

Temporal variation in earthworm abundance and diversity along hedgerow-to-field transects in contrasting agricultural land uses

Miranda T. Prendergast-Miller (1), David Jones (2), and Mark E. Hodson (1)

(1) Environment Department, University of York, York, UK, (2) Soil Biodiversity Group, Life Sciences, Natural History Museum, London, UK

Earthworms are regarded as ecosystem engineers, integral to soil processes such as aggregation, nutrient cycling, water infiltration, plant growth and microbial function. Earthworm surveys were conducted for one year on hedge-to-field transects in arable and pasture fields (Yorkshire, UK). The transects incorporated hedgerow and field margin habitats and extended 60 m into the arable or pasture field. At defined distances, earthworm abundance and biomass were recorded, and earthworms were identified to species and ecological group. Soil density, moisture and temperature were also measured. Additional transects were surveyed on experimental plots with arable-to-ley conversions in the arable fields (wheat crop to grass-clover ley), and tilled plots in the pasture fields (grass-clover ley to wheat crop). The conversion plots were established to determine the benefit of grass-clover leys on soil function; and the tilled pasture plots were established to compare the impact of conventional or minimum tillage practices on earthworm abundance and diversity.

A baseline survey was conducted before establishment of the experimental ley and tillage plots. The results showed differences in earthworm abundance, with greater earthworm numbers in the pasture soils compared to arable soils. In both soils, abundance of ecological group was endogeic > epigeic > anecic, and each group was dominated by the same species: *Allolobophora chlorotica*, *Lumbricus castaneus* and *Apporectodea longa*. After one year of treatment, there was some indication of increased earthworm abundance in the arable-to-ley conversion strips. Conversely, tillage in the pasture plots tended to reduce earthworm abundance, and conventional tillage tended to have the greater impact. However, within these major changes, there was also evidence of spatial (distance along transect; field location) and temporal (seasonal) variation on earthworm abundance. Although conversion to ley or tillage did not alter the pattern of ecological grouping, there were changes in species diversity which will also be discussed.

This earthworm study is part of a larger project which aims to (1) link soil biodiversity (microbes, soil fauna) with soil function (productivity, water infiltration, drought resilience), and (2) demonstrate the benefits of grass-clover leys and minimum tillage in boosting soil biodiversity, soil function, and hence, sustainable agricultural productivity.