

HIGHLIGHTS

Communicating soil biodiversity research to kids around the world

Rémy Beugnon^{1,2,3,+}, Romy Zeiss^{1,4,+}, Elisabeth Bönisch^{1,4}, Helen R. P. Phillips⁵ and Malte Jochum^{1,4,6,*}

¹ German Center for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Puschstrasse 4, 04103 Leipzig, Germany

² Leipzig Institute for Meteorology, Universität Leipzig, Stephanstraße 3, 04103 Leipzig, Germany

³ CEFE, Univ Montpellier, CNRS, EPHE, IRD, 1919, route de Mende, 34293 Montpellier Cedex 5, France

⁴ Institute for Biology, Leipzig University, Puschstraße 4, 04103 Leipzig, Germany

⁵ Organismal and Evolutionary Biology Research Programme, Viikinkaari 1, P.O. Box 65, 00014 University of Helsinki, Finland

⁶ Department of Global Change Ecology, Biocenter, University of Würzburg, Emil-Hilb-Weg 22, 97074 Würzburg, Germany

+ these authors contributed equally to this work

* Corresponding author, e-mail: malte.jochum@uni-wuerzburg.de

Received 22 April 2024 | Accepted 1 July 2024

Published online at www.soil-organisms.org 1 August 2024 | Printed version 15 August 2024

DOI 10.25674/413

Abstract

In today's era of unprecedented global challenges, such as biodiversity loss, and a concurrent growing scepticism towards science, effective science communication is paramount to bridging the gap between the scientific community and the public. This is particularly true for soil biodiversity. Soils are home to more than half of the species on our planet and provide essential ecosystem services to humanity. But we still know too little about them, and our knowledge often does not effectively reach the general public. In this article, we present benefits of communicating science in plain-language, for example via encouraging scientists to take a step back and rethink the wider context of their research. We created a series of scientific articles covering various aspects of soil biodiversity tailored towards kids aged 8–15 and published them in *Frontiers for Young Minds*, a scientific journal providing articles written by scientists for kids and reviewed by kids. This endeavour evolved into a comprehensive collection of 33 research articles, written by 78 scientists and reviewed by 30 scientific mentors together with 59 young minds.

As these articles were only available in English, we recognized the language barrier as a significant obstacle, limiting access for the vast majority of children worldwide. Therefore, we started the Translating Soil Biodiversity project with the goal of translating the English articles into as many languages as possible. Thanks to the motivation and generosity of a hundred volunteers, articles from the collection have already been translated into 22 languages. This multilingual and open resource is now available as a valuable tool for children and educators globally.

By making scientific knowledge accessible and engaging for kids around the world, we aim to inspire curiosity, foster understanding, and cultivate a sense of stewardship towards the environment from an early age. Through initiatives like ours, researchers can help to empower future generations with the knowledge and awareness needed to address pressing environmental challenges and to build a sustainable future, not only on top of, but empowered by, diverse and functional soil ecosystems.

Keywords Science communication | children | translation | teaching | online resource

The need for science communication in soil biodiversity

Soil biodiversity is as a crucial ecosystem parameter, bolstering and safeguarding soil and ecosystem functioning (Bardgett & van der Putten 2014, Crowther et al. 2019, Guerra et al. 2021), thereby fortifying the provision of essential ecosystem services to human populations, including food and goods (FAO 2022). Despite their critical importance, soils and their biodiversity remain largely overlooked by the general public, often relegated to the status of mere ‘dirt’. This is also represented in many current policies, which target mainly physical and chemical aspects of soil systems (IPBES 2019). Indeed, soil is the only environmental medium without a European Directive targeting its protection (cf. Water Framework Directive, or Air Quality Directive, but see https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_3637). This lack of awareness perpetuates a general underestimation of the vital role soils play in supporting life on Earth (Anthony et al. 2023) and many processes central to healthy ecosystems and human well-being.

