

LECTURERS IN VETERINARY PARASITOLOGY

INTRODUCTION, NEMATODA AND SYSTEMIC PLATYHELMINTHES

THIRD YEAR STAGE

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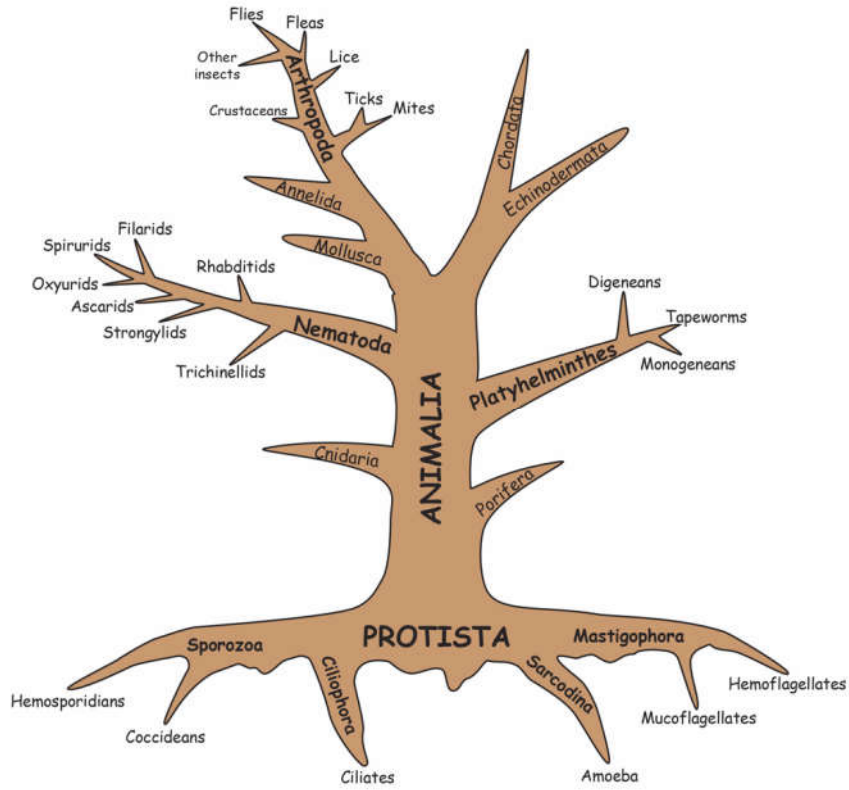
College of Veterinary Medicine

University of Basrah

CHAPTER THREE

SYSTEMATIC PLATYHELMINTHES

NC STATE UNIVERSITY



Heterophyes heterophyes:

Phylum: Platyhelminthes

Class: Trematodes

Subclass: Digenea

Order: Opisthorchiforms

Family: Heterophyidae

Genus: *Heterophyes*

Species: *H. heterophyes*



Fig. (20): Adult worm
Heterophyes heterophyes

in fish eating mammals in Asia and North Africa; utilize brackish water fish such as mullet for second intermediate hosts.

Name: *Heterophyes heterophyes*

Definition: Fish tape worm (intestinal flukes)

Distribution: Egypt, Far East, Middle East & Africa.

(For Egypt it found near to Port said
& Abu Rawash)

Disease: Heterophiasis

Diagnostic Stage: Eggs in stool (yellowish oval eggs containing
mature miracidium)

Infective Stage: Encysted metacercaria in fish muscles.

