

Phylum Platyhelminthes- characteristics, classification, examples

Platyhelminthes (flatworms) definition

Platyhelminthes are triploblastic, bilaterally symmetrical, dorsoventrally flattened, acoelomate flatworms with organ grade of construction without a definite anus, circulatory, skeletal or respiratory system but with Protonephridial excretory system and mesenchyme filling the space between the various organ of the body.

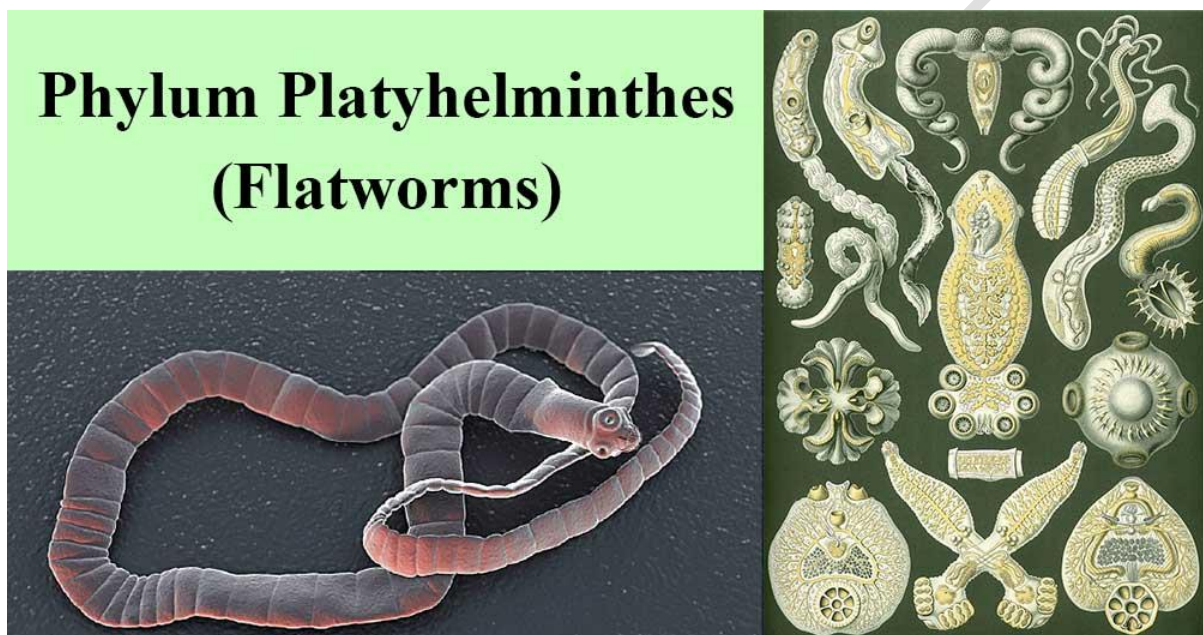


Figure: Phylum Platyhelminthes.

- They are free-living, commensal or parasitic.
- They are bilaterally symmetrical and dorsoventrally flattened, triploblastic worm.
- Bilaterally symmetrical with the definite polarity of head and tail ends.
- Triploblastic i.e. body derived from three embryonic germ layers; ectoderm, mesoderm, and endoderm.
- Dorsoventrally flattened i.e. well-developed ventral surface with mouth and gonopore.
- Their body generally shapes as a worm but varies from moderately elongated flattened to long ribbon-like and leaf-like.
- They are small to moderate in size varying from microscopic to extremely elongated form measuring up to 10-15 meters.
- Their body is unsegmented except in class Cestoda.