Fortunately, recent advancements in soil science have helped promoting the significance of soil biodiversity in mainstream media; notable examples include global maps depicting the distribution of soil animals such as earthworms (Phillips et al. 2019, <https://www.bbc.com/news/science-environment-50157313>) or nematodes (van den Hoogen et al. 2019, <https://theecologist.org/2019/jul/24/hidden-world-beneath-our-feet>). The Food and Agricultural Organization (FAO) is also making multiple efforts to raise awareness for soil and its biodiversity, for example, with books for children (<https://doi.org/10.4060/cc0530en>), appealing posters, or protocols for doing soil experiments at home (<https://www.fao.org/soils-2015/resources/information-material/en/> and <https://www.fao.org/global-soil-partnership/resources/publications-new/world-soil-day-and-children/en/>). Even in marketing for gardening equipment, soil biodiversity is considered and used as a purchase incentive, for example, in soil inocula that are announced as beneficial for soil organisms such as earthworms.

To give soil biodiversity the attention and protection it requires in order to sustainably provide the wealth of ecosystem services human societies depend on, it is imperative to bridge the gap between soil biodiversity and the public. Scientific information must be disseminated effectively to counteract misinformation and pseudoscience (Iyengar & Massey 2019), fostering a deeper appreciation and understanding of soil biodiversity beyond the scientific community. By engaging with diverse audiences through innovative communication

strategies, we can raise awareness for soil biodiversity and underscore its fundamental importance in sustaining life on our planet. In this context, we set out to bring soil biodiversity knowledge to kids around the world by providing easy access to scientific knowledge in the form of plain-language articles written by scientists for kids. In this article, we present benefits of communicating science in plain-language, for example via encouraging scientists to take a step back and rethink the wider context of their research.

From a few articles to a multilanguage article collection for kids

In our endeavour to shed light on soil biodiversity for the public, particularly targeting kids between 8 and 15, we embarked on a journey of explaining our science in simple, easily-accessible terms (Fig. 1). As an outlet, we chose *Frontiers for Young Minds*, a journal dedicated to sharing scientific knowledge with children and teenagers (<https://kids.frontiersin.org/>). This journal allows scientists to write research articles tailored for young readers based on peer-reviewed scientific articles, which are then reviewed by kids of the target age together with a scientific mentor. Our initiative began in 2019 with the proposal for an English article collection in the journal, focused on Soil Biodiversity (Beugnon et al. 2022), aiming to provide accessible and engaging content for kids. Over the following months, our collection gathered significant interest within the scientific community, resulting in the contribution of 33 articles from 78 authors. This collection included introductions to specific taxa (e.g. mites, Barreto & Lindo 2020a, and springtails, Potapov 2020) or soil biodiversity in specific ecosystems (e.g. in high-elevation systems, Steinwandter & Seeber 2022). The collection invited young readers to get active and engage with soil organisms, for example by building self-made heat extractors for soil fauna or by looking for earthworms in deadwood (Ashwood et al. 2020). Articles in the collection also explained why biodiverse soil systems are the foundation of human life on earth, for instance, because of their role in ecosystem processes such as the decomposition of dead organic material (Barreto & Lindo 2020b) or their involvement in greenhouse gas regulation (Ganault et al. 2021b, Lafuente & Cano-Díaz 2021). Moreover, the

► **Figure 1.** 33 article illustrations and, in the center, the Soil Biodiversity collection illustration. Each article of the collection is represented by one of these cover illustrations showing its topic. They were created by an illustrator and adapted based on feedback of the authors of the articles. Credit: *Frontiers for Young Minds*.



collection explained how soil ecosystems are affected by strengthening global-change drivers such as, for example, climate change, microplastics contamination (Barreto et al. 2021), or biological invasions (Jochum & Eisenhauer 2020). Young readers were also introduced to how we can safeguard healthy soil ecosystems (Orgiazzi 2022), amongst many other topics not discussed here. The collaborative effort of getting these articles published involved the active participation of 59 young minds and 30 scientific mentors. The process of writing and publishing the collection spanned approximately two years, from the submission of the first article in August 2020 to the final production of the eBook in October 2022 (Fig. 2). Throughout this time, editorial oversight, together with engaging in the review process and highly motivated young reviewers, ensured the accuracy and clarity of the content, while also maintaining its accessibility to young audiences.

