

Critters Beneath our Feet – Exploring Earthworms

Measuring earthworm populations in contrasting disturbed and undisturbed ecosystems

In this exercise you will compare the abundance of earthworms in disturbed and natural areas, and use these numbers to extrapolate to the numbers of earthworms found in larger areas.

Worms are from a group of animals called “annelids” (from the Latin “annelus”, meaning little ring). These rings can be easily seen on an earthworm’s body. On some earthworms you can see a thicker ring around the body, called the clitellum (refer to drawing of earthworm). If it has a clitellum, this means the earthworm is reproductively mature – it can mate and produce offspring – the clitellum is the structure that produces the cocoon that protects the earthworm eggs in the soil until they hatch. Earthworms are hermaphrodites, meaning they have male and female genitalia in one individual! The clitellum also makes the earthworms easier to identify if you are interested in what species it is.

Earthworms either eat leaf litter or soil – it depends on the kind of earthworm. But most earthworms eat a lot! When you collect your earthworms, you may be able to see their digestive tube through their skin – this tube will be filled with soil or litter, and appear dark.

For older students who are identifying earthworms they collect:

The non-native earthworms found in Canada come from three different functional groups – in other words, they have three different ways of feeding and burrowing (important functions for earthworms!) The first type of earthworm is called “anecic”, and it digs semi-permanent vertical burrows that can go quite deep into the soil (even up to a metre). These worms eat litter, not soil, so they come to the top of their burrow and drag leaf litter down into the burrow to feed upon it. The burrows can be easily spotted because the worms also cast (poop) outside the entrance of their burrow. These worms are also pigmented – they are often a reddish or brown colour. We have one kind of anecic earthworm in Canada; its scientific name is *Lumbricus terrestris*, but it is also known as a nightcrawler. It is our biggest worm, and the one you usually see crawling on the soil (or sidewalk) after a rain (why might the worms come to the surface when it rains?).

The second type of earthworm is called “epigeic” (epi = on; geic = earth). These worms are much smaller than *L. terrestris* (about 1-7 cm) and we have a few different species. These worms don’t actually make burrows – they live on the surface of the soil, and eat the leaf litter above them. These worms are also pigmented – being red, brown, or sometimes pink in colour.

The third type of earthworm is called “endogeic” (endo=in; geic=earth). These earthworms are variable in size (from 2-12 cm), and they are the only type of worm that eats soil, not litter. These worms are not pigmented, unlike the epigeic and anecic species. Sometimes they do appear dark because of the soil in their digestive tube, though!

In the field:

- 1) Chose 2 locations, one in a more natural forest or grassland setting and one that is more disturbed such as an agricultural field, a garden, or a heavily landscaped area.
- 2) Draw a 25×25 cm square in the soil in each field site. Try to remove any leaf litter or overlying grass from your quadrat.
- 3) Mix up dry mustard powder (available at bulk food stores): 80ml into 4l of water. This solution will be used to collect the earthworms! The mustard is mildly irritating to earthworms (but does not permanently harm them) and when poured on the soil earthworms will quickly come to the surface.
- 4) Pour 2 L of the mustard solution over each delineated square in the soil.

- 5) Over the next 5 minutes, collect the earthworms emerging from the soil. After 5 minutes, use a trowel to dig through the moist soil to find any earthworms that haven't yet come to the surface. Count the earthworms, taking note of any mature earthworms – the ones with a clitellum. Release them after counting them.

(Option for older students: they can bring the mature earthworms back to the lab to try and identify them to species.)

- 6) Which site had the largest number of earthworms over the same 625cm² area? Convert to a total population of earthworms per m² (10,000 cm²), per km² (1000m²). Did you find any mature earthworms? Did these mature earthworms look similar to each other, or might they be different species?

Back at the lab (older student option):

- 7) Use the key provided to try and identify your mature earthworms to species. Are there any differences in the number of species at disturbed and natural sites? Is this what you would expect? What functional groups do your worms belong to?

Note: keys to worm identification for school activities can be found at the following sites:

<http://www.naturewatch.ca/english/wormwatch/about/key/taxonomic.html>

<http://greatlakeswormwatch.org/identification/index.html>

These sites also have more great background information on earthworms.