

Feedbacks of a couple of eco-informatic tools for soil invertebrate functional traits: an example of interoperability by semantic data integration

Johanne Nahmani - CNRS

B. Pey, B. Laporte, M-A Laporte, A. Auclerc, Y. Capowiez, J. Cortet, F. Dubs, S. Joimel, S. Salmon, M. Hedde, & the BETSI consortium



Un centre créé et développé par la FRB



BETSI PROJECT

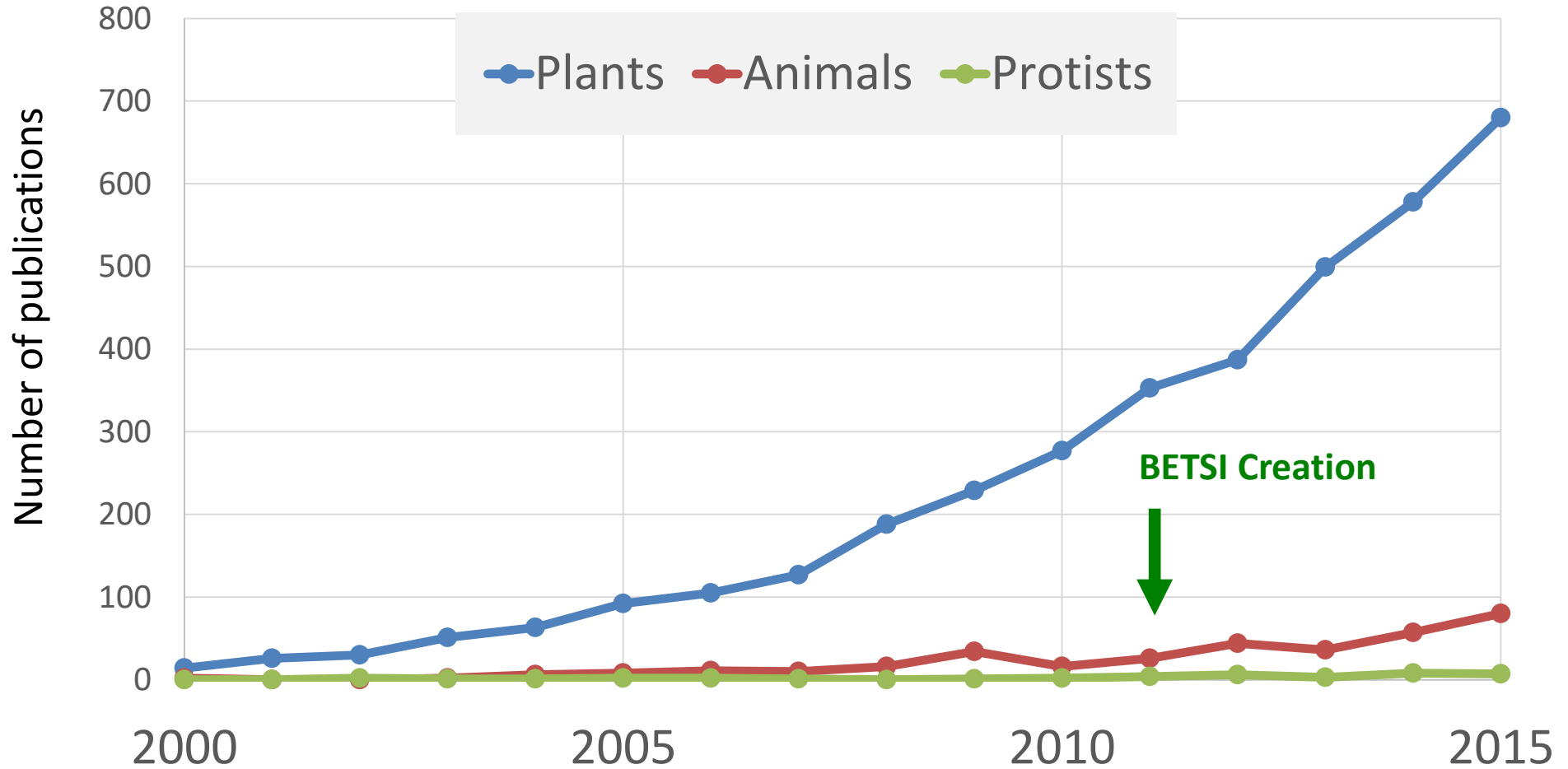
What is the BETSI project?

- A French project, lead by Mickaël Hedde, and co-administrated by Benjamin Pey, Sophie Joimel and Johanne Nahmani
- A consortium of 50 researchers on soil ecology
- It means "**Biological and Ecological Traits for Soil Invertebrates**"
- Database creation start in February 2011 and operational since May 2014
- The project was funded by the CESAB/FRB
- BETSI database requests and contributions are available after quick registration. Please contact BETSI administrators to obtain it.