Mode of infection: Eating raw or undercooked fish, mainly
bouly & bory containing encysted metacercaria

in their muscles

Treatment: Praziquantel (Distocide® , Biltricide®) &
Niclosamide (Niclosan ® , Yomesan ®)

Prevention: Proper disposal of human sewage

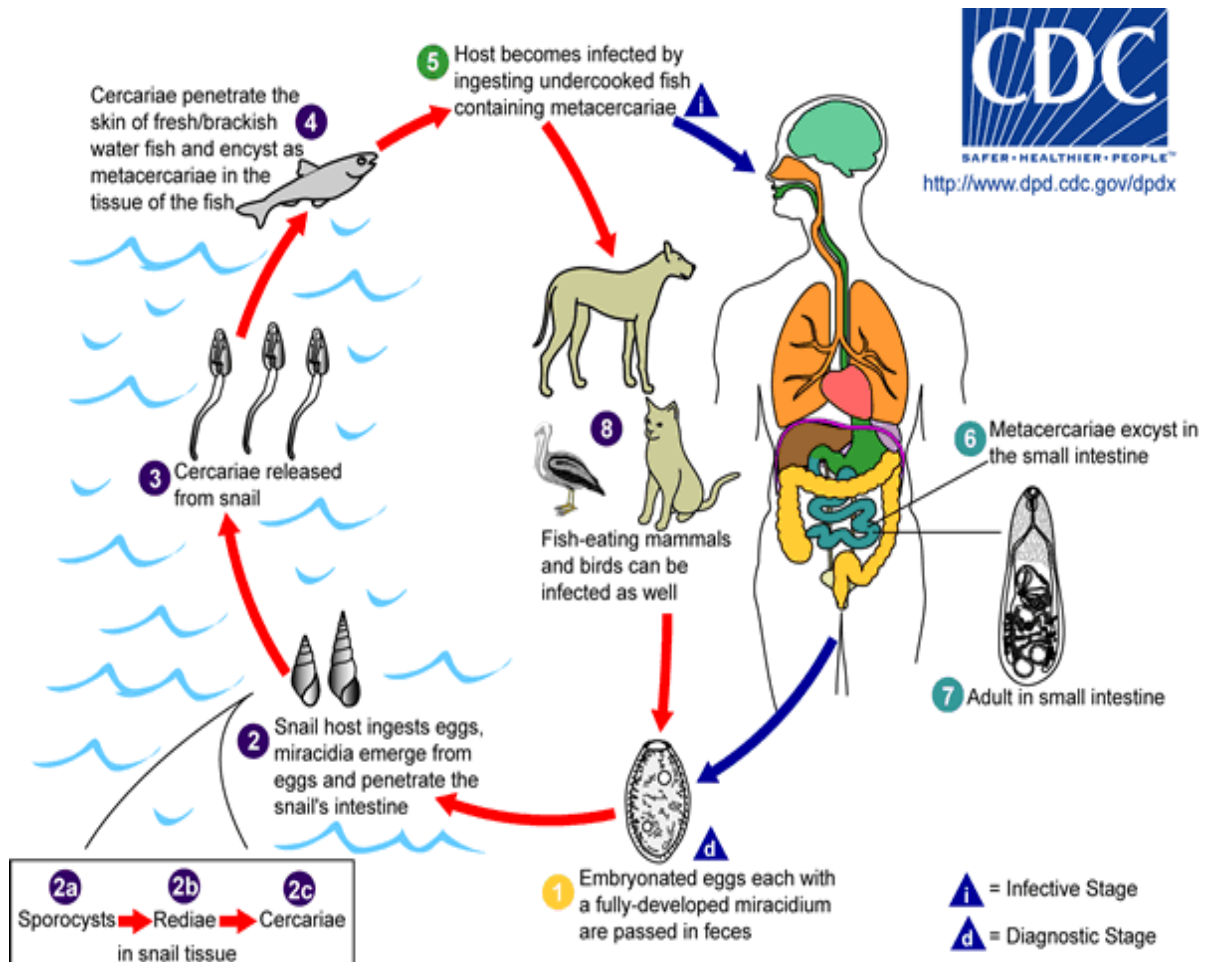


Fig. (21): Life cycle of *Heterophyes heterophyes*

Presence of the flukes in human intestine initiate intestinal mucosa inflammation, most of patients are asymptomatic, if symptoms appear, abdominal pain & non bloody diarrhoea occurs. The diagnostic feature of adult worm: have three suckers: interior, posterior and genital, with rough spiny tegument. Furthermore, adult worm is the smallest trematodes in size (2 mm in length). While, Egg found in feces or stool of heterophiasis, with Yellowish oval egg with conical operculum, thick shell and mature miracidium.



