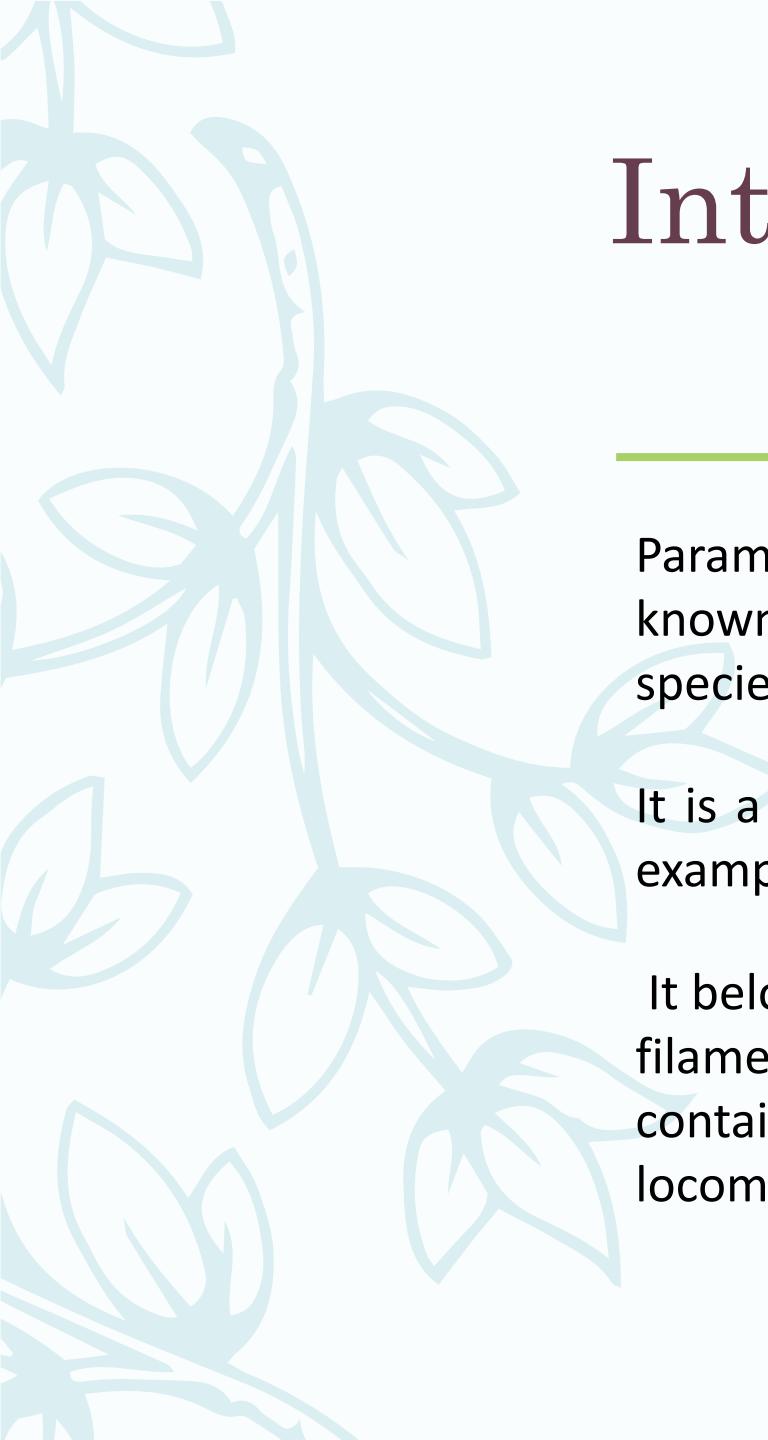


Paramecium

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B.Sc. Part-I, Paper-I, Group-A

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Introduction

Paramecium is a unicellular organism. It resembles the sole of a shoe, hence also known as slipper animalcule. It ranges from 50 to 300um in size which varies from species to species. It is mostly found in a freshwater environment.

It is a single-celled **eukaryote** belonging to kingdom Protista and is a well-known example of ciliate **protozoa**.

It belongs to the phylum Ciliophorans its whole body is covered with small hair-like filaments called the cilia, helps in locomotion. There is also a deep oral groove containing not so clear oral cilia. The main function of this cilia is to help both in locomotion as well as dragging the food to its oral cavity.

