

Testing a new technique to investigate earthworm fluxes in an alley cropping system

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Context

- Alley cropping is a type of agroforestry, in which herbaceous strips planted with trees alternate with crop alleys.
- These herbaceous strips host higher densities of earthworms than crop alleys.
- The impact on earthworm communities in the crop alley is not well known.

Is there a spillover from earthworm-rich herbaceous strips to earthworm-depleted crop alleys?



Aims

- To investigate earthworm fluxes between the herbaceous strip and the crop alley
- To develop a methodology to monitor earthworm fluxes between habitats at small scale

Domaine de Restinclières, Hérault, South of France
Mediterranean climate Calcareous loamy Fluvisol

Methods

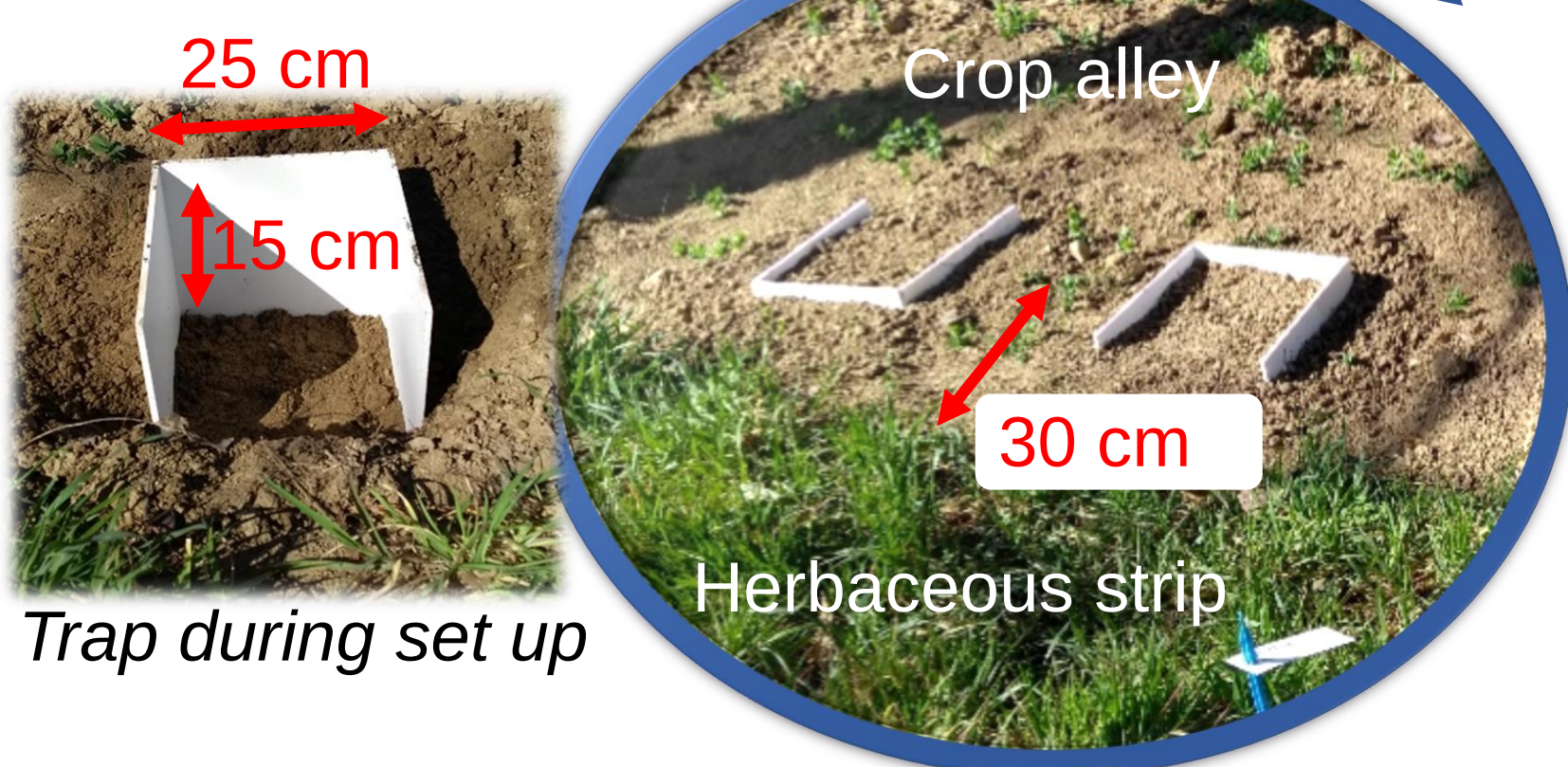
- Hand sorting of earthworms at different distances from the herbaceous strip (soil monoliths of 25*25*30 cm)



