

Earthworm Dissection

Pictures: Modern Biology, Holt

Introduction:

Among the most familiar invertebrate animals are the earthworms, members of the phylum Annelida. The word annelida means "ringed" and refers to a series of rings or segments that make up the bodies of the members of this phylum. Internally, septa, or dividing walls, are located between the segments. External segments are called metameres. There may be more than 100 segments in an adult worm.

The clitellum is a swelling of the body found in sexually mature worms and is active in the formation of an egg capsule, or cocoon. Eggs are produced in the ovaries and pass out of the body through female genital pores. Sperm are produced in the testes and pass out through tiny male genital pores. During mating, sperm from one worm travel along the sperm grooves to the seminal receptacles of another worm. Fertilization of the eggs takes place outside the body as the cocoon moves forward over the body, picking up the eggs of one worm and the sperm of its mate. The pumping organs of the circulatory system are five aortic arches.

Circulatory fluids travel from the arches through the ventral blood vessel to capillary beds in the body. The fluids then collect in the dorsal blood vessel and reenter the aortic arches. The earthworm takes in a mixture of soil and organic matter through its mouth, which is the beginning of the digestive tract. The mixture enters the pharynx, which is located in segments 1–6. The esophagus, in segments 6–13, acts as a passageway between the pharynx and the crop. The crop stores food temporarily. The mixture that the earthworm ingests is ground up in the gizzard. In the intestine, which extends over two-thirds of the body length, digestion and absorption take place. Soil particles and undigested organic matter pass out of the worm through the rectum and anus.

The nervous system consists of the ventral nerve cord, which travels the length of the worm on the ventral side, and a series of ganglia, which are masses of tissue containing many nerve cells. The nerve collar surrounds the pharynx and consists of ganglia above and below the pharynx. Nervous impulses are responsible for movement and responses to stimuli. Each segment contains an enlargement, or ganglion, along the ventral nerve cord.

Excretory functions are carried on by nephridia, which are found in pairs in each body segment. They appear as tiny white fibers on the dorsal body wall. The earthworm has no gills or lungs. Gases are exchanged between the circulatory system and the environment through the moist skin.

Phylum	Annelida
-Class	Oligochaeta
-Family	Lumbricidae
-Genus	<i>Lumbricus</i>
-Species	<i>terrestris</i>



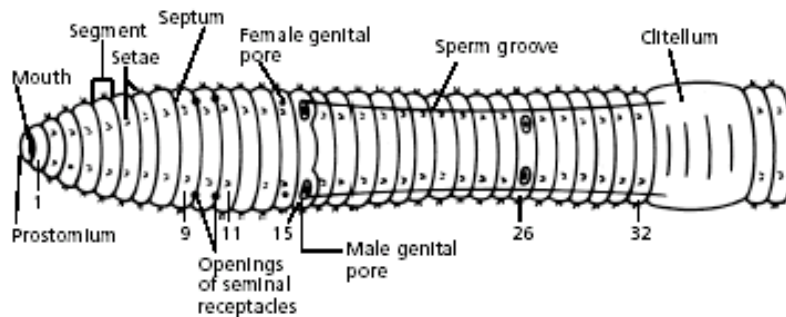
Materials:

- Safety goggles
- dissecting pins
- forceps
- scissors
- paper towel
- scalpel
- water
- dissecting probe
- preserved earthworm
- dissection tray

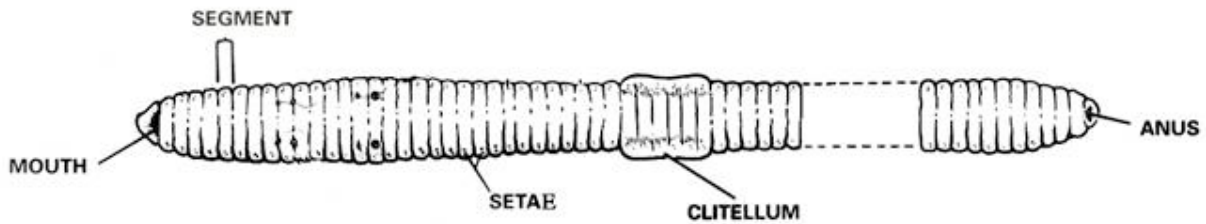
Procedure:

External Anatomy

1. Place earthworm in the dissecting tray & rinse off the excess preservative. Identify the dorsal side, which is the worm's rounded top, and the ventral side, which is its flattened bottom. Turn the worm ventral side up, as shown in the diagram below.



