TECHNICAL NOTE

Earthworm sampling

In brief

Earthworms are key organisms and indicators of soil quality, which also links to the productivity of an ecosystem. The higher the earthworm density and diversity, the better the earthworm's living conditions and the more fertile is the soil. They are relatively easy to detect and determine into three ecological groups.

The number and distribution of the three ecological categories and the numerous earthworm species depends on soil management, soil type, the vegetation and climate conditions.

In this technical note, various methods how to sample, measure and interpret earthworms are shown.

Three ecological categories

There are more than 4000 species of earthworms worldwide, around 400 in Europe and around 40 in our latitudes (Switzerland, Germany). Bouché (1971) in France and Lee (1959) in Australia defined the ecological categories of earthworms. Initially, they characterized the species according to morphological, demographic, ecological and anatomical criteria. Later, Lee and Forster (1991) included behavioural characteristics and over the years, three categories simplified the identification of ecological groups. Some species, however, may have mixed properties and even a certain behavioural plasticity.

Occurrence and ecological needs

Site-specific factors as soil pH, content of organic matter, soil texture, land use and farm practices influence the occurrence and abundance of earthworms. The different spatial way of life and preferences roughly determine the three ecological categories in the soil layer.

- **Epigeic species** (leaf litter dwellers, 2-6cm long) decompose fresh organic matter close to the soil surface. They are small and mostly dark red. Preferred habitats: grassland, forest and compost, rarely found in cropland due to lack of permanent litter layers. They have a vigorous reproduction rate but a short lifespan.
- **Endogeic species** (shallow burrowers, small up to 18cm long) decompose organic substances in the soil and live in horizontal unstable galleries in the root area of the upper soil layer. They are pale, not pigmented. Their reproduction rate is limited (8-12 cocoons/year) and lifespan is medium (3-5 years).
- **Anecic species** (deep burrowers, 15-45cm long) pull plant parts from the soil surface into their vertical stable burrows (diameter of 8-11mm), where they decompose partly and get ready for feeding. Because of their behaviour, they are particularly sensitive to soil tillage at times, when they are active. Reproduction rate is limited and lifespan long.
  Anecic *Nicodrilus* species are large and black-brown. Adults partially place their faeces at the soil surface (worm casts).
  Anecic *Lumbricus* species are large and red-brown. Adult animals deposit their faeces into the soil or above ground.

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