abundance of butterflies at different distances (25 m and 40 m) from the forest edge. Size distribution, evaluated using average wingspan, showed significant difference for Nymphalidae when compared between sites but no significant difference was observed between distances from the edge.

Darlington Tuagben, Forestry Development Authority of Liberia, Liberia

Mahlet Shebabaw, University of the Free State (South Africa), Ethiopia

2009

Response of ground arthropod assemblages to *Maesopsis eminii* colonisation in Amani Nature Reserve

Abstract

To investigate whether the ground arthropods fauna is impoverished under *Maesopsis eminii*, 115 pitfall traps were placed in forest areas with different degrees of *M. eminii* colonisation. Eleven orders were identified in the three forest types with no significant difference in the individual numbers. The study revealed that the coleopteran family assemblage is not different in any of the forest types in terms of abundance but had less diversity compared to the native forest. This indicates that the arthropod diversity and activity density is moderately impoverished under *M. eminii* dominated forest.

Evans Ewald Nkrumah, Kwame Nkrumah University of Science and Technology, Ghana

Inyambo Mukela, National Irrigation Research Station, Zambia

Jean-Paul Ntungane, National University of Rwanda, Rwanda

2009

DISTRIBUTION

Do ground dwelling insect assemblages in forest fragments differ from those found in linear strips and the surrounding matrix (tea plantation)

Abstract

The similarity of invertebrate taxa were examined for forest, a riparian forest strip and tea plantation. The forest sample differed markedly from the assemblage found in the tea plantation, whereas the riparian strip shared species from the forest and tea plantation. Moisture dependant species, such as those belonging to the woodlice, were found to be present in the corridor but not largely represented in the tea plantation which was dominated by coleoptera (beetles), orthoptera (grasshoppers) and hymenoptera (ants).

Roger O'Malley, University of Aberdeen, UK

1998

An investigation of community structure of benthic invertebrate fauna in a montane tropical river ecosystem and the impact of human disturbance

Abstract

This study investigated benthic invertebrate community diversity and structure in four rivers in the Upper Sigi catchment area within the East Usambara Mountains, Tanzania. A standardised kick sampling technique was used to collect invertebrates from the riffle areas of these rivers. A total of 49 different taxa were identified. The main orders were Ephemeroptera, Trichoptera, Plecoptera and Diptera which accounted for 36 of the families collected. Differences in community composition and structure between the relatively undisturbed forested rivers and those experiencing more human disturbance were recorded. Of the abiotic factors monitored stream depth, flow rate and stream width were found to correlate with taxa diversity.

Mary Anderson, University College Dublin, Ireland

Andrea Strasser, University of Basel, Switzerland

2000

Effect of disturbance on diversity and abundance of detritus invertebrates in Amani Nature Reserve

Abstract

This study investigated the effect of disturbance on detritus invertebrates in three study sites with different degree of disturbance: natural forest, *Maesopsis* forest and open habitat. The natural forest, which was least disturbed, had the highest species diversity and number of individuals, while open habitat which was heavily disturbed had the lowest species diversity and number of individuals. Amount of leaf litter varied significantly between habitat types, open habitat had the highest amount of litter and *Maesopsis* forest had the lowest amount of litter. The amount of litter did not correlate with species richness and number of detritus invertebrates. Most species found in the natural forest were also present in the open habitat (56% overlap). These results suggest that the variation in detritus invertebrate species diversity, abundance and amount of leaf litter in the different habitat types is correlated with disturbance but not with the amount of leaf litter.

Josephine Nzilani, National Museums of Kenya, Kenya

Moreen Uwimbabazi, Makerere University, Uganda

2006

Leaf litter communities in natural forest and shade cropping areas

Abstract

We compared leaf litter frog and invertebrate species richness and abundance between natural forest and areas used for cardamom shade cropping. Contrary to our expectations, richness and overall abundances for both groups were higher in the cardamom fields than in the forest. However, community species composition as well as abundances for some invertebrate orders and most frog species differed significantly between the two areas. We also found significant differences for environmental variables between forest and cardamom areas. Frog abundance was correlated with temperature and leaf litter weight, whereas invertebrate abundance was correlated with leaf litter weight only. In conclusion, forest and shade crop areas provide different habitats for leaf litter communities, and many forest-dependent species may be lost due to the conversion of forest to shade crop field.

