



# BIOL 160. INVERTEBRATE SYSTEMATICS. PHYLUM PLATYHELMINTHES

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# LESSONS 7 AND 9

## PHYLUM PLATYHELMINTHES

### Introduction:

- CLASSIFICATION
- BIOLOGICAL CHARACTERISTICS
- ADAPTIVE RADIATION
- ECONOMIC IMPORTANCE.



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# GENERAL CHARACTERISTIC:

These group of organisms are the acoelomates.

Its the 1<sup>st</sup> group under the Bilateria.

They are the flatworms

They have three body layers (triploblastic).

Body consists of outer ectoderm,



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The middle mesoderm and the inner endoderm (gastrodermis).

They are dorso-ventral in structure.

They have soft bodies and few have internal spicules.

Most secrete mucous to protect their body, for defence and for attachments.

Free-living ones have cilia on body.

They are vermiformed organisms.



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The parasitic ones have no cillium nor epithelium and less mesoderm.

The mesoderm is modified for rapid absorption.

Animals have definite head but no anus.

The head is cephalized with parallel venation but no network.

There is no vascularization (blood network) at this stage of development.



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There is some intestine but it ends blindly inside the animal.

There is no excretion since food obtained is channeled into production of sperms and eggs.

Animals are hermaphrodite, and egg production is continuous in adults.

Parasites have complex life-cycles that involves many hosts and larval stages



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# CLASSIFICATION

Because of complexities, the animals are described better under their classes.

Phylum Platyhelminthes has 4 classes;

**Cestoda, Tubellaria, Monogenea and Trematoda.**

Class Cestoda has 2 subclass;  
**Cestodaria and Eucestoda.**, whilst  
class Trematoda has 2 subclass;  
**Digenea and Aspidogastrea**



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# 1. Class Cestoda

This has **14 Orders** with class Cestodaria having 2 and Eucestoda 12 of them.

**Subclass Eucestoda has 12 Orders;**

Aporida, Diphyllida, Tetraphyllida,

Pseudophyllida, Caryophyllida,

Cyclophyllida, Spathebothrillida,

Trypanorhyncha, Lithobothrillida,

Lecanicephallida, Nippotaeniida,

Protocephallida



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**Subclass Cestodaria has 2 Orders;  
Amphilinida and Gyrocotyllida.**

## **2. Trematoda**

**This has 6 Orders with Aspidogastrea  
having 1 and Digenea 5 of them.**

**- Subclass Digenea has 5 Orders;**

**Azygiida, Opisthoschiida, Plagioschiida,  
Echinistomiida, Stregidiida**

**- Subclass Aspidogastrea has 1 order;  
Aspidobothria**



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### 3. Class Tubellaria has 12 Orders but no subclass;

Tricladiida, Polycladiida,  
Satenullida, Proseriata,  
Temnocephallida, Macrostomiida,  
Neochabdocoela, Acoela,  
Nemertodermatiida, Prelecithopora,  
Lecithoepitheliida, Proplicestomata



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4. Monogenea has 2 Orders;

Polyopisthocotylea,

Monopisthocotylea.

The monogeneans and  
trematodans are referred to as  
the flukes.



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# Class CESTODA

These are made up of the segmented or ribbon-like flatworms.

They are mostly parasites.

Their epidermis is less developed since they live in the midst of their food. Eg. Tapeworms.

They thus, have no mouth or intestines.



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Have excretory protonephrodia instead of anus.

They have organs for attachment; the head region of tapeworms has suckers and rostrum on the head.

These have hooks and spines that enable them to attach to hosts tissues.

