CLASS 1. TURBELLARIA

Class Turbellaria is divided into following **two** major groups:

Group I. Archoophoran turbellarians

(*arch* = primitive + *oophoro* = ovary)

1. They have most primitive organization.
2. Vitellaria (yolk glands) are absent.
3. Eggs are entolecithal.
4. Cleavage is spiral.

Group II. Neoophoran turbellarians

(*ne* = new + *oophoro* = ovary)

1. They have an advanced level of organization.
2. Vitellaria (yolk glands) are present.
3. Eggs are ectolecithal.
4. Spiral cleavage is greatly modified.

Group I. Archoophoran turbellarians

This group includes the following **six** orders:

Order 1. Acoela

1. Minute marine turbellarians measuring less than 2 mm in length.
2. Mouth and sometimes a simple pharynx are present, but no intestine or body cavi
3. Protonephridia are absent.
4. Gonads are often not bounded by a cellular wall.
5. Oviducts are absent.
6. Statocyst is with one statolith.
7. Usually free-living found under stones or on bottom of mud; some live in the intest various echinoderms.

Examples. *Convoluta, Afronta, Amphiscolops, Ectocotyla, Paratomella.*

Order 2. Nemertodermatida

1. Small marine flatworms similar to Acoela.
2. Have an epithelial digestive tract.
3. Statocyst with two statoliths.
4. They produce uniflagellate sperm.

Example. *Nemertoderma.*

Order 3. Macrostomida

1. Small (0.8 to 11 mm in length) marine and freshwater species.
2. Digestive system with a simple pharynx and a simple sac-like ciliated intestine.
3. Nervous system with one pair of ventrolateral nerve cords.
4. Testis is compact; penis armed with a stylet.
5. Yolk glands are absent.
6. Asexual reproduction with chains of zooids.

Examples. *Macrostomum, Microstomum.*

Order 4. Haplopharygida

1. Small marine species similar to macrostomids.
2. They have a proboscis.
3. A temporary anus is present.

Example. *Haplopharynx.*

Order 5. Catenulida

1. Mostly small freshwater species.
2. Digestive system contains a simple pharynx and ciliated sac-like intestine.
3. Excretory system consists of a single median protonephridia.
4. Statocyst sometimes present, usually with one statolith.
5. Gonads are unpaired. Single testis is in the form of compact mass. Penis unarmed. Male gonopore is dorsal above the pharynx.
6. Yolk glands absent. No female gonoduct.
7. Asexual fission occurs with the formation of chains of zooids.

Examples. *Catenula, Stenostomum.*

Order 6. Polycladida

1. Exclusively marine flatworms of moderate body size, averaging 3 to 20 mm in length.
2. Body usually greatly flattened and more or less oval in shape.
3. A pair of anterior marginal or dorsal tentacles may be present.
4. Many are brightly coloured.
5. Pharynx is tubular or plicate (= bell-shaped).
6. Intestine is elongated and centrally located, with many highly branched diverticula.
7. Nervous system consists of many radially arranged nerve cords.
8. Eyes are numerous.
9. Testes and ovaries are numerous and scattered.
10. They feed on coelenterates and store their undischarged nematocysts in their skin as means of self-defence.

Examples. *Notoplana, Leptoplana, Gnesioceros, Stylochus, Prostheceraeus, Pseudoceros.*

(**Note.** Order Polycladida is often divided into two suborders: 1. **Acotylea** (*e.g.*, *Notoplana*) and 2. **Cotylea** (*e.g.*, *Thysanozoon, Yungia*).

Group II. Neoophoran turbellarians

This group includes the following **five** orders:

Order 1. Lecithoepitheliata

1. Marine or freshwater species.
2. Mouth and pharynx are at the anterior end of body, intestine is simple.
3. Ovary produces eggs which are surrounded by follicle-like yolk cells.
4. Female ducts are simple or none.
5. Penis is with cuticular stylet.

Example. *Prorhynchus.*

Order 2. Prolecithophora

1. Usually small sized.
2. Marine and freshwater species.
3. They contain a plicate or bulbous pharynx and a simple intestine.
4. Ovary produces eggs and follicle-like yolk cells.

Examples. *Plagiostomum, Hydrolimax.*

Order 3. Proseriata

1. Small-sized marine turbellarians.
2. Statocyst with one statolith.
3. Pharynx is plicate and tubular but gut is not branched.
4. Female reproductive system consists of separate ovaries and yolk glands.

Examples. *Octoplana, Monocelis, Nemertoplana.*

Order 4. Rhabdocoela

1. It is a large group of small (less than 3 mm) marine, freshwater and terrestrial forms.
2. Digestive tract is complete having simple bulbous pharynx. Intestine unbranched sac-
   without diverticula.
3. Excretory system with protonephridia.
4. One pair of nerve cords.
5. Eyes are usually present.
6. They contain one or two gonads, yolk glands present or absent.
7. Free-living, commensal or parasitic forms.

