

Acoelomate Definition

What is Acoelomate

An acoelomate is an invertebrate with three germ layers that lack a body cavity or a coelom. That means acoelomates do not possess a fluid-filled cavity between the body wall and the digestive tract. Therefore, the **middle layer of the acoelomates is completely filled with organs and tissues**. The middle layer of the body of the acoelomates is derived from the mesoderm. The other two germ layers are the endoderm and the ectoderm. Since acoelomates do not have a coelom, the internal organs, which are derived from the mesoderm, are not protected against the external pressure and shocks. In addition to the coelom, acoelomates also do not comprise a cardiovascular system and a respiratory system. Since acoelomates consist of thin and flat bodies, the gas exchange occurs by simple diffusion. The acoelomates comprise simple organized digestive tracts, nervous, and excretory systems. The elimination of the wastes is achieved through the specialized cells and tubules. A single orifice serves as both the inlet of food and the exit point of wastes. In addition, acoelomates comprise a defined head region with sensory organs to detect light as well as food sources.

Platyhelminthes (unsegmented flatworms) are the most precise example of acoelomates. They are free-living animals in the freshwater habitats. Some Platyhelminthes are parasitic. Ribbon worms, tapeworms, flukes, and planarians are examples of Platyhelminthes. The planarian is shown in *figure 1*.



Figure 1: A planarian

- An acoelomate is an animal which lack a *coelom*, or formal body cavity. True body cavities form only in multicellular organisms with true tissues. Within this

group, the *eumetazoa*, there are the organisms like coral and [jellyfish](#), which have only 2 basic tissues. The *triploblastic* eumetazoa have 3 [tissue](#) types.

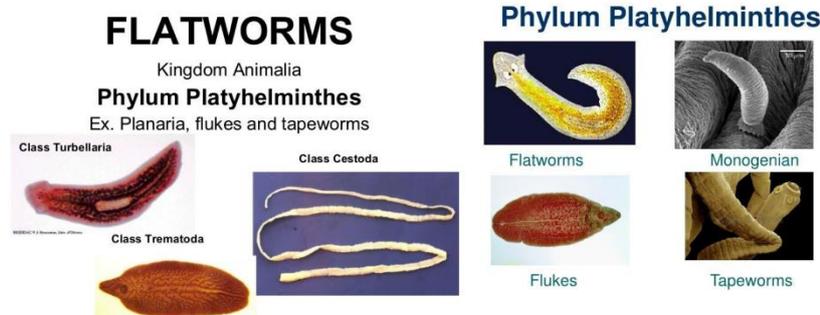
- An acoelomate is the simplest form of animals which have 3 true tissues. These tissue are the [endoderm](#), [mesoderm](#), and [ectoderm](#), in that order from inside to out.
- In an acoelomate, these tissues touch back-to-back, without any space in between. The organs form within it, and are surrounded by the mesoderm. The ectoderm is the [skin](#), while endoderm forms the digestive tract.
- While *pseudocoelomates* and *coelomates* have a cavity between these tissues, an acoelomate does not.
- An acoelomate, such as in the examples below, is solid except for the digestive tract itself.

Examples of an Acoelomate

Platyhelminthes

The [phylum](#) Platyhelminthes, otherwise known as the flatworms, is a large and diverse phylum, containing many an acoelomate flatworm.

PHYLUM - PLATYHELMINTHES



Flatworms are parasitic or free-living, unsegmented worms. They have an incomplete gut, with one opening through which food is both ingested and excreted. However, they have a high degree of *cephalization*, meaning they have a centralized [nervous system](#) toward their [head](#). Below is an example of a large *turbellarian*, a type of free-living flatworm.