Classification

Kingdom: Chromista

Infrakingdom: Alveolata

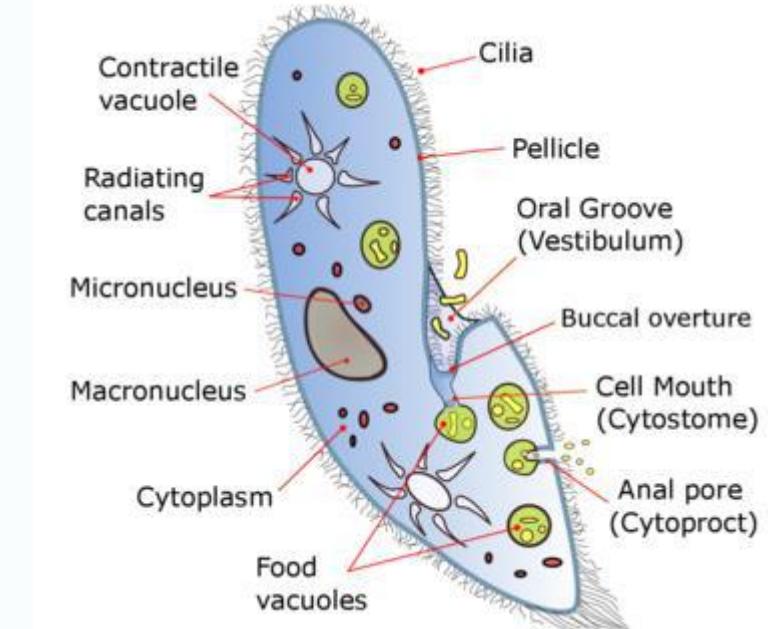
Phylum: Ciliophora

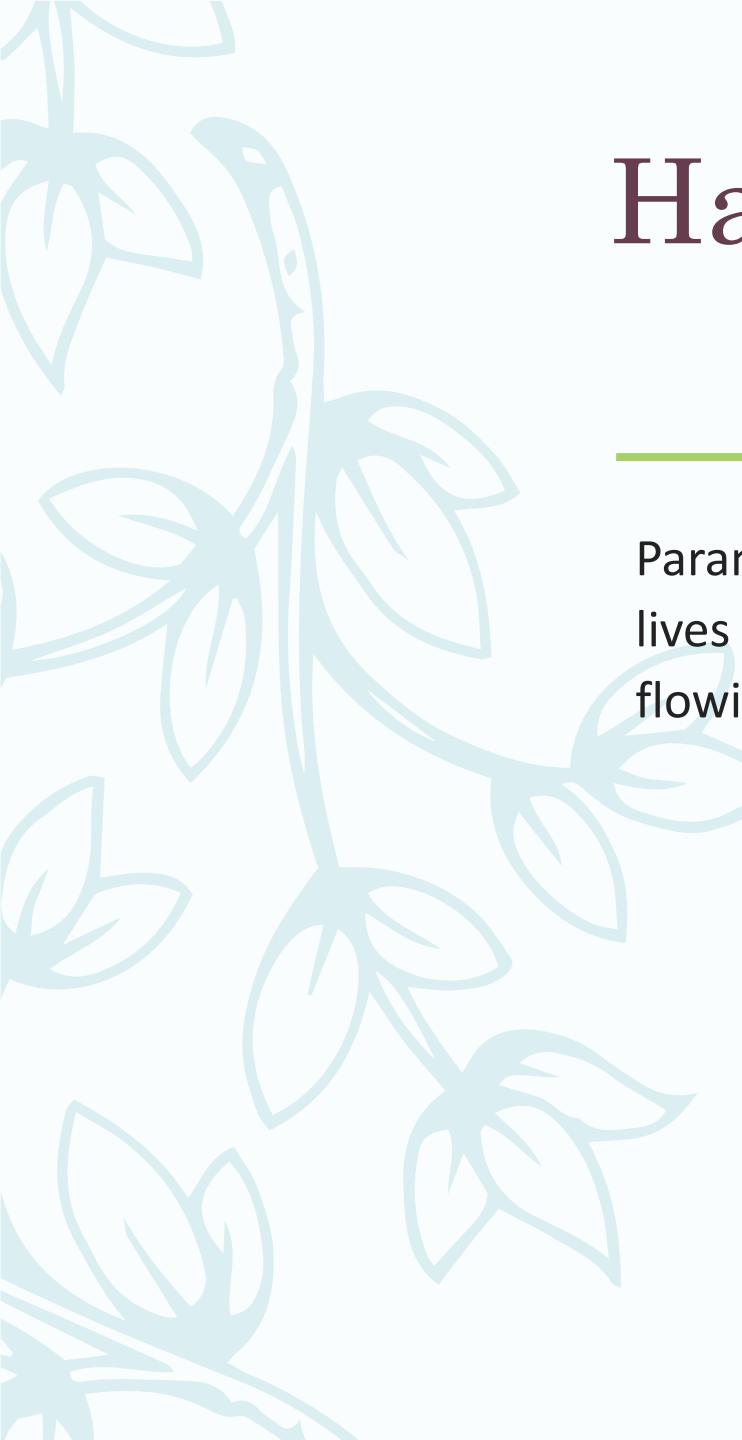
Class: Oligohymenophorea

Order: Peniculida

Family: Parameciidae

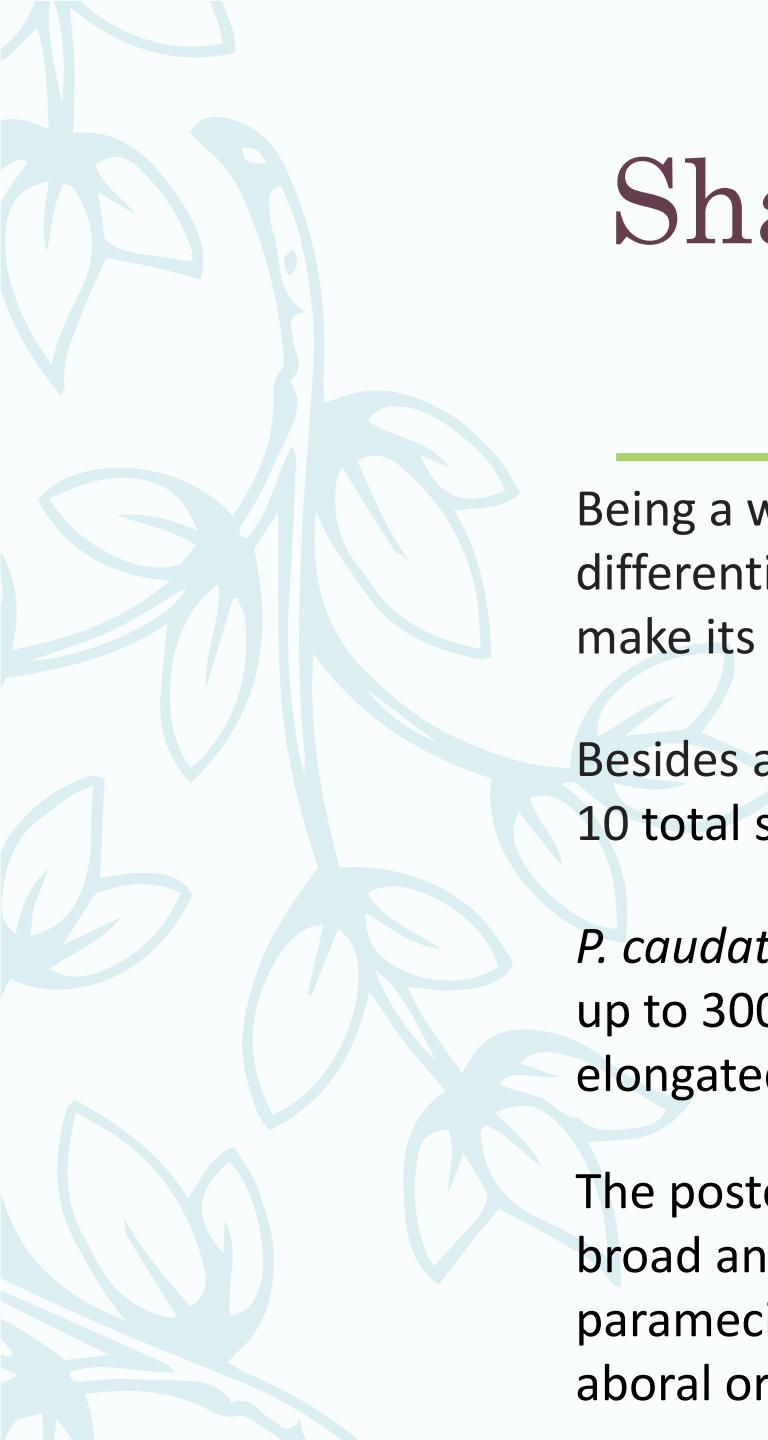
Genus: Paramecium





Habit and Habitat

Paramecium has a worldwide distribution and is a free-living organism. It usually lives in the stagnant water of pools, lakes, ditches, ponds, freshwater and slow flowing water that is rich in decaying organic matter.



