7. Platyhelminthes

General Characters

Platyhelminthes includes ***flatworms*** (Gk. ***Platys*** = flat; ***helminth*** = worm). They are bilaterally symmetrical, acoelomate, triploblastic invertebrates without an anus. The flatworms are both free living as well as parasitic.

1. They are ***dorsoventrally flattened*** like a leaf.

2. They show ***organ grade*** of organization.

3. They are ***acoelomate*** animals. The cavity between the body wall and the gut is filled with ***parenchyme*** or ***mesenchyme***.

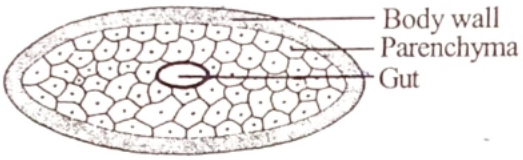

Fig. 7.1: T.S. of a Platyhelminth worm showing acoelom.

4. They are ***triploblastic*** animals. They contain three layers. They are the ***ectoderm,*** the ***mesoderm*** and the ***endoderm.***

5. They are ***bilaterally symmetrical*** animals. The body of the animal can be divided into two equal similar halves through only one plane. Animals with this symmetry have definite polarity of ***anterior*** and ***posterior*** ends.

6. Some members have segmented body. The segmentation in platyhelminthes is called ***pseudometamerism.***

7. Many of the ***parenchyma*** cells give rise to ***muscle fibres.*** The muscle fibres are arranged in ***circular, longitudinal*** and ***vertical layers.***

Fig. 7.2: Tape worm, Planaria.

8. The ***digestive system*** is completely absent from ***Cestoda*** and ***Acoela.*** The alimentary canal is branched in turbellarians. The ***anus*** is ***absent*** from them.

9. The ***respiratory organs*** are absent. In parasites, respiration is ***anaerobic.***

10. There is no circulatory system.

11. The excretory system is formed of ***protonephridia*** (flame cells).

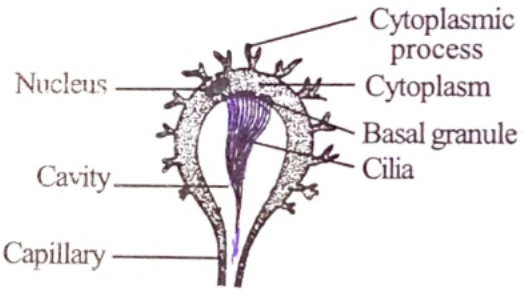

Fig. 7.3: Flame cell.

12. The ***nervous system*** is well developed. It is ladder-like. It is formed of longitudinal nerve cords with ganglia. A pair of anterior ganglia form the brain. The longitudinal nerve cords are connected together by transverse connectives.

13. They are ***hermaphrodites***, i.e., both male and female reproductive organs are present in the same animal.

14. ***Fertilization*** is internal in them. Self or cross fertilization takes place in them.

15. Their ***development*** is direct or indirect. Endoparasites show usually indirect development with many larval stages. Their life cycle is completed in one or two hosts.

16. They are ***free living*** or ***parasitic.*** In parasitic worms, adhesive organs like ***hooks, spines, suckers*** and ***adhesive secretions*** are present.

Outline Classification of Phylum Platyhelminthes

Class 1. Turbellaria

Order 1. Acoela
Order 2. Rhabdocoela
- Sub order 1. Notandropora
- Sub order 2. Opisthandropora
- Sub order 3. Lecithopora
- Sub order 4. Temnocephala.

Order 3. Alloeocoela
Order 4. Tricladida
- Sub order 1. Maricola
- Sub order 2. Paludicola
- Sub order 3. Terricola

Order 5. Polycladida

Class 2. Trematoda

Order 1. Monogenea (Heterocotylea)
Order 2. Digenea

Class 3. Cestoda

Sub class 1. Cestodaria (Manozoa)
- Order 1. Amphilinidea
- Order 2. Gyrocotylidea

Sub class 2. Eucestoda (Merozoa)
- Order 1. Diphyllidea
- Order 2. Trypanorhyncha
- Order 3. Pseudophyllidea
- Order 4. Cyclophyllidea (Taenioidea)
- Order 5. Tetraphyllidea
- Order 6. Proteocephaloidea

Classification

Platyhelminthes are acoelomate ***flatworms.***

Phylum Platyhelminthes is divided into three classes, namely

1. *Turbellaria*
2. *Trematoda* and
3. *Cestoda*

Class 1. Turbellaria

Turbellaria includes free living flatworms with a ***ciliary*** covering. The term turbellaria was used by ***Ehrenberg*** (1831) because they cause turbullence in water by the beating of their cilia. They have the following characters.

1. They are ***free living*** flatworms. Some are ***commensals*** or ***parasitic.***
2. The outer layer of the body wall is ***epidermis*** which is cellular or syncytial.
3. The body is covered with ***cilia.***
4. The epidermis contains crystalline rod-like structures called ***rhabdites.***
5. The body is ***unsegmented.***
6. The mouth is ventral.
7. The ***pharynx*** is ***protrusible.***
8. Intestine is present.
9. Suckers are absent.
10. Life cycle is simple.

Common Examples of Turbellaria

Planaria (Dugesia)
Bipalium *Convoluta*

The class turbellaria is divided into 5 orders. They are,

Order 1. Acoela
Order 2. Rhabdocoela

2. Liver Fluke (*Fasciola hepatica*)

Phylum : *Platyhelminthes*
Class : *Trematoda*
Order : *Digenea*

Fasciola hepatica is an ***endoparasite*** with a leaf-like, dorsoventrally flattened body. It is commonly known as ***liver-fluke.***

It is a flattened worm. Hence it is included in the phylum ***Platyhelminthes*** and class ***Trematoda.***

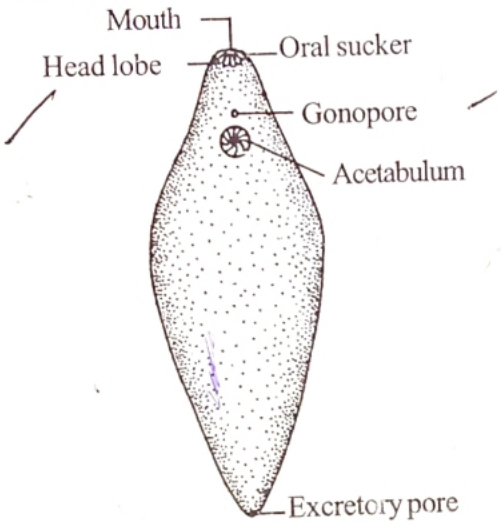

Fig.7.27: Fasciola hepatica; ventral view.

