

Camille Imbert

INRAE InfoSol



GLOBAL SYMPOSIUM ON SOIL BIODIVERSITY | 19-22 April 2021

A soil biodiversity survey coupled with the French National Soil Quality Monitoring Network ?

Camille Imbert^{1*}, Lucia Santorufo², Carole Ortega¹,
Yvan Capowiez⁵, Nathalie Cheviron⁶, Daniel Cluzeau⁷,
Hedde⁹, Antoine Lévêque¹⁰, Christian Mougin⁶,
Guénola Pérès¹³, Lionel Ranjard¹⁴, Benoît Vanhée¹⁵,
Antonio Bispo¹

Claudy Jolivet¹, Apolline Auclerc³, Nolwenn Bougon⁴,
Jérôme Cortet⁸, Gaëlle Deronzier⁴, Mickaël
Florence Maunoury-Danger¹¹, Laurent Palka¹²,
Cécile Villenave¹⁶, Stanislas Wroza⁴,

Coordination : INRAE InfoSol, Orléans, France



¹ INRAE Infosol, Orléans, France / ² Department of Biology, University of Naples Federico II, Naples, Italy / ³ INRAE Université de Lorraine-ENSAIA, LES, Vandoeuvre-les-Nancy, France / ⁴ OFB, Vincennes, France / ⁵ INRAE, EMMAH, Avignon, France / ⁶ INRAE, EcoSys, Plateforme Biochem-Env, Versailles, France / ⁷ Université de Rennes, ECOBIO, F-35042 Le Grand, France / ⁸ Université Paul Valéry Montpellier 3, CEFE, Montpellier, France / ⁹ INRAE Montpellier SupAgro Cirad, Eco&Sols, Montpellier, France / ¹⁰ OFB CNRS MNHN Patrinat, F-75005 Paris, France / ¹¹ INRAE Université de Lorraine-ENSAIA, LIEC, Metz, France / ¹² MNHN, CESCO, Paris, France / ¹³ INRAE, Agrocampus Ouest, SAS, Rennes, France / ¹⁴ INRAE, Agroécologie, Dijon, France / ¹⁵ Université Catholique de Lille, Ecologie et biodiversité, Lille, France / ¹⁶ Elisol Environnement, Congénies, France

Introduction : A considerable gap of knowledge in soil biodiversity

Agricultural studies
(particularly in
agroecology)

Focus on
soil biodiversity

Species ID ?
Distribution areas ?
Habitat ?



We don't know !



Articles

Any time

Since 2020

Since 2019

Since 2016

Custom range...

Sort by relevance

Sort by date

include patents

include citations

Create alert

Your search did not match any articles.

Suggestions:

Make sure all words are spelled correctly.

Try different keywords.

Try more general keywords.

Try fewer keywords.

[Try your query on the entire web](#)

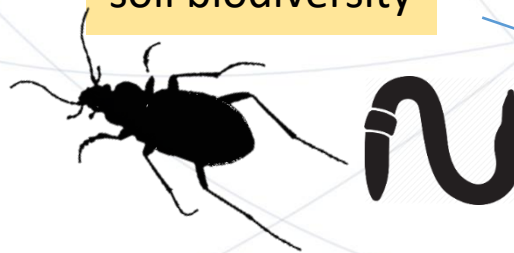


Introduction : A considerable gap of knowledge on soil biodiversity

Agricultural studies
(particularly in
agroecology)

Focus on
soil biodiversity

Species ID ?
Distribution areas ?
Habitat ?



Need of large-scale soil biodiversity monitorings

Any time

Since 2020

Since 2019

Since 2016

Custom range...

Sort by relevance

Sort by date

include patents

include citations

Create alert

Your search did not match any articles.

Suggestions:

Make sure all words are spelled correctly.

Try different keywords.

Try more general keywords.

Try fewer keywords.

