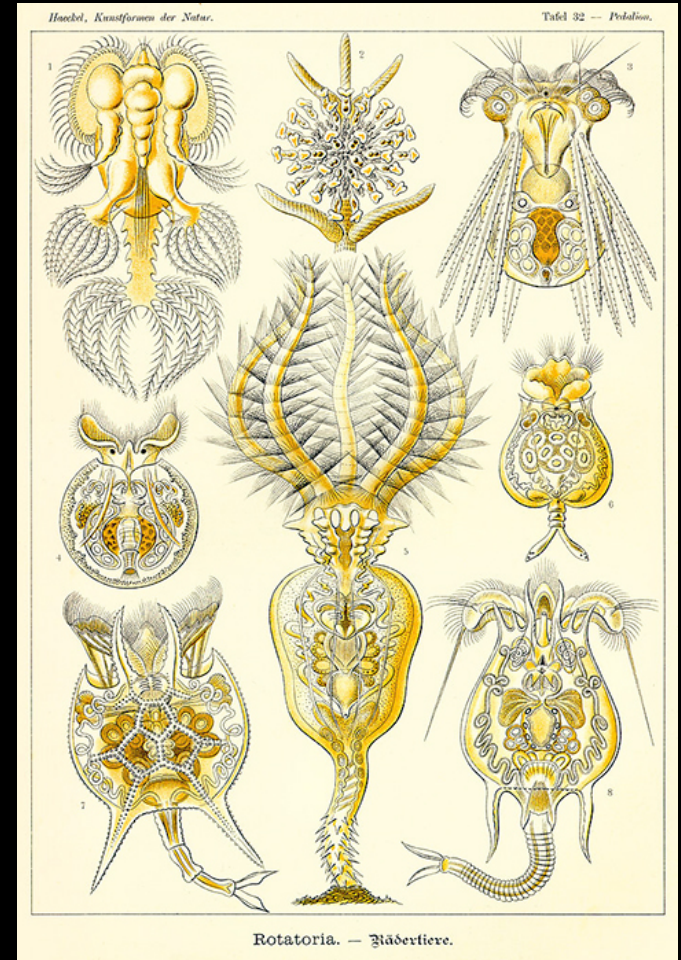


Introduction to Phylum Rotifera

- Microscopic aquatic invertebrates
- Approximately 2,000 described species
 - "Wheeled animalcules"