The head region of tapeworm is referred to as the scolex

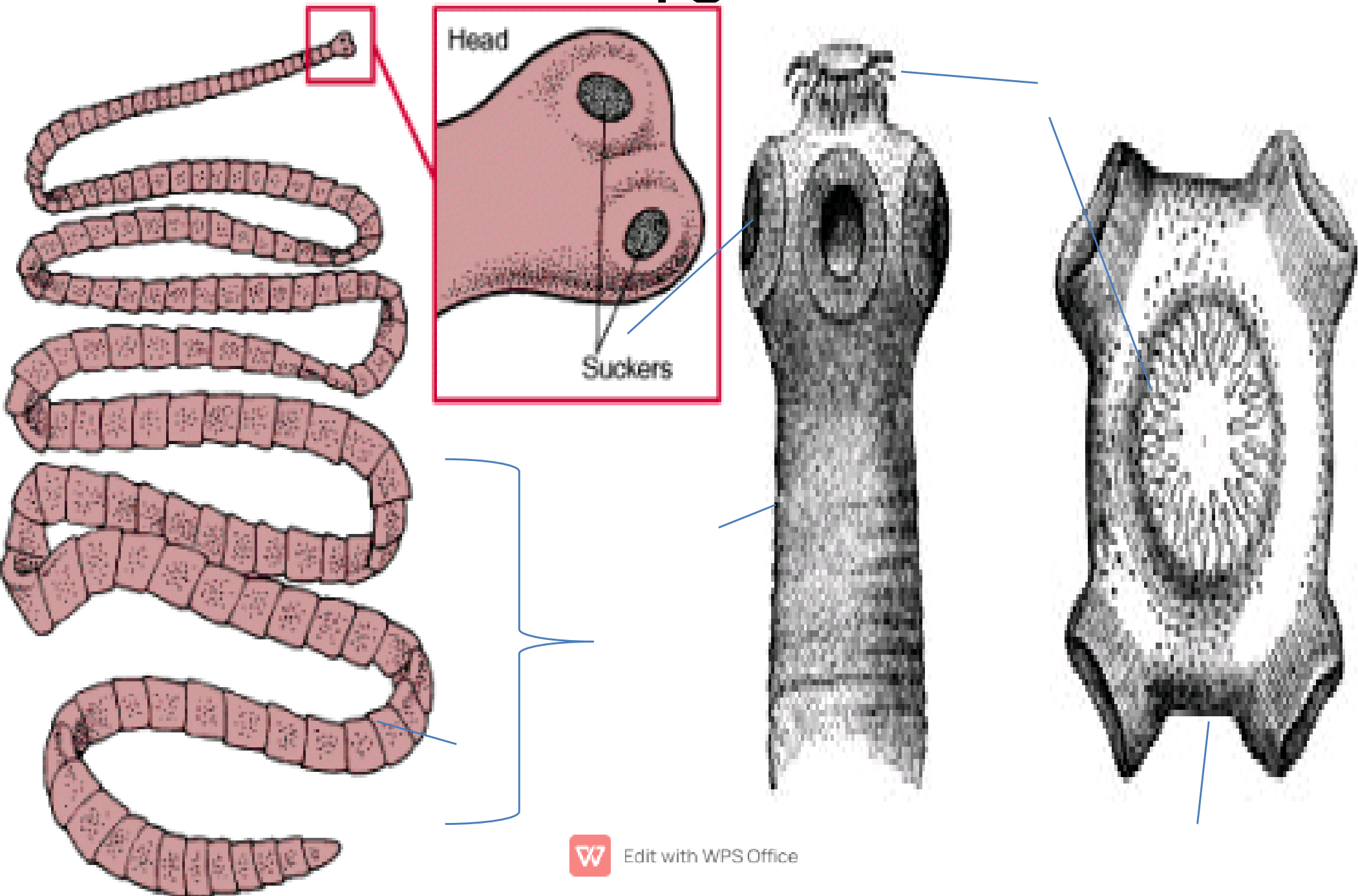


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They rather possess folded terguments for absorption referred to as **microthriches**.

The body has muscles are made up of both subtergumental circular and longitudinal fibres, and parenchymatous musculature forming the **dorso-ventral fibres**.



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The extensive length is made up of segments (**ploglottids**) in a **strobilla form**.

Each segment contains a complete set of reproductive organs, nervous and excretory systems.

In reproduction, the animals use digested food to form gametes.



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They undergo self and cross-fertilizations within **proglottids**.

Each proglottid has eggs that fills the uterus.

Fertilized eggs in a proglottid is referred to as **glavid proglottid**.

These proglottids are hatched or shed when taken by hosts.



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In Taenia, a fully grown animal develops 650-1000 proglottids with each bearing 100,000 eggs. On average, 5- 10 proglottids are shed everyday in faeces.



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# TYPES OF TAPEWORMS

*Taenia solium* --- pork tapeworm

*Diphyllobothrium latum* --- fish  
tapeworm

*Dipylidium caninum* --- dog tapeworm

*Taeniarhynchus saginatus* --- beef  
tapeworm

*Vampirolepis nana* ----- dwarf  
tapeworm.



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# LIFE CYCLE

Animals have both simple and complex life-cycles.

*Taenia saginata* has simple cycle that involves 1 intermediary host

*Diphyllobothrium dendriticum* has complex life cycle

The adult *Taenia* lives in the gut of a primate such as a human.



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Proglottids leave the body through the anus and fall onto the ground, where they may be eaten with grass by animals such as cows.

This is known as the  
intermediate host.



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The juvenile form migrates and establishes as a cyst in the intermediate hosts body tissues such as muscles, rather than the gut.

They cause more damage to this host than it does to its definitive host.



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The parasite completes its life cycle when the intermediate host passes on the parasite to the definitive host, this is usually done by the definitive host eating an infective intermediate host, such as possibly a human with a preference for raw meat—in whose gut the adult *Taenia* establishes itself.



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## 2. Class Tubellaria

These are flatworms.

Most of them are free-living.

Many are aquatic while the terrestrial ones live in moist places.

They usually secrete mucus to protect themselves against dessiccation.



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They have the same 3 body layers as the cestodans.

The external layer has ciliated epithelia.

The outer cells secrete mucous.

They have **rhabdite** that has threads and its used like that of the cnidocytes in cnidarians.



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# A *Plobolitrema* and a *Planaria*



- The marine polycladids are the largest flatworms.
- The middle mesoderm forms the muscular body of the animal.



The muscles are made up of the circular, longitudinal, diagonal and transverse muscle fibres. The mouth is ventral and toward the center in most species. It has a pharynx before ending in one or double bags referred to as caeca.