Site in early March, during sampling and set up of traps.

✗ Sampling position, 5 replicates

- Design and set up of directional traps (soil cores delimited by plastic walls)



The traps allowed earthworm entrance from one side only: from the crop alley or from the herbaceous strip. Earthworms already present were manually removed during the set up of traps. Earthworm density in the traps at the end of the experiment was determined by hand sorting.

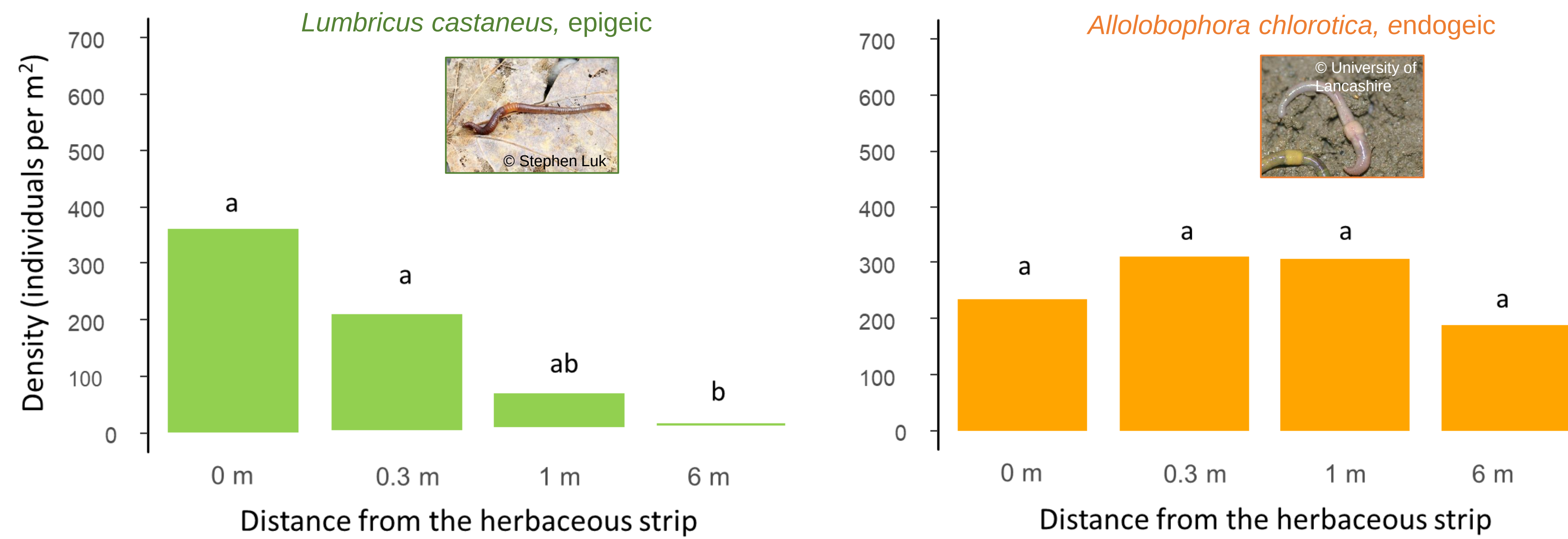
- There were two types of traps, with 5 replicates each:
- With litter mixed with the soil (pea litter, 100g)
 - No litter addition



Site in early May, during removal of traps. Traps were removed after two months.