The liver fluke is an endoparasite. It lives inside the ***bile-duct*** of liver in sheep, goats and cattle. It causes a disease called ***liver-rot*** in sheep.

It is conical in shape and flat-like a leaf. It is about 25 mm long and about 15mm in breadth.

It is narrow at the anterior end, broad in the middle and tapers towards the posterior end.

The entire body is covered by ***cuticle.***

At the anterior end there is a triangular projection, the ***head-lobe.***

It has two suckers, an ***oral sucker*** or ***anterior sucker*** at the tip of the head lobe and a ***ventral sucker*** or ***acetabulum*** behind the head lobe, on the ventral side.

The oral sucker encloses the mouth and the ventral sucker has no aperture. The suckers help in the attachment of the parasite to the host.

Between the two suckers there is a ***genital opening*** or ***gonopore.*** At about one third of the length from the anterior end, in the mid-dorsal line, there is a minute aperture, the ***opening of Laurer's canal.***

An ***excretory pore*** is present at the hind end.

Body Wall

The body wall of liver fluke is ***triploblastic.*** It is covered with a tough ***cuticle.*** The cuticle protects the animal from the digestive juice of the host. It bears a number of backwardly directed ***spines*** or ***spinnules*** which help to anchor the fluke to the bile-duct of the host.

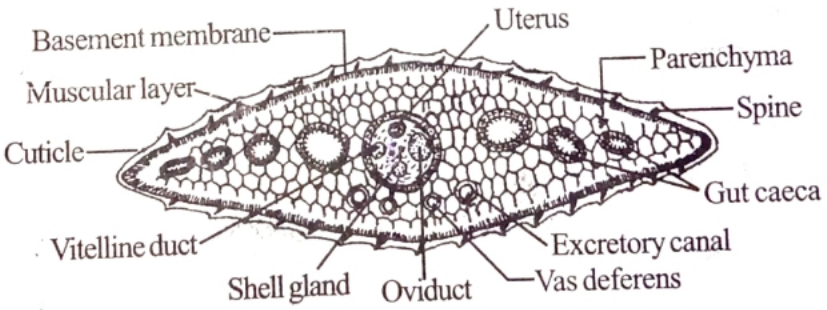

Fig.7.28: Fasciola hepatica; Transverse section.

Below the cuticle a thin ***basement membrane*** is present. Below the basement membrane is a muscular layer formed of ***circular*** and ***longitudinal muscles.*** The muscle fibres are very smooth. The space present in between the muscular layer and the inner organ is filled with ***parenchyma.***

Digestive System

The digestive system is very simple. It is formed of a ***mouth,*** the ***pharynx, oesophagus*** and the ***intestine.***

The ***mouth*** is sub-ventral in position. It is surrounded by the ***oral sucker.*** It leads into a funnel-shaped muscular ***pharynx.***

The pharynx is surrounded with ***pharyngeal glands.*** The lumen of the pharynx is very narrow, which leads into a short, narrow ***oesophagus.***

The oesophagus is followed by the ***intestine.*** The intestine soon after its origin divides into two branches called ***caeca.*** Each caecum runs upto the posterior end where it ends blindly. Each caecum is divided into a number of branching ***diverticula.*** The ***anus*** is absent.

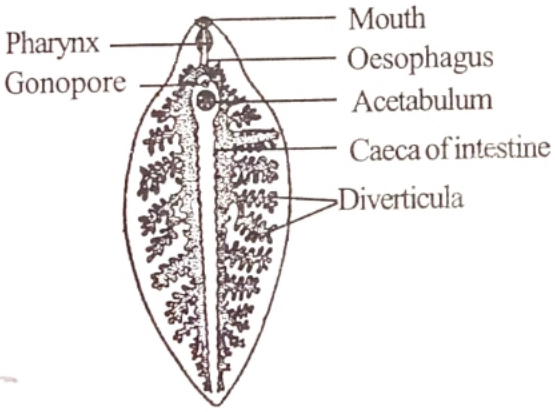

Fig. 7.29: Fasciola hepatica: Digestive system.

The liver fluke feeds on the blood and bile of the host. It sucks the liquid food by the muscular pharynx. As the food is already in the digested state and fit for absorption, the digestive glands are completely absent. The food is absorbed in intestine. The branches of diverticula transport the digested food to the different parts of the body along the parenchyma.

Respiratory System

Liver fluke has no special respiratory organs. The respiration is of ***anaerobic*** type. That is, the stored glycogen in the body is broken up into CO_2 and volatile fatty acids by the process of ***glycolysis.*** The CO_2 diffuses out through the body wall. The fatty acids are excreted by the excretory organs. The energy produced during glycolysis is enough to maintain the various activities of the animal.

Excretory System

The excretory system in liver fluke is formed of ***protonephridia.*** It has no internal opening. It consists of a median longitudinal ***excretory canal.*** The canal opens to the outside at the posterior end of the animal by an ***excretory pore.***

The excretory canal gives out many branches. Each branch ends in a cell called ***flame cell.***

Each flame cell is formed of a ***single cell.*** It has an elastic thin wall with a ***nucleus*** and a ***cavity.*** The cavity contains a ***bundle of cilia.*** The cilia show flickering movement like a flame; hence the name ***flame cell.*** The surface is produced into ***pseudopodia.***

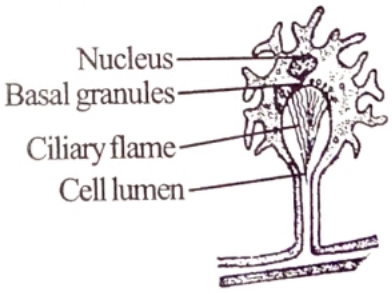

Fig. 7.30: Flame cell.

