

Earthworm biological traits, soil and landscape characteristics

Marichal Raphael¹, Praxedes Catarina², Brown George³, Castaneda Edana⁴, Desjardins Thierry⁵, Gond Valery⁶, Grimaldi Michel⁵, Guevara Edward⁷, Oswald Johan⁸, Sarrazin Max⁹, Lavelle Patrick¹

¹UPMC, France

²Museu Paraense Emílio Goeldi, Brazil

³Embrapa Florestas, Brazil

⁴Universidad Amazonia, Colombia

⁵IRD, France

⁶CIRAD, France

⁷CIAT, Colombia

⁸University of Rennes, France

⁹Centre IRD, Guyana

This study analyzes the links between the occurrence and frequency of biological traits in earthworm communities and soil and landscape characteristics in Amazonia. Biological traits are a powerful attribute to consider in order to understand the links between biodiversity and ecosystem processes. The present consensus is that diversity expressed in the nature and range of traits, rather than species numbers, determines ecosystem functioning. Biological traits are also important characters that determine communities in a given environment. Few studies have ever considered earthworm biological traits and their ecological significance. Therefore, we sampled earthworms at 135 points distributed among 3 localities, 9 sub localities and 27 farms in the South of Pará state (Eastern Brazilian Amazonia). At each point, 3 samples 25 x 25 cm in size were hand-sorted for earthworms (TSBF method). Traits (10) of 1256 earthworms in total were measured. They were individual (length, post and pre-clitellar diameter, length and type of caudal setae, pigmentation) or species specific (gizzards, thickness of septa, type of typhlosole, ecological category), multiquantitative, semi quantitative or fully quantitative. All the earthworms were determined at the morpho-species level. The landscape in a 100 m radius centered on each point was described with a set of metrics that basically described the composition, diversity and fragmentation pattern of the landscape on a matrix of 20 x 20m pixels. At each point 41 chemical and physical soil parameters were measured. Each data set (trait frequency matrix, landscape metrics and soil data) was analyzed using PCA and co-inertia analyses were performed to search for co variations. Significant co-inertias were measured between the biological traits matrix and landscape structure ($p=0.047$, $RV=0.05$), landscape composition ($P=0.015$, $RV=0.12$) and soil characteristics ($p=0.01$, $RV=0.26$), respectively. These results show a strong link of earthworm traits with soil characteristics and landscape structure and composition.