Elizabeth Duffy, University of Cambridge, UK

Susanne Fritz, Imperial College London, Germany

Agnieszka Malinowska, Wageningen University, Poland

2007

OTHER**Patterns of species abundance within a community of fig-wasps****Abstract**

A community of Chalcid wasps (Chalcidoidea:Agaonidae) inhabiting the reproductive structures of one species of East African fig, *Ficus natalensis* (Moraceae) were scored. The wasps maintain a range of obligate mutualist and parasitic relationships with the host plant, detracting, to various extents, from its reproductive functions. Figs were collected such that all contents of a single fig could be scored, producing abundance scores for seed number and a range of wasp genera. Syconium diameter was also recorded. Multiple linear regression identified a strong effect originating from syconium diameter, which correlated with seed number, which made all regressions positive and significant in summary. The majority of component regressions were non-significant, especially with respect to the larger and less numerous wasp species, for example, *Lachaisea*, *Sycophila*, *Otitesella* and *Philotrypesis*. Significant negative correlations were identified between the pollinator species *Alfonsiella* and its competitor *Philoaenus*; also between *Elisabethiella* and its natural enemies *Sycoscapter* and *Philoaenus*. The results demonstrate the importance to the community of variety in oviposition strategies and the difficulty in isolating individual effects from the complex of community interactions.

Hazel Burton, University of Sussex, UK

Andrew Jackson, University of Oxford, UK

2000

Cricket (*Gryllus* spp.) calling activity and factors determining call characteristics in Amani, East Usambara Mountains**Abstract**

Male cricket calling activity was studied in relation to burrow size, cricket morphology and environmental factors. Four days of measurements at five time intervals were obtained from five different habitats. Cricket calling activity was greatest between 17.30 and 19.00. Habitat type was also influential, with greatest calling activity heard in banks by grassland and pond. Average sound pressure level and number of species heard were significantly correlated with calling activity. *Gryllus* sp. has a distinct call represented by three or four frequency modulated chirps. Highly significant relationships were found between call frequency, burrow height and relative humidity, but not burrow length, width or air temperature.

Cecilia R. Eldridge, Anglia Polytechnic University, UK

Hanitriniala Vola Razakarivony, University of Antananarivo, Madagascar

2001

Drosophilids as indicators of the level of environmental changes: A case study at Amani, in East Usambara Mountains**Abstract**

Drosophilids are highly diversified and most often habitat specific, but poor attention has been given so far to their relation to habitat modifications. Here we tested the hypothesis whether fruit flies can be used to reliably assess the extent of the habitat changes. A comparison of the species composition and abundance was made on a mosaic of five adjacent habitats at the Amani Nature Reserve in East Usambara Mountains. A total of 6 genera and 44 species were recorded. Using species-specific abundance profiles, the relative frequency of an invading species (*Zaprionus tuberculatus*) and endemic species (*Drosophila baucipyga*), and an index reflecting the ratio of

two sister species of *Drosophila* (*D.teissieri* and *D.yakuba*), we provided multiple consistent evidence that these insects are among the most informative indicators of forest disturbance.

Riana Rakotondrainy, University of Antananarivo, Madagascar

Terence Suinyuy, Apiculture and Nature Conservation Organisation, Cameroon

Kate Lee, University College Dublin, Ireland

2002

Investigating the activity patterns of a land slug species of Amani Nature Reserve, East Usambara Mountains

Abstract

There is little background information on ecology of land slugs in Amani Nature Reserve. The study focused on the activity patterns of a common species of slug at two sites 3 days each. We sought to find out if relationships existed between parameters such as weight, location, time of day, weather, and activity patterns. It was observed that there appeared to be a pattern of activity. Individuals A and B suggested a six-hour periodicity. And there tends to be a relationship between weight and activity as smaller slugs were more active.

