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New data on earthworms in two nature conservation areas in Hungary

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INTRODUCTION & AIM

Regardless of their well-known role in providing ecosystem services and maintaining soil quality, data on earthworm diversity are sporadic. There have been multiple efforts to collect samples but it is obvious that Hungarian protected areas are not under thorough investigation. This research provided new information for earthworm research on a slope of the Gödöllő Hillside and at the border of a peaty meadow near the Galga Creek. The Gödöllő area is steep while the Galga Creek area is a wetland with a sandy area. We hypothesize that there will be more earthworms at the bottom of the slope, being a more favorable habitat due to the more abundant food sources, while in the Galga Creek area, a higher number are expected to be present around. the sandy “hill”, as the peaty meadow provides a much more favorable area compared to the sandy hill, because sand is known to dry out easily and there is less organic matter, so it is not favored by earthworms (being the opposite of the peaty area).

MATERIALS AND METHODS

Two protected areas were sampled: the Gödöllő Hillside Landscape Protection Area, the *ex lege* protected peaty meadow of Galgahévíz (Fig. 1). The Gödöllő area is hilly, with steep slope and brown forest soils. The Galgahévíz area is flat and characterized by peaty meadow soils.
Earthworms were collected in five replicates of a 25×25×25cm cube (Fig. 2.). It was dug by using a shovel on the 20th of April, 2024. The search normally takes 30 minutes (gross: including the digging, counting, and recultivating the area, as well as marking the bottles holding the earthworms and collecting samples for soil analyses).
Soil samples were collected to provide some basic soil information of the area examined for providing data on earthworms.
The NIR device measured pH (H_2O), soil organic matter (%), total organic carbon (g/kg), total N (g/kg) and P (mg/kg), exchangeable K, Ca, Mg and CEC (Cation Exchange Capacity) (mmol/kg), total Al and Fe (g/kg), clay and soil moisture contents (%). NIR spectrometer uses a wavelength range of 1300–2600 nm (MEMS technology). It is produced by the AgroCares Company (The Netherlands) and works with the SoilCares mobile application.

RESULTS & DISCUSSION

The most important results are related to the earthworms, as there is a lack of data or sporadic. *Aporrectodea rosea* was found at both sites. *Eisenia fetida* and *Lumbricus terrestris* were only found in the peaty meadow site while *Octolasion cyaneum* was only found in the steep slope area.
In the Gödöllő area we found 137.6 individuals per square meter with an average weight of 21.86 g per per square meter at the lower third of the slope while there were only 32 individuals per square meter with an average weight of 8.16 g per per square meter in the upper third of the slope.
In the Galgahévíz area there were no earthworms in 3 examined holes and only 1-1 in the other 2 holes in the sandy part. At the lower, wetter area the minimum number of individuals was one and in 3 of the holes there were 2 or more individuals, so the difference was obvious. Furthermore, the bigger size animals are known to escape from the area where the digging is done but in this case there was one *L. terrestris* found with 12 times more weight than any other individuals.

Soil examination proved significant differences between the slope sections (upper third and lower third) in the Gödöllő area. The pH, soil organic matter, N, K, clay parameters yielded higher values at the upper third of the slope while „only” the soil moisture and the phosphorous content were higher at the lower third of the slope. It is against our hypothesis as we expected all the soil nutrients to increase at the lower third of the slope and we do not know the explanation yet, as the slope steepness is quite high, above 12 % and with this steepness we expected the majority of nutrients moving downward, due to severe soil water erosion.

Both sampling sites (the hilly area and the peaty meadow) proved the hypothesis: the lower section of the steep slopes and the less sandy area of the peaty meadow provided better habitats, and this was associated with higher earthworm abundance and earthworm weight. The research provides a baseline for further investigations because there is a lack of related publications.

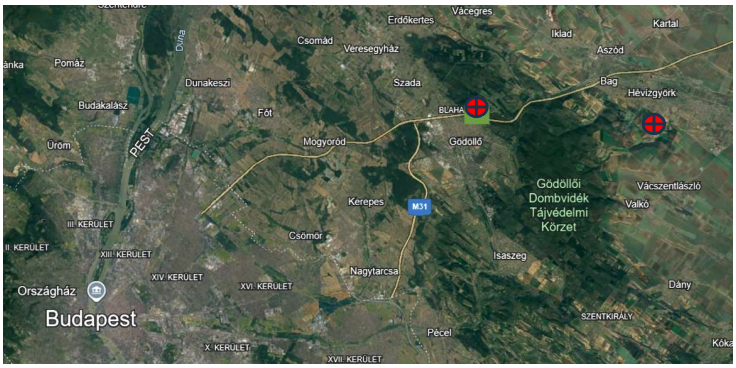

Fig. 1. The situation of the two examined areas, the hilly Gödöllő to the west, the flat Galgahévíz to the east, Hungary (the capitol of Hungary (Budapest) can be seen in the western part of the figure.

Fig. 2. The recultivated whole after counting the earthworm and collecting the soil samples in the lower and wetter part of the peaty meadow in the Galgahévíz area, Hungary (20th of April, 2020).