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It has anus for excretion.  
The animals engulf or suck their  
food.  
Most have pharynx that can be  
everted out.



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The freshwater species *Microstomum caudatum* can open its mouth almost as wide as its body is long, to swallow prey about as large as itself. The contractions of the muscles move the head of the animals from side to side when they are moving.



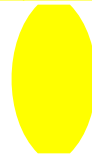
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Some have false eyes, nose and chemo-receptors that form the sensory systems.

Gaseous exchange is by means of excretory tubules called the flame bulbs.



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They are tubules that have network in the body and lead outside the body of the organisms.

They have elaborate sensory organs, with the formation of a false central ganglia (brain).





Most turbellarians have **ocelli** ("little eyes"); one pair in most species but two or even three pairs in some.

A few large species have many eyes in clusters over the brain, mounted on tentacles, or spaced uniformly round the edge of the body.



The ocelli can only distinguish  
the direction from which light is  
coming and enable the animals  
to avoid it.

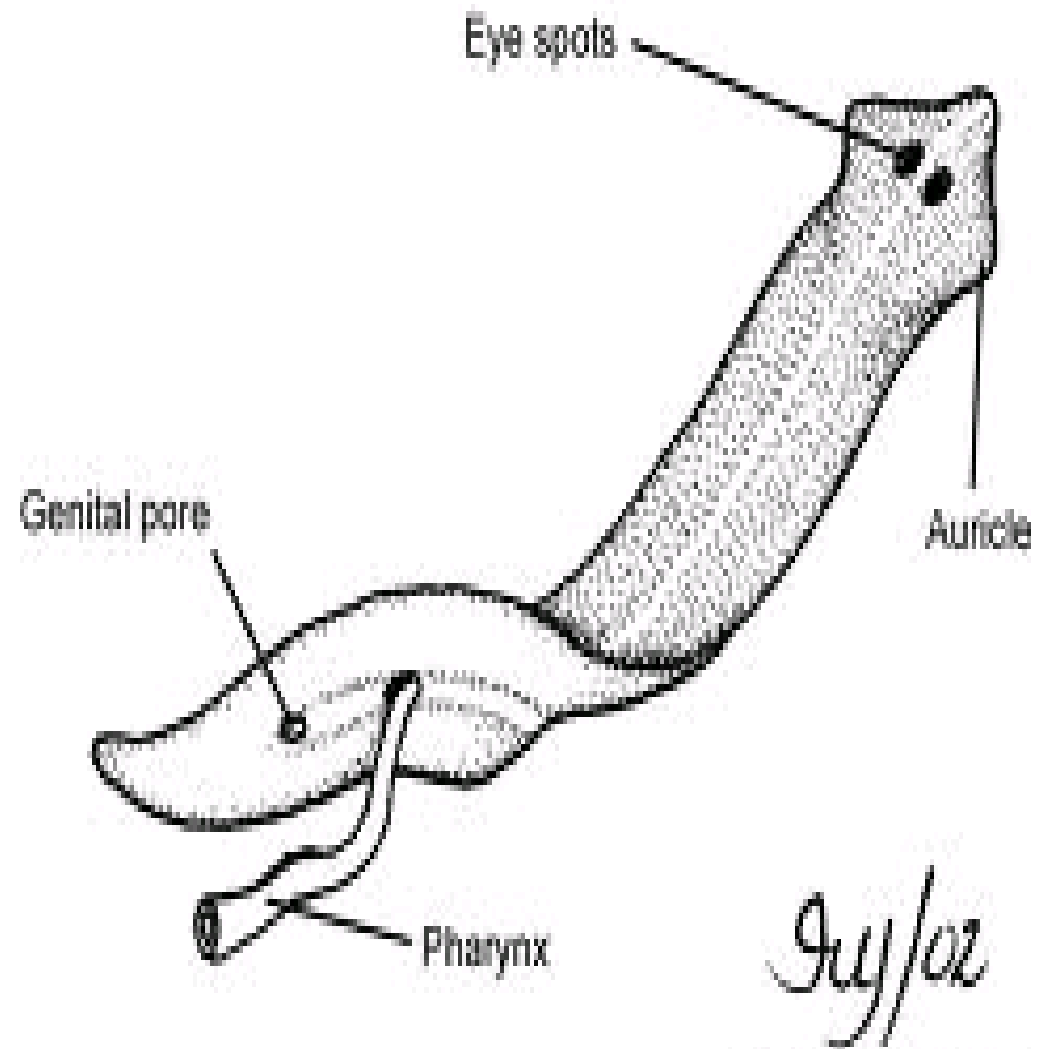
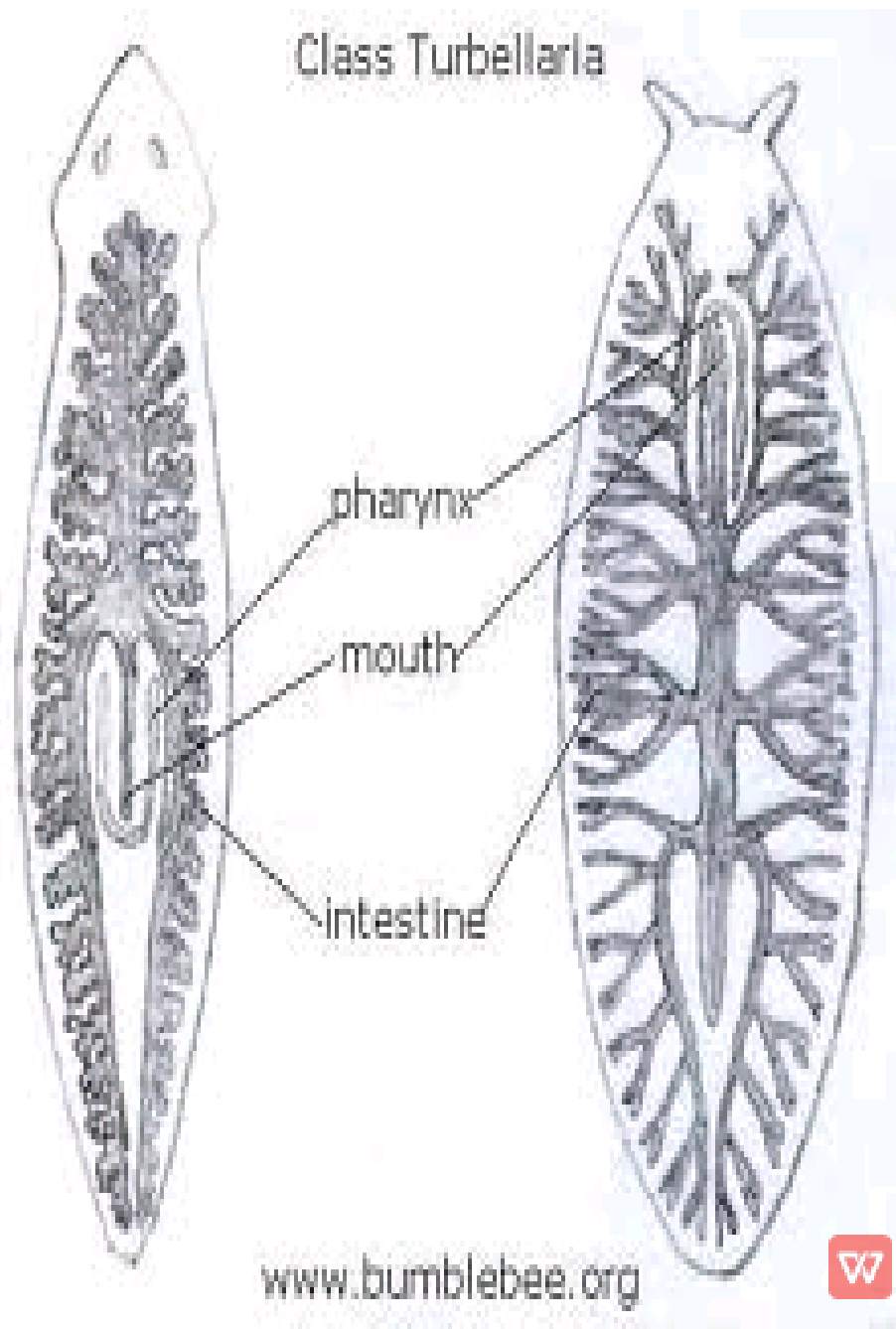