By leveraging the expertise of scientists, the enthusiasm of young contributors, and the support of scientific mentors, we successfully produced a comprehensive, accessible resource on soil biodiversity tailored for young readers. Yet, only 19% of the world's population can speak English, and this figure will likely be lower when considering only kids (<https://www.statista.com/statistics/266808/the-most-spoken-languages-worldwide/>, accessed in 2023), making this resource inaccessible to the vast majority of the intended target audience.

To effectively reach kids around the world, we needed to speak their language, not only by breaking down the scientific content into simple terms but also by translating it into the languages they could read. This motivated us to start the second phase and initiate our ongoing project 'Translating Soil Biodiversity' (<https://www.idiv.de/en/young-minds/languages.html>). The project name highlights our three missions: (1) translating scientific findings on soil biodiversity by explaining them in plain language, (2) translating them into different languages, and (3) explaining how research works. The articles themselves introduce the concept of published, written science while also communicating scientific methods and knowledge acquisition through their content. Our current focus is on translating the English article collection into as many languages as possible, together with an additional group of helpers – volunteer translators – and making this knowledge openly available. With the help of 110 volunteers from mostly, but not exclusively, the field of soil ecology, we have already managed to translate all of the 33 articles into 1–7 different languages each. In total, our translated article collection encompasses 145 article translations in 22 languages (as of 2024-06-26). For some of the languages (e.g., French, German, Spanish), we will soon have the entire article collection translated,

while we only have 1–2 translations for other languages (e.g., Basque, Macedonian, Vietnamese). Despite single translations already planned for 46 languages, many other languages are still not covered. Both the original collection and the translations are available online and in Open Access (CC-BY 4.0) to ease their re-use and implementation worldwide.

What we have learned from the process as authors, translators, editors, science communicators

Science communication always brings benefits for both the provider and the receiver of information. During the editing of the English article collection and the organisation of the translations, the team members and the volunteer translators learned a lot and benefited in different ways. In the first instance, as we received contributions from diverse fields of research, this allowed editors, reviewers, and translators to expand their knowledge (e.g. Ariotti et al. 2020, Cadena et al. 2022, Jurburg 2020).

When writing an introduction of an article intended for a younger audience, the context needs to be even broader than in a typical scientific article. Writing for such a broader context required us, as authors, to take several steps back and remind ourselves why we are doing this work and how we can explain its relevance to those outside the scientific world, as well as relating it to other research in the wider subject of soil and ecosystem ecology.

Similarly, when writing for a different type of audience, namely kids and the broader public, the writing skills of the authors, editors, and translators need to be adapted. The texts need to be easily accessible and understandable for the target audience. Thus, contributors had to break out of their everyday writing trot when reviewing or translating articles that were not the same type of research or focused on different study organisms than they do in their everyday work. This aspect also relates to the figures included in the articles for kids, which have to be easily accessible and understandable as well. The authors of the original articles produced figures to simply and easily convey their studies' main findings. However, these adaptations can now also prove useful in other settings, such as grant proposals, where those evaluating may not be familiar with the soil realm and the authors have to break down and effectively communicate their research ideas to people working in different fields of science.

Given the range of knowledge captured in the collections, we engaged with a large number of people to write the original articles, translate them, advertise and

use them (Fig 2), from a broader scientific background than what may be considered typical. We can see this engagement by people approaching us at conferences about the collection, via their wish to contribute to it after coming across the flyers or posters, or their effort

to introduce our work to their colleagues, friends, and families. These newly-established contacts can be valuable for future research collaborations, spreading similar communication efforts and experiences, and simply exchanging current research topics.