The liquid wastes are absorbed from the surrounding tissues by the flame cells. By the

movement of cilia, the wastes are sent out through the excretory pore.

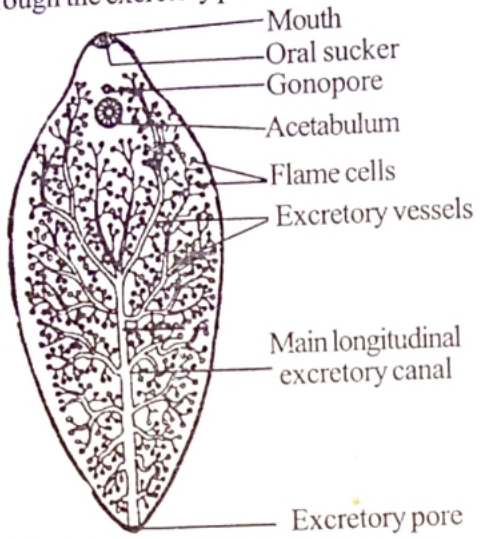

Fig.7.31: Fasciola; Excretory organs.

Nervous System

The nervous system is formed of a ***nerve ring*** and ***nerve cords.*** The nerve ring surrounds the ***oesophagus.*** It consists of three ***ganglia*** (nerve thickening). Two are dorso-lateral called ***cerebral ganglia*** and one is ventral in position.

Anteriorly small nerves arise from the ganglia and supply the ***head lobe*** and the ***oral sucker.***

Posteriorly, three pairs of ***nerve cords*** arise from the ganglia. They are a dorsal pair, a ventral pair and a lateral pair. These nerve cords are connected by ***transverse commissures.***

The lateral cords are well developed; they extend upto the posterior end of the body, giving off branches to the different parts of the body.

Reproductive System

Liver fluke is ***hermaphrodite.*** Both ***male*** and ***female*** reproductive organs are present in the same animal. It contains complicated reproductive organs. The male and female genital ducts open into a common chamber, the ***genital atrium.*** The genital atrium opens outside through the common ***genital aperture.***

Male Reproductive System

It consists of two ***testes.*** They are tubular and highly branched. A ***vas deferens*** arises from each testis. The two ***vasa deferentia*** run forward and join to form a median bag-like structure the ***seminal vesicle.***

The sperms produced by the ***testes*** are stored in the seminal vesicle. The seminal vesicle leads into a narrow tube, the ***ejaculatory duct.*** The ejaculatory duct opens into a muscular tube called ***penis.*** It opens into the genital atrium by the male ***genital aperture.***

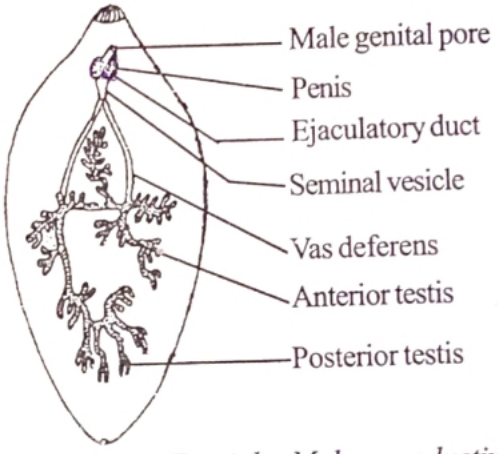

Fig.7.32: Fasciola; Male reproductive system.

Female Reproductive System

The female reproductive system is formed of a single ***ovary.*** It is tubular and branched. It lies in the middle of the body in front of the testes. An ***oviduct*** arises from the ovary. It runs forward and joins the ***vitelline duct.***

There are numerous small rounded ***yolk glands*** or ***vitellaria*** on the sides of the body. These glands secrete yolk and the shell.

A minute duct known as ***yolk duct*** arises from each yolk gland. All yolk ducts unite into an ***anterior longitudinal vitelline duct*** and

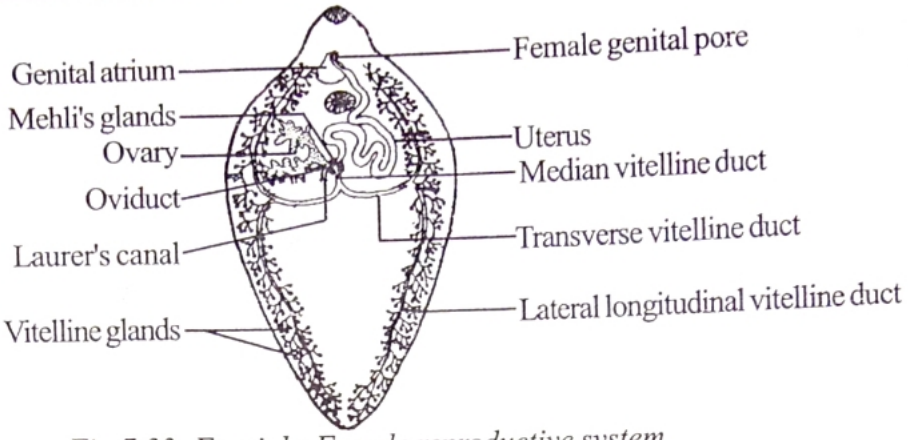

Fig.7.33: Fasciola-Female reproductive system.

a ***posterior longitudinal vitelline duct*** on each side.

The two longitudinal ducts join to form a ***transverse vitelline duct.***

The transverse vitelline ducts of the two sides run inward and join to form a ***median vitelline duct*** which runs forward and joins the oviduct.

The junction of median vitelline duct and the oviduct is slightly dilated to form an ootype. Around the ootype there is a mass of unicellular ***Mehli's glands*** or ***shell glands.*** The secretion of Mehli's glands lubricates the passage of eggs in the uterus. It also activates the sperm and hardens the egg shell.

From the ootype arises a large duct called ***ovo-vitelline duct*** or ***uterus.*** The uterus runs forwards as a coiled tube and opens to the exterior through the female genital pore close to the male genital pore.