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# L/S of turbellaria



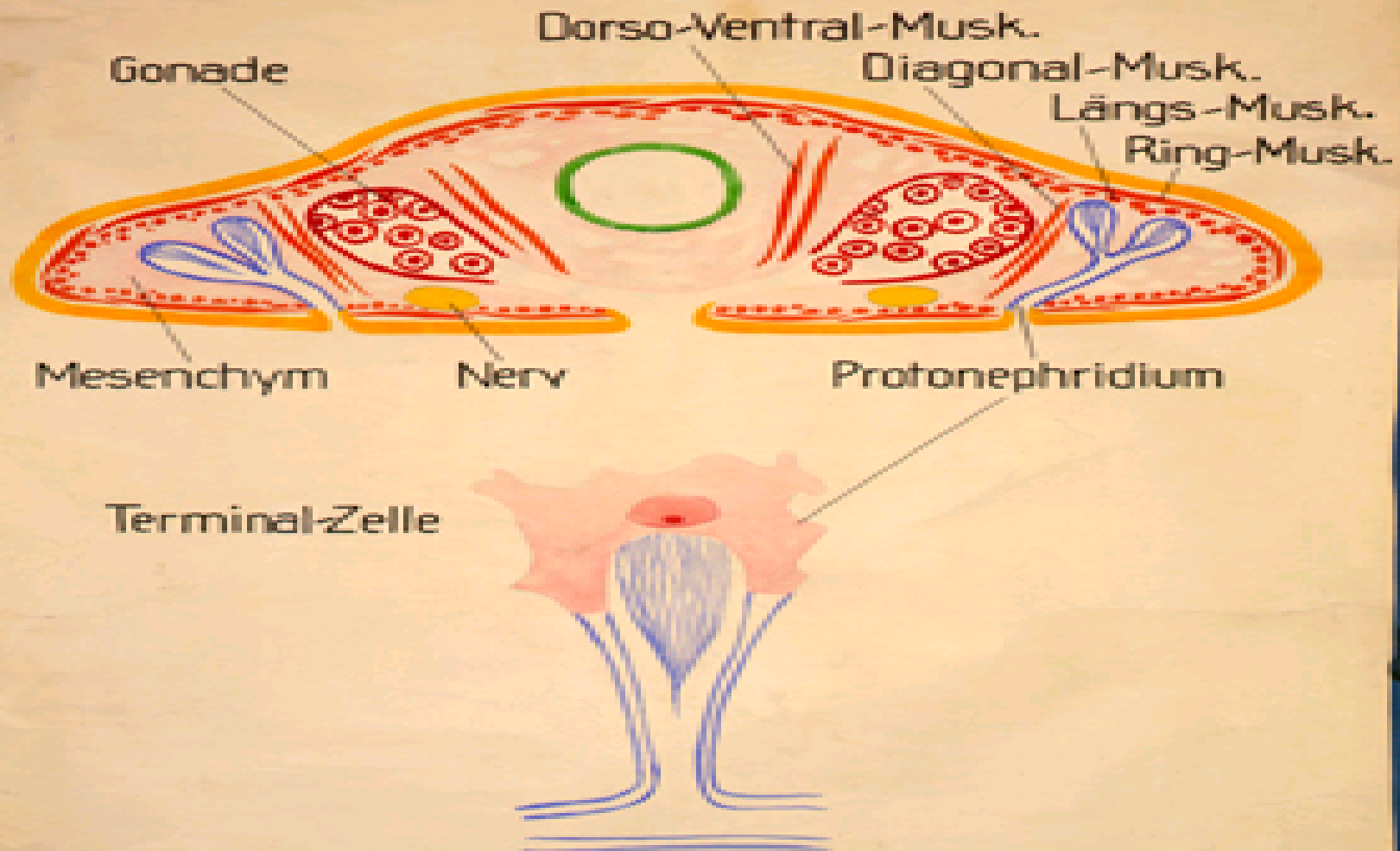
*Guy/or*

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# T/S of Planaria



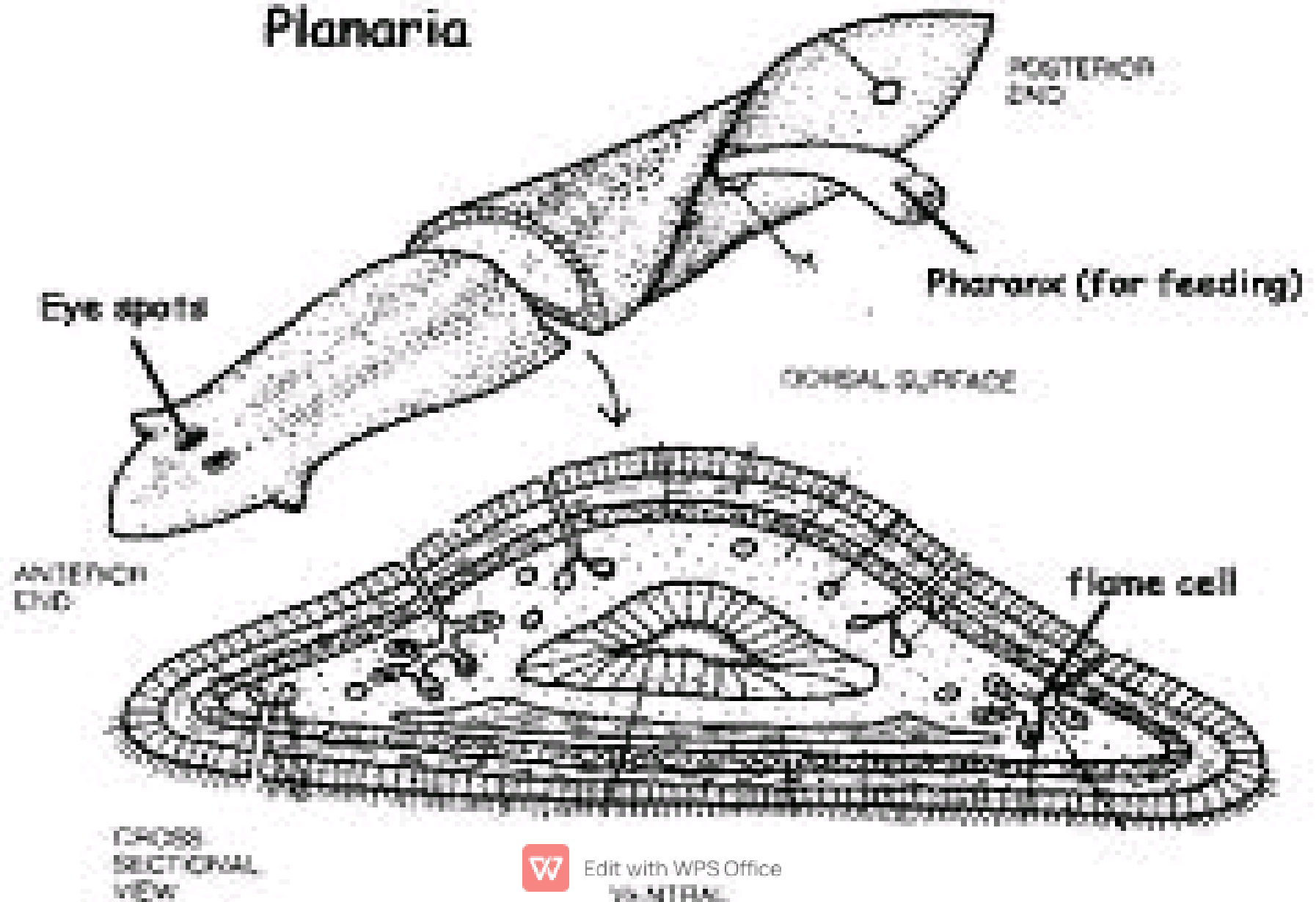
PLATHELMINTHES

*Querschnitt  
allg. Schema*



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# Planaria



# Reproduction in turbellarians

All turbellarians are hermaphrodites, in other words have both female and male reproductive cells, and fertilize eggs internally by copulation.



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Some of the larger aquatic species mate by penis fencing, a duel in which each tries to impregnate the other. The loser adopts the female role of developing the eggs.



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In most species "miniature adults" emerge when the eggs hatch, but a few large species produce plankton-like larvae.

Most of them have 2 penises  
each.



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# Mating by penis-fencing



# THE FLUKES

These are two Classes under  
Platyhelminthes

Class Monogenea

Class Trematoda



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The flukes are made up of the trematodes and monogeneans.

The animals are leaf-like in form.

The adult forms are found as endo-parasites in vertebrates.



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Monogeneans are ecto-parasite  
and have simple life-cycles  
whilst trematodes are endo-  
parasites.

They have complex life-cycles  
that involves more than one  
host.



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They possess many penetrating glands, and these can produce substances for cysting.

They have suckers and hooks for attachments.

They have high fecundity rate as endo-parasites



