

What is the effect of land use on earthworm communities on a national scale

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Introduction



Land use is one of the environmental filters that impacts earthworm communities (Decaëns *et al.*, 2012, Phillips *et al.*, 2019).

In agricultural lands:

Cluzeau *et al.* (2012) sampled 109 points on 27 200 km² (Brittany, France). They observed the greatest abundance and richness of earthworms in grasslands, followed by crops and finally forests:



Boag *et al.* (1997) in Scotland with 100 samples over 77 910 km². Samples showed that richness was higher in grasslands than in crops.

Other authors have even summarized on a European scale, (Pulleman *et al.*, 2012), (Rutgers *et al.*, 2016), which shows us that some countries like Spain or Denmark collected 189 samples on 506 000 km² and 78 samples on 43 000 km² respectively.

In urban lands:



Earthworm communities are poorly studied in urban environments and by consequence poorly described in scientific literature:

Marechal *et al.* (2021) collected 46 samples from 13 km² (Guyancourt, Yvelines, France), their study shows that earthworm abundance is not impacted by soil engineering but that the richness decreases.

Vergnes *et al.* (2017) collected 20 samples in parks on a surface of 481 km², (Val de Marne and Seine-Saint-Denis departments, île de France, France). This study shows that the addition of topsoil improves earthworm abundance, whereas without the addition of topsoil, earthworm abundance decreases.

Xie *et al.* (2018) collected 85 samples on 2848 km² (Beijing, China), and showed that the abundance and biomass of earthworms were lower in the residential areas of Beijing than in other cities.

These studies focused on very specific land uses (roadside, parks, residential areas).

In natural lands:

