

Why do all Brachiopods look the same?

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The Dorset Geologists Association
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What do you
mean "Extinct" !

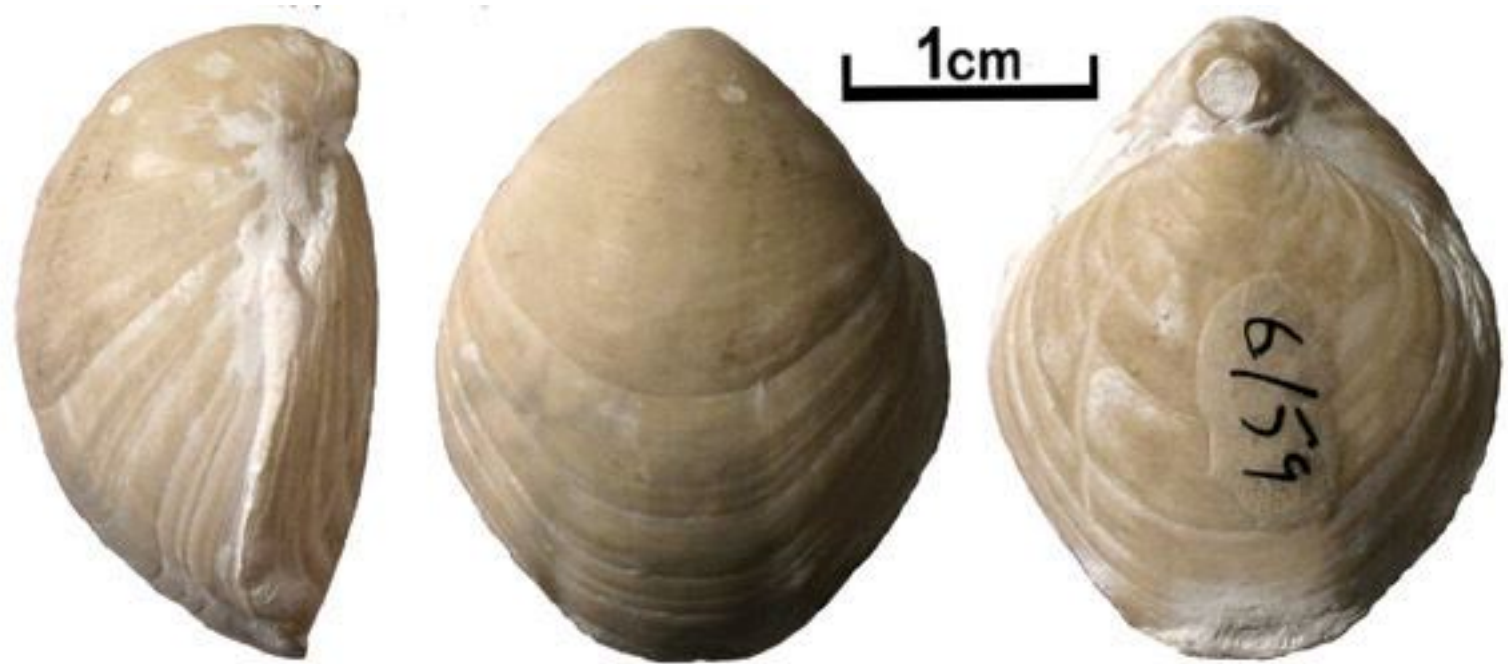


They even get washed up on the beach in some parts of the world!



Typical Terebratulid

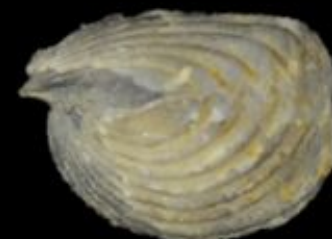
Two different valves
One with a hole in it for the pedicle
Longer than wide
Smooth
Often a fold in the line of join (the commissure)



Typical Rhynconellid

- 2 Different valves
- One with a hole in for pedicle
- Wider than Long
- Ribbed
- Zig-zag commissure
- Large deflection in commissure

