EGU22-8992, updated on 16 Aug 2022
https://doi.org/10.5194/egusphere-egu22-8992
EGU General Assembly 2022

Human land-use increases earthworm diversity at local scale but not at the regional scale while improves abundance, biomass, and body size

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Global biodiversity is being threatened by climate change and human activities. Prior studies have demonstrated the negative concequences of land-use such as conversion of forest into monoculture, while its effects on belowground organisms especially soil invertebrates remain unclear. Earthworms are well-known ecosystem engineers that deliver multiple ecosystem functions including decomposition, carbon sequestration and plant growth. Yet, all of those functions are negatively affected by land-use conversion. Previous studies concerning land-use effects on soil biodiversity were generally conducted at a single site and small spatial scale, how soil biodiversity changes across spatial scales remains poorly understood.

In current study, earthworms were quantitatively sampled from 41 sites in three land-use types (i.e., farmland, orchard and forest at each site, five replicates) in subtropical region of China. Earthworm species were identified using both morphological and molecular methods. Earthworm density, biomass and body size were recorded. Notably, the species were also classified into different functional guilds. Totally, 84 species (or subspecies) were identified. Generally, local diversity (α diversity) was higher in agricultural lands than in forest lands, however, the opposite was true for regional diversity (γ diversity). In addition, the density of earthworm was the lowest in forest, while the biomass and body size were higher in agricultural lands. A higher proportion of endogeic and anecic earthworms were found in farmland and orchard than in forest. The land-use caused changes in soil properties contributed to the difference in earthworm diversity, abundance, biomass and body size.

In conclusion, we suggest that the impacts of human land-use on soil earthworm assemblage are scale-dependent, and the diversity, abundance, biomass and body size respond differently to land-use. Researches on different scales about land-use effects to soil biodiversity are urgently needed.