- The majority of them are white, colorless and some derive color from ingested food while free-living form are grey, brown-black or brilliantly colored.
- Their anterior end of the body is differentiated into the head.
- Mouth and genital pores on the ventral surface are well marked in turbellarians but less marked in cestodes and trematodes.
- Their parasitic form has adhesive structures like hooks, spines and suckers, and adhesive secretions.
- The body is covered with cellular or syncytial, frequently ciliated epidermis; while trematodes cestodes, lacks epidermis and their body covered with cuticle.
- Exo- and endoskeleton are completely absent, hence the body is generally soft. The hard part consists of cuticle, spines, thorns, hooks, teeth.
- They are acoelomate i.e. without any body cavity.
- Space between various organs filled with special mesodermal tissues, the mesenchyme, and parenchyma.
- Their [digestive system](#) is branched and incomplete without an anus and totally absent in acoela and cestode.
- They lack skeletal, respiratory and circulatory systems.
- The excretory system includes a lateral canal and a single or pair of protonephridia with flame cells or bulbs. Absent in some primitive form.
- Their nervous system is primitive, ladder-like. The main nervous system consists of a pair of ganglia or brain and one or three pairs of longitudinal nerve cords connected by transverse nerves.
- Their sense organs are simple. A common occurrence in tubellaria but greatly reduced in parasitic form. Chemo- and tangoreceptors commonly in the form of ciliated pits and grooves.
- They are mostly monoecious (hermaphrodite).
- Their reproductive system is highly evolved or complex in most of the forms.
- Asexual reproduction occurs by fission in many freshwater turbellaria.
- In the majority of form, eggs are devoid of yolk. They are produced separately in the yolk or vitelline glands.
- Fertilization is internal but cross-fertilization in trematodes and self-fertilization in cestodes.
- Their life cycle is complicated involves one or more hosts.
- Parthenogenesis and polyembryony commonly occur trematodes and tapeworms.

- Some tapeworm propagates by endogenous or exogenous budding.
- The flatworm is either free-living or ecto-or endocommensals or parasitic.

Phylum Platyhelminthes (flatworms) Classification

The classification is from Hyman, L.H., (1951) up to suborder only with certain modifications.

Class 1- Turbellaria (L., *turbella*= a little string)

- Mostly free-living but some ectocommensals and endocommensals or parasitic called
- Terrestrial marine or freshwater.
- Body unsegmented and covered with ciliated cellular or syncytial epidermis, containing mucus-secreting cells and rod-shaped body called
- Mouth ventral. intestine preceded by the muscular pharynx.
- Adhesive organs(suckers) abundantly present.
- Sense organ i.e. Tango, chemo, and photoreceptors common in free-living forms.
- The excretory system consists of **protonephridia**, the **flame cells**.
- Mostly reproduction sexual, asexual and by regeneration.
- Life cycle simple.

Order 1- Acoela

- Small, exclusively marine, less than 2 mm.
- Ventral mouth; no muscular pharynx and no intestine.
- The excretory system is totally absent.
- No flame cells, definite gonads, gonoducts, and yolk glands.
- Mostly free-living, found under stones or bottom mud, algae, some live in the intestine of sea-urchins and sea-cucumbers.
- Some colored or brown by symbiotic algae.
- Examples: *Convoluta*, *Ectocotyle*, *Afronta*.

Order 2- Rhabdoceola

- Small (less than 3mm) freshwater, marine, and terrestrial form.
- Simple pharynx and sac-like intestine without diverticula.

- Nervous system with 2 main longitudinal trunks.
- Protonephridia excretory system.
- Eye usually present.
- The reproductive system comprises few compact gonads, gonoducts and a cuticularized structure instead of penis papilla present. Yolk gland present or absent.
- Marine, freshwater or terrestrial. Free-living, commensal or parasitic form
- Examples: *Catenula*, *Microstomum*, *Macrostomum*, *Mesostoma*.

Suborder 1. Notandropora

- Exclusively freshwater forms.
- Simple pharynx.
- The excretory system consists of a single median protonephridia.
- Testes single compact mass, penis unarmed.
- No yolk gland.
- Asexual fission occurs with the formation of the chain of zooids.
- Examples: *Catenula*,

Suborder 2. Opisthandropora

- Freshwater or marine form.
- The excretory system consists of paired nephridia.
- Testes compact, penis armed with a stylet.
- No yolk gland.
- Asexual reproduction with a chain of zooids.
- Examples: *Macrostomum*, *Microstomum*.