Ovum



Snail (*Prienella conica*)

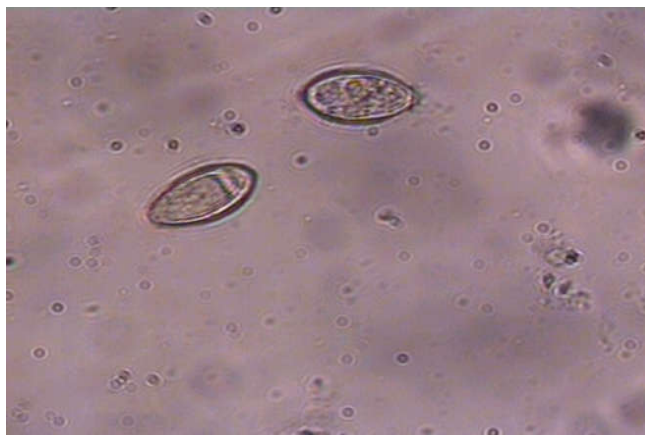
Fig. (22): ovum of *Heterophyes heterophyes* and intermediate host snail

Metagonimus yokogawii:

in fish eating mammals in Asia; utilizes freshwater trout, other salmonids, and cyprinids, for second intermediate hosts. The adult which measured 1-2.5 X 0.4-0.7 millimeter, the whole body is covered with spiny cuticle, ventral sucker at right side of the body. Egg with operculum and miracidium inside egg shell measured 27-30 X 15-17 μm , the figure of this parasite collected from dog's intestine from Basrah city/ southern Iraq in 2004 by Prof. Dr. Suzan Al-Azizz as a first record in Iraq and Basrah city.



A



B

Fig. (23): A- Adult *Metagonimus yokogawai* isolated from dog's intestine, B- Ova with miracidium inside