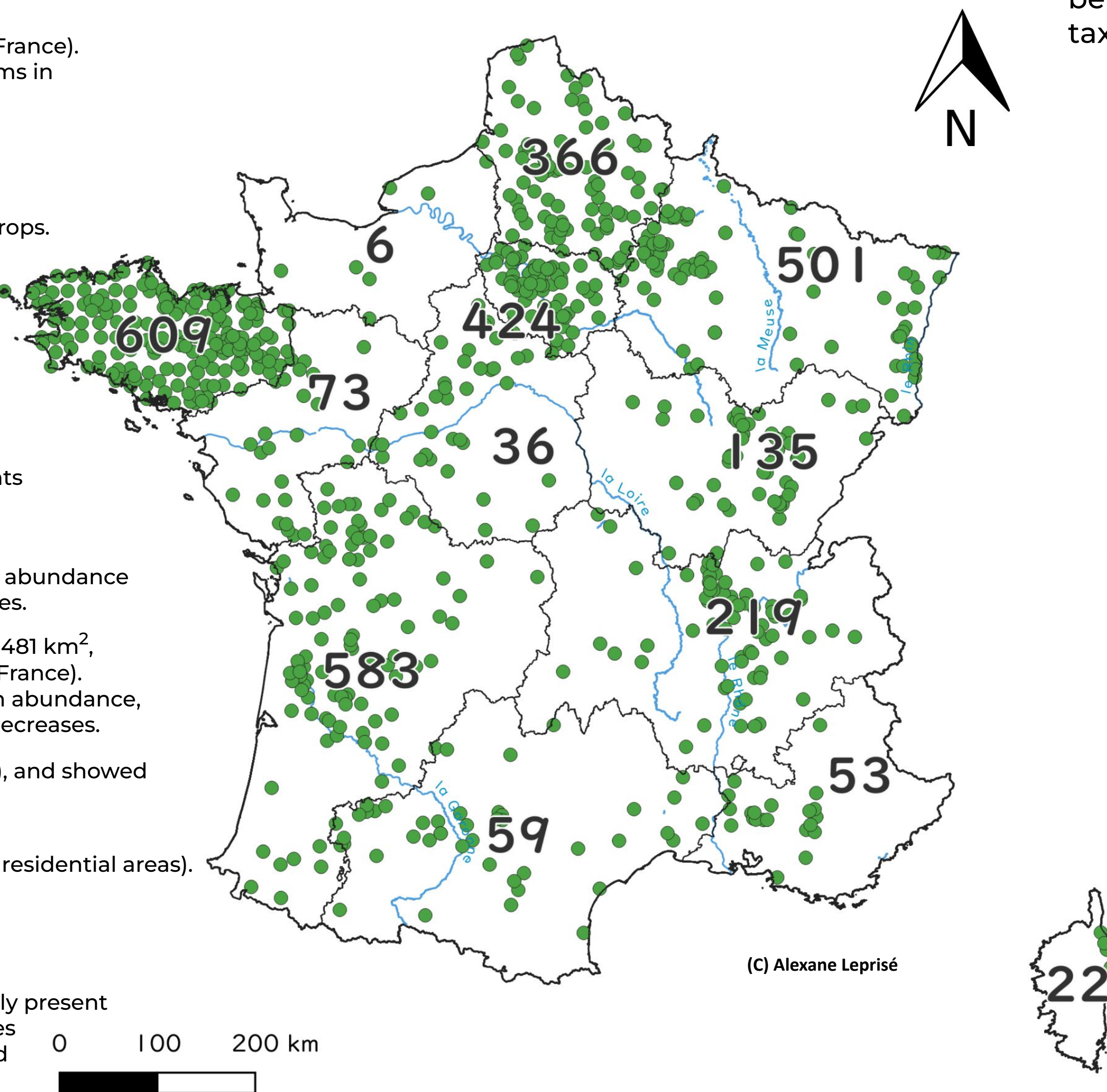


Just like urban soils, natural soils are also poorly studied and poorly present in the scientific literature. Most studies of earthworm communities in natural environments are carried out in very small and localised geographical areas, (Jiménez *et al.*, 2001),(Reynolds 2015).

This study presents the data available in the EcoBioSoil database.

By selecting only sampled points collected with the spade test (see M&M) and removing all temporal repetitions (which means that each geographical sample is unique), this synthesis allows to compare the impact of soil occupations on earthworms at a national scale.

Plots sampled in the EcoBioSoil database until 2020

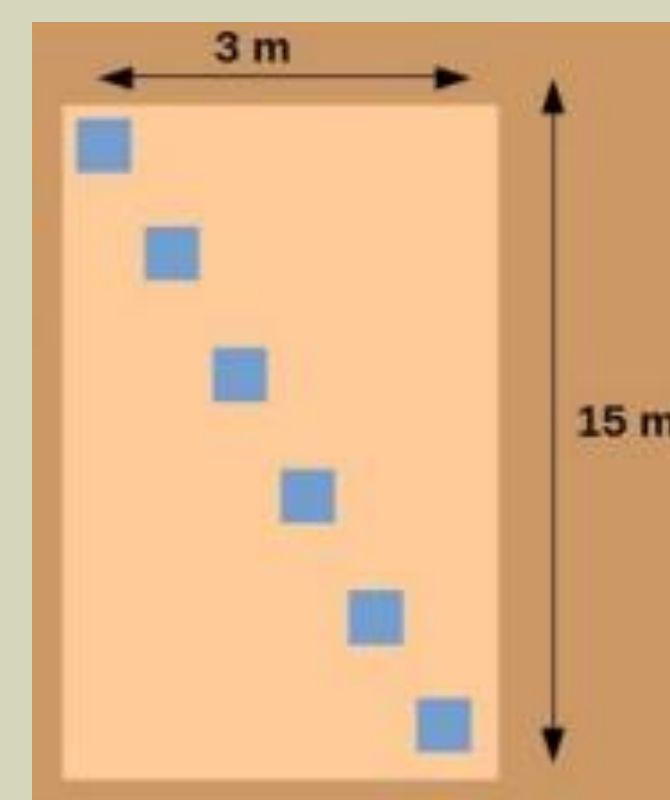


Materials & Methods



The samples were collected using the ISO 23611-1:2018 method (extraction of blocks of soil). Earthworms were stored in alcohol before being counted, weighed and determined at the lowest taxonomic level (subspecies, species or genus).

The protocol



The aim of this method is to extract 6 blocks of soil on a diagonal within a 3m wide and 15m long rectangle.

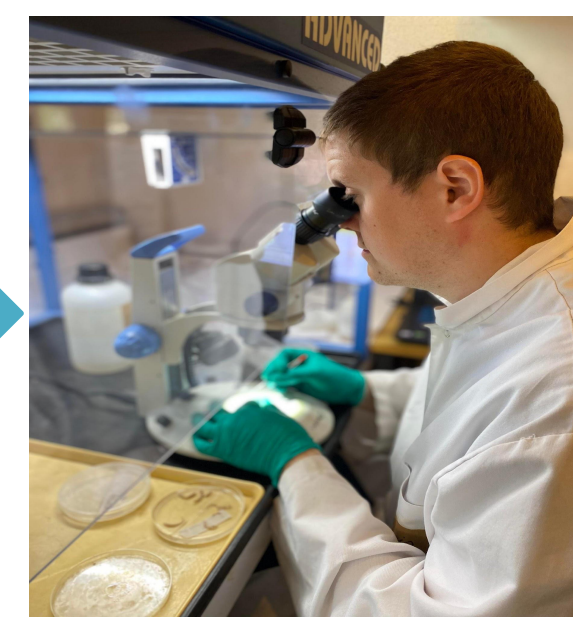
Block dimensions:
20 cm X 20 cm X 25 cm

A total of 1508 areas were sampled at the national level (543 940 km²) :
1 sample every 360 km²