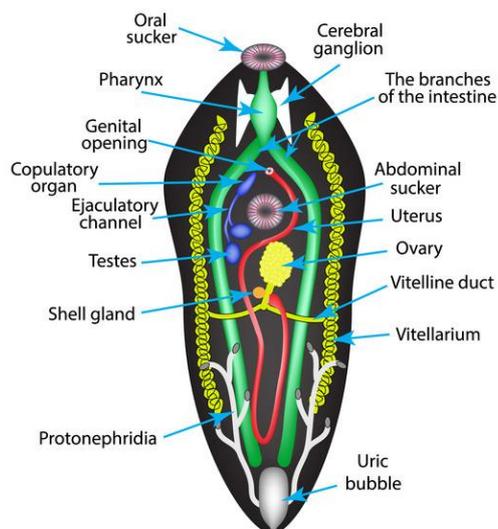


Figure 2: A Turbellarian

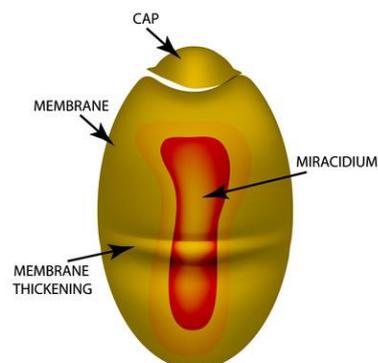
These acoelomate creatures also take on a number of parasitic forms, such as flukes and tapeworms. Both of these parasitic forms live within the gut of their host, feeding on whatever the host feeds on. Regardless of whether the acoelomate is free-living or parasitic, it exchanges gas the same way. Flatworms are typically so thin that gas-exchange can be accomplished across the skin, without the need for lungs, gills, or other complex organs.

The phylum consists of four classes: **Trematoda (flukes)**, **Cestoda (tapeworms)**, **Turbellaria (planarians)**, and **Monogenea**.

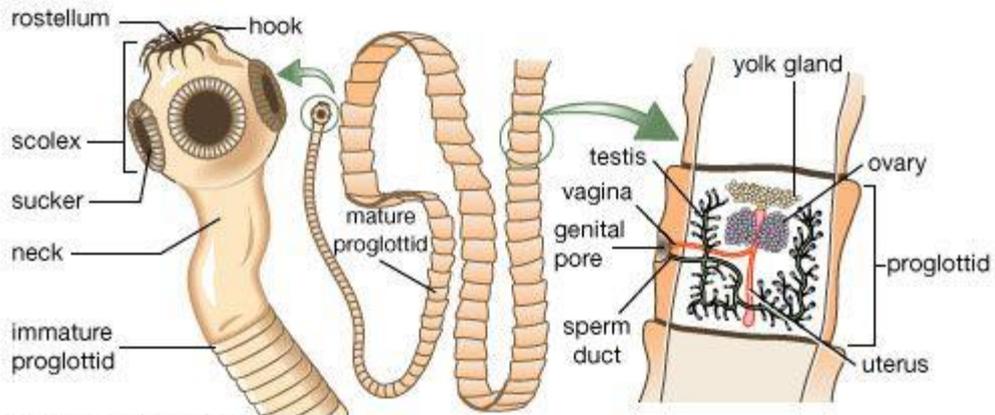
LIVER FLUKE



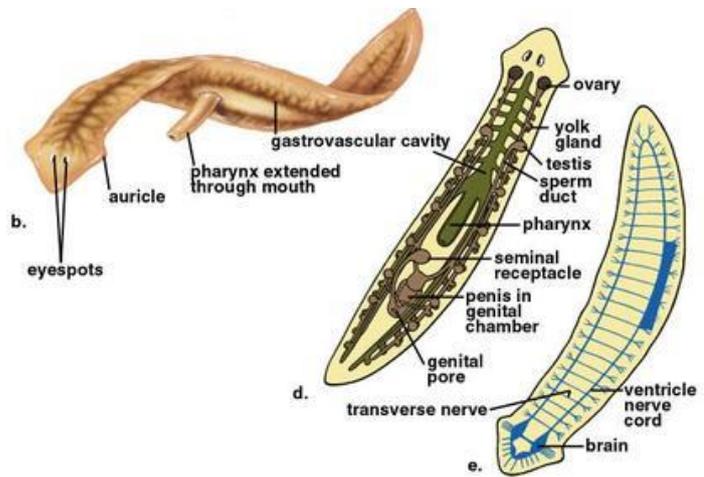
ADULT LIVER FLUKE



EGG LIVER FLUKE



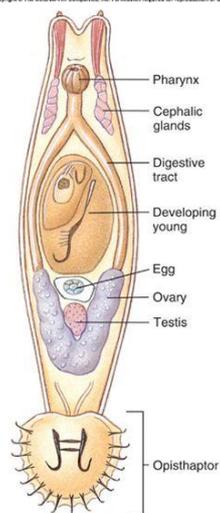
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Class Monogenea

- All **monogeneans** are parasites.
- Often found in the gills or external surfaces of fishes.

