

# **Introduction to Helminthes**

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# Helminthology

## Platyhelminthes

## Nemathelminthes

- Cestodes and trematodes
- Nematodes

Helminthes are multicellular and bilaterally symmetrical animals.

## Differences between Cestodes, Trematodes & Nematodes

	<b>CESTODES</b>	<b>TREMATODES</b>	<b>NEMATODES</b>
<b>Shape</b>	Tape like segmented	Leaf like unsegmented	Elongated, cylindrical, unsegmented
<b>Sexes</b>	Sexes not separate Monoecious Hermaphrodite	Sexes not separate Monoecious except Schistosoma	Sexes are separate Diecious
<b>Head end</b>	Suckers, often with hooks	Suckers, no hooks	No suckers, no hooks, well developed
<b>Alimentary canal</b>	Absent	Present, incomplete, no anus	Present, complete, anus present
<b>Body cavity</b>	Absent	Absent	Present

# Classification According to Mode of Transmission

Directly transmitted helminthes

- a. *Enterobius vermicularis*
- b. *Hymenolepis nana*

Soil-Transmitted Helminthes

- a. *Ascaris lumbricoides*
- b. *Trichuris trichiura*
- c. Hookworms
- d. *Strongyloides stercoralis*

Vector-Borne Helminthes

- a. Filarial worms
- b. Schistosomes

Food-borne Helminthes

- a. *Capillaria spp.*
- b. *Paragonimus spp.*
- c. Liver flukes
- d. Intestinal flukes
- e. Intestinal cestodes
- f. Extra-intestinal cestodes

# Nematodes

- **Intestinal Nematodes**
  - *Ascaris lumbricoides*
  - Hookworms - *Ancylostoma duodenale* and *Necator americanus*
  - *Trichuris trichiura*
  - *Strongyloides stercoralis*
  - *Capillaria philippinensis*
  - *Enterobius vermicularis*
- **Blood and Tissue Nematodes**
  - Lymphatic filarial worms – *Wuchereria bancrofti* and *Brugia malayi*
  - *Angiostrongylus cantonensis*
  - *Trichinella spiralis*

