

# Microarthropod Diversity in Temperate Bog and Forest Soils

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## INTRODUCTION

Soil is a complex matrix of inorganic and organic particles, air and water <sup>1</sup>. Soil fauna of varying scale live within this matrix and play a vital role in decomposition, nutrient regeneration and soil structure <sup>2</sup>. Soil microarthropods are one group of soil fauna. Amazingly diverse and abundant, they are one of the most species rich communities in forest ecosystems <sup>1,3</sup>. Within this group are representatives of most trophic levels, making them functionally as well as biologically diverse <sup>1</sup>.

### Bog - forest habitat



Bog located in the Metro Vancouver area of BC. The bog is undergoing succession to Coastal Wester Hemlock zone forest. This is an interesting and valuable plant ecology field trip location.

Plant communities are strongly linked to soil microarthropod communities. Plants contribute energy to the soil food web through the litter layer <sup>4</sup>. Plants also benefit from microarthropod activities such as nutrient turnover and regulation of microbe populations <sup>1</sup>. As presence, diversity and relative abundance of microarthropods is known to vary greatly between (and within) different terrestrial biomes, they are a good study organism for enhancing understanding of plant ecology <sup>1,4</sup>.

## MATERIALS & METHODS

In this activity, soil cores were sampled from temperate coniferous forest and bog locations. Differences in plant community composition were expected to be reflected in soil microarthropod communities <sup>5,6</sup>.

### Bog sampling location



Peat bogs are deep layers of peat from decaying sphagnum moss. These soils are anoxic, nutrient poor, acidic, waterlogged and high in organic material <sup>5</sup>. Due to the acidic nature of the soil, flora and fauna tend to be specialized and unique <sup>6</sup>. Examples of plants in this location included: labrador tea, bog blueberry and bog rosemary.

### Forest sampling location



Forest soils tend to be high in nutrients, well drained, low in organics and rich in fungi <sup>7</sup>. Forest soils can support a high diversity of plants, whereas bog soils create a difficult environment accessible only to specialized plant species <sup>7</sup>. This sampling location contained plants typical of the coastal western hemlock zone.

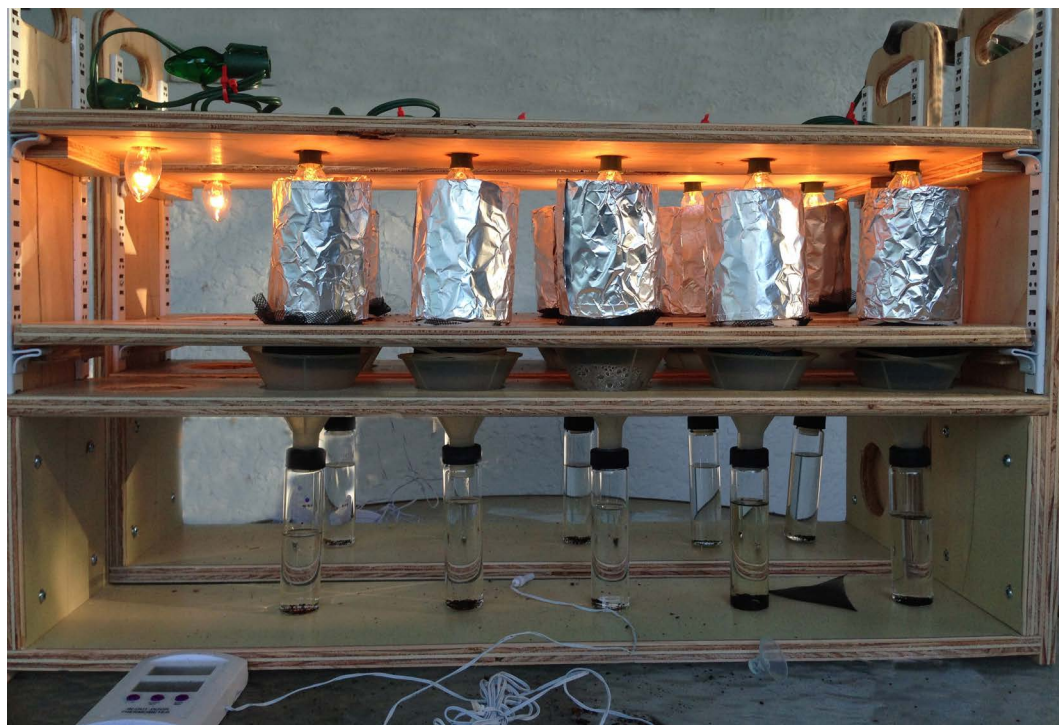
### Soil sampling



Soil cores were sampled and stored in 5cm X 5 cm PVC pipe pieces. Intact cores are recommended for use in the extractor instead of grab samples as they increase extraction efficiency<sup>1</sup>.