[Try your query on the entire web](#)

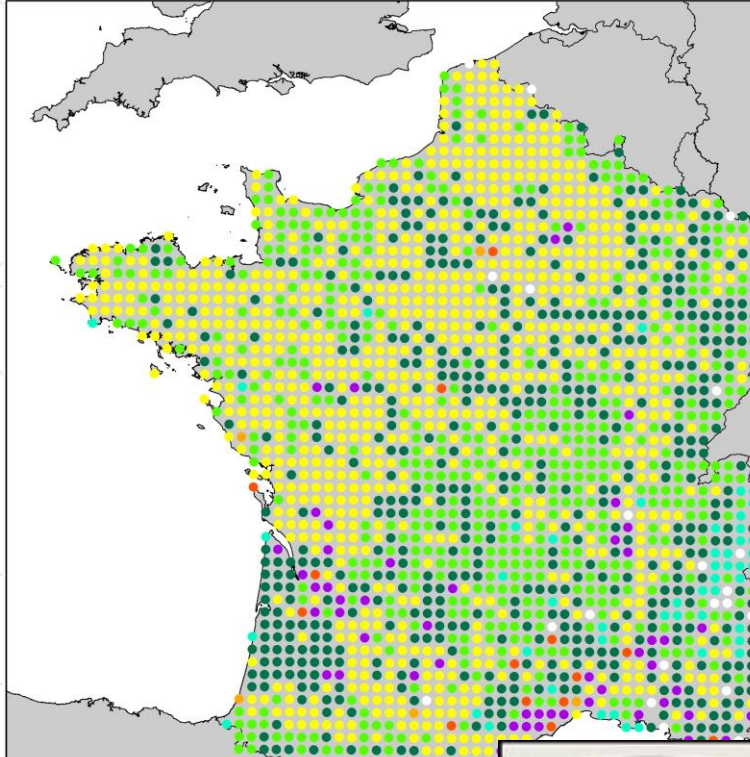


Introduction : French National Soil Quality Network (RMQS)

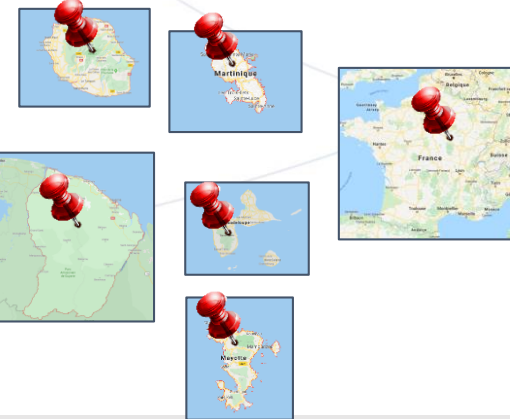


RMQS characteristics :

- 2240 sites
- 16 km x16 km grid
- On different land uses
- A sampling campaign each 15 years, since 2000



Advantages for adding a soil biodiversity monitoring :



Operational teams

Continental France and overseas territories (French Guiana, West Indies, Reunion and Mayotte islands)

Data on :

- Soil physical-chemical characteristics
- Contaminants
- Agricultural or soil management practices
- Some on biodiversity...

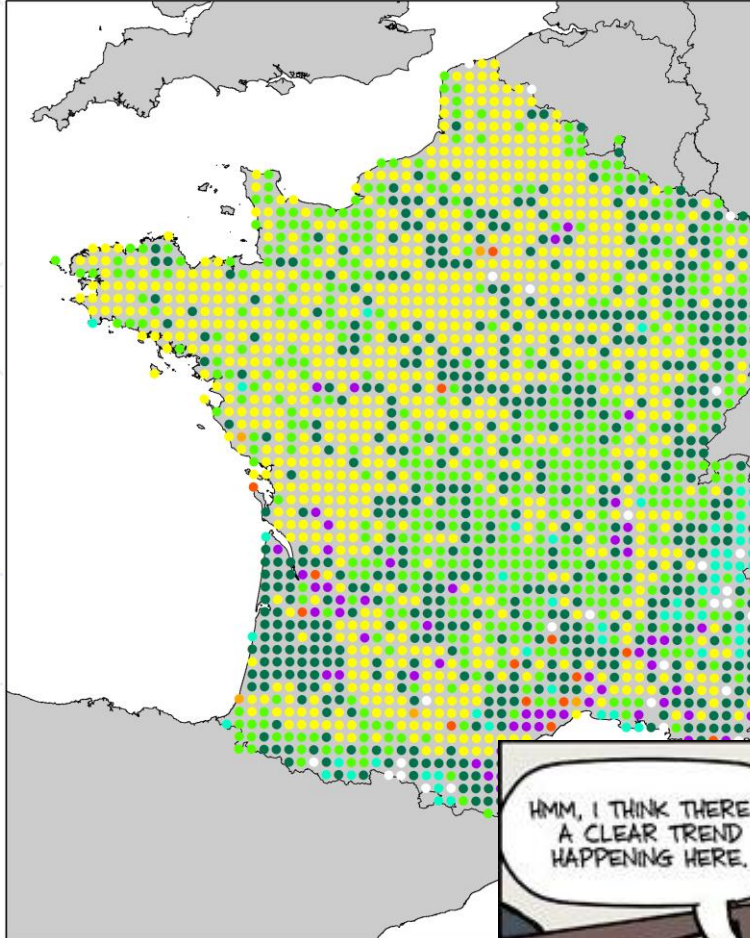


Introduction : French National Soil Quality Network (RMQS)