From the ootype arises another canal known as ***Laurer's canal.*** It runs vertically upwards and opens on the mid-dorsal surface.

During copulation, the sperms are received from the other fluke through this canal. So it is also termed ***copulation canal.***

Life History

Liver fluke is a ***digenic parasite.*** It completes its life cycle in two hosts, namely ***sheep*** and a ***snail*** called *Limnaea truncatula.* Sheep is the ***primary host*** and snail is the ***secondary host.*** Its development is ***indirect*** since there are larval stages.

Capsule

Fertilization is ***internal.*** It occurs in the ***ootype.*** The fertilized egg is surrounded by many ***yolk cells.*** The egg and yolk cells are surrounded by a shell. The complete structure is called ***capsule.*** The capsule is ***oval*** in shape and it has a ***lid*** or ***operculum*** on one side.

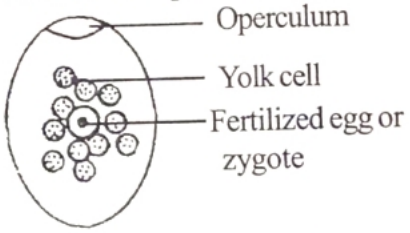

Fig.7.34: A capsule.

The capsules pass into the uterus. From there, they pass into the bile duct of sheep through the ***gonopore.*** Then they reach the intestine and pass out through the faeces. When the eggs are laid in dry places, they die out. But when they are laid in moist places, the operculum opens and a larva is released. This larva is called ***miracidium larva.***

Miracidium Larva

Miracidium is hatched from the ***capsules.*** It has the following salient features:

1. It is a free swimming larva living in ponds.

2. It lives for 24 hours.

3. It is ***microscopic.***

4. It is ***conical*** in shape.

5. The anterior end is ***broad*** and the posterior end is ***narrow.***

13. The larva has two ***protonephridia.*** Each protonephridium has a flame cell and a long duct. The duct opens to the outside by a ***nephridiopore.***

14. The interior of the larva is filled with groups of specialized cells called ***germ cells.***

15. It does not feed.

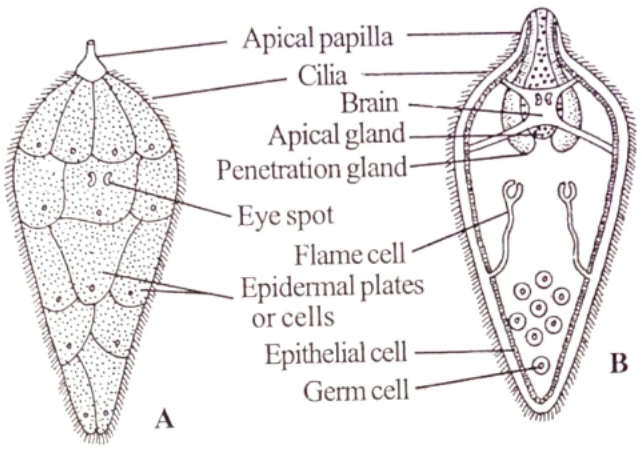

Fig.7.35: Miracidium larva; A Surface view, B Inner view.

6. The anterior end has a small projection called ***apical papilla.***

7. The body is covered by ***cilia.***

8. The body wall is covered by a layer of ***epidermal plates.*** There are twenty-one plates arranged in five rows. The number of plates in each row is as follows: I row has 6 plates; II row has 6 plates; III row has 3; IV row has 4 and V row has 2.

9. At the anterior end inside the body, there is a sac-like gland called ***apical gland.*** It opens at the ***apical papilla*** by a duct.

10. Two sac-like glands are located on the sides of the apical gland. They are called ***penetration glands.*** They also open at the apical papilla.

11. A large ***brain*** or ***apical ganglion*** is situated near the anterior end.

12. Two eyes are located above the brain.

16. When it comes in contact with the snail *Limnaea truncatula,* the miracidium penetrates into the body of the snail. It reaches the digestive gland of the snail and gets transformed into another larva called ***sporocyst.***

Sporocyst

Sporocyst develops from ***miracidium.*** It is the second larva of ***liver fluke.*** It has the following salient features:

1. It lives in the digestive glands of snail.

2. It is in the form of an elongated sac.

3. It is covered by ***cuticle.***

4. It has two ***protonephridia.*** Each protonephridium has two flame cells; they open to the outside by a single ***nephridiopore.***

5. The larva is filled with germ cells. The germ cells divide and redivide to form the next larva called ***redia larva.*** Each sporocyst can produce 5 to 8 larvae.

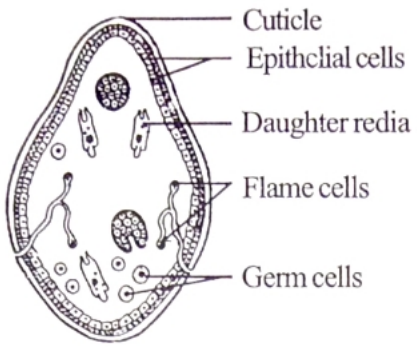

Fig. 7.36: Sporocyst larva.

Redia Larva

Redia larva develops from the germ cells of ***sporocyst.*** The redia larva has the following salient features:

8. The mouth leads into a pharynx which ends in a sac-like intestine. The pharynx is surrounded by a group of ***pharyngeal glands.***

9. Two protonephridia are located inside the body. Each protonephridium is formed of many ***flame cells.*** It opens to the outside by a nephridiopore.

10. The cavity of redia larva is filled with ***germ cells.***

11. The germ cells of redia develop into ***daughter redia.***

12. The germ cells of daughter redia develop into the next larva called ***ccrcaria.*** They come out through birth pore.