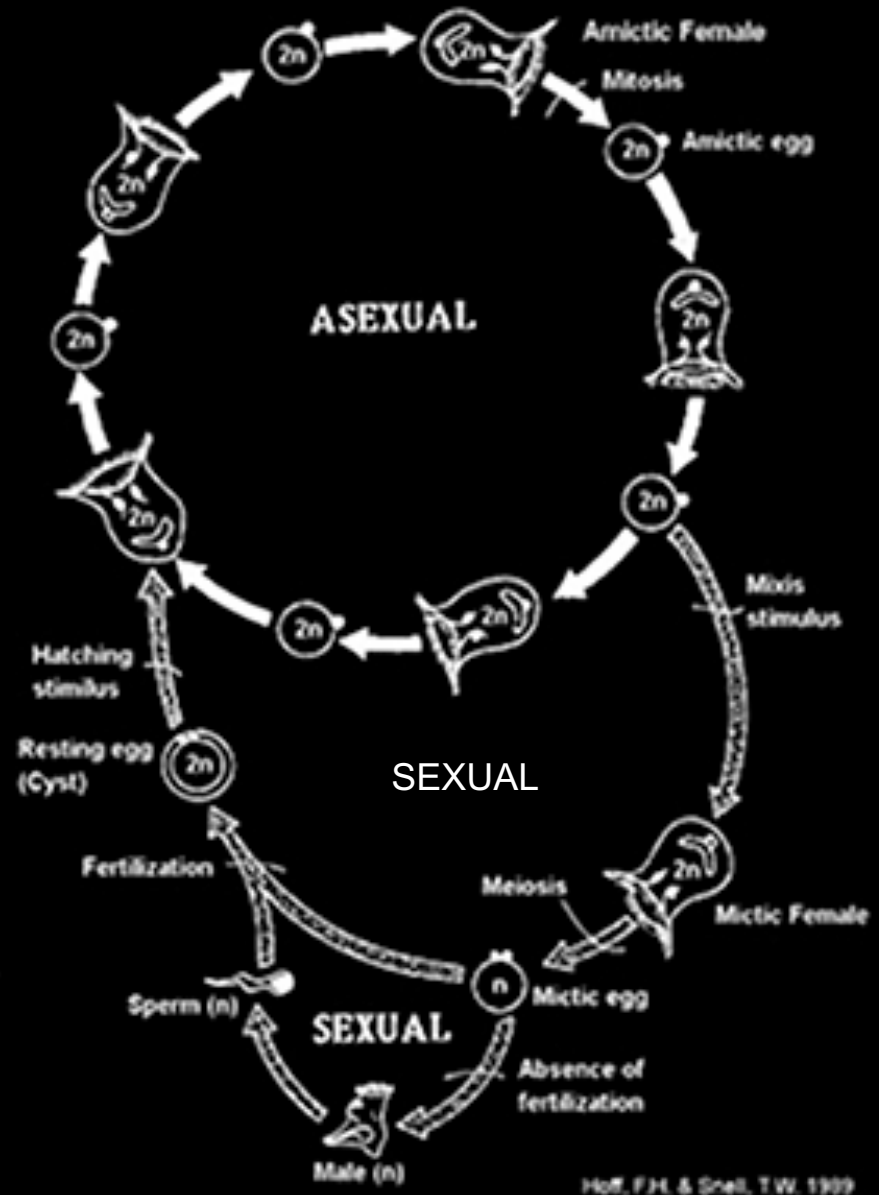


Left: Antoine van Leeuwenhoek
Above: Ernst Haeckel.
Right: Haeckel's illustrations of the Rotatoria (Rotifera)

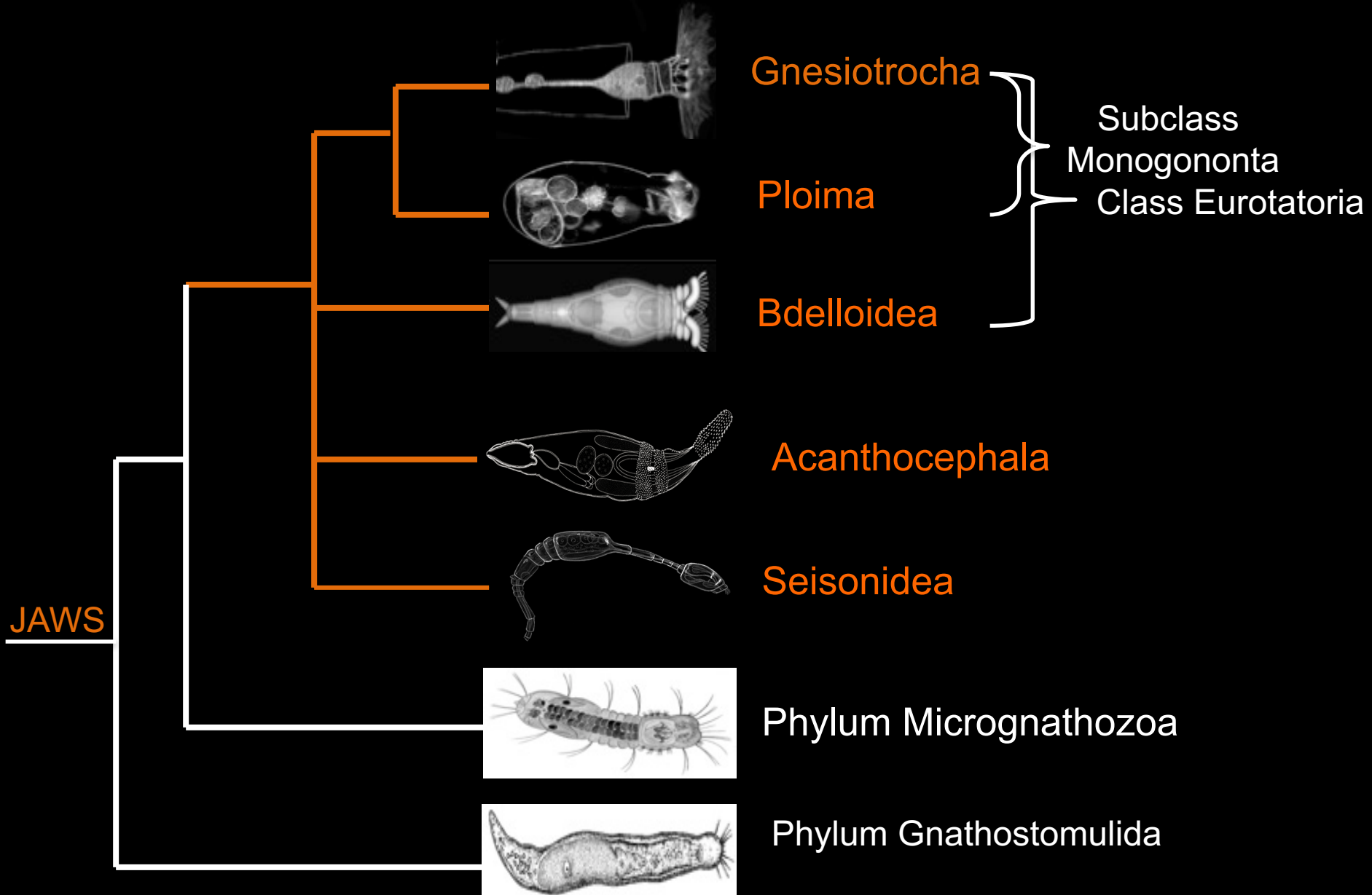


Life Cycle of Rotifers

- Most rotifers are dioecious
- Most rotifers are cyclic parthenogens: asexual (predominant) and sexual lifecycle phases
- Produce both parthenogenetic (amictic) and meiotic (mictic) eggs
- Most rotifers also undergo **direct development** – the eggs hatch as juveniles (no larva in the lifecycle)
- Gnesiotrochan rotifers undergo **indirect development** – egg → larva → adult



