

# CONCEPT MAP

# EARTHWORM

*Pheretima posthuma* or Indian Earthworm belongs to Phylum Annelida of Kingdom Animalia. It is terrestrial, living in burrows made in moist soil. It feeds on dead and decaying organic matter present in soil. Earthworm possesses great power of regeneration.

## ANATOMY

### Body wall

- Body wall consists of **cuticle, epidermis, muscular layer** and **parietal peritoneum**.
- Cuticle is thin, delicate, non-cellular and chitinous.
- Epidermis lies beneath cuticle and consists of **supporting cells, glandular cells, basal cells, receptor cells** and **setal cells**.
- Muscular layer consists of an outer layer of **circular muscles** and inner layer of **longitudinal muscles**.
- Parietal peritoneum is the innermost layer of body wall and forms outer boundary of coelom. It secretes **coelomic fluid**.

### Coelom

- It is the space between the body wall and alimentary canal formed by splitting of embryonic mesoderm (**schizocoelom**). It is lined externally by the parietal peritoneum and internally by visceral peritoneum. It is filled with coelomic fluid.
- It is not a continuous cavity but is divided into compartments by transverse partitions called **septa**.
- Coelom consists of **phagocytes, circular cells, chloragogen cells** (excretory) and **mucocytes**.

### Digestive system

- Alimentary canal is **complete** and **straight tube**.
- It is functionally regionated into various parts viz. buccal cavity, pharynx, oesophagus, gizzard, stomach, intestine and anus.
- Mouth** leads to buccal cavity which extends from 1<sup>st</sup> to 3<sup>rd</sup> segment.
- Oesophagus** extends from 5<sup>th</sup> to 7<sup>th</sup> segment and is dilated into **gizzard** in 8<sup>th</sup> segment.
- Stomach** extends from 9<sup>th</sup> to 14<sup>th</sup> segment.
- Intestine** is distinguished into **pretyphlosolar** region (15<sup>th</sup>-26<sup>th</sup> segment), **typhlosolar** region (from 27<sup>th</sup> segment upto 25 segments in front of anus) and **post-typhlosolar** region (in last 23 to 25 segments).
- Digestive glands associated with alimentary canal include: **pharyngeal gland** (present in roof of pharynx and secretes saliva), **glandular cells** of gastric epithelium and **intestinal epithelium**.

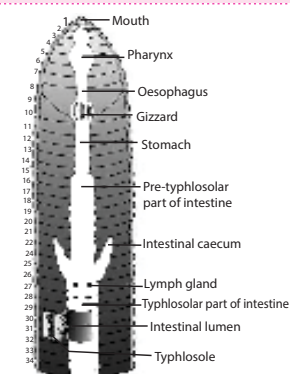
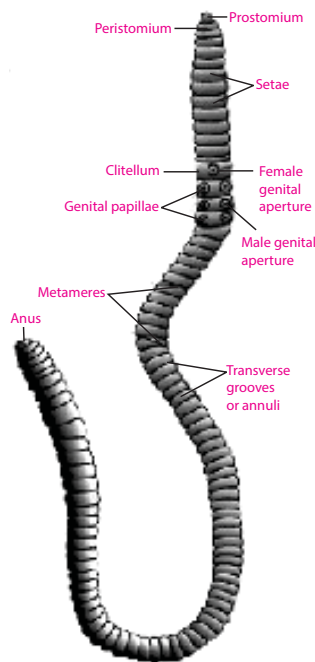


Fig.: Alimentary canal of earthworm



## MORPHOLOGY

- Earthworm is bilaterally symmetrical, body is pointed in front and blunt behind.
- Mature worm measures about **150 mm** in length and **3 to 5 mm** in width.
- Body glistening deep brown or clay coloured (due to presence of **porphyrin** pigment in body wall).
- Dorsal surface carries a dark median line which is actually dorsal blood vessel beneath the skin.
- Body divided into 100-120 similar segments called **metameres** or **somites**.
- External segmentation corresponds with internal segmentation (**metamerism**).
- The first segment of body is termed as **peristomium** which bears **prostomium** anteriorly.
- Clitellum** (circular band of glandular tissue) is found from 14<sup>th</sup> to 16<sup>th</sup> segments. Due to its presence, body is differentiated into **pre-clitellar, clitellar** and **post-clitellar** regions.
- Except the first, last and clitellar segments, each segment bears a ring of tiny curved, chitinous structures called **setae** or **chaetae**. Peristomium encloses a crescent shaped mouth and anus is situated in anal segment or **pygidium**.
- Female genital pore is situated on ventral surface of 14<sup>th</sup> segment. A pair of male genital pores lies on the ventral surface of 18<sup>th</sup> segment. Two pairs of **genital papillae** are present on the ventral surface of 17<sup>th</sup> and 19<sup>th</sup> segment (one pair in each segment). Four pairs of **spermathecal pores** are situated ventro-laterally in the intersegmental grooves of segments 5/6, 6/7, 7/8 and 8/9. **Nephridiopores** are scattered irregularly all over the body surface except first two segments.
- Dorsal pores** located mid-dorsally one in each intersegmental groove, behind 12<sup>th</sup> segment.