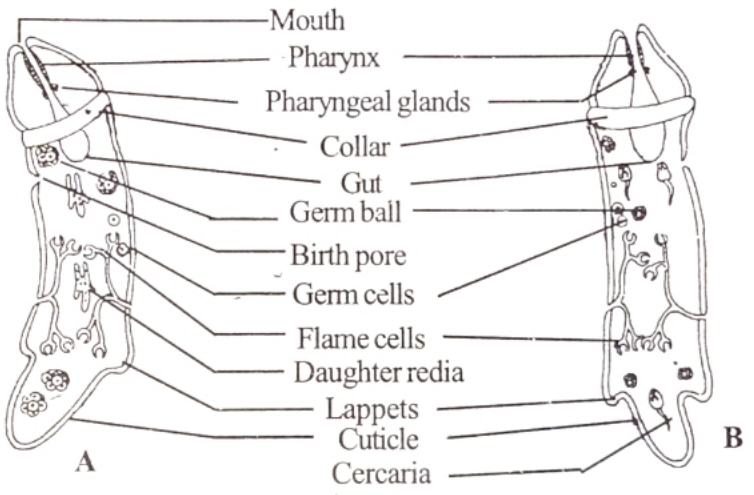

Fig. 7.37: Redia larva. A. Redia with daughter redia, B. Redia with cercaria.

1. It lives in the digestive glands of the snail.
2. It is ***cylindrical*** in shape.
3. The body is covered by ***cuticle.***
4. The anterior end has a ***mouth.***
5. Behind the mouth, there is a muscular ring called ***collar.***
6. Behind the collar, an opening called ***birth pore*** is located.
7. Near the posterior end a pair of projection is found. They are called ***lappets.*** They are used for locomotion.

Cercaria

The cercaria develops from the germ cells of redia. Each redia produces about twenty cercariae. The cercaria has the following salient features:

1. It is a free living larva.
2. It is tadpole-shaped.
3. It has an oval body and a tail.
4. The body is covered by ***cuticle.***
5. It has two ***suckers,*** an ***oral sucker*** and the ***acetabulum.***

6. It has a simple alimentary canal. It is formed of a mouth, the pharynx, the oesophagus and a 'U'-shaped intestine.

7. Numerous flame cells are located inside the body. The flame cells of each side are connected together by an ***excretory tubule.*** The excretory tubules of the two sides open into an ***excretory vesicle.*** From the vesicle an ***excretory duct*** arises. It runs into the tail and bifurcates. These bifurcations open to the outside by ***nephridiopores.***

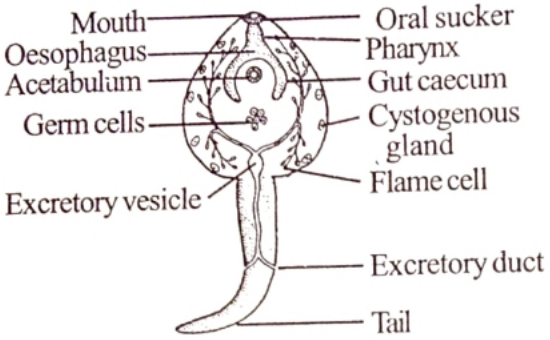

Fig.7.38: Cercaria larva.

8. The body wall contains many ***cystogenous glands.***

9. The body cavity is filled with groups of ***germ cells.***

10. The cercaria lives for three days and it is transformed into another larva called ***metacercaria.***

Metacercaria

The cercaria loses its tail and the cystogenous gland secretes a cyst around the larva. The encysted cercaria is called ***metacercaria.*** It is found attached to the grasses. It has a round shape. Germ cells are located inside the metacercaria.

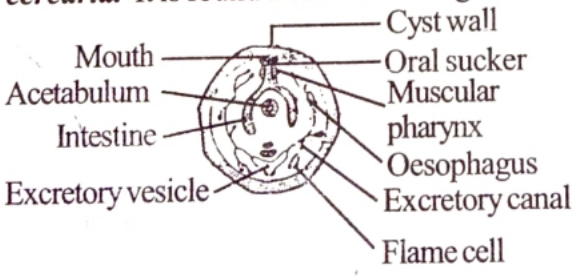

Fig.7.39: Metacercaria.

Infection

When a sheep eats the grass containing metacercaria, the larva enters the intestine. Here the cyst wall dissolves and the larva is liberated. It penetrates the wall of the intestine and enters the coelom. From the coelom it gets into the liver and grows into an adult fluke.

Alternation of Generations

The life history of liver fluke shows an alternation of generations. In *Fasciola,* the sexual reproduction alternates with a series of parthenogenetic reproductions. Miracidium larva is produced by sexual reproduction. ***Redia*** and ***cercaria*** are developed by ***parthenogenesis*** from the germ cells. Thus sexual reproduction alternates with parthenogenetic generation. This type of reproduction is called ***heterogamy*** or ***heterogenesis.*** The alternation of generations is also called ***metagenesis.***

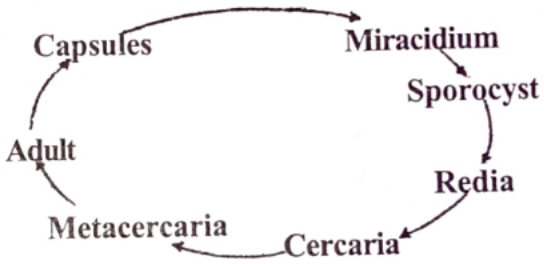

Fig.7.40: Fasciola; life cycle.

Pathogenesis

Liver fluke causes a disease called ***liver rot.*** It is characterized by ***hepatitis, inflammation*** and ***gall stones.***

Prevention and Treatment

Liver fluke infection is prevented by the following methods:

1. Severely infected sheep must be killed.
2. The manure of infected sheep must be destroyed.
3. The snail population must be killed.

Liver fluke-infection is treated by the following drugs: ***Carbon tetrachloride, hexachloroethane, filcin, emetine hydrochloride, tetrachloroethane,*** etc.

3. Tape Worm

Phylum	:	*Platyhelminthes*
Class	:	*Cestoda*
Subclass	:	*Eucestoda*
Order	:	*Cyclophyllidea*

Taenia solium is an acoelomate, segmented, ribbon-shaped intestinal parasite in man. It is included in phylum ***Platyhelminthes*** and in class ***Cestoda.***

Taenia solium is a common ***endoparasite*** found in the intestine of man who eats ***pork*** (flesh of pig) as his food.

