Aschelminthes

General Characters

Aschelminthes are *pseudocoelomate, triploblastic bilaterally s**ymmetrical unsegmented*** and v*ermiform 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:

- They are *parasitic or free living.*
- They ar*e bilaterally* sy*m*metrical.
- The body wall is *triploblastic.*
- They ar*e pseudocoelomate* animals.
- They have *org**an system** g*rade of organization.
- The body is covered with a *cuticle.* The epidermis is s*yncytial* in nature.
- *Circular muscles* are absent from the body wall.
- The alimentary canal is straight with a *mouth a*nd an ***anus.***
- The respiratory and circulatory system are absent. *10. T*he excretory organs ar*e protonephridia.*
- *T*he nervous system is formed of longitudinal nerves *an*d a brain.
- *T*he sexes are separate. Sexual dimorphism is a common feature. Males are usually smaller than the females.

Classification

Phylum.4*schelminthes* is divided into live classes. They are the following:

- *Rotifera*
- *Nematomorpha*
- *Gastrotricha*
- *5.* N*ematoda*
- *Kinorhyncha*

Class 1. Rotifera

- It includes microscopic aschelminths living in ponds. lakes, streams and rarely in oceans.
- Body wall is thickened into stiff plates or *lorica* into which the head may retreat.
- Anterior end has a ciliated *corona (wheel-organ).*
- *Post-anal foot* has two toes; foot has cement glands.

- Digestive system has a feeding organ, *mastax,* lined internally by strong cuticle.
- Body musculature includes longitudinal and transverse muscle bands and strands.
- Nervous system has three major ganglia and nerves.
- Excretory system consists of two *protonephridia* with ***flame cells.***
- Sensory organs are ***antenna****e a*nd e*ye spots.*
- Males are smaller than females*;* ***parthenogenesis*** **is** common.
- Examples: *Brachionus, Philodina, Asplanchna, Rotaria, Collotheca,* etc.

Class 2. Gastrotricha

- It includes microscopic, marine or freshwater *aschelminths.*
- Body wall contains *cuticle* bearing short *spines;* cilia are present on the ventral side.
- Posterior end is forked with adhesive tubes and glands.
- Pharynx is *triradiate* and muscular; mouth is surrounded by bristles.
- Body musculature includes six pairs of longitudinal muscles.
- Excretory system consists of tw*o protonephridia.*
- Nervous system has a saddle-shaped ganglion and two lateral nerves.
- *T*hey *are dioccions or monoccious;* freshwater females *are parthenogenic; n*ewly hatched young ones look like the adult.
- Examples: *Chaetonotus, Lepidodermella, Macrodas*ys, etc.

Class 3. Kinorhyncha

- It includes marine, microscopic animals.
- Superlicial segmentation divides the body into 13 or 14 somites.
- Body surface has *spiny cuticle* but no cilia.
- Mouth cone or head is protrusible and is covered with scalids.
- A pair of adhesive tubes is present in the front part of the ventral surface.
- Anerve ring, ventral cord and segmental *ganglia* are present in cach somite.
- Digestive system is complete, with salivary glands.
- They ar*e dioecious;* gonads are a pair of tubular sacs; sertilization is internal; metamorphosis with several larval stages is a common feature. Examples*: Echinoderes, Pycnophye*s, etc.

Class 4. Nematomorpha

- This group of *Aschelminthes* includes *hair worms,* found in springs; one genus *(Nectonema)* is marine.
- Body is long, thin, slender and worm-like.

- Body wall has thick *cuticle* bearing small papillae, single-layered cellular epiderinis and longitudinal muscles.
- Digestive system is complete in larva but degenerate in adults.
- *Pseudocoel* is mostly filled with parenchyma.
- Circulatory, respiratory and excretory systems are absent.
- Nervous system consists of a *cir**cumenteric nerve** ring* and a *ventral nerve cord.*
- They are *dioecious; g*onads are paired; penial spicules are absent; oviducts also open into cloaca.
- *Juveniles* are parasitic in grasshoppers, crickets and other insects. Examples: *Paragordius, Nectonema,* etc.