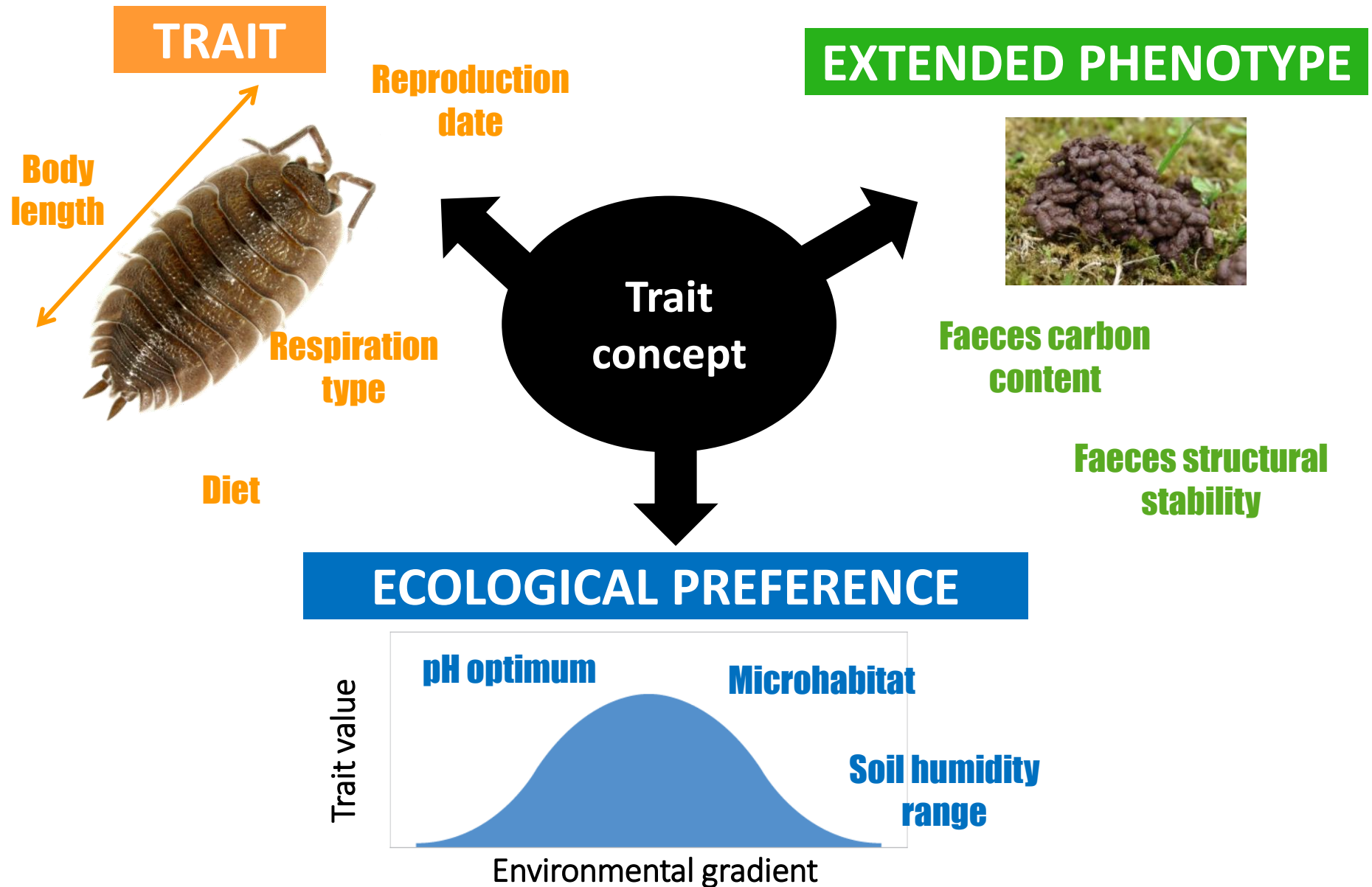
What were the main objectives?

- Summarize and organize data on soil invertebrate traits
- Promote the use of trait-based approaches in soil invertebrate ecology
- Give a reference structure to archive soil invertebrate trait data

TRAITS : STATE OF THE ART



What the hell are « functional traits » ?



Trait data = an huge, heterogenous set

Heterogeneity
of the data nature & sources

(numeric, discrete, textual)

Semantic heterogeneity
of trait names

(ex: body length / body size...)

**These heterogeneities lead to
METHODOLOGICAL & SCIENTIFIC misunderstandings**

Trait data = an huge heterogenous set

Heterogeneity
of the data nature & sources

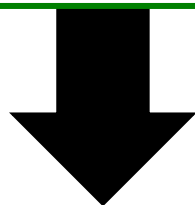
(numeric, discrete, textual)

Semantic heterogeneity
of trait names

(ex: body length / body size...)

Fuzzy coding:

```
010101010100110  
100110011010100  
101001101011010  
111011110101001  
100010110010010  
001001000010001  
010100100010001
```



DATABASE / BETSI

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```
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**Semantic heterogeneity
of trait names**