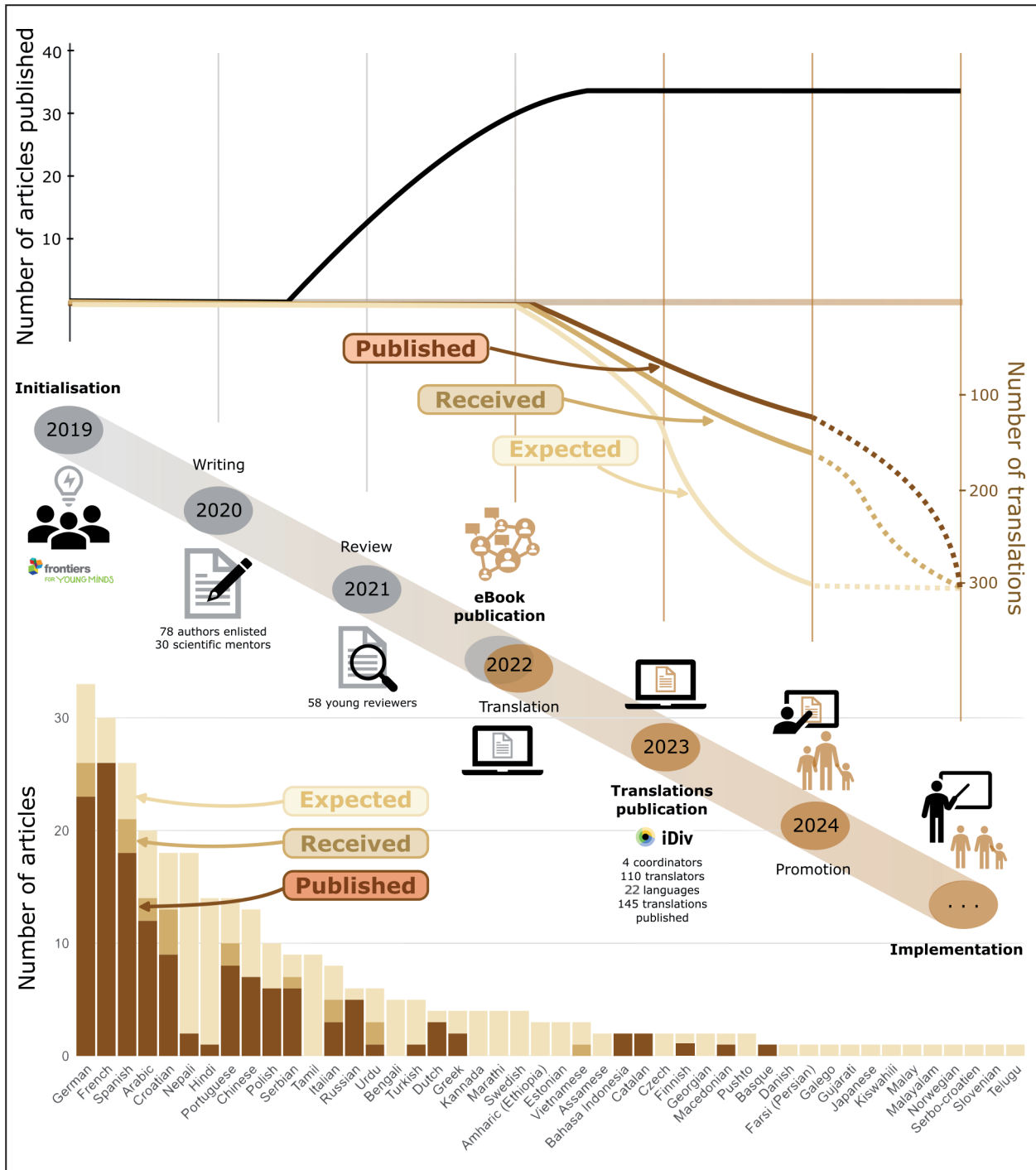


Figure 2. Full timeline of the project - from a quick idea to reaching hundreds of thousands of people around the globe. Upper part: The number of Soil Biodiversity collection articles published in Frontiers for Young Minds (black) and translations expected, received, and published (<https://www.idiv.de/de/young-minds/languages.html>) over time, as of 2024-06-26. Middle diagonal: Timeline of our project with the Frontiers for Young Minds Soil biodiversity collection in gray and the Translating Soil Biodiversity project in brown. Lower part: The number of translations expected, received, and published for each of the 46 languages covered so far, as of 2024-06-26.

