Chapter 4: Triploblastics Coelomates Protostomes Metazoans: Annelids

Presented by Pr. SOUTTOU Karim

Course of Zoology

1- General characteristics:

- Protostomes Triploblastics Coelomates Metazoans, Hyponeuriens (ventral nerve cord with ganglia).

- Free or parasite.

- Bilaterally symmetrical.

- Corps divided into 3 parts: Head, soma, pygidium.

- Body metameric.

- Digestif system complete.

Phylum Annelida

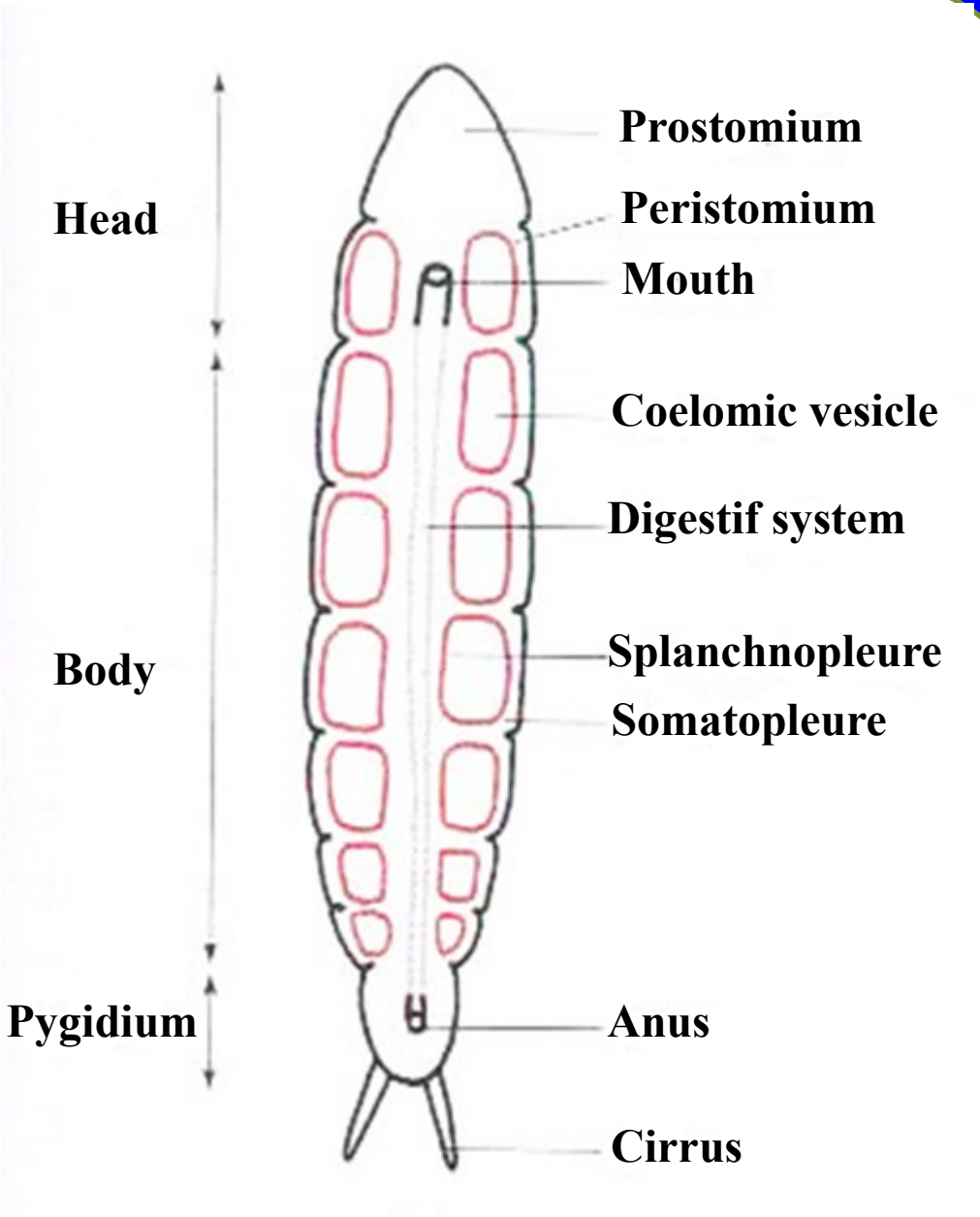
Class 1: Polychaeta (Poly: many; chaite: hair

Class 2: Oligochaeta (Oligo: few; chaite: hair

Class 3: Achaeta (A :absence; chaite :hair

I. – Phylum Annelida

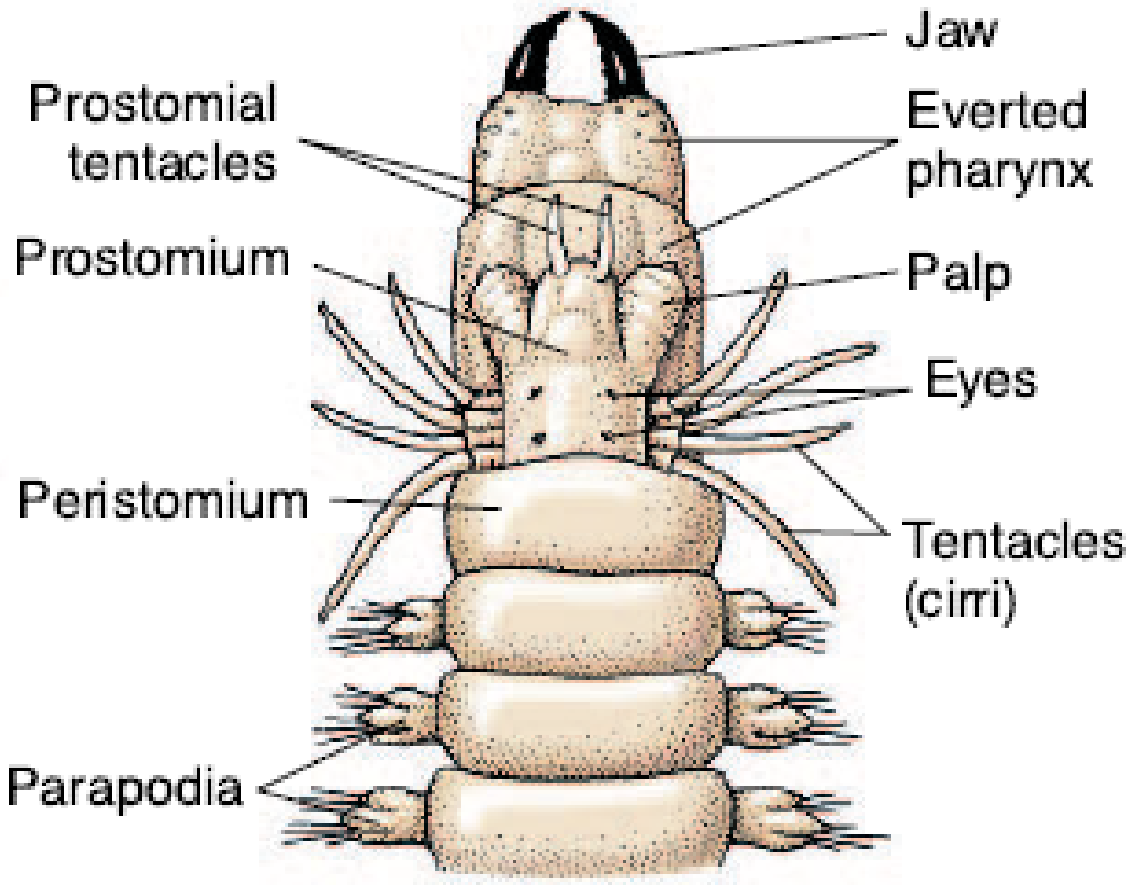
1. – Class 1 : Polychaeta



Body of Polychaeta

I. – Phylum Annelida

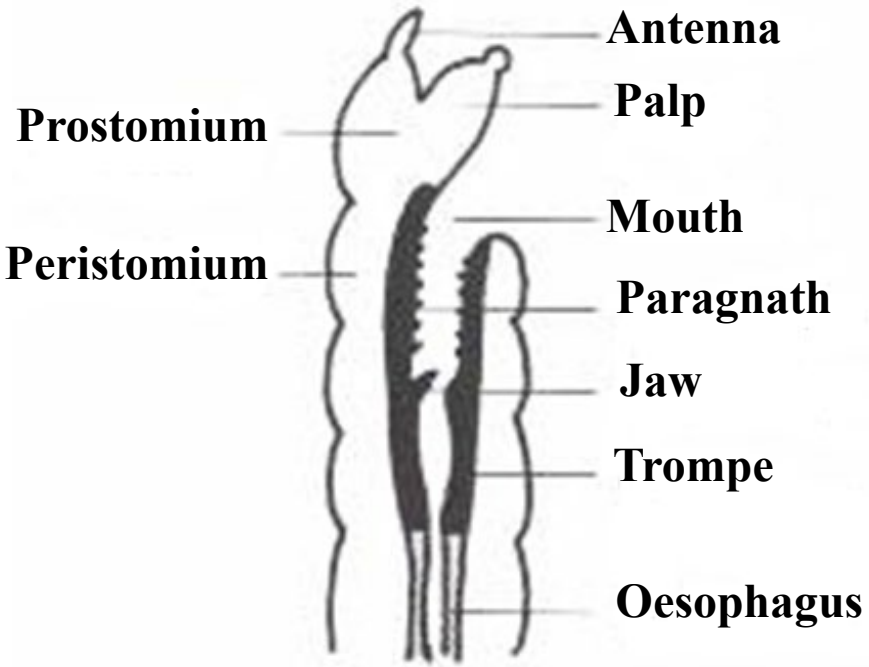
1. – Class 1 : Polychaeta



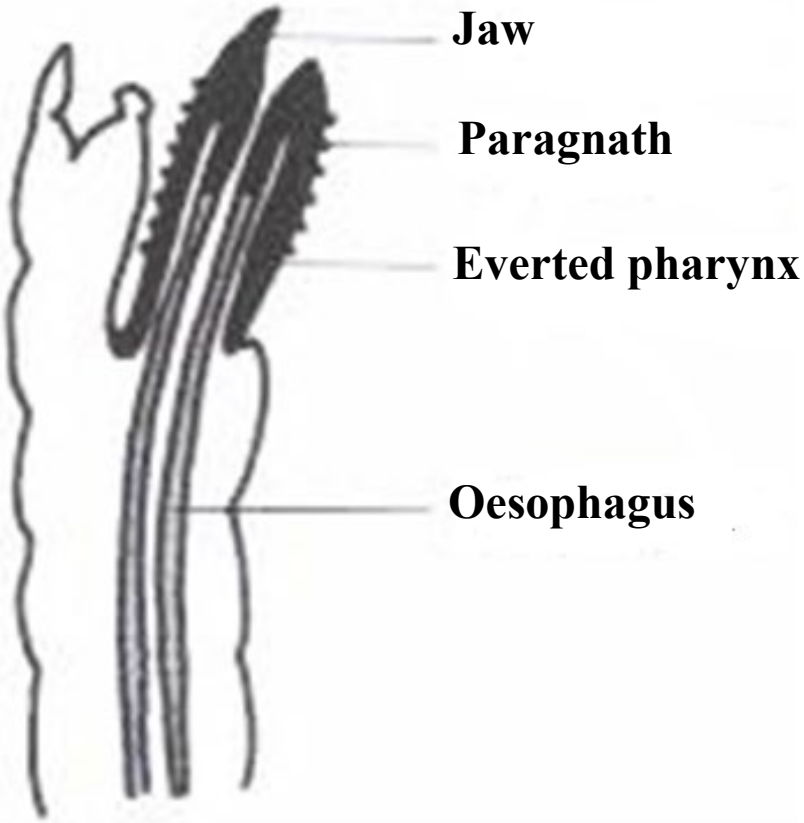
Anterior end with pharynx everted of Polychaeta

