

## Earthworms

### Background

Earthworms – variously called angleworms, garden worms, red worms, fishing worms, and (when especially large) night crawlers- are found around the world wherever soil conditions are appropriate. There are many kinds of earthworms. Some are only 1-3 inches long when full grown, but one, a native to Australia, can reach the length of 3 yards. Some kinds of earthworms are specific to a certain region or soil type, while others have a wide distribution.

### Characteristics:

Having no internal or external skeleton, earthworms are soft and fleshy. The long, cylindrical body consists of a series of rings called *segments*. The segments are progressively smaller toward the head end and, in some species, are somewhat flattened toward the tail end. An enlarged glandular area, the *clitellum*, partially surrounds the body about one fourth of the way between head and tail. Mucous glands keep the skin moist and give the worm a shiny appearance. Each segment has four pairs of tiny spines called *setae* – two pairs on the bottom and one on each side. The *setae* are too small to see but can be felt by holding the worm in one hand and gently sliding it through the fingers of the other.

All the important organs, including the brain, hearts (five pairs of them), reproductive structures, and stomach, are located in the region forward of the clitellum. The mouth is surrounded by the first ring, or segment, which forms the lips. The intestinal track, a straight tube, extends the length of the body, terminating at the last segment.

Many people mistakenly believe that an earthworm broken into two pieces will become two earthworms. It is true, that if the body is broken behind the clitellum and not too many segments are lost, the forward portion containing the internal organs will sometimes heal and survive. However, the rear portion, lacking these organs, will die.

### Habits:

Earthworms spend most of their time burrowing in the soil. They burrow by two methods. If the soil is loose, they press their *setae* against the sides of the burrow to hold their position, then use their nose to push the particles of soil aside. They can also literally eat their way through the soil. Since earthworms need moisture, they will gradually burrow deeper if the topsoil becomes dry. As the soil cools in autumn, they burrow down to spend the winter months below the frost line.

At night, especially when the soil is moist, earthworms come to the surface to consume organic debris and sometimes to mate. They usually extend only their forward portions out of the burrow; then, if disturbed they can quickly withdraw to safety with a few rapid contractions of their muscular bodies. Some times, following an exceptionally heavy rainfall, earthworms come to the surface of the ground, apparently seeking drier areas. At these times, they can appear in large numbers on sidewalks and streets, where they become stranded.

### Reproduction:

Earthworms are *hermaphroditic*, that is each one produces both sperm and egg cells. When two worms mate, each receives sperm from the other, then goes its separate way to complete the reproductive process. Later, the clitellum produces a mucous band that slips forward over the earthworm's body. Eggs and sperm are released into this band as it passes over the reproductive pores.

## Earthworms (cont)

As the band slips off the worm, each end closes to form an oval cocoon. The cocoon remains in the soil for two or three weeks before the eggs hatch. About three months later, the young worms will be full grown adults.

### **Benefits to the Soil:**

Good soil and earthworms go together and even perpetuate each other. Earthworms prefer rich soil containing abundant organic material, which they consume for food. The organic material also helps keep the soil moist – a necessity for earthworms' survival. In turn, earthworms greatly improve the soil, first by releasing nutrients from the organic materials they consume, and, second by mixing the soil and keeping it loose. Earthworm burrows also aerate the soil and increase its capacity to hold water. On the other hand, clay or sandy soils that contain little or no organic material and other types of soil that tend to dry out quickly often have low earthworm populations and, in their absence, rarely improve by natural means.

Earthworms are prolific, and in good soil conditions they can reach high population levels. Charles Darwin estimated that a single acre might contain as many as 50,000 earthworms. In general, the better the soil, the higher the earthworm population. However, many other animals, including birds, garter snakes, salamanders, toads and a number of mammals, prey on earthworms. (And even though earthworms do not occur naturally in water, they sometimes become prey of fish when offered on a hook.)

### **Earthworms in the Classroom**

Earthworms are not as exciting as other classroom animals since they are often underground and rarely seen. However, a colony of earthworms can be useful as a source of natural food for other classroom animals, such as frogs, toads, salamanders, turtles and garter snakes.

### **How to Obtain:**

An adequate supply of earthworms for classroom study can be found in almost any neighborhood by digging in a garden or overturning rocks, logs or boards. Earthworms can also be found by searching a lawn with a flashlight the night after a soaking rain. Or they can be purchased from a bait shop or ordered from a biological supply company.

### **Housing:**

Once obtained, earthworms can be kept in a variety of ways, depending on the teacher's plans. If they are to be held for only a few days, a dozen can be kept in a milk carton, cottage cheese container, or similar container half-filled with moist soil or sphagnum moss. A lid with small holes punched in it will prevent escapes and provide adequate ventilation. Earthworms should be kept cool to keep them inactive. (If they are placed in the refrigerator, they will live for several weeks.)

If the goal is to maintain a breeding earthworm colony, a larger and slightly more sophisticated system will be needed. In this case, the container should be as large as possible, because the greater the volume of soil, the easier it is to maintain a constant environment. A metal or plastic tub, for example is sufficient to accommodate several hundred earthworms; proportionately fewer worms can be produced in a bucket or a standard aquarium. Good garden soil is a satisfactory medium, and if mixed with leaf litter, compost, peat, sawdust, or cow manure, it will be even better. Place 8-10 inches of the medium in the container, and add water as needed to keep the medium moist but not wet.

## **Earthworm (cont)**

Then, two or three dozen earthworms can be placed on the surface and allowed to burrow into the soil. Placing a thin layer of leaf litter or shredded paper towels on the surface of the soil will help reduce moisture loss.

### **Diet:**

If the soil is of good quality, the earthworms will not have to be fed for some time, but small amounts of food added to the surface will gradually disappear. Since earthworms will consume almost any type of organic debris, they can be fed shredded bits of grass, dried leaves, lettuce, and apple or potato peelings. Earthworms will also consume small amounts of soaked cornmeal, chicken mash, oatmeal, or coffee grounds. A little grass seed sprinkled on the soil will soon sprout and provide a natural food. The earthworms will eat the roots and, when the grass dies they will also eat the leaves. If the system is watered enough to keep the grass healthy, the moisture level in the soil will be about right for the worms. Earthworms do not require light, so they can be kept in total darkness. (Even in the dark, grass seeds grown on the surface of the soil will sprout and grow for a while before being consumed by the worms.)

Earthworms will survive and reproduce at room temperature, but their optimum temperature is much lower – about 50° - 60°F. It is best, therefore, to keep the colony in the coolest part of the room.

### **Observations, Activities, and Questions:**

- Observe and describe an earthworm. Count the segments. Do all earthworms have the same number of segments?
- Place an earthworm on a moist paper towel and describe how it moves. Can an earthworm crawl backward? Gently touch it on the head, tail and middle. How does it react in each case? Flash a bright light on the earthworm. How does it react?
- Moisten a finger with water and gently rub a large earthworm. Can you feel the setae?
- Place alternating 1-inch layers of moist sand and moist soil in a large transparent jar. Add a few earthworms and place the container in the dark (or cover with black paper). Observe the layers at one week intervals, adding moisture if needed. What happens to the layers?