Shape and Size

Being a well-known ciliate protozoan, paramecium exhibits a high-level cellular differentiation containing several complex organelles performing a specific function to make its survival possible.

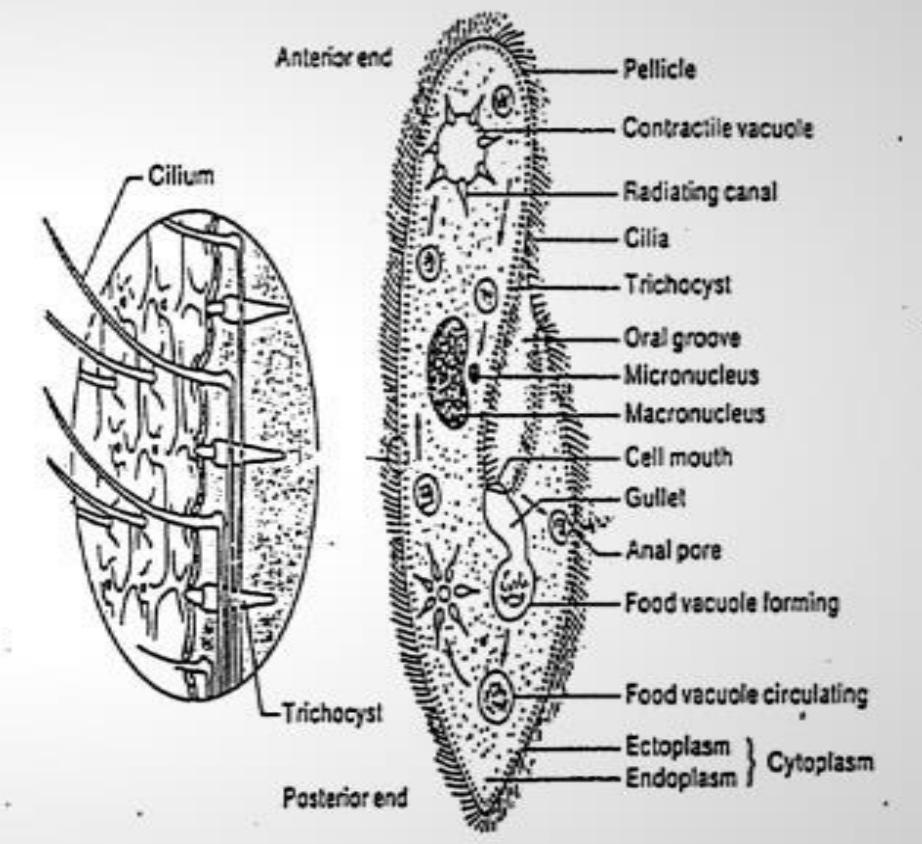
Besides a highly specialized structure, it also has a complex reproductive activity. Out of the 10 total species of Paramecium, the most common two are *P. aurelia* and *P. caudatum*.

