Effects of earthworms on the density and structure of mesofauna communities in the soil

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SUMMARY

The dissertation presents the results of a detailed analysis of various aspects of the impact of earthworm species representing three ecological groups, on the density and structure of the natural mesofauna community. Field and laboratory experiments, planned for calculations by analyses of variance and carried out in mesocosms, were used to investigate the effect of the density gradient and species diversity of earthworms as well as the main non-trophic (engineering) forms of their activity in the whole soil profile and in its different layers (litter and mineral soil).

The results obtained indicate a complex effect of the presence and density of various earthworm species on the density and structure of mesofauna communities. The effect of earthworms is observed at all levels of organization, from higher taxa to ecological groups and mesofauna species. The studied groups of mesofauna reacted differently to the presence of earthworms. In the litter, in most cases, the density of potworms and major groups of mites decreased with increasing densities of earthworms. In soil, however, an increase in mite density can only be observed in the presence of *A. caliginosa*. The overall density of springtails, their different species and all ecological groups in the litter was decreasing in the presence of *L. terrestris*. In the soil, this species caused only a decrease in density of *P. subarmata*. Reactions of springtails to the increase in density of *L. rubellus* and *A. caliginosa* were often different: (i) in soil the density of hemiepigeic group increased quite often, (ii) in litter, whereas the presence of *A. caliginosa* decreased the density of *P. subarmata*. The effect of earthworms on the mesofauna in the litter layer was negative in most of the studied cases, which may be related to the reduction of the volume of the food substrate and the mesofauna living space. On the contrary, in the mineral soil, the impact of earthworms caused an increase in mesofauna density in most cases. Since most of the mesofauna occurs in the top soil layer, the results obtained for the whole soil profile usually confirm the results for the litter layer.

The impact of monospecific earthworm populations on the mesofauna was characterized by a wide range of variability. The strength and direction of interaction depended on the earthworm species and intraspecific relationships. The effect of particular earthworm species depended mainly on their density, but the type of the relatioship can be both linear and non-linear.

Interspecific interactions modified the strength and direction of impact of particular earthworm species on the mesofauna. The effect of earthworms therefore depends on whether they occur in monospecific populations or in groups of different species. Compared to the direction of impact of a monospecific population, interspecific interactions may change the strength and direction of impact of particular earthworm species on the mesofauna. The result depends on the species composition of the earthworm community.

Non-trophic (engineering) and trophic forms of earthworm activity appeared to be comparable in terms of strength and importance for the mesofauna community. The specificity of the impact of non-trophic forms of activity (bioturbation, excretion of feces and mucus secretion) depended on the earthworm species, soil layer, mesofauna group as well as the interactions between them. The most significant results of the non-trophic activity of earthworms were obtained in the litter layer.