Class 5. Nematoda

- It includes aquatic, terrestrial or parasitic, elongated ***roundworms.***
- Body wall consists o*f cuticle, c*ellular or s*yncytial epidermis and longit**udinal muscle c**ells in four bands.
- Chia, circulatory and respiratory systems are absent.
- Digestive system is complete with muscul*ar pharynx* and *glands.*
- Excretory systein consists of glandular organs or canals or both.
- 11 *L'ulva* is anterior and ovaries ar*e didelphic.*
- 12. The life cycle is simple. The gravid females crawlin wwwal region causing itching sensation. The eggs are released. The patient scratches the affected region and eggs come under the nails and again they reach the same host through mouth along food.
- 13. The women and young girls are more susceptible than adult men and male children.
- 14. The itching caused by migration of the worms in the anal region and *allergic irritation o*f the skin may be intense, causing *sleeple**ssness, restlessness, nervousness, sexual** disorder, abdominal pain, appendicitis,* etc.
- 15. *Infection* o*f Enterobius* is prevented by good sanitation and proper disposal of human faeces.
- 16. *Enterobius* infection is treated with ***Gentian violet** tablets.*

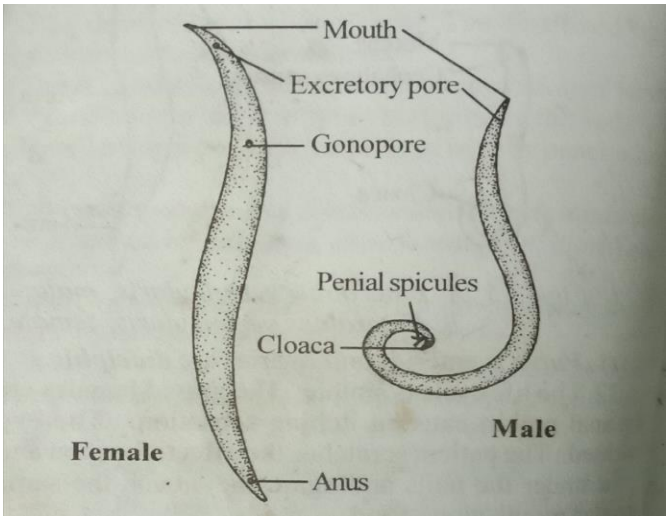
Ascaris lumbricoides

phylum :Aschelminthes

class :Nematoda

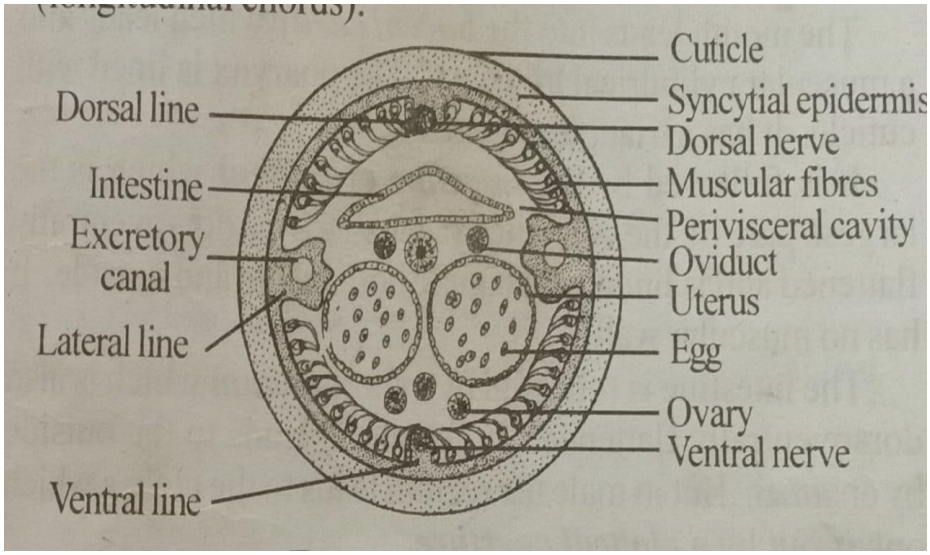
order : Ascaroidea

- *Ascaris lumbricoides is a round worm include, phylum Aschelminthes and in the class Nematoda*
- *Ascari*s is *an endoparasite* living in the *intestine o*f man. It causes *ascariasis.* It is cosmopolitan in distribution. It is more common in children than in adults.
- It has a length of about 10 to 14 inches. The body of the worm is long, *cylindrical a*nd tapering at both anterior and posterior ends. The colour of the animal is reddish yellow'.
- There are four *longitudinal lines* running throughout the length of the body. Of these four lines, one i*s* ***mid-dorsal,*** on*e mid-ventral* and the other two ar*e lateral i*n position.
- *Ascaris* shows *sexual dimorphism.* The female *Ascaris* i*s larg*er than the male. The posterior end of the female is *straight* but in the male it is curved ventrally like a hook.
- The mouth is situated at the anterior end of the body and is guarded by three lips. Of these three lips, one is *dorso median* and the other two are *ventrolateral* in position.
- On the ventral side, about 2 min from the anterior end is a small opening called the ***excretory pore.***



Body Wall

