

Earthworm taxonomy, biology and ecology. An overview of recent advances (2013-2016) in Brazil*

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Abstract

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As done in the past two IOTM's, the present talk synthesizes recent (2013-2016) advances in earthworm taxonomy, biology and ecology in Brazil. The work presented includes mostly unpublished results of research performed over the last 3 years by graduate and undergraduate students and researchers belonging to various collaborating institutions, both in Brazil and abroad. Earthworm populations were quantitatively evaluated by handsorting soil monoliths (generally using the TSBF-method) in 11 locations (total 98 sites) including agricultural, pastoral, agroforestry, regenerating and old forest systems. Furthermore, at these and at > 10 other locations (140 sites total) scattered throughout Brazil, earthworms were collected using qualitative methods, by searching in various niches (soil, litter, under rocks, next to streams, swamplands, rotten logs, bromeliads). Many of these worms were identified to species level, but much material must still be processed. Over 1000 individuals were barcoded, of which ~50% were *Pontoscolex corethrurus*, for which neotypes were collected at the type locality (Blumenau). The genetic variation and DNA size of this species was found to be more variable than previously assumed. The Fritz Müller Oligochaete Collection at Embrapa Forestry now contains over 1000 glass vials with earthworms and over 1500 tubes with tissue samples or whole worms, representing well over 200 species, all preserved in alcohol 80%. Over 60 new species were found, many in the *Glossoscolex* and *Fimoscolex* genera, but also in several Ocnerodrilidae genera. Overall 100 new CO1 barcode MOTUs were generated for BOLD. Five taxonomy courses were given, training over 60 persons in earthworm identification. Additionally, a molecular phylogeny course trained 10 students in these techniques. For the first time on record, sperm was found in the nephridia of *Glossoscolex*, shedding some light on how this genus lacking spermathecae may actually reproduce. The biology of some *Glossoscolex*, *Rhinodrilus* and *Andiorrhinus* species were studied, revealing differences in growth, casting rates and cast properties. The gut and cast bacteria of *Perionyx excavatus* and *Dichogaster annae* were studied, and the impacts of *P. corethrurus* on sugarcane rhizosphere microbial diversity were evaluated. The use of mustard, onion and formalin were compared, revealing formalin as more efficient for population and biodiversity assessment. Earthworms were found to be important components of Amazonian Dark Earths, although their populations were greatly affected by land use system in these soils. The role of earthworms as environmental and soil quality bioindicators was further elucidated, indicating the need for methodological and theoretical adaptations in order for optimal adoption of this practice. *Funded by CNPq, Newton-CONFAP, NERC, EU, Fapesp, Fapema, Fapemig, Fapeam, Fundação Araucária, Embrapa and CAPES