Suborder 3. Lecithopora

- Freshwater, marine or terrestrial forms.
- Bulbose pharynx.
- The excretory system consists of paired nephridia.
- Separate ovaries and yolk glands.
- Reproduction is exclusively sexual.
- Mostly free-living, some commensals or parasitic form.

- Examples: *Anoplodium*, *Mesostoma*.

Suborder 4. Temnocephalida

- Freshwater ectocommensals form.
- The anterior end of the body provided with 2-12 tentacles.
- Posterior end of the body provided with 1-2 adhesive discs.
- Dolii form pharynx.
- Simple gonopore.
- Examples: *Temnocephala*, *Monodiscus*.

Order 3- Alloecoela

- Moderate-sized between 1 and 10mm.
- Mostly marine, freshwater and brackish water form.
- Pharynx simple, Bulbose or plicate; intestine straight or branched (short diverticula).
- The excretory system consists of paired protonephridia having 2 or 3 main branches and nephridiopores.
- Nervous system with 3 or 4 pairs of longitudinal nerve cords provided with transverse connectives.
- The reproductive system consists of numerous testes and a pair of ovaries.
- Penis papilla is mostly present.
- Some are ectoparasitic or ectocommensals in the habit.
- Examples: *Prorhynchus*, *Plagiostomum*, *Geocentrophora*.

Suborder 1. Archophora

- Marine form.
- Plicate pharynx.
- Primitive female reproductive system, no female ducts.
- Male copulatory apparatus simple opening posteriorly.
- Examples: *Proporoplana* (only examples).

Suborder 2. Lecithoepitheliata

- Marine, freshwater or terrestrial form.
- Simple or Bulbose pharynx.
- Penis with the cuticular stylet.
- Simple or none female ducts.
- No yolk glands.
- Nutritive cells surround ova.
- Examples: *Prorhynchus*, *Geocentophora*.

Suborder 3. Cumulata

- Freshwater or marine form.
- Bulbose or plicate pharynx.
- Intestine usually devoid of diverticula.
- Unarmed penis.
- The female reproductive system consists of **germovitellaria** or separate ovaries and yolk glands.
- Examples: *Hypotrichina*.

Suborder 4. Seriata

- Mostly marine and freshwater form.
- Plicate pharynx.
- Intestine usually with lateral diverticula.
- The female reproductive system consists of separate ovaries and yolk glands.
- Statocyst is mostly present.
- Examples: *Otoplana*, *Bothrioplana*.

Order 4- Tricladida

- Large-sized turbellarians (2 to 60cm long).
- Marine, freshwater or terrestrial forms.
- Mouth mid-ventral.
- Pharynx plicate usually directed backward.
- Intestine with 3 branches, each with many diverticula.

- Eyes usually present.
- Protonephridia as lateral networks with many nephridiopores.
- The male reproductive system consists of 2 or numerous testes; a penis papilla present.
- The female reproductive organ consists of a pair of ovaries with yolk glands and a copulatory brusa.
- Single gonopore.
- Examples: *Gunda*, *Dugesia*, *Bdelloura*, *Geoplana*.

Suborder 1. Maricola

- Exclusively marine form.
- A pair of eyes and auricular grooves present.
- Typical penis papilla sometimes armed with the stylet.
- Rounded copulatory brusa present.
- Only sexual reproduction takes place.
- Examples: *Bdelloura*,

Suborder 2. Paludicola

- Mostly freshwater, rarely brackish water forms.
- Eyes 2 to many or completely absent.
- Brusa usually presents anterior to the penis.
- Mostly asexual reproduction.
- Examples: *Planaria* or *Dugesia*.