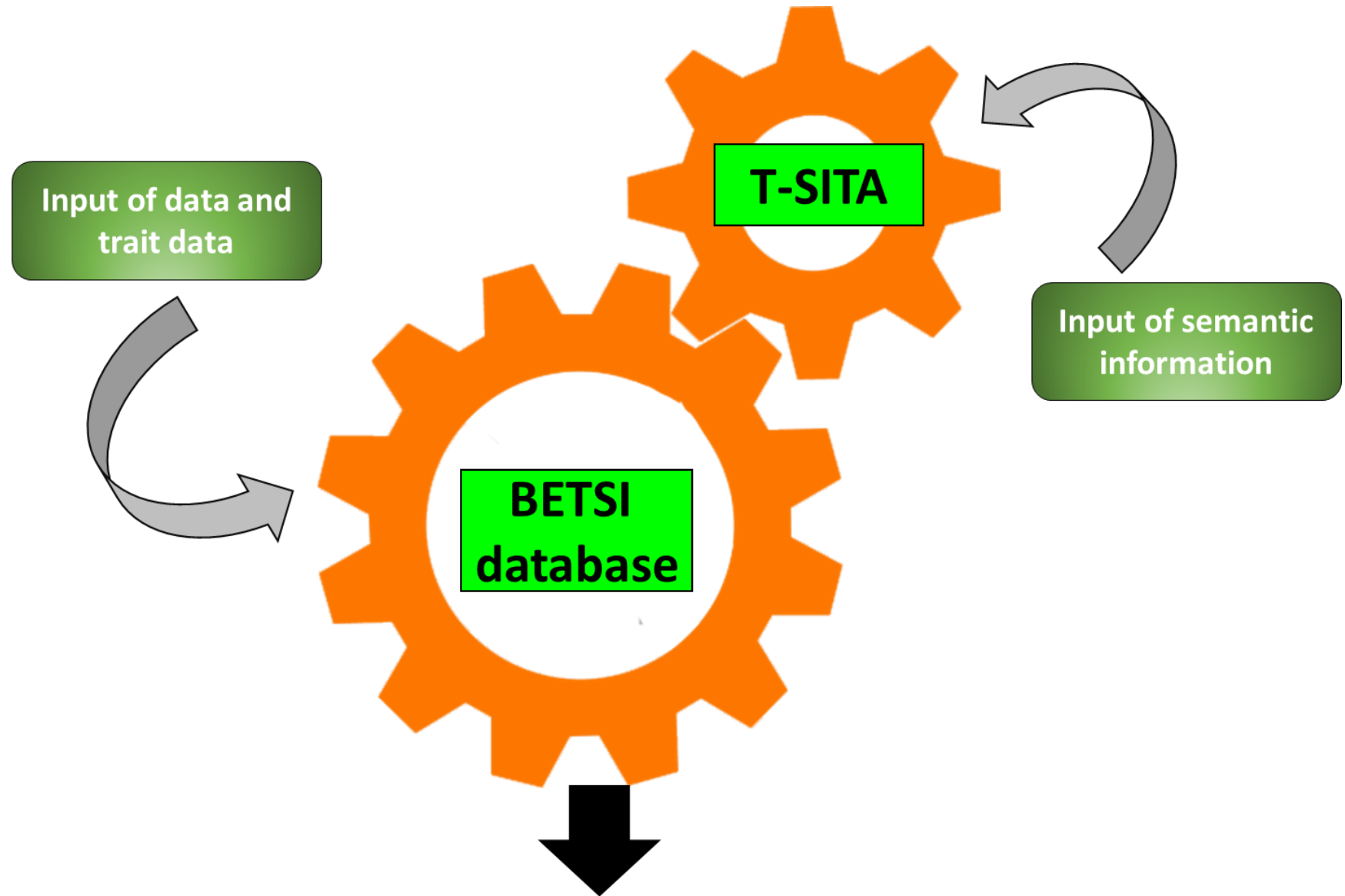
(ex: body length / body size...)

