

## Spotlight on the unseen majority – the way to open community-driven publishing for global soil biodiversity

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Received 30 June 2023 | Accepted 21 November 2023

Published online at [www.soil-organisms.de](http://www.soil-organisms.de) 1 December 2023 | Printed version 15 December 2023

DOI 10.25674/so95iss3id358

### Abstract

Soil biodiversity does not only represent a major share of the total Earth's biodiversity, but has also major importance for the functioning of terrestrial ecosystems. This realization has triggered an unprecedented scientific, public, and political interest in the distribution, drivers, trends, and conservation measures of soil biodiversity. Here, we outline the role of the journal *Soil Organisms* in this rapidly developing field and our planned approaches to address the most pressing scientific and societal issues related to soil biodiversity. In the last couple of years, *Soil Organisms* has played a pioneering role in the movement to mobilize soil biodiversity and function data, with the goal to become the hub for unbiased soil biodiversity knowledge publishing. We plan to follow this successful route and introduce new approaches, such as requiring authors to share their raw data and statistical code along with the results to ensure reproducibility, we will accept submissions of manuscripts published as preprints, and we invite authors to submit their rejected papers along with their responses to reviewers' comments from other journals. Next to the already existing and successful paper formats of *Research Articles*, *Invited Reviews*, and *Calls for collaboration*, we will introduce *Editors' Highlights* and *Invited Comments* to complement the journal's portfolio in a way that ensures fast information flow on important developments related to soil organisms. Together with our Editorial Board of international specialists in soil biodiversity, ecology, and taxonomy, representing expertise across taxa, scientific disciplines, and research approaches, we aim to further establish *Soil Organisms* as a globally recognized and esteemed scientific platform, serving as a worldwide forum for researchers in the fields of soil organismic and functional biodiversity.

**Keywords** Data mobilization | policy advice | forum for discussion | open access | open science

Approximately 60% of Earth's species are born in soil, live in soil, or cannot make their living without soil (Figure 1; Anthony et al. 2023). Over the last years, soil biodiversity was highlighted by FAO (Food and Agriculture Organization of the United Nations et al. 2020) and IPBES/IPCC (Pörtner et al. 2021), and there is increasing interest to enumerate, monitor with standardized procedures, document, and conserve soil biodiversity, especially in the European Union. In 2023, a number of multi-million Euro projects were funded to assess soil biodiversity and create tools for its monitoring, conservation, and link it to ecosystem services; moreover,

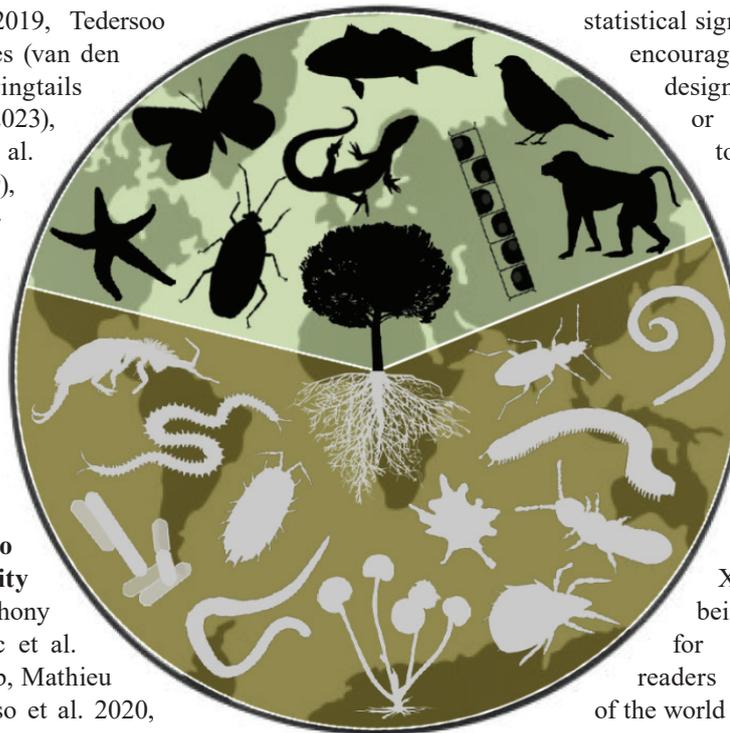
the EU Soil Health Regulation was issued. The National Biodiversity Monitoring Center of the Federal Agency for Nature Conservation in Germany has established an expert group on soil biodiversity monitoring, and the German Federal Environmental Agency is about to establish a Soil Monitoring Center.

