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Editorial

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Global diversity of earthworms and enchytraeids (Clitellata): papers in honor of András Zicsi (1928–2015). Editorial

RÜDIGER M. SCHMELZ
IfAB, Institute for Applied Soil Biology, Tomberg 24a, 22337 Hamburg, Germany
Universidad de A Coruña, Fac. Ciencias, GIBE, Evolutionary Biology Group, CICA, As Carballeiras s/n, Campus de Elviña, 15071 A Coruña, Spain
E-Mail: rmschmelz@gmail.com

This Special Volume of *Zootaxa* unites forty papers written in honor of the late András Zicsi (1928–2015), the eminent earthworm taxonomist. They deal with the taxonomy, systematics and distribution of earthworms and enchytraeids, the two major groups of soil-dwelling Oligochaeta. Altogether, 71 new species-group taxa are described, 60 species and subspecies of earthworms and 11 species of enchytraeids. They are from 15 countries all around the globe: Spain, Italy, Hungary, Turkey, Botswana, Mexico, Colombia, Brazil, China, Japan, Korea, Taiwan, Laos, Malaysia, Thailand, and Vietnam.

The volume begins with an annotated list of the 10 genus- and 243 species-group taxa erected and described by András Zicsi (Csuzdi *et al.* 2018a). A superficial comparison of Zicsi's papers with the ones united here present three differences that highlight changes in earthworm taxonomy in the last 50 years: Firstly, while most of Zicsi's papers were published in German, all contributions here are in English. The time when taxonomists could publish—and expect to be read and understood—in their own (non-English) mother-tongue is definitely over. Secondly, while the majority of Zicsi's taxonomical papers are without co-author, the one-hundred-and-eleven authors and co-authors of this volume demonstrate that earthworm taxonomy is leaving the sphere of specialists who work on their own and in isolation, and is turning more and more into a cooperative group activity. Thirdly, and most importantly, DNA sequence data are increasingly included in the work of species recognition and delimitation, even though morphological scrutiny continues to be the backbone of sound taxonomical research. Almost half of the new species described here (and several others described previously) are characterized by a DNA-'barcode'. Zicsi welcomed all these changes and participated in them in his later years. And he was desperate that most of his collection, preserved in formaldehyde, was largely useless for DNA sequencing. Let's hope that better techniques will show up in the next decades to extract new information out of formaldehyde-preserved specimens.

In the papers presented here, DNA sequence data are made useful to different degrees: Several contributions explicitly combine them with morphological data, to erect new species (Csuzdi *et al.* 2018b; Marchán *et al.* 2018; Seesamut *et al.* 2018), to revalidate junior synonyms (Szederjesi *et al.* 2018b), or to unveil the complexity of a widespread species (Rota *et al.* 2018). Or DNA sequence data are used to corroborate taxonomic decisions based mainly on the morphological account (Cervantes & Fragoso 2018; Dong *et al.* 2018; Dózsa-Farkas *et al.* 2018; Nagy *et al.* 2018; Nguyen *et al.* 2018; Shen *et al.* 2018; Sun *et al*. 2018). The usefulness of DNA data in earthworm taxonomy is still limited by the lack of DNA data in many species, especially in those described decades ago. Nevertheless, an approach as in Marchán *et al.* (2018) is likely to become common practice in the near future: to select clades on a DNA-sequence-based phylogenetic tree, and then to turn back to the sequenced specimens for morphologcial scrutiny and the formal erection of species taxa.

The species descriptions themselves adhere to the rigid norms for erecting and describing species that are currently valid in the respective taxa, yet they also document the personal style and preferences of the authors: descriptions and illustrations confine to the established character catalogue, or they include additional observations on morphology and anatomy; some authors prefer line drawings, others photographs, many use both; line drawings are schematic or beautifully refined (see Nguyen *et al.* 2018; Seesamut *et al.* 2018). Describing species is not—not yet!—an automated and streamlined routine business but rather the result of a long and often sinuous process of observation, annotation, memory, and thought.

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The papers of this volume are arranged in loose biogeographical order. There are 12 contributions from Northwestern Eurasia and Eastern Asia, respectively, 14 from the Americas, and there is one notable paper from Africa, with the first earthworm species described ever from Botswana (Nxele *et al.* 2018), member of a family endemic to southern Africa (Tritogeniidae).

Eleven new species are described form Northwestern Eurasia (i.e., Europe, Russia, the Near East and Central Asia): one species of *Octodrilus* (Lumbricidae) from Italy (Csuzdi *et al.* 2018b); six species of Hormogastridae from Spain (Marchán *et al.* 2018), accommodated in two most recently erected genera; one species of *Fridericia* (Enchytraeidae) (Nagy *et al.* 2018) from Hungary; two species of *Dendrobaena*, and one species of *Healyella* (Lumbricidae) from Turkey (Szederjesi *et al.* 2018a).