Rotifers are part of the animal lineage called Gnathifera

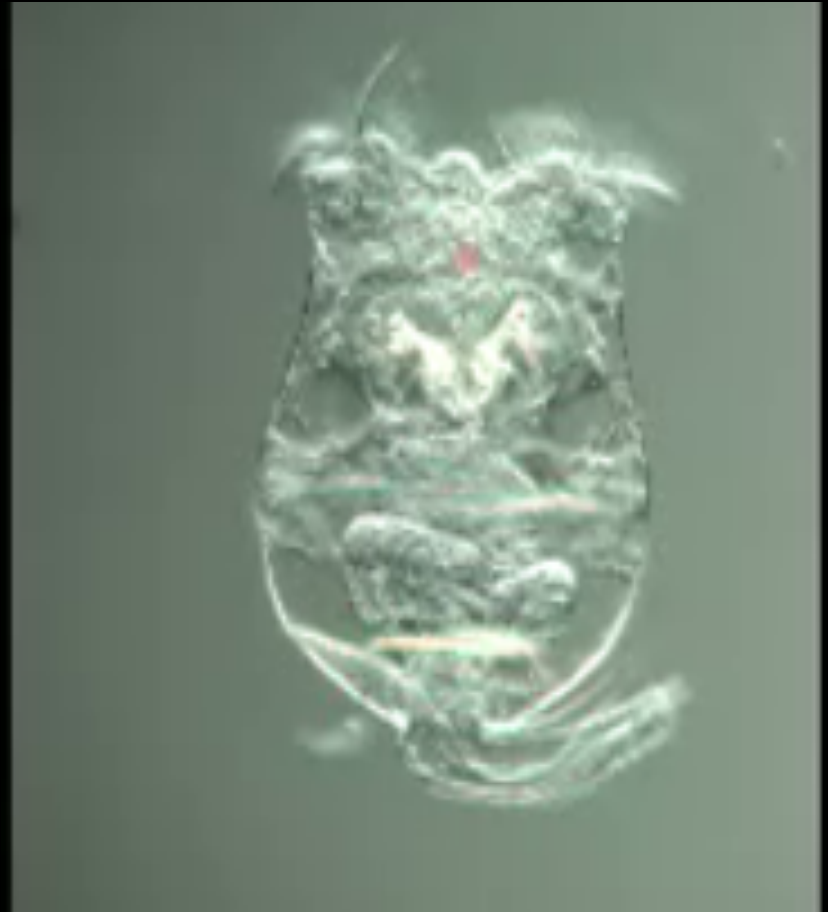


Subclass Monogononta

- Defined by presence of a single gonad
- Majority of described rotifers are monogononts (100 genera, >1,500 named species)
- Majority of monogononts are free-living: benthic, free-swimming, and sessile lifestyles
- Two groups within Monogononta: Ploimates and Gnesiotrochans

Ploimate Rotifers

- ~1300 species
- Planktonic or benthic
- Most abundant and diverse rotifers
- Important in freshwater food webs (e.g., microbial loop)



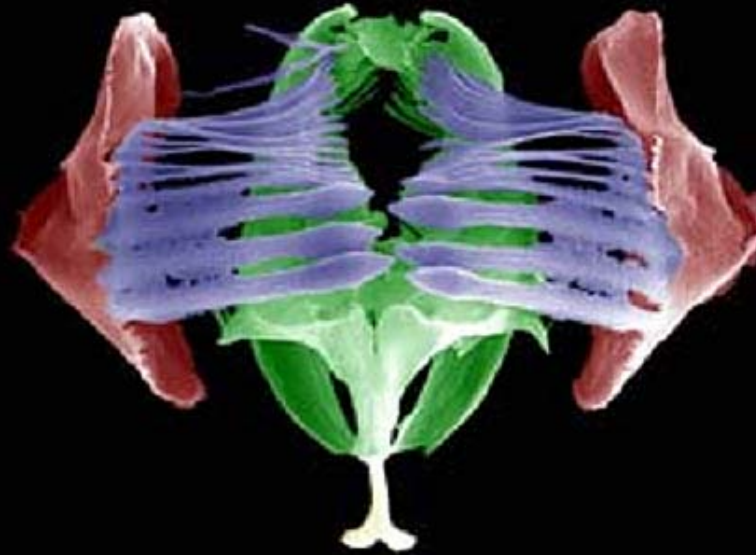
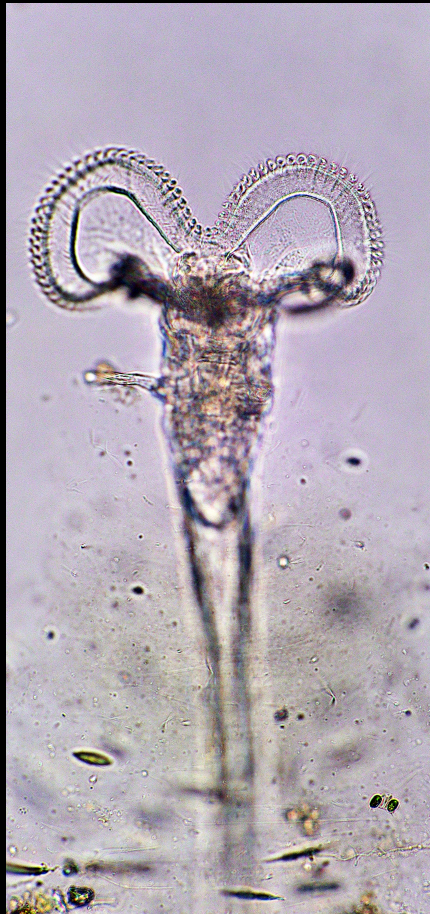
Gnesiotrochan Rotifers