Suborder 3. Terricola

- Terrestrial, tropical and subtropical forms.
- Elongated body mostly.
- 2 to many eyes.
- Brusa is mostly absent.
- Male and female antra usually separate.
- Asexual reproduction may also occur.
- Examples: *Bipalium*, *Geoplana*.

Order 5- Polycladida

- Moderate -sized turbellarians (2 to 20 mm).
- Marine, many bottom dwellers or littoral zones.
- Plicate pharynx, intestine highly branched.
- The nervous system consists of numerous radially arranged nerve cords.
- Numerous eyes.
- Male and female gonopore separate.
- No yolk glands.
- Testes and ovaries are numerous and scattered.
- Examples: *Leptoplana*, *Notoplana*, *Cestoplana*, *Planocera*, *Thysanozoon*.

Suborder 1. Acotylea

- Usually vertical curtain-like pharynx.
- Suckers absent behind the gonopore.
- Nuchal type tentacles.
- Eyes never occur as a pair of clusters on the anterior margin.
- Examples: *Euplana*, *Leptoplana*, etc.

Suborder 2. Cotylea

- Tubular pharynx.
- Sucker present behind the female pore.
- A pair of marginal tentacles bearing eyes or a cluster of eyes at the anterior margin.
- Examples: *Thysanozoon*, *Yungia*.

Class 2- Trematoda (Gr., *trematodes*= having pore)

- **Ectoparasitic** or **endoparasitic** commonly called
- Body unsegmented dorsoventrally flattened **leaf-like**.
- Teguments thick but without cilia and rhabdites.
- Body undivided and covered with cuticle.
- Suckers and sometimes hooks present.
- Digestive tract incomplete consists of the anterior mouth, simple pharynx and two forked or many branches intestine; anus absent.

- 3 pairs of the longitudinal nerve cord.
- Protonephridial excretory system consisting of **flame cells**.
- Mostly hermaphrodites(**monoecious**).
- Single ovary, 2 to many testes.
- Development direct (in ectoparasites) or indirect (in endoparasites) with alternation of hosts.

Order 1. Monogenea

- Mostly ectoparasites in cold-blooded aquatic vertebrates.
- Oral suckers either weak or absent.
- Anterior end provided with a pair of adhesive structures.
- Posterior end provided with an adhesive disc usually with hooks.
- Excretory pores paired situated anteriorly on the dorsal side.
- Male and female gonopore usually separate.
- Vagina one or two. Uterus is small with a few shelled eggs.
- Only **one host** in the life cycle.
- Free-swimming ciliated larva called
- Examples: *Diplozoon*, *Polystoma*, *Gyrodactylus*, *Dactylogyrus*.

Order 2. Digenea

- Endoparasites of vertebrates and invertebrates.
- 2 suckers without hooks; oral sucker around the mouth and ventral sucker or acetabulum.
- Single posterior excretory pore.
- No vagina. The uterus usually long with many shelled eggs.
- The life cycle complicated involving many larval stages.
- One to more intermediate hosts in the life cycle.
- Larval forms reproduce asexually before metamorphosis.
- Examples: *Fasciola*, *Bucephalus*, *Opisthorchis*, *Paragonimus*, *Schistosoma*.

Order 3. Aspidocotylea (=Aspidogastrea)

- No oral suckers.
- Large ventral suckers subdivided into several suckers without hooks.
- Only one testis in the male system.
- Endoparasites in the gut of fishes and reptiles.
- Examples: *Aspidogaster*, *Cotylapsis*, *Stichocotyle*.

Class 3- Cestoda (Gr., ketos, gridle+ eidos, form)

- Endoparasitic in the intestine of vertebrates.
- Commonly called tapeworm.
- Body divided into many segmented (**proglottids**) but rarely undivided, elongated, flat, ribbon-like.
- Tegument without microvilli.
- Body without epidermis and cilia but covered with cuticle.
- Anterior end (scolex) is provided with adhesive structures (**hooks, suckers**) except in cestodaria.
- Mouth and digestive systems totally absent.
- The excretory system consists of **protonephridia** with typical terminal **flame**
- The nervous system usually comprises a pair of ganglia and 2 lateral longitudinal nerve cords.
- Each mature segment or proglottids monoecious, with male and female organs.
- Life cycle complicates usually involving 2 or more hosts.
- Embryos with hooks.