Samples available in the EcobioSoil database:

58	Forests and Woodlands
61	Agroforestry
204	Grasslands
422	Annual crops
294	Vineyards
24	Market gardening
145	Urban green areas
214	Urban vegetable gardens
86	Urban roadsides

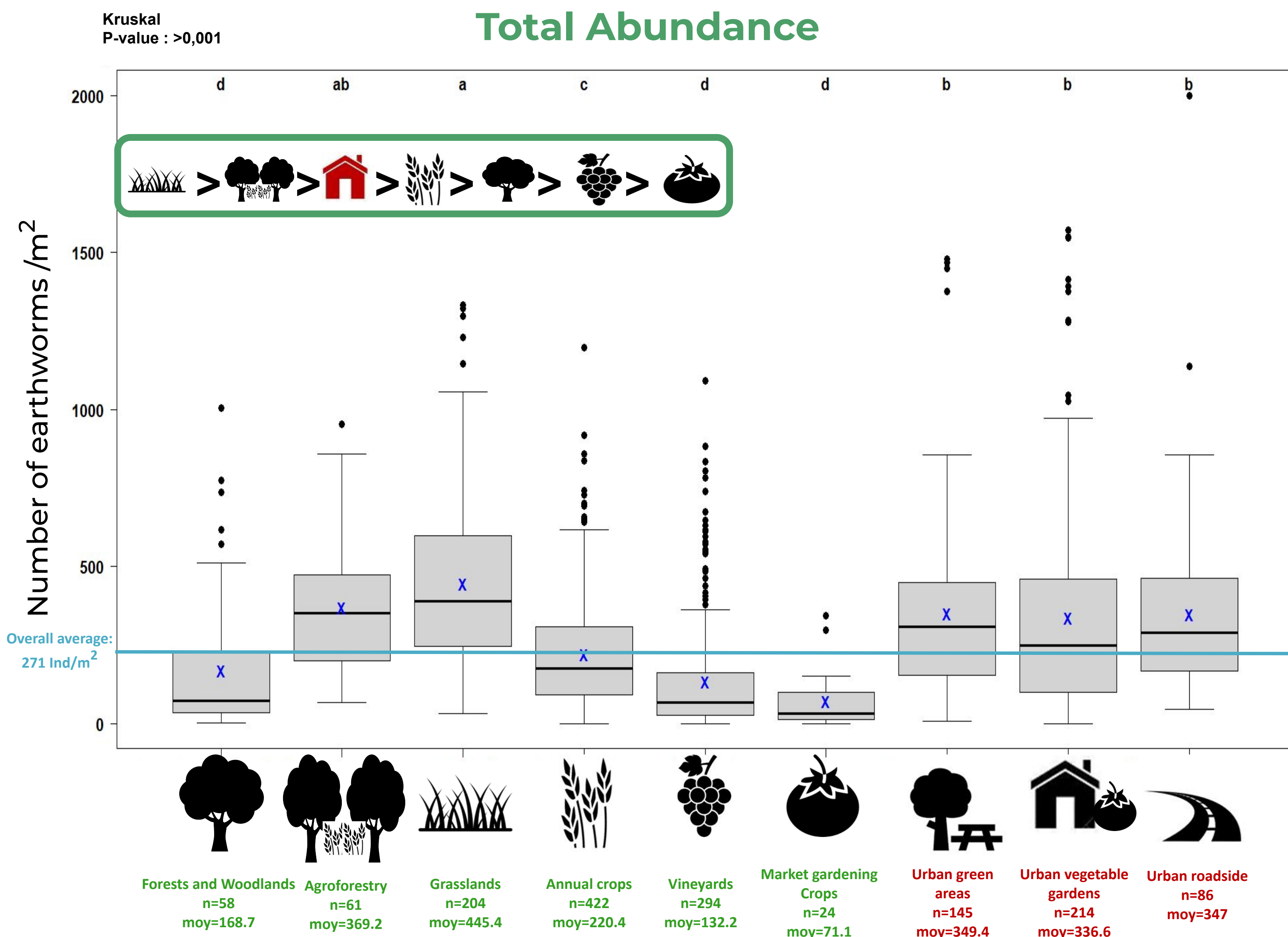


➔ What is the impact of **land use** on earthworm abundance and earthworm communities richness?