# NEMATODES CLASSIFICATION (MODE OF INFECTION)

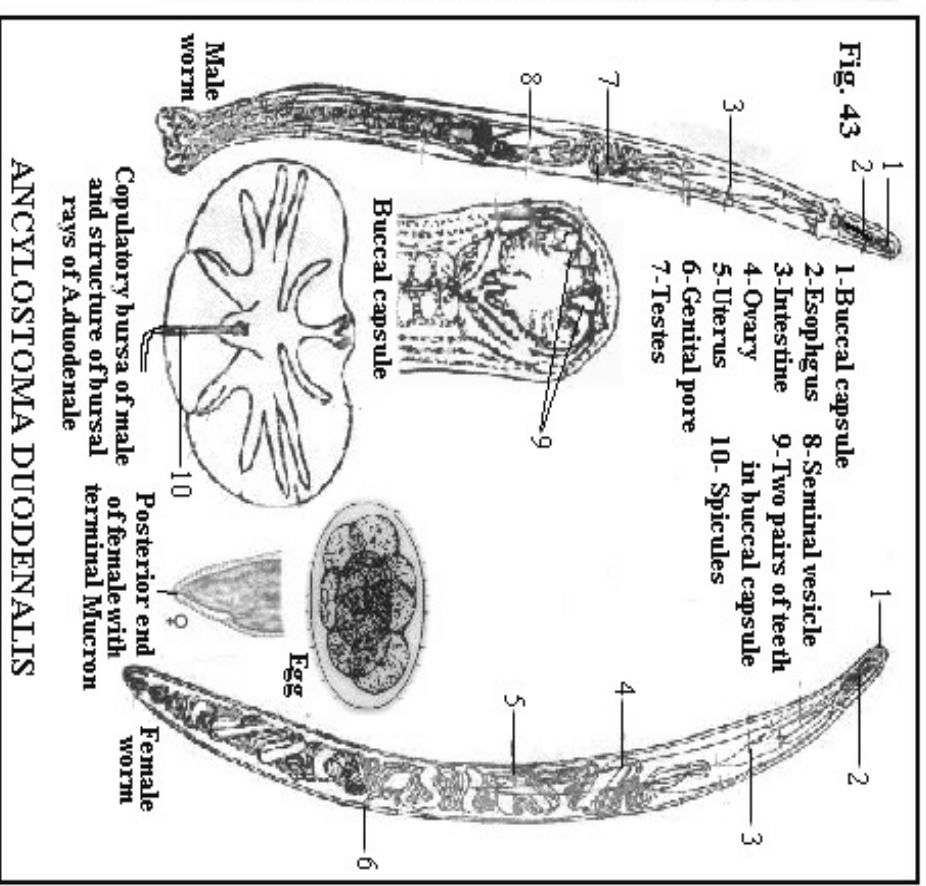
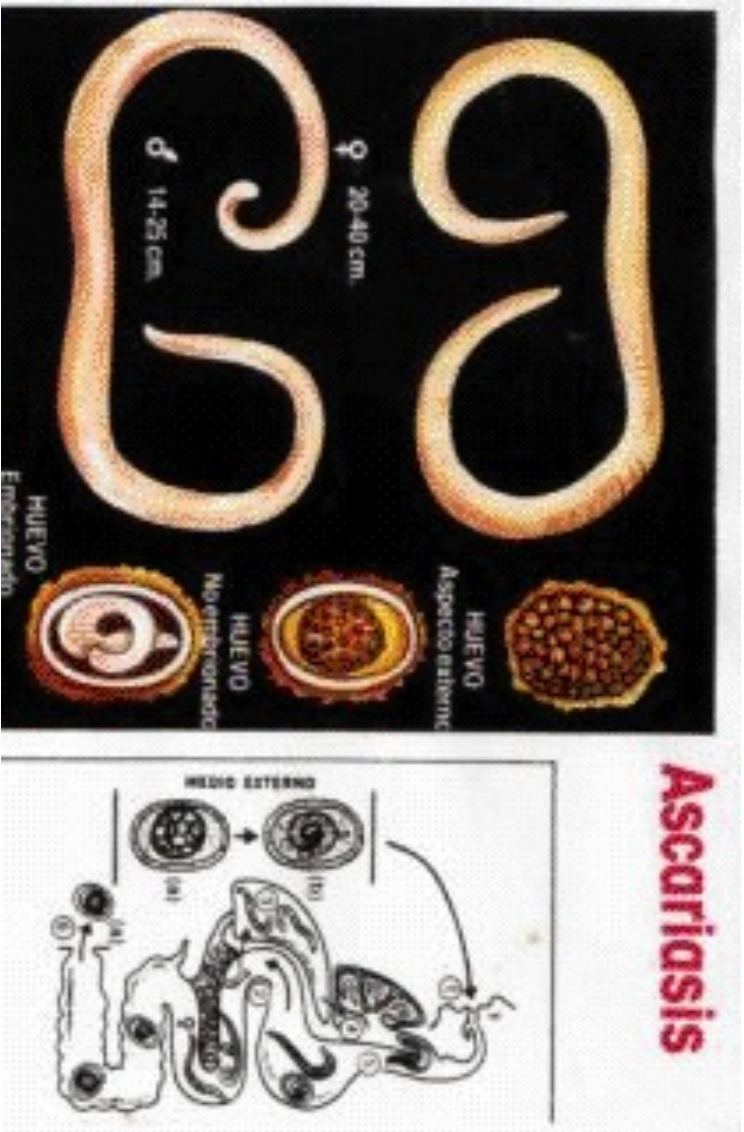
- i. **By ingestion:**
  - a. Eggs: Ascaris, Enterobius, Trichuris
  - b. Larvae within intermediate host: Dracunculus
  - c. Encysted larvae in the muscle: Trichinella
- ii. **By Penetration of Skin:** Ancylostoma, Necator, Strongyloides
- iii. **By blood sucking insects:** Filariae
- iv. **By inhalation of dust containing eggs:** Ascaris, Enterobius

# Nematode Classification Based on Mode of Reproduction

- I. Oviparous – egg laying nematodes
  - a. unsegmented eggs – *Ascaris* and *Trichuris*
  - b. segmented eggs – hookworms
  - c. embryonated egg – *Enterobius*
- II. Viviparous – produce larvae  
Ex. *Trichinella*, *Wuchereria*, *Brugia*, *Dracunculus*
- III. Ovoviviparous – lay embryonated eggs which hatch immediately