2. Locate the conspicuous **clitellum**, a saddle-like swelling on the dorsal surface. The clitellum produces a mucus sheath used to surround the worms during mating and is responsible for making the cocoon within which fertilized eggs are deposited. The anterior of the animal is more cylindrical than the flattened posterior and is the closest to the clitellum. The **ventral surface** of the earthworm is usually a lighter color than the dorsal surface. The **mouth** is located on the ventral surface of the first segment while the **anus** is found at the end of the last segment. Find the anterior end by locating the **prostomium** (lip), which is a fleshy lobe that extends over the mouth. The other end of the worm's body is the posterior end, where the anus is located.

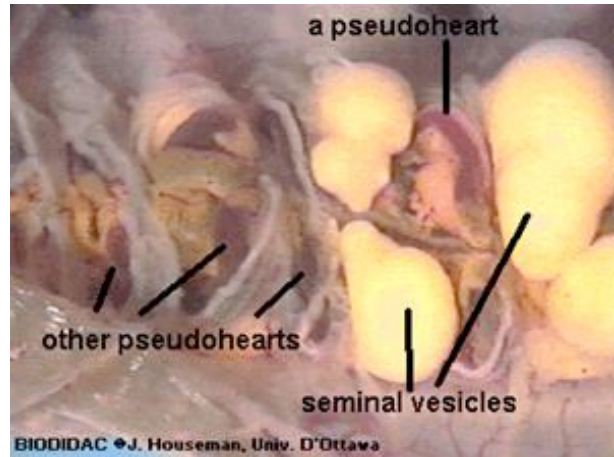
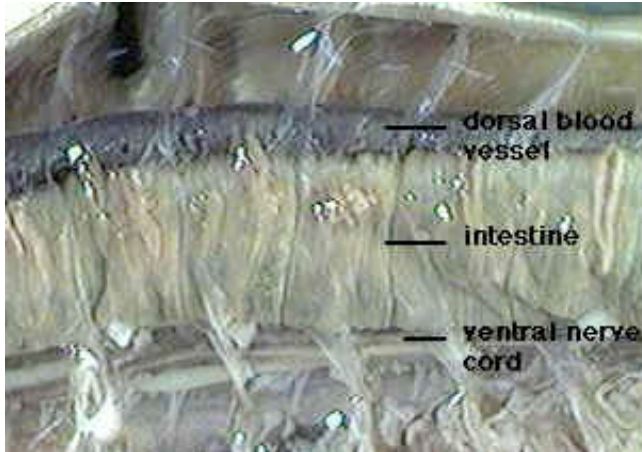


3. Locate the **clitellum**, which extends from segment 33 to segment 37. Look for the worm's **setae**, which are the minute bristle-like spines located on every segment except the first and last one. Run your fingers over the ventral surface of the earthworm's body. You should be able to feel bristle-like setae used for locomotion.
4. Refer again to the diagram of the ventral view of the worm to locate and identify the external parts of its reproductive system. Find the pair of **sperm grooves** that extend from the clitellum to about segment 15, where one pair of **male genital pores** is located. Look also for one pair of **female genital pores** on segment 14. There is another pair of male genital pores on about segment 26. Try to find the two pairs of openings of the **seminal receptacles** on segment 10. *Note: These openings are not easy to see.*

Internal Anatomy

Hint: Position your preserved earthworm dorsal side up and pin it down through the first segment and then again further back behind the clitellum. Cut a slit in the dorsal surface near the posterior pin. Using fine scissors extend the cut forward to the first segment. Be careful not to cut too deep. Starting at the first segment, cut the septa (thin membranes) that internally divide the segments, so the skin can be laid flat. Use additional pins to hold the integument open and expose the organs. Continue to lay the skin back until you have uncovered a centimeter or so of the intestine.