Science communication and teaching

Being able to write about a research topic from the very basics and motivate someone else is an important skill for media engagement, press releases, and interviews, amongst many other activities. But while our collection was designed for kids, it can actually help many others. It may be a useful resource for students starting in the field of soil biodiversity research, providing an overview and introduction to the diverse research field.

The article collection can also be used and built upon to be used in schools. One idea is to focus on certain articles to explain the importance of soil biodiversity to school classes. For example, by selecting articles about earthworms, kids can learn about the organism characteristics (Ganault et al. 2021a), the exemplary effect of belowground organisms on ecosystems (Joly & Subke 2022), where to find them (Ashwood et al. 2020), and how to actively get involved in scientific projects (i.e. citizen science, Burton & Cameron 2021). The materials can also support teachers during their own education by providing easily-accessible information and examples for interactive learning, for instance, through active involvement in Citizen Science and home experiments. To further aid the goal of ensuring our collection reached teachers and bring the articles and their content into the classroom, we have established promising contacts with the Biodidactics departments at two different universities (i.e., Leipzig and Würzburg, Germany). Currently, we are co-supervising a project about how to use selected articles of the collection in accordance with the school curriculum in Saxony, Germany, and how to combine the collection with an ongoing Citizen Science project about soil ecosystem functioning with schools in the Odenwald, Germany.

Outlook

Science communication is key to raise awareness for the key environmental challenges that will strengthen over the next decades. Our main message is present across all articles of the collection: soil biodiversity is important and there are many reasons why it is worth taking a closer look at what's beneath your feet. Our article collection on soil biodiversity can be used in various ways and brings benefits to everyone involved, being a toolbox for teachers and students as well as an easy teaching, communication, and networking resource for scientists. Currently, we are translating our articles with the goal of preparing anything from single articles up to complete eBooks in as many

languages as possible. There is no limit to the number of languages, and we are always welcoming additional translations (<https://www.idiv.de/de/young-minds/languages.html> – ‘How to contribute’) that enable us to reach new audiences with our central message that soil biodiversity is important and that protecting it will be key to maintaining optimal living conditions for humans on our planet.

Acknowledgements

RZ was funded by the German Federal Environmental Foundation (DBU, 20021/752). RB, RZ, EB, and MJ acknowledge support of iDiv funded by the German Research Foundation (DFG FZT 118, 202548816). HRPP received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 101033214 (GloSoilBio). iDiv also financially supported the coordination of translation activities and is hosting our translated articles. We would like to thank the following people for their support in the project: Frontiers for Young Minds staff (Hedwig Ens, Will Savage, Jessie Miller), all the authors, young reviewers and science mentors of the FYM articles, additional external editors (for articles authored by the collection editors), other team members (Stefan Bernhardt, Evangelia Chronopoulou, Ioannis Constantinou, Vrinda Dabas, Amelie Hauer) for helping with translations and coordination, volunteer translators, and additional young reviewers for translated versions (happened only for a small subset of articles).

FYM article authors:

Agnès Duhamet, Alberto Orgiazzi, Alexander Brandt, Amandine Erktan, Angela Lafuente, Anton M. Potapov, Apolline Auclerc, Axel Julian Touw, Brad Bebout, Carlos Barreto, Concha Cano-Díaz, Cristiana Ariotti, Dolores Ruiz-Lupión, Edel Pérez-López, Eleanor M. Slade, Elena Giuliano, Elena Vanguelova, Elisabeth Darling, Enrique Doblas-Miranda, Erin K Cameron, Eva Koller-France, Felicity Victoria Crotty, Felix Gottschall, Francis Ashwood, Franciska de Vries, François-Xavier Joly, Frank Ashwood, Gaëlle Lextrait, Gianpiero Vigani, Helen R P Phillips, Henry Chung, Hüsna Öztoprak, Ina Schaefer, Inês Santos Martins, Jens Bast, Jens-Arne Subke, Jes Hines, Jordi Moya-Laraño, José Q. García-Maldonado, Julia Seeber, Julia Siebert, Kevin Butt, Léa Beaumelle, Lena Neuenkamp, Leslie Bebout, Malte Jochum, Marcel Dominik Solbach, María Pilar Gavín-Centol, Marie

