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Measuring Soil Microarthropod Diversity Using a High-Gradient Tullgren-Type Extractor

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Extended Abstract

Plant ecology field trips are enhanced by exploring diverse underground fauna through soil sampling and analysis. Soil fauna play a vital role in decomposition, nutrient regeneration and soil structure (Coleman et al. 1999; Reynolds et al. 2007). Soil microarthropods are one of the most species rich communities in forest ecosystems and are represented at most trophic levels, making them functionally as well as biologically diverse(Crossley and Blair 1991; Coleman et al. 1999). Strongly linked to soil microarthropod communities, plants contribute energy to the soil food web through the litter layer (Edgar 1992). Plants also benefit from microarthropod activities such as nutrient turnover and regulation of microbe populations (Coleman et al. 1999). Studying presence, diversity and relative abundance of microarthropods enhances understanding of plant ecology (Edgar 1992; Coleman et al. 1999).

Differences in plant community composition between bog and forest locations are predicted to be reflected in differences in soil microfauna communities (Kotiaho et al. 2013; Limpens et al. 2014). Forest soils tend to be high in nutrients, well drained, low in organics and rich in fungi, while peat bog soils are anoxic, nutrient poor, acidic, waterlogged and high in organic material (Ohlson 1999; Limpsens et al. 2014). Due to the acidic nature of bog soil, its flora and fauna tend to be specialized and unique (Antonović et al. 2012). Forest soils can support a high diversity of plants, whereas bog soils create a difficult environment accessible only to specialized plant species (Ohlson 1999).

In this activity, soil cores were sampled from temperate coniferous forest and bog locations during plant ecology field trips. Microarthropods were extracted from samples using a modified high-gradient Tullgren soil extractor (Crossley and Blair 1991; Coleman et al. 1999). Plant communities above each sampling location were described. Abiotic measurements such as soil temperature, moisture, and pH were determined using representative samples from each area. After extraction, soil microarthropod samples were counted and sorted into groups using UBC Biodiversity Research Centre keys (Srivastava 2016). Comparisons of abundance and diversity were made between the bog and forest ecosystems.

This activity enhances understanding of plant ecology by emphasizing the importance of the belowground ecosystem. Examining soil and plant interactions, beta diversity and functional groups contributes to student understanding of terrestrial ecosystems.

Keywords: plant ecology, soil fauna, Tullgren extractor
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About the Author

Robyn Wood is a Senior Laboratory Demonstrator in the Vancouver Community College Science Department, where she has worked since 2004. Her graduate and undergraduate work was in environmental biology and resource conservation and management. She teaches lab skills and theory to students in ABE and UT level biology, anatomy and physiology and chemistry courses.

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