

Surviving the flood: investigating differences in survival between earthworm species in flooded soils

Background

Climate change is resulting in increased extreme weather events. Together with changes in land use and management this is causing increased frequency of flooding events and some areas experiencing floods for the first time. Additionally, modern flood management includes deliberately flooding land to reduce down stream impacts. Flooded soils rapidly become oxygen deficient and whilst submersion in water is not harmful to earthworms *per se*, reduced oxygen concentrations can be. Different earthworm species can survive in water at different lower limits of oxygen concentration. With increased likelihood of flooding, earthworm populations are increasingly vulnerable to both reductions in abundance and also diversity which could have consequences for soil recovery from flooding and delivery of ecosystem services.

Objectives

The student will investigate differences in responses to reduced oxygen concentrations between earthworm species, in particular the contrasting ecotypes of *Lumbricus terrestris* (anecic, vertical burrowing), *Lumbricus castaneus* (epigeic, surface dwelling) and the green and pink colour morphs of *Allolobophora chlorotica* (endogeic, soil dwelling). They will determine oxygen concentrations and soil water contents at which different earthworms actively avoid or migrate from patches of soil and differences in the oxygen affinity of the earthworms' haemoglobin. The student will also determine whether acclimatization plays a role in earthworm tolerance of low oxygen conditions and whether differences exist between different populations of the same species.

Novelty

Differences in tolerance of earthworm species to low oxygen concentrations are not currently understood, nor has the impact of increased frequency of flooding on earthworm populations been investigated.

Timeliness

Climate change is resulting in more frequent flooding and flooding of previously unflooded areas. In addition, management of flooding is moving towards deliberate flooding of upstream fields. Given the importance of earthworms to soil-derived ecosystem services, it is important to understand impacts of flooding on earthworm populations.

Training

You will be trained in a variety of complementary methods including earthworm identification, soil and solution analysis, and respiration measurement. The project will be primarily laboratory focused though field work will be involved for earthworm and soil sampling. You will be based in the Department of Environment and Geography at the University of York but will spend periods of time at the University of Liverpool in the Department of Evolution,

Ecology & Behaviour. End user involvement will come from discussions with ADAS to ensure the management implications of the project findings are fully considered.

More information

Contact Mark Hodson mark.hodson@york.ac.uk

Deadline

Apply by 14th Jan. 2022