Sünnemann, Marisol Quintanilla-Tornel, Matthias C. Rillig, Melanie Mira Pollierer, Michael Steinwandter, Nadia Maaroufi, Nico Eisenhauer, Nicole Marie van Dam, Olivia Azevedo, Paolina Garbeva, Paul Manning, Paula Maza-Márquez, Pierre Ganault, Sacha Delmotte, Sandra Ramírez, Santiago Cadena, Sharon L Grim, Stefan Geisen, Stefan Scheu, Stefanie Maaß, Stephanie D Jurburg, Sue Benham, Victoria J Burton, Walter R. Waldman, Wolfgang Wilcke, Xin Rui Ong, Yvan Capowicz, Yvonne Oelmann, Zoë Lindo

FYM collection editors:

Rémy Beugnon, Malte Jochum, and Helen R P Phillips. Additionally, Nathan M Good and Vishal Shah each edited single articles that were authored by two of the collection editors.

FYM scientific mentors:

Anna Klamerus-Iwan, Christopher A Emerling, Cristiana Ariotti, Daniel Garza, Fares Z Najjar, Francesco Catania, Gary Bates, Hannah Simba, Irina Moshkova, Jessica Audrey Lee, Joyce Sakamoto, Julia Rittenschober, Kirsty Salmon, Luisa I Falcon, Lynette Cheah, M. Nils Peterson, Maria Claudia Segovia-Salcedo, Maskit Maymon, Nicole Ricker, Nina Freund Lear Markham, Patricia Welch Saleeby, Rita Araujo, Ruchira Sharma, Ryan Thomas Weir, Salza Palpurina, Shruti Parikh, Sreenivas Rao Ravella, Suhas Kumar, Tom Vercauteren, Vinuselvi Parisutham

Young reviewers:

Adam, Alexander, Anhad, Anna, Anna-Marie, Anshul, Ashima, Astère, Avani, Aya, Catherine, Cecília, Dario, FDR-HB_Peru iGEM Team, Giulia, Gwen, Harrison, Inja, Isabel, Jack, Jedidiah, Jovena, Juan Diego, Junie, Juniper, Kavin, Kaysville Junior High, Kaytlin, Konstantin, Lilu, Luvena, Mackenzie, Maddie, Margarida, Maria, Marie, Matías, Meha, Mercy School Institute, Michelle, Miles, Nivedita, Nokutenda, Nynke, Pran`atee, Rose, Rutendo, Sanskriti, Sasyak, Sebastian, Shashipreetham, Shreeya, Shriya, Sophia, Tacy, Tanishkaa, Thuvisha, Valerie, Vetrivel, Yuthiga

Translators (Status 2024-06-26):

Agnieszka Józefowska, Agustín Sarquis, Aicha Aboukhait, Alkyoni Sfindouraki-Basakarou, Alper

