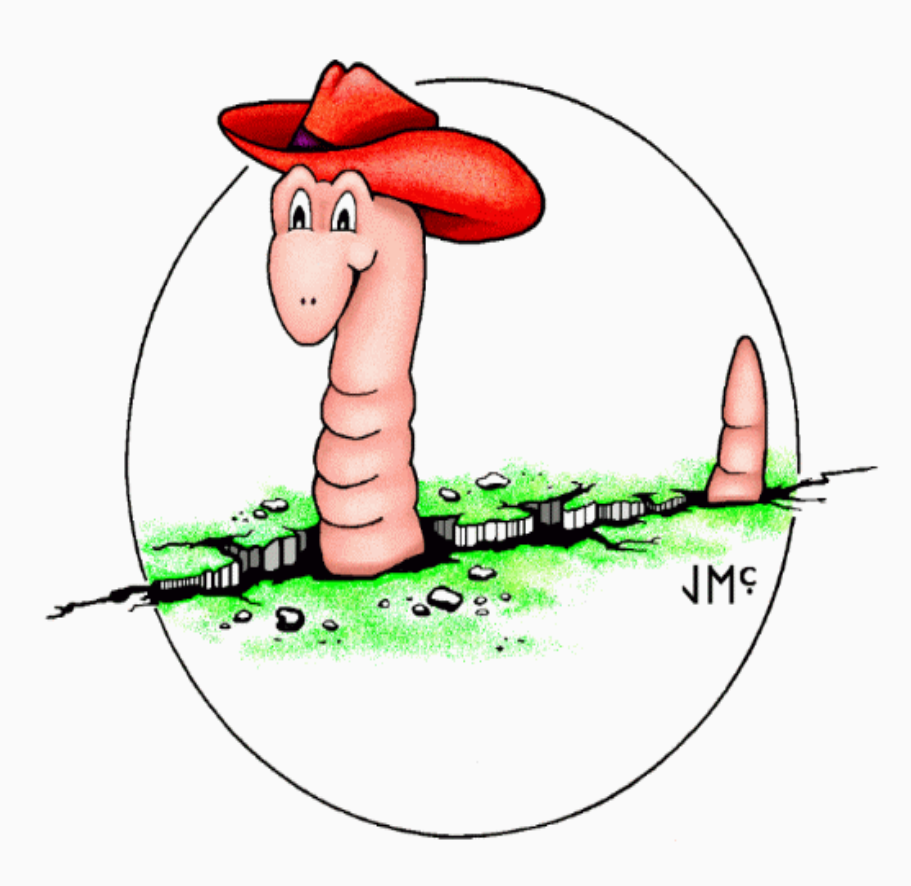
ES20-TE3

Recognize the need for an intact habitat to support animal populations and biodiversity.

Indicators for this outcome

(e) Relate an organism's specific adaptations and behaviour to its niche in an ecosystem. (K)

(h) Evaluate the importance of a keystone species in a specific terrestrial ecosystem. (S)



Concept: Plant and Animal Adaptations

1. Define the term "adaptations" as it relates to plant and animal development.

2. Differentiate between structural adaptations and behavioral adaptations in plants and animals.

3. Describe two structural adaptations which can be observed in animals.

4. Describe two behavioral adaptations which can be observed in animals.

Procedure

Note:

Anterior: "front"
Posterior: "back"
Dorsal: "top"
Ventral: "bottom"

1. Observe the external anatomy of the earthworm. Earthworms are annelids, or segmented worms that have bodies made up of a series of ring like segments. The earthworm has no head and no appendages, but does possess external characteristics to study. First, identify the anterior and posterior ends. The anterior end is somewhat larger than the posterior. Count and record the number of segments. There may be as many as 100.

2. Observe each segment closely. You may need to use a hand lens. Note the tiny bristles on the ventral (bottom) surface. These setae help the worm move through soil.

3. Each segment also contains a pair of small excretory pores called nephridiopores. You may need to use a hand lens to see these openings.

4. Openings to the oviducts are found at segment 14, counting from the anterior end. These female pores release the eggs. Sperm ducts can be found on segment 15. The clitellum is the enlarged structure that begins at segment 31. The clitellum secretes mucus that holds 2 earthworms together during mating. It also produces a cocoon in which eggs and sperm are deposited. Observe these structures.

5. Place the earthworm on its ventral side. (The ventral side is more flattened than the dorsal side.) Pin the earthworm to the dissecting pan. Using a scalpel, make a shallow incision from the clitellum toward the mouth. Be careful not to cut too deep or you will slice into the digestive system. Using forceps, spread the incision open and pin the body wall to the dissection pan.

6. Identify the thin walls between each segment. These are called septa.

7. Identify the organs of the digestive system. Beginning at the mouth, locate the thick-walled pharynx. The esophagus extends from the pharynx. Next, 2 swollen structures can be seen, the crop and the gizzard. The crop temporarily stores food and the gizzard then grinds it. Leading from the gizzard is the intestine, which runs the length of the worm to its anus. The earthworm feeds on organic material in soil, pushing this material through its digestive tract and absorbing nutrients.

