

## PHYLUM – CTENOPHORA

- **Ctenophra** name was given by Eschscholtz. These animals are known for their **beauty** and **delicate** nature. In sunlight their comb-plate give the effect of a **rainbow**. The animals of this phylum are known as “**sea-gooseberries**” or “**Comb-jellies**” or “**Sea-walnuts**”. Nematoblasts are absent, so they are also called “**ancindaria**”.
- All animals are **marine** and **pelagic** (float on sea surface) and show Bioluminescence.
- Body form may be **spherical, cylindrical** or **Pear - shaped**. Body is soft **transparent** jelly like having **Bira-dial symmetry** with **tissue grade** body organisation.
- Animals are **Troploblastic** Mesoglea contains ameoboid **mesodermal cells called Colloblast**.
- Locomotion takes place by the presence of **8 ciliary comb plates** on the body surface.
- Skeletal, Excretory and Respiratory system are **Absent**.
- Animals are **carnivorous**. They feed on the eggs and larvae of Molluscs, fishes and crustaceans. A pair of long solid tentacles are present. In place of nematoblasts on the tentacles a special type of cells are present called **Lasso-cells** which help in catching the prey. Anus is absent.
- All animals are **Bisexual**. Complex type of **sexual reproduction** is found. Metagenesis is absent. Regeneration is normally found. Development is of **indirect type**. Life cycle involves a free living **Cydropid** larval stage. Cleavage is **Holoblastic** determinate and **unequal**. Asexual reproduction is absent.
- **Regeneration & paedogenesis** is normally found.
- Ctenophora is divided into **two classes** on the basis of tentacles.

### TENTACULATA

e.g. *Pleurobrachia*

*Valeman*

*Cestum* - “Venus’s girdle”

*Ctenolana* - Commensal with Alcyonium

*Hormiphora*

*Euchloro rabra* - with cnidoblast ctenophore. (Exception)

### NUDA

*Beroe* - Swimming eye of cat.

## PHYLUM – PLATYHELMINTHES

- **Gegenbaur** Suggested the name **Platyelminthes**. Included flat worms most primitive bilateral animals. **Free living** (terrestrial, fresh water or marine) or **parasite**.
- Study of worms causing parasitic infestation in human is **Helminthology**. Most members of this phylum are the parasites of vertebrate. Some are found in aquatic habitat.
- Body organisation is of **Tissue organ grade**.
- Body is **Triploblastic** i.e. body is formed from three germinal layers i.e. Ectoderm, Endoderm & Mesoderm.
- Body is **Bilaterally** symmetrical.
- Anterior and posterior parts are clear. **Distinct head** begins from this phylum.
- Locomotory organs are absent in these animals but **adhesive organs** are present like **suckers, hook** etc.
- Epidermis is **syncytial** and is some time ciliated. On the body wall of parasitic animals a thick cuticle is present i.e. **Tegument**. This cuticle protects the parasite from the digestive - enzymes of the host. It is secreted by Epidermis.

- Muscles in the body-wall are **mesodermis**. Below the epidermis **longitudinal, circular** and **oblique** muscles are present.
- **Nervous system** is **ladder like** having brain ring and two main longitudinal nerves connected at intervals by transverse commissures. Sense organs occur in free living form.
- These are **acoelomate**. In between various organs a solid, loose mesodermal tissue called Mesenchyma or **Parenchyma** is present.
- In Turbellaria and Trématoda class an **incomplete** (Blind sac body plan) and without anus digestive system is present. In animals of class Cestoda, digestive system is completely absent.
- **Skeleton** and **circulatory** systems are absent. Turgidity of the fluid in the parenchymal meshes maintainst the form of the body (Hydrokeleton)
- Animal **respire** through **body surface**. **Anaerobic** respiration in internal parasite like Toenia.
- **Excretory** organs are **protonephridia** or flame-cells. **Flame-cells** are also termed as the **Solenocytes**. They also help in **osmoregulation**.
- All animals of this phylum are **Bisexual**. Reproductive system is **complex** an well-developed. **Fertilization** may be **self** or **cross** and **internal**. Cleavage is **spiral & determinate**. Development may be **direct** or **indirect**. In indirect development, larva may be one of more types. In these animals **yolk/vitelline glands** are present which provide nutrition to the eggs.

**Dugesia** (Planaria) - Found in fresh water, Nocturnal, Cannibalism, slow creeping omnivorous. Reproduce sexual as well as asexual (Transerve Binary fission), food power of regeneration. Pharynx can be everted. **Fasciola** - (Liver fluke), Found in the bile ducts of liver of Sheep & Goat (Digenetic endoparasite) It causes Liver-rot or cirrhosis.

