



# Lesson 19: Pit-Traps and Other Methods For Arthropod Sampling

## Key Concepts:

- Different organisms inhabit different types of habitats.
- Arthropods are a diverse group of organisms that include predators, herbivores, decomposers, and parasites.
- Arthropod populations vary across diverse habitat types and can be sampled using pit-traps.

## Skills:

- Identification
- Classification
- Making Descriptions
- Measurement
- Calculations

## Materials:

- Trowel, 1 per group
- Metric measuring tape, 1 per group, or plastic flagging taped marked at 2.5 meter intervals up to 50 meters long
- Forceps or tweezers
- Magnifying glasses
- 16-ounce cups, 2 for each trap
- Permanent marker
- Data sheets
- Plastic bags
- Small cooler with ice, optional

## Objective

Students will sample arthropods in different habitats on their schoolyard grounds. The population sampling can occur on a regular basis to sample throughout the season or it can be done once. The methodology and data collected in this study will provide many opportunities for independent student inquiry projects.

## Background

Scientists use many techniques to measure the diversity of species in an area. Key to any of these techniques is the ability to determine what species occur in an area, and a common way to sample arthropods is to trap them. In this lesson, your students will sample arthropods that crawl on the ground by setting a pit trap.

Arthropods are components of all food webs, and samples collected in pit traps may include decomposers, herbivores, predators, and parasites. This lesson, especially when conducted in the schoolyard or at home, provides powerful connections between students and nature. It also provides data that can be used in calculating biodiversity indices (see lesson 18).



## Procedure

### Part 1: Choosing Pit Trap Locations

Students will first choose areas in which to set up their pit traps. These locations should be chosen to include micro-habitats that vary with respect to proximity to the building, vegetation and ground coverage, and topography. They should be marked on a map and demarcated by stones or other natural objects.

### Part 2: Habitat Descriptions

Conduct a habitat description for each habitat. Describe the ground cover (grass, gravel, soil, mulch, etc), any vegetation that shades the traps, and the amount of time that the traps are shaded during the day, and anything else that might be relevant. You can use the Site and Habitat Description Page if you desire, or create one that is relevant to your site. This data sheet asks for information on tall vegetation (trees) and shorter shrubs that might be shading your site, as well as information on ground cover.

## Part 3: Pit Traps

1. Dig holes that are the right size for your cups. You should put at least 5 pit traps in each habitat.
2. Place 2 cups, one inside the other, in the holes. Make sure the rim of the cup is just below the surface of the soil.
3. Leave the traps alone for 2-3 days.
4. Empty the traps into plastic bags. Use a separate bag for each trap and label each bag to indicate the location of collection. To empty the trap, take the inside cup out of the second cup, leaving the second cup in the ground to preserve the hole for future use, and turn the cup over in a plastic bag or plastic shoe box.
5. Identify the insects using a key immediately, or freeze all specimens or use a kill jar to identify later.
6. Record the taxonomic order of the specimens found and their numbers in the data table. Discuss the kinds of organisms that are found in the traps; you probably don't have any butterflies, but do have species that crawl or walk. Why?
7. Analyze the data. First, discuss the following questions with your students:
  - *Were the same insect species found in all habitat sites?*
  - *Were the same numbers of insects found at all habitat sites?*
  - *Were the same numbers of species found at all habitat sites?*
8. Discuss hypotheses for any differences that the students found in the types of species, number of species, and overall numbers of arthropods in the different sites.
9. There are many more ways you can use the data. Here are a few ideas:
  - Your students will probably notice that each individual cup within a habitat had different numbers of organisms and species in it. This illustrates the importance of large sample sizes in scientific studies.
  - Calculate a biodiversity index for each site (see lesson 18), calculating the total number of species found in each site (by combining all of the traps in the sites), and the relative numbers of the species.
  - Try keying out the organisms that you found.
  - Discuss the food and habitat requirements of the organisms in each location.



## Extensions

There are many other ways to sample insects. Many of the tools needed for the methods described below (like pooters and beat sheets) can be purchased from biological supply companies, but it's easy to make your own.

