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Decreasing dung beetle diversity with changes in forest structure and diversity

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Human-induced changes in forest structure normally result in a reduction of species diversity. Dung beetles have been proposed as effective indicators of habitat change, and play important roles in ecosystem functioning of tropical forests. Here we analysed relationships between dung beetle richness and abundance with several measures of forest structure and composition, including canopy openness, leaf-litter mass and tree richness. We sampled 135 forested transects (300m) in Eastern Brazilian Amazon, encompassing a large gradient of forest degradation – from undisturbed, burnt and logged primary forests to recurrently degraded secondary forests. Trees, lianas and palms were measured and identified in a plot of 250x10m in each transect. Dung beetles were sampled with nine baited pitfall traps per transect. Hemispheric photographs were taken to assess canopy cover, and 50cm quadrat samples of litter were taken to estimate litter mass. Data were analysed using dung beetles species richness and abundance as response variables and tree species richness and abundance, canopy openness and litter mass as explanatory variables. Positive and significant relationships were found between dung beetle species richness and both tree species richness and litter mass. Both plant species and litter accumulation can represent good proxies of habitat heterogeneity for dung beetles. Higher tree diversity, as well as larger deposits of leaf litter, may offer a greater variety of niche habitats and resource diversity (including rotten fruits and fungi, as well as microhabitat variation generated by litter accumulation for nesting and feeding conditions), and are characteristics often related with less disturbed areas of forest. The close association found between dung beetles and changes in forest structure and composition demonstrates that forest degradation can have profound impacts on the diversity of these ecologically important insects.