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Identification and functional roles of amoeboid protozoa in soil

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Abstract

Protozoa are the major consumers of bacterial production in soil, forming the base of the heterotrophic eukaryotic food web that channels the energy flow via bacteria to higher trophic levels in soil (i.e. the bacterial energy channel). Among them, amoebae and amoeboid flagellates are of major importance due to their small size, high abundance, fast turnover and ability to penetrate even the smallest pores with their flexible pseudopodia, making them key regulators of bacterial biomass and nutrient cycling.

Despite these important functions for soils we have only a vague idea on the identity of the dominant taxa of amoeboid organisms in soils. Major reasons for the general ignorance in environmental studies of these key eukaryotes are methodological difficulties in cultivation and quantification in the opaque soil environment as well as a lack of taxonomic expertise. However, recent developments in molecular techniques now allow closing the methodological gap on this functionally important trophic link in the soil food web.

Within my PhD project as part of the EU-project EcoFINDERS we aim at designing DNA-based barcodes for dominant taxa of amoeboid organisms, eventually to determine their diversity across soils throughout Europe and China using high-throughput sequencing.

Cultivation of amoeboid organisms from several soils already indicated an enormous hidden diversity. Morphological and molecular information retrieved from these cultures indicates deep phylogenetic relationships among many amoeboid organisms and the existence of high numbers of new taxa and even genera. This information is crucial to develop effective genetic barcodes targeting broader protozoan taxa for pyrosequencing.

First ecological studies investigating grazing of amoebae have confirmed strong impacts on total bacterial biomass and community composition. Further we found grazing differences even between closely related taxa suggesting niche specialisation, making it difficult to treat protozoa as a single functional black box in soil food webs.