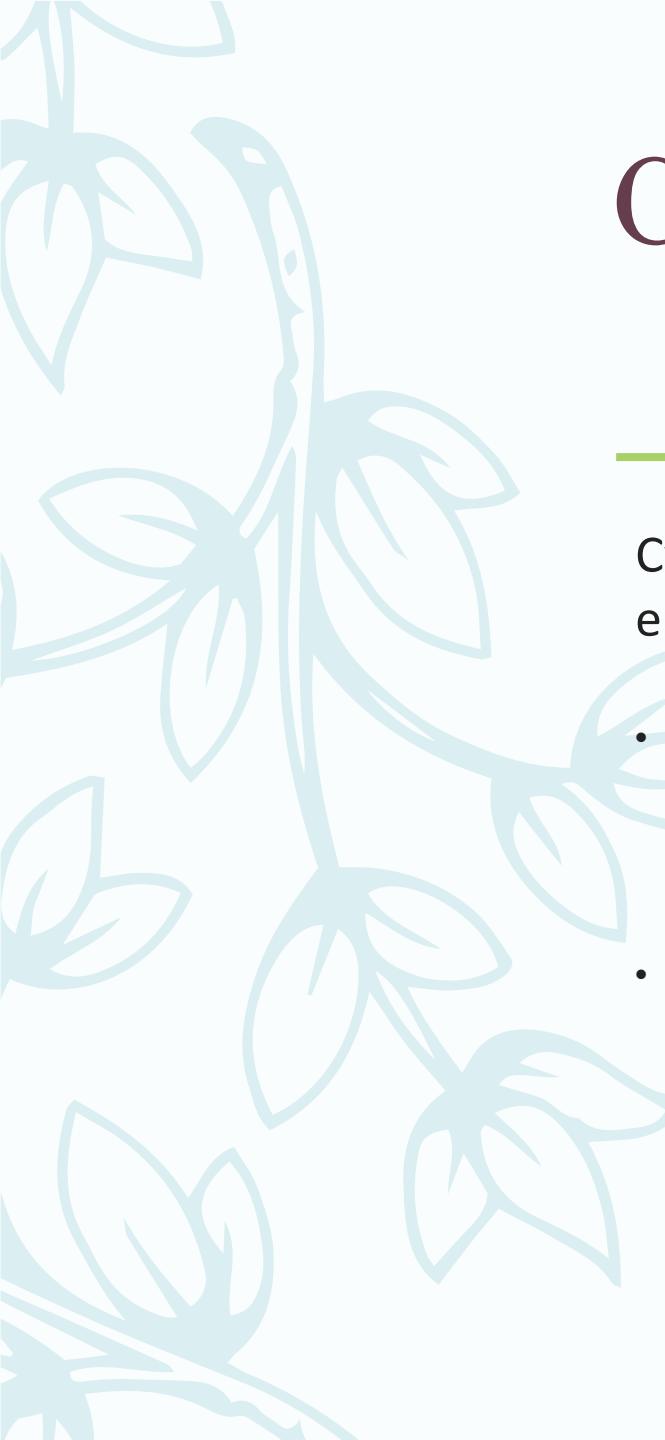
P. caudatum is a microscopic, unicellular protozoan. Its size ranges from 170 to 290um or up to 300 to 350um. Surprisingly, paramecium is visible to the naked eye and has an elongated slipper like shape, that's the reason it's also referred to as a slipper animalcule.

The posterior end of the body is pointed, thick and cone-like while the anterior part is broad and blunt. The widest part of the body is below the middle. The body of a paramecium is asymmetrical. It has a well-defined ventral or oral surface and has a convex aboral or dorsal body surface.

Structure

Pellicle - a membrane covering that protects the paramecium like skin
Cilia - hair like appendages that help the paramecium move food into the oral groove
Oral Groove - collects and directs food into the cell mouth
Cell Mouth - opening for food
Anal Pore - disposes of waste
Contractile Vacuole - contracts and forces extra water out of the cell
Radiating Canals - paths to the contractile vacuole
Cytoplasm - intercellular fluid needed to contain vital cell parts
Trichocyst - used for defense
Gullet - forms food vacuoles
Food Vacuole - storage pocket for food
Macronucleus - larger nucleus which performs normal cell functions
Micronucleus - smaller nucleus which is responsible for cell division.

