
General Introduction to Flatworms (Phylum: *Platyhelminthes*)

The *Platyhelminthes* (Greek: *platys*-flat, *helminthes*-worm) which belong in the kingdom *Animalia* are unsegmented flat worms with a head and a tail end. They are considered the most primitive bilaterally symmetrical animals. Bilateral symmetry means that their body exists in mirror images about a long anterior-posterior axis with definite upper and lower surfaces and anterior and posterior ends. The bilateral shape of the body is an important feature because it permits cephalization, the concentration of sensory structures and nervous function (head ganglion) in the head end. This is an important trend in evolution.

Furthermore, flatworms are triploblastic, which means that body structure is based on three fundamental cell layers (endoderm, mesoderm and ectoderm). As a third characteristic, they have no body cavity (coelom) other than the gut, an organization which is called acoelomate. They lack an anus and therefore, the same pharyngeal opening both takes in food and expels waste. The space between the outer cell layers (= epidermis) and the distinct internal organs is filled with a soft tissue called parenchyma. This tissue is of mesodermal origin and often interspersed by gaps (= schizocoelium) containing simple excretory organs for osmoregulation (protonephridium). Because of the lack of any other body cavity, in larger flatworms the gut is very often highly branched (polyclads) in order to transport nutrients to all parts of the body. Respiratory system and blood vessel system are also completely missing and therefore, diffusion is used for transport of oxygen inside the body. This constraints flatworms to be flat. For maintaining metabolism, no cell can be too far from the outside, making a flattened body shape necessary.

Almost all species are hermaphrodites with a quite complex reproductive system. In most cases, number and arrangement of male and female reproductive structures are highly species specific and can be used in taxonomic studies for discrimination of morphologically even highly similar species. The length of flatworms varies between 0.4 mm for some free living species and several meters for parasitic forms (fish tapeworm *Diphyllobothrium latum*: 25 m in length).

Flatworms were once divided into three groups. Most of them are parasitic. Of the almost 20 000 species known, 14 000 are parasites belonging to either the class *Cestoda* (tapeworms) or the class *Trematoda* (flukes). The minority of flatworms (about 4 500 known) are free living and belong to the class *Turbellaria*. The tapeworms are intestinal parasites in vertebrates and show anatomical and life history modifications for parasitism. Flukes are all parasitic as well but have complexer life cycles than tapeworms passing through a number of juvenile stages in one, two, or more intermediate hosts before reaching adulthood, at which time they parasitize in one definite host. In contrast, Turbellaria are mostly free-living and common in fresh water and in moist terrestrial habitats. The majority of turbellarian flatworms are marine and can be found in the oceans where they are almost all benthic and most common in shallow water.

One taxonomic subgroup of the *Turbellaria* is the order *Polycladida*, a highly diverse group of free living flatworms. Members of this order are characterized anatomically by having a highly branched and irregular gut and a pharynx plicatus (a highly ruffled pharyngeal tube). At first glance, polyclads are large flamboyantly coloured flatworms. They have been known as inhabitants of tropical reefs for about 150 years. Hundreds of species are believed to occur in tropical waters, but only a small fraction has been exactly described so far.

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