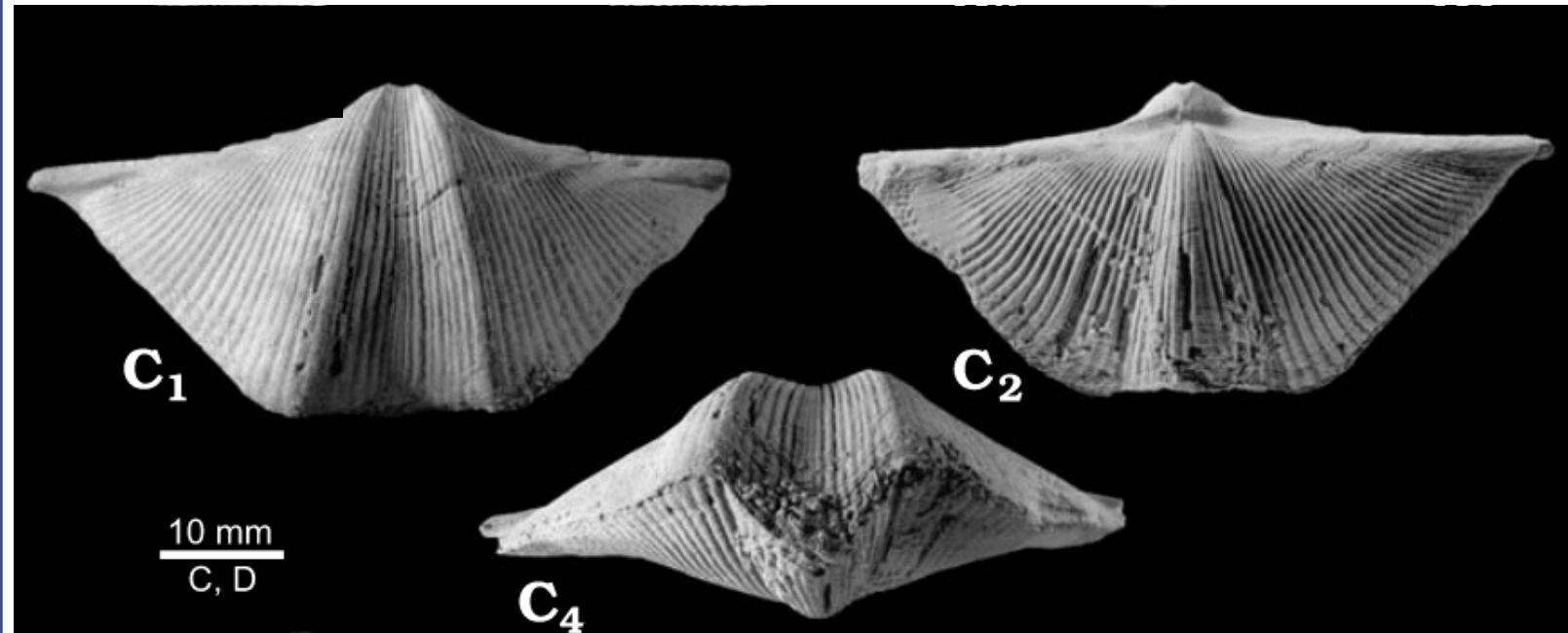
<http://geolorraine.free.fr/fossiles/fossiles/page.php?idp=56>



"Rhynconella" edwardsi Chapuis & Dewalque – Bajocien inf

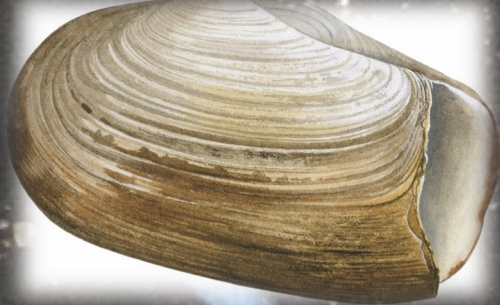
Typical Spiriferid

- 2 Different valves
- One with a hole in for pedicle
- Long, straight hinge
- Wider than Long
- Ribbed
- Zig-zag commissure
- Large deflection in commissure



Cyrtospirifer rudkinensis Ljaschenko, 1959,
Semiluki Horizon, Central Devonian





But at least brachiopods are not boring, like these bivalves



Some weirdos

Lingula sp (Sowerby 1816)

Large muscular pedicle used to anchor shell in mud
Chitinous (not calcite) shell
Little or no lateral gape
Anterior gape divided into 2 inhalant and a central exhalant aperture delineated by setae
Dorsal and ventral valves almost identical
A homologue of razor shells (*Ensis sp*)
Very long fossil record – Darwin termed a “Living Fossil” but form seems to have evolved on several occasions in the past



A

U-shaped reburrowing by Glottidia (Thayer and Steele-Petrovic 1975).

