The drilosphere of anecic earthworms: A hotspot of biochemical and biological activity

W. S. Andriuzzi[1,2], P. Ngo[3], S. Geisen[4], K. Dumack[4], T. Bolger[5], M. Bonkowski[4], C. Rumpel[3], O. Schmidt[2]

Anecic earthworms are "ecosystem engineers"

- **Anecic earthworms** make permanent vertical burrows in the soil
- The soil around them is the **drilosphere**
- The earthworm-mediated incorporation of surface organic matter increases **soil biochemical heterogeneity** and **macroporosity**

What we did

- We used **stable isotope tracers** to investigate **C and N incorporation** in soil around burrows by anecic earthworms
- We analysed **sugar composition** in the soil organic matter and studied the **protists** in the drilosphere

➔ We compared active (= with earthworm) and inactive (= without earthworm) burrows

What we found

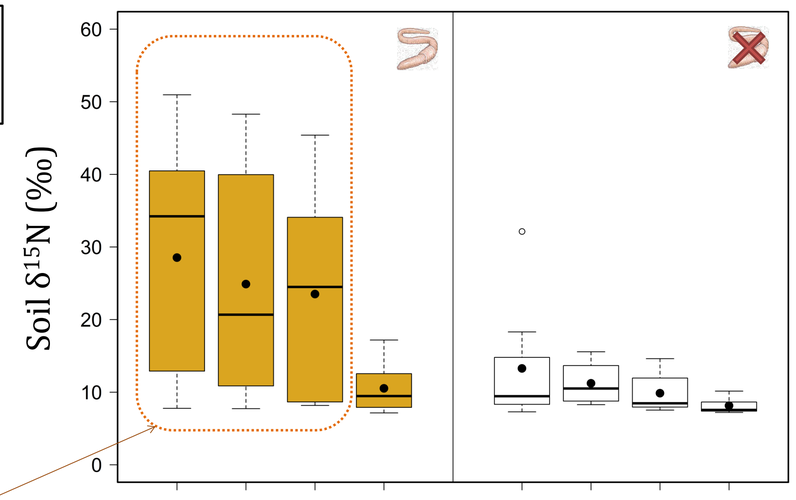
- **In the topsoil the drilosphere is larger than previously assumed** (≥ 8 mm wide, not 2 mm)
- Earthworm presence necessary to maintain distinct **drilosphere properties**, both biochemical and biological

  ➔ Interactive effects of earthworm presence and soil microhabitat on the density of some important amoebozoan groups

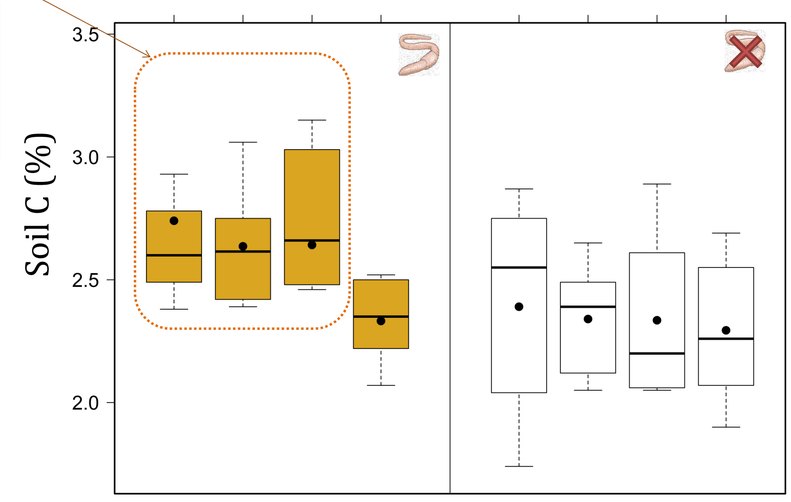
- **But two co-occurring anecic earthworm species had dissimilar effects**

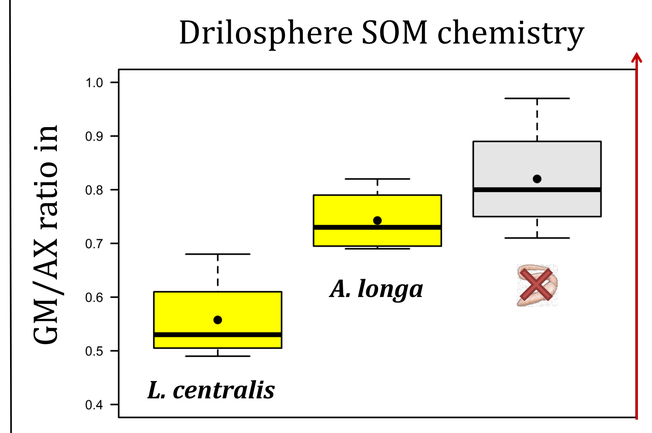
  ➔ *L. centralis* incorporated more fresh residue than *A. longa*, with consequences on soil biochemistry (e.g. less decomposed SOM)

