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CENTRE FOR THE SYNTHESIS AND ANALYSIS
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Project summary



BETSI

Biological and ecological functional traits of soil invertebrates to link species assemblages to environmental factors

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Organism traits bring together all the qualitative and quantitative information associated with the biology of the organisms and their relationships with the environment. These information are very useful for diagnosing the impact of environmental constraints (pollution, agricultural practices, climate, etc.) on individuals, populations and communities.

Context and objectives

The soil fauna represents a poorly known side of biodiversity, sometimes compared to the deep seas or the tropical forest canopy. However, an incredible diversity is hidden under our feet, as up to 25% of all known biodiversity can be found there. Spiders, centipedes and other earthworms populate our soils and are in permanent contact with the environment in which they live, feed and reproduce. By digging galleries, they act on the structure of the soil allowing the infiltration, and storage of water and by feeding on organic matter, they ensure its recycling. These complex and varied interactions are driving scientists to further study these

organisms and how they respond to changes in their environment, be it human pressures or climate change.

Until recently, earthworms, spiders or insects were classified into groups based on common characteristics such as habitat or food resources. This classification, based on very subjective criteria, depended very much on the researcher implementing it and had many limitations. A complementary approach is based on objective relationships between the properties of individuals (traits) and their environment. This makes possible to predict more accurately the response of an organism to changes in its environment.

BETSI's objective was therefore to synthesize knowledge about soil organism traits and to demonstrate the concept of their usefulness in understanding the response of soil organisms to environmental pressures.

Methods and approaches used for the project

This approach, based on the functional traits of soil organisms, has many advantages but it had some shortcomings: particularly in terms of semantics, in terms of the software used by researchers to store their data, the data format (digital, text), or data encoding. All of these are detrimental to the comparison and reuse of data from several studies.

In order to solve these problems, the BETSI working group has developed tools for a simpler and more efficient data management:

- a database of the functional traits of these organisms (<https://portail.betsi.cnrs.fr>) and,
- a thesaurus, an exhaustive lexicon of their biological and ecological properties, which will serve as a stable reference source and will make it possible to overcome semantic problems.

Principal conclusions

This thesaurus is the first initiative to address the semantic problems of soil invertebrate traits. This Internet platform is the result of a collaborative effort by a community of scientific experts to put together and set the definitions of about 100 ecological traits and preferences. The T-SITA thesaurus has been linked to a soil invertebrate database to improve data integration and scientific integrity.

Both tools are now operational: when a researcher carries out research work, he can enter his results into the database. These two tools proposed by the BETSI working group therefore represent a major step forward for the community of scientists studying soil invertebrates by allowing a real pooling of their research.

Anticipated (or actual) impact of these results for science, society, and public and private decision making

The BETSI database is an essential tool for future studies on biodiversity and soil functioning. For example, it made it possible to analyse the relationships between agricultural pressures (ploughing, use of phytosanitary products) and the responses of soil invertebrates. The BETSI database has supported more than 35 scientific articles since it was put online.

The BETSI database and the associated T-SITA thesaurus are at the heart of the construction of a European data warehouse on soil biodiversity called Eudaphobase (<https://www.cost.eu/actions/CA18237/#tabsName:overview>). This will be used to

understand, protect and sustainably manage soils, their biodiversity and associated functions. It will combine available data in terms of distribution (German database Eudaphobase) and traits (BETSI) to better understand soil functioning and predict the state of associated ecosystem services.

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