The body is long, narrow, ribbon-shaped and dorsoventrally flattened. It reaches about 6 to 10 feet in length.

The body of the animal is divided into three regions, namely the ***scolex,*** the ***neck*** and the ***strobila.***

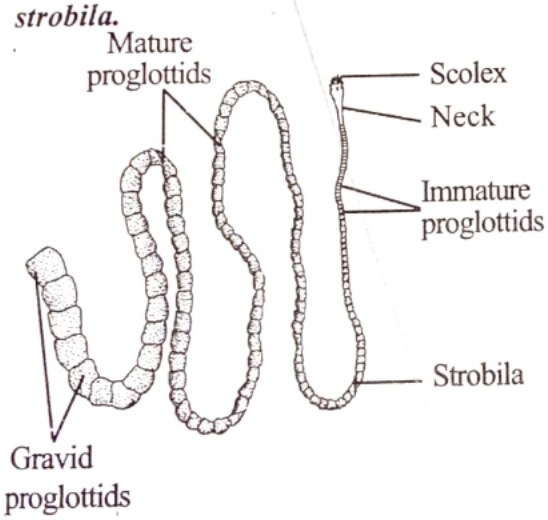

Fig.7.41: Taenia solium; External structure.

The ***scolex*** is a small knob-like structure, situated at the anterior end. It has the size of a pin-head. It possesses a small terminal cone called ***rostellum*** which is protrusible. Around the base of the rostellum, there is a double circlet of chitinous ***hooks.*** The scolex has four ***suckers,*** which project from the surface. The suckers and hooks help to attach the animal to the intestine of the host.

The region immediately following the scolex is the ***neck.*** The neck is short, narrow and unsegmented. The neck is followed by the ***strobila*** which is formed of a chain of about 850 segments. Each segment is termed as ***proglottid.*** New segments are formed from the posterior part of the neck by budding.

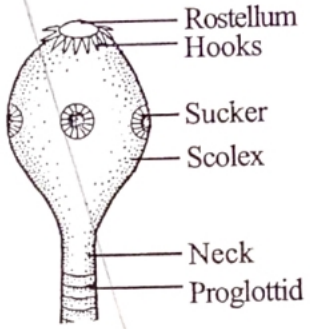

Fig.7.42: Taenia-Scolex.

The older segments are pushed away. So the new segments are located near the scolex and the old segments are located at the posterior end. The oldest segment is the last segment. The process of budding of the segment is termed ***strobilization.***

The tape worm is a segmented animal showing a repetition of structures in each segment. As the new segments are formed from the anterior region, this type of segmentation is termed ***pseudo-metamerism.***

Each proglottid contains a set of male and female reproductive organs and a part of the ***nervous*** and ***excretory*** systems. But the youngest segments lying near the neck are having no sex organs. They are termed as ***immature proglottids.*** The proglottids of the middle region are termed as ***mature proglottids*** which contain sex organs. The posterior most seg-

8. Nematoda
(Aschelminthes)

General Characters

Nematoda are ***pseudocoelomate, triploblastic bilaterally symmetrical unsegmented*** and ***vermiform animals.*** They live in freshwater or in seawater or on land or live as parasites. They are smaller in size. They are characterised by the following general features:

1. They are ***parasitic*** or ***free living.***
2. They are ***bilaterally*** symmetrical.
3. The body wall is ***triploblastic.***
4. They are ***pseudocoelomate*** animals.

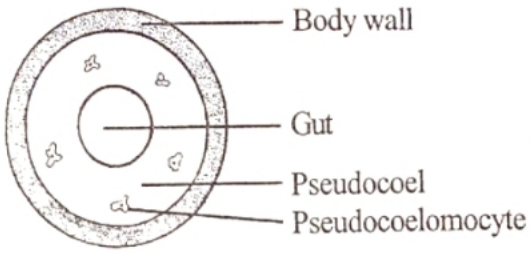

Fig.8.1: T.S. of a nematode worm showing pseudocoelom.

5. They have ***organ system*** grade of organization.
6. The body is covered with a ***cuticle.*** The epidermis is ***syncytial*** in nature.

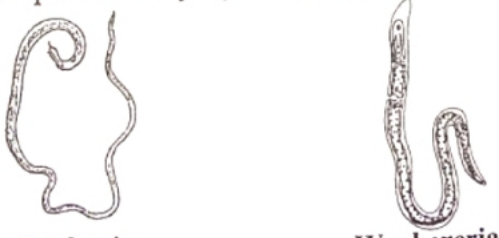

Fig.8.2: Nematode parasites.

7. ***Circular muscles*** are absent from the body wall.
8. The alimentary canal is straight with a ***mouth*** and an ***anus.***
9. The respiratory and circulatory system are absent.
10. The excretory organs are ***protonephridia.***
11. The nervous system is formed of longitudinal nerves and a brain.
12. The sexes are separate. Sexual dimorphism is a common feature. Males are usually smaller than the females.

Outline Classification of Phylum Nematoda

Class 1. Rotifera
Class 2. Gastrotricha
Class 3. Kinorhyncha
Class 4. Nematomorpha
Class 5. Nematoda
- Sub class 1. Aphasmidia (Adenophorea)
  - Order 1. Enoploidea
  - Order 2. Dorylaimoidea
  - Order 3. Mermithoidea
  - Order 4. Chromadoroidea
  - Order 5. Monohysteroidea
  - Order 6. Desmoscolecoidea
- Sub class 2. Phasmidia (Secernentea)
  - Order 1. Trichuroidea (Trichinelloidea)
  - Order 2. Dioctophymoidea
  - Order 3. Rhabditoidea
  - Order 4. Rhabdiasoidea
  - Order 5. Oxyuroidea
  - Order 6. Ascaroidea

10. ***Infection*** is made easier through contaminated food, water and clothings.

11. The larva of filarial worms circulate in the peripheral blood vessels during night. This ***periodic appearance*** of the parasite coincides with the biting habit of the *Culex* mosquito and helps in the spreading of the parasite.

12. The pin worm *Enterobius vermicularis* exhibits ***retroinfection.*** In this process, the female lays the eggs in the perianal region of man. The egg hatches there itself and migrates, back again to the intestine and starts life. This phenomenon prevents wastage of eggs.