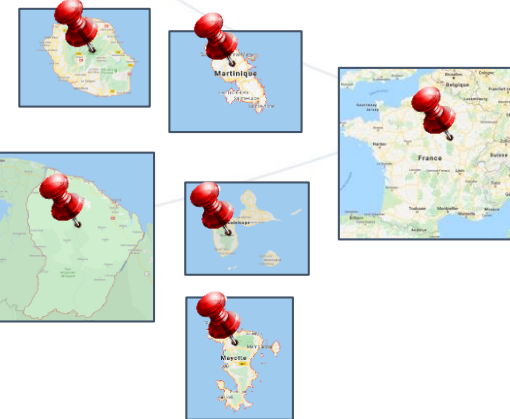


RMQS characteristics :

- 2240 sites
- 16 km x16 km grid
- On different land uses
- A sampling campaign each 15 years, since 2000



Advantages for adding a soil biodiversity monitoring :



Can we add a soil biodiversity monitoring to the RMQS ?



Methodology

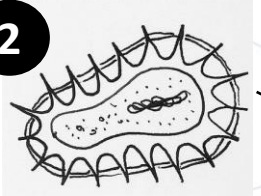
1

Soil biodiversity survey



OFB request

2



Working group

3



Sampling design ?

Taxa ?

€ ?

Survey writing with the work group

4



Gather informations on wich taxa and functions to choose, which protocols, costs etc



Results

Can we add a soil biodiversity monitoring to the RMQS ?

Sampling frequency
every 15 years ?

Grid size
of 16km*16km ?

Sampling
seasonality ?



Results

Can we add a soil biodiversity monitoring to the RMQS ?

Sampling frequency
every 15 years ?

Sampling
seasonality ?

**YES
WE
CAN**

Grid size
of 16km*16km ?

RMQS-Biodiversity

Ok to sample biodiversity every 16 km, every 15 years on the same site, anytime during the year