I. – Phylum Annelida

1. – Class 1 : Polychaeta



Everted trompe at rest



Everted trompe in activity

I. – Phylum Annelida

1. – Class 1 : Polychaeta

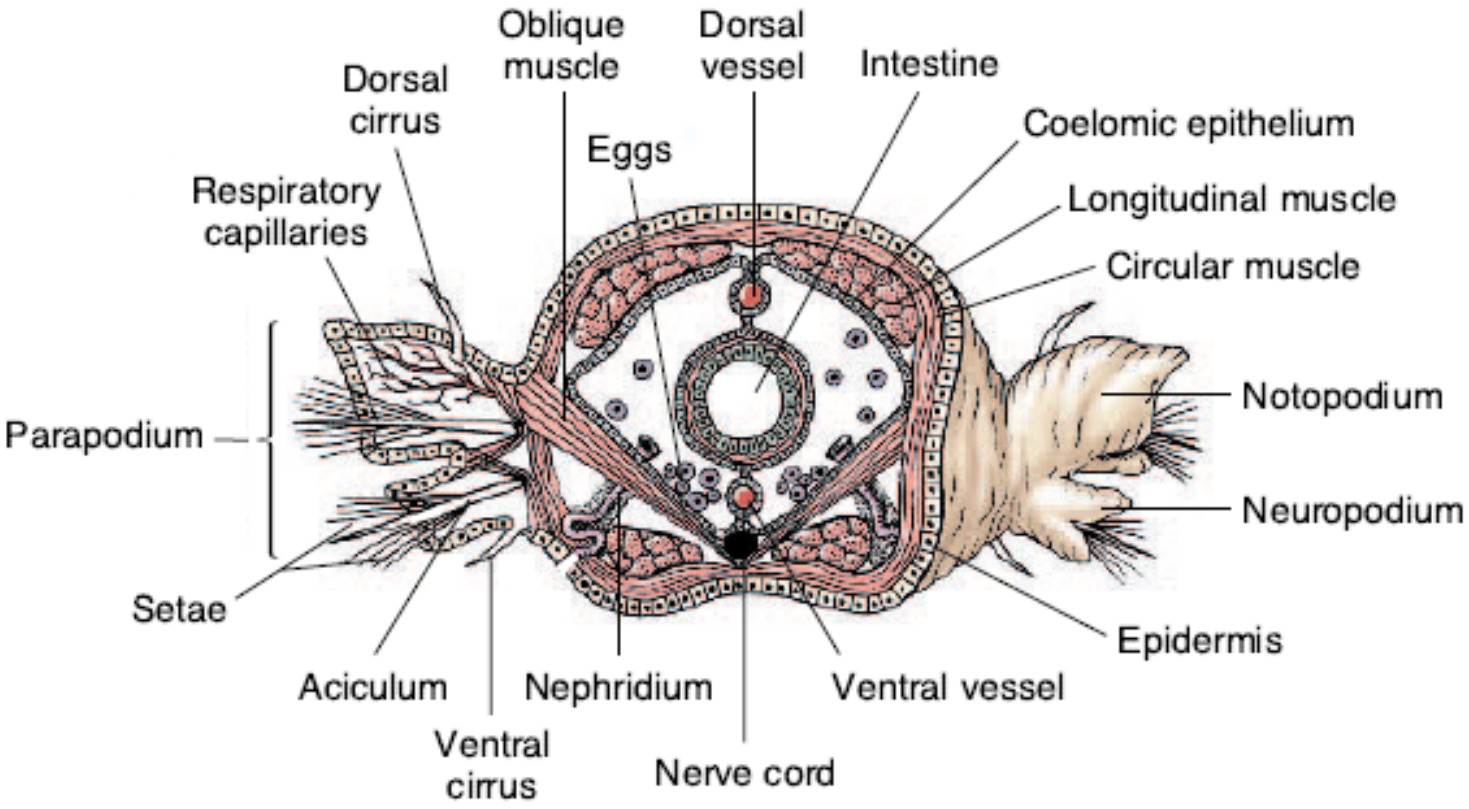


Figure: Generalized transverse section through region of the intestine

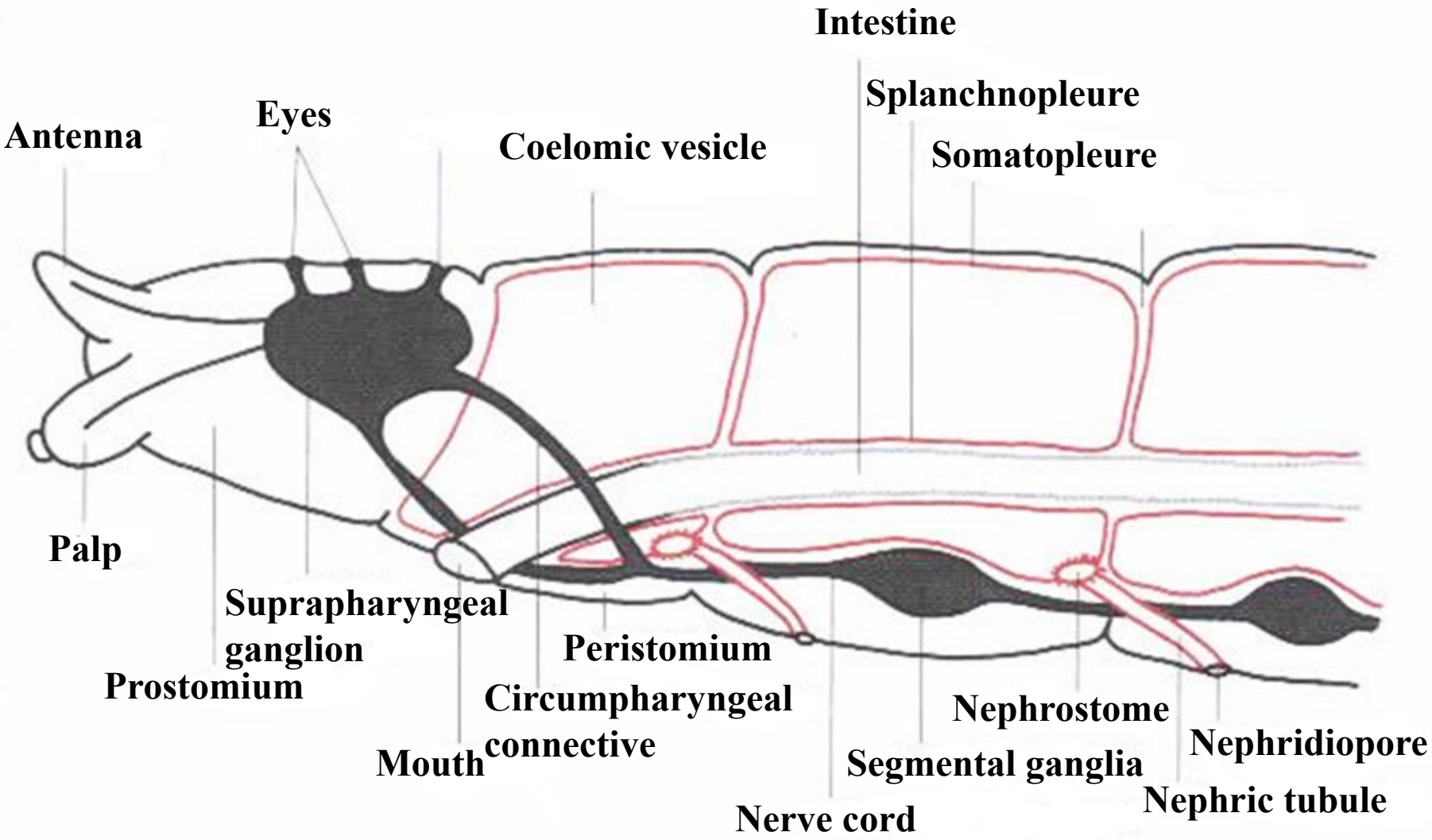


Figure: Sagittal section of anterior area of *Nereis*

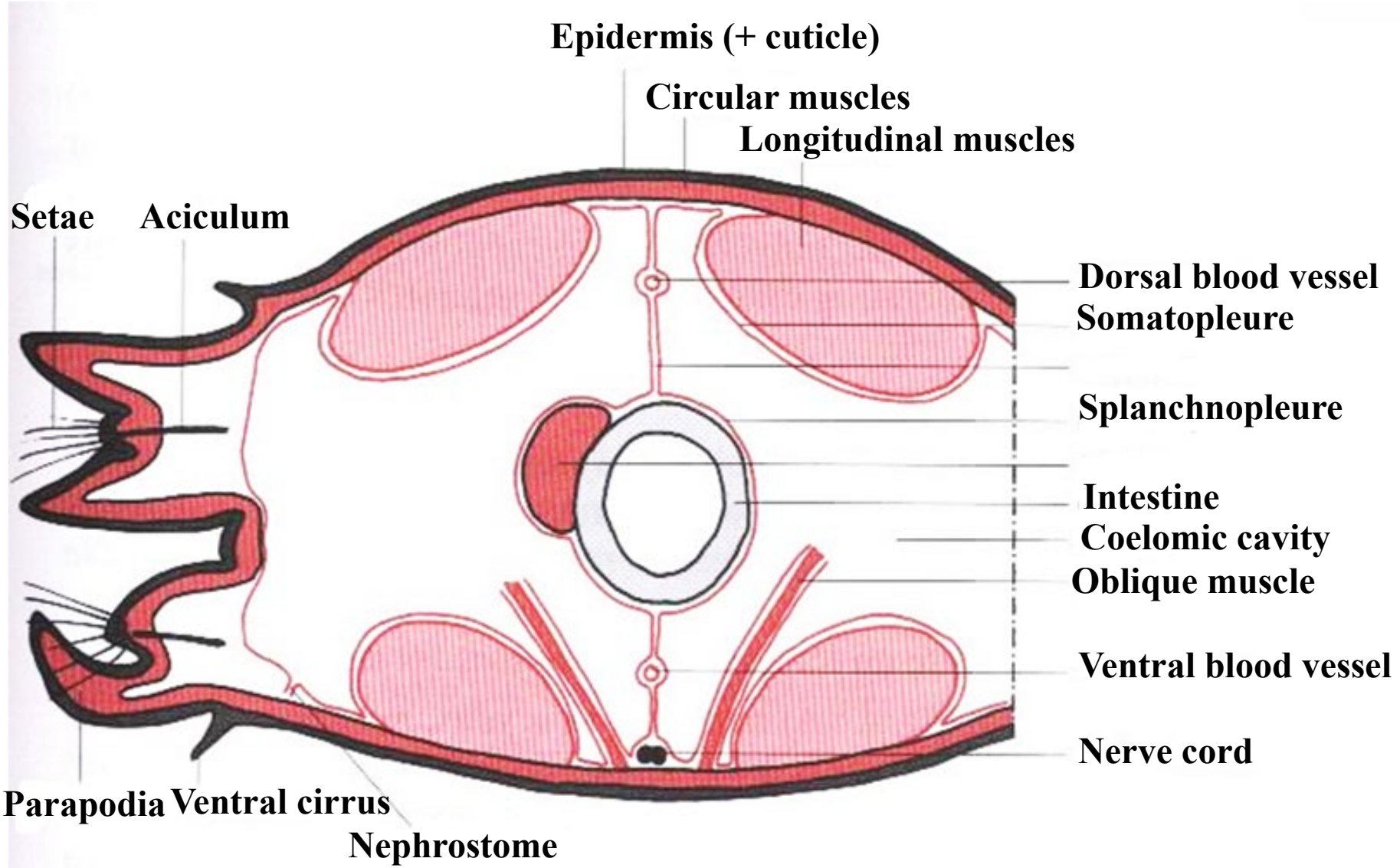


Figure: Transverse section through region of the intestine

I. – Phylum Annelida

1. – Class 1 : Polychaeta

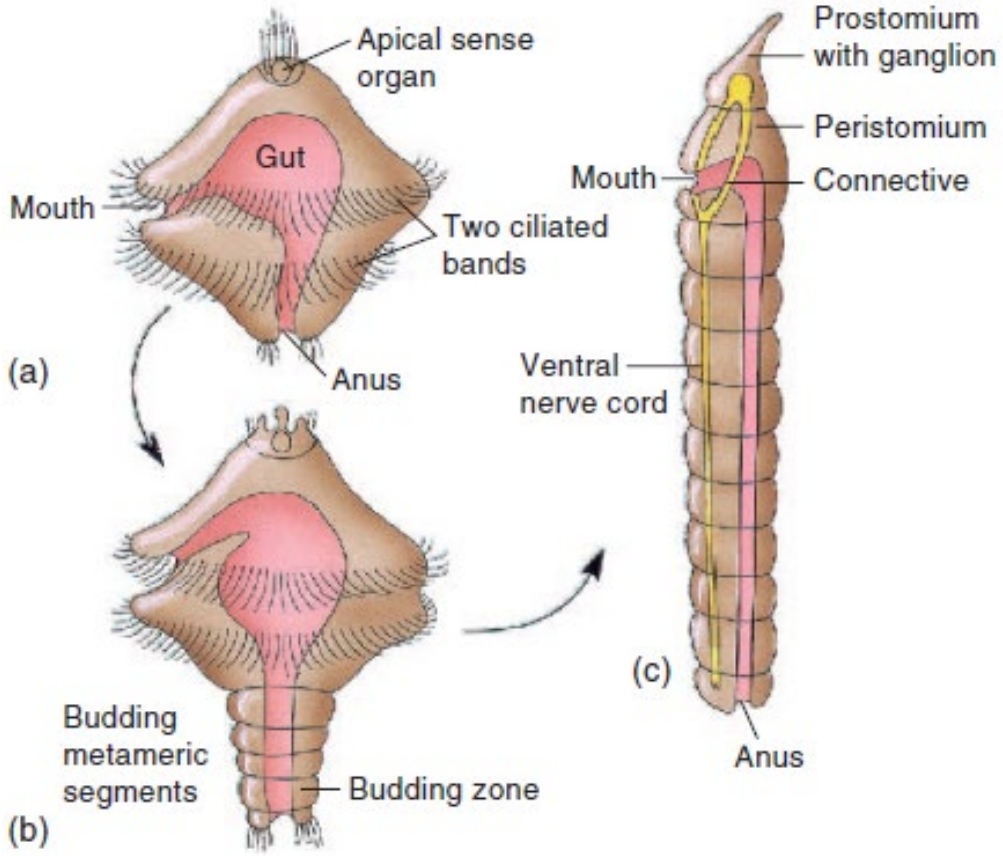


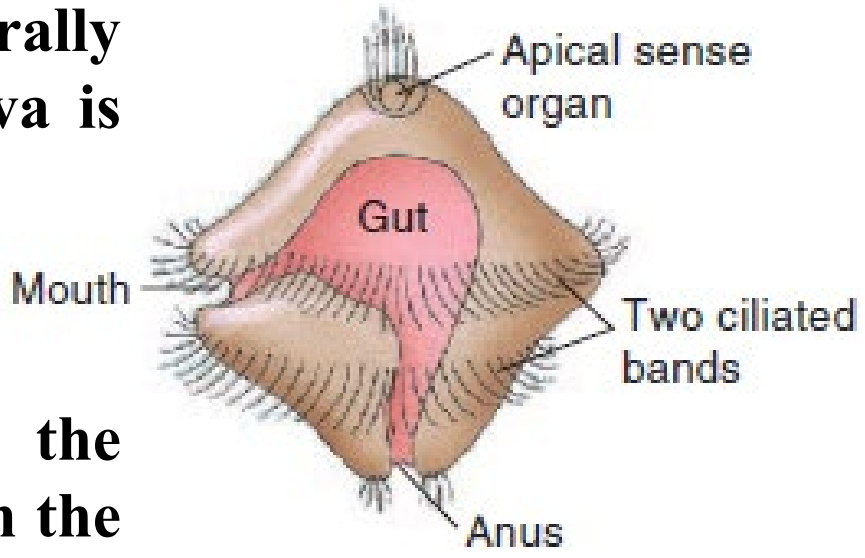
Figure: Polychaete Development. *(a)* Trochophore. *(b)* A later planktonic larva, showing the development of body segments. As more segments develop, the larva settles to the substrate. *(c)* Juvenile worm.

I. – Phylum Annelida

1. – Class 1 : Polychaeta

*The reproduction is asexual (fission, budding, breakage) and sexual. The sexes are generally separate. The trochophore larva is characteristic of Polychaetes.

*The trochophore swims in the plankton or remains enclosed in the egg where it evolves into a post-trochophore.

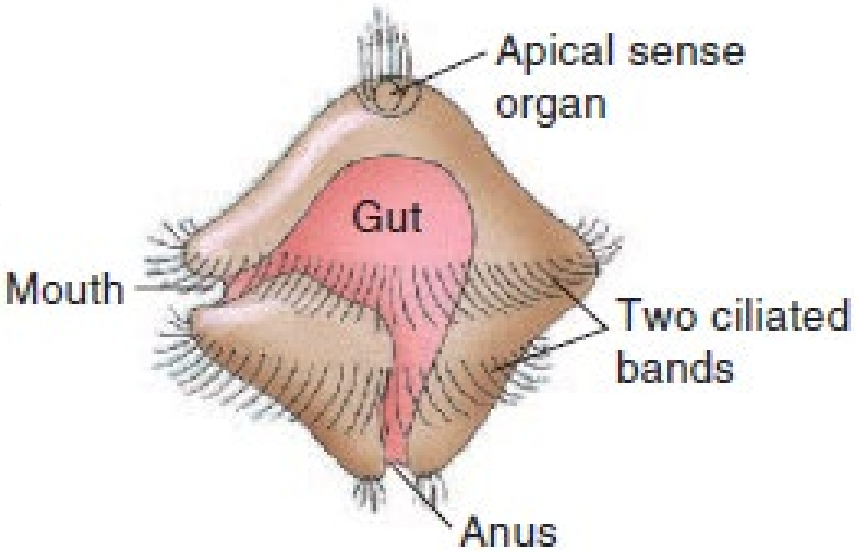


Trochophore larva

I. – Phylum Annelida

1. – Class 1 : Polychaeta