**Classification
Definition
Equivalence**

DATABASE / BETSI

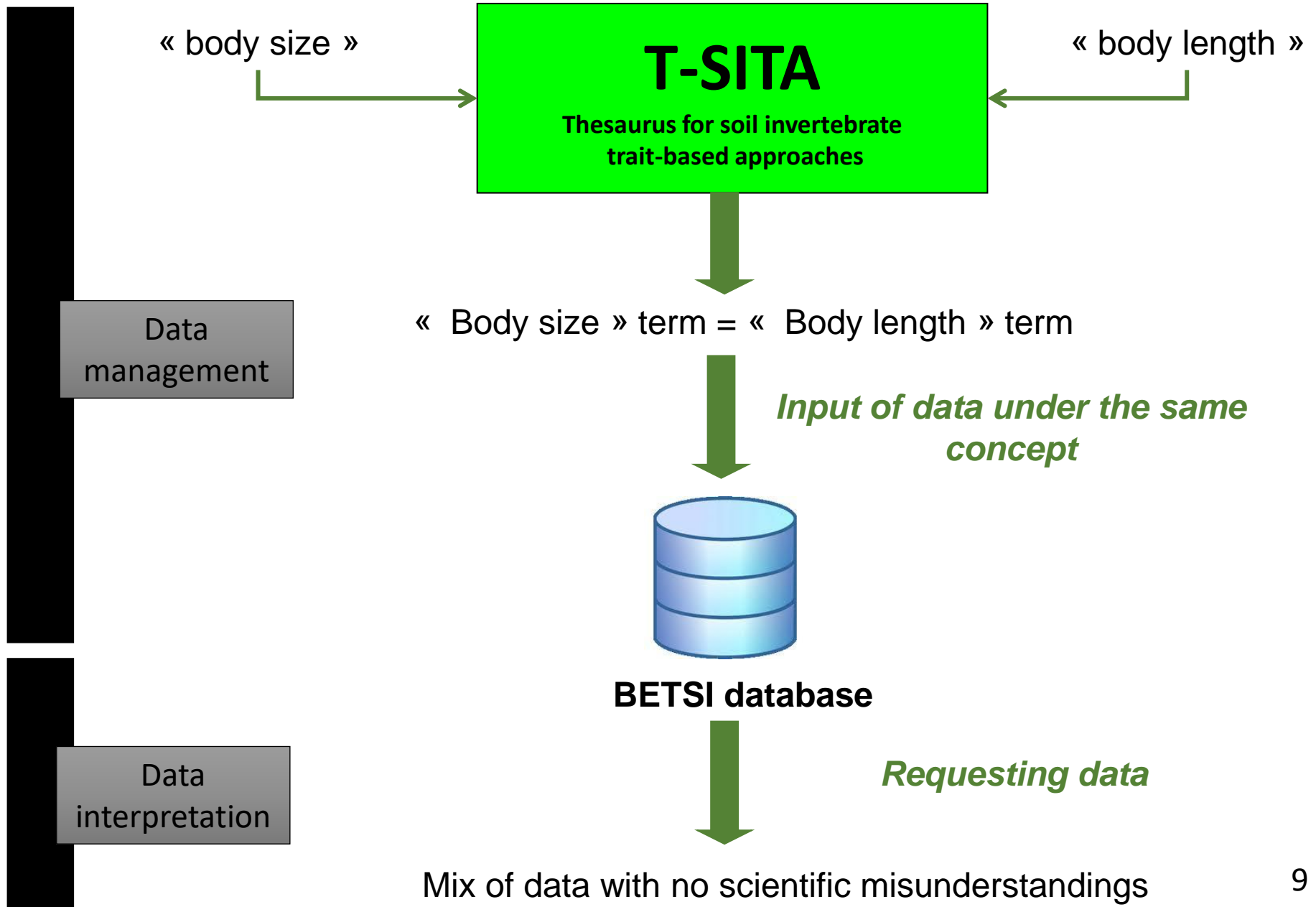
THESAURUS / TSITA

Interoperability of BETSI database and T-SITA



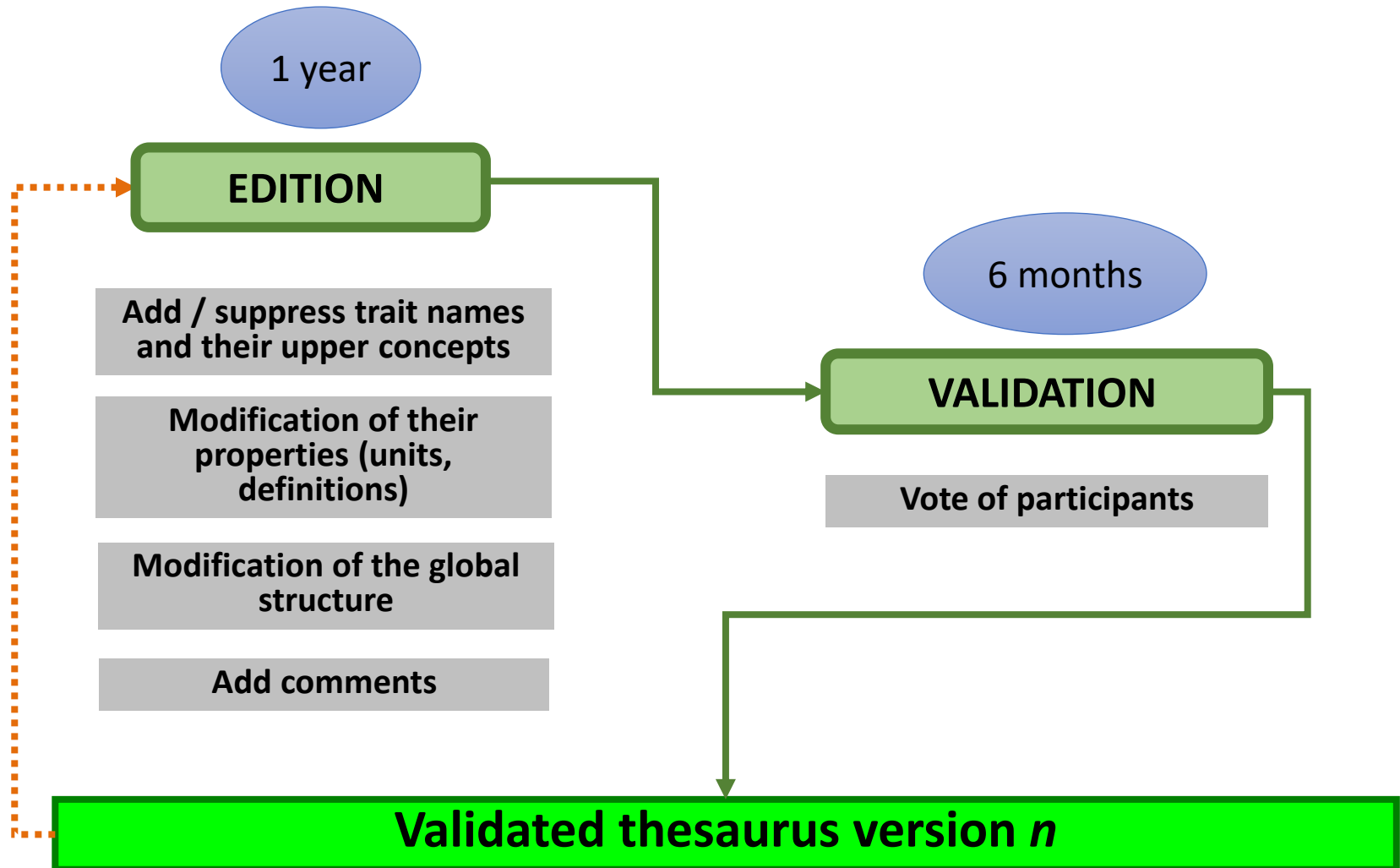
Reduce scientific misleadings and methodological problems

An example of interoperability benefit



Construction of a trait thesaurus

By means of a collaborative tool to construct ecological thesaurus



MAJOR OUTCOMES : TSITA

ThesauForm - T-SITA

Thesaurus for Soil Invertebrate Trait-based Approaches

HOME

FACETED SEARCH

BROWSE HIERARCHY

BETSI DATABASE

Browse the Hierarchy

Treeview

- T-SITA
 - Ecological_preference
 - Trait
 - Behaviour
 - Morphology
 - Growth_and_development
 - Body_dimension**
 - Body_length**
 - Body_width
 - Body_shape
 - Body_weight
 - Nutrition
 - Relation
 - Reproduction
 - Phenology
 - Physiology

Body length

Preferred Name: Body length

Definition: The known longest dimension of the physical structure of organisms

Bibliographic Reference: Maggenti and Maggenti, 2005

Preferred Unit: mm

Broader Term: [Body_dimension](#)

Statistics from BETSI database :	Number of observations	Number of species
Araneae (Class, Arachnida)	122	48
Chilopods (Class, Chilopoda)	247	46
Diplopods (Class, Diplopoda)	391	177
Earthworms (Subclass, Diplostesticulata)	224	98
Ground beetle (Family, Carabidae)	761	278
Isopods (Order, Isopoda)	54	11

Body_length

Enter Search Terms here

http://t-sita.cesab.org/BETSI_vizHierarchy.jsp

MAJOR OUTCOMES : THE BETSI DATABASE



A database for soil invertebrate biological and ecological traits

Presentation

Data exploration
map

Data request

Contribute data

Data template
support

Tutorial

T-SITA

Trait information
scanning

Technical
documentation

Copyright
management

Raw files

View

Edit

The BETSI database: summarize and organize data on soil invertebrate traits

The BETSI database hosts soil invertebrate trait data.