Results : 5 protocols on the field to monitor both taxa and functions

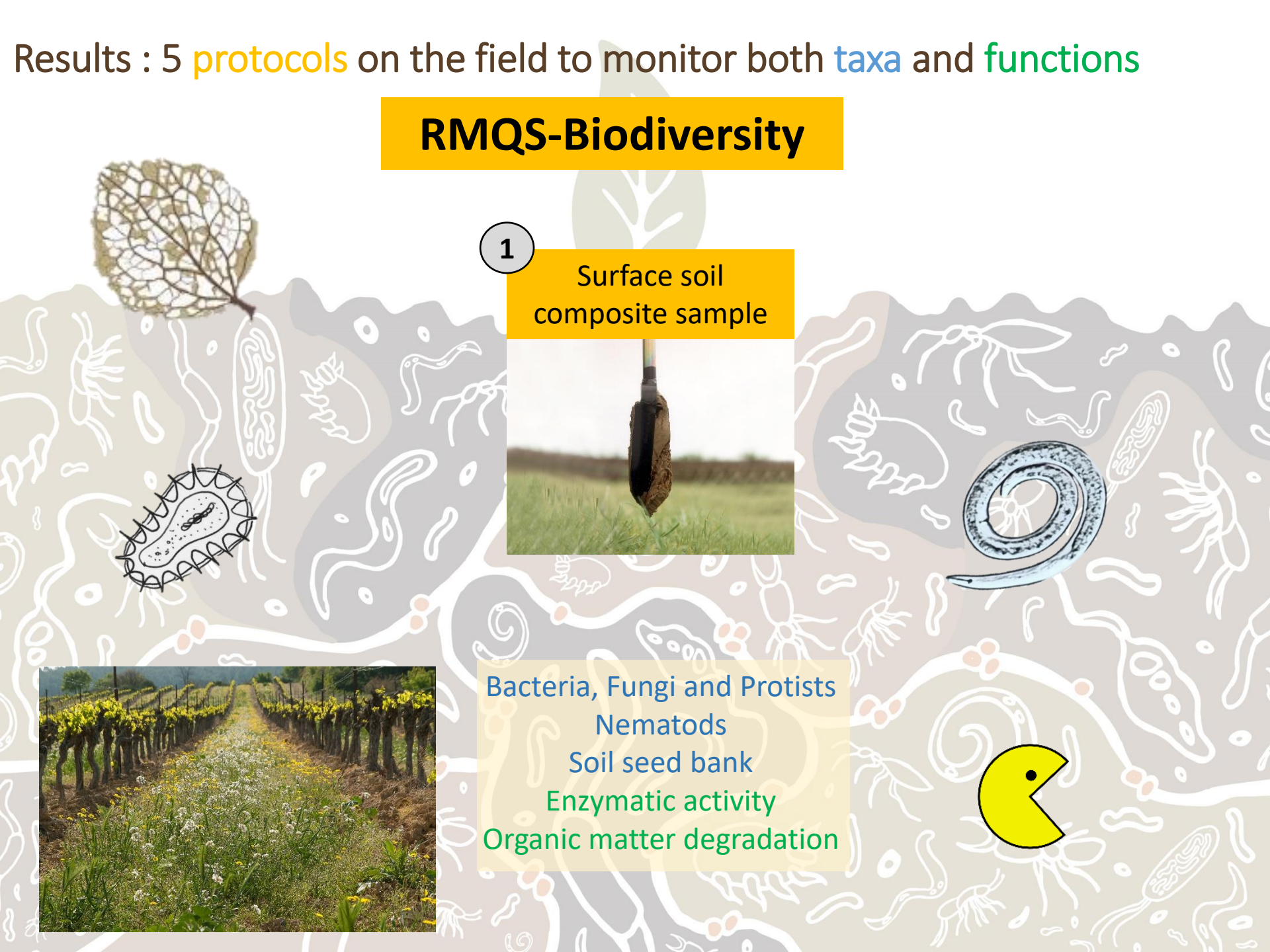
RMQS-Biodiversity

1

Surface soil composite sample



Bacteria, Fungi and Protists
Nematods
Soil seed bank
Enzymatic activity
Organic matter degradation



Results : 5 protocols on the field to monitor both taxa and functions

RMQS-Biodiversity

1

Surface soil composite sample

- Bacteria, Fungi and Protists
- Nematods
- Soil seed bank
- Enzymatic activity
- Organic matter degradation

2

Cylindrical split corer ø 5 cm



Below-ground mesofauna



Results : 5 protocols on the field to monitor both taxa and functions

RMQS-Biodiversity

1 Surface soil composite sample

- Bacteria, Fungi and Protists
- Nematods
- Soil seed bank
- Enzymatic activity
- Organic matter degradation

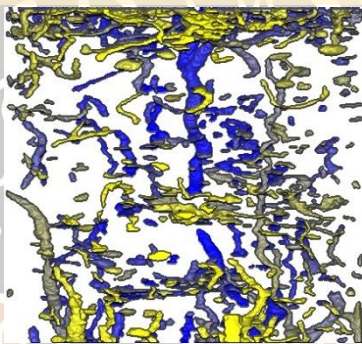
2 Cylindrical split corer ø 5 cm

Below-ground mesofauna

3 Cylindrical split corer ø 16 cm



Soil porosity



Results : 5 protocols on the field to monitor both taxa and functions

RMQS-Biodiversity

1 Surface soil composite sample

- Bacteria, Fungi and Protists
- Nematods
- Soil seed bank
- Enzymatic activity
- Organic matter degradation