1. Turn the worm dorsal side up. Using a scalpel and scissors, make a shallow incision in the dorsal side of the clitellum at segment 33. (**CAUTION: Scalpels and scissors are very sharp. Report any cuts to your teacher.**) Using the forceps and scalpel, spread the incision open, little by little. Separate each septum from the central tube using a dissecting needle, and pin down each loosened bit of skin. Continue the incision forward to segment 1.
2. Use the diagram below to locate and identify the **five pairs of aortic arches, or hearts**. Then find the **dorsal blood vessel**. Look for smaller blood vessels that branch from the dorsal blood vessel.

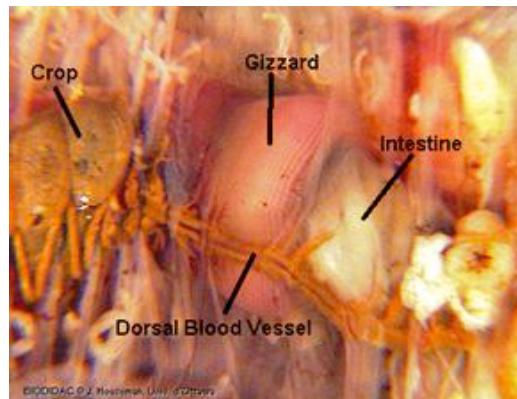


Digestive System

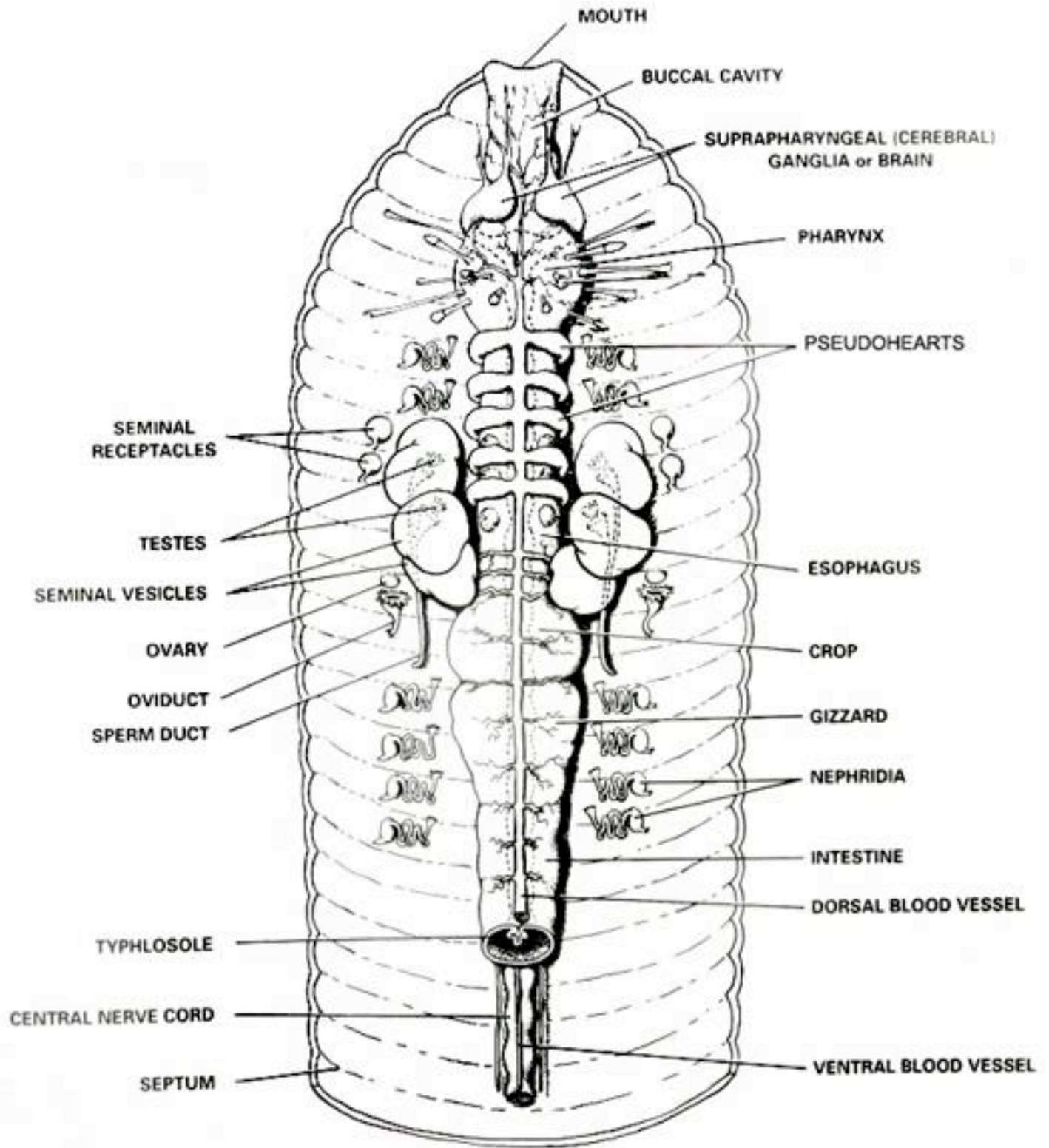
The earthworm is an example of a foraging herbivorous annelid, obtaining food by eating its way through the soil and extracting nutrients from the soil as it passes through the digestive tract.