The trochophore has three ciliated bands. During its metamorphosis, the trochophore goes through a series of stages in which the organs of the larva are replaced by those of the adult.



Trochophore larva

I. – Phylum Annelida

1. – Class 1 : Polychaeta

Figure: Errantia predator Polychaete

I. – Phylum Annelida

1. – Class 1 : Polychaeta

Figure: *Arenicola marina*
Burrowing sedentary Polychaete

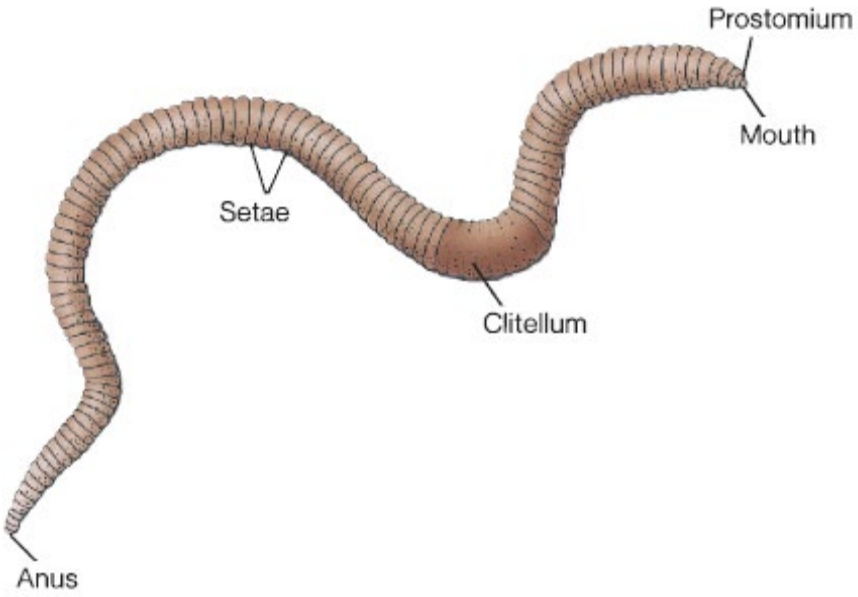
I. – Phylum Annelida

1. – Class 1 : Polychaeta

Figure: Tube-dwelling sedentary polychaete : *Sabella pavonina*

I. – Phylum Annelida

2. – Class 2 : Oligochaeta



The Oligochaetes differ from Polychaetes by the following characteristics:

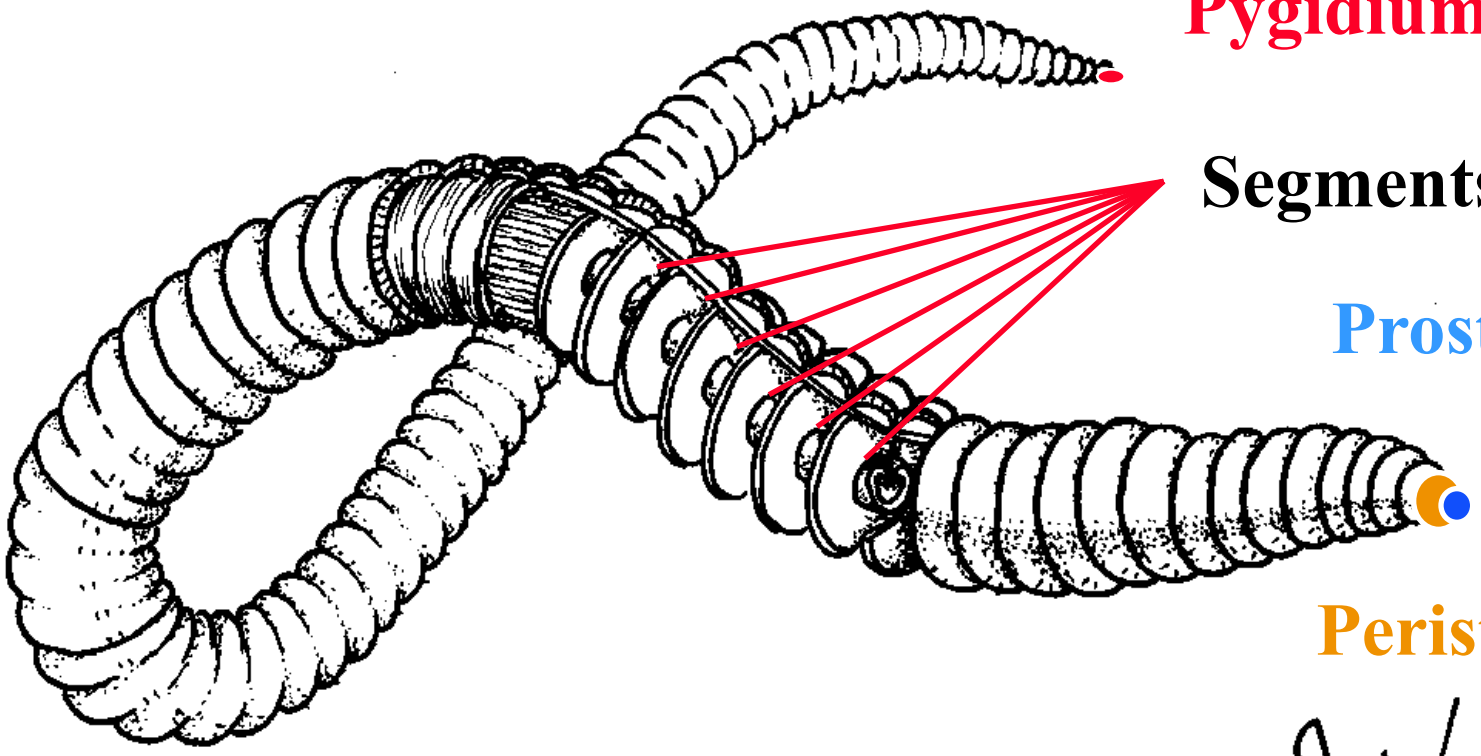
- **Absence of parapodia,**
- **Reduction of setae,**
- **No everted pharynx,**
- **Clitellum (or saddle), a glandular structure carried to sexual maturity,**
- **Hermaphroditism,**
- **Internal fertilization,**
- **Direct development (without larval stages).**

I. – Phylum Annelida

2. – Class 2 : Oligochaeta

The earthworms participate in the fertilization of the soil through their excrement composed of humus, in the aeration and permeability of the soil by creating galleries during their movement under the ground.