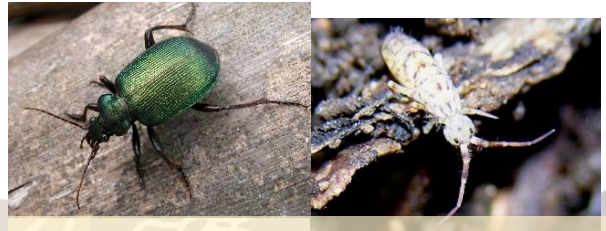
2 Cylindrical split corer ø 5 cm

Below-ground mesofauna

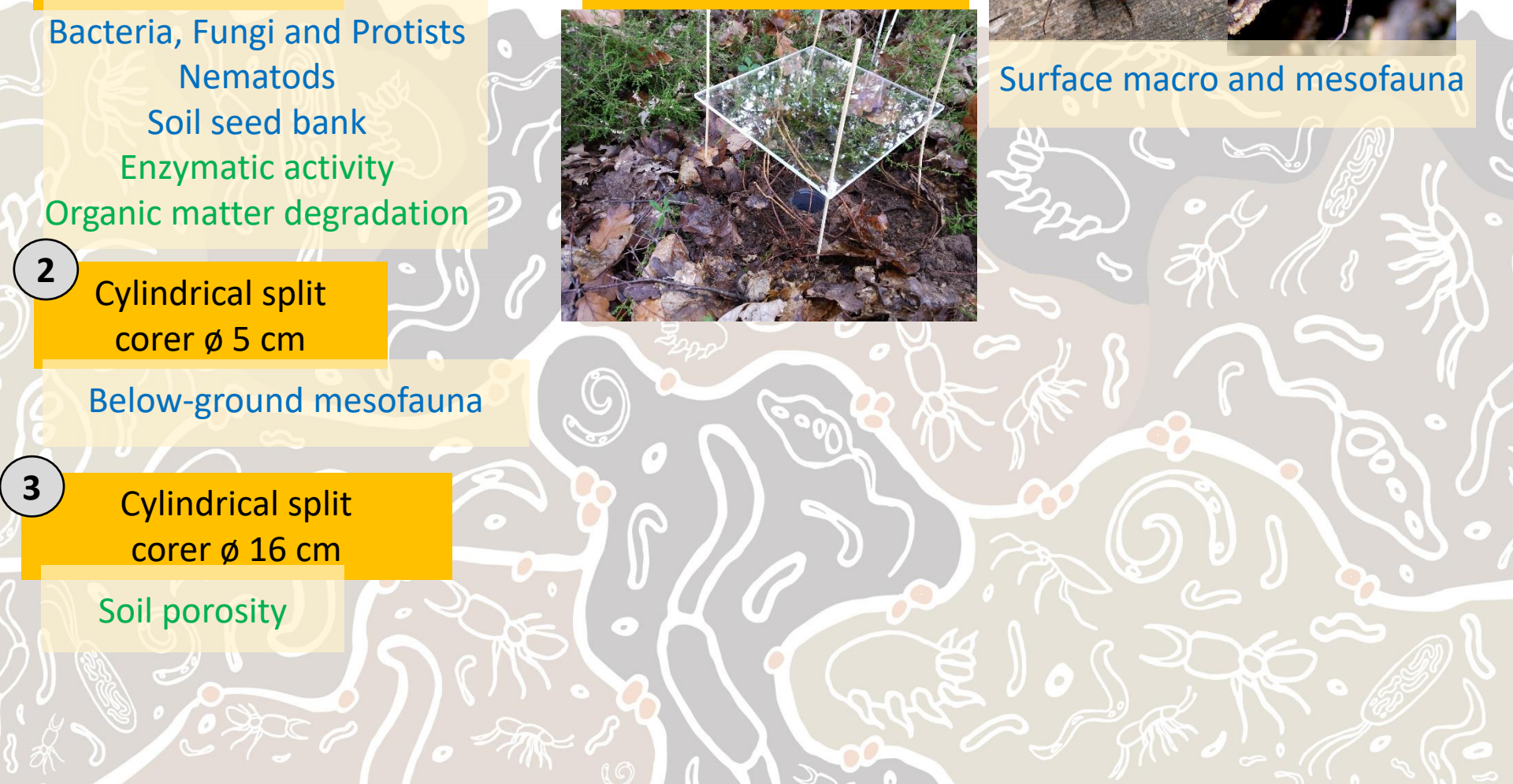
3 Cylindrical split corer ø 16 cm

Soil porosity

4 Pitfall traps



Surface macro and mesofauna



Results : 5 protocols on the field to monitor both taxons and functions

RMQS-Biodiversity

1 Surface soil composite sample

- Bacteria, Fungi and Protists
- Nematods
- Soil seed bank
- Enzymatic activity
- Organic matter degradation

2 Cylindrical split corer ø 5 cm

Below-ground mesofauna

3 Cylindrical split corer ø 16 cm

Soil porosity

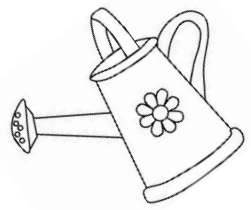
5 Hand sorting of a soil block + mustard



Earthworms and larvae

4 Pitfall traps

Surface macro and mesofauna



Results : 5 protocols on the field to monitor both taxons and functions

RMQS-Biodiversity

1 Surface soil composite sample

Bacteria, Fungi and Protists
Nematods
Soil seed bank
Enzymatic activity
Organic matter degradation