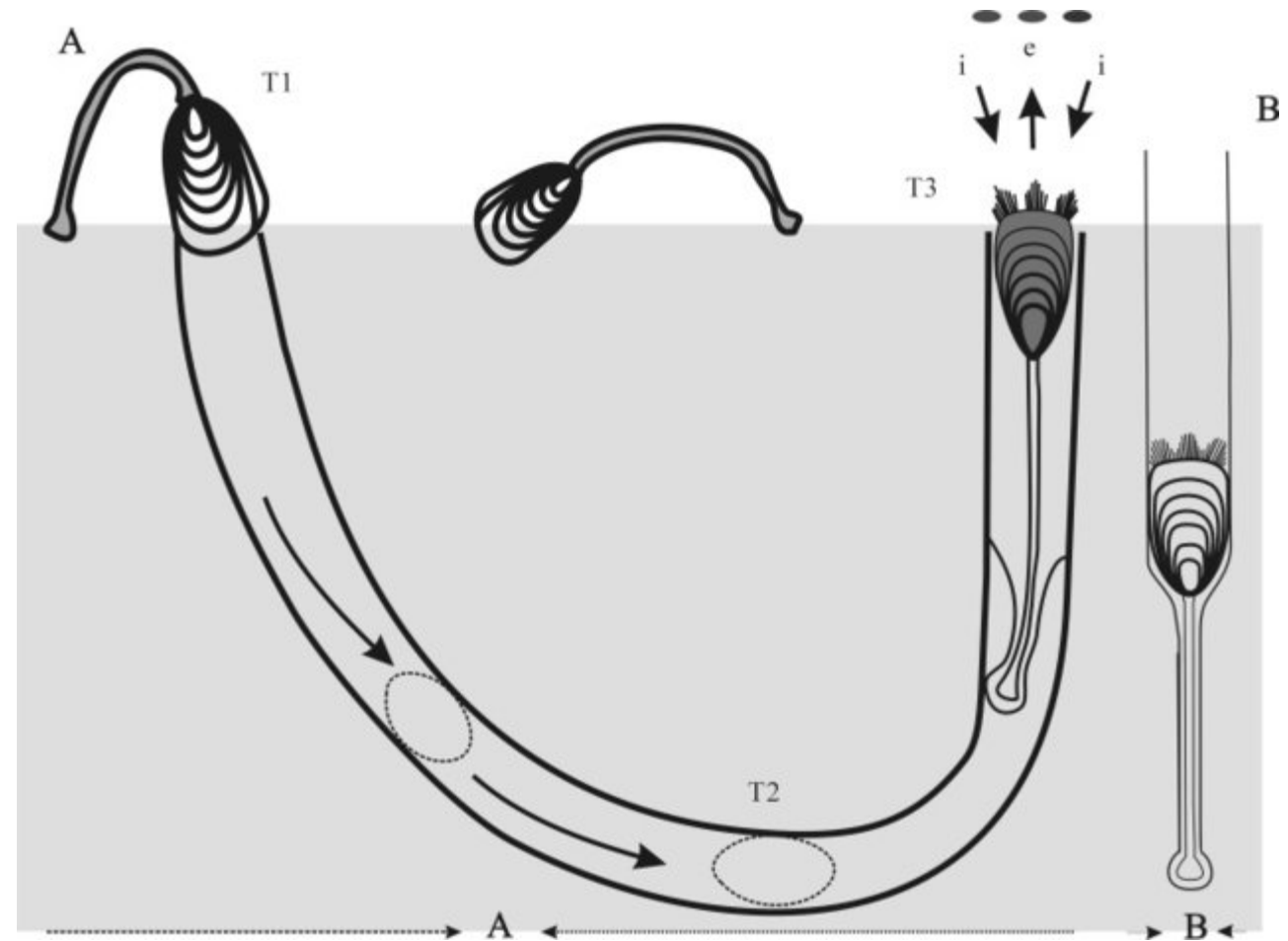
The brachiopod

- props itself up with its pedicle, orienting its shell downwards (T1).
- burrows using a scissor-like motion of the valves.
- typically burrows deeply enough (T2) to return to the surface in a normal life position (T3) with three apertures

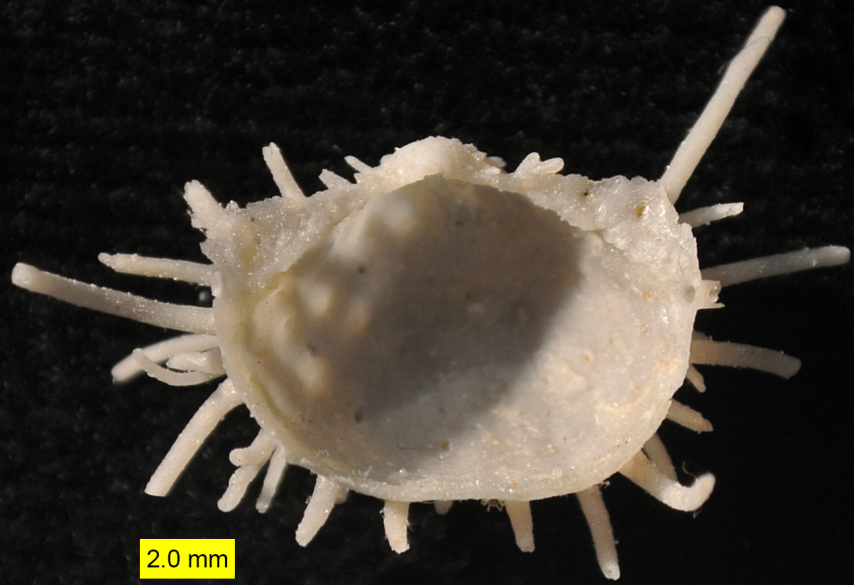
(i = inhalant pseudosiphon;
e = exhalant pseudosiphon projecting above the sediment–water interface.

B