Results & Discussion



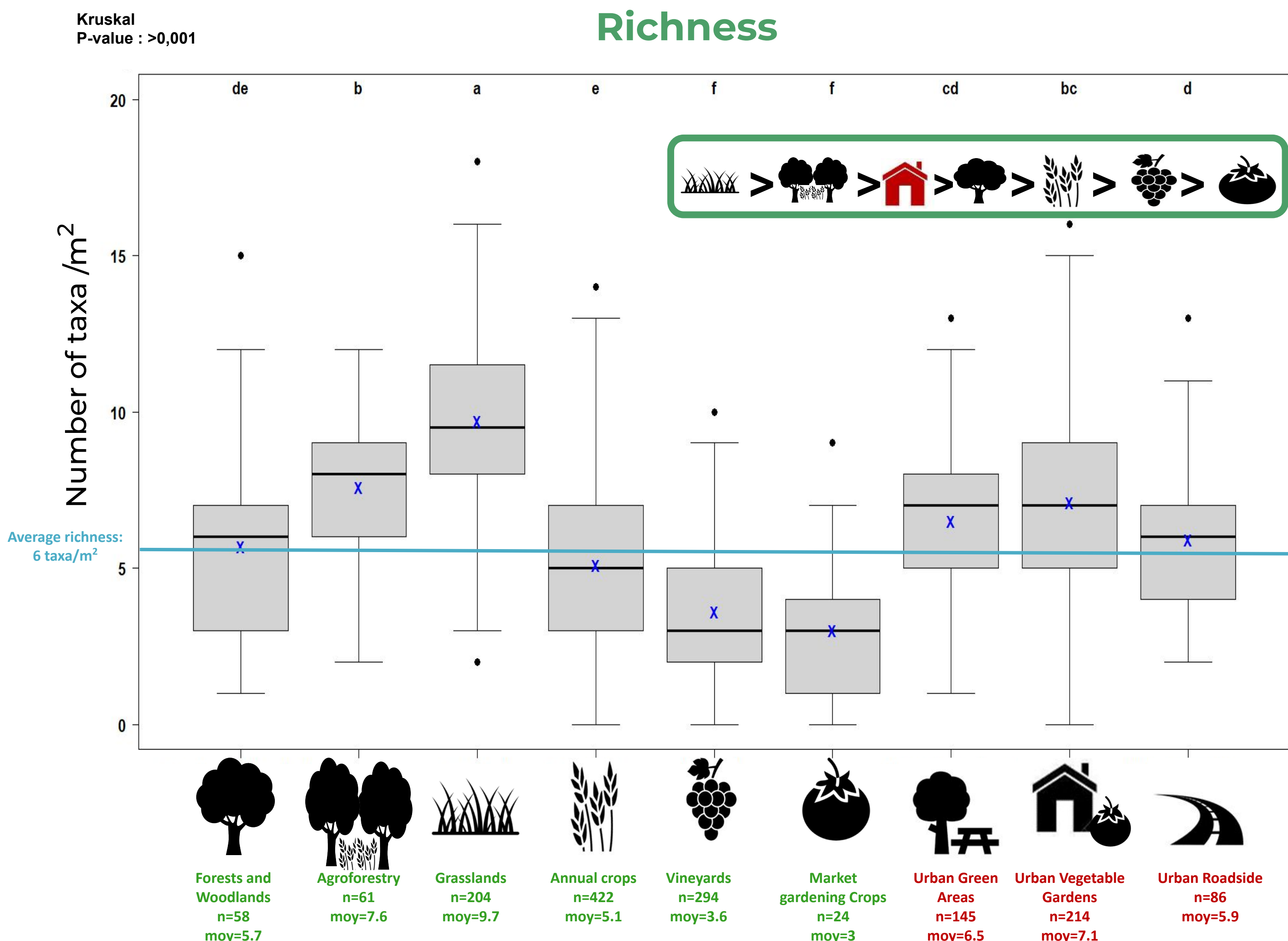
Total Abundance



The land use patterns are similar to those of 2015, highest abundance was found in grasslands (moy= 445.5 Ind/m²). Earthworm abundance was the lowest in market gardening (71.1 Ind/m²), vineyards (moy= 132.2 Ind/m²) and forests(moy= 168.7 Ind/m²).

The abundance found is slightly higher than the 2015 national data (264 Ind/M²), there is no noticeable difference with the national data, the biggest difference is in vineyards with 31 individuals less.

Richness



In terms of richness, we see the same thing as for abundance, the patterns are also in the same order as the 2015 data, the largest earthworm richness was found in grasslands (moy 9.7 taxa). Earthworm richness was the lowest in vineyards (moy= 3.6 taxa) and market gardening crops (moy= 3 taxa).

The total richness is exactly the same as in 2015 (6 taxa). The highest difference is in grassland with 0.7 taxa more.

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