2. Economic Importance of Aschelminthes

Aschelminthes are ***pseudocoelomate, unsegmented*** and ***worm-like*** animals. They are free living or parasitic. They are commonly known as ***nematodes***. These are very important in the economic and medical point of view, because they affect the economy and health of man in various ways.

Most of them are parasites living in man and other organisms and they obtain food from them. They also cause diseases in man, domestic animals and plants. They cause little or extensive damage in the hosts. In general, fifty species of round worms live as human parasites. Most of them do not require intermediate hosts.

The infection is direct by contamination through water, air and food. Some Aschelminthes live as parasites in cattle, sheep, poultry and in various vertebrates. The round worms also live as parasites in various crops and plants. The parasites can be classified into

1. Human parasites

2. Plant parasites and

3. Parasite of domestic animals.

1. Human Parasites

These nematodes live inside the body of man causing dullness, illness or even death. The most common human aschelminth parasites are *Ascaris lumbricoides, Ancylostoma duodenale, Wuchereria bancrofti, Dracunculus medinensis, Enterobius vermicularis, Trichocephalus trichuris* and *Loa loa*.

1. Ascaris lumbricoides

It is commonly called as ***round worm***. It is an ***endoparasite*** living in the intestine of man. It is more common in children than in adults. The male worm is smaller than the female. The male worm is recurved at its posterior end with a pair of penial setae. The infection is by contamination through food and water. It causes haemorrhage, pneumonia and inflammation of gall bladder and bile duct. It is a ***monogenic*** parasite.

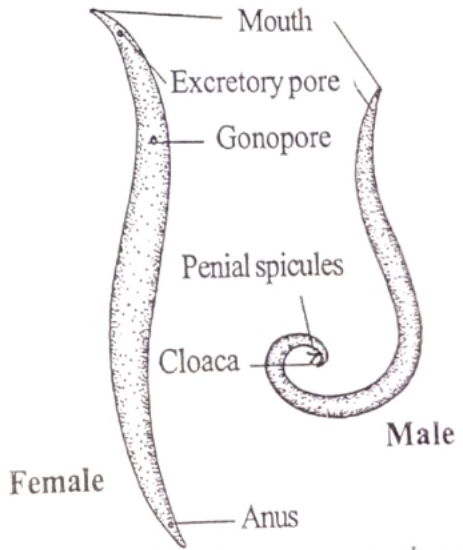

Fig.8.30: Ascaris, human round worm.

2. Ancylostoma duodenale

It is commonly known as ***hook worm***. The adult lives in the intestine of man. It sucks the blood, lymph, bits of mucous membrane and tissue fluids. It is a ***monogenic*** parasite. The juveniles enter man through the skin from the contaminated soil.

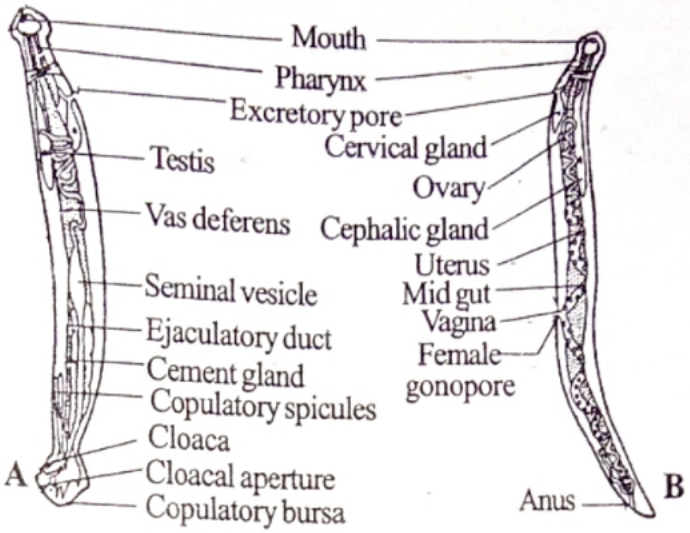

Fig.8.31:Ancylostoma, human hook worm.

3. Wuchereria bancrofti

It is commonly known as ***filarial worm.*** It is a ***digenic*** parasite. ***Man*** is the primary host and the *Culex* mosquito is the secondary host. It lives in the lymph nodes and lymph vessels of man. It is ***viviparous.*** It causes a serious disease in man called ***elephantiasis*** due to the blocking of lymph vessels and glands.

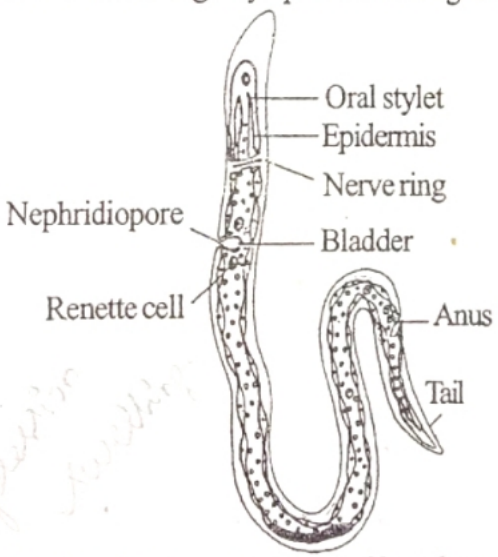

Fig.8.32: Wuchereria, human filarial worm.

4. Dracunculus medinensis

It is commonly known as ***guinea worm.*** It is an ***endoparasite*** living in the sub-cutaneous tissue. It is a digenic parasite because it completes its life cycle in two hosts. The primary host is man and the intermediate host is *Cyclops*. It produces blisters on the skin.