8. Locate the dorsal blood vessel, which is found along the dorsal surface of the digestive tract. Identify the 5 pairs of aortic arches, or hearts, which circle the esophagus.

9. Identify the cerebral ganglia, which are found along the dorsal surface of the pharynx. A ventral nerve cord can be seen beginning at the cerebral ganglia and extending the length of the worm.

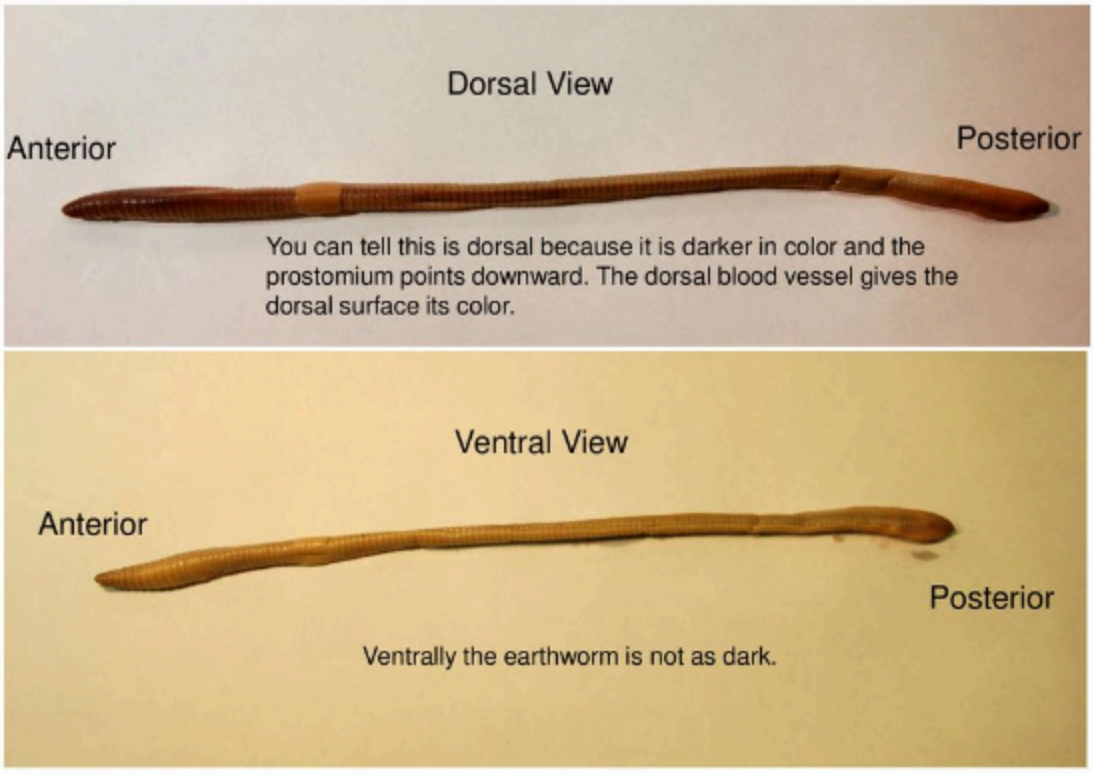
10. Locate the excretory organs called nephridia. These paired organs are found in each segment. Nephridia remove nitrogenous waste.

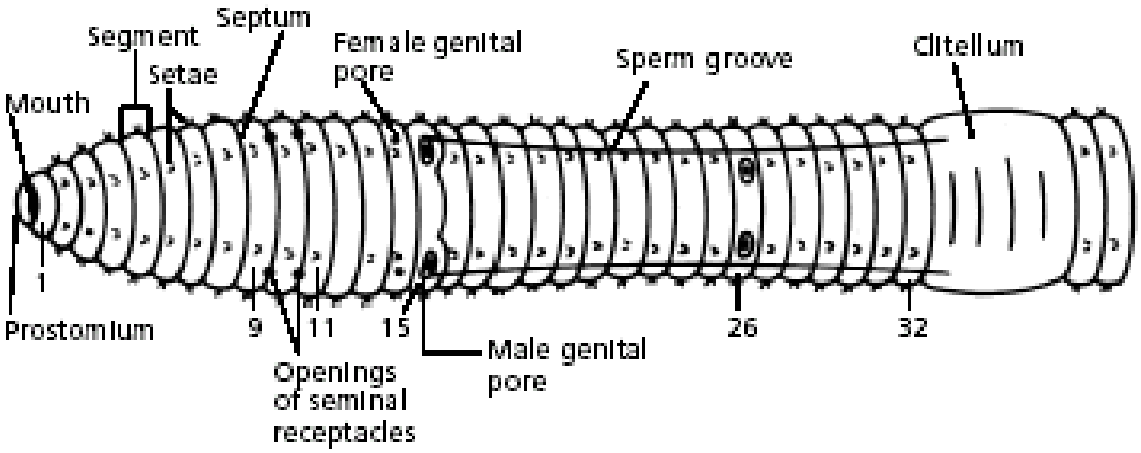
11. Earthworms are hermaphroditic, meaning they have both male and female sex organs. Locate and identify the Seminal Vesicles and Seminal Receptacles.