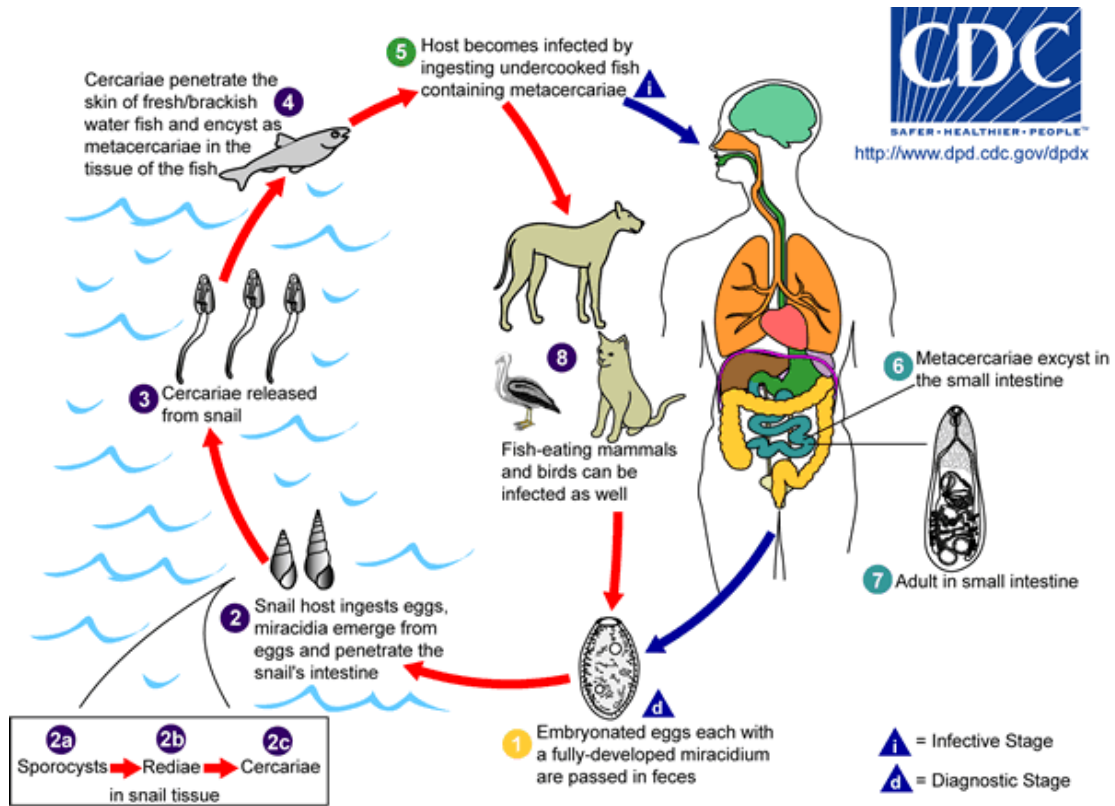


Fig. (24): Life cycle of *Metagonimus yokogawai*

Lung Flukes

1- Family: Troglotrematidae:

Paragonimus westermani

The human lung fluke, it is found in the Orient including India and Philippines. Nearly 50 known species in the genus; this particular species is found in North America. Large, fleshy worms that live in the lungs. Found in canines, pigs, felids, raccoons, goats, muskrats, opossum, and even two reports from humans also.

Definitive host becomes infected by eating improperly cooked crustacean. Adult infections become established in lungs but larval forms may wander into brain, pleura, mesentery, etc.(ectopic infection). Reservoir hosts include - dogs, cats, pigs, rodents, and other animals

Man becomes infected by eating improperly cooked crabs, ingestion of metacercaria from cutting boards where salads are fixed, medicinal use of crab juices). Smoked or pickled crab do not kill.

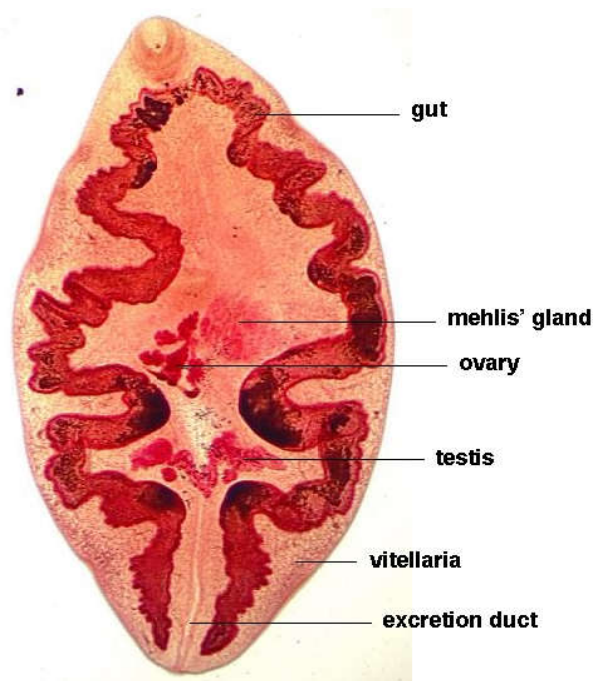


Fig. (25): Adult *Paragonimus westermani*

Pathology

- Early invasive stages usually asymptomatic.

- In the lung or ectopic site, connective tissue forms pseudo tubercles. In the CNS, they can cause paralysis and in rare cases can be fatal. In the heart they can cause severe damage and can be fatal.

- Lung infections cause chronic cough, bloody sputum, pneumonia -like conditions.

Prevention includes

- Cooking of crabs, crayfish
- Care when eating salads, no crab juice.
- Proper disposal of feces and sputum.