Thirty-seven new species are described from Eastern Asia, many of them belonging to the pheretimoid group in Megascolecidae: altogether 22 new species of *Amynthas*: two species from Japan (Shen 2018); nine species from Laos (Hong *et al.* 2018); and eleven species from southern China (Dong *et al.* 2018; Jiang *et al.* 2018; Sun *et al.* 2018; Zhao *et al.* 2018). One new species of *Metaphire* from southern China is added to the list (Sun *et al.* 2018). Further interesting finds are the first species of *Pheretima* sensu stricto in Vietnam (Nguyen *et al.* 2018), a new marine littoral oligochaete species from Thailand and mainland Malaysia (Seesamut *et al.* 2018)—a putative sister species of the cosmopolitan *Pontodrilus litoralis*—and two new species of *Drawida* from Taiwan (Shen *et al.* 2018). Finally, ten new species of Enchytraeidae are described: two species of *Mesenchytraeus* from China (Zhang *et al.* 2018); furthermore two species each of *Achaeta* and *Xetadrilus*, and one species each of *Bryodrilus*, *Chamaedrilus*/*Cognettia*, *Enchytronia*, and *Mesenchytraeus*, from Korea (Dózsa-Farkas *et al.* 2018).

Twenty-three new species-group taxa are described from Central and South America: from Mexico one species each of the genera *Diplotrema* and *Lavellodrilus* (Fragoso & Rojas 2018), and two species of *Protozapotecia* (Cervantes & Fragoso 2018) (Acanthodrilidae); from Colombia one species each of *Righiodrilus*, *Andiodrilus* (Celis *et al.* 2018), *Glossodrilus*, and *Martiodrilus* (Feijoo *et al.* 2018) (Glossoscolecidae and Rhinodrilidae); from Brazil three species of *Holoscolex* (Hernández-García *et al.* 2018a), two species of *Andiorrhinus* (Hernández-García *et al.* 2018b), five new species of *Glossoscolex*, one of them with three subspecies (Bartz *et al.* 2018; Feijoo & Brown 2018), and one species of *Fimoscolex* (Feijoo & Brown 2018). Furthermore, two new genera of Ocnerodrilidae are erected to accommodate two new species (Hernández-García *et al.* 2018c).

Apart from the description of new species, other topics related to taxonomy are covered as well: redescriptions of known species found in China (Lu *et al.* 2018), Thailand and Malaysia (Seesamut *et al.* 2018), or worldwide (Rota *et al*. 2018); regional or State-defined checklists of species from the Balkans or Turkey, with information on the biogeographical distribution type of the species (Misirlioğlu & Stojanović 2018; Stojanović *et al.* 2018; Valchovski *et al.* 2018); records of species in Turkey (Szederjesi *et al.* 2018a), Colombia (Feijoo *et al.* 2018), and in states of southern Brazil (Demetrio *et al.* 2018; Ferreira *et al.* 2018; Santos *et al.* 2018; Steffen *et al.* 2018), some of them as yet undescribed, together with indications on reference material and information of habitat parameters and the species' ecology; furthermore life cycle differences among natural populations of *E. andrei* (Latif *et al.* 2018), a morphological aberration in *Lumbricus rubellus* (Carrera-Martínez & Callaham 2018), and purely nomenclatural issues (Nicholson & Csuzdi 2018). Höser (2018) relates species-specific habitat preferences of the central European lumbricid genus *Proctodrilus* to processes of soil formation. Shen (2018) advocates the use of biogeographical species knowledge to assess the accuracy of species identifications and synonymizations in some regions of South-East Asia.

All in all, the volume covers taxa from 11 families and 36 different genera. With an estimated number of 7000 species of earthworms and enchytraeids known, this volume increases the number of known species by one per cent—a small but notable proportion. The forty contributions, though seemingly disparate in contents and coverage, should be understood as forty more pieces of the jigsaw puzzle "Global diversity of terrestrial Oligochaeta", whose final number of pieces is completely unknown, even though the rough outlines—the distribution of families and genera over the continents, their phylogenetic and phylogeographic relationships—are by now quite well-established.

Earthworm taxonomy is not an ivory tower discipline. Many species are discovered in areas where people live, work, and sustain their livelihood. Because of their body size they are often known by the locals before science gets hold of them. Farmers are interested in the species that live on their lands. Sustainable agriculture is unthinkable without earthworms. The amount of endemic species with a narrow distribution range—and therefore with risk of extinction—is tremendous. It is therefore important to build and to maintain the bridge from the 'producers' to the

'users' of earthworm taxonomy, as can be seen in this volume by species checklists (e.g., Stojanovic *et al.* 2018), abstracts in the language of the country (here in most of the contributions from the Americas), or by proposals of vernacular names (Marchán *et al.* 2018).

My call for papers to commemorate the person and scientific legacy of András Zicsi has received an overwhelming response from earthworm and enchytraeid taxonomists in many parts of the world. This volume is a strong signal that terrestrial oligochaete taxonomy in the 21st century is very much alive, despite the often difficult working conditions of earthworm taxonomists and the increasing legislative obstacles to conduct biodiversity research. My heartful thanks go to Zhi-Qiang Zhang, editor-in-chief of *Zootaxa*, to make this volume possible, to the production team of *Zootaxa*, to the numerous peer reviewers, who dedicated their time and expertise to the improvement of the manuscripts, to the corresponding authors for their fantastic cooperation, and to all contributors for their work and, last but not least, for their patience with the delay of this volume's publication, for which this editor holds responsibility.

Rüdiger M. Schmelz, *Zootaxa* editor for Oligochaeta

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