### Reproductive system

- Earthworms are **monoecious** but cannot fertilise their own eggs as they are **protandrous**.
- Male reproductive system**: It includes **testes, testes sacs, seminal vesicles, vasa deferentia, prostate glands** and **accessory glands**.
- Testes are 2 pairs (one in 10<sup>th</sup> and other in 11<sup>th</sup> segment) lying ventro-laterally beneath the alimentary canal, on either side of nerve cord. They produce spermatozoa.
- Each testis sac of 10<sup>th</sup> segment encloses a testis and a spermiducal funnel. Each testis sac of 11<sup>th</sup> segment encloses a testis, a seminal vesicle and a spermiducal funnel.
- Seminal vesicles are two pairs and receive spermatozoa produced by testes through testis sac. They help in maturation of spermatozoa.
- Vasa deferentia help in conduction of sperms.
- A pair of prostate glands are situated on either side of intestine and extend from 17<sup>th</sup> to 20<sup>th</sup> segment, their secretion serves as a medium for transfer of sperms.
- Accessory glands are present in 17<sup>th</sup> and 19<sup>th</sup> segments and open to exterior by genital papillae.
- Female reproductive system**: It consists of **ovaries, oviducts** and **spermathecae**.
- A pair of ovaries are attached to the posterior surface of septum present between 12<sup>th</sup> and 13<sup>th</sup> segments. They produce ova. Oviducts are two short tubes each lying immediately behind respective ovary and open to outside by female genital pore.
- Four pairs of spermathecae open to outside through spermathecal pores situated ventro-laterally. They store sperms received from other earthworm during copulation.

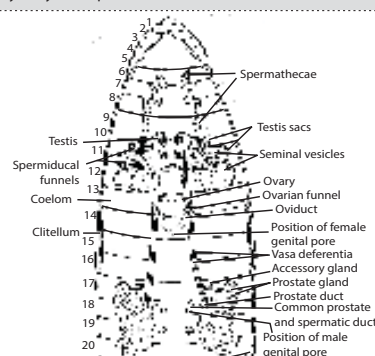


Fig.: Reproductive system of earthworm

### Blood vascular system

- It is of **closed type**.
- Blood is composed of blood plasma containing respiratory pigment **haemoglobin** and blood corpuscles (**leucocytes**).
- Blood vessels include **dorsal** blood vessel, **ventral** blood vessel, **sub-neural** blood vessel, **lateral oesophageal** blood vessels and **supra-oesophageal** blood vessel.
- Four pairs of tubular hearts are present. These are provided with valves. Anterior 2 pairs of hearts are known as **lateral hearts** and posterior 2 pairs of hearts are called **lateral-oesophageal** hearts.
- Spherical masses called **blood glands** are situated in 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> segments which produce blood corpuscles and haemoglobin.

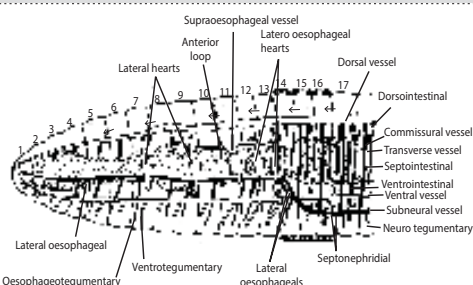


Fig.: Circulatory system of earthworm

### Excretory system

- Earthworms are both **ammonotelic** and **ureotelic**.
- Nephridia perform the function of excretion and osmoregulation.
- According to their location nephridia are: **septal, pharyngeal** and **integumentary**.
- Septal nephridia** – Occur in 15<sup>th</sup> segment onward. They are attached to septa and open internally, having **nephrostome**. Vary from 80-100 per segment and are largest in size. Enteronephric and remove metabolic wastes from blood and coelomic fluid.
- Pharyngeal nephridia** – Occur in segments 4, 5 and 6. Lie on sides of gut in 3 paired groups. Closed internally, without nephrostome. Enteronephric and remove metabolic wastes from blood only.
- Integumentary nephridia** – Occur in all segments except first two. Attached to body wall. Closed internally without nephrostome. Smallest in size, **ectonephric** and remove wastes from blood only.
- In addition, **chloragogen cells** also serve the function of excretion.

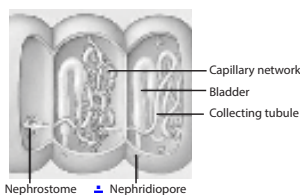


Fig.: Septal nephridium of earthworm

### Nervous system

- Nervous system is well developed and consists of central, peripheral and autonomic nervous system.
- Central nervous system comprises of **supra-pharyngeal** (cerebral) **ganglia**, a pair of **peripharyngeal connectives**, a pair of **sub-pharyngeal ganglia** and **ventral nerve cord**. Ventral nerve cord has segmental ganglia.
- Nerves arising from the central nervous system and supplying various body parts constitute peripheral nervous system.
- Autonomic nervous system consists of an extensive nerve plexus situated beneath epidermis, within the muscles of body wall and on alimentary canal.
- Various receptors include tactile receptors, buccal receptors (chemo-receptors), photoreceptors.

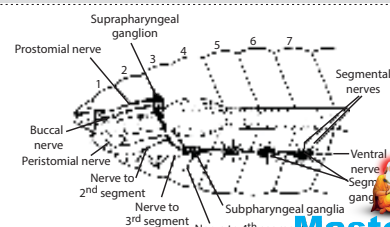


Fig.: Nervous system of earthworm