All the BETSI database content is **public** after a quick registration.

Please contact [BETSI administrators](#) to obtain it.

Operational

Free use

Win-Win **philosophy**

Data exchange policy : protection
of providers and users

MAJOR OUTCOMES : THE BETSI DATABASE



A database for soil invertebrate biological and ecological traits

- Presentation
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View Edit

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50 consortium members

> 1300 sp

> 45 traits

> 25 Publications

> 13 000 attributes

PERSPECTIVES

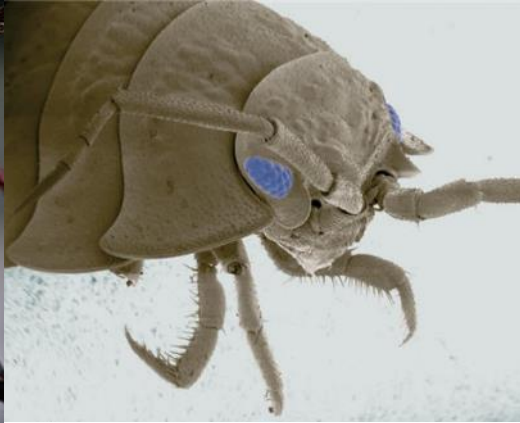
Database enrichment and valorization

National and international projects:

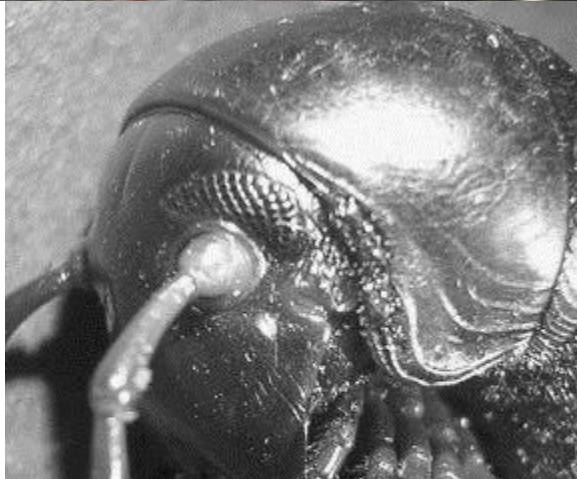
Hanbook of Morreti et al. in TSITA

Include trait matching?

Include Nematods, Enchytreids, protists ...



Thank you



The BETSI database

request traits | betsi.com X

betsi.cesab.org/request-traits

Dashboard Content Structure Appearance People Modules Configuration Reports Help Hello Nahmani Log out

Data request

- Trait data
- Field experiment data

Contribute data

Data template support

Tutorial

T-SITA

Trait information scanning

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Raw files

Login

Trait data request:

Select at least one taxon and only one trait/preference and to run a request

Taxonomy choice ?

Start to enter the first letters of the taxon for which you need traits* (Latin name of either phylum, class, family, genus or species) and select it in the drop-down menu. If you want to request additional taxa, please space them with a semicolon (";").

Amara (Acorius) metallescens
(Zimmermann, 1831);

Functional traits ?