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The flukes have little or no epithelial layer ; the terguments of the mesoderm serves additionally as a protective layer. They have a muscular pharynx for active sucking of food. The pharynx opens into a branched gut.



The adults have no special  
sensory organs

The monogeneans are  
separated from the trematodes  
by the possession of larval  
haptor.

This is a flap at the posterior  
side that is used for  
attachments



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FIG. 9.

- A, *Schurostomum* (*Bilharzia*) *haematodes*, the thin female in the gynaecophoric canal of the stouter male. (after Leuckart).  
 B, *Druetium macrostomum*, showing the digestive and the greater part of the genital apparatus with the cirrus protruded.  
 C, Snail (*Succinea*), the tentacles deformed by *Leucochloridium* (Natural size).  
 D, *Leucochloridium* removed from the tentacle (Natural size, after Zeller).  
 E, *Bucephalus polymorphus*. (Highly magnified; after Ziegler).  
 F, Portion of a sporocyst containing *Bucephalus* in process of development. (X about 50, after Laane Duthiers.)



Monogenea has no subclass  
while Trematoda has 2  
subclasses.

## 1. CLASS TREMATODA

Trematoda has subclasses;

**Digenea and Aspidogastrea**

The body plan or bauplan of the  
flukes are just like that of the  
tuberallians



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The animals have 2 or more host stages in their life-cycle.

Most have their intermediate hosts in mollusks.

The definitive host is the final host.



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The parasites are diverse and can inhabit digestive tract, circulatory, urinal and respiratory systems.

Eg. Schistosoma (blood flukes),  
Clonorchis, Fasciola (liver fluke),  
Riberoria, etc.



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## Types of blood flukes;