Segmentation



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I. – Phylum Annelida

2. – Class 2 : Oligochaeta

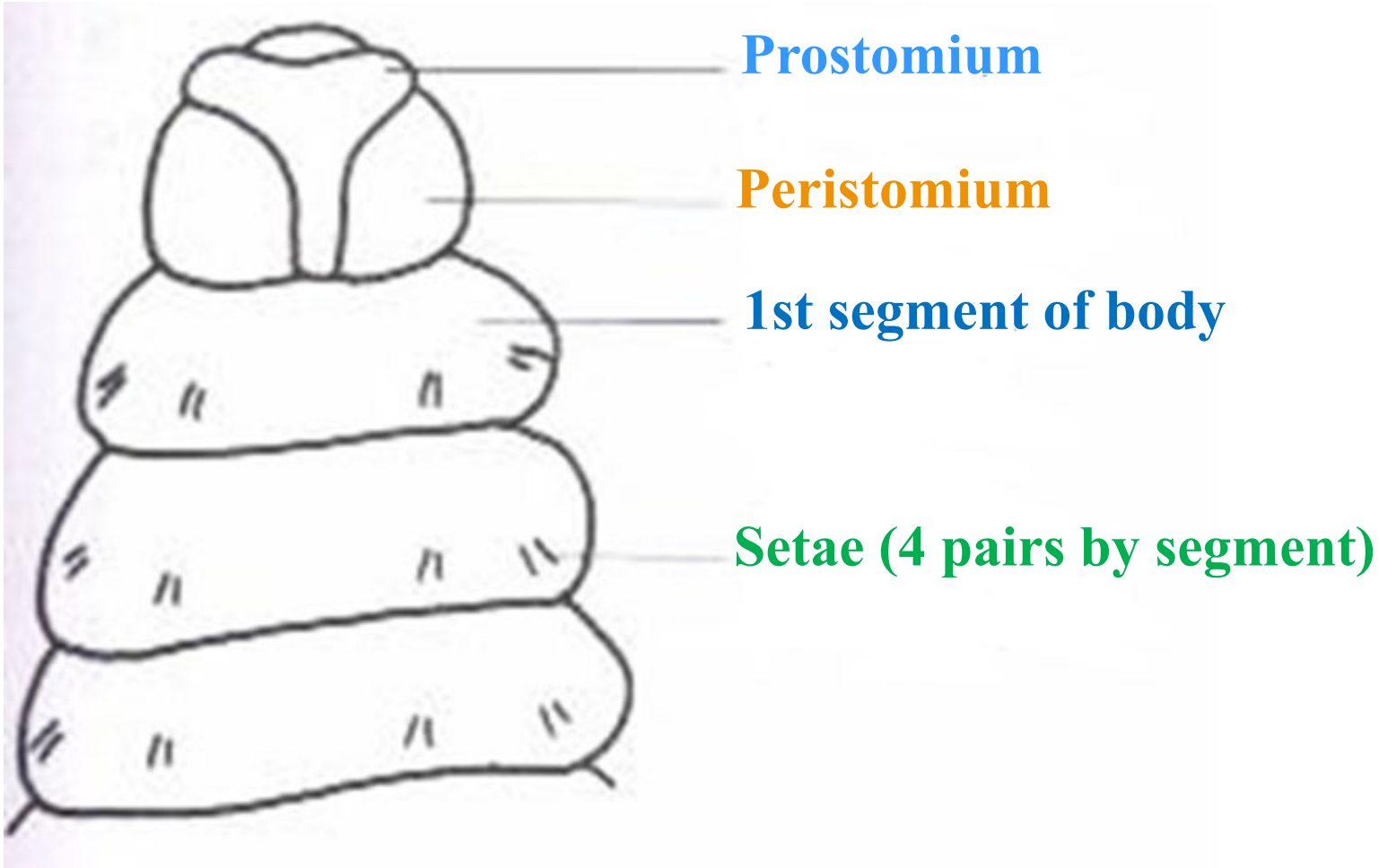


Figure: Anterior part of the body of Oligochaeta (ventral part)

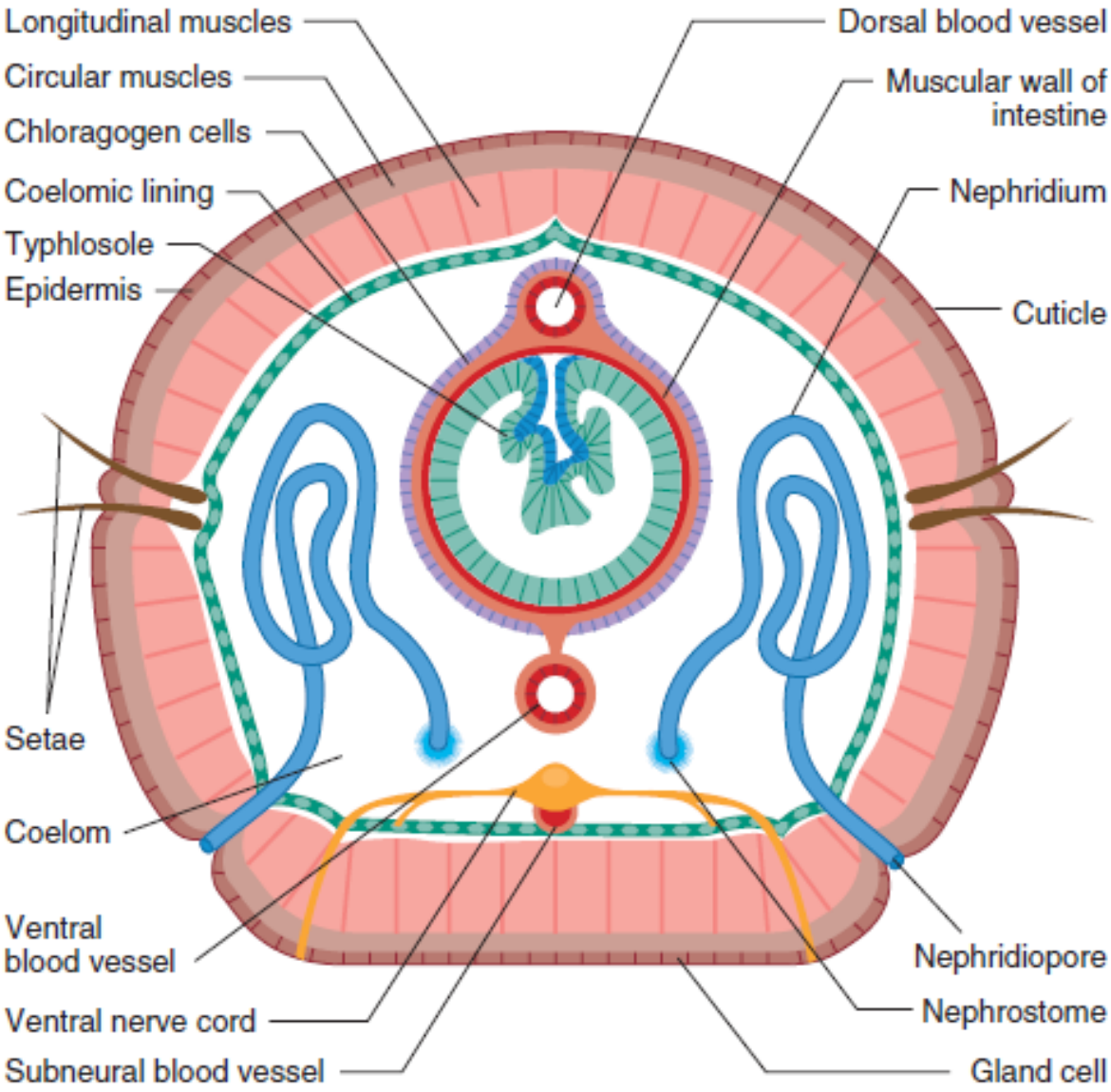


Figure: Earthworm Cross Section

I. – Phylum Annelida

2. – Class 2 : Oligochaeta

Cuticle

Circular muscles

Longitudinal muscles

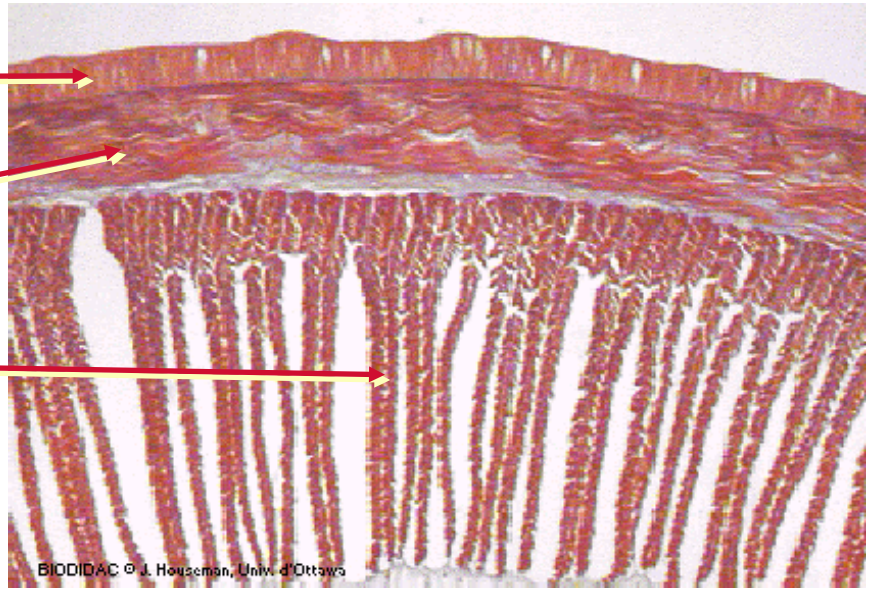


Figure: Body wall of Oilgochaeta

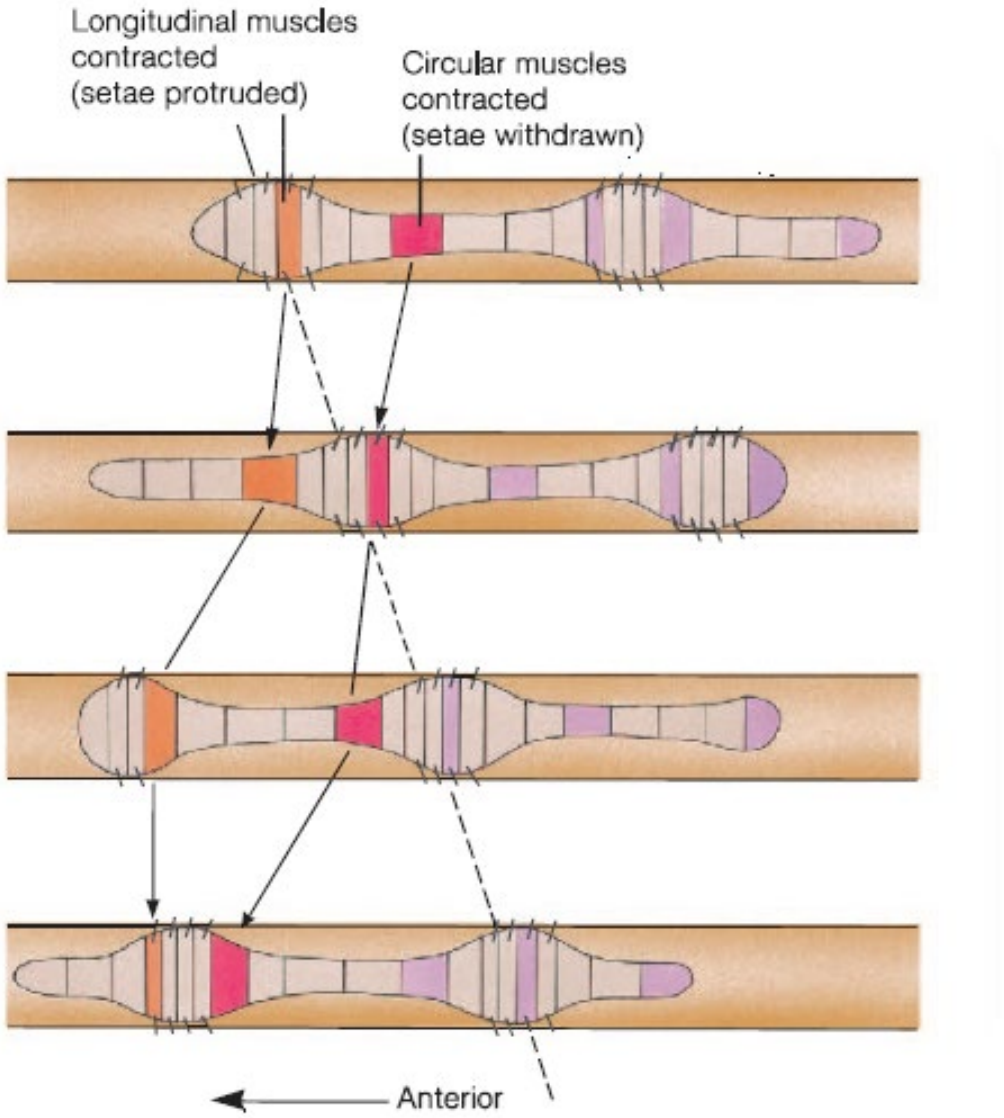
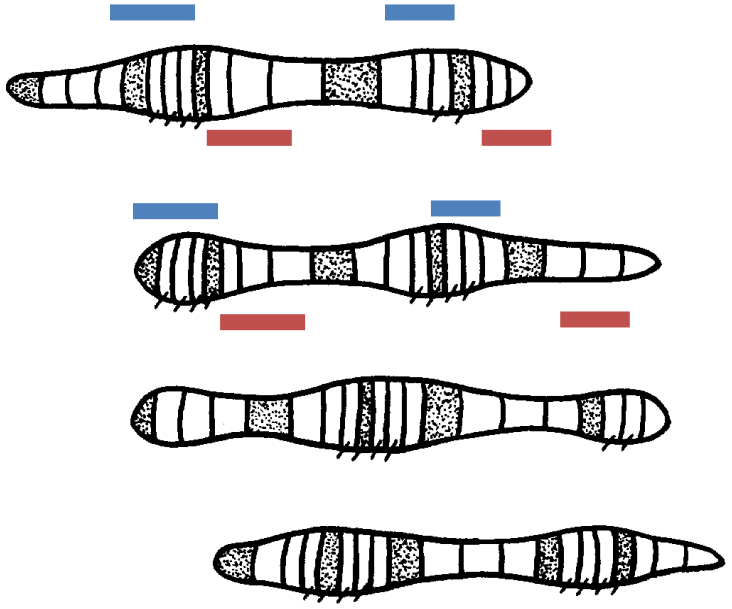