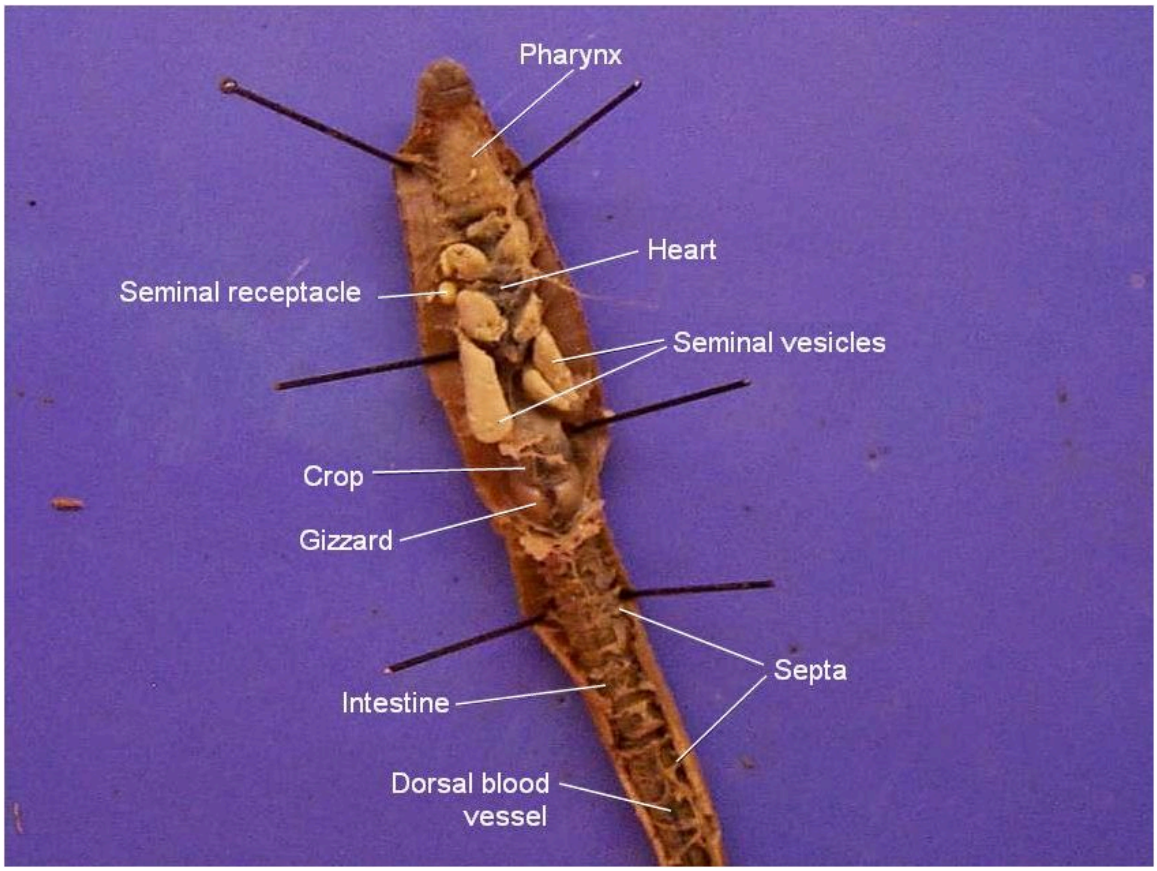
During mating, sperm from one worm travels to the seminal receptacles of another worm. Once the 2 worms have separated, fertilization of the eggs occurs in the cocoon created by the clitellum. First the cocoon is moved over the outside body wall where eggs are deposited, and then it is moved over the seminal receptacles where sperm are deposited. Fertilization occurs outside the body.

12. Once you have observed the structures of the earthworm, dispose of the specimen in accordance with local guidelines and your teacher's instructions.

Images


Dorsal View
Anterior
Posterior
You can tell this is dorsal because it is darker in color and the prostomium points downward. The dorsal blood vessel gives the dorsal surface its color.
Ventral View
Anterior
Posterior
Ventrally the earthworm is not as dark.


Segment
Septum
Setae
Female genital pore
Sperm groove
Clitellum
Mouth
1
Prostomium
9
11
15
26
32
Openings of seminal receptacles
Male genital pore


Pharynx
Heart
Seminal receptacle
Seminal vesicles
Crop
Gizzard
Septa
Intestine
Dorsal blood vessel

Post Lab Reflections

1. Describe the adaptations that earthworms have made to become a sustainable organism within soil ecosystems.

2. Describe four specific ways which earthworms influence soil ecosystems.