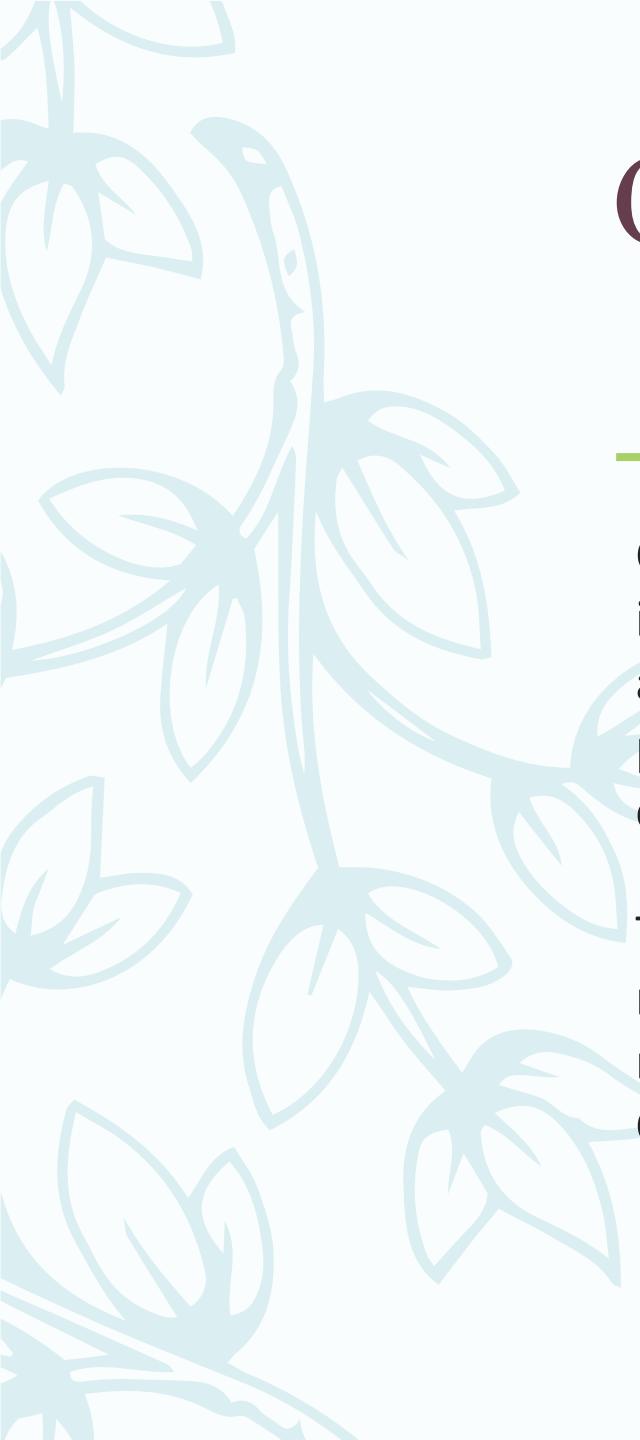




Cytoplasm

Cytoplasm is a jelly-like substance further differentiated into the ectoplasm and endoplasm-

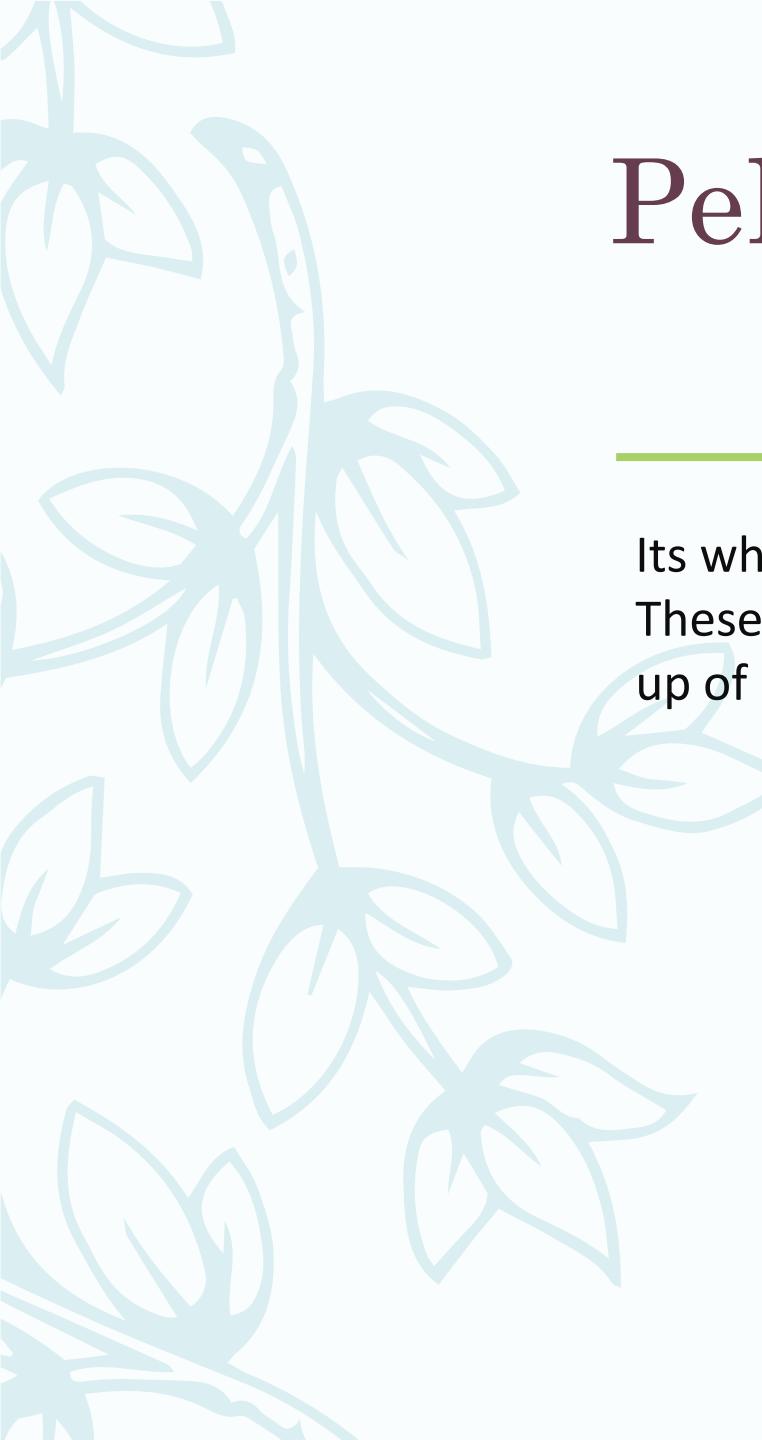
- **Ectoplasm:** Ectoplasm forms a thin, dense and clear outer layer containing cilia, trichocysts, and fibrillar structures. This ectoplasm is further bound to pellicle externally through a covering.
- **Endoplasm:** Endoplasm is one of the most detailed parts of the cytoplasm. It contains several different granules. It contains different inclusions and structures like vacuoles, mitochondria, nuclei, food vacuole, contractile vacuole etc.