2 Cylindrical split corer ø 5 cm

Below-ground mesofauna

3 Cylindrical split corer ø 16 cm

Soil porosity

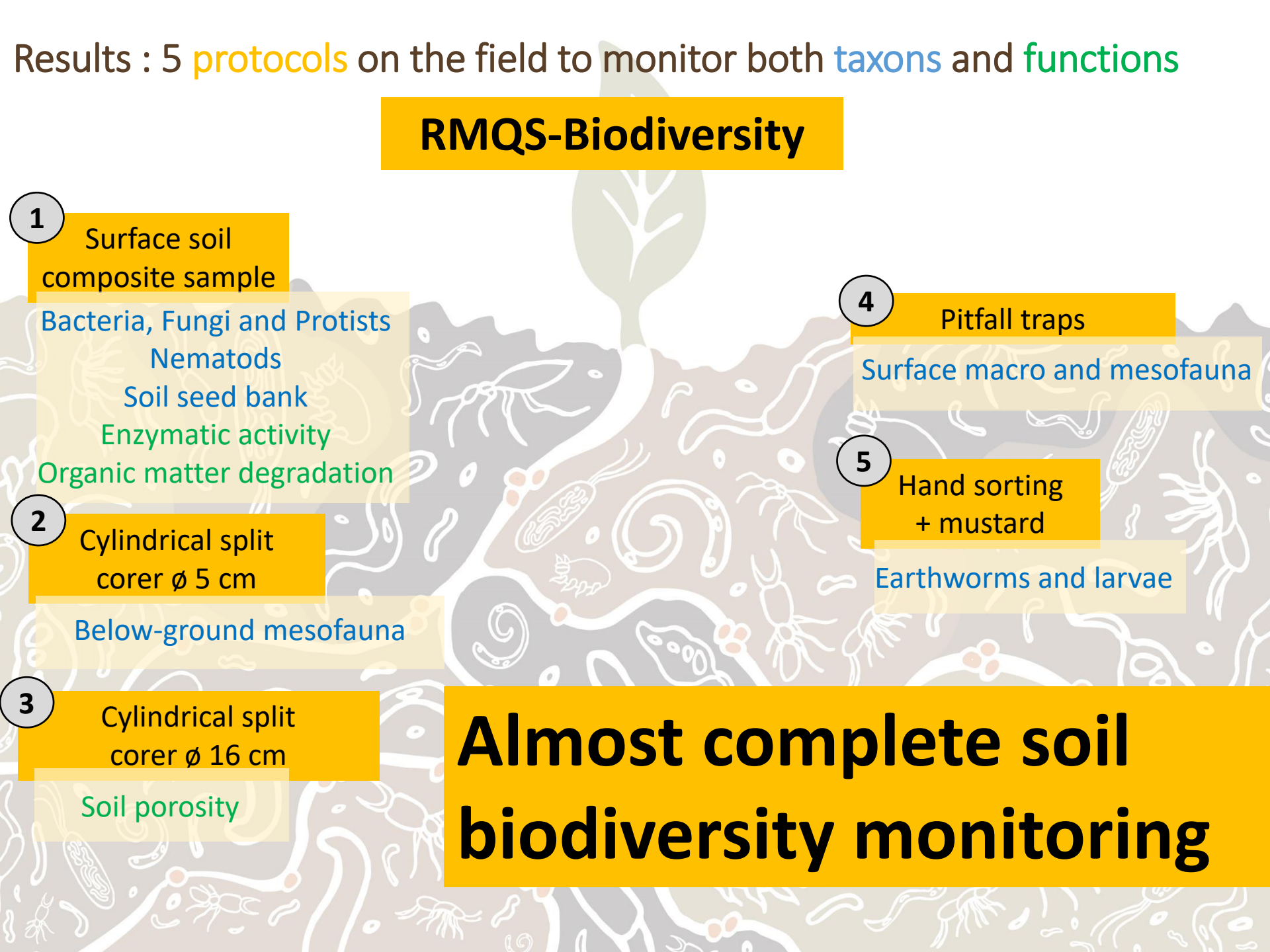
4 Pitfall traps

Surface macro and mesofauna

5 Hand sorting + mustard

Earthworms and larvae

Almost complete soil biodiversity monitoring



Next step : Sampling strategy

Biodiversity is very sensitive
to disturbances

&

Protocols the same day
(RMQS + RMQS-Biodiversity)

**WORK IN
PROGRESS**

Field tests :
temporal sequence
spatial arrangement of the protocols



First proof of the RMQS-Biodiversity Manual





**Thank you for
your attention**