Figure: Earthworm Locomotion. Arrows designate activity in specific segments of the body, and broken lines indicate regions of contact with the substrate.

I. – Phylum Annelida

2. – Class 2 : Oligochaeta

- Longitudinal muscles contracted
- Circular muscles contracted
- Setae



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The contraction of the longitudinal and circular muscles ensures the movement by peristalsis for the earthworm. The setae also play a role in their movement.

2. – Class 2 : Oligochaeta

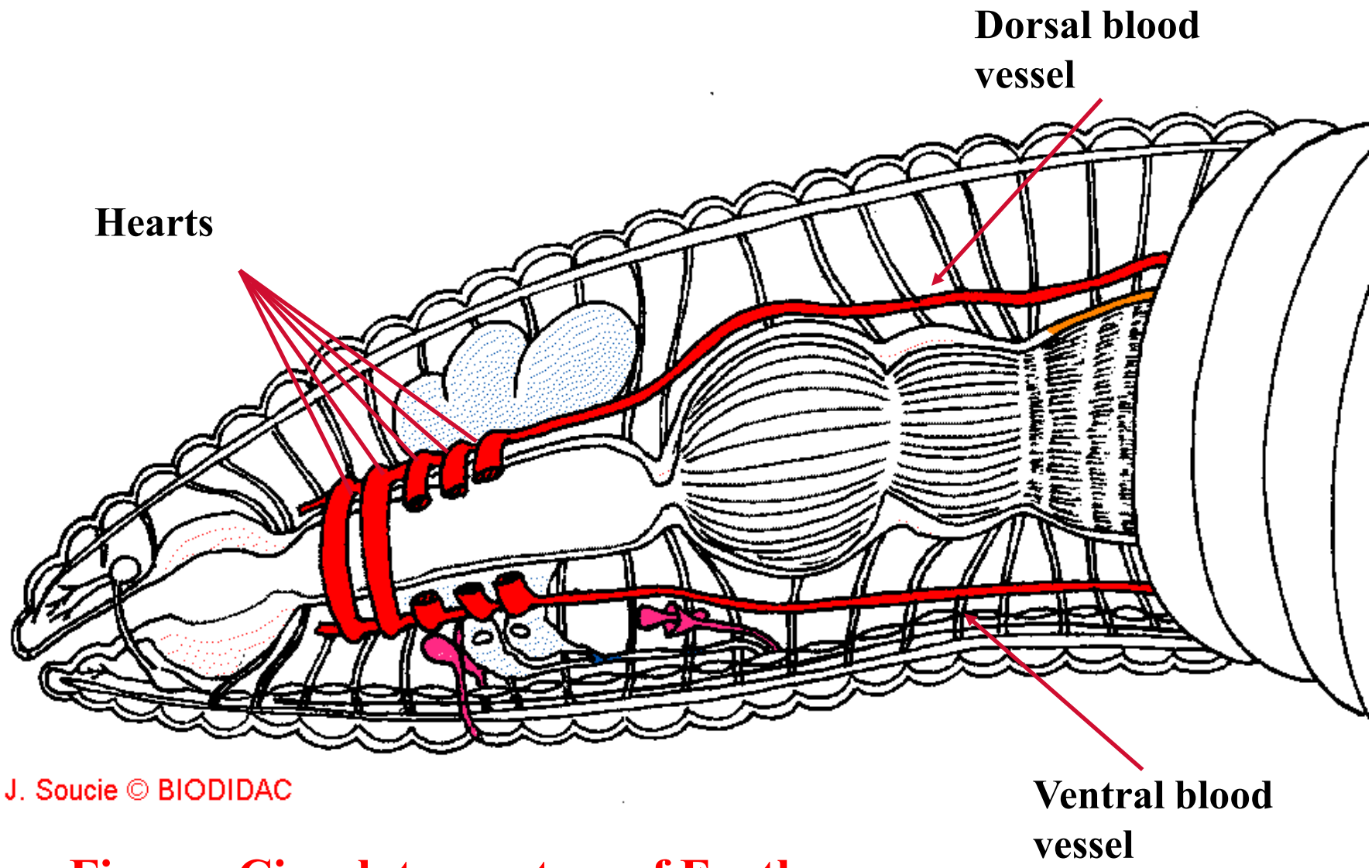


Figure: Circulator system of Earthworm

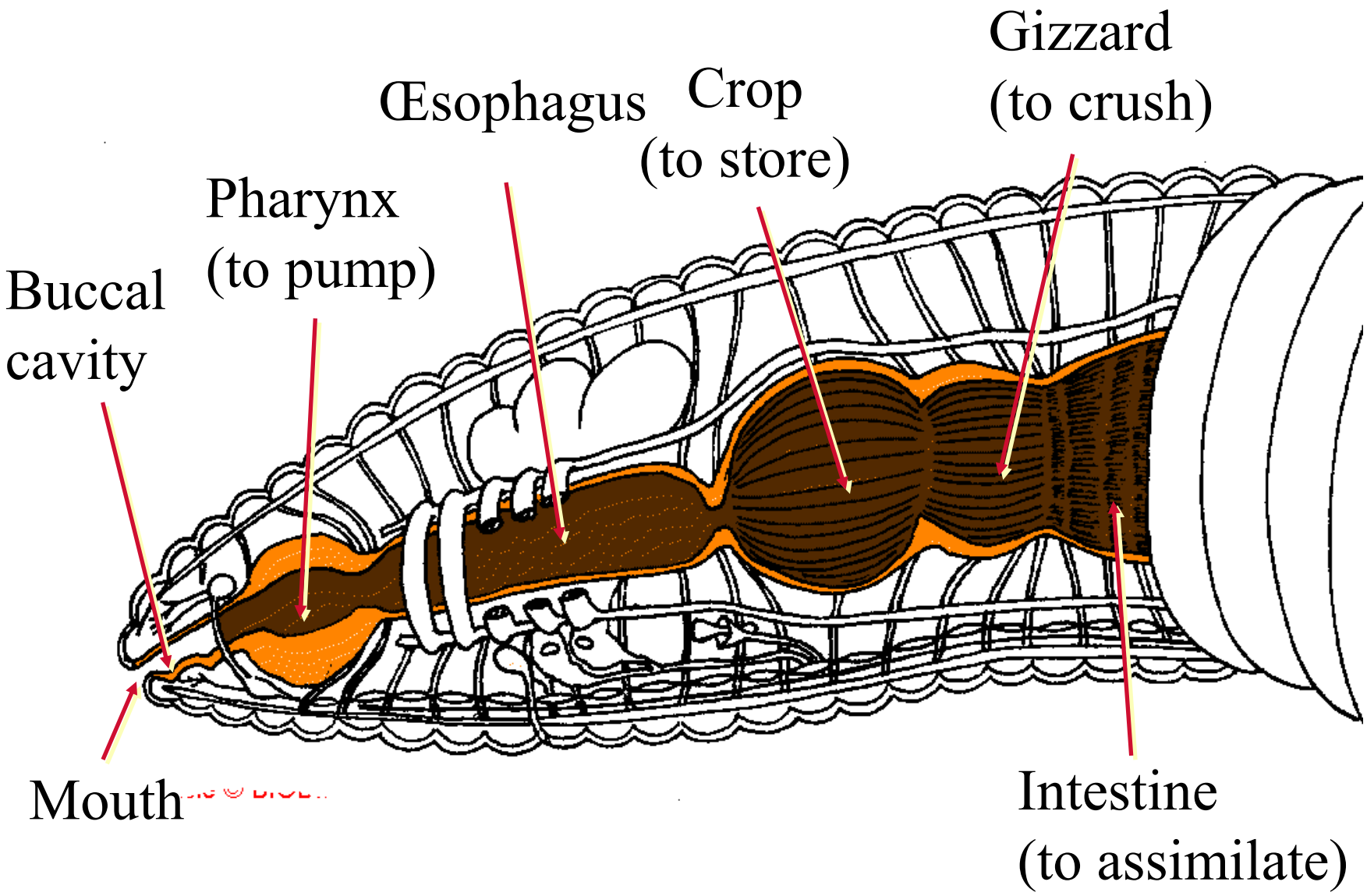