Cilia

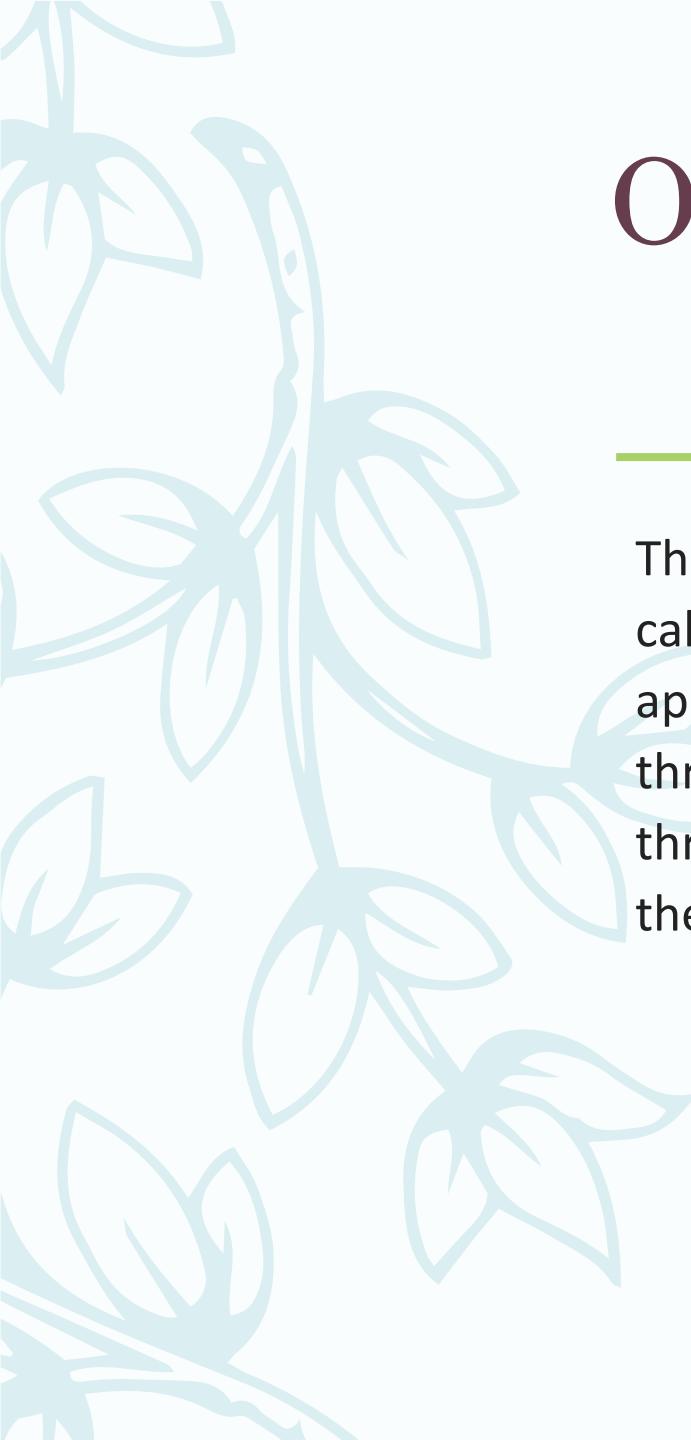
Cilia refers to the multiple, small hair-like projections that cover the whole body. It is arranged in longitudinal rows with a uniform length throughout the body of the animal. This condition is called holotrichous. There are also a few longer cilia present at the posterior end of the body forming a caudal tuft of cilia, thus named caudatum.

The structure of cilia is the same as flagella, a sheath made of protoplast or plasma membrane with longitudinal nine fibrils in the form of a ring. The outer fibrils are much thicker than the inner ones with each cilium arising from a basal granule. Cilia have a diameter of 0.2um and helps in its locomotion.



Pellicle

Its whole body is covered with a flexible, thin and firm membrane called pellicles. These pellicles are elastic in nature which supports the cell membrane. It's made up of a gelatinous substance.



