

## Earthworm Biology<sup>1</sup>

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### Taxonomy

Earthworms (Figure 1) are scientifically classified as animals belonging to the order Oligochaeta, class Chaetopoda, phylum Annelida. In this phylum there are about 1,800 species of earthworms grouped into five families and distributed all over the world. The most common worms in North America, Europe, and Western Asia belong to the family Lumbricidae, which has about 220 species. Earthworms range from a few millimeters long to over 3 feet, but most common species are a few inches in length. Only a few types are of interest to the commercial earthworm grower, and of these only two are raised on a large-scale commercial basis. Some of the more common species used for bait are the following.

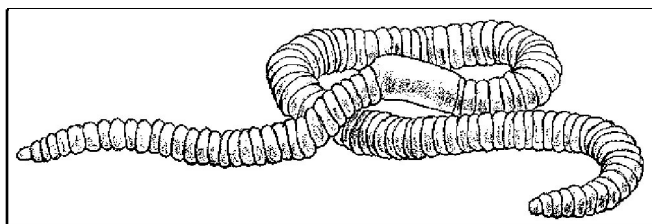


Figure 1. Earthworm.

- **Nightcrawlers.** This earthworm is common to the northern states and may be picked from fields and lawns at night for commercial fish-bait sale. Although very popular with fishermen, they are not commonly raised on a commercial basis because they reproduce slowly and require special production and control procedures.
- **Field worms** (also known as garden worms). These make excellent fish bait and are often preferred by those who want a small number of worms for their own use. They are not prolific breeders, so are not recommended for commercial enterprises.
- **Manure worms** (also known as bandlings, red wigglers, or angleworms because of their squirming reactions when handled). These are particularly adaptable to commercial production and are one of the two types most commonly grown by successful worm farmers.
- **Red worms.** These are basically another type of manure worm, differing mainly in size and color from their larger and darker cousins. They are also very adaptable to commercial production,

1. This document is Circular 455, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. It was originally published as Leaflet 2828 for the Division of Agricultural Sciences at the University of California, July 1976, and was reprinted as FCES Circular 455 in May 1979. Revised: June 2005. Reviewed: May 2008. Please visit the EDIS Web site at <http://edis.ifas.ufl.edu>

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and together with manure worms constitute about 80 to 90 percent of commercially-produced worms.

Manure worms and red worms can adapt to living in many different environments. They will eat almost any organic matter at some stage of decomposition, as well as many other types of materials which contain organic substances that can be ingested.

These worms may be found in manure piles or in soils containing large quantities of organic matter, but the new grower should purchase breeding stock from a reputable grower or distributor. Breeder worms may be purchased in lots as small as 1,000 worms. (One 8-foot by 3-foot by 1-foot deep bin, however, may contain 100,000 worms or more.)

## Biology

Because the physical structure of earthworms varies only slightly from one species to another, a description of one species will apply in most respects to any other. In this section, the nightcrawler, *Lumbricus terrestris*, is used for descriptive purposes.

The earthworm, while primitive, has well-developed nervous, circulatory, digestive, excretory, muscular, and reproductive systems, the major elements of which are shown in Figure 2. The most noticeable external feature (Figure 3) is the ringing or segmentation of the body, which is not merely external but involves nearly all of the internal structure. The nightcrawler has about 150 segments, while manure and red worms have approximately 95. Segmentation within the earthworm serves the same general function as the division of the animal body into organs--that is, different segments perform different functions.

The first section of the earthworm, the anterior end or head, consists of the mouth and the prostomium, a lobe which serves as a covering for the mouth and as a wedge to force open cracks in the soil into which the earthworm may crawl. Small hair-like structures, called setae (bristles), are located on each segment. These can be extended or retracted and a

principal function is for movement. The worm's lack of protruding structures other than setae facilitates efficient burrowing; in addition, various skin glands secrete a lubricating mucus which aids movement through the earth and helps to stabilize burrows and casts.