- The body is covered with an outer elastic membrane called *cuticle.* The cuticle protects the parasite from the digestive enzymes of the host.
- Beneath the cuticle is situated a layer of *epidermis.* It is a sheet of continuous protoplasm with scattered nuclei and devoid of cell boundaries. This type of epidermis is called *syncytial epidermis.*
- The epidermis is thickened in four regions forming *longitudinal chords.* They are one *dorsal,* one v*entral* and tw*o lateral chords.* . These chords project into the body cavity and they are *externally* visible as *longitudinal lines.*
- The next layer is the *muscular layer.* It is formed of *longitudinal muscle fibres.* Circular muscles are absent. The muscles are arranged in four longitudinal blocks, because they are separated by the four thickenings of the epiderinis (longitudinal chords).
- Each muscle fibre has an outer broader *muscular part* with contractile fibres and an inner narrow *protoplas* with a nucleus.
- The protoplasmic part consists of non actile fibres and projects towards the body cavily.



Digestive System

- The alimentary canal is a simple, straight tube. Th*e mouth* is situated at the anterior end. It is surrounded by thr*ee lips.*

- The mouth leads into the *buccal cavity* which leads into a muscular cylindri*cal pharynx.* The pharynx is lined with cuticle. It has a triangular lumen.
- It is followed by th*e intestine or midgut* which is the largest part of the *alimentary canal. It is dorsoventrally flattened and is lined with cuticle both* inside and outside. It has no muscular walls.
- The intestine is followed by a short *rectum* which is also dorsoventrally flattened. In female, it leads to the outside by an *anus.* But in male the rectum leads to the cloaca which opens out by a *cloacal aperture.*

Digestion

- *Ascaris* feeds on the digested food of its host. The food is sucked by the muscular pharynx. The digestion is *extracellular* in the intestine. The digested food is absorbed through intestinal cells.

Respiration

- In the intestine of man there is no oxygen. Hence respiration occurs without oxygen. This type of respiration is called anaerobic respiration. During anaerobic respiration, energy is released from glycogen by a process called glycolysis.
- Glycolysis consists of a series of reactions occurring in the absence of oxygen. During anaerobic respiration, glycogen is broken into fatty acids and CO_2 with the release of energy. CO_2 diffuses out through the surface of the body.