Maria Ogrzewalska, University of Warsaw, Poland

Stephen Awoyemi, University of Ibadan, Nigeria

2002

A comparative study of Coleoptera diversity and abundance in disturbed and undisturbed forest in Amani Nature Reserve

Abstract

This study was conducted in disturbed and undisturbed forest of Eastern Usambara mountains in Amani Nature Reserve. We compared the relative abundance and diversity of Coleopteran families in both habitats. Three methods were used: pit fall traps, leaf litter extractions and beating tray. Analyses were done using the G-statistic (test of independence) to determine significance of counts. Diversity was measured using Simpson's index of diversity. The results showed that the undisturbed forest had higher abundance and diversity of Coleopteran families as compared to disturbed forest. However, it was also found that relative humidity and % shade did not affect the abundance and diversity of Coleoptera in both habitats.

Patricia Namwanda, Makerere University, Uganda

Theogene Ngaboyamahina, Karisoke Research Center, Rwanda

2005

Odonata assemblages in natural and artificial water systems in Amani Nature Reserve

Abstract

The species diversity and composition of Odonata within Amani Nature Reserve was surveyed in 28 sites, over 6 days (visual surveys - 2 man hours per site). A total of 29 species of Odonata was recorded across all surveyed sites, in three categories (artificial fishponds and rivers (running and slow flowing)). Comparisons of species richness and diversity against environmental variables, recorded at each site, revealed that vegetation cover and shade influence species composition, but did not affect species diversity and abundance. The most abundant species differed between habitats, and it is argued that forest specialists are negatively impacted by generalists where forest is fragmented along mountain streams.

Daniel Acquah-Lamptey, University of Ghana, Ghana

Stefan Fischer, University of Vienna, Austria

Neema Robert, Sokoine University, Tanzania

Frank Pennekamp, Université Catholique de Louvain, Belgium

2010

Patterns of millipede distribution in Amani Nature Reserve

Abstract

Habitat fragmentation is an escalating problem worldwide. An area of high forest endemism, Amani Nature Reserve forms a mosaic of multiple land use types – primary forest, agriculture, plantation and human settlements. The poor dispersal ability of millipedes has been invoked to explain their high endemism in the Usambaras and the Eastern Arc. Today, this factor could expose these macroinvertebrates to negative impacts of landscape fragmentation. We investigated the abundance, species richness and species composition of millipede assemblages in edge and core forest habitats using quadrats and walking transects. Contrary to our expectations, we found that assemblages clustered mainly on the basis of sampling method, rather than habitat. This indicates that edges do not seem to influence millipede assemblages strongly and that future surveys need to use a full complement of sampling methods. Moreover, these results highlight the need for a revival of taxonomic skills to remedy the knowledge gap in taxon descriptions, keys and revisions of poorly described tropical organisms, exemplified by the diplopods.

Kirby J Waddington, University of KwaZulu-Natal, South Africa

Finiavana R Andriamboavanjy, University of Antananarivo, Madagascar

2010

Pollinator communities in two different management systems in the fragmented landscape of Amani Nature Reserve

Abstract

Pollinator communities are declining in many parts of the world and the main reasons are probably fragmentation and destruction of natural habitats. Our study was conducted in the fragmented part of Amani Nature Reserve, with the aim of comparing insect pollinator abundance and richness between two different management systems located within the forest, tea plantations and shambas. The effect of distance from forest edge was also assessed. We found a higher abundance and richness of pollinators in the shamba compared to the tea plantation. Floral abundance and richness did not explain the variation in pollinator communities; neither did the distance from forest edge. Further research is needed to evaluate the main factors affecting the pollinator communities in different management systems in Amani Nature Reserve both locally and regionally.

Ulrika Samnegård, Stockholm University, Sweden

Marta Sampaio, Lisbon University, Portugal

2010