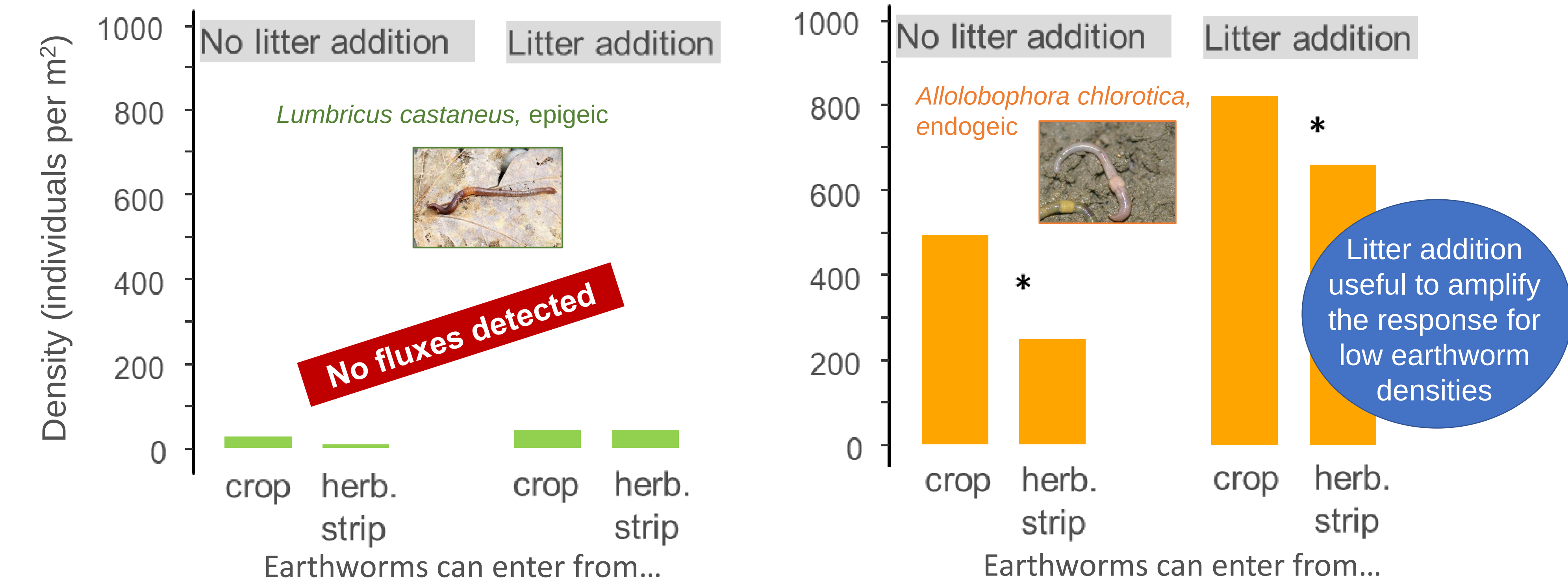
Results

Earthworm density in undisturbed soil cores (early March)



different letters indicate significant differences at $p < 0.05$

Earthworm density in the directional traps after two months



* significant differences ($p < 0.05$)

These oriented traps may not be adapted to detect epigeic earthworm fluxes. In addition, the season was probably not optimal for epigeic earthworm movements (drought/ heat). The gradient-type distribution observed in March for earthworm density with the distance from the herbaceous strip suggests a spillover at other seasons.

More earthworms were found in the traps open towards the crop alley than in the opposite direction. This refutes our hypothesis of spillover from the herbaceous strip. At the opposite, the herbaceous strip could act as a refuge against adverse conditions in the crop alley at this period (drought/ heat).

Conclusions

- Traps effective to detect fluxes of endogeic earthworms
- No spillover from the herbaceous strip, but a refuge hypothesis
- The response probably varies with the season and the species