- ~220 planktonic and sessile species
 - Divided into two orders:
 - **Order Flosculariaceae**
 - **Order Collotheceae**

Gnesiotrochan Rotifers

Order Flosculariaceae:

- ~180 species
- Highly variable body plans; united by the presence of malleoramate trophi



Left: *Floscularia melicerta*
Middle: Malleoramate trophi
Right: *Limnias ceratophylli*

Gnesiotrochan Rotifers

Order Collothecaceae

- 60 species
- Adults are predominantly sessile



Left to right: *Collotheca coronetta*; *Stephanoceros fimbriatus*; *Stephanoceros millsii*

Order Collothecaceae

All collothecids possess an **infundibulum** as an adult.

The infundibulum is not a corona – it is a funnel- or bowl-shaped head, which has a different developmental origin.

The infundibulum does not possess locomotory cilia; instead it bears stiff setae for prey capture.

Standard
ciliated
corona
in species of
Brachionus

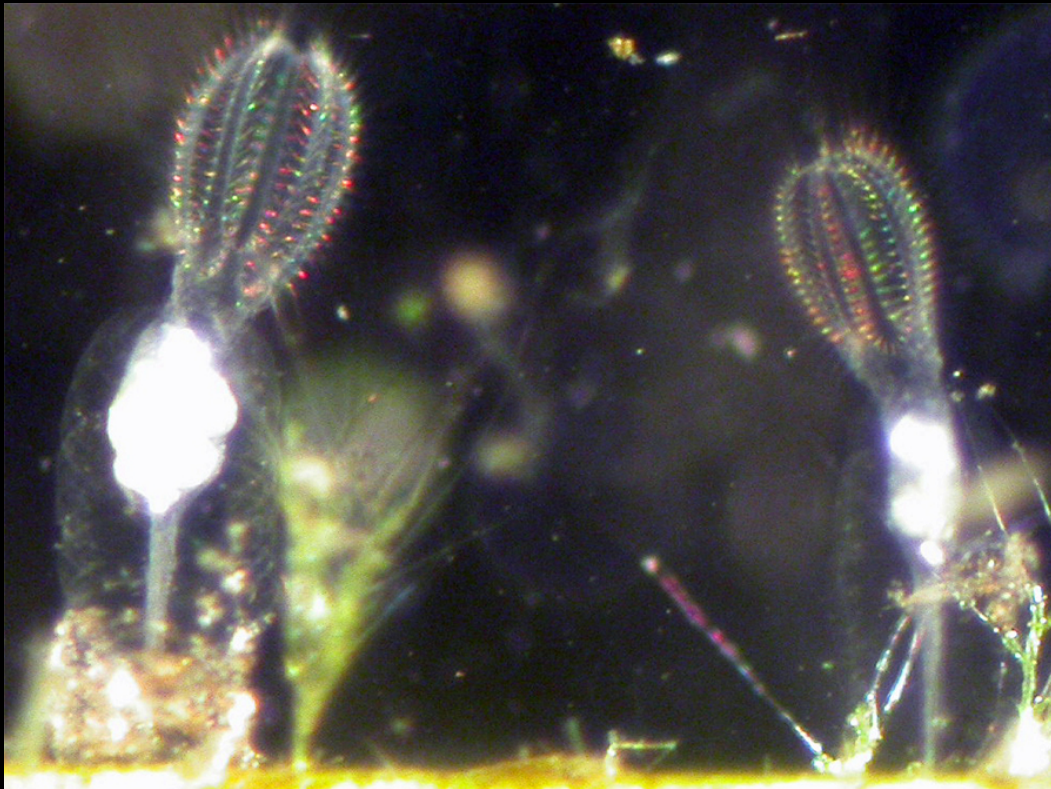


Infundibulum of
Stephanoceros
fimbriatus
covered in
elongate setae

Infundibulum in species of *Stephanoceros* shows striking differences from other species in the order