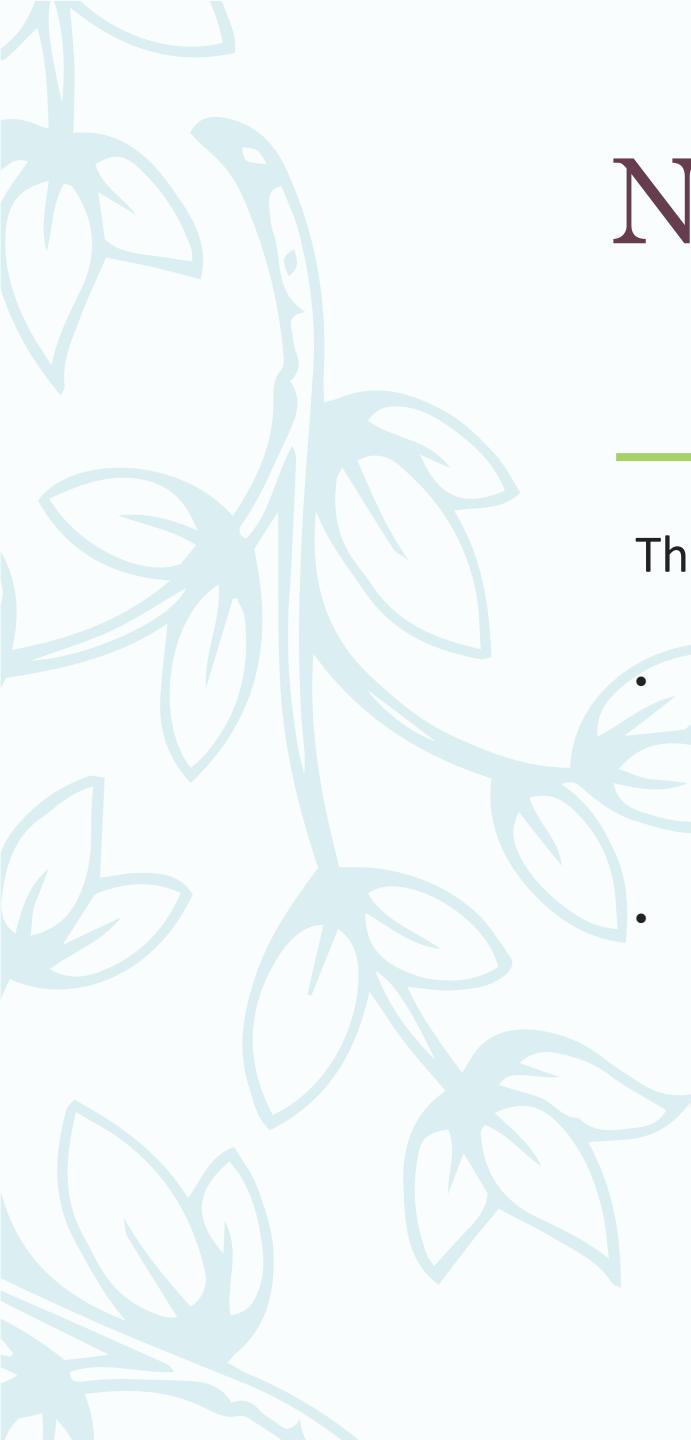
Oral groove

There is a large oblique shallow depression on the ventro-lateral side of the body called peristome or an oral groove. This oral groove gives an asymmetrical appearance to the animal. It further extends into a depression called a vestibule through a short conical funnel. This vestibule further extends into the cytostome through an oval-shaped opening, through a long opening called a cytopharynx and then the oesophagus leads to the food vacuole.



Cytopyg[e]

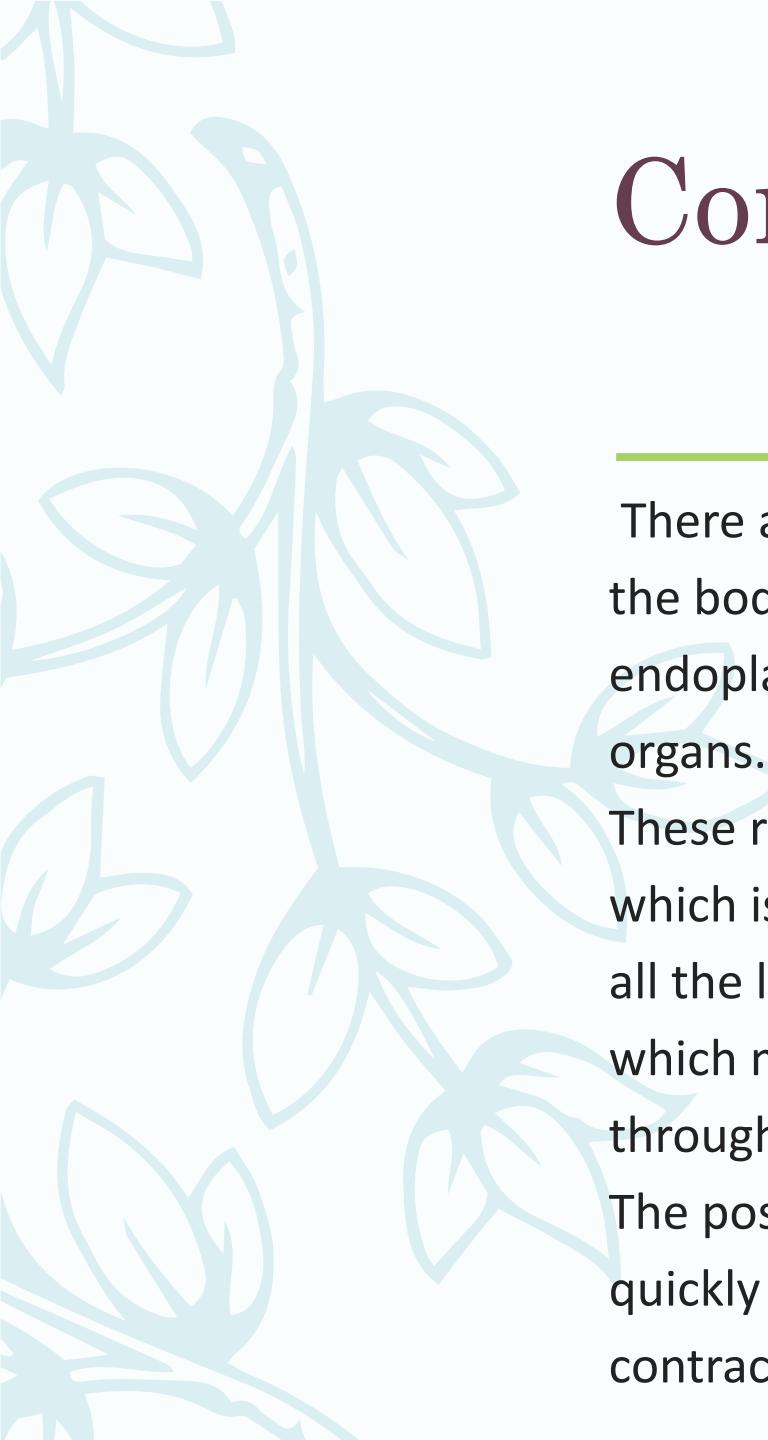
Cytopyg[e]: Lying on the ventral surface, just behind the cytostome is the cytopyg[e] also called a cytoproct. All the undigested food gets eliminated through the cytopyg[e].