In parallel to these top-down developments, important bottom-up initiatives are emerging and thriving. There has been a surge of synthesis initiatives gathering soil biodiversity and function data during the past decade, ranging from soil microorganisms including their biomass (Patoine et al. 2022) and diversity (Bahram et al. 2018,

Soudzilovskaia et al. 2019, Tedersoo et al. 2012) to nematodes (van den Hoogen et al. 2019), springtails (Potapov et al. 2023), earthworms (Phillips et al. 2019, Singh et al. 2019), and soil multidiversity-multifunctionality relationships (Delgado-Baquerizo et al. 2020), often supported by preceding *Calls for collaboration*, specifically data submission. **Soil Organisms** has played a pioneering role in this movement to mobilize soil biodiversity and function data (Anthony & Gessler 2022, Djukic et al. 2021, Guerra et al. 2021b, Mathieu et al. 2022, Ochoa-Hueso et al. 2020, Potapov et al. 2022, Smith et al. 2020, Tsiafouli et al. 2022) in a truly collaborative

way (Maestre & Eisenhauer 2019). The grassroots monitoring initiative Soil BON (Soil Biodiversity Observation Network) provides protocols and indicators of essential soil biodiversity variables across scales, from local to global scale (Guerra et al. 2021a, Guerra et al. 2021b) with Soil BON Foodweb (Potapov et al. 2022) and Soil BON Earthworm initiatives (Phillips et al. 2022) focusing specifically on soil fauna. Novel collections are complemented with mobilization of existing data in the framework of the GBIF call for soil biodiversity data papers and the EUdaphobase COST Action (Tsiafouli et al. 2022). At the same time, national-level monitoring programs for soil biodiversity are being discussed, citizen science initiatives are being tested (Neu et al. 2022), and young minds are getting inspired (Beugnon et al. 2022).

Increased interest will result in data and knowledge production, sharing, syntheses, and interpretation. Finally, new ecological theories for science will emerge resulting in regulations for society (Eisenhauer et al. 2021, Thakur et al. 2020). In this period, it is especially important to provide independent and unbiased scientific publishing tools to describe the status, trends, drivers, and functional impacts of soil biodiversity. Therefore, we intend to further develop **Soil Organisms** as the hub for unbiased soil biodiversity knowledge publishing, where we evaluate work based on the scientific soundness, rather than by potential impact and



**Figure 1.** A recent synthesis of available data suggests that ~59% of Earth's species are born in soil, live in soil, or cannot make their living without soil (Anthony et al. 2023). Icons were provided by PhyloPic.

statistical significance of effects. We encourage submission of well-designed studies with neutral or non-significant effects to combat the existing publication bias and provide a solid basis for future synthesis studies. *Soil Organisms* is proud to offer open access publication of scientifically sound content without any charges for publication and download (Eisenhauer & Xylander 2019), being inclusive for contributors and readers from regions of the world with lower levels of research funds, where accumulation of soil biodiversity knowledge is of

high priority (Guerra et al. 2020). This remarkable open access – no APC model is the result of the development of the journal since 2008, when we focused the scope of the journal exclusively on soil organisms, which had already accounted for a larger share of publications since the early 1960s under Wolfram Dunger. Accordingly, the name of the journal was changed from 'Abhandlungen und Berichte des Naturkundemuseums Görlitz' (first published in 1827) to 'Soil Organisms'. From then on, all contributions appeared in English, and the authorships became significantly more international. The majority of publications from earlier volumes and all since 2018 are available open access via the Senckenberg homepage.