This order is divided into the following three suborders:

Suborder 1. Typhloplanoida, Example. *Mesostoma.*

Suborder 2. Dalyellioida, Examples. *Anoplodiera, Syndesmis, Kronborgia.*

Suborder 3. Kalyptorhynchia, Examples. *Gyratrix, Gnathorhynchus.*

Order 5. Tricladida

1. Relatively large (measuring from 2 to 60 cm in lenght) marine, freshwater and terres
   turbellarians.
2. Pharynx is plicate, tubular and posteriorly directed.
3. Intestine (=gut) has three branches.
4. Eyes present in most species.
5. Protonephridia form paired lateral network.
6. Male reproductive organs consist of two to numerous testes; a penis papilla present.

7. Female reproductive organs consist of a pair of ovaries with yolk glands and a copulatory bursa.
8. Gonophore single.

This order is divided into following **three** suborders:

Suborder 1. Maricola. Examples. *Bdelloura* (It is commensal on the book gills of horseshoe crabs), *Ectoplana*.

Suborder 2. Paludicola. Examples. *Planaria, Dugesia, Dendrocoelum, Procerodes, Phagocata, Polycelis, Procotyla.*

Suborder 3. Terricola. Examples. *Bipalium, Geoplana, Orthodemus.*

CLASS 2. TREMATODA

The class Trematoda is divided into **two** subclasses: 1. Digenia and 2. Aspidogastrea.

Subclass I. Digenia

1. They include flukes which are endoparasites in vertebrates (such as fishes, amphibians, reptiles birds and mammals) and invertebrates.
2. They contain two to four hosts in their life cycle. The **first intermediate host** is typicall gastropod snail, **second intermediate host** is usually an arthropod and the **definitive ho** is a vertebrate.
3. Adult digeneans range in size from approximately 0.2 mm to 6.0 cm in length.
4. They are typically dorsoventrally flattened, but some are thick and fleshy, whereas oth are long and thread-like.
5. Most flukes contain two suckers which lack hooks. **Oral sucker** occurs around the mo and aid in feeding. **Ventral sucker** or **acetabulum** is found on mid-ventral or posterior of body and prevent dislodgement.
6. Their body is covered with a nonciliated cytoplasmic syncytium, the **tegument**. The tegu plays a vital role in the physiology of digeneans (Box 23.4).

Subclass 2. Aspidogastrea

1. They are endoparasites in the gut of fish and reptiles and in the pericardial and renal cavity of bivalve molluscs.
2. Oral sucker is absent.
3. Anterior end of body is without paired adhesive structures.
4. The entire ventral surface of body acts as an **adhesive organ** which is either a single ventral sucker or a longitudinal row of suckers. This organ lacks hooks.
5. The digestive tract contains a single intestinal caecum.
6. They contain a single nephridiopore.
7. Male reproductive system has only one testis.
8. Their life cycle is simple involving no alternation of hosts.

Examples. *Cotyaspis, Aspidogaster.*

Subclass 1. Digenia

The subclass Digenia is divided into following **two** orders:

Order 1. Gasterostomata

1. Adults are parasite of aquatic vertebrates, mainly fishes.
2. Mouth is ventral.

Examples. *Bucephalopsis, Bucephalus.*

Order 2. Prostomata

1. Adults are parasites on all vertebrates.
2. Mouth is subterminal or terminal in position.

Examples. *Schistosoma, Fasciola, Opisthorchis* (or *Clonorchis*) *sinensis* (Chinese liver fluke), *Echinostoma*, *Paragonimus* (lung fluke).

CLASS 3. CESTOIDEA (CESTODA)

Class Cestoda is divided into following **two** subclasses:

Subclass 1. Cestodria

1. Coelomic or intestinal parasites of vertebrates (mainly fish and rarely reptiles).
2. Body is undivided, *i.e.*, no strobila (**monozoic**, *i.e.*, body consists of a single different unit).
3. Scolex is absent.
4. Alimentary canal is absent.
5. Only one set of monoecious reproductive organs is present.
6. Development is indirect including **lycophore larva** bearing ten hooks.

Subclass 2. Eucestoda

1. Endoparasitic forms in gut (intestine) of vertebrate hosts.
2. Body is usually very elongated ribbon-like.
3. Body is divided into scolex, neck and strobila (**polyzoic**). Strobila contains many proglottids.
4. Scolex with hooks and adhesive suckers.
5. Each proglottid contains one set of reproductive organs.
6. Embryo (larva) with six hooks.