Funnel-shaped infundibulum bears five elongate tentacles

Tentacles covered in stiff setae, arrangement of which varies between species



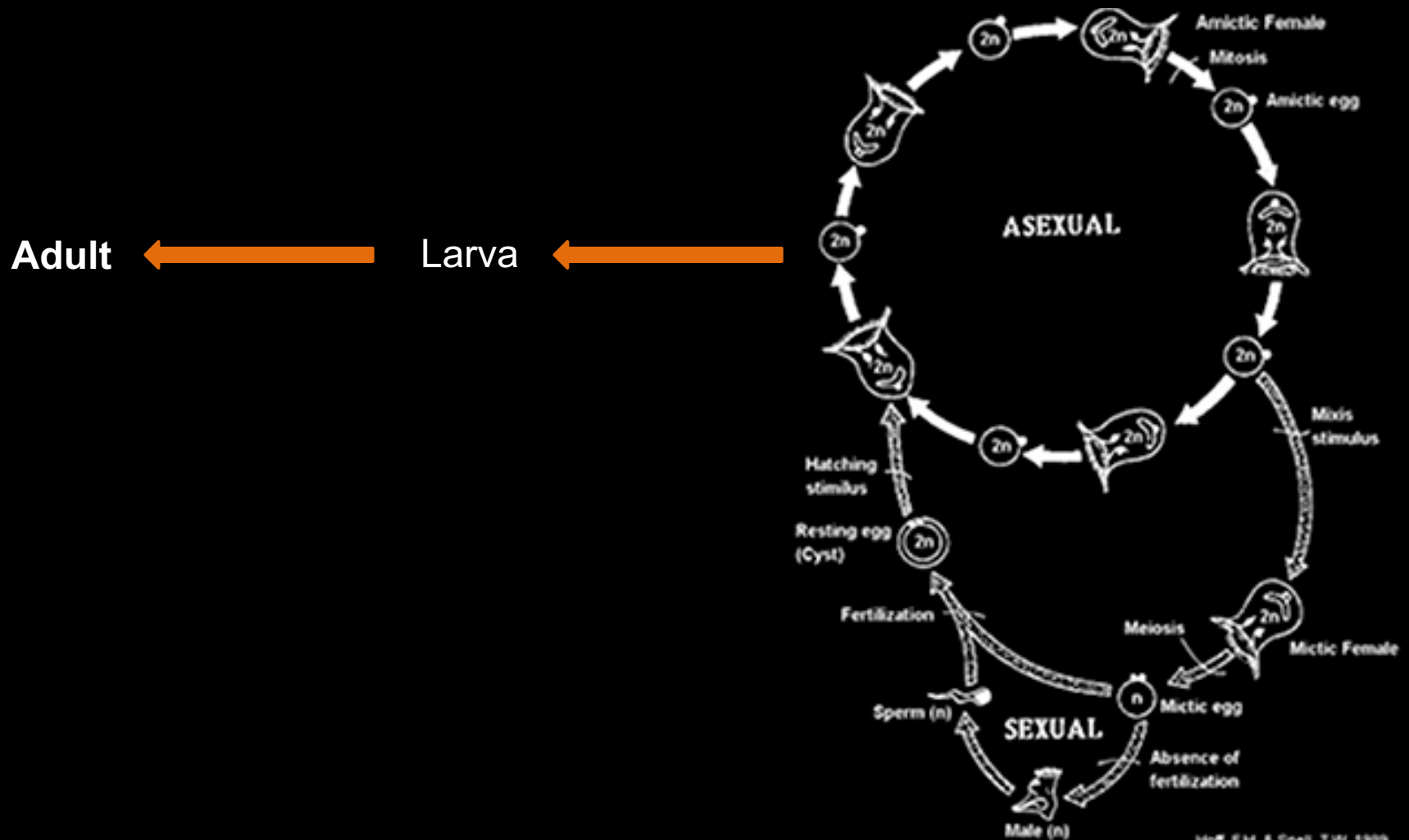
Left: *Stephanoceros fimbriatus*



Right: *Stephanoceros millsii*

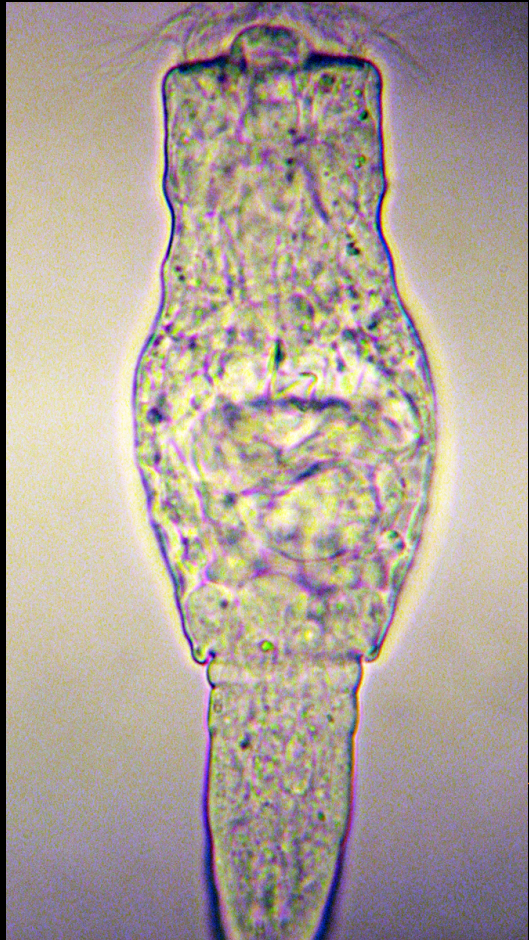
Life History of Gnesiotrochans

Many species of Gnesiotrocha have **Indirect Development** (egg to larva to adult)