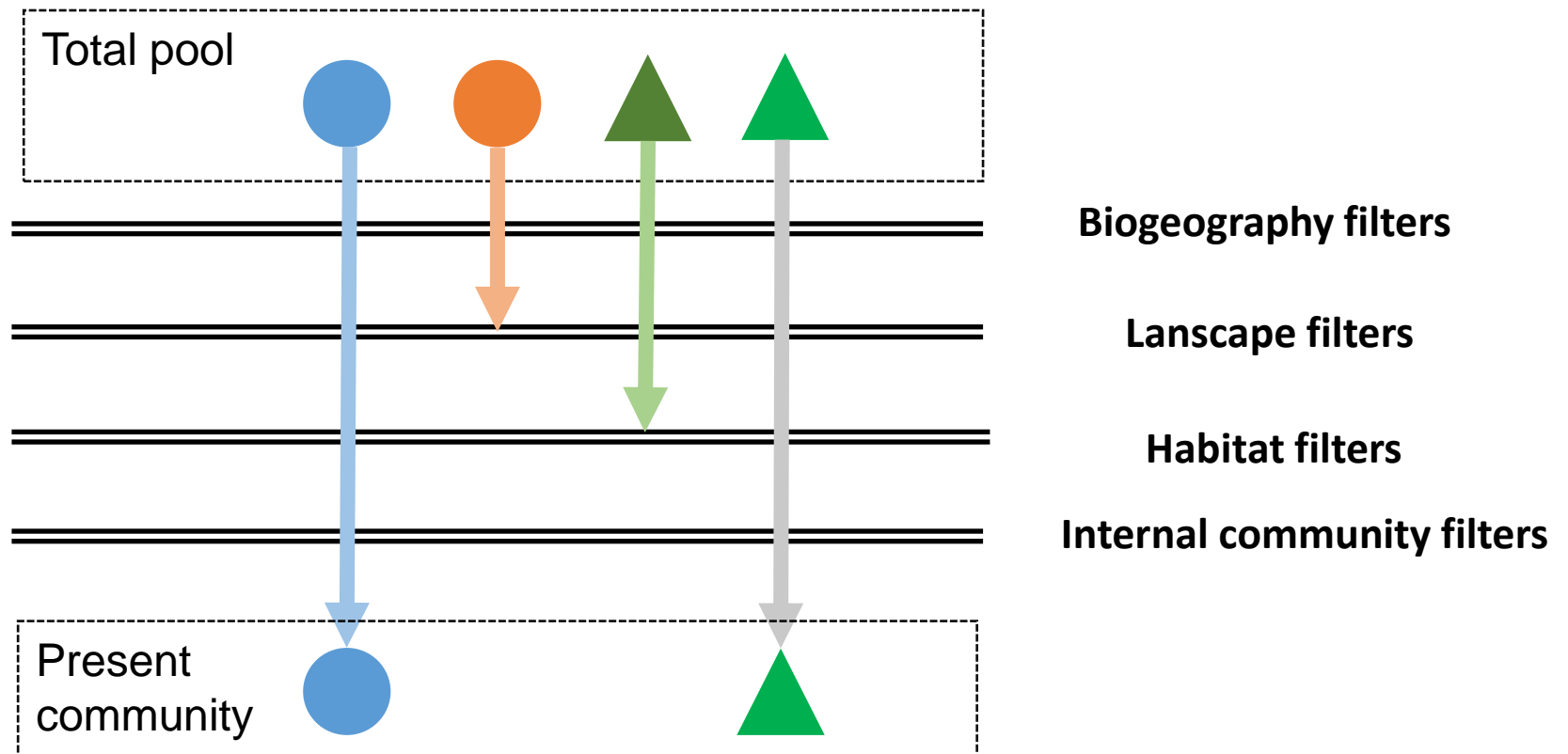
- Voltinism
- Receptor_type
- Wing_development
 - Level 1: Macropterous, Apterous, Brachypterous
- Antenna_categorical_length
- Foraging

Numerical traits

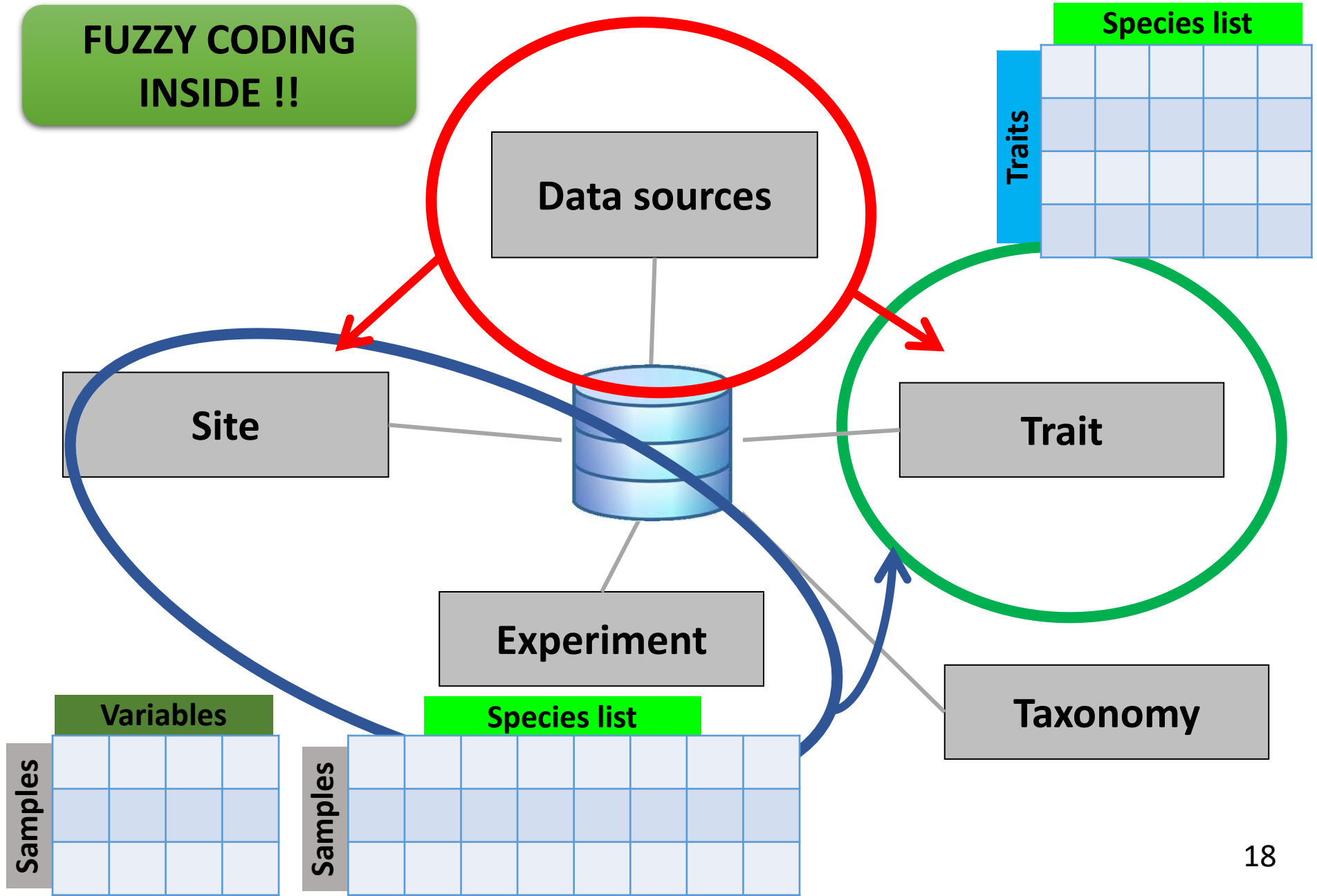
- Radial_nervure_length
- Trochanter_length
- Antenna_length
- Femur_width
- Dry_body_weight
- Clutch_length
- Median_nervure_length
- Mandible_width
- Tibia_length
- Mandible_length