Grassland topsoil (0-5 cm depth)
Site: Co. Kildare, Ireland
Species: ***Lumbricus terrestris***

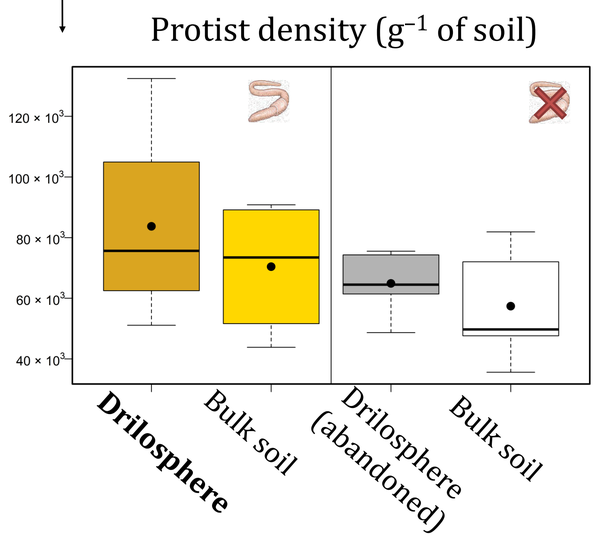


Grassland topsoil (0-10 cm depth)
Site: Lusignan, France
Species: ***Lumbricus centralis***
Aporrectodea longa

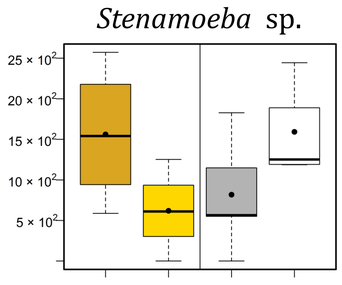




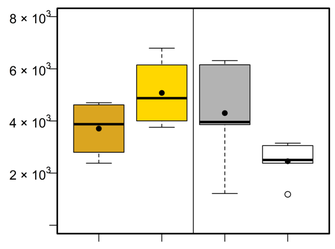
GM/AX is the ratio of microbial-derived (galactose, mannose) to plant-derived sugars(arabinose, xylose)



Stenamoeba sp.

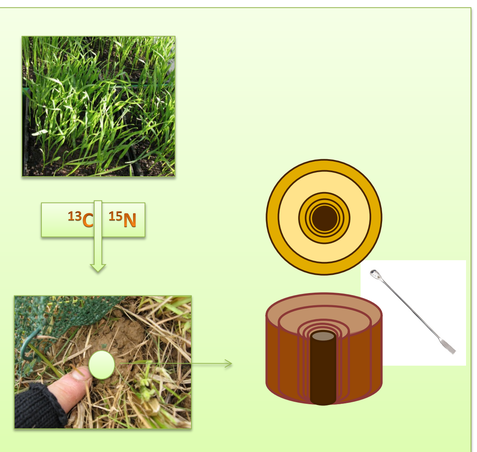


Tubulinea



How we did it

- Found openings of natural earthworm burrows at the soil surface
- Placed plant litter enriched in ^{13}C and ^{15}N stable isotopes around them
- Collected topsoil after ~50 days
- Took small concentric layers around the burrows (0-2. 2-4, 4-8 and 50-80 mm)
- Measured soil $\delta^{13}C$ and $\delta^{15}N$ signatures
- In study 2, analysed sugar composition of SOM and identified protists



[1] Department of Soil Quality, Wageningen University, Wageningen, The Netherlands, walter.andriuzzi@wur.nl; [2] School of Agriculture & Food Science, University College Dublin, Dublin, Ireland; [3] BIOEMCO, CNRS-INRA-Université Paris VI, Thiverval-Grignon, France; [4] Department of Terrestrial Ecology, Institute of Zoology, University of Cologne, Köln, Germany; [5] School of Biology and Environmental Science, University College Dublin, Dublin, Ireland
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