Microarthropods were extracted from samples using a modified high-gradient soil extractor <sup>1,3</sup>. Plant communities above each sampling location were described. Abiotic measurements such as soil temperature, moisture, pH and organic content were determined using representative samples from each area.

### High-gradient extractor

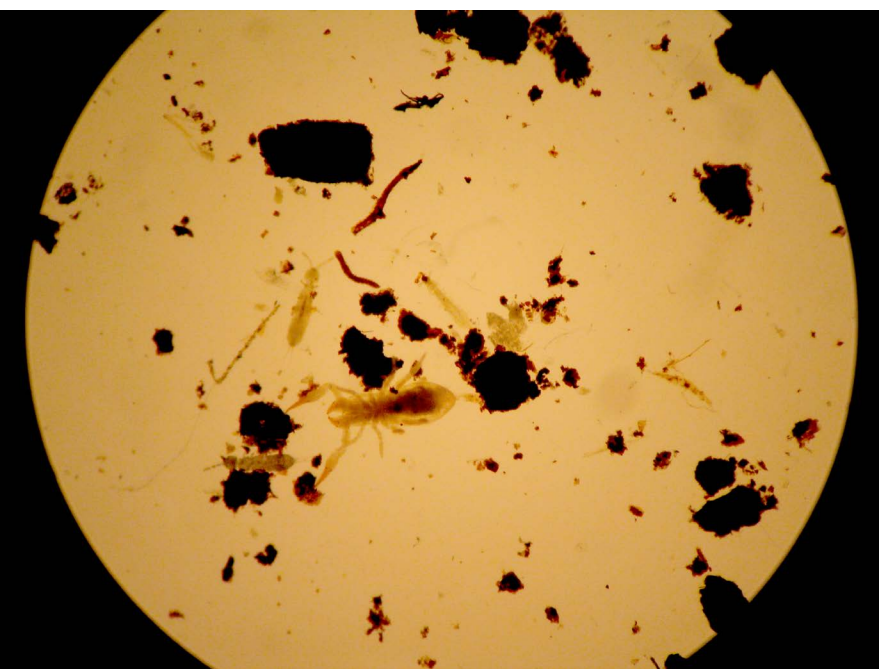


The modified high-gradient extractor was constructed based on instructions provided in “Soil Invertebrates”. <sup>1,2</sup>. This is a nice design for student activities as it is easy and inexpensive to construct, sets up quickly and readily stores away when not in use. The system is designed to be used in a cold room set at 10°C to ensure a high temperature and moisture gradient develops between the top of the soil core and the sampling vial. For optimum recovery, samples are extracted for 5-8 days <sup>1,3</sup>.

## RESULTS

After extraction, soil microarthropod samples were counted and sorted into groups using UBC Biodiversity Research Centre keys<sup>9</sup>. Microwell plates were used to help keep track of samples.

### Abundance and diversity



Comparisons of abundance and diversity can be made between the bog and forest ecosystems. This allows for discussions around soil and plant interactions and the concept of beta diversity.

### Functional role



Research can be carried out on functional role/s of different groups in soil. This pseudoscorpion is a predator of mites and other small soil creatures<sup>8</sup>. It is useful for students to understand predation as an important regulating force in the underground food web.

Sources of error can be discussed. There are a number of potential sampling and extraction techniques, and each is subject to certain biases <sup>1,10</sup>.

## CONCLUSION

This activity enhances comprehension of plant ecology and forest and bog ecosystems. During certain times of the day, or seasons of the year, there is little apparent animal activity in the bog or forest. This activity allows to students to take a closer look and understand that there is actually a huge amount of activity occurring underground. Introducing the concept of functional roles can lead to a deeper understanding of contemporary concepts such as ecosystem services. Beta diversity can help students understand how we can assess and look at environmental change, whether natural or man-made.

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