Life History of Gnesiotrochans

Larva is morphologically distinct from the adult



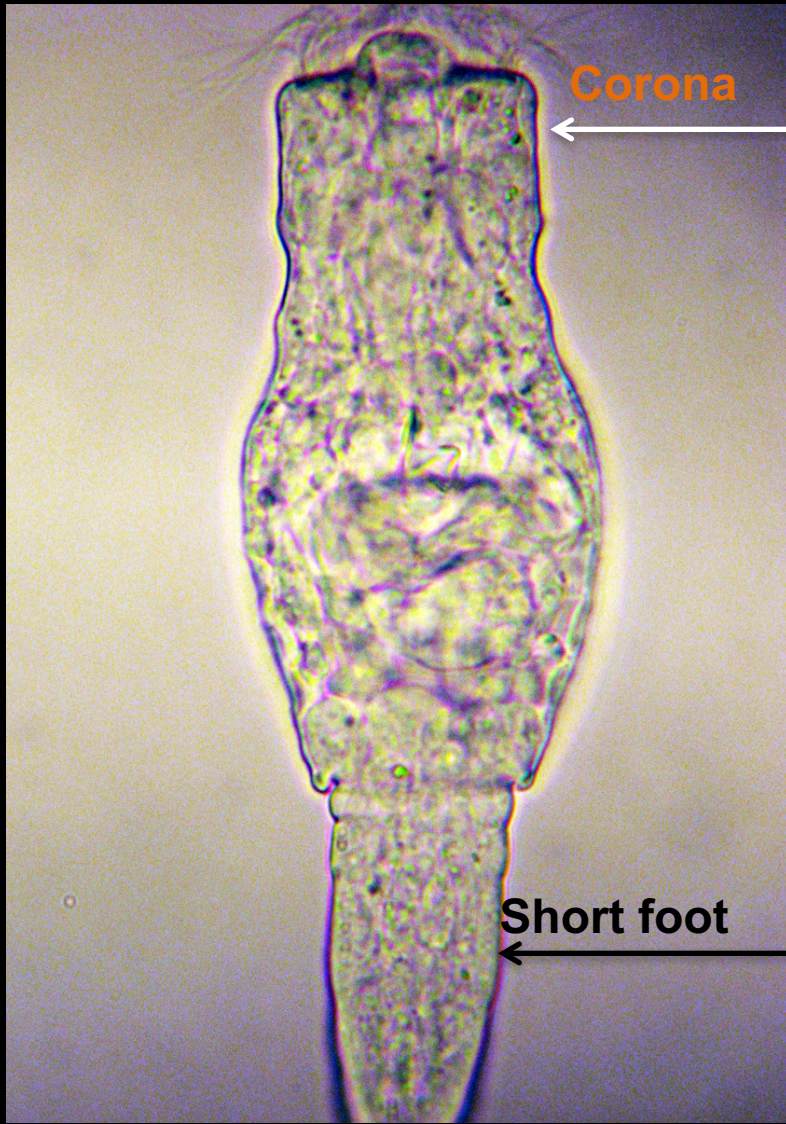
← Ciliated corona with eyespots
(Eyespots not present in many adults)

Trunk with developing mastax and gut

← Foot with adhesive glands

Life History of Gnesiotrochans

Larva is morphologically and ecologically distinct from the adult



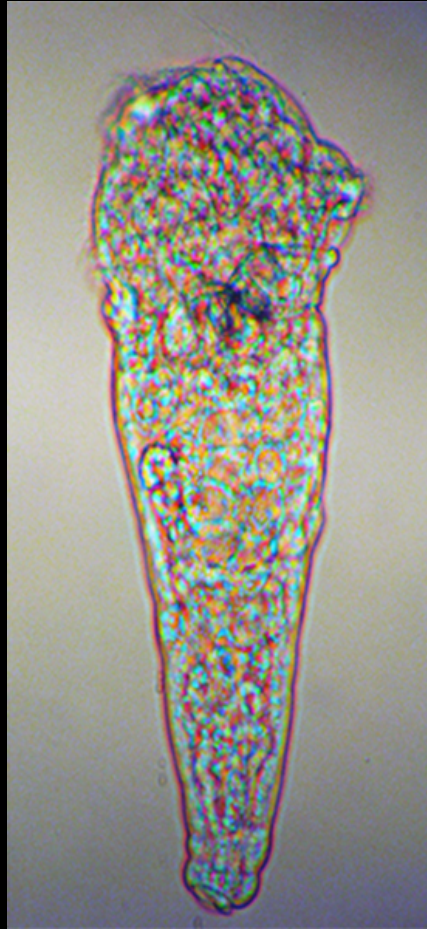
Infundibulum

Secreted Tube

Elongate foot



Larval ecology and function



- Larva is the planktonic stage in the lifecycle of sessile species
- Larval stage is temporary (few hours)
- Larva functions to disperse species across bodies of water (e.g., lakes; ponds)