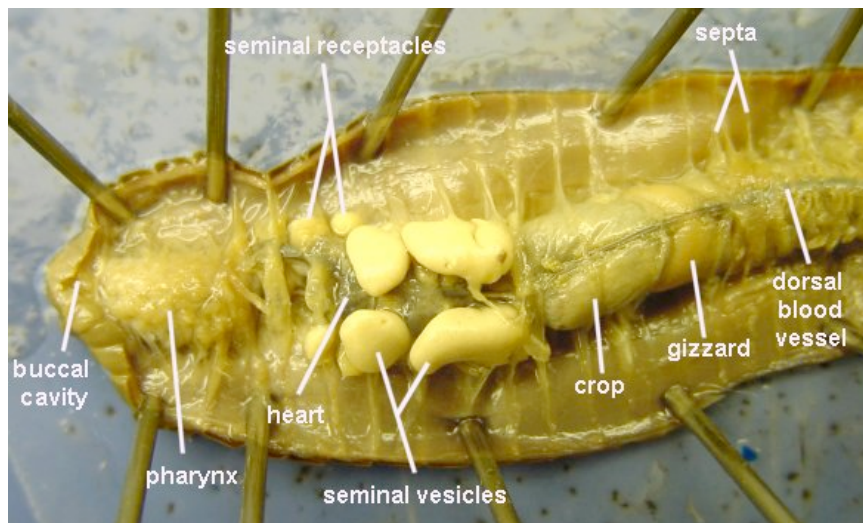
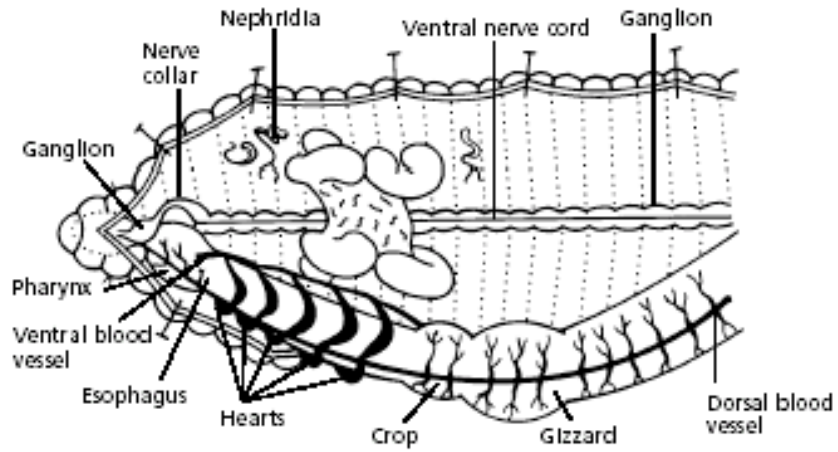
Hint: Starting at the anterior end, locate the muscular pharynx (food ingestion). This is followed by a tube-like esophagus which terminates in a crop (the wider organ) which serves as a storage stomach. Posterior to the crop you will find the gizzard. Gently press on the crop and gizzard to test their firmness. While the crop is soft and thin, the gizzard is muscular (soil is ground up and churned within the gizzard). The gizzard is followed by a long intestine in which both digestion and absorption occur. Undigested material is voided through the anus.