The BETSI project

- Understand and predict the biological and ecological responses of soil invertebrates to different environmental filters acting at several scales



The BETSI database



ThesauForm - T-SITA

Thesaurus for Soil Invertebrate Trait-based Approaches

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Ground beetle (Family, Carabidae)
Isopods (Order, Isopoda)

Number of observations

114
53
386
200
86
6

Number of species

45
27
176
97
31
1

Functionnal trait

Qualitative trait

Diet

Foraging

Level 1: Trap_strategy, Hunting_strategy

Level 2: Trap_strategy, Hunting_strategy, Sit_and_wait, Run_and_kill

Antipredator_behaviour

Dispersal_behaviour

Reproduction_type

Antenna_categorical_length

Sexual_dimorphism

Vertical_distribution

Motion_strategies

Habitat

Sperm_transmission

Microhabitat

Humus_form

Sociability

Furcula-length

Parental_care

Mating_strategy

Body_shape

Mouthpart_type

Voltinism

Receptor_type

Wing_development

Quantitative trait

Antenna_length

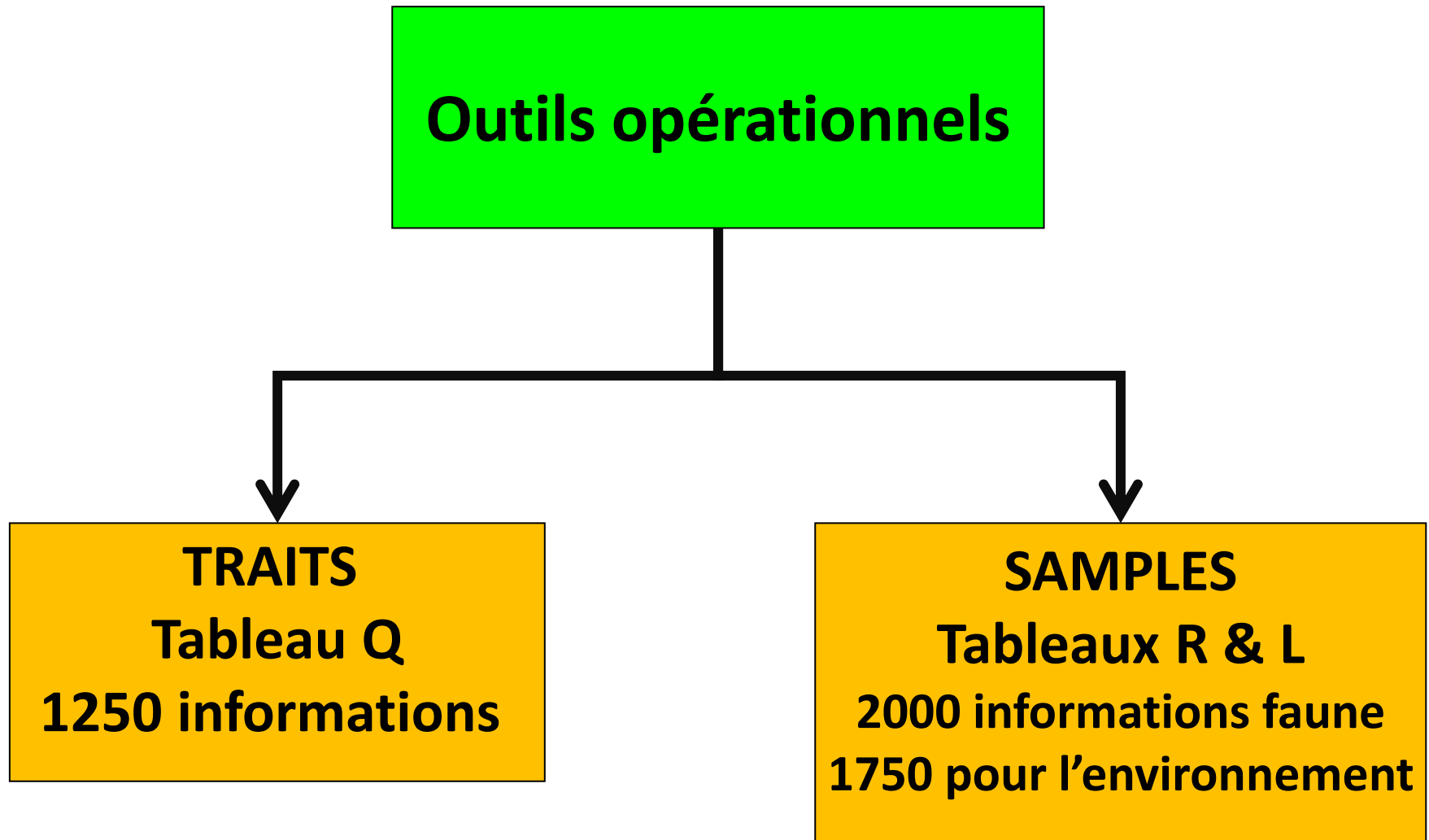
Saltatory_apparatus_length

Wing_surface

Antenna_surface

Mandible_width

Etat de remplissage de la base



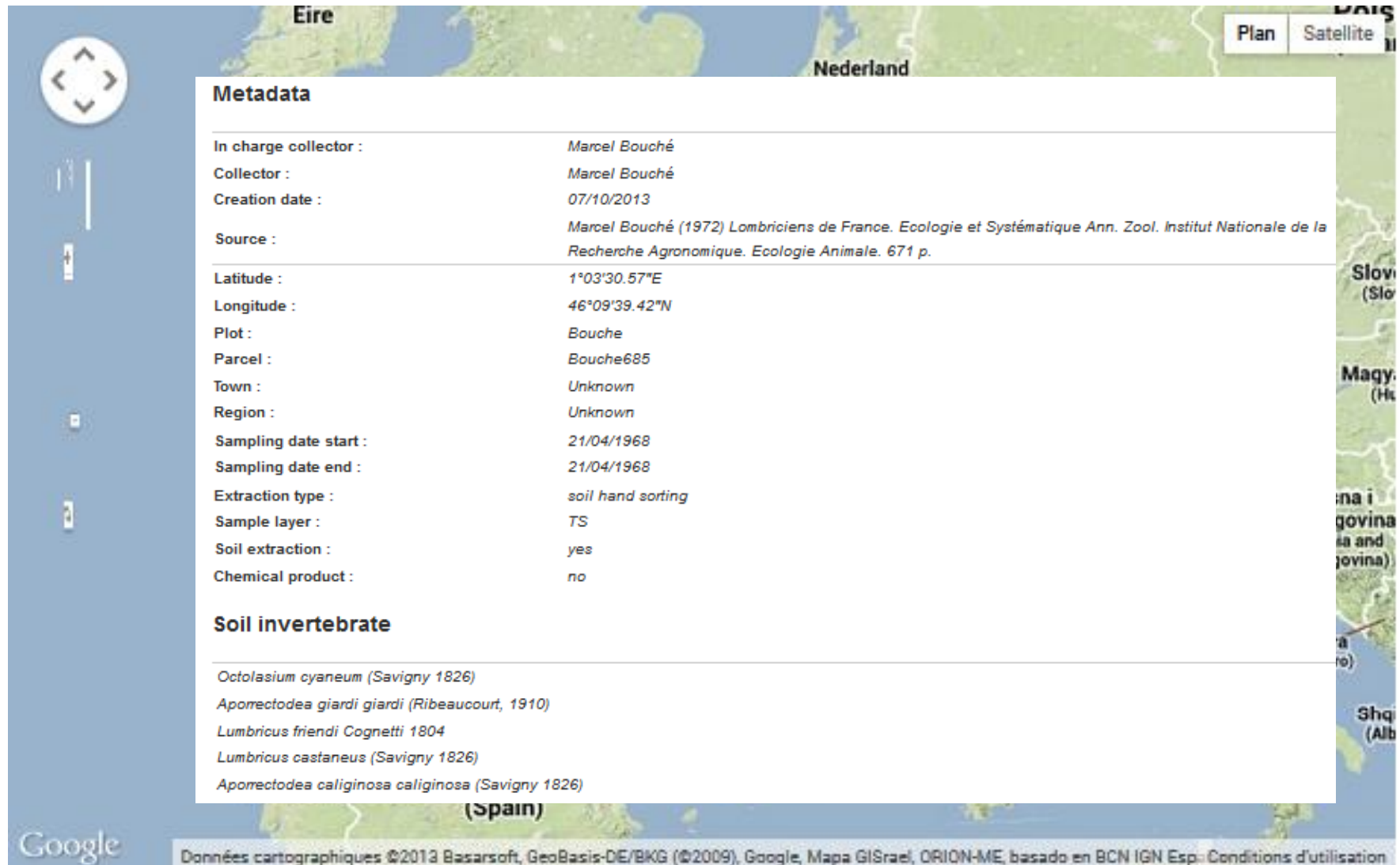
Valorisation

Articles :

- *A thesaurus for soil invertebrate trait-based approaches (T-SITA)*, **en préparation**
- *A database for soil invertebrate functional traits* **en préparation**
- *Pey et al., A review of current use of and future needs for soil fauna response traits*, BAAE **en révision**