Differences between species of Flosculariaceae and Collothecaceae

Flosculariaceae

Gradual metamorphosis



Larva

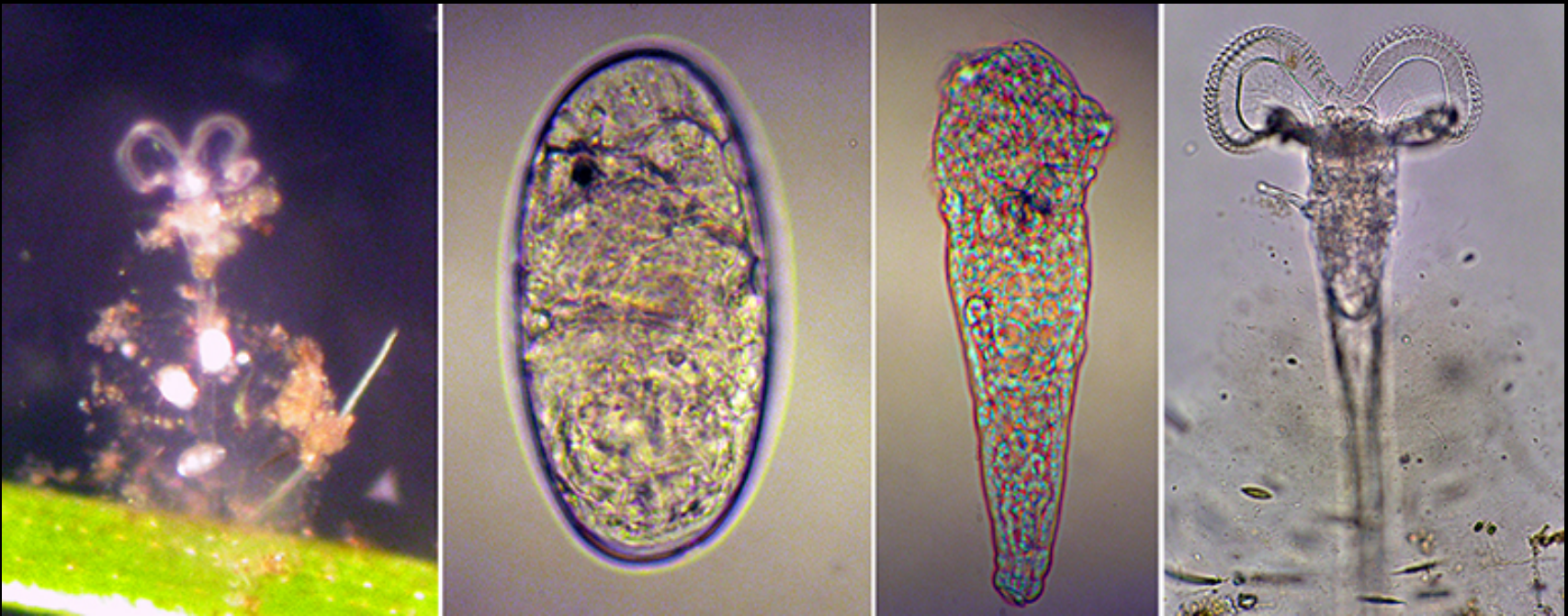
Collothecaceae

Drastic metamorphosis



Life History - Flosculariaceae

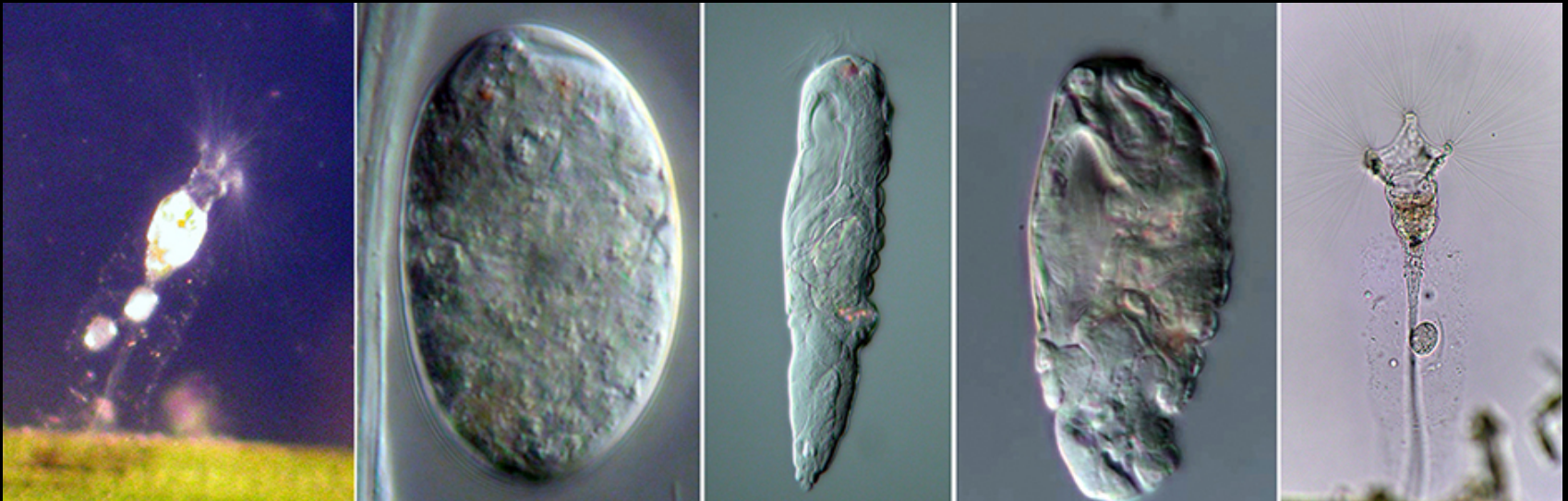
- Larvae undergo a gradual morphological transition to adulthood – gradual metamorphosis
- Marked by allometric growth of corona and elongation of body and foot



Gradual metamorphosis of *Floscularia melicerta* – from egg to larva to adult

Life History - Collothecaceae

- In the Collothecaceae, larva replaces its ciliated corona with an infundibulum, during a process called **drastic metamorphosis**
- Infundibulum develops precociously and cryptically inside the larval head
- Infundibulum emerges once larva has settled permanently on a substrate