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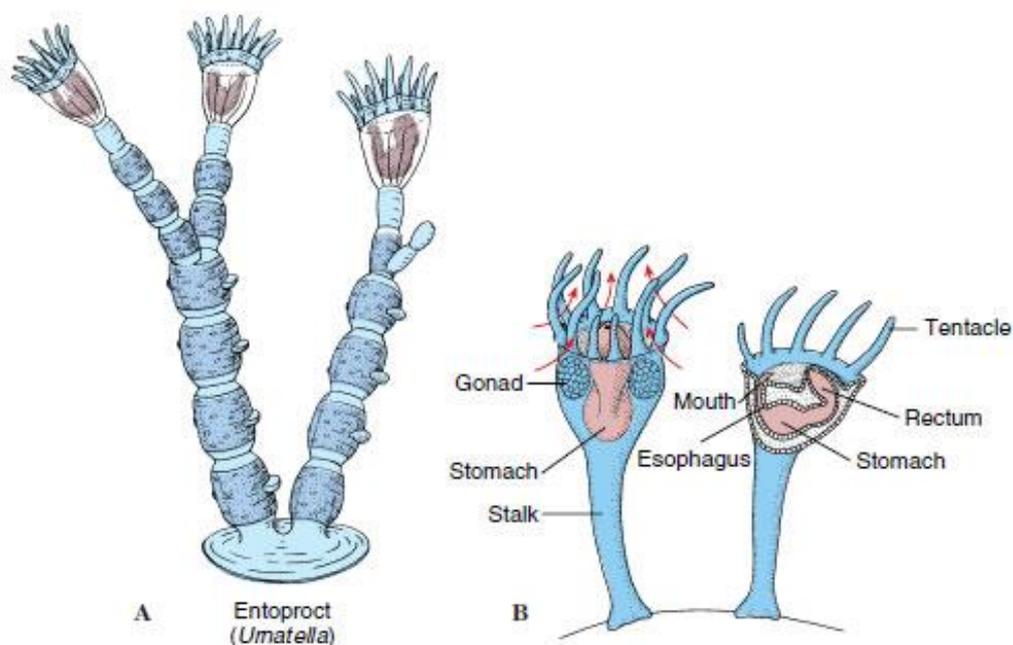
Platyhelminthes Examples

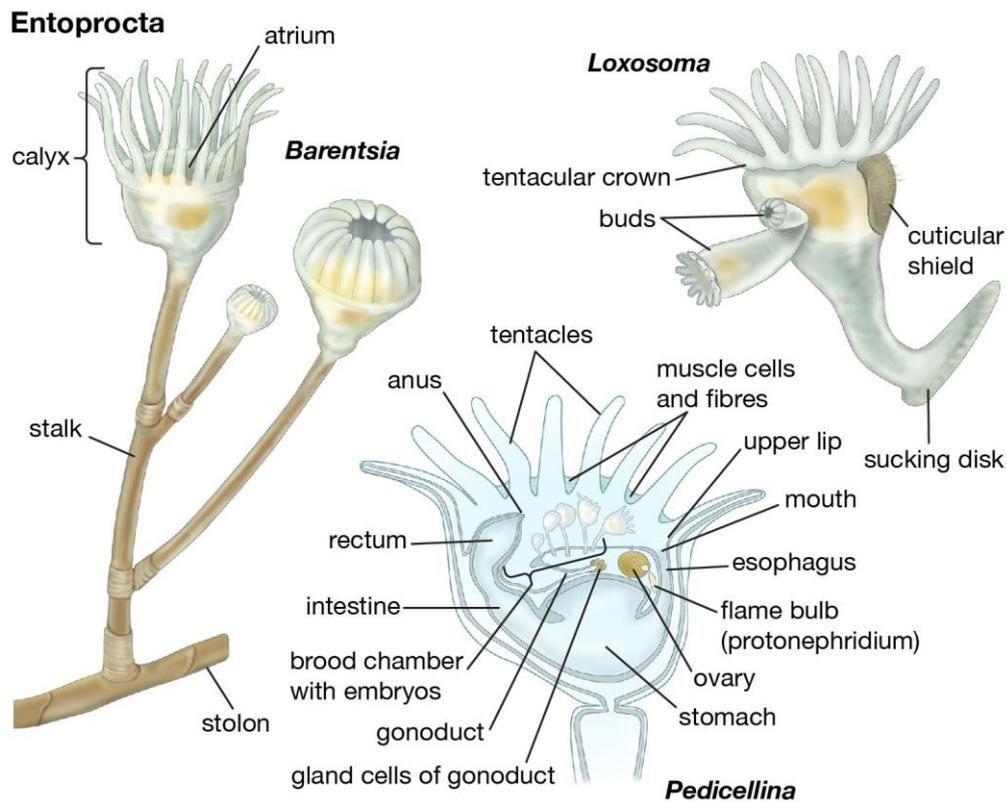
- Taenia (Tapeworms)
- Fasciola (Liver fluke)
- Taenia saginata (Beef tapeworm)
- Echinococcus granulosus – The dog tapeworm.
- Planeria (freshwater flatworm)
- Opistorchis.