- *Pelosi et al., Reducing tillage in cultivated fields: a way to improve soil*, ASE, **accepté**

Communications : 7 communications colloques

Perspectives



The screenshot shows a web application interface. At the top, a map of Europe is visible, with labels for 'Eire', 'Nederland', and 'Spain'. In the top right corner of the map area, there are buttons for 'Plan' and 'Satellite'. On the left side, there is a navigation control with a compass and zoom in/out buttons. The main content area is divided into two sections: 'Metadata' and 'Soil invertebrate'. The 'Metadata' section contains a table with various fields and their values. The 'Soil invertebrate' section contains a list of species names with their respective authors and dates.

Metadata	
In charge collector :	Marcel Bouché
Collector :	Marcel Bouché
Creation date :	07/10/2013
Source :	Marcel Bouché (1972) <i>Lombriens de France. Ecologie et Systématique Ann. Zool. Institut Nationale de la Recherche Agronomique. Ecologie Animale. 671 p.</i>
Latitude :	1°03'30.57"E
Longitude :	46°09'39.42"N
Plot :	Bouche
Parcel :	Bouche685
Town :	Unknown
Region :	Unknown
Sampling date start :	21/04/1968
Sampling date end :	21/04/1968
Extraction type :	soil hand sorting
Sample layer :	TS
Soil extraction :	yes
Chemical product :	no

Soil invertebrate
<i>Octolasion cyaneum</i> (Savigny 1826)
<i>Aporectodea giardi giardi</i> (Ribeaucourt, 1910)
<i>Lumbricus friendi</i> Cognetti 1804
<i>Lumbricus castaneus</i> (Savigny 1826)
<i>Aporectodea caliginosa caliginosa</i> (Savigny 1826)

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