



Digging Deeper...

Grade: 1

Subject Areas:

Life science, Mathematics,
Language Arts, Investigation
and Experimentation

Skills: describing,
drawing, identifying,
observing, sensing

Duration: 1 hour

Connections:
anatomy, animals, habitats,
decomposition, art, math,
soils

Vocabulary

decomposition

decomposer

segmented worms

flatworms

round worms

organic matter

aerate

clitellum

setae

Objective:

Students will learn about the role worms have as decomposers and will study the basic anatomy of earthworms.

Materials

- access to a rich forest floor or compost pile
- rulers (optional)
- trowels or other hand tools
- gummy worms (one per student)
- living worms (two kinds)
- magnifying glasses
- 4-5 trays (one per table)
- moist paper towels
- shredded cardboard
- spray bottles
- popsicle sticks or other dull pokers
- rulers (optional)
- picture of one or more earthworms

Standards

Strands: Excellence in Environmental Education Guidelines

Strand 1 — Questioning and Analysis: A) Questioning: Learners are able to develop questions that help them learn about the environment and do simple investigations. **C) Collecting Information:** Learners are able to locate and collect information about the environment and environmental topics.

Strand 2 — Knowledge of Environmental Processes and Systems

Strand 2.2 The Living Environment: C) Systems and Connections:

Learners understand basic ways in which organisms are related to their environments and to other organisms. **D) Flow of matter and energy:** Learners know that living things need some source of energy to live and grow.

California State Educational Standards:

Life Science: 2a: Students know different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.

2b: Students know both plants and animals need water, animals need food, and plants need light.

Investigation and Experimentation: 4a: Students will draw pictures that portray some features of the thing being described.

Background

Breaking it Down

Forests are great places to witness decomposition. One third of the planet's land area is covered by forests. In any forest, the dominant plants are trees. There are many different types of forests from temperate to tropical. All forest ecosystems can be divided into three layers: the forest floor, the understory, and the canopy.

Much of the King Range National Conservation Area (NCA) and surrounding area is covered by thick, lush temperate forests of Douglas fir, madrone and tanoak. Here decomposition happens relatively quickly because of moderate temperatures and abundant moisture. **Decomposition** is the process of breaking things down into smaller parts with the help of decomposers. There are many **decomposers** living on the forest floor including mites, millipedes, fungus, bacteria, protozoa and worms. Each one has a unique role in the process of decomposition.

The forest floor is a fascinating place. It is here that nutrients are returned to the soil to be absorbed again by the roots of plants in a continual cycle which includes growth, the fall of leaf litter, and decay. In one teaspoon of forest soil, there may be millions of bacteria and protozoa; two main decomposers. These can only be seen with the aid of a microscope because they are very small.

When it comes to decomposition, there is one group that stands out—worms. Worms are classified into three phyla or major groups, one of which is the **segmented worms** or annelids.

The other two groups are **flatworms** and **roundworms**. The annelids include earthworms and leeches.

World of Worms

There are three main environmental factors influencing the populations of earthworms: moisture, temperature and pH. Of course, a good amount of food needs to be available for the worms as well. Earthworms eat organic matter. This **organic matter** is made of things like dead animals, algae, old leaves, and poop. Worms have a true gut, a mouth and an anus.

Aristotle, the famous Greek

philosopher, referred to earthworms as “the intestines of the earth”. These organisms have a huge influence on the health of a forest ecosystem. They help break down all of the stuff that falls out of the trees with the help of other decomposers. There are two other major decomposers: fungi and bacteria. Where earthworms are active there tends to be a greater presence of bacteria because of the way earthworms move through the soil. Earthworms mix the soil layers as they move. This helps **aerate** or bring oxygen to places. The roots of plants, bacteria and fungi all need oxygen to live. In addition, nutrients are enhanced by earthworm activity as they ingest, digest and excrete the forest floor litter. Because of their

Local Connection

Marine Worms

Most people don't think of worms living in the ocean, but they do. As a matter of fact, there are over 10,000 known species of marine worms worldwide. They come in a variety of colors, shapes, and sizes and are often confused with other invertebrates with thin long bodies. Many marine worms are segmented worms and belong to the same group as their cousin - the earthworm.

Marine worms have a variety of adaptations. They can be skilled carnivores or passive herbivores. Some worms bury themselves in sandy bottoms and are sessile, meaning they are fixed in place. Many sessile worms have hair like structures ringing their mouths to trap floating algae and other nutrients that swim nearby. These types of worms are filter feeders. Other filter feeding worms live in a tube and stick out feathery gills to breathe. Still others are mobile and live in cracks and crevices and usually prefer shallow environments. Some mobile worms have long bristly setae that look like legs. Many worms live in beds of seaweed or mussels. Ribbon worms that live in intertidal zones can reach lengths nine feet long.

importance to leaf litter communities, such as forests, they are considered a keystone species.

Worm Facts!