Excretory System

- The excretory system is formed *of protonephridium. It* is H-shaped and is formed of two *longitudinal excretory canals a*nd *a transverse canal. Fr*om the transverse canal arises a *terminal duct.* It opens to the outside by the *excretory pore* located behind the mouth on the ventral side. There are no flame cells and internal opening.
- The nitrogenous wastes are absor through the thin is of the canals and are eliminated through the excretory mre The nitrogenous waste is mainly in the form of *urea.*

Nervous System

- The nervous system consists of a *circumpharyngeal nerve ring, l*ocated around the pharynx. The nerve ring gives off *six nerve*s anteriorly and six nerves posteriorly. Of the six posterior nerves, two are thicker than the rest. They run in the *dorsal* and *ventral* lines. They are connected by transverse commissures at intervals.

Reproductive System

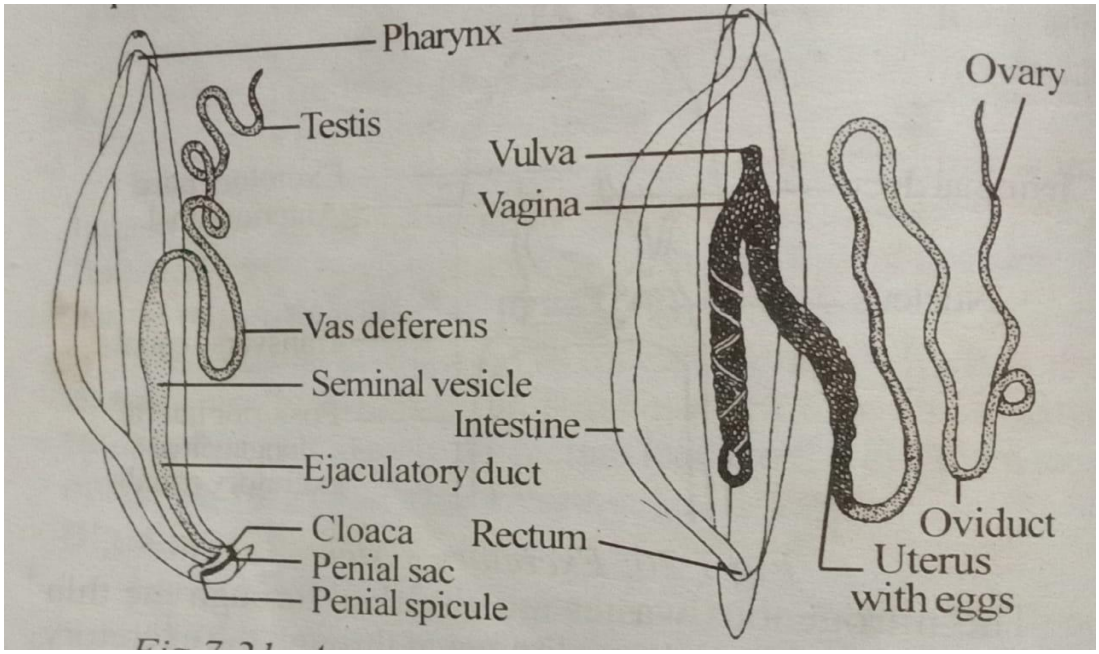
The sexes are separate. *Ascaris* shows well marked *sexual dimorphism.*

Male Reproductive System

- It consists of a single *testis.* It is a coiled thread-like structure. It lies in the anterior part of the body cavity. The testis leads into a v*as deferens*. The *vas deferens* elongates into a muscular tube, the *seminal vesicle.* The *sperms* are stored in the seminal vesicle.
- The seminal vesicle is followed by a short muscular *ejaculatory duct* which joins with the cloaca. The cloaca dorsally has a pair of *penial sac*s in which lie two penial *setae o*r *spicules.* The setae can be protruded out. They help in the transference of sperms during copulation.