*Soil Organisms* is continuously developing and improving. From 2024 on, we require authors to share their **raw data and statistical code along with the results** to make the analyses underlying conclusions reproducible and thus publications more transparent and trustable. We also encourage authors to submit their data to external structured repositories, such as Edaphobase or GBIF, and recommend the inclusion of digital supplementary materials, such as photographs, videos, distribution maps, and omics data, for which we provide specific DOIs. This approach ensures that valuable research data is readily available to the scientific community, fostering further collaboration, utilization in research, policy briefs and decision making, education,

and practical applications by being findable, accessible, interoperable, and reproducible (Wilkinson et al. 2016). It is also benefiting the author, who is getting additional citable products and more recognition from the research community (Allen & Mehler 2019, Wilkinson et al. 2016).

From 2024 on, we **accept submissions of manuscripts published as preprints** on external platforms. Early publishing can be important to initiate discussions in the research community, or present the citable idea description to funders. We would like to support this. Moreover, we invite authors to submit their revised manuscripts that were rejected in another journal together with responses to reviewers to save time in the publishing process without losing quality. In 2024, we are further **launching special issues** dedicated to specific topics of great significance that will enable us to comprehensively cover particular areas of interest and **yearly journal student awards** that will be presented to the best paper from Bachelor, Master, or PhD students based on an evaluation by the editorial board. More information on these changes and new features will soon be available from the journal web page.

The standard format in *Soil Organisms* is the **Research Article**, subject to review by two international peers. In addition to this, we continue to publish **Invited Reviews**, which offer a comprehensive overview of broader fields and are summarized by internationally recognized experts. The recently introduced format **Call for collaboration** was a great success with already almost 10 papers published (Anthony & Gessler 2022, Djukic et al. 2021, Guerra et al. 2021b, Mathieu et al. 2022, Ochoa-Hueso et al. 2020, Potapov et al. 2022, Smith et al. 2020, Tsiafouli et al. 2022), resulting in additional collaborators joining the initiatives and bringing general attention to the topics. For example, the recently introduced soil macrofauna database with thousands of sampling locations roughly doubled in size within one year after the publication of a call paper (Mathieu et al. 2022). Other new formats, namely **Editors' Highlights** and **Invited Comments**, focus on the most recent and significant developments in organismic soil biology, taxonomy, ecology, and other pertinent areas, including commentary on conservation legislation and funding policies. They are supposed to complement common **Review Papers**, which could already attract a lot of scientific attention and had an impact on the field, such as reviews on Collembola (Potapov et al. 2020; 65 citations in Google Scholar) and earthworms (Singh et al. 2019; 87 citations in Google Scholar). Furthermore, we welcome the submission and publication of **Identification Keys** for larger taxa of soil fauna, either within the journal or as supplements, as exemplified by Jordana (2012) and Schmelz & Collado (2010).

*Soil Organisms* is supported by numerous international specialists in soil biodiversity, ecology, and taxonomy as members of the editorial board, representing expertise across taxa, scientific disciplines, and research approaches. Our primary aim is to provide authors with a swift and constructive review process, offering clear editorial recommendations to minimize the challenges of managing conflicting reviews and uncertainties during revisions. To ensure fairness, since 2019 we have implemented a **double-blind reviewing process**. We also have **simple formatting requirements**, in line with the common structure of scientific papers, only requesting authors to adhere to the full journal formatting guidelines after their manuscript is accepted.

In the coming decade, our aspiration for *Soil Organisms* is to further establish it as a globally recognized and esteemed scientific platform, serving as a worldwide forum for researchers in the fields of soil organismic and functional biodiversity. Given our journal's rich history in soil organismic research, we anticipate it will become a repository of essential knowledge in the field of soil biology, supported by the global soil ecological community. Building on this solid basis, we aim to keep evolving and developing the journal in innovative ways to address the most pressing scientific and societal issues related to soil organisms. We believe that our commitment to fair open access publishing will not only set a benchmark for soil ecology but also serve as a model for the broader scientific publishing community.

## Acknowledgements

NE and AP acknowledge support by the German Centre for Integrative Biodiversity Research Halle–Jena–Leipzig, funded by the German Research Foundation (FZT 118). We thank the Senckenberg Gesellschaft für Naturkunde and the Senckenberg Museum für Naturkunde Görlitz for providing the financial resources for publishing *Soil Organisms*.

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