Spiny cuticle, Attached to bile ducts by posterior suckers. Temporary copulatory canal Laurer's canal **is found**. Respire anaerobically. Holozoic - feeds on blood, bile and epithelial cell of bile duct hermaphrodite may undergo self or cross fertilisation. Show **polyembryony** and **metagenesis** Life history involve two hosts (Digenetic)

(1) Primary host - Sheep & Goat

(2) Secondary host - Garden-snail (Planorbis, Lymnea, Bulinux)

Shows special multiplication in larva stage namely **Miracidium, Sporocyst, Redia** and **Cercaria** and **Metacercaria**.

Infective stage for Primary host (Sheep) - Metacercaria.

Infective stage for Secondary host (Snail) - Miracidium. (Free swimming)

**Schistosoma** - (Blood fluk) Found in veins of human bladder and intestine. Respire aerobically and feeds on blood. Unisexual, Large male carries female in a groove gynaecophoric canal on ventral side.

Life history show sexual dimorphism

Life history involve two hosts (Digenetic)

(1) Primary host - Man

(2) Secondary host - Graden - snail (Planobis, Lymnea, Bulinus)

Shows special multiplication in larva stage namely Miracidium, Sporocyst and Cercaria.

Infected stage of Primary host (Man) - Cercaria

Infected stage of Secondary host (Snail)- Miracidium. (Free swimming)

Larva enters human body by boring in skin while bathing in ponds.

In damages the liver & causes intestinal disorder - Schistosomiasis or Bilharzia

**Toenia solium** : (Pork tapworm) Flate, white ribbon - like, size - 4m x 6mm

Three region (1) head or scolex with hooks & suckers (2) Neck - for forming new proglottides.

## Divided into three classes

Turbellaria	Trematoda	Cestoda
<ul style="list-style-type: none"> <li>- Free living fresh water or marine known as Planarians or Eddy worm</li> <li>- Body is unsegmented and leaf like Coverde by delicate ciliated epidermis. Rod shaped Rhabdites In epidermis</li> <li>- Mouth in often venral and anus absent. Alimentary canal is present (Branched)</li> <li>- Reproduction - asexual sexual and shows good power of regeneration, no larva.</li> <li>- Suckers - absent</li> </ul> <p>e.g.</p> <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px;"> <p><b>Dugesia - (Planaria)</b>  <b>Microstomum</b> - Enemy of Hydra  <b>Macrostomum</b>  <b>Mesostoma</b>  <b>Gunda</b>  <b>Canvoluta</b> - Symbiont on <b>Zoochlorella</b> and Diatoms, algae.  <b>Inchthyophaga</b> - Parasite on fishes</p> </div> <p>Ref.</p>	<ul style="list-style-type: none"> <li>- Endo-Parasite, known as flukes, or <u>flat worms</u></li> <li>- Body-Unsegmented and leaf life, covered by tegument, (Find spines) No epidermis in adult</li> <li>- Mouth - anterior &amp; anus is absent. Alimentary canal-branched.</li> <li>- Life history - included larval stage &amp; involve, more than one host.</li> <li>- Suckers - for attachment in the host</li> </ul> <p>e.g.</p> <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px;"> <p><b>Fasciola</b> (The liver flukes  <b>Schistosoma</b> (the blood flukes)  <b>Paragonimus</b> (lung fluke worm) (in lungs of man and pig)  <b>Diplozoon</b> - Ectoparasite on the gill of fish. (Monogenetic)  <b>Opisthorchis</b> - Human liver fluk or Chinese liver fluk</p> </div> <p>Ref.</p>	<ul style="list-style-type: none"> <li>- Endo - Parasite Intestina lparasite, known as tape worms</li> <li>- Body Ribbon like, covered by tegument. No epidermis is adult.</li> <li>- Mouth and Anus absent (food from body surface). Alimentary canal absent.</li> <li>- Life history - includes larval stage &amp; Involve, more than one host. Each proglottieds has one or two sets of male &amp; female reproductive organ</li> <li>- Scolex has suckers &amp; hooks for attachment</li> <li>- Body divided into scolex, neck and strobilla of few to numerous proglottids. No true segments</li> </ul> <p><b>Taenia solum</b> - Pork tapeworm  <b>Taenia saginata</b> - Beef tapeworm  <b>Echonococcus</b> - Dog tapeworm  <b>Hymenolepis</b> - Smallest tapeworm in man's intestine - 10 cn, 200 proglottids (Monogenetic)</p> <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px;"> <p><b>Amphilina</b>  <b>Rellientina</b> - Birds' tape worm  <b>Phylloothrium</b></p> </div> <p>Ref. <b>Moniezia</b> - Endoparisiste of ruminents</p>

