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sDiv working group meeting report

”sMacroS I”

The first meeting of the sDiv working group “sMacroS” took place between 19-22 March 2025 with the goal of advancing a global synthesis on soil animal biodiversity and biomass/metabolism. This workshop series brings together experts from multiple existing macroecological soil biology initiatives, data scientists and modelers to coordinate data efforts, develop a synthesis platform and stimulate collaborative publications towards a synthesis in soil fauna macroecology.

Areas of discussions and key conclusions

To create a unifying platform for synthesis papers and support for global biogeochemical models and soil-related policies, participants discussed how to link existing initiatives on soil macroecology, such as macrofauna (earthworms, sOilFauna, FaunaService, OniscidBase), mesofauna (Collembola, Oribatida), microfauna/microflora (Global Atlas Database Bacteria and Fungi, protists and testate amoebae, nematodes), as well as other large-scale initiatives (European Soil Fauna Atlas, Soil BON Foodweb). Discussed synthesis topics included soil animal biogeography, traits, and conservation. Consensus emerged around the value of establishing integration across projects via shared standards and a metadata template for future integration. Key synthesis ideas were refined during the workshop regarding the research question and potential methodological approach.

Content presentations

The workshop opened with an introduction to iDiv and sDiv, followed by presentations on existing initiatives, including soil microorganisms and microfauna, mesofauna, macrofauna, other global-scale studies (Soil BON Foodweb) and data warehouse (Edaphobase). Two synthesis ideas were introduced: (1) biodiversity synthesis focused on testing global patterns and drivers as well as latitudinal gradients of alpha- and beta-diversity across multiple taxa; and (2) the biomass or energy synthesis aimed to assess global soil animal biomass distributions, identify their major drivers and implications for ecosystem functioning. Detailed discussions helped specify which type of diversity, abundance, and biomass data are necessary. Key datasets were identified as candidates for integration. The establishment of a shared database for soil fauna was debated. Edaphobase emerged as a promising platform, though participants flagged challenges regarding taxonomic harmonization and data quality assurance.

Research directions and ideas discussed

The sMacroS will function as a synthesis platform. Currently, two synthesis papers (biodiversity and energy) are planned, and each will be led by one postdoc. Other synthesis ideas resulted from the platform, such as a roadmap paper towards the synthesis, and developing soil-related policies were also discussed. For the biodiversity synthesis, the major question is what drives global patterns in alpha and beta diversity of soil animals? It remains

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uncertain whether microorganisms will be included, such as from DNA data. Regarding the energy synthesis, the main question is how biomass of soil fauna is distributed along latitudinal gradients? It remains open whether metabolism will be included, as it lacks microorganisms which may contribute the majority of soil metabolism.

Structure of the week

The week started with a warm welcome from the sDiv center, self-introduction, and then followed up with a general presentation on what to achieve during this week. We then started a round discussion by hearing short presentations from each soil macroecology initiative to give an overview of data availability, followed by several rounds of break-out groups for more in-depth discussion on research synthesis ideas, then these discussions were reported and discussed in the whole group. Additional teamwork was organized on paper compilation and manuscript writing. Further, dedicated sessions on database standards, metadata and integration options were also organized. Complementing these activities, an established Think Tank inspired new ideas and brainstorming of new research directions. Daily wrap-ups were done for everyone including those participating remotely.

Next steps and deliverables

The next steps were to agree on a common data template and develop R scripts to standardize biodiversity data. This would provide templates for community data standards for ecologists for global use. Future other steps were to draft two planned publications: one on biodiversity and one on biomass. These require defining the methodological approaches, select the data to be included, statistical analysis and geospatial modelling for publications. Additionally, several opinion paper ideas on large data use, and roadmaps towards a synthesis of soil fauna macroecology were proposed but the lead not yet being decided.

Working atmosphere and feedback on sDiv support

The group well mixed different nationalities, expertise and constructive set of tones from the beginning of the meeting. This made the discussion productive and highly collaborative. The team also mixed advanced and early-career researchers, making the workshop very dynamic. The hybrid sessions allowed easy participation of online participants, and although without enjoying the food deliveries, daily summaries and inclusion of online participants to breakout groups made discussions inclusive despite the logistic demand. Social parts (dinner, iDiv cake and connect event) offered opportunities to make personal connections. Participants highly appreciated both the guided tour through the city and the dinners.