1. Locate the **digestive tract**, which lies below the dorsal blood vessel. Refer to the diagram above to locate the **pharynx, esophagus, crop, gizzard, and intestine**.

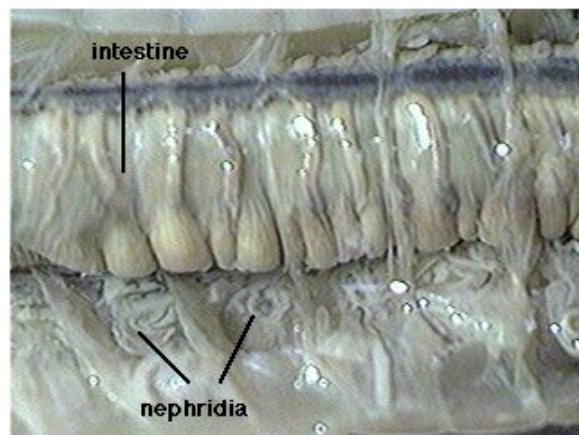


2. To find organs of the nervous system, push aside the digestive and circulatory system organs. Use the diagram below to locate the **ventral nerve cord**. Trace the nerve cord forward to the nerve collar, which circles the pharynx. Find one pair of **ganglia** under the pharynx and another pair of ganglia above the pharynx. The ganglia above the pharynx serve as the brain of the earthworm.

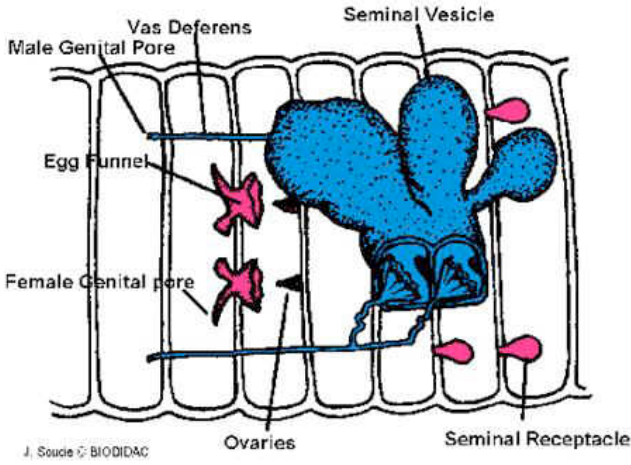
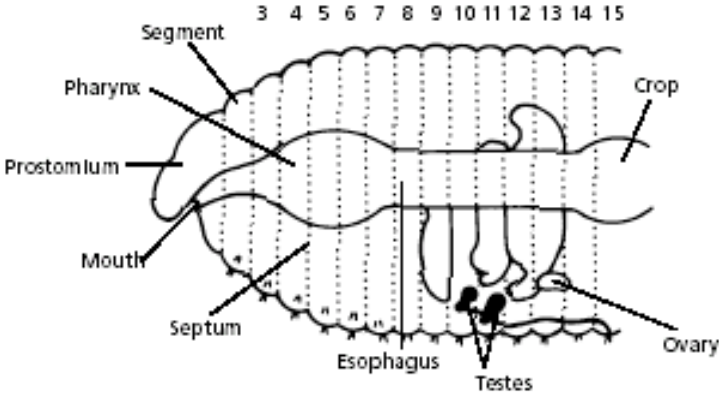




3. The worm's excretory organs are tiny **nephridia**. There are two in every segment. Use the following diagram to locate some nephridia.



4. Use the diagram below to locate and identify a **pair of ovaries** in segment 13. Look for two pairs of tiny **testes** in segments 10 and 11. To find these organs, you will again have to push aside some parts already dissected.



- 5. Dispose of your materials according to the directions from your teacher.
- 6. Clean up your work area and wash your hands before leaving the lab.