(3)log strobila ~ 850 proglottides. T. Sodium is human gut parasite. Attached to intestinal wall by hoods & suckers. Saprozoic nutrition, anaerobic respiration. Hermaphrodite - Self fertilization (Between two different Proglottids of the same species). Man gets infection from undercooked pork containing encysted larvae cysticerci. Life history involve two hosts (Digenetic)

(1) Primary host - **Man**

(2) Secondary host - **Pig**

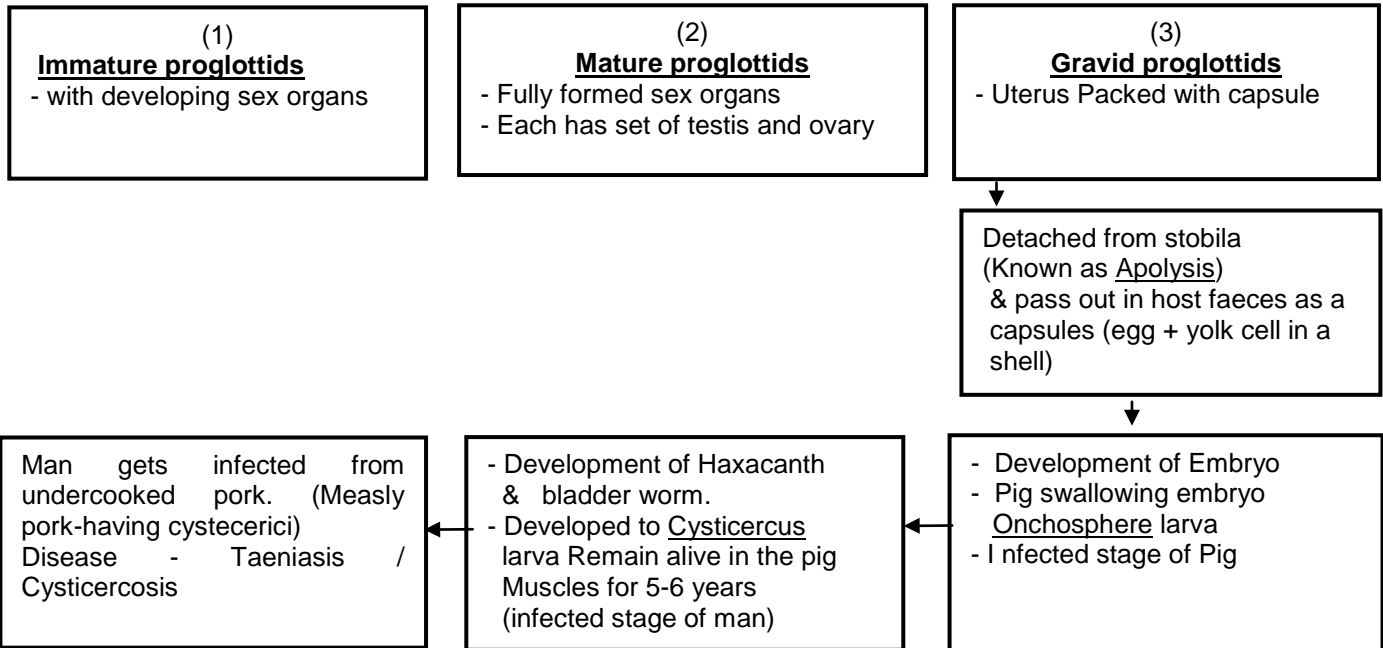
Shows special multiplication in larva stage namely **Onchosphere**, **Hexacanth**, **Bladder worm** and **Cysticercus**

Infetive stage of **Primary host Man** - **Cysticercus**.