Figure: Digestif system of Earthworm

2. – Class 2 : Oligochaeta

Système excréteur

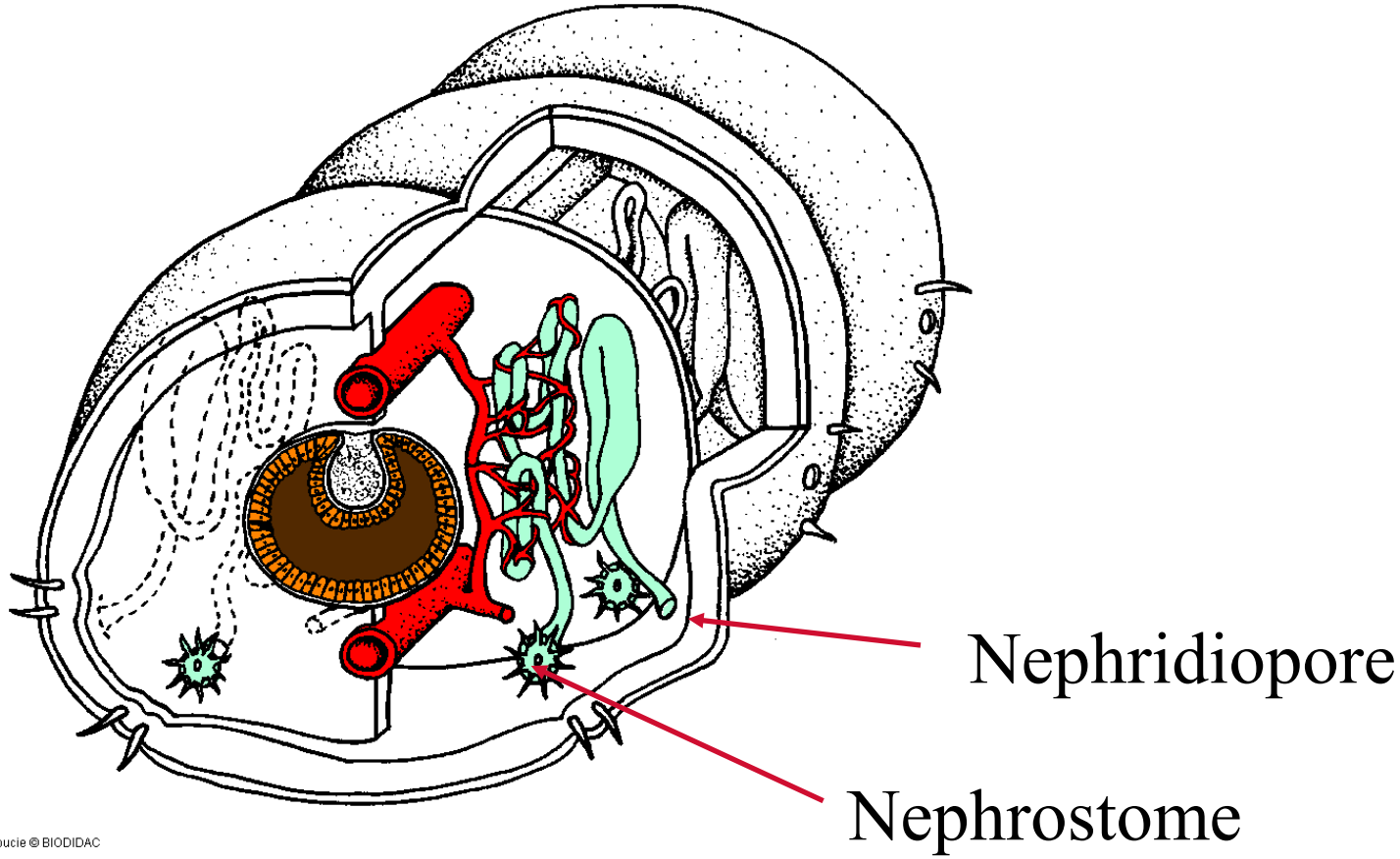


Figure: Excretory system of Earthworm

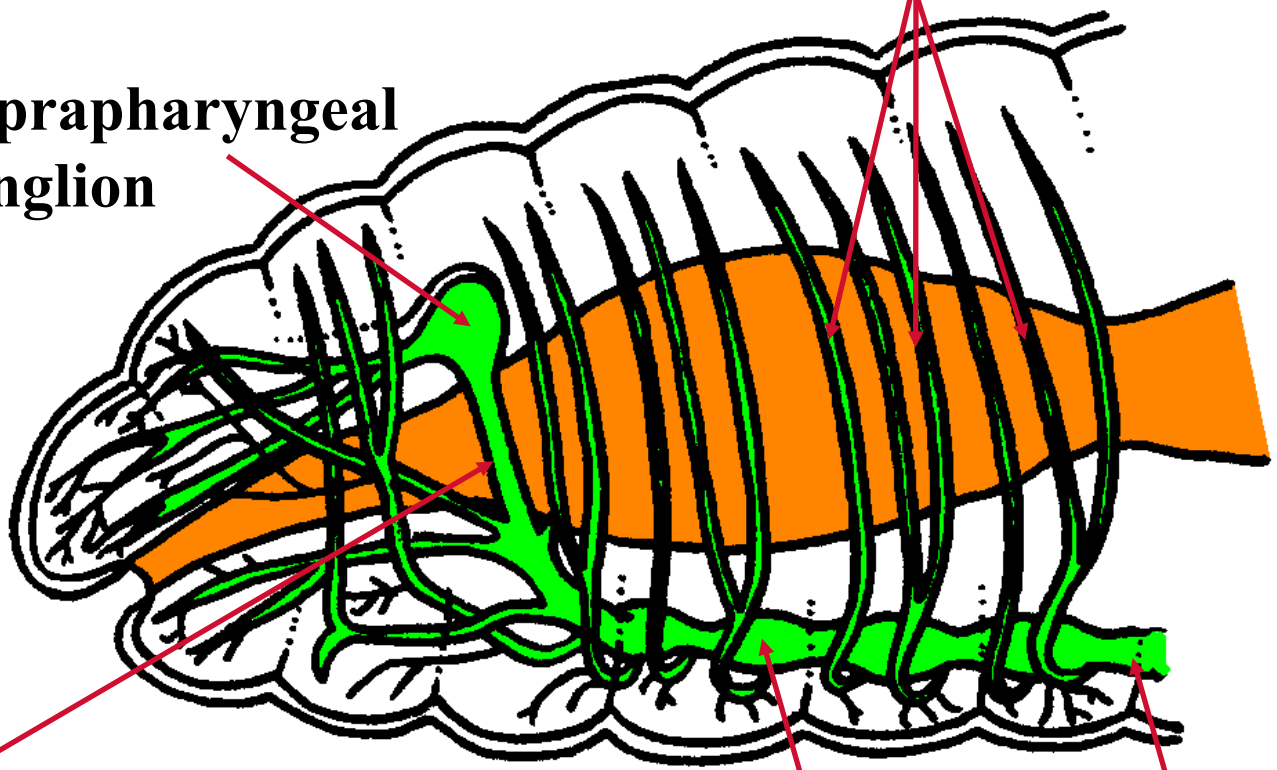


Figure: Nervous System of Earthworm

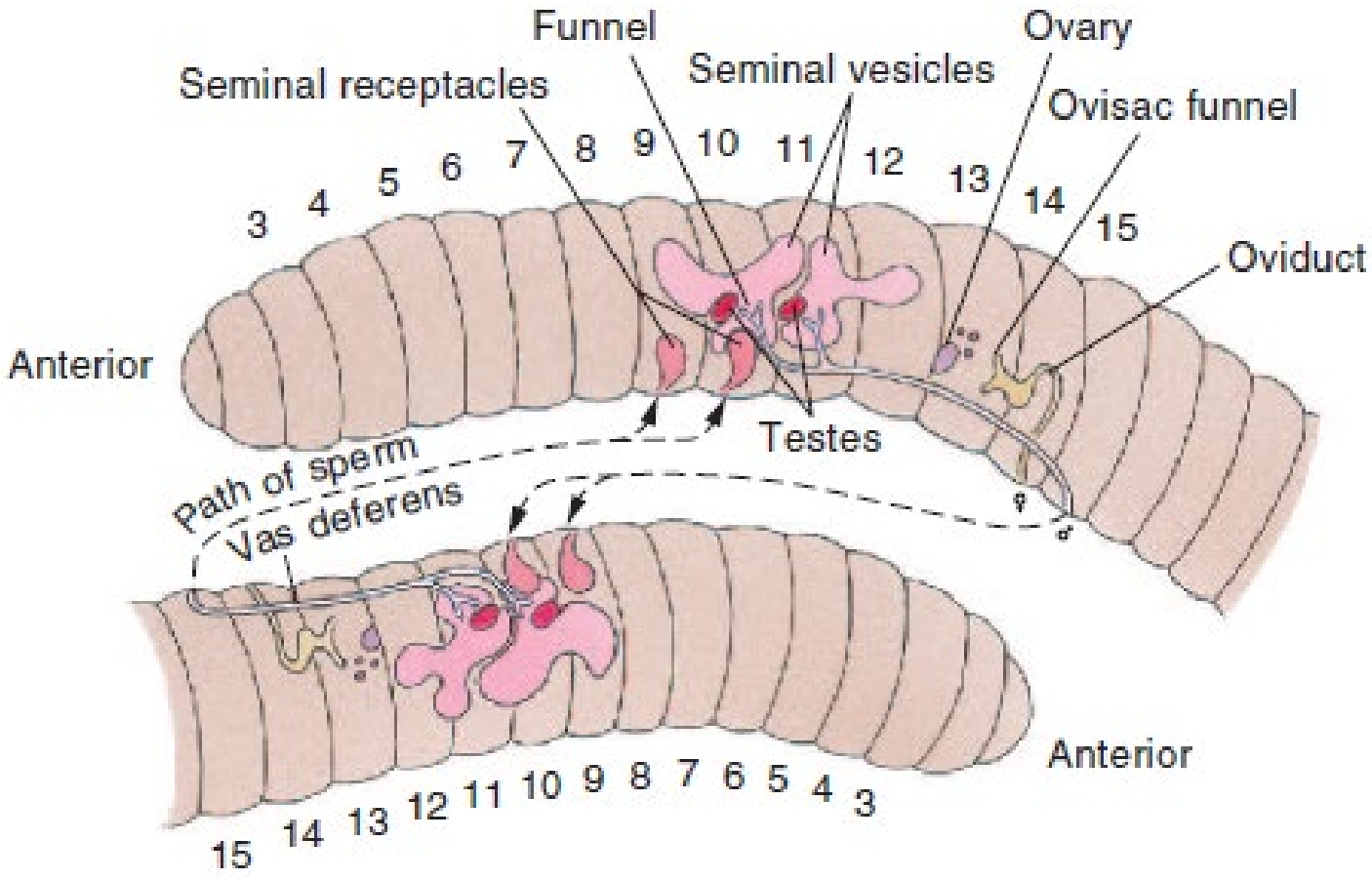
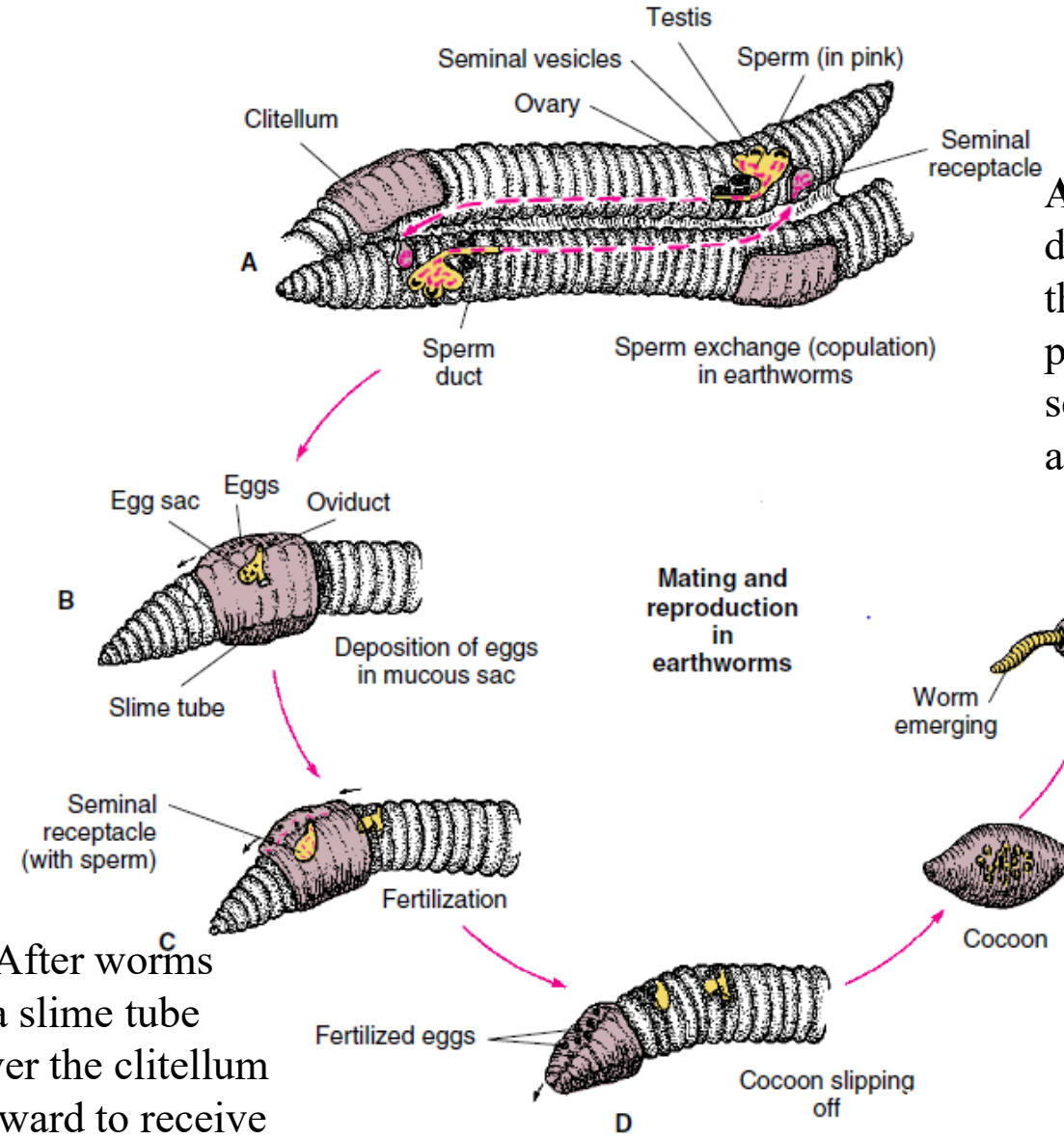


Figure: Earthworm Reproduction. Mating earthworms, showing arrangements of reproductive structures and the path sperm take during sperm exchange



A, Mutual insemination occurs during copulation; sperm from the genital pore (somite 15) pass along seminal grooves to seminal receptacles (somites 9 and 10) of each mate.