Nucleus

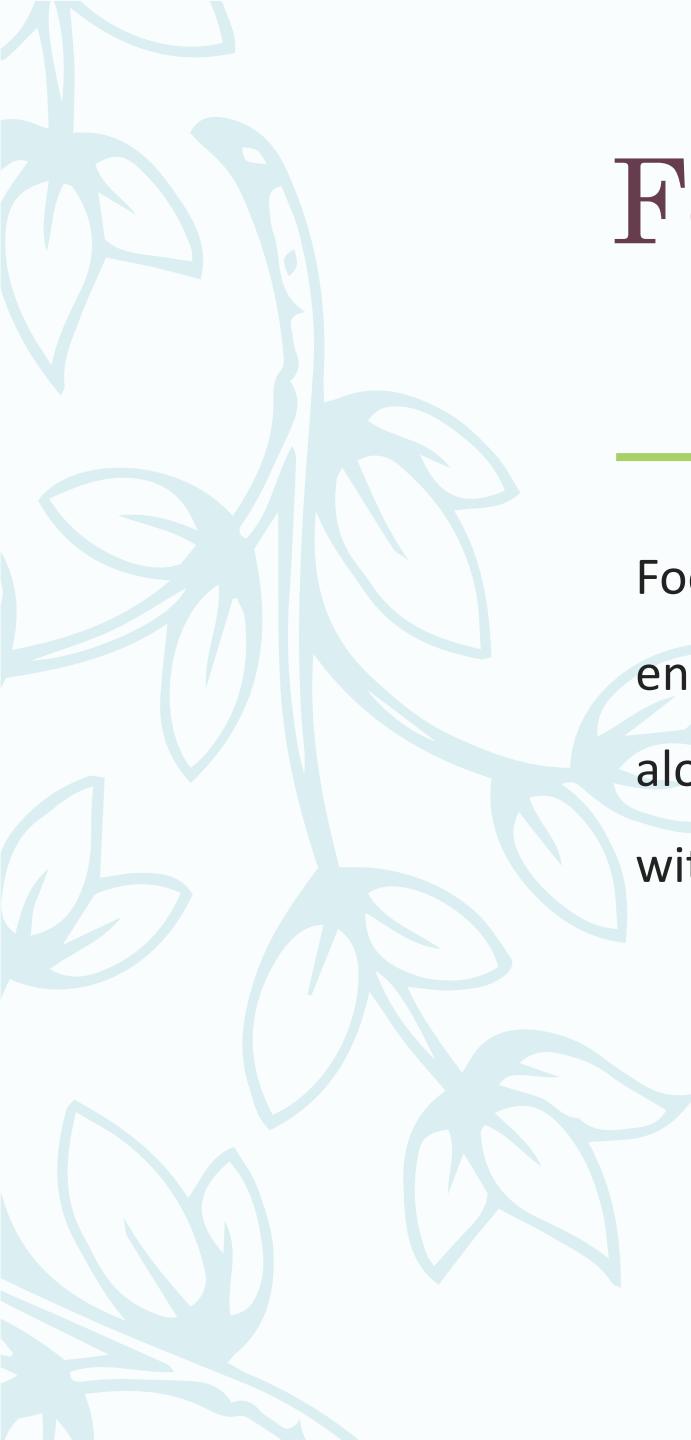
The nucleus further consists of a macronucleus and a micronucleus.

- **Macro Nucleus:** Macronucleus is kidney like or ellipsoidal in shape. It's densely packed within the DNA (chromatin granules). The macronucleus controls all the vegetative functions of paramecium hence called the vegetative nucleus.
- **Micro Nucleus:** The micronucleus is found close to the macronucleus. It is a small and compact structure, spherical in shape. The fine chromatin threads and granules are uniformly distributed throughout the cell and control reproduction of the cell. The number in a cell varies from species to species. There is no nucleolus present in *caudatum*.



Contractile Vacuole

There are two contractile vacuoles present close to the dorsal side, one on each end of the body. They are filled with fluids and are present at fixed positions between the endoplasm and ectoplasm. They disappear periodically and hence are called temporary organs. Each contractile vacuole is connected to at least five to twelve radical canals. These radical canals consist of a long ampulla, a terminal part and an injector canal which is short in size and opens directly into the contractile vacuole. These canals pour all the liquid collected from the whole body of paramecium into the contractile vacuole which makes the vacuole increase in size. This liquid is discharged to the outside through a permanent pore. The contraction of both the contractile vacuoles is irregular. The posterior contractile vacuole is close to the cytopharynx and hence contract more quickly because of more water passing through. Some of the main functions of contractile vacuoles include osmoregulation, excretion, and respiration.



Food Vacuoles

Food vacuole is non-contractile and is roughly spherical in shape. In the endoplasm, the size of food vacuole varies and digest food particles, enzymes alongside a small amount of fluid and bacteria. These food vacuoles are associated with the digestive granules that aid in food digestion.