There are three main categories of earthworms when you look at their role in an ecosystem: epigeic, anecic and endogeic. (These categories are too complex for young students to learn) Not all segmented worms fall neatly into one of these categories, however. Epigeic worms live in the top layers of leaf litter or loose materials like compost piles and manure heaps. This type cannot burrow very well so they are prone to predation. They are usually reddish in color which acts as camouflage. Red wigglers are an example of these. Even though anecic worms eat fresh litter at the surface, these guys can burrow. Their burrows are coated with mucous which helps stabilize the soil. Burrows can be as deep as 2 meters or 6 1/2 feet. Night crawlers belong to this group and are a favorite bait for some anglers. Endogeic worms don't come up to the surface very often. They are whitish in color because they don't need color for camouflage. They like dark places like under logs and their excrement (or casts) are highly prized by organic farmers because of their high nutrient content. This last group greatly enhances the mixing between upper and lower soil layers.

Earthworms are segmented and have a structure called a clitellum. The **clitellum** is easy to see and looks somewhat like a belt just above the place where their intestine begins. It is used during reproduction and for the storage of fertilized eggs. Worms are like many primitive animals. They are hermaphroditic, meaning they can produce either egg or sperm. When two worms are ready to mate—no problem. They are neither male or female, but somehow figure out which

one will produce the eggs and which one will produce the sperm necessary for fertilization. They have a crop for storing food and a gizzard for breaking food down before it passes into their intestine.

Worms have to remain moist in order to breathe. Those earthworms that burrow have retractable bristles called **setae** that help them cling to soil. These can be felt by touching a worm or seen using a magnifying glass. As a matter of fact, these bristles help worms grip the soil when predators like birds are trying to eat them. Many animals like to eat earthworms. Earthworms are not like flatworms. If you cut a flatworm in two, both parts will grow into a new flatworm. Only the very tip of some earthworms will grow back. Many people make the mistake of chopping earthworms in half thinking they are increasing their population.

The world of worms is amazing. They are often unnoticed and under appreciated. By learning about them we can gain a greater respect for them and their role as decomposers.

Activity 1: Digging Deeper

Procedure

1. Explain to the students that they are going to investigate the forest floor. Take them on a short walk to a nearby forest with a few rulers. Have them begin by lying on their backs. (if it is too wet, they can kneel)

2. Have the children roll over onto their stomachs. Ask: "What is covering the forest floor?" Next, have them make a "nose hole" in the leaf litter and sniff the ground. Ask: "Is the smell familiar?" "What does it smell like?" Have them poke down into the leaf litter and explore. Ask: "What do you see?" "Do you see any worms?" "Do you see any insects?" "Do you see any

Materials

- access to a rich forest floor or compost pile
- rulers (optional)
- trowels or other hand tools

roots"? How deep is the leaf litter? (optional: measure the depth of the forest floor or humus)

3. Explain that all of the old leaves are being recycled by decomposers. Worms and other little animals eat the old leaves. They break it all down during a process called decomposition. Decomposition is very important in a forest. Without it, all of the stuff that falls out of trees would pile up and up. Make sure the students wash their hands following this activity.

- *Do you see any leaves?*
- *What types of plants do you see?*
- *Is the ground under your body dry or moist? Is the ground soft or hard?*
- *What do you see in on the forest floor?*
- *What types of things live underground?*

Activity 2: The World of Worms

Preparation

Separate the live worms up into trays or shoeboxes. Mix them if you have more than one kind. Give them adequate moisture by laying down moist shredded cardboard. Have paper towels handy for the group activity. Spray their habitat with water periodically so the worms don't dry out. This is a great activity for students to do with an older buddy.

Procedure

1. Have the students sit down in a group area and begin asking questions. Introduce worms by passing out a gummy worm to each student. Don't let them eat the gummy worms yet! Have them compare their gummy worms to a

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Activity 2: The World of Worms (cont.)

picture of a real earthworm. An option is to measure them by having them stretch their gummy worms out against a large ruler. Older students can measure the length of live worms this way.

2. Have them eat their gummy worm. Explain to them that next they are going to look at real live worms. Hold up the picture and show them a few features (clitellum, segments, setae, mouth, anus, etc.). Explain that there are no girl worms or boy worms. They can be either! Emphasize that they are not to hurt the worms. Explain to them that the worms have to stay moist. Break the students into groups with each one receiving a tray of worms and some magnifying glasses. Pass out

the students worksheet (attached). Together, have students come up with three words that describe worms (or do this ahead of time for them to copy). Write these words on the board and have them fill in their worksheet. Before they touch the worms ask them what they see. Encourage them to ask you questions as well.