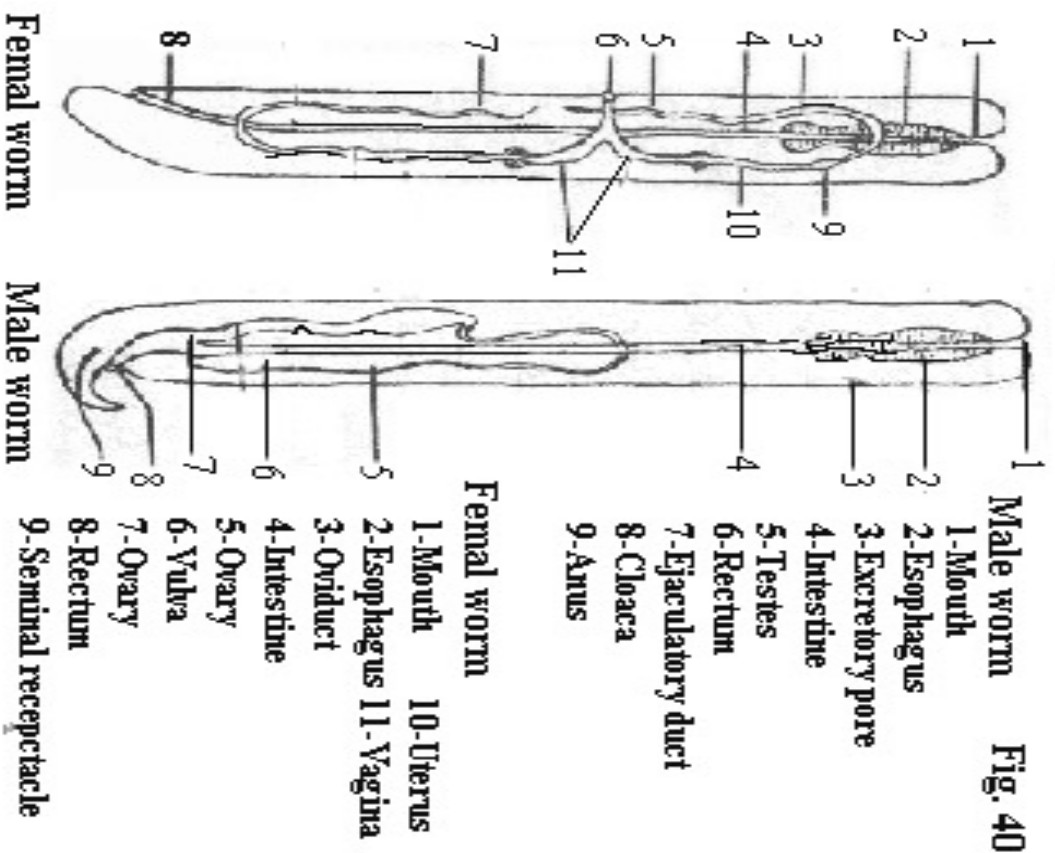
Ex. *Strongyloides*

# Biology of Nematodes



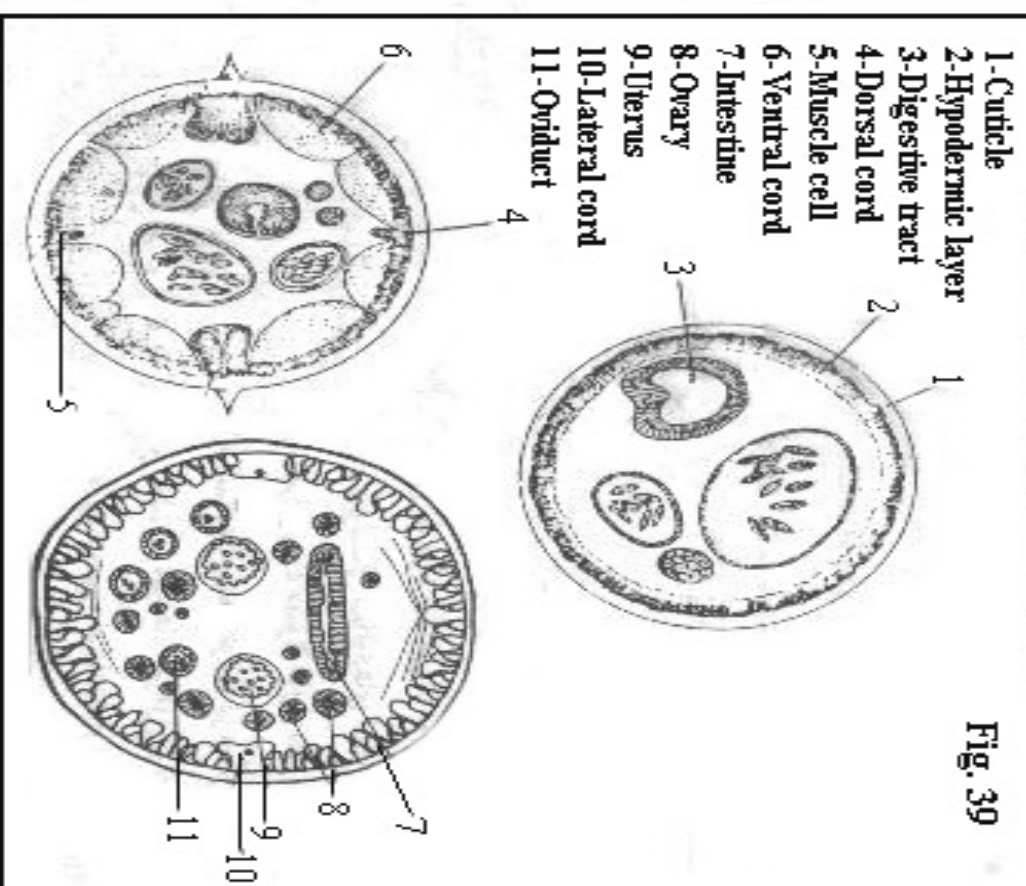


**Schematic drawing of Internal Structure of Nematodes**



**Fig. 40**

**Cross-section of Nematode**

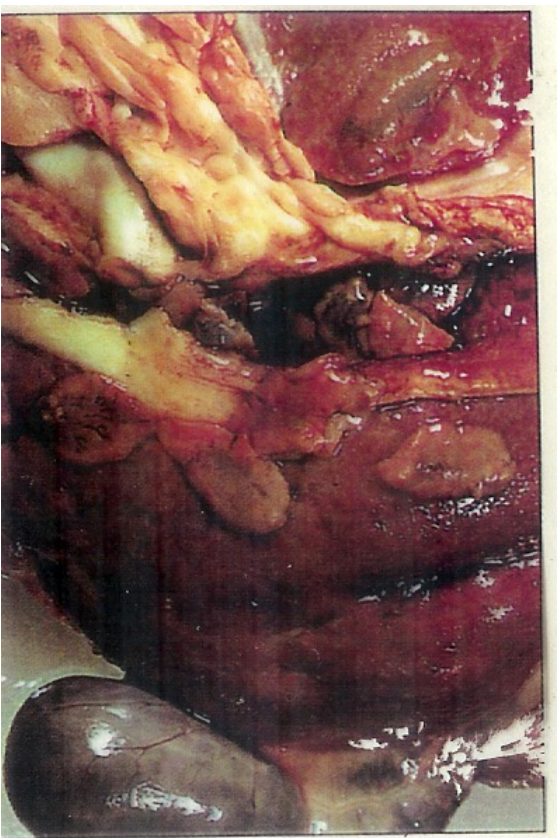