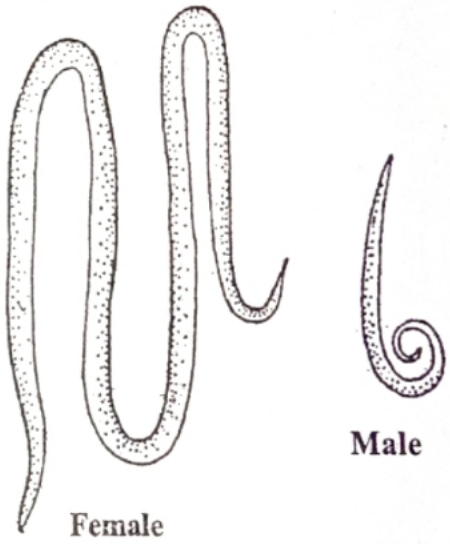

Fig.8.33: Dracunculus, guinea worm.

5. Enterobius vermicularis

It is commonly known as ***pin worm.*** It lives in the caecum. The worms are slender. It is a ***monogenic*** parasite. It causes severe itching in the perianal region.

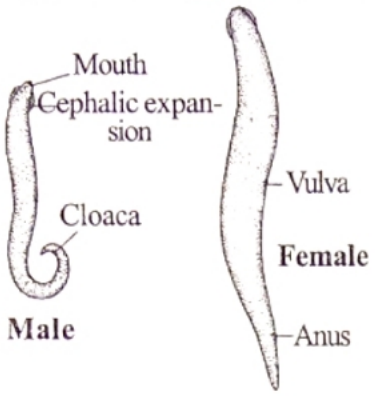

Fig.8.34: Enterobius, pin worm.

6. Trichocephalus trichuris

It is commonly known as ***whip worm.*** It occurs in the caecum and large intestine of man.

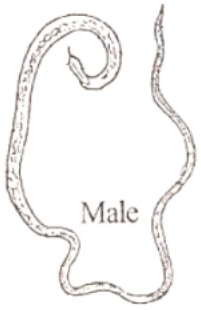

Fig.8.35: Trichocephalus, whip-worm.

It causes damage to the epithelial cells and blood cells. It is a ***monogenic*** endoparasite. The severe infection causes anaemia and abdominal pain.

7. Loa loa

It is found in ***Africa***. It is commonly known as ***African eye worm***. During their migration, they pass across the eye ball. The intermediate host is the mango flies. It causes swelling and pain in the eyes.

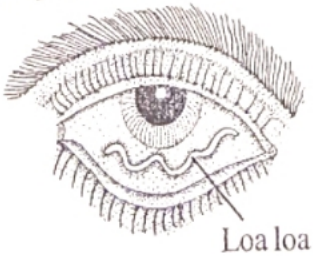

Fig.8.36: Loa loa, eye worm.

2. Plant Parasites

These are otherwise called ***phytoparasites.*** They usually feed on the plant juices. They cause injuries in plant tissues. The common plant nematode parasites are *Tylenches anguillula* and *Heterodera marioni.*

1. Tylenches anguillula

It is a nematode parasite. It lives in wheat plant. It causes galls on wheat plants. The juveniles live in the stem of wheat plant. It sucks the plant juices.

2. Heterodera marioni

It is a plant parasitic nematode. It is commonly called ***sugarbeet eelworm***. It attacks the roots of bean, pea, cabbage, cotton, etc. It feeds on the tissues. It causes heavy damage to the crops. *Heterodera* sp. also causes damage to the roots of potato plant.

3. Parasites of Domestic Animals

These are the nematode parasites which infect domestic animals like domestic fowls and dogs. The most important parasites are *Heterakis gallinae* and *Toxocara canis.*

1. Heterakis gallinae

It lives in the caeca of domestic fowls. Males are smaller than females. It carries a protozoan which causes disease known as ***black head.***

2. Toxocara canis

The larvae of this parasite enter pregnant female dog, migrate through placenta and finally reach the young ones. The larvae usually infect the children and live in the liver. It causes damage to the liver. Sometimes, it is fatal to the host.

9. Annelida

General Characters

The phylum ***Annelida*** consists of bilaterally symmetrical, true coelomate, triploblastic, metamerically segmented worm-like animals. Eg. *Nereis, earth worm, leech*, etc. They have the following general characters:

1. Annelids have a ***soft, elongated*** and ***cylindrical*** body.
2. Annelids are ***bilaterally symmetrical*** animals.
3. They have ***organ-system*** grade of organization.
4. They are the first ***true coelomate*** animals.
5. They have ***triploblastic*** body wall.
6. The anterior end has a ***head*** in some forms.
7. The muscle layers are thick in the body wall. Hence the body wall is said to be ***dermomuscular.***
8. The body is divided into a number of segments called the ***metameres***. The segmentation is known as ***metamerism***.

Fig.9.1: Megascolex.

9. The body is covered with a thin ***cuticle***.
10. ***Locomotory*** organs are ***setae***.
11. Digestive system is well developed.
12. Blood vascular system' is a ***closed type***.
13. Excretory system is formed of segmentally arranged ***nephridia***.

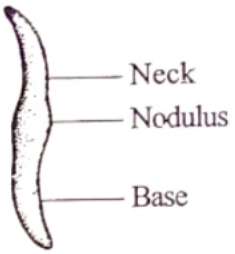

Fig.9.2: Seta.

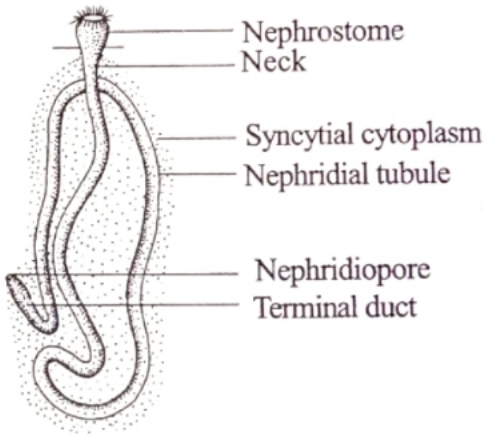

Fig.9.3: Nereis; Metanephridium.

14. Nervous system is formed of a pair of ***cerebral ganglia*** (brain) and a double ventral ***nerve cord***.
15. Mostly annelids are ***hermaphrodites***.
16. The gonoducts are formed from ***coelom (coelomoducts).*** The coelomoducts have connection with nephridia.
17. Regeneration is a common character in this phylum.
18. Their development is ***direct*** or ***indirect. Trochophore*** is a typical larva.