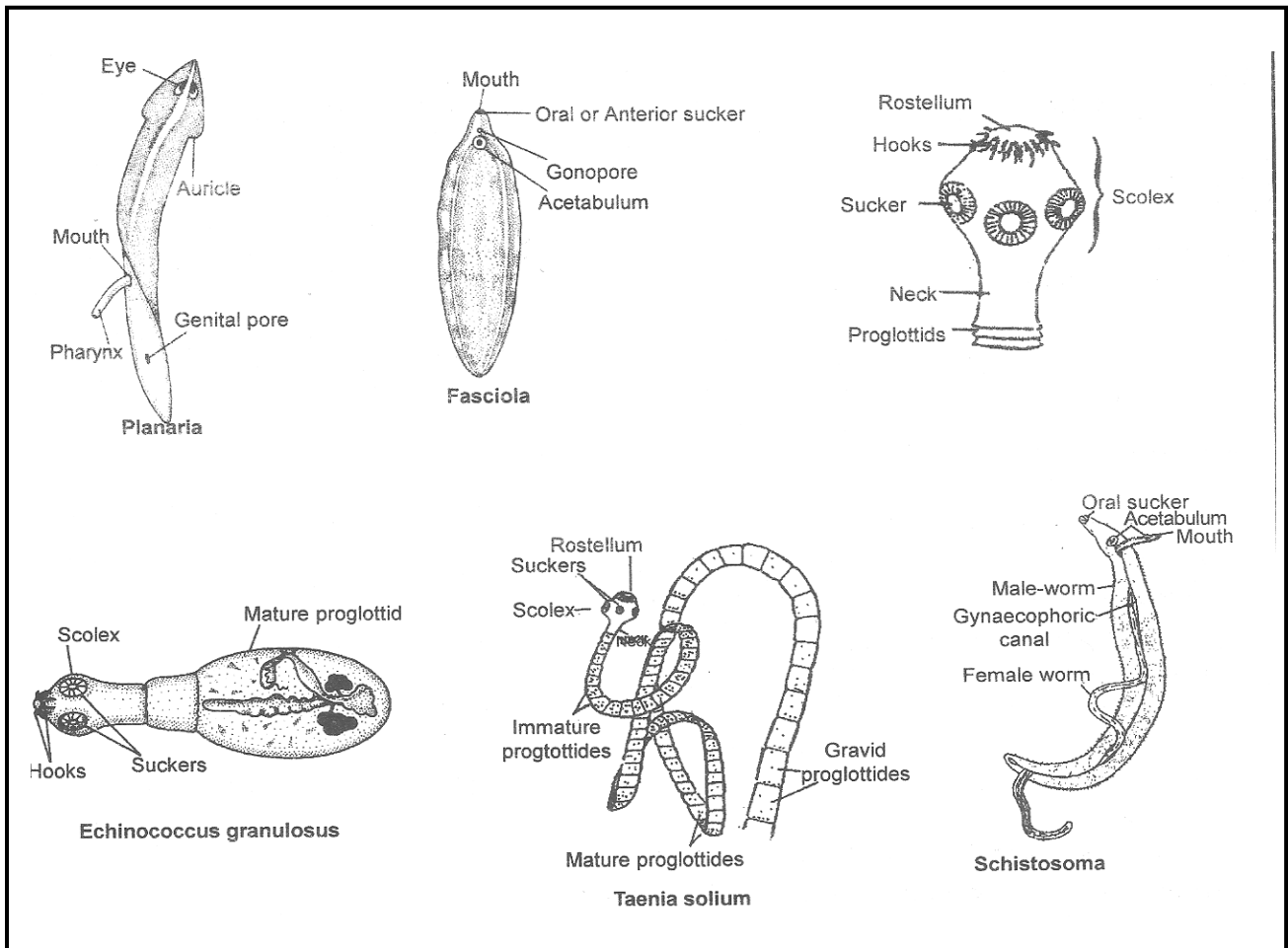
Infetive stage of **Secondary host Pig** - **Onchosphere**

It causes the disease **Cysticercosis**

There are three types of Proglottids.



**WITNESS FEW COMMON FLAT WORMS**



**Taenia saginata (Beef Tapeworm) -**

**Digenetic - Primary host - Man**

**Secondary - Cow sometimes Sheep**

The Beef tapeworm, infects the beef eating population. Scolex without rostellum & hooks. Longer than T. solium

