

## Cooperations

### Habitat Rather than Prey Limits Predatory Ants

Tropical Brown Food Webs (BFW) convert leaf litter into tissue, soil organic matter and CO<sub>2</sub>. The webs consist of microbes, grazing organisms (i.e. Oribatida and Collembola) and their predators, including ants. It has been shown that nutrient supply (carbon = C, nitrogen = N and phosphorus = P) in tropical forests increases the biomass of microbes, leading to a faster decomposition of the leaf litter. These nutrient additions can also increase mite and/or collembolan density according to the nutrient combination and concentration.

Our aim was to determine the effect of increased prey availability on leaf litter ants. Leaf litter constitutes both the habitat and food reservoir of leaf-litter ants. The Ecosystem Size Hypothesis predicts that predators are disproportionately limited by the amount of habitat relative to their prey. Accordingly, we predicted that the leaf-litter ant trophic groups (predators, fungus-growers, hemipteran tenders) would respond differentially to a nutrient addition experiment, with predatory ants being particularly affected by habitat availability.

The nutrient addition (CN, CNP) was performed at Copalinga, 1000 m a.s.l., in Podocarpus National Park, in April 2009, at the end of the dry season, when litter quantity is highest, and followed the NUMEX protocol (see Newsletter no 1: <http://tinyurl.com/TMFnews01>). C, N, P addition was equivalent to 5 times the annual nutrient input by litterfall. Six months later, we collected the leaf litter arthropods in control and treated plots (n = 8 per treatment, 2 x 2 m plots). The densities of

ants, of their potential prey (e.g. springtails = Collembola, moss mites = Oribatida) and of other predators (e.g. spiders, beetles) was measured.

The litter volume in plots with added nutrients decreased significantly, resulting in a loss of habitat (see Figure 11). Collembola density was enhanced by the CNP addition. Ants responded differentially according to their trophic group: despite increased prey availability, predatory species in general and collembolan hunters in particular were negatively affected by both treatments (CN, CNP) while the other ant trophic group densities did not change. By contrast, the density of other predators among the litter fauna, spiders in particular, generally increased (see Figure 11).

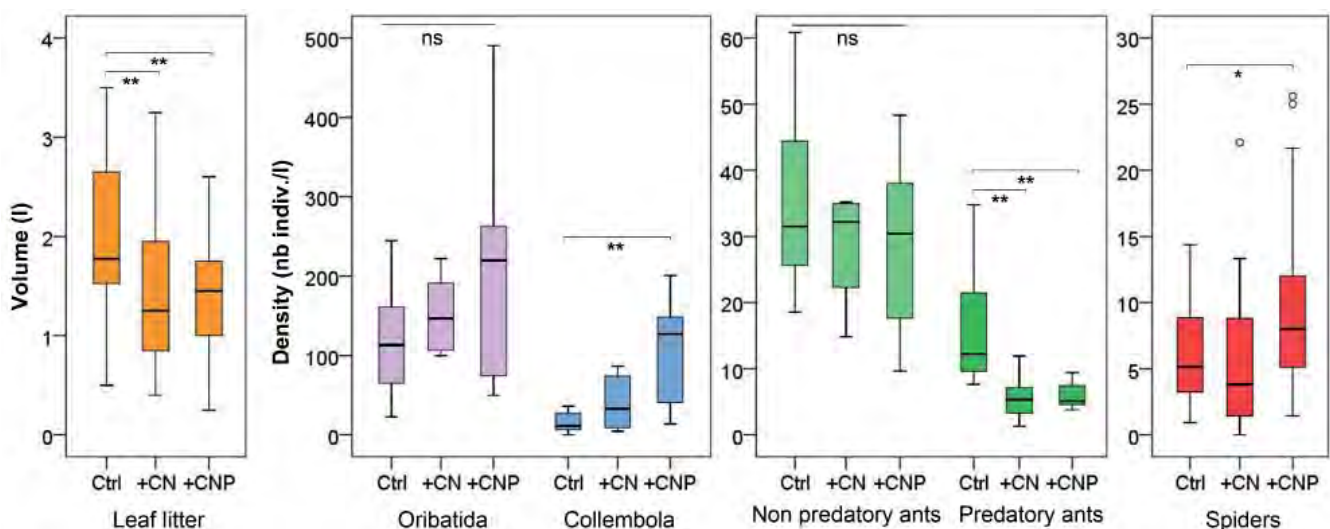
Our results suggest that predatory ants in tropical BFW are limited by habitat size rather than by prey availability. Habitat size affects these ants more than their prey, other ant trophic groups and other large predators such as spiders.

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**Figure 11:** Density (number of individuals per litter volume unit) of preys (Oribatida, Collembola), non predatory ants, predatory ants and spiders in control, CN- and CNP-enriched plots. Despite a higher density of prey in nutrient enriched plots, predatory ant densities decreased with the treatments. This may be due to the reduction of available habitat, which did neither affect large predators (spiders) nor non predatory ants. Graph: Justine Jacquemin, Mark Maraun, Yves Roisin, Maurice Lepage.