3. Have them place a live worm on a moist paper towel. Each student should be encouraged to touch the worms and to handle them with care. They should try not to injure them. Encourage them to look at a worm through a magnifying glass to look for small bristles (setae). Have the students feel a worm and describe what they observe. After a thorough exploration, have

the students draw a worm. (see attached worksheet)

- *Can you tell which end is the head?*
- *Can you see any features on your worms?*
- *What color are they?*
- *How do they move?*
- *Do you think they like the light?*
- *Do you think they like to be dry or moist?*
- *Can you tell a girl worm from a boy?*
- *What do worms do?*
- *Are worms slimy?*
- *Why are worms important? What can worms eat?*

Extensions

- Make a worm farm or worm box.
- Explore the different homes in the different levels of a forest (canopy versus forest floor).
- Have students learn about other things live under the ground.
- Connect worms to weather.
- Have students explore worms online.
- Begin composting school food waste or begin a compost pile on campus.
- Use “worms squirm” to begin introducing other animal behaviors.
- Have the students sing songs about worms like “Nobody Likes Me” or “Wiggly Worm”.
- Make a list of words that begin with “W”.

References

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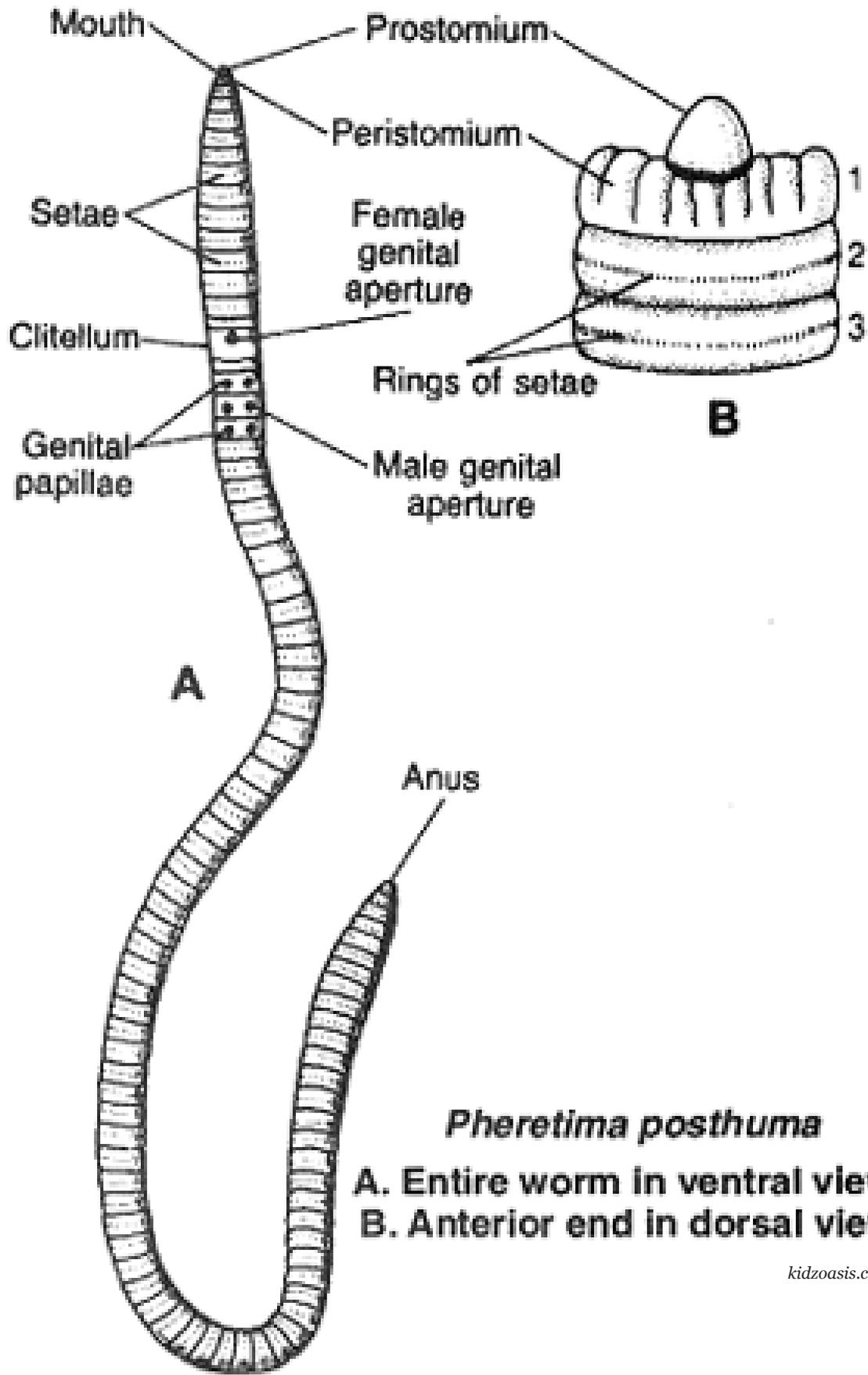
Epigeic (Bohlen et al 2004)



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Pheretima posthuma
A. Entire worm in ventral view,
B. Anterior end in dorsal view

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Name: _____

Date: _____



Draw your worm in the box below

Worms _____

Worms _____

Worms _____

Vocabulary:

eat, squirm, wiggle, burrow, breathe, decompose