Entoprocta

Definition of Entoprocta: A **phylum of pseudocoelomate animals resembling the Bryozoa but lacking a true coelom and having the anus adjacent to the mouth.**

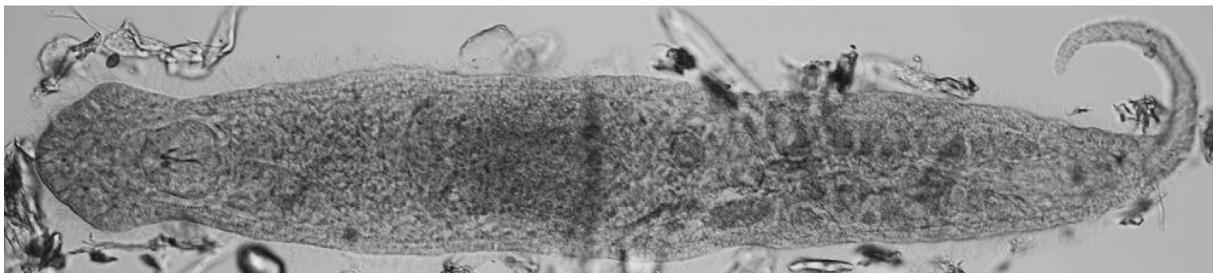
Entoprocts are tiny, filter feeding organisms found in fresh and salt water. They are usually [sessile](#), and are usually acoelomate. Like the flatworms, they lack a coelom, but have 3 distinct basic tissues. Unlike the flatworms, the entoprocts have a complete gut, which is “U” shaped. This allows one side of their body to attach to the [substrate](#), while the other side filters food from the water column. 150 species of entoproct, any member of the phylum Entoprocta, a group of aquatic invertebrate animals composed of about 150 species and subdivided into four families. Entoprocts occur throughout the world, primarily in marine habitats, although one genus, *Urnatella*, is a freshwater form.