Life-cycle

Adults encysted as pairs in lungs, eggs up trachea; out with feces, then, mature in environment in several weeks after that hatch to miracidium which penetrates special intermediate host snail (*Pomatiopsis lapidaria*), then, sporocyst and two redial generations, later, cercariae either emerge and penetrate crayfish (i.e. *Cambarus* spp.) , or snail with cercariae eaten by crayfish. Other *Paragonimus* spp. may use freshwater crabs or other crayfish species. The metacercaria in gills, muscle eaten by definitive host which bores through gut wall; through diaphragm and penetrates lung directly maturation into adults.

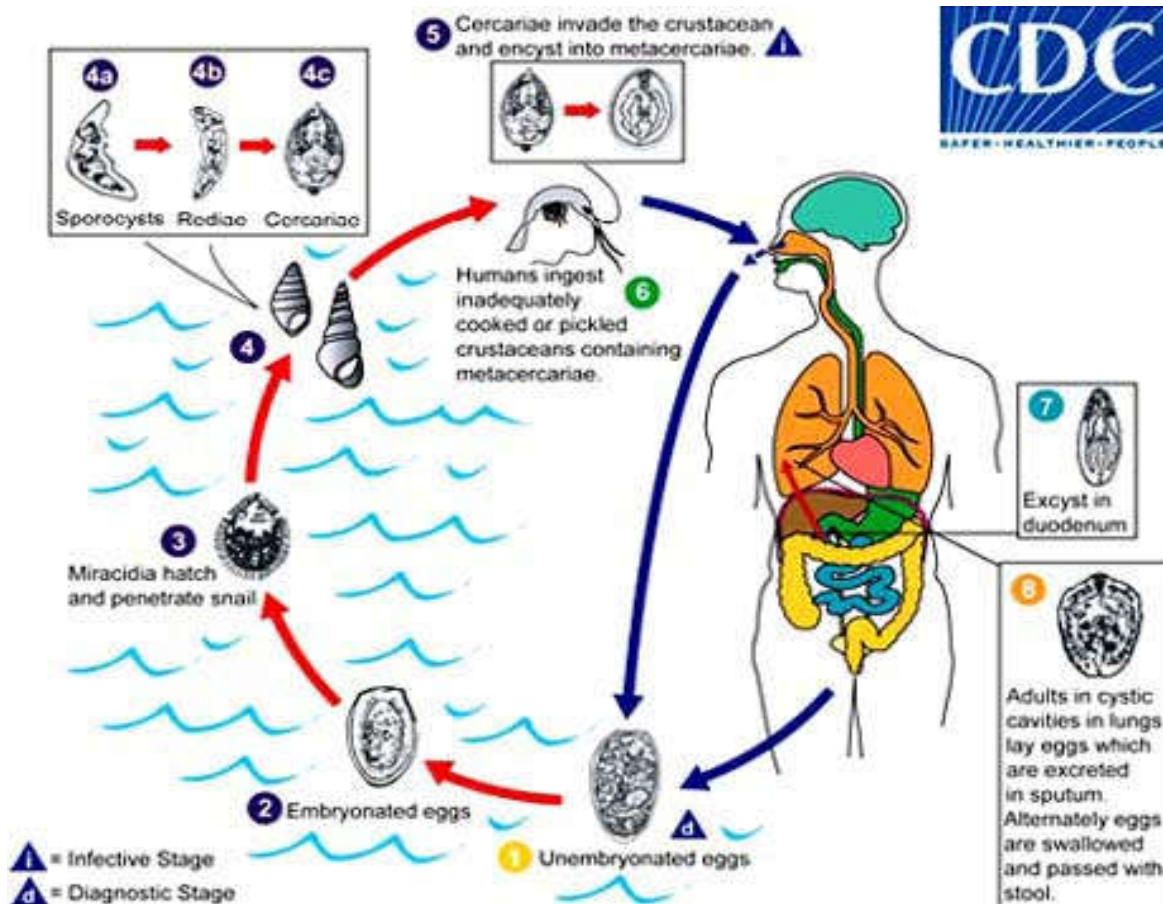


Fig. (26): Life cycle of *Paragonimus westermani*

Blood Flukes

Family: Schistosomatidae:

***Schistosoma* and other spp.**

Elongate bodies without pharynx, in birds (many genera); mammals (3 genera), eggs non-operculate, live in blood vessels, especially mesenteric blood vessels.

