National biodiversity inventory and monitoring of terrestrial collembolans and mites in Switzerland

Guillaume Lentendu*[1], Sylvain Lanz[2], Loïc Bulliard[2], and Edward Mitchell[1]

[1]Laboratory of Soil Biodiversity, University of Neuchâtel – Suisse
[2]horizon A, 2072 Saint-Blaise – Suisse

Résumé

Collembolans and mites are among the most abundant animals in soils. Oribatid mites and collembolans have direct impact on organic matter degradation, while gamasina mites are key predators in the soil food web. They are good indicators of soil functional diversity and general ecosystem biodiversity. However, the diversity of Acari and Collembola is not fully described even in otherwise well studied regions such as Switzerland.
We are conducting a Swiss national inventory for these two groups to first estimate their total diversity in terrestrial ecosystems and to (re)develop taxonomic that was missing. A total of 320 sites were selected covering all bio-georegions of the country and the five main terrestrial habitats with nation-wide monitoring programs. Collembolans and mites specimens were morphologically characterized and DNA barcoded. Using third generation sequencing techniques, we sequenced the full ribosomal operon, thus allowing higher taxonomic resolution for species discrimination, while allowing to create a reference database for short read sequencing metabarcoding approaches targeting the 28S rRNA gene. Indeed, in-silico analyses allowed for designing new metabarcoding primers targeting the 28S D9-D10 region for Acari and the 28S D6-D7a region for Collembola, allowing comparable species discrimination while being easier to amplify than the traditional COI barcoding marker. Morphological analyses of the first 80 samples analysed revealed over 400 species, including at least one new species of Collembola and five of Gamasina for science. In this first subset, collembolans were found to be more diverse in forest soils while gamasina mites were more diverse in floodplains. Ongoing metabarcoding analyses will provide more details on the ecology of these groups and will help select samples for morphological analyses to optimise the discovery of novel species. Ultimately, this project will provide a tool for soil biodiversity inventory and monitoring to complement traditional biotic inventories.

Mots-Clés: taxonomy, monitoring, acari, collembola, biodiversity, metabarcoding, long reads barcoding

*Intervenant