**S. japonicum-** lines in the  
venules of small intestines

**S. mansoni-** lives in venules of  
large intestine,

**S. haematobium-** lives in  
venules of urinary tract.



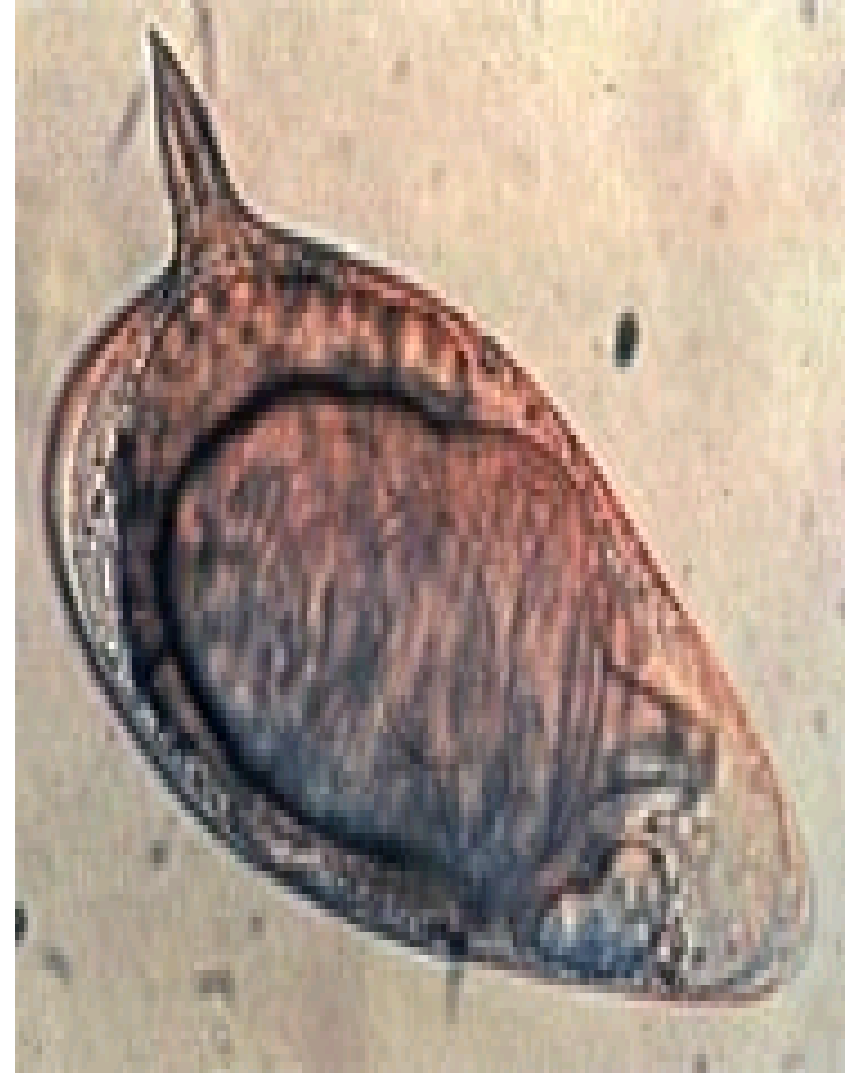
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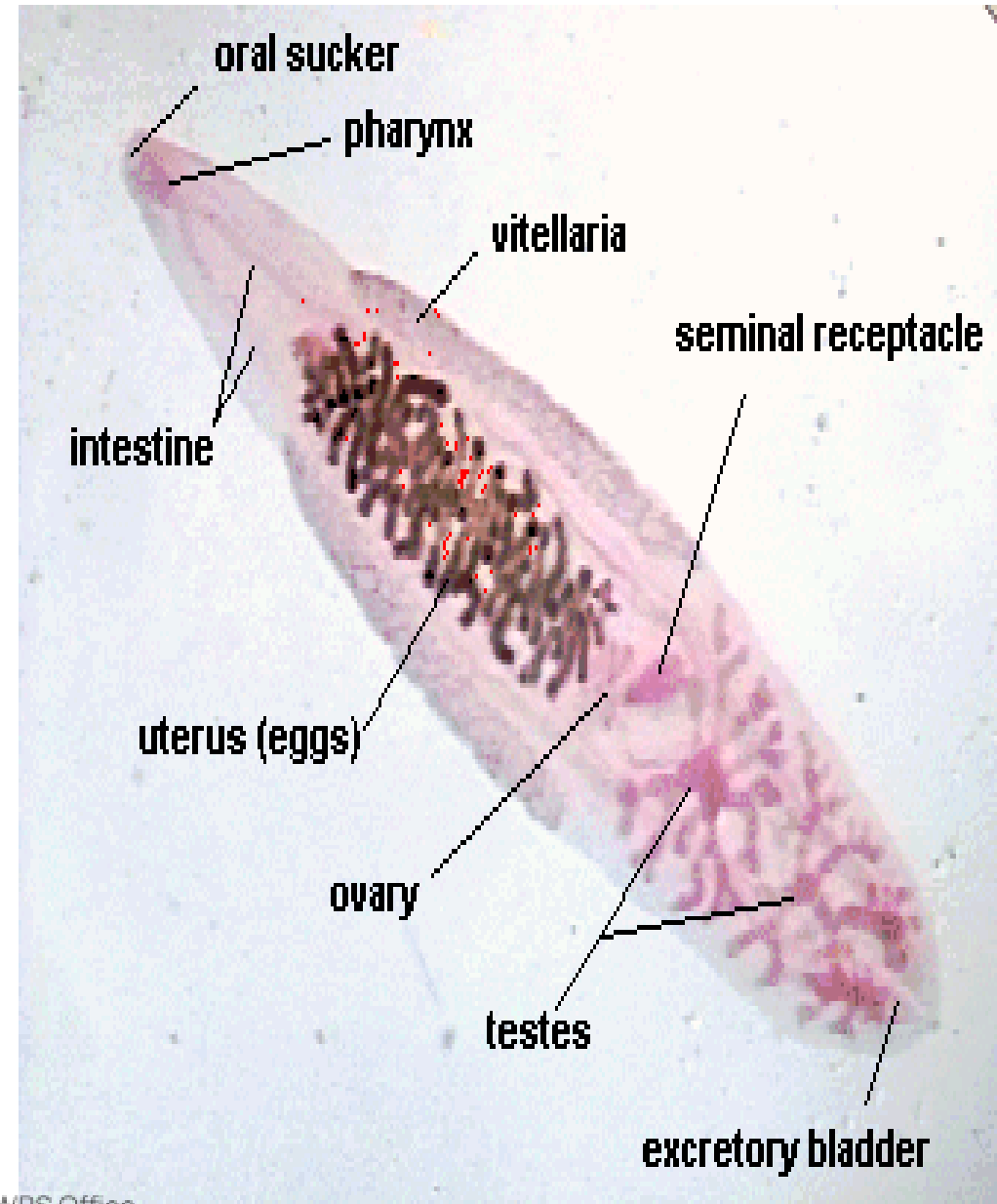
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- The eggs released come out through urine and faeces.
- The retained eggs cause severe inflammation.
- They find themselves in water bodies.
- Infest 2<sup>nd</sup> host