Çeviker, Alyssa Larges, Amelie Hauer, Anastazija Dimitrova, Andrea Benech, Andrea Ermenić, Andrey Zuev, Anibal Castillo, Anna Zueva, Anne Boudrot, Anne Gallet-Budynek, Anton M. Potapov, Audrey Losfeld Dutoit, Bartłomiej Woś, Bibiana Betancur Corredor, Birgit Lang, Bruno Čaleta, Camila Leandro, Carlos Barreto, Caroline Pequegnot, Caterina Barrasso, Concha Cano, Davorka K. Hackenberger, Dino Aleksandrić, Dominika Siegieda, Dragana Rajković, Adam Ossowicki, Raza Ullah Khan, Dragana Rajković, Ege Okumuş, Elia Guariento, Elisabeth Bönisch, Enrique Doblás Miranda, Evangelia Linda Chronopoulou, Filip Popović, Flavien Collart, Gabriela Fontenla-Razzetto, Hashim S. Dhaher, Ignatius Putra Andika, Ina Schaefer, Ines Graubner, Ingrid Patetta, Isis Petrocelli, Islam Mohammad Zidan, Janna Barel, Jon Zubieta, Jonathan Bonfanti, Jonathan von Oppen, José Q. García-Maldonado, Juan F. Dueñas, Julia Seeber, Julie Delaunay, Justine Lejoly, Katarina Matvijev, Kevin Hörmlle, Kiran Gurung, Lena Neuenkamp, Lucie Malard, Malte Jochum, María Morel Revetria, María Teresa Barral Silva, Mariana Gliesch Silva, Marie Husseini, Marie Sünnemann, Matteo Anderle, Mayrice Delforge, Melanie M. Pollierer, Michael Steinwandter, Michela Audisio, Muniba Shan, Nathalie Fromin, Nicole Scheunemann, Pablo Castro Sánchez-Bermejo, Patrick Pachl, Paul Kardol, Perla Griselle Mellado Vazquez, Piotr Pacanowski, Raghad S. Mouhamad, Raghvendra Shrikrishna Vanjari, Raza Ullah Khan, Ricarda Lehmitz, Romy Zeiss, Sacha Delmotte, Sally S. Saud, Sandra Varga, Sarita Pudasaini, Simone Kilian Salas, Stefanie Maaß, Sumaira Shan, Susana Castro Sowinski, Susanne Horka, Tabea Hoppe, Tanja Trakic, Teodora Šimić, Tiia Määttä, Ujjwal Dhakal, Usama Ali Syed, Vinicius Tirelli Pompermaier, Weronika Kamola-Uberman, William Perrin, Xin Sun, Zhonghui Tang and Ziyu Lin.

Author contributions

RB and RZ worked on the first draft of the manuscript. MJ revised the first draft. All authors revised the manuscript.

7. References

- Anthony, M. A., S. F. Bender & M. G. A. van der Heijden (2023): Enumerating soil biodiversity. – *Proceedings of the National Academy of Sciences*, 120(33), e2304663120 [https://doi.org/10.1073/pnas.2304663120].
- Ariotti, C., E. Giuliano, P. Garbeva & G. Vigani (2020): The Fascinating World of Belowground Communication. –