F, Young worms emerge in two to three weeks.

E, The cocoon is deposited near the burrow entrance.

B and **C,** After worms separate, a slime tube formed over the clitellum passes forward to receive eggs from oviducts and sperm from seminal receptacles.

D, As the cocoon slips off over the anterior end, its ends close and seal.

Figure: Earthworm copulation and formation of egg cocoons.

I. – Phylum Annelida

3. – Class 3 : Achaeta

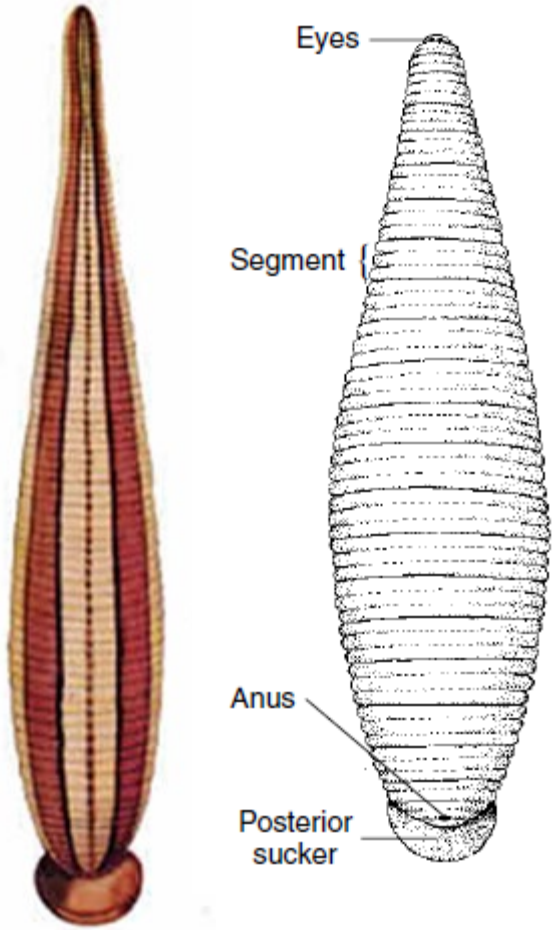
The Hirudinae differ from other Annelids by:

Ø The absence of parapodia and setae.

Ø A fixed number of segments, with a secondary external annulation.

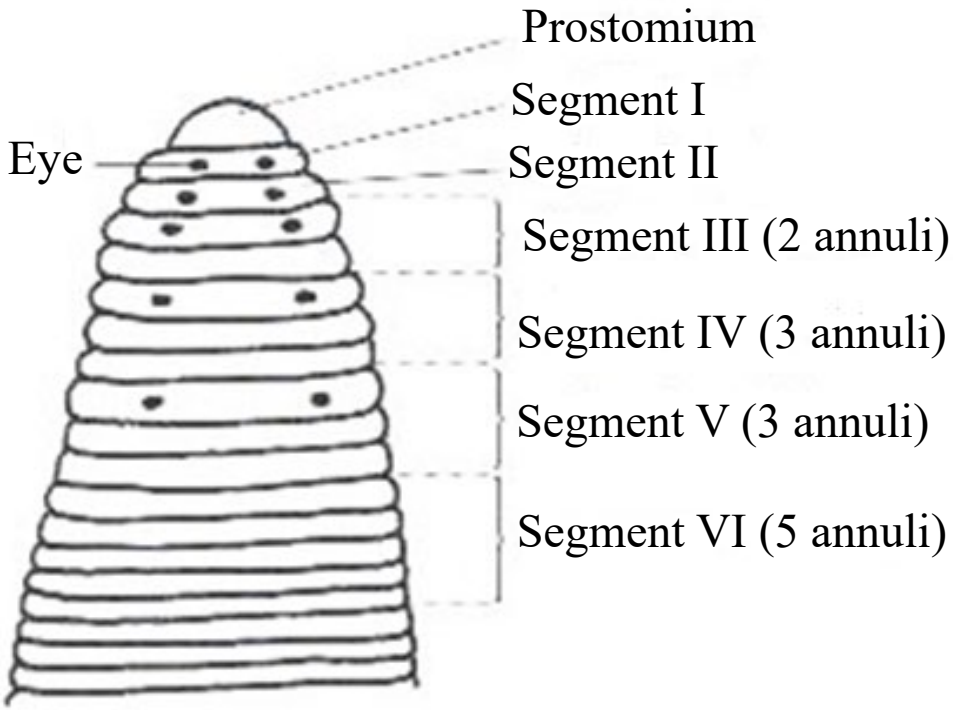
Ø Ventral suckers, at both ends of the body.

Ø A reduced coelom, filled for the most part with mesenchyme.



I. – Phylum Annelida

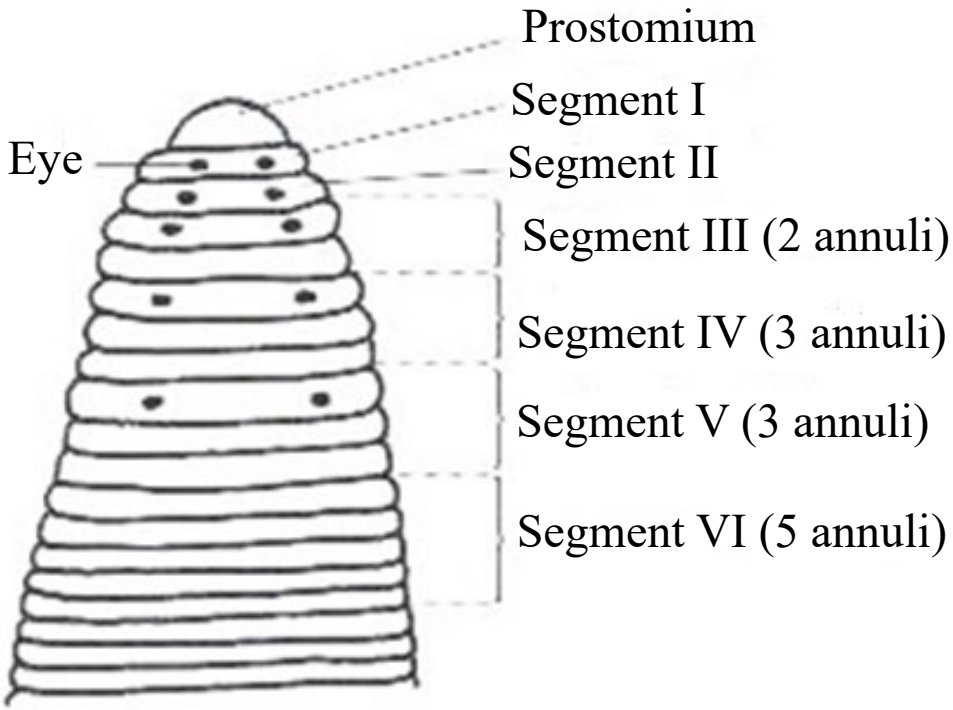
3. – Class 3 : Achaeta



The segments are 33 in number, but they are not clearly defined, due to the absence of setae and parapodia and especially because secondary segments (annuli) exist externally.

I. – Phylum Annelida

3. – Class 3 : Achaeta



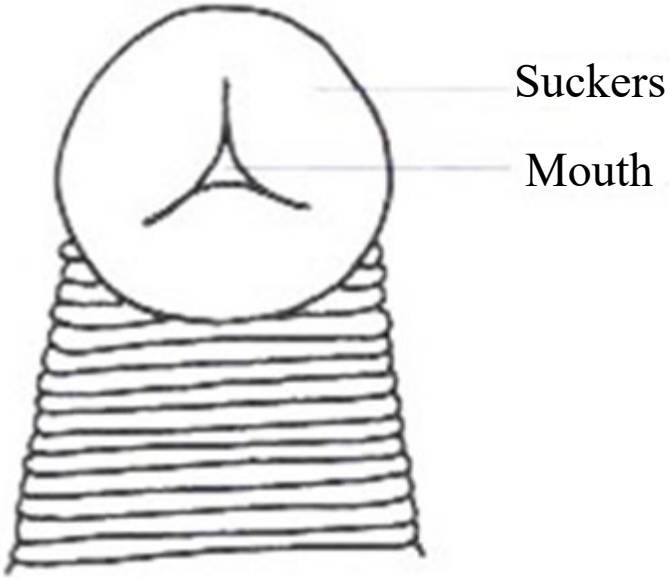
***The distinction of segments is essentially based on the distribution of the pairs of ganglia of the ventral chain.**

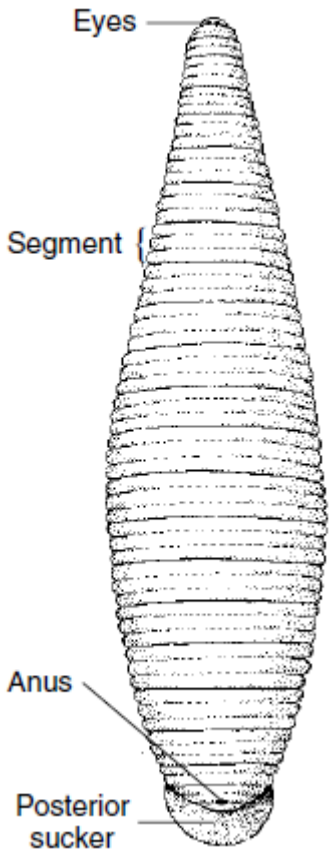
***A clitellum is normally present on segments 9, 10, 11.**

I. – Phylum Annelida

3. – Class 3 : Achaeta

***The suckers are dissimilar, with the anterior one surrounding the mouth generally being smaller than the posterior sucker.**





I. – Phylum Annelida

3. – Class 3 : Achaeta

*The body is commonly divided into 5 regions:

§ the cephalic region of 4 segments, carrying the oral sucker, mouth, eyes and jaws,