Gnathostomulida

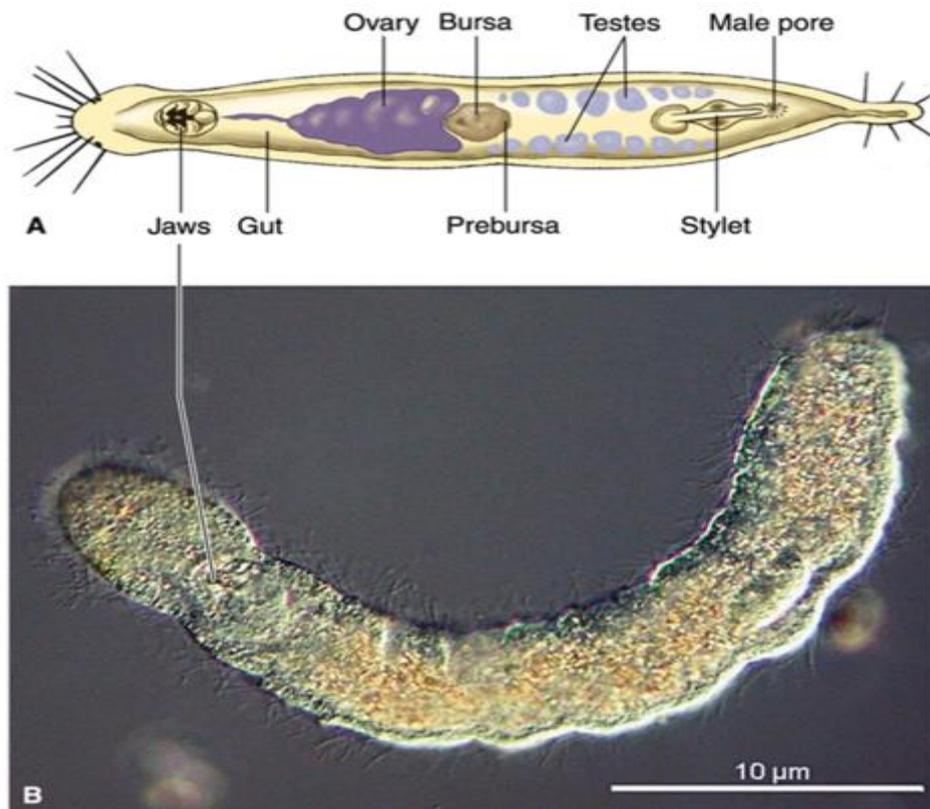
Gnathostomulids, or jaw worms, are a small phylum of nearly microscopic marine animals. They inhabit sand and mud beneath shallow coastal waters and can survive in relatively anoxic environments. They were first recognised and described in 1956.



Gnathostomula paradoxa

Like the flatworms, the Gnathostomulida are a phylum of worm-like animals, which live mostly in marine environments. The word “gnatho” refers to “jaws” as these tiny little creatures have some of the tiniest jaws in the animal [kingdom](#). These tiny jaws can be seen in the image below, near the head of the creature. Like the other acoelomate phyla, these animals have no body cavity. The space between their skin and intestines is packed with muscles and filler cells. This makes a [circulatory system](#), [heart](#), and lungs unnecessary. All that can be seen in the image below is the jaw and intestine of the animal. 100 species was discovered in the 1920s on the German coast but not described

until 1956, Gnathostomulida have since been reported from many sheltered sandy shores around the world. With fewer than 100 known species, this is one of the smallest animal phyla.



Gastrotricha

Definition of Gastrotrich: **Any of a phylum (Gastrotricha) of minute aquatic pseudocoelomate animals that usually have a spiny or scaly cuticle and cilia on the ventral surface.**