- Frontiers for Young Minds **8**: 547590 [https://doi.org/10.3389/frym.2020.547590].
- Ashwood, F., E. I. anguelova, S. Benham & K. R. Butt (2020): Looking for Earthworms in Deadwood. – Frontiers for Young Minds, **8**, 547465 [https://doi.org/10.3389/frym.2020.547465].
- Bardgett, R. D. & W. H. van der Putten (2014): Belowground biodiversity and ecosystem functioning. – Nature **515**(7528): Article 7528 [https://doi.org/10.1038/nature13855].
- Barreto, C. & Z. Lindo (2020a): Armored Mites, Beetle Mites, or Moss Mites: The Fantastic World of Oribatida. – Frontiers for Young Minds **8**: 545263 [https://doi.org/10.3389/frym.2020.545263].
- Barreto, C. & Z. Lindo (2020b): Decomposition in Peatlands: Who Are the Players and What Affects Them? – Frontiers for Young Minds **8**: 107 [https://doi.org/10.3389/frym.2020.00107].
- Barreto, C., M. C. Rillig, W. R. Waldman & S. Maaß (2021): How Soil Invertebrates Deal With Microplastic Contamination. – Frontiers for Young Minds **9**: 625228 [https://doi.org/10.3389/frym.2021.625228].
- Beugnon, R., M. Jochum & H. R. P. Phillips (2022): SOIL BIODIVERSITY. – Frontiers Media S [https://www.frontiersin.org/research-topics/11796/pdf].
- Burton, V. J. & E. K. Cameron (2021): Learning More About Earthworms With Citizen Science. – Frontiers for Young Minds **8**: 548525 [https://doi.org/10.3389/frym.2020.548525].
- Cadena, S., P. Maza-Márquez, S. I. Ramírez Jiménez, S. L. Grim, J. Q. García-Maldonado, L. Prufert-Bebout & B. M. Bebout (2022): Microbial Mats: Primitive Structures That Could Help us Find Life on Other Worlds. – Frontiers for Young Minds **10**: 654148 [https://doi.org/10.3389/frym.2022.654148].
- Crowther, T. W., J. van den Hoogen, J. Wan, M. A. Mayes, A. D. Keiser, L. Mo, C. Averill & D. S. Maynard (2019): The global soil community and its influence on biogeochemistry. – Science **365**(6455) [https://doi.org/10.1126/science.aav0550].
- FAO (2022): Soils for nutrition: State of the art. – FAO [https://doi.org/10.4060/cc0900en].
- Ganault, P., L. Beaumelle & A. Auclerc (2021a): The Way Soil Organisms Look Can Help Us Understand Their Importance. – Frontiers for Young Minds **9**: 562430 [https://doi.org/10.3389/frym.2021.562430].
- Ganault, P., S. Delmotte, A. Duhamet, G. Lextrait & Y. Capowicz (2021b): Earthworms and Their Role in Greenhouse Gas Emissions. – Frontiers for Young Minds **9**: 562583 [https://doi.org/10.3389/frym.2021.562583].
- Guerra, C. A., R. D. Bardgett, L. Caon, T. W. Crowther, M. Delgado-Baquerizo, L. Montanarella, L. M. Navarro, A. Orgiazzi, B. K. Singh, L. Tedersoo & et al. (2021): Tracking, targeting, and conserving soil biodiversity. – Science **371**(6526): 239–241 [https://doi.org/10.1126/science.abd7926].
- IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. – Zenodo [https://doi.org/10.5281/ZENODO.3831673].
- Iyengar, S. & D. S. Massey (2019): Scientific communication in a post-truth society. – Proceedings of the National Academy of Sciences **116**(16): 7656–7661 [https://doi.org/10.1073/pnas.1805868115].
- Jochum, M. & N. Eisenhauer (2020): How Introduced Earthworms Alter Ecosystems. – Frontiers for Young Minds **8**: 534345 [https://doi.org/10.3389/frym.2020.534345].
- Joly, F.-X. & J.-A. Subke (2022): The Bizarre Role of Soil Animals in the Decomposition of Dead Leaves. – Frontiers for Young Minds **10**: 638736 [https://doi.org/10.3389/frym.2022.638736].
- Jurburg, S. D. (2020): Bacteria in Soil Keep Your Hamburger “Healthy”. – Frontiers for Young Minds **8**: 545905 [https://doi.org/10.3389/frym.2020.545905].
- Lafuente, A. & C. Cano-Díaz (2021): Can Methane-Eating Bacteria in Drylands Help Us Reduce Greenhouse Gases? – Frontiers for Young Minds **9**: 556361 [https://doi.org/10.3389/frym.2021.556361].
- Orgiazzi, A. (2022): Protecting Soil Biodiversity: A Dirty Job, but Somebody’s Gotta Do It! – Frontiers for Young Minds **10**: 677917 [https://doi.org/10.3389/frym.2022.677917].
- Phillips, H. R. P., C. A. Guerra, M. L. C. Bartz, M. J. I. Briones, G. Brown, T. W. Crowther, O. Ferlian, K. Gongalsky, J. van den Hoogen, J. Krebs & et al. (2019): Global distribution of earthworm diversity. – Science **366**(6464): 480–485 [https://doi.org/10.1126/science.aax4851].
- Potapov, A. (2020): Springtails—Worldwide Jumpers. – Frontiers for Young Minds **8**: 545370 [https://doi.org/10.3389/frym.2020.545370].
- Steinwandter, M. & J. Seeber (2022): Belowground Mountaineers: Critters Living in Mountain Soils. – Frontiers for Young Minds, **10**: 660110 [https://doi.org/10.3389/frym.2022.660110].
- van den Hoogen, J., S. Geisen, D. Routh, H. Ferris, W. Traunspurger, D. A. Wardle, R. G. M. de Goede, B. J. Adams, W. Ahmad, W. S. Andriuzzi & et al. (2019): Soil nematode abundance and functional group composition at a global scale. – Nature **572**(7768): 7768 [https://doi.org/10.1038/s41586-019-1418-6].