1. **Quadrats**
  - Randomly choose a location for your quadrat.
  - Set up a 1 meter square area with a meter stick, pencils at each corner and 5 meters of string to wrap around pencils to create a quadrat. You can use hula hoops or coat hangers too.
  - Find all the insects in the quadrat, and preserve or record examples.
2. **Potato trap:**
  - Slice a potato in half the long way.

- Dig out some of the potato flesh from both sides.
- Place the two halves together. You should have a potato with an empty center. Hollow out an entrance or slice an entrance. Use toothpicks to hold the halves together.
- Place the potato traps in various habitats for 24-72 hours. Open up the potato traps in plastic tubs to contain the arthropods.

### 3. Sticky Logs

- Using “Tangle Trap” Insect Trap Coating, apply a thin layer to a stick or rock (or almost anything) and place the sticky trap in a desired location to trap insects. Sticky sticks can be placed in trees and other interesting bug sites.
- Leave the sticky sticks out for a day or a series of days to catch more.

### 4. Sweep Nets

- Use a “sweep” net to quickly whisk through vegetation and immediately flop the bag over the rim to prevent insects from escaping.
- Use the sweep net in different types of vegetation and habitats to compare species compositions.

### 5. Pooters

- A pooter is an aspirator for collecting small or highly mobile insects and mites.
- Pooters can be made from a vial (2.5-5 cm diameter), 2 pieces of copper tubing, one 8 cm and the other 13 cm long. A rubber stopper, with two holes, that fits snug in the vial and holds the copper tubing. Flexible rubber tubing about 1 meter long and a small piece of cloth mesh to place over the opening inside of the vial of the 8 cm copper tubing with the flexible rubber tubing. The cloth mesh prevents the insect from entering the mouth of the collector.

### 6. Beat Sheets

- Make a “beat sheet” from durable white cloth attached to a 1m square frame. You can also use the top of a white cardboard paper box or glue white paper to the box.
- Place the sheet or box top under a tree, shrub or limb and sharply beat the foliage with a stick. Specimens will fall onto the sheet or box and can easily be seen against the white background.

### 7. Sweeping Separator Box

- Insects are separated from their leaf litter because they are attracted to light.
- The sweeping separator box is made with a cardboard box and a clear jar, such as a plastic pop bottle. The box must be without cracks so that light does not enter. A small hole is placed  $\frac{1}{4}$  of the way down the box. This is where the clear bottle is inserted, so that the threads of the top of the bottle are on the inside of the box and most of the bottle is outside.
- Gather up leaf litter and place in the box. Make sure the box is sealed and that no light is coming in except through the clear bottle.
- Insects will be attracted to the light and will climb out of the leaf litter and into the clear plastic bottle.

### 8. Aquatic Macroinvertebrates

- Aquatic macroinvertebrates often live in dense packs of leaves that are trapped among the rocks in streams. Collect these clumps of leaves in the streams and place them in a larger bucket with stream water. The macroinvertebrates will emerge as the leaf pack is loosened.
- You can create a clump of leaves by stuffing leaves in a net onion or orange bag and anchor this in the stream for a number of days. The macroinvertebrates will colonize the leaves at different rates depending upon environmental conditions. Check the leaf pack every 2 days for the presence of macroinvertebrates.

## Site and Habitat Description Data Sheet

Provide a site and habitat description for pit trap location. The description includes the amount and type of vegetation (or non-vegetation) in your trap line area.

### SITE DESCRIPTION

**Names:** \_\_\_\_\_ **Class:** \_\_\_\_\_

**School:** \_\_\_\_\_

**Site Name:** Create a name to identify the site and its location for which you are collecting data. (e.g. Playground South Corner)

\_\_\_\_\_  
**Description:** Write a description of your site so that a visitor to your school would be able to find it:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### HABITAT DESCRIPTION

**Date:** \_\_\_\_\_

**Number of traps:** \_\_\_\_\_

**Trees and Shrubs:** Describe surrounding trees or shrubs. (Is the pit trap shaded? For how much of the day?):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Vegetation:** What other vegetation surrounds the traps?:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Other:** Is there something else that surrounds the traps? (e.g. gravel, soil, pavement, etc?)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