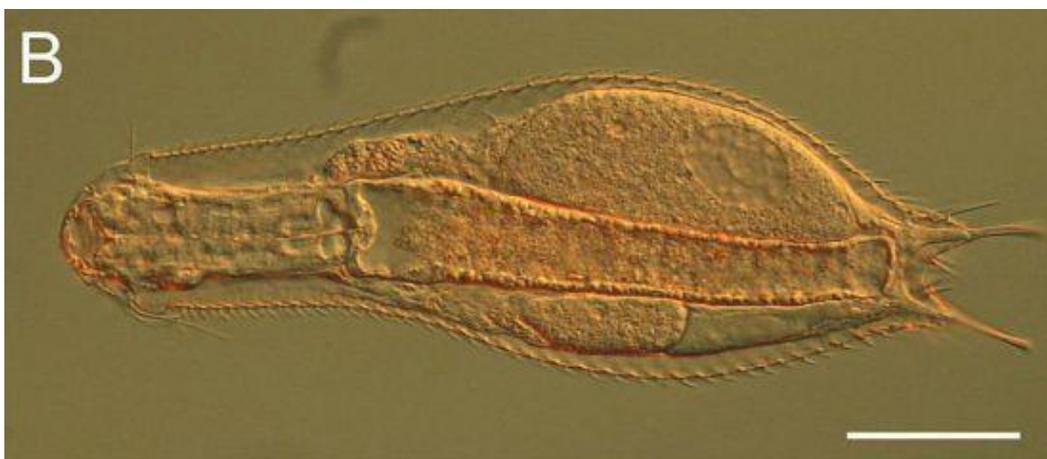
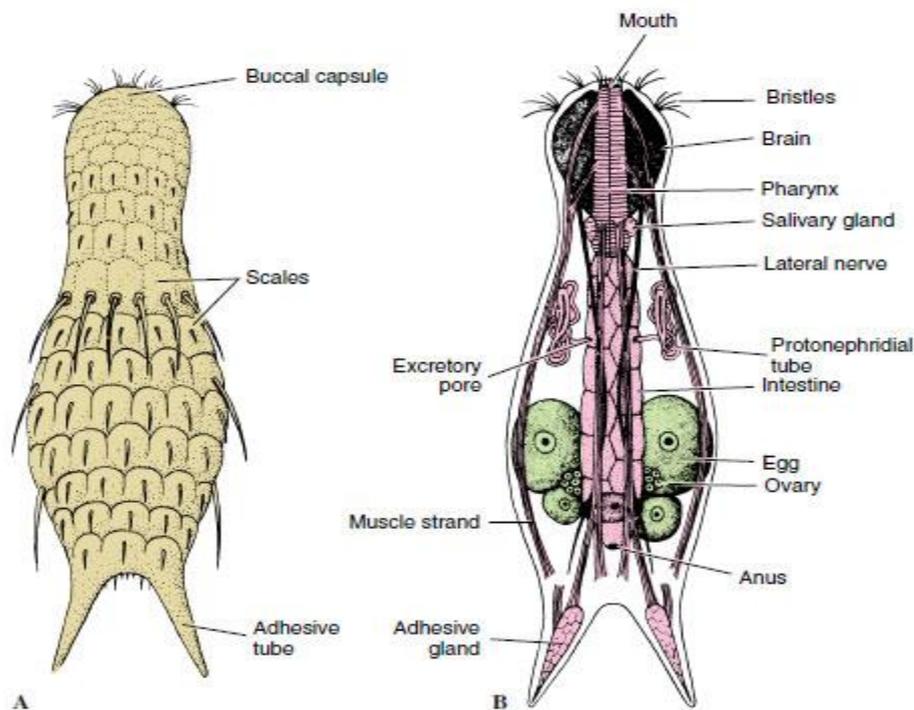


Figure 3: Chaetonotidae

The Gastrotricha are supposedly acoelomate. However, this may simply be because the gastrotricha are hard to study. These tiny animals (most are only 1 mm), are commonly thought to be related to other, non-acoelomate groups. For this reason, some scientists don't always classify them as acoelomates. However, any body cavity they have is filled with mesenchyme cells and [muscle](#), effectively making them acoelomates.

The gastrotricha symbolize a number of problems scientists have with identifying and classifying organisms. First off, the gastrotricha are microscopic. The largest is only 3 mm in length. Look at one in the image below.



It is hard for scientists to tell exactly what is happening on the inside of the [organism](#). Is there a cavity, or can you just see right through the layers of skin to the other side? While the gastrotricha is recognized by its peculiar mouth and spines, its acoelomate condition is often debated.

Gastrotrich, any of about 500 species of the phylum Gastrotricha, a group of microscopic aquatic invertebrates that live in the spaces between sand grains and soil particles and on the outer coverings of aquatic plants and animals. They occur in salt water and freshwater and also on sandy seashores.

Why does being Acoelomate Matter?

In classifying animals, scientists tend to use a variety of common features to identify which groups are most closely related. While DNA evidence has added vast knowledge to this field, it is also only one piece of the puzzle. The development of a body cavity is one characteristic which scientists have tracked for ages as a standard delineator between different phyla.

As the Gastrotricha and other phyla show, this is not always easy. While it is easy to distinguish a coelom in a large animal, it may be nearly impossible in a microscopic animal. Thus, an acoelomate may look exactly the same as a microscopic coelomate, because the actual body cavity is so small. Further, animals like those in the Gastrotricha did not stop evolving millions of years ago. While they may be acoelomate, they have also developed many advanced features like organs, spines, and complicated intestines.

Sometimes, people tend to associate an acoelomate with primitive evolution, and somehow think that a coelom is the more “advanced” form. Having or not having a body cavity are simple different strategies for surviving on this world. Flatworms have been around far longer than humans, and will probably outlive us too. The acoelomate body plan is simple, yet very effective.