# A Fasciola and Clonorchis

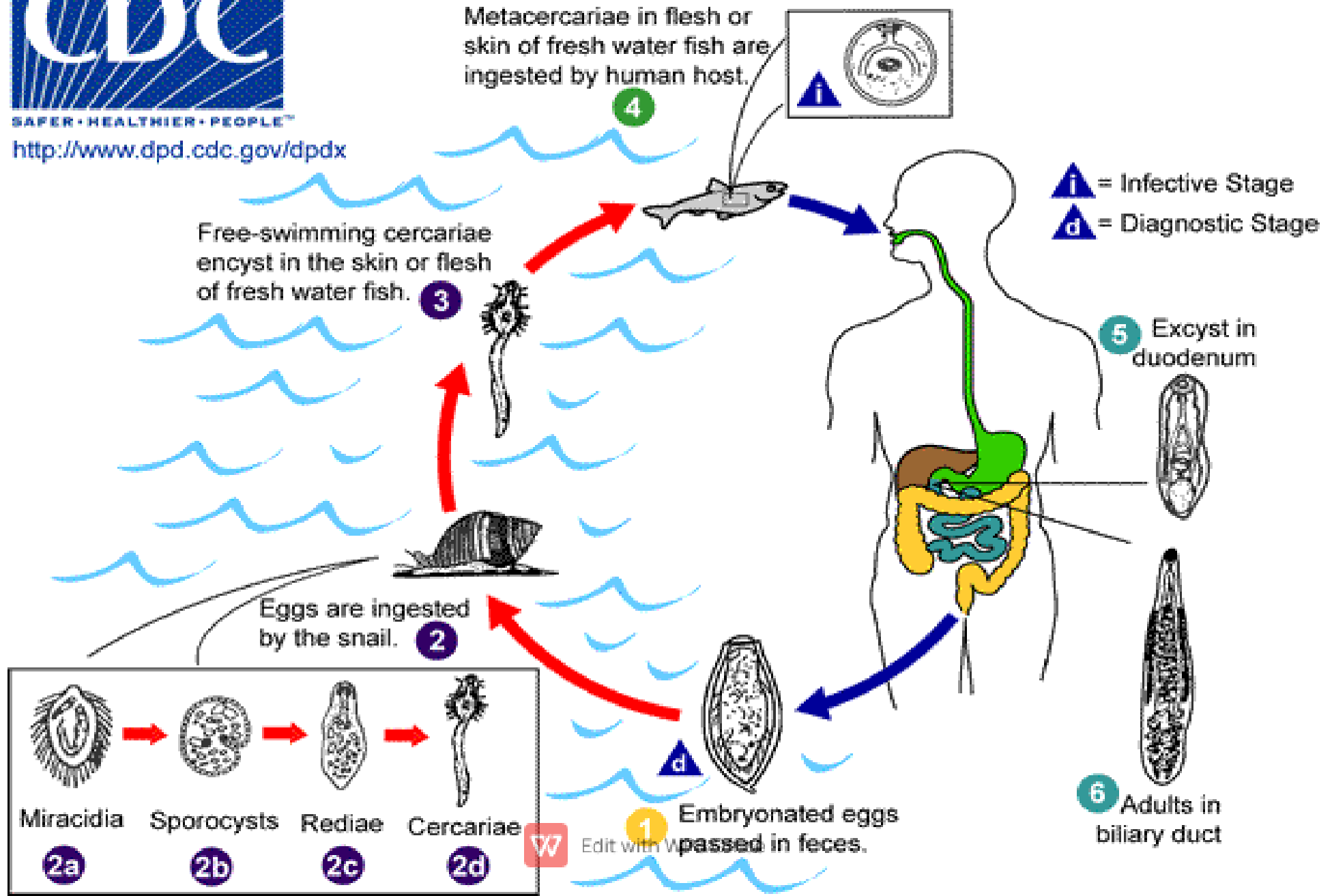


# Life cycle of flukes



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## 2. Class Monogenea

These are mostly ectoparasites.

They possess hooks for attachments referred to as **opisthaptor**. They use these to clamp to the skin of their hosts.



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They are found in the gills , and  
skin of fishes, and also bladder  
of turtles and frogs.

Monogeneans are at times put  
under cestoda.

Eg. *Gyrodactylus* spp.



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