Drastic metamorphosis of *Collotheca campanulata* – from egg to larva to adult

Drastic metamorphosis in *Stephanoceros fimbriatus*

1. Hatching and release of lecithotrophic larvae from the parent's gel tube

2. Search and settlement for appropriate substratum

3. Secretion of the gel tube and metamorphosis of the corona

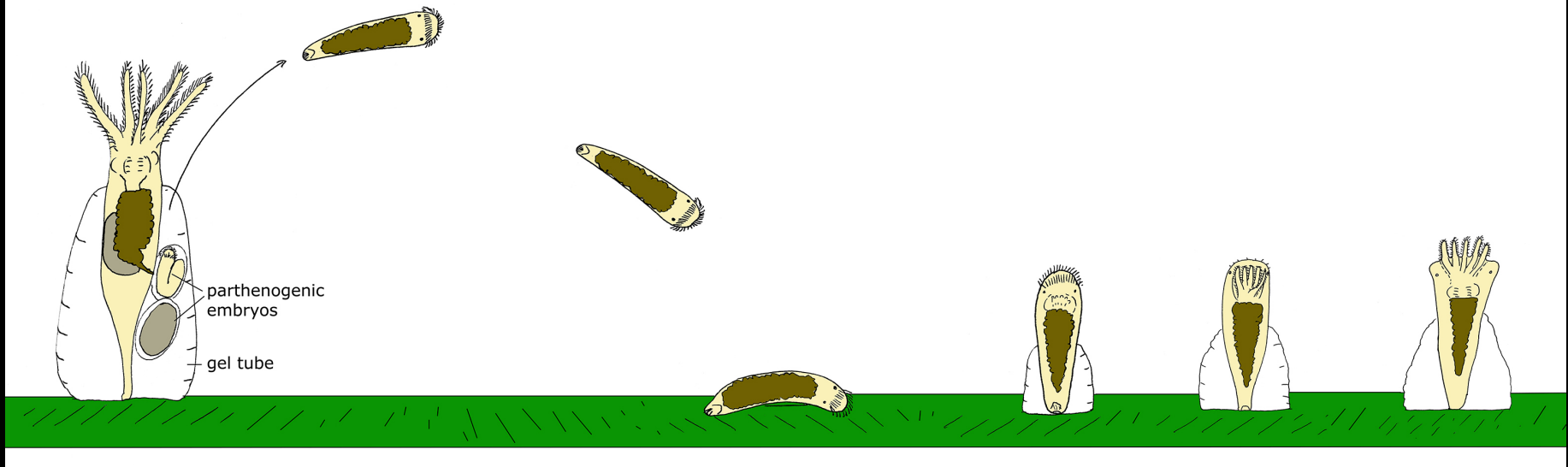


Illustration of the process of drastic metamorphosis in *Stephanoceros fimbriatus*.

- Egg develops within tube of mother, prior to larval emergence from egg
- Larva emerges from tube of mother and swims for a short time, looking for a suitable substrate
- Once a substrate is encountered, larva settles and undergoes metamorphosis, replacing larval corona with "secondary" head, the infundibulum

"It became a contest between rotifers and scientist, and generally the rotifers seemed to triumph."
– Shackleton (1909)