**Echinococcus - (Dog tapeworm or Hydatid worm)**

**Digenetic - Primary host - Dog**

**Secondary - Pig**

With two or three proglottids  
It causes the disease Hydatid

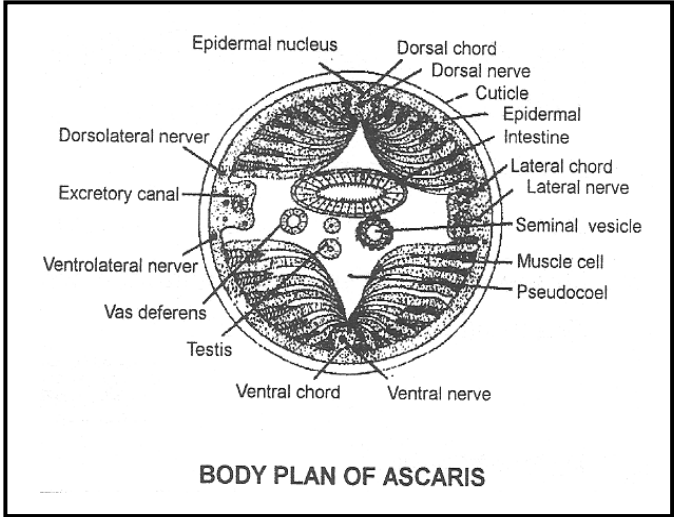
**UNIQUE FEATURES**

- Bilateral symmetry.
- Organ-system level of organization
- Head with sense organs at the front end.
- Three germ layers.
- Muscle layers both in the body wall and gut
- Brain ring and nerve cords,
- Organised excretory system, and
- Gonoducts and copulatory organs

**PHYLUM - ASCHELMINTHES (NEHATHELMINTHES OR NEMATODA)**

Earlier round worms or thread worm were classified as Achelminthes by **Grobben**.

- **Gegenbour** established the Phylum Nematelminthes. Phylum included round worm.
- **Nematods** are found everywhere in fresh water, sea water, soil humus - rich soil. Many as a parasite and cause health problems.
- Animal of this phylum are **Cylindrical**, tapering at both end without segmentation.
- Symmetry - Bilateral, Germ layer - Triploblastic, Level of organisation - Organ system level and having tube within tube plan.
- Anterior end does not show distinct head.
- No appendage
- Body wall consist of
  - (1) Cuticle - Firm, non living, resistant to digestive enzymes of host.
    - Moulded (changed) many time during growth period (usually four times).
  - (2) Epidermis - Without cilia. Syncytial i.e. a continuous layer of cytoplasm having scattered nuclei.
  - (3) Muscle layer - Longitudinal fibre divided into four quadrants.



- Body cavity is there between body wall and digestive tract. Which is not lined by mesothelium i.e. Pseudocoel (developed from blastocoel) and contain Pseudocoelomic fluid.
- Skeleton is not mineralized. High fluid pressure in the pseudocoelom maintainst body shape. It is called Hydro skeleton.
- Digestive tract is complete and differentiated into mouth, pharynx, intestine & Anus. Mouth is surrounded by 3 - lips having sensory papillae and amphids. Pharynx is muscular. It is used to suck of food. Intestine is non muscular.
- Respiration is through body surface by diffusion.
- Circulatory system is undeveloped
- Nervous system comprises of circum pharyngeal ring (Brain). Sense organs like Papilalae (Tangoreceptors) Amphids (Chemoreceptor) are present on lip Paired unicellular Phasmids (chemoreceptor) are found near hind end of body.
- Excretory system is H-shape of gland cells or intracellular canal or Protonephridia -(Renettle cell). Excretory matter is ammonia.
- Reproduction system is developed as sexes are generally separate. Sexual dimorphism is present. Male is smaller than female and curved from its caudal end. Male has penial spiculas for copulation. Genital tract joins digestive track to form cloaca. Female is larger than male and straight. Genital track open independently, Female lays numerous eggs with Chitinous shell. Fertilization is internal and development is mostly direct. Cleavage is Holoblastic spiral and determinate type. Number of cells are fixed from larva to adult development knows as Eutely. Nematoda has been classified into two classes on the basis of specialised sense organ Caudal receptor & Excretory system.

## 1. PHASMIDIA

- e.g. Ascaris** - Intestinal round worm (in small intestine) larva - Rhabditiform/Rhabditoid  
 Enterobius - Pin worm or seat work (in large intestine)  
 Ancylostoma - Hookworm (in small intestine)  
 Wuchereria - Filarial worm (in Lymph vessels/gland) by female culex mosquito. Viviparous (Digenetic)  
 Loa - loa - Eye worm (African eye worm)  
 Trichuris - Whip worm (in intestine)  
 Rhabditis - Free living  
 Trichinella - (First in intestine then in stripped muscle)  
 Dracunulus - Guinea worm (madina worm) or fieryserpent (Digenetic - Cyclops as intermediate) (Oldest discovered Nematode)