Schistosoma spp. (in mammals; 4 groups)

A. *Schistosoma haematobium* group

- 7 species
- most use *Bulinus* snails as intermediate host.
- indigenous to Africa and adjacent regions
- most with posterior spine on egg
- *S. haematobium*, *S. intercalatum*, *S. mattheei* in primates. Available evidence suggests that *S. haematobium* can cause urinary bladder carcinoma
- *S. mattheei*, *S. bovis*, *S. curassoni*, *S. margrebowiei*, *S. leiperi* in artiodactyla

B. *Schistosoma mansoni* group

- 4 species
- most used *Biophalaria* snails as intermediate host.
- indigenous to Africa; introduced to the Caribbean and South America
- most with large, sublateral spine of egg

Species:

1. *S. mansoni* in primates and rodents
2. *S. rodhaini* in carnivores and rodents
3. *S. edwardiense*, *S. hippopotami* in artiodactyla

C. *Schistosoma indicum* group

- 4 species

- most species use *Indoplanorbis* snails as intermediate hosts.
- indigenous to Asian countries
- Most species have egg with terminal spine

1. *S. indicum, S. spindale, S. nasale* in artiodactyla
2. *S. incognitum* in rodents, carnivores, and artiodactyla

D. *Schistosoma japonicum* group

- 4 species
- variety of snails as intermediate hosts.
- indigenous to Asian countries
- most eggs spherical or subspherical, with small spine
- *S. japonicum* in primates, rodents, and carnivores. Evidence suggests that this parasite may cause hepatic carcinoma.

1. *S. mekongi* in primates and carnivores
2. *S. sinensium, S. malayensis* in rodents

life-cycle of *Schistosoma* spp.

Adults in veins in visceral region; females inch down into venules to release eggs, eggs trapped in capillaries; granuloma; out with feces or urine or remain trapped, embryonate en route, then hatch to miracidia, miracidium penetrates snail and two sporocyst generations released after that furcocercous cercariae released and penetrate skin of definitive host resulting to schistosomule migrates; blood vessels; heart; liver, this will be matures in

about three weeks and migrate down veins to sites of infection; en route males and females pair.

Pathology and Immunology

- adults evade immune system by coating themselves with host proteins
- adults cause little damage
- most pathology associated with eggs; many carried to exotic sites
- delayed type hypersensitivity around egg granulomas; leaking antigens; eosinophilia; neutrophilia
- blood vessel occlusion; fibrosis; bloody diarrhea; bloody urine; edema; ascites; cirrhosis
- a few reports have suggested that the pharaoh Akhenaton may have had *Schistosoma haematobium*
- some historical reports have suggested that Napoleon Bonaparte, who had chronic dysuria, may have acquired *Schistosoma haematobium* during his Egyptian campaign of 1798.

Other Genera and Species

- *Schistosoma tiumdouthitti*
 - 1-rodents and lagomorphs in far North America
 - 2- hepatic portal system
- *Heterobilharzia americanum*

1. medium sized mammals; carnivores; in North America

2. in raccoons

- *Gigantobilharzia, Bilharziella, Trichobilharzia, Microbilharzia, etc.*

Found in birds

- *Ornethobilharzia turcestanicum*

Found in the blood vessels of cattle.

So, Generally:

- Schistosome: A parasitic trematode worm contracted from infested water that is capable of causing liver, gastrointestinal tract and bladder disease.
- Three main species of these trematode worms (flukes) -----
Schistosoma mansoni, S. haematobium, and S. japonicum, that produce disease in humans.
- Schistosomiasis or bilharzia after the German physician Theodor Bilharz (1825-1862). Nickname “Bill Harris” by British soldiers serving in Europe during WWI.

