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Tropical soil zoology and ecology: some past and current trends and future challenges

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Soil zoology and ecology are a relatively recent addition to soil science, especially in the tropics. Although the discipline emerged in the late 1800's with the contributions of naturalists such as Darwin and P.E. Müller, it was not really until the 1950's that it really took off. Most of the work performed up until then was basically of the natural history type, mainly observations on soil animal habits and behavior. Much of the literature also covered taxonomy, revealing the vast and complex web of interacting species in tropical soils. With the advent of the IBGP program and other such consortia throughout the tropics in the 1960's and 70's, research foci shifted to processes and analyses of the functional importance of animals in soils, work performed in parallel with the study of land use impacts (especially pesticides, cropping and tillage) on soil animals. At present, these approaches (functional and natural history/taxonomic) sill represent the bulk of the research on soil animals in the tropics. Unfortunately, they are often performed very independently of each other and at an unsyncopated pace. Ideally, taxonomists and ecologists should work together, aiming for common goals that are symbiotic. Nonetheless, this has rarely happened, and sometimes the taxonomic work can even delay the functional/ecological work, or reduce its scope, e.g., when too many new species are found requiring years to describe. Furthermore, the scarcity and sometimes absence of taxonomists for particular groups in many tropical countries means that much of the functional work on soil animals is often not reported at species levels. Although dependence on traditional morphological taxonomy can be reduced using molecular methods, its application is still in development and represents an area of ample future work in field soil ecology. Soil biology is one of the most rapidly growing fields in soil science in Brazil, although soil zoology continues to lag way behind soil microbiology. A major challenge facing soil zoologists in the tropics, particularly in less developed countries is to address the need for applied research to solve production-related problems, ever more pressing in countries where growing populations and aspirations are increasing pressure on natural resources, including soils. We must show simultaneously the need for conservation and sustainable use of soil animals, including their usefulness in ecotoxicology and as bioindicators, their value for soil processes and ecosystem services (including plant growth), and other potential uses, all of which represent significant challenges, not only in the tropics but worldwide.