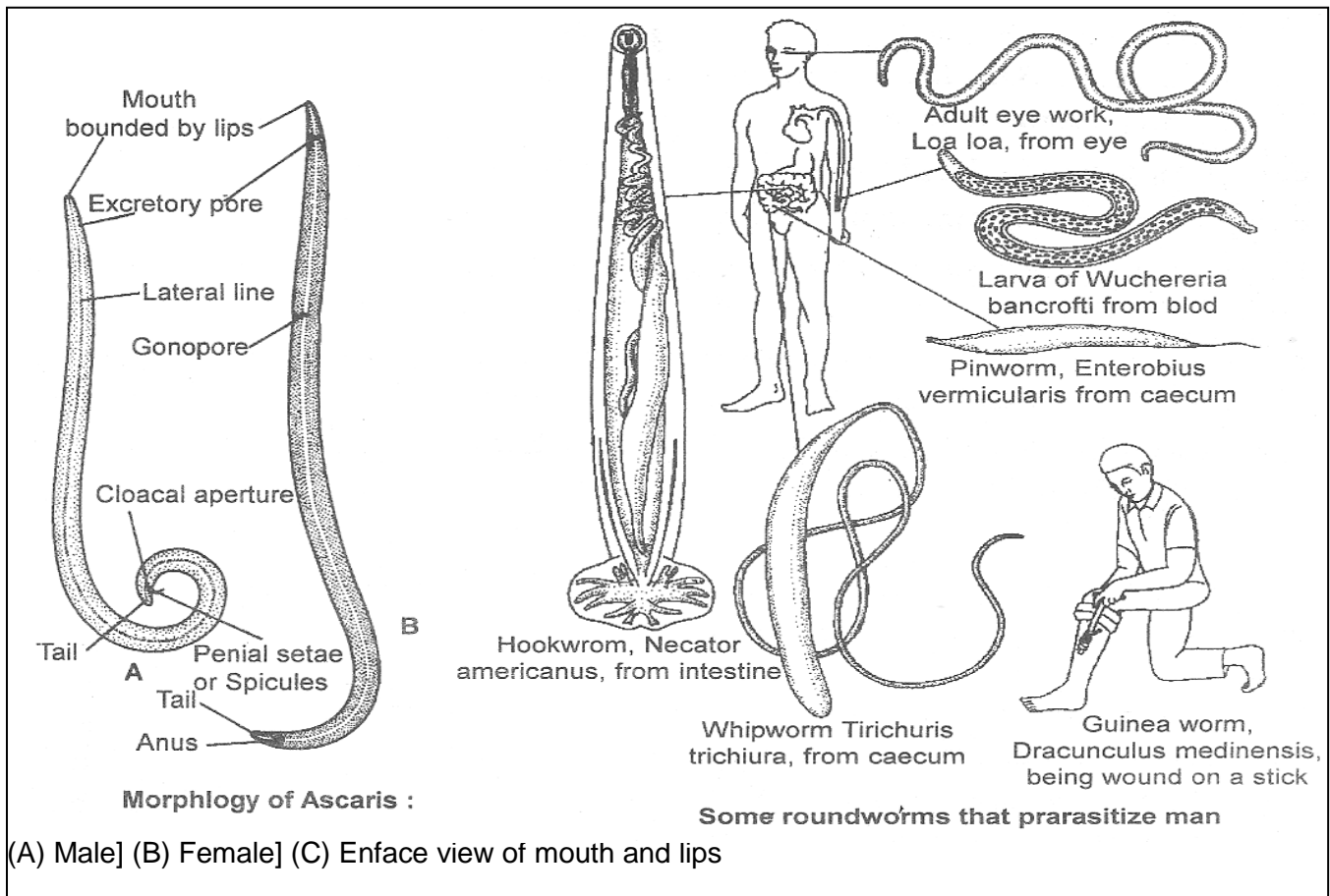
## 2. APHASMIDIA

e.g. *Desmoscolex*

## UNIQUE FEATURES

- Syncytial epidermis
- Body wall musculature of longitudinal fibres only.
- Pseudocoel, a body cavity without a lining of mesodermal coelomic epithelium.
- Complete digestive tract.
- Fluid filled body cavity.
- Separate sexes.

### WITNESS FEW FOUND WORMS



## PHYLUM – ANNELIDA

- **Lamarck** coined the term **Annelida**
- Free living found in moist soil, fresh water, sea or few are parasite.
- Body is Soft elongated cylindrical or flattened divided into segments or metamers by ring like, groves called Annuli.
- **Symmetry - Bilateral, Germ layer - Triploblastic, Level of organisation - Organ system level having tube within tube plan.**
- Anterior end forms a distinct head with sense organ in few annelids.- Appendages are simple, unjointed and locomotory having **Chitinous Setae** and **Parapodia**
- **Body wall** consist of
  - (1) **Cuticle** - Thin moist Albuminoid cuticle allow free exchange of gas.
  - (2) **Epidermis** - Single layered epidermis made up of supporting cell, sensory and glandular cell.
  - (3) **Muscle layer** - (1) Circular layer. (2) Longitudinal layer. Muscle are smooth/unstrained.
 Body wall may have minute chitinous setae.