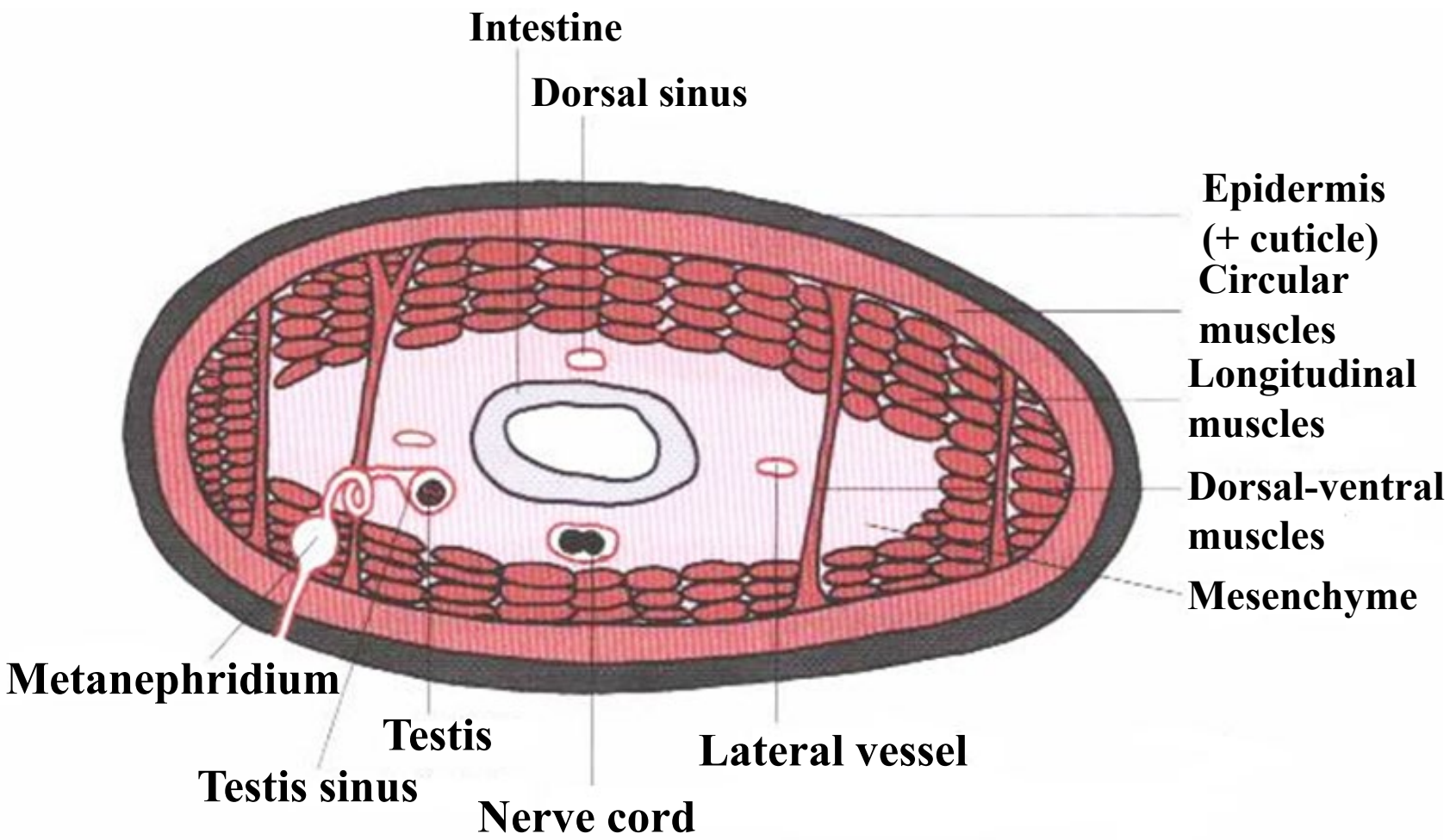
§ the preclitellum of 4 segments

§ the clitellum of 3 segments

§ the middle region of 15 segments

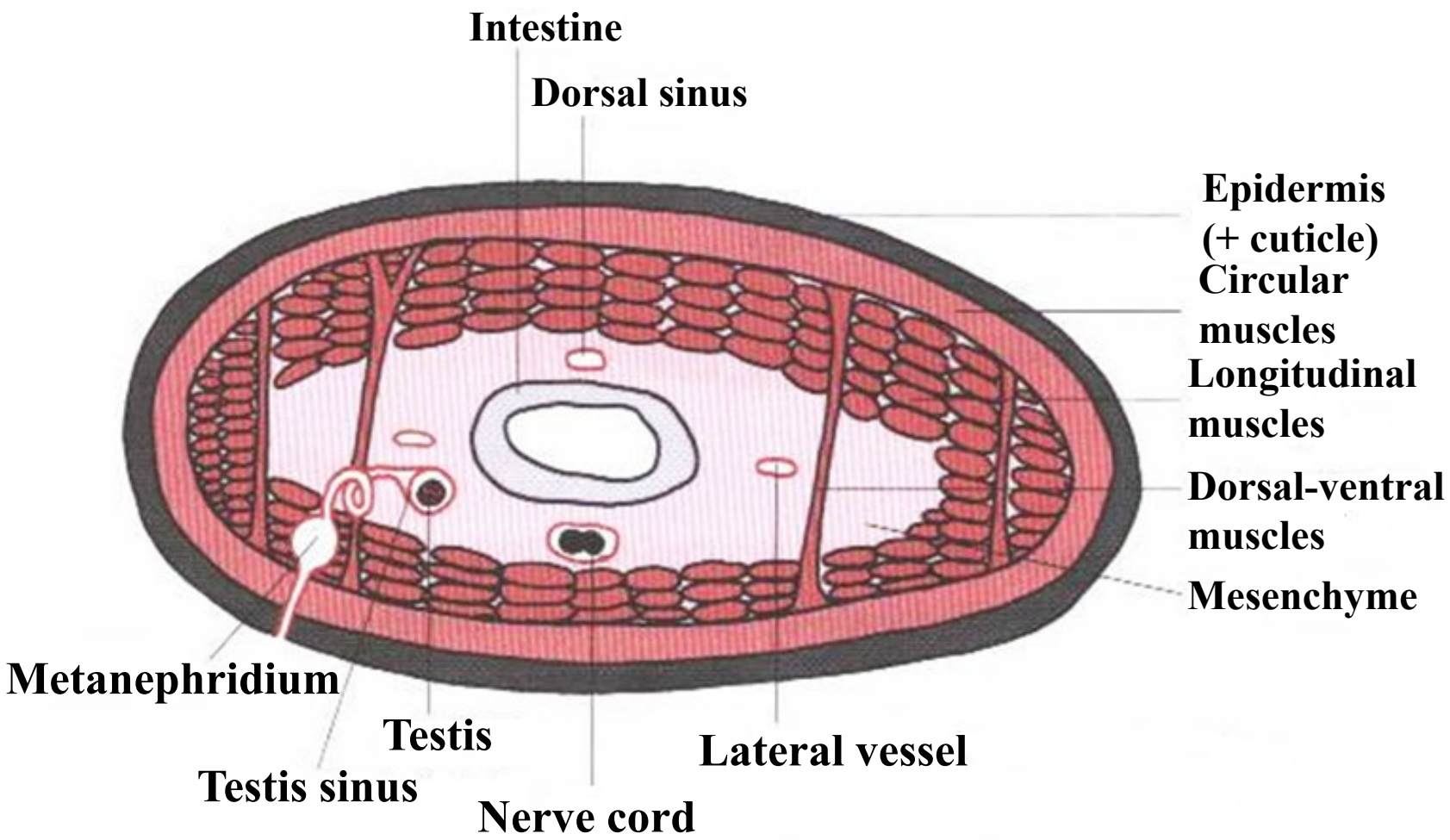
§ the terminal region of 7 segments, modified to form the posterior sucker.

3. – Class 3 : Achaeta



*The coelom is reduced and consists of a few spaces or sinuses, connected by capillaries.

3. – Classe 3 : Achaeta



*The body wall is composed of a layer of epidermal and glandular cells, a connective, vascularized dermis, circular and longitudinal musculature.

I. – Phylum Annelida

3. – Class 3 : Achaeta

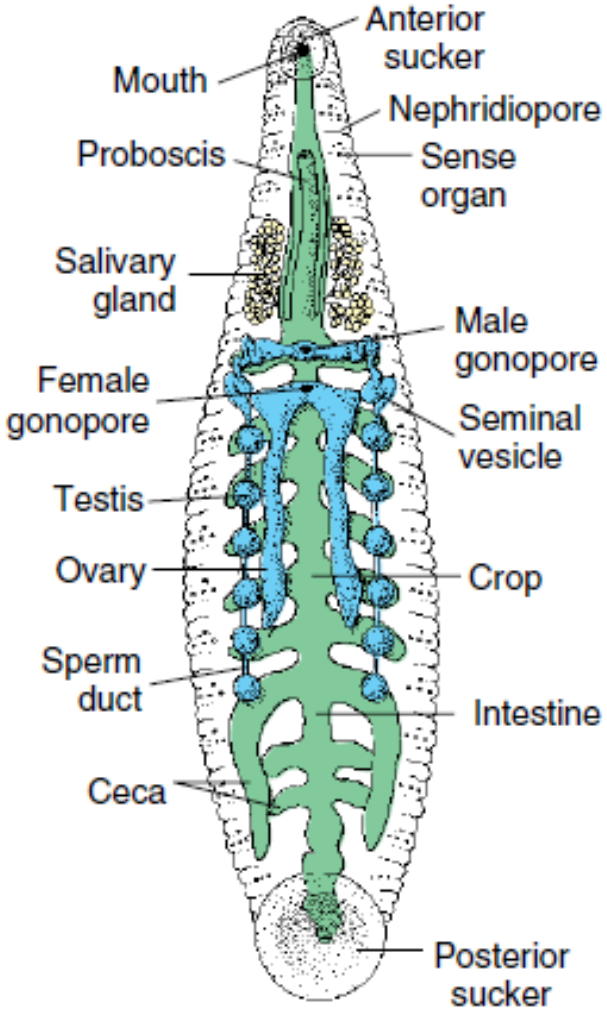
*The circulatory system is either in the form of blood vessels or coelomic sinuses, modified into channels to circulate blood.

*Respiration is mainly cutaneous, but some leeches have gills or vesicles that can be used for gas exchange.

I. – Phylum Annelida

3. – Class 3 : Achaeta

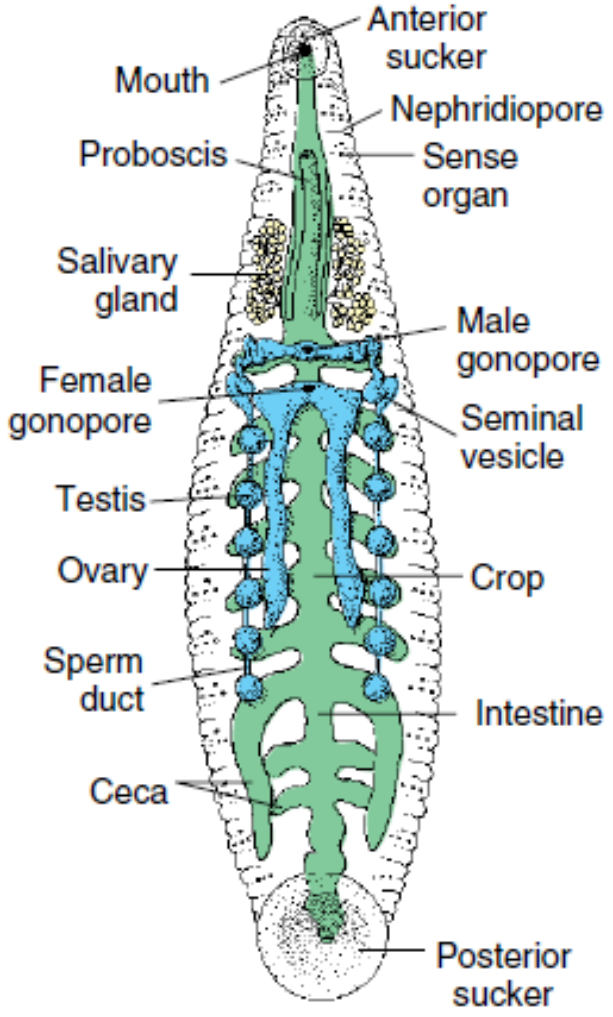
***The digestive tract is complete and diverticulated for blood storage. The mouth, equipped with jaws for piercing the host's skin, is located inside the anterior sucker.**



I. – Phylum Annelida

3. – Class 3 : Achaeta

***Leeches produce an anticoagulant secretion (hirudinin) from their salivary glands that keeps the host's blood fluid.**



I. – Phylum Annelida

3. – Class 3 : Achaeta

Reproduction

***Hirudinidae are hermaphrodites, with a single pair of ovaries and numerous testes.**

***A cocoon is secreted to collect the eggs. The cocoons are deposited on moist soil or on plants.**

I. – Phylum Annelida

3. – Class 3 : Achaeta

Medical significance of *Hirudo medicinalis*

Leeches are used to stimulate blood circulation. When a scar forms, blood vessels sometimes become blocked. By making its way under the skin, the leech releases anticoagulants in large quantities. This allows the clots to dissolve, which restores circulation.

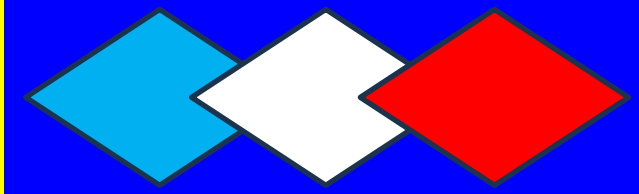
I. – Phylum Annelida

3. – Class 3 : Achaeta

Hirudo medicinalis feeding on blood from human arm.

Comparison between Polychaeta and Oligochaeta

Polychaeta	Oligochaeta
Presence of parapodia	Absence of parapodia
Presence of sensory organs at the level of the prostomium	Absence of sensory organs at the level of the prostomium
The setae are organized in the form of two rami: notopodium and neuropodium	Setae reduction (4 pairs of setae by segment)
Everted pharynx	No everted pharynx
Absence of clitellum	Clitellum, a glandular structure brought to sexual maturity
Presence of a larval stage: The Trochophore	Direct development (without larval stages)
External fertilization	Internal fertilization
Separate sexes	Hermaphroditism



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