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Soil Biodiversity Atlas: mapping earthworms of Europe

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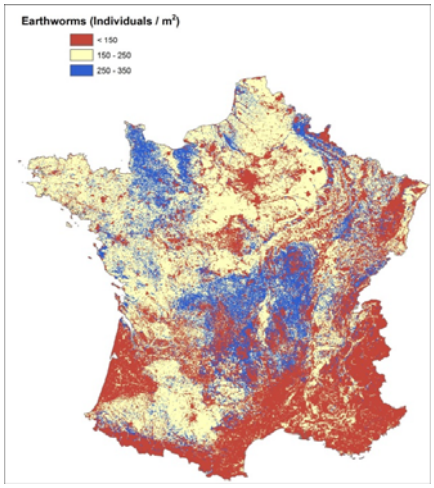
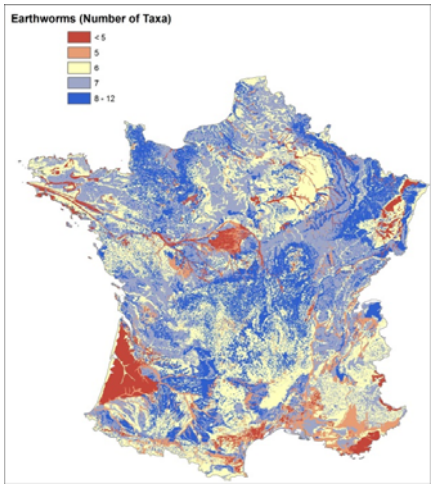
Soil biodiversity maps

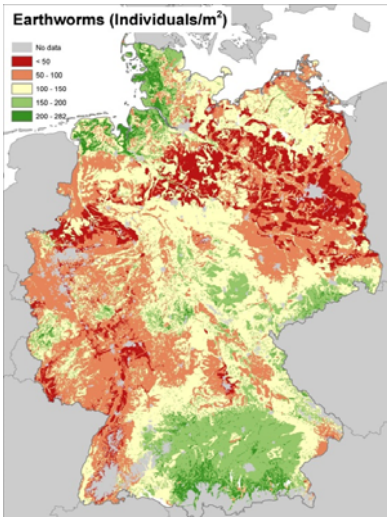
Soil maps are increasingly used for nature conservation, spatial planning, environmental modelling and soil management, and have great potential in awareness raising. However, large area maps of soil biodiversity hardly exist, due to lack of data and harmonized methods, and the great variety of organisms thriving in soils.

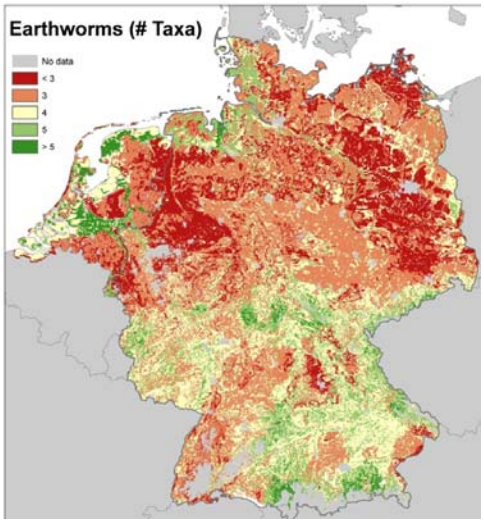
As a spin-off of the FP7-EU EcoFINDERS project, we are producing a first European soil biodiversity map, with earthworms as the targeted soil organisms. In order to arrive at reasonable surface coverage of countries for which abundant earthworm data are available (amongst others: Netherlands, Germany, Ireland and France) we applied a '***digital soil mapping***' approach. Multiple regressions are used to relate scarce earthworm data to environmental characteristics (covariates) with a higher spatial resolution. Statistically significant relationships were used to build habitat response models for constructing earthworm maps with abundance, number of taxa (species) and some common species (e.g. *Aporrectodea caliginosa*). To our knowledge, this will be the first earthworm map of (parts of) Europe. The final map will be submitted for publication in the Global Soil Biodiversity Atlas (JRC).

Please join this initiative by providing yet unidentified data on earthworms elsewhere in Europe.



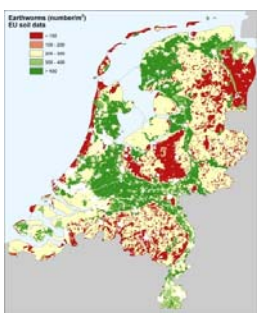






Current issues

National datasets with earthworm observations are difficult to capture and offer different levels of usability. We currently have access to datasets of the Netherlands, Germany, Ireland and France, provided by the authors of this poster. Issues still to be solved are: differences in sampling protocols throughout the datasets, availability and quality of data for environmental predictors, sample size effects on estimates for number of taxa, and unequal density and distributions of observations per country. Consequently, the current maps represent the state of the art, but still are quite uncertain. Mountains and water bodies will be excluded from mapping. We will improve the method where practically possible (see above, and without water bodies, cities and mountains, before publication in the Global Soil Biodiversity Atlas.



Data, calculations and mapping

Datasets from Germany (Edaphobase), Netherlands (BiSQ, NSM), Ireland (CreBeo and more) and France (RMQS-BioDiv, Bioindicatorz, VitiEcoBioSoil, Agrinov) were processed for statistical analysis. Generalized Linear Regression (GLM) models of the Gaussian family (McCullagh and Nelder 1989) are used to relate earthworm variables to land use, soil type and other environmental parameters (predictors). The models to be calibrated by the available data were all formulated to be according to the syntax: **Respons = Σ intercept + a_n · PRED$_n$ + b_n · PRED^2_n**. The quadratic terms in the regression formula allow for predicting non-linear response behavior as inflicted by optimum and minimum conditions. The regression models were calibrated using a stepwise procedure based on the Bayesian Information Criterion (BIC) (Schwarz 1978). This is done in order to restrict the addition of terms to those that have a significant ($p<0.05$) contribution to the overall model, making the full model highly significant. Calculations were conducted using S-Plus 2000 (MathSoft, Cambridge, MA). Subsequently, the calibrated regression formulae were used to generate continuous maps of earthworm responses by substituting mapped values for the model predictors in the calibrated regression formulae (soil and environmental data of Europe by JRC). The method is described in Van Wijnen et al. 2012, Sci Tot Env 415:49-55.