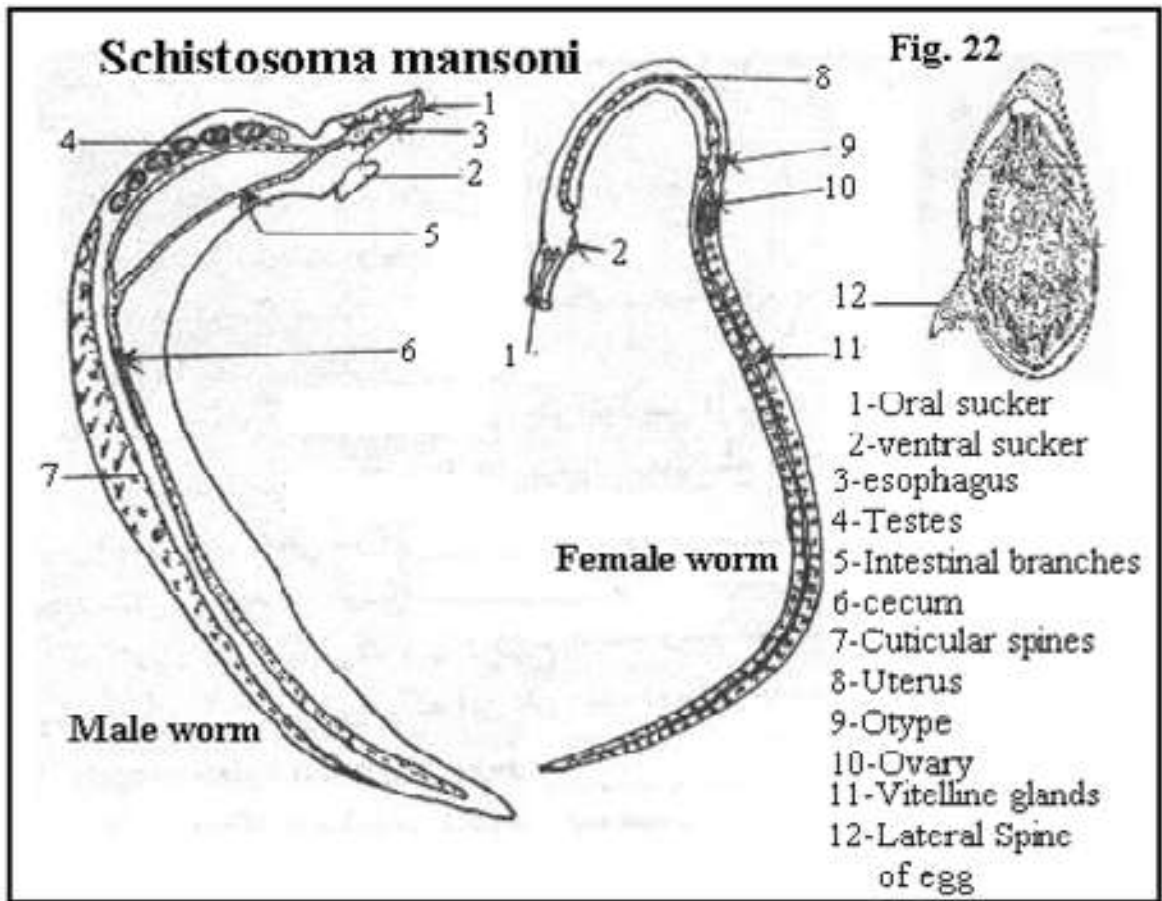


Fig. (27): Typical structure of male, female and ovum of *Schistosoma mansoni*



Fig. (28): Ovum of *Schistosoma mansoni*



Fig. (29): Ovum of *Schistosoma haematobium*

Ova of *S. mansoni* with lateral spin Ova of *S. haematobium* with terminal spin



Fig. (30): Ovum of
Schistosoma japonicum

Ova of *S. japonicum* with minute spin or knob