**Fig. 39**

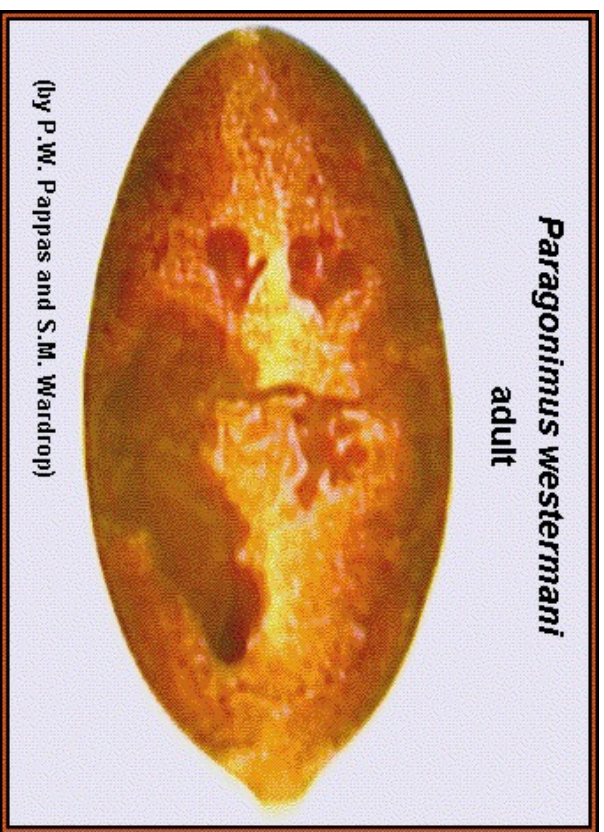
# Trematodes

- **Blood Flukes – *Schistosoma* spp.**
- **Lung Fluke - *Paragonimus westermani***
- **Intestinal Flukes – *Fasciolopsis buski*, *Echinostoma ilocanum*, heterophyid flukes**
- **Liver Flukes – *Fasciola* spp., *Clonorchis sinensis*, *Opisthorchis* spp.**