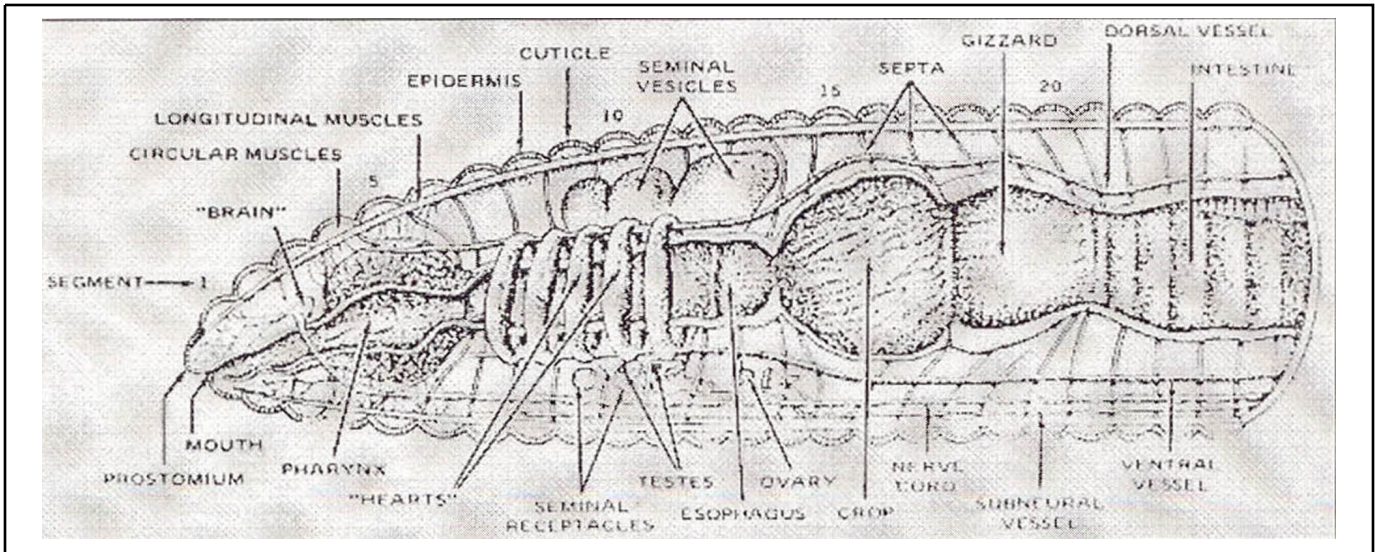
The earthworm's digestive tract is highly adapted to its burrowing and feeding activities. The worm swallows soil (including decomposing organic residues in the soil) or residues and plant litter on the soil surface. Strong muscles mix the swallowed material and pass it through the digestive tract as digestive fluids containing enzymes are secreted and mixed with the materials. The digestive fluids release amino acids, sugars, and other smaller organic molecules from the organic residues (which include living protozoa, nematodes, bacteria, fungi, and other microorganisms as well as partially decomposed plant and animal materials). The simpler molecules are absorbed through intestinal membranes and are utilized for energy and cell synthesis.

Earthworms lack specialized breathing devices. Respiratory exchange occurs through the body surface.

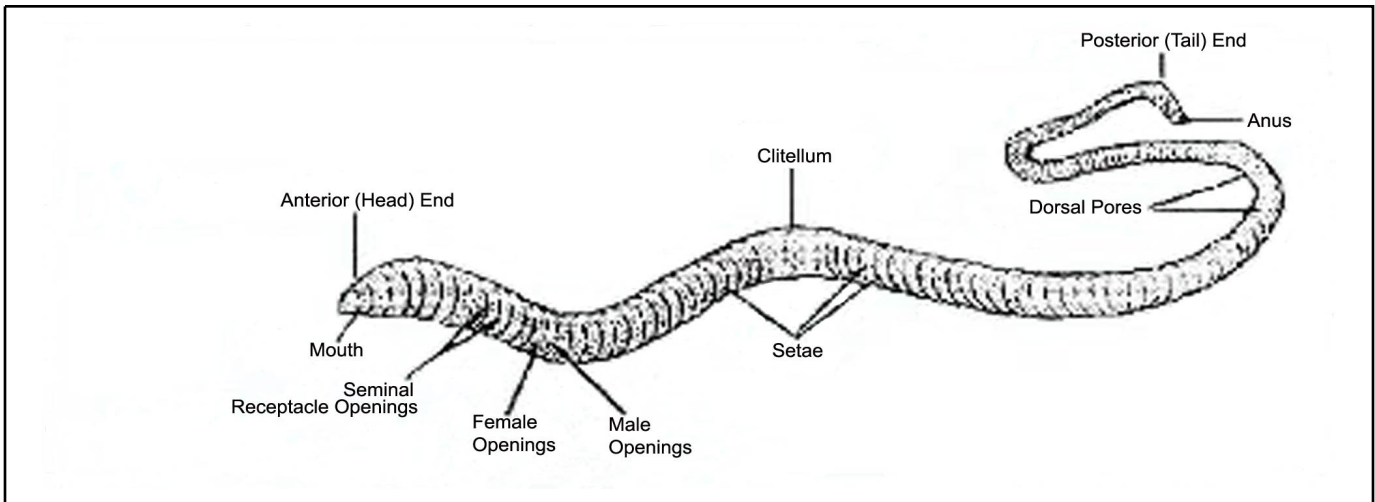
**Reproduction.** Earthworms are usually not self-mating although they are hermaphroditic (each individual possesses both male and female reproductive organs). A mutual exchange of sperm occurs between two worms during mating. Mature sperm and egg cells and nutritive fluid are deposited in cocoons produced by the clitellum, a conspicuous, girdle-like structure near the anterior end of the body. The ova (eggs) are fertilized by the sperm cells within the cocoon, which then slips off the worm and is deposited in or on the soil. The eggs hatch after about 3 weeks, each cocoon producing from two to twenty baby worms with an average of four.

## References

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**Figure 2.** Internal structure of the earthworm, *Lumbricus terrestris*. Credits: R. E. Gaddie, North American Bait Farms, Inc., Ontario, California.



**Figure 3.** External structure of the earthworm, *Lumbricus terrestris*. Credits: R. E. Gaddie, North American Bait Farms, Inc., Ontario, California.

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