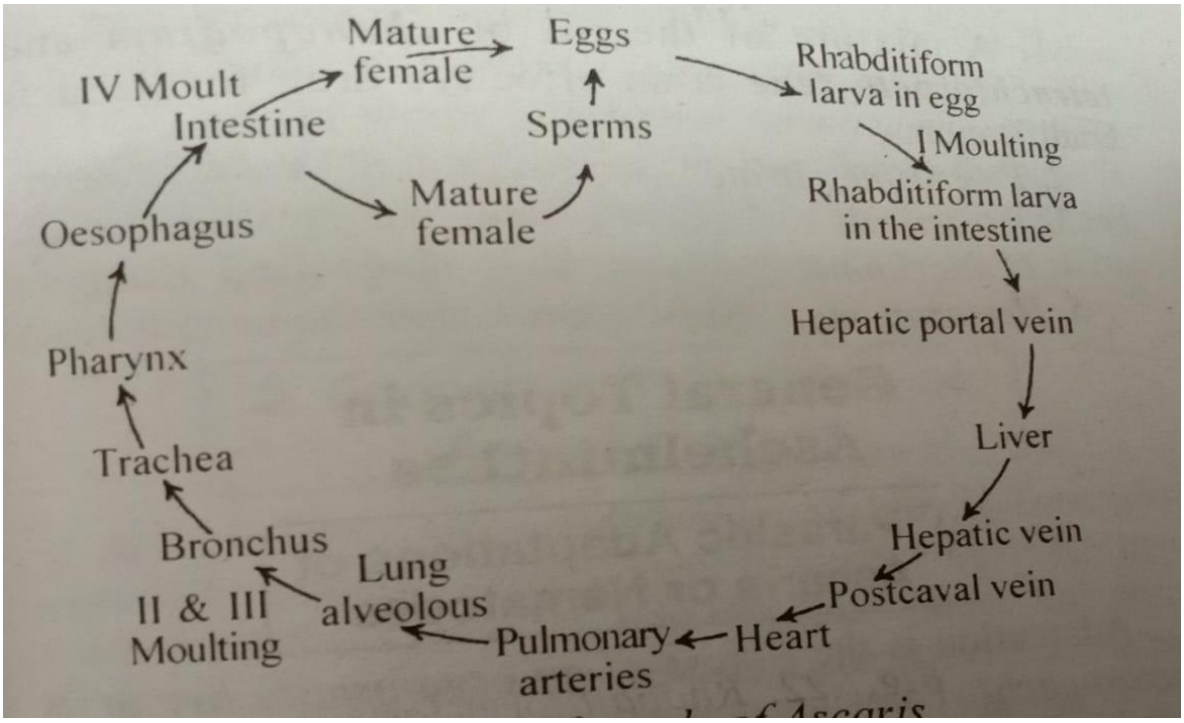
Female Reproductive System

- It consists of a pair of *ovarie*s. They are tubular and thread like. They occupy the posterior part of the body. Each ovary leads into an *oviduct* which is slightly broader than the ovary. The oviduct leads anteriorly into the *uterus.* The uterus is a long, inuscular and straight tube. The uterus contains *fertilized eggs.* The uteri of both the sides unite anteriorly to form a median v*agina.* The vagina opens to the outside through the v*ulva or gonopore.*



