

Toward a Common Set of Functional Traits for Soil Protists

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Abstract

Protists are major actors of soil communities and play key roles in shaping food webs, community assembly, and ecosystem processes, yet their functional diversity is understudied. High-throughput sequencing data have revealed their ubiquity and diversity, but lack of standardized traits has hampered the integration of functional information, limiting our understanding of soil ecosystems. Here we propose a framework for soil protists, identify a set of common traits to characterize their functional diversity, and apply the framework on a broad-scale, real-world dataset. We reviewed studies on soil protists to identify the traits used in the literature, and define a framework based on 10 key traits that satisfy two criteria: availability of information, and applicability to most taxa. The framework was tested on a dataset of environmental DNA metabarcoding data from 1123 soil samples collected in 48 glacier forelands worldwide. Traits were assigned to all the 570 Molecular Operational Taxonomic Units (MOTUs) detected in our dataset, leading to the production of a global trait-based dataset from glacier forelands. We estimated the functional space of protist communities and evaluated if the selected traits were effective in describing protist diversity. The functional space of protist communities showed that the MOTUs are clustered in three regions, mainly reflecting different nutritional and habitat preferences. The proposed framework is appropriate for multiple applications, including estimation of functional diversity and food web analyses, and provides a basis for ecological studies on soil protists, enabling the functional characterization of this essential but often neglected component of soil biodiversity.

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