# Biology of Trematodes



Male and Female Schistosomes



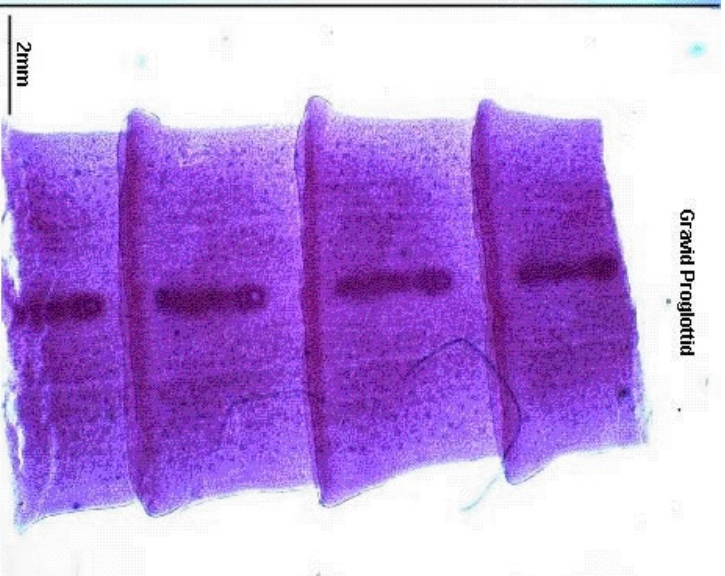
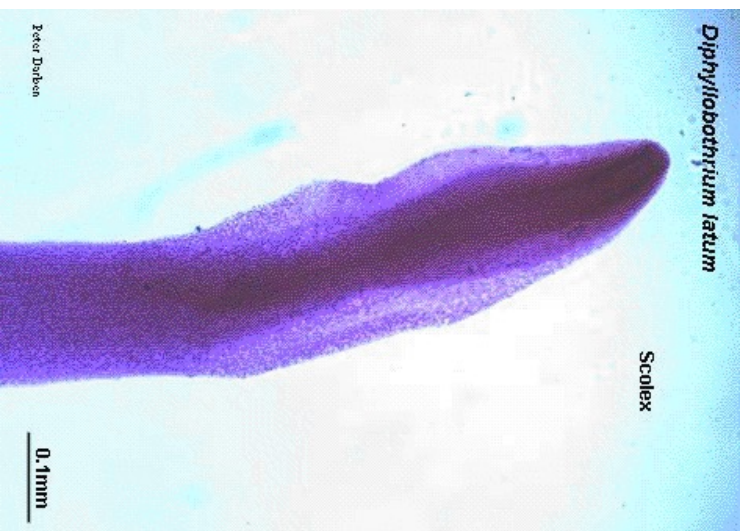
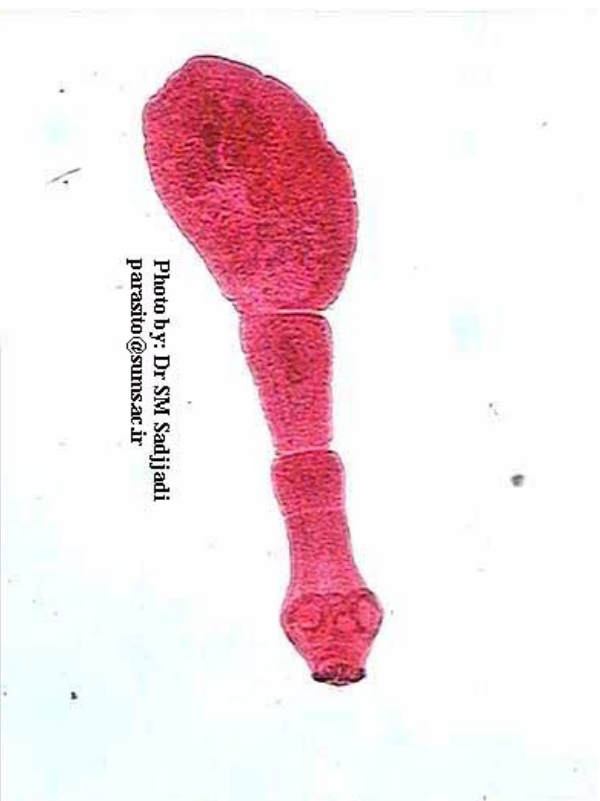
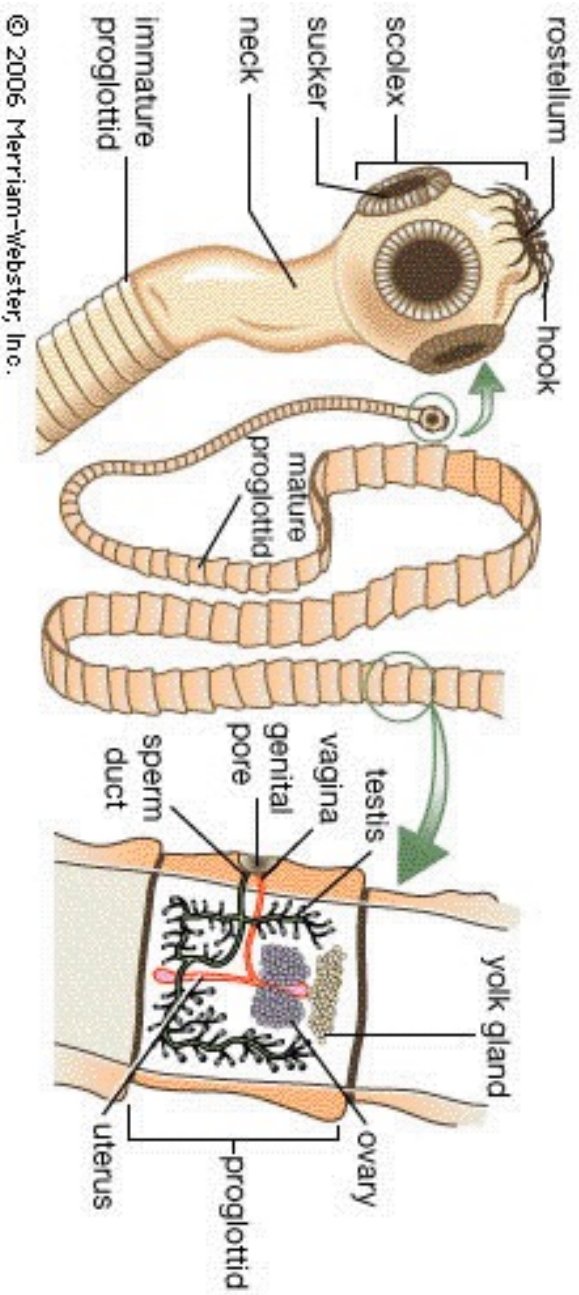
*Paragonimus westermani*  
adult

(by P.W. Pappas and S.M. Wardrop)

# Cestodes

- **Intestinal Cestodes – *Taenia solium*, *T. saginata*, *Hymenolepis nana*, *H. diminuta*, *Dipylidium caninum*, *Raillietina garrisoni*, *Diphyllobothrium latum***
- **Extraintestinal Cestodes – *Echinococcus granulosus*, *E. multilocularis***

# Biology of Cestodes



**Thank you.**