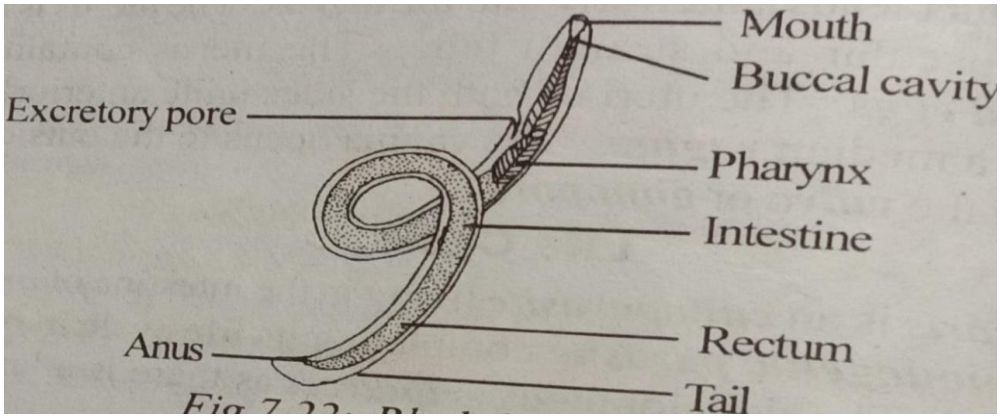
Life Cycle

- *Ascaris* is an *endoparasite* living in the intestine of man. It is a *monogenic parasite* completing its life cycle in o*nl*y one host. The development i*s indirect* as there is a larval form in its life cycle.
- Fertilization: Fertilization *is internal.* The eggs are fertilized in the oviduct.
- Laying eggs: Fertilized eggs are laid by the female in the intestine of man. A female can lay about 2,70,00,000 eggs in her life time. The eggs are passed out through the faeces of man.
- Eggs: The eggs are oval in shape. It is covered by three membranes, namely an outer *protein layer*, a middle *shell* and an inne*r lipoid layer.* The egg is resistant to all kinds of weathers and can survive for several years.
- Cleavage: The segmentation of the egg i*s holoblastic* and *unequal.* The cleavage is of *spiral type* and the development i*s determinate.* Cleavage leads to the forination of a *blastula.* The blastula invaginates and becomes the *gastrula.* The gastrula develops into a larva called *Rhabditiform larva.*
- Rhabditiform larva: It is the larva of A*scaris*. It looks like the *Rhabditis* (adult) hence the name. It is cylindrical in shape. It has a straight alimentary canal with a mouth and the anus. It contains all the parts of an adult A*scari*s except the reproductive organs.



Infection

- The *Rhabditiform* larva remains inside the egg. Further development occurs when it enters the host. 11 enters the host through contaminated food and water. When the egg enters the intestine of man, the egg membranes dissolve and the *Rhabditiform* larva is released.



- **Extra-intestinal Migration**: The newly hatched *Rhabditiform* larva does not remain in the intestine. It goes out of the intestine for a tour for about ten days. The tour under-taken by the *Rhabditiform* larva outside the intestine is called e***xtra intestinal migration.***

- It penetrates through the intestinal wall and reaches the ***mesente****ric blood vessel*s. Then it reaches th*e live*r through the hepatic portal vein.
- From the liver it enters the *heart* via the *hepa****tic vein*** and the ***post cával vein.***
- From the heart, it is carried to th*e* ***lung*****s** through *pulmonary arteries*. In the lungs it enters th*e alveoli* where it lives for some days and grows.
- From the alveoli of lungs it passes through the *bronchus* into the *trachea* and then to th*e throat.* It then moves into the *oesophagus*. Finally it reaches the small intestine and grows into an adult.
- Moulting: Moulting is the shedding of the outer cuticle. *Rhabditiform* larva moults four times before it becomes the adult. When it is inside the egg, it moults for the first time. In the alveolus of the lungs, it moults twice. The fourth moult occurs in the intestine. This moult converts the larva into an adult.

Pathogenesis

- *Ascaris* causes a diseases called *ascariasis.*
- Ascariasis depends on the severity of infections. When A*scari*s shares the food of inan, it causes ***weakness, anaemia a*****nd** ***eosinophilia.***
- When the worms damage the intestinal mucosa, it leads **to** ***enteritis o*****r** ***peritonitis.***
- When the parasite enters the appendix, it causes *appendictis.*
- When the parasite damages the liver, it causes *hepatitis.*
- When the parasite damages the lungs, it causes ***pneumonia.***

Prevention

Infection of *Ascaris* is prevented by the following methods:

- Human faeces should be safely disposed underground.
- Fruits and vegetables should be thoroughly washed.
- I lands should be properly washed before eating.
- Finger nails should be regularly cut.

Treatment

The infection of *Ascari*s can be treated by the following drugs:

- A mixture of the oil of *chenopodium* and *tetrachloroethylene* is an effective drug for *Ascaris* eradification.
- *Piperazine citrate*
- *Tetramisole*
- *Dithiazanine*
- *Hetrazan*