Subclass 1. Cestodaria

- Endoparasitic in the coelom or intestine of vertebrates.
- Body unsegmented, leaf-like without scolex and strobila (**monozoic**).
- No alimentary canal.
- Only one set of the monoecious reproductive system.
- Larva **lycophore** with 10 hooks.

Order 1. Amphilinidea

- Endoparasitic forms in the coelom of fishes.
- Body flattened, oval or elongated.
- No sucker.
- Scolex absent.
- Protrusible pharynx.
- Anterior end bears frontal glands.
- Male and vaginal pores situated posteriorly.
- The uterus is very much coiled opening near the anterior end.
- Examples: *Amphilina*.

Order 2. Gyrocotylidea

- Endoparasitic forms in the intestine of fishes.
- Body elongated and flattened.
- An anterior sucker and a posterior rosette-shaped adhesive organ present.
- Anterior end bears eversible proboscis.
- Uterine, male and vaginal pores are together situated in the anterior half of the body.
- Uterus short straight runs directly to pores.
- Examples: *Gyrocotyle*.

Subclass 2. Eucestoda

- Endoparasitic form in the intestine of fishes.
- Body long, ribbon-like.
- The body is divided into scolex, neck, and strobila with many proglottids (**polyzoic**).
- Scolex expanded bearing adhesive structures.
- Mostly with several sets of monoecious reproductive organs.
- Larva with 6 hooks.

Order 1. Tetraphyllidea

- Endoparasitic forms; exclusively in the intestine of elasmobranch fishes.
- Scolex with 4 leaf-like **bothria** (**sessile suckers**) often provided with
- Testes are anterior to ovaries.

- Vitelline glands scattered.
- Cirrus armed with spines and hooks.
- Common genital atrium marginal.
- Examples: *Phyllobothrium*, *Myzophyllobothrium*.

Order 2. Diphyllidea

- Parasitic in the intestine of elasmobranch fishes.
- Scolex with 2 bothria and spiny head stalk.
- Strobila consists of not more than 20 proglottids.
- Examples: *Echinobothrium*.

Order 3. Trypanorhyncha

- Parasitic in the spiral valve of the digestive tract of elasmobranch fishes.
- Moderately sized body.
- Scolex with 4 bothria and 4 protrusible spiny proboscides.
- Vitellaria in cortical parenchyma placed in a continuous layer.
- Testes extend behind the ovary posteriorly.
- Lateral gonopores; ventrally open uterus.
- Examples: *Haplobothrium*, *Tetrarhynchus*.

Order 4. Pseudophyllidea

- Parasitic in the intestine of teleost fishes and terrestrial vertebrates.
- Body segmented into strobila or unsegmented.
- Scolex with 2 to 6 shallow bothria (Suckers) rarely without adhesive organs.
- Bilobed ovary, testes numerous, follicular and scattered in the mesenchyma of proglottids.
- Vitellaria follicular, numerous.
- Midventral gonopores.
- Examples: *Bothriocephalus*, *Dibothriocephalus*.

Order 5. Taenioidea or Cyclophyllidea

- Parasitic in the intestine of reptiles, birds, and mammals.
- Large-sized tapeworm.
- Scolex bears 4 large in cupped suckers (**acetabula**) often with an apical rostellum armed with hooks.
- Ovary two or many lobed; uterine opening absent.
- Gonopores on one or both margins.
- The excretory system consists of 4 longitudinal vessels.
- Vitellaria (yolk gland) single and compact.
- Examples: *Taenia*, *Echinococcus*, *Hymenolepis*, *Moniezia*.