- **First Protostomi eucoelomate animals**

**Body cavity** is true coelom lined by mesodermal coelomic epithelium. **Schizocoel.**

It is divided by transverse septa into compartment. It is filled with coelomic fluid that contains cells.

- As such there is no **Skeleton**. Fluid filled coelom serves as a **hydrostatic skeleton**.

- **Digestive tract** is **complete**, straight and extends through entire body. The gut has both circular and longitudinal muscles. Few Annelids and **sanguivorous**. Digestive gland are developed for the first time in Annelids.

- **Respiration** is through **skin** i.e. **Cutaneous respiration**. Some have **gills** (branchial respiration).

- **Circulatory system** is **closed**. Some blood vessels enlarge to act as pumping heart. (Heart appear first time in annelids)

The blood is red with hemoglobin dissolved in plasma (**Erythrocrurin**) It has amoeboid corpuscles only. Few Annelids like **Sebilla** have **Chlorocrurin** as a respiratory pigment also. **Hirudinaria** has circulatory system with **haemocoelic system**.

- **Excretory organ** is **Nephridia**. Coiled tubules also in **osmoregulation**.

Excretory matter (1) **Ammonia** in aquatic form (2) **Urea** in land form

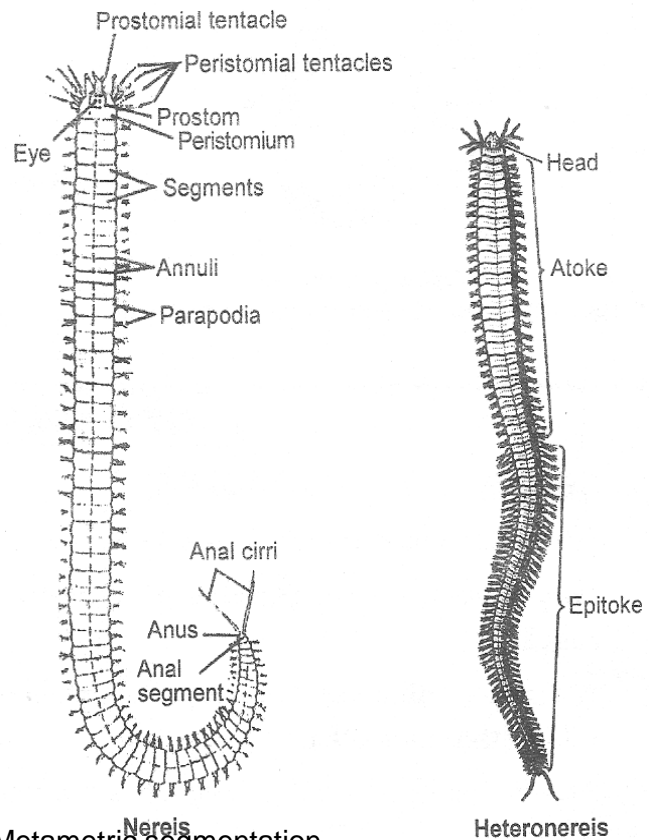
- **Nervous system** consist of **A circumenteric nerve ring**, **Double, midventral**, nerve cord with ganglia. Sense organ chemoreceptor, photoreceptor & tentacle, palp, eyes may be present.

- Sexes may be separate or united. **Asexual** reproduction by **budding** or fission is some cases also. Atok (asexual), Epitok (sexual) Phenomenon also found (Nereis).

- **Cleavage** is **spiral** and **determinate unqual & holoblastic**. Regeneration is usually found. Life history includes a **trochophore** larva in few Annelids.

**Nereis** : Inhabits in Sea - shore between tide mark, burrows, Nocturnal, Carnivorous, Gregarious Fertilization in sea.

**Parapodia** in each segment except first & last, During breeding body divides in two parts anterior asexual part - **Atoke** and posterior sexual portion **Epitoke**. This change is known as **epitoky**.



**UNIQUE FEATURES**

To suck impure blood by leach is called Phlebotomy Metameric segmentation  
 Nephridia for excretion and osmoregulation  
 Closed circulatory system with respiratory pigment dissolved in the plasma  
 Setae in the body wall in most forms.  
 Head, appendages and respiratory organs in some cases,  
 Circular and longitudinal muscles in both body wall and gut wall.



“Annelida” is classified into 4 classes on the basis of presence or absence of sense organ and position of setae

<b>Polychaeta</b>	<b>Oligochaeta</b>	<b>Hirudinea</b>	<b>Archiannelida</b>
<ol style="list-style-type: none"> <li>Most of the members are found in sea water.</li> <li>Cephalisation is more distinct. Head with well developed eyes, tentacles and olfactory plants.</li> <li>Setae numerous and are present in parapodia, parapodia helps in locomotion and also in respiration. Suckers are absent</li> <li>Clitellum absent.</li> <li>Animals unisexual and gonads are formed only during breeding season.</li> <li>Development is indirect. Larval stage is called <u>Trochophore</u>.</li> </ol> <p>e.g. <b>Nereis</b> - Sand worm  <b>Aphrodite</b> - Sea mouse  <b>Arenicola</b> - Lug worm  <b>Sebilla</b> - Peacock worm  <b>Chaetopterus</b> - paddle worm shows bio – florescence great power of regeneration.</p> <p><b>Euinice</b> - Palalo worm  <b>Polynoe</b> - Scale worm  <b>Terebella</b> - respire by gills  <b>Glycera</b> - Smoot blood worm</p>	<ol style="list-style-type: none"> <li>Most of the members are terrestrial, but some are aquatic.</li> <li>Cephalisation absent. No distinct head, eyes, tentacles and olfactory palps.</li> <li>Setae for locomotion. Number of setae is limited and situated in micro bags present in body wall, single setae is present in a bag. Parapodia &amp; sucker are absent.</li> <li>Clitellum is present permanently for cocoon formation. Fertilization is external and is held in cocoon.</li> <li>Bisexual or rmaprodite cross fertilisation &amp; external</li> <li>Development is direct. No larva</li> </ol> <p>e.g.  <b>Pheretima</b>  <b>Eutyphaeus</b>  <b>Lumbricus</b> - European earthworm  <b>Dravida</b>  <b>Megascolex</b> - Largest earth worm (S. India)</p> <p><b>Dero</b> - Fresh watered  <b>Nais</b> - Fresh watered  <b>Tubifex</b> - Blood worm (Fresh water)  indicator organic loading</p>	<ol style="list-style-type: none"> <li>Aquatic, terrestrial, extoparaside and <u>sanguivorous</u></li> <li>Cephalisation absent. No distinct head, eyes, tentacles and olfactory palps.</li> <li>Parapodia and setae are absent. Suckers at both the ends</li> <li>Clitellum(9-11egments) development only in breeding season</li> <li>Animals of this class are bisexual. Fertilization is external</li> <li>Development is direct. No larva</li> </ol> <ul style="list-style-type: none"> <li>Number of segments are fixed i.e. 33 segments. Each segment subdivided into numerous rings. Called “Secondary external annulation”</li> <li>Anticouglulant Hirudin in the saliva</li> <li>Saw like chitinous teeth in buccal cavity</li> <li>circulation with haemocoelic system</li> <li>Heamocoelomic system is present</li> <li>Coelom is divided in tubes having coelomic fluid and haemoglobin. A special mosedermal tissue Botryoidal tissue made up of adipose tissue for fat storage is present.</li> </ul> <p>e.g. <b>Hirudinaria</b> - Fresh water leech  <b>Bonellia</b> - Sea leech – male is ill developed and lives permanently in the uterus of female (unisexual)  <b>Pontobdella</b> - Skate sucke.</p> <p>e.g. <b>Hirudo</b> - Medicinal leech (Highly modified)</p> <p><b>Glossiphonia</b> - Fresh water leech  <b>Haemadipsa</b> – Terrestrial leech  <b>Haemopsis</b> - Horse leech  <b>Acanthobdella</b> – Ectoparaside with setae C.L. between oligochaeta Hirudinea</p>	<ol style="list-style-type: none"> <li>Members of this class are salt water animals with small body.</li> <li>Cephalisation absent. No distinct head, eyes, tentacle present and olfactory plants.</li> <li>Parapodia and setae are absent.</li> <li>Citellum absent.</li> <li>Animals are unisexual</li> <li>Development is indirect. Larval stage is called <u>Trochophore</u></li> </ol> <ul style="list-style-type: none"> <li>External segmentation is not very distinct</li> </ul> <p>e.g. <b>Polygordius</b> - C.L. between Annelida &amp; Mollusca (living fossil)</p> <p>Ref. <b>Protodrillus</b>  <b>Dinophilus</b>  <b>Nerilla</b></p>