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Symposium «Entomology in Belgium 2010»

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**Effects of experimental rainfall exclusion on a diverse ant
assemblage from Ecuadorian mountain rainforests**

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Models of global climate change generally predict higher rainfall variability, with more intense rainfall events separated by extended drought periods. We integrated experimental and gradient approaches to study the effects of prolonged droughts on a diverse ant assemblage in a mountain rainforest of Ecuador. The experiment was designed to test three predictions. (1) Prolonged drought will lead to declines in ant species richness and abundance. (2) Declines will be more marked at higher elevations where ants are adapted to moist conditions. (3) Soil-nesting species will be less affected than species nesting in dead wood or in leaf litter because the moisture decrease will be more important aboveground than underground. Three 3x3 m experimental tents and three controls were installed at three elevations (1000, 1500 and 2000 m a.s.l.). Ants were collected six months after the experiment started. At that time, dead wood, leaf litter and soil samples were ~45%, ~50% and ~20% drier underneath tents than controls, respectively. Total species richness was not significantly affected by the experiment but abundance increased and assemblage composition was modified. Changes differed according to microhabitat. *Camponotus* and *Solenopsis* in dead wood, and Dacetini in leaf litter, were found more frequent by underneath tents. At the opposite, *Pheidole* species seemed to prefer moist conditions. Ant response was globally consistent over the elevational gradient. It appears that moisture limits the production of a majority of Andean ant species, maybe by causing a physiological distress and/or limiting nesting site quantity.

**Leaf litter ants trophic level revealed by stable isotopes in an
Andean Brown Food Web**

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Ants are numerically and ecologically important in tropical forests. Leaf-litter ants play an active role in the brown food webs as omnivorous and predators but little is known about their dietary habits, due to the difficulty of direct observations. In the Andes, the high diversity of leaf-litter ants and the strong heterogeneity of their distribution at fine spatial scale leads to the fundamental question of their niche separation. We propose here a niche-based approach to interpret the distribution patterns of leaf-litter ants, from species co-existence to antagonistic interactions due to interspecific competition.

Previous studies based on isotopes focused mainly on canopy or invasive ant species, and we propose here to assess the trophic niche of the most frequent leaf-litter ant species among the mesofauna (mites and collembolans). Naturally occurring differences in stable isotopic ratios (¹⁵N and ¹³C) are a powerful tool to study trophic positions and relationships in animal communities, as they give an information integrated over time about their diet. ¹⁵N ratio reflects the trophic level as the consumers tissues are enriched by +-3‰ relative to their diet. Intercolonial variability of ¹⁵N ratios gives evidence about the omnivorous vs. specialized character of the studied species. ¹³C ratio remains almost constant

from one trophic level to another and allows the identification of the food source.

We performed a nutrient addition experiment of C+N and C+N+P, in order to stimulate the mesofauna and its predating ants. We used cane sugar as carbon source because of its distinct isotopic signature. It allowed us to "trace" carbon fluxes through the trophic chain and to highlight prey-predator relationships.

The ^{15}N ratio has shown that most ants occupy a predatory position in the trophic chain, and mesofauna low trophic levels. The intercolonial variability of ^{15}N ratios has allowed us to distinguish omnivorous species with large range values, from specialized predators.

The nutrient addition enhanced the activity of decomposing microbes, resulting in a decrease of leaf-litter quantity. It increased significantly collembolan density, but in spite of a higher prey availability, the total abundance of ants didn't raise. The trophic relationship between small predatory ants and the mesofauna has been highlighted by tracing carbon fluxes throughout the food chain. These results suggest that leaf-litter ants are more limited by space than by food availability. Competition with other predators is another possible explanation of the absence of positive effect of nutrient addition on ant abundance.

**Rapid assessment protocol for surveying arboreal-nesting ant
distribution in tropical forests**

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Numerically dominant arboreal-nesting ants are known to structure the distribution of other ant species and of other arthropods, such as hemiptera providing them with energy-rich resources that sustain their large colonies. The diversity and distribution of arboreal-nesting ants are difficult to study in tropical forests due to tree heights reaching up to 45m. Commonly used techniques (canopy fogging, pitfall trapping, baiting) involve climbing trees which is time-consuming. The aim of the current study was to evaluate the efficacy of an alternative protocol based on baits spread every 5m along a rope. One end of the rope is tied around the trunk and, with the help of a sling-shot, the other is slung over a branch in the canopy, forming a loop that enables the baits to be easily brought back down for inspection. So, no climbing is required. Baits were composed of a mixture of proteins, lipids and carbohydrates, and were left for 24 hours before being collected. The protocol was tested in two very different regions: a dry forest in Mozambique (n= 55 trees sampled; tree height <20m) and an Amazonian forest in French Guiana (n= 15; h<45m). Arboreal-nesting ants were also collected by hand from branch-clippings and by beating the vegetation. The protocol allows the presence of dominant arboreal-nesting ants (*Dolichoderus*, *Azteca* and *Crematogaster* in Amazonia, *Crematogaster* in Mozambique) to be easily detected. A stratified ant distribution at the baits was observed on tall Amazonian trees. On-site confrontations between

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dominant ants colonizing baits allowed us to identify a supercolony of *Crematogaster* colonizing three-fourths of the trees along the 500m Mozambique transect. The protocol offers a tool for rapidly investigating spatial and temporal patterns in dominant ant distribution. Considering the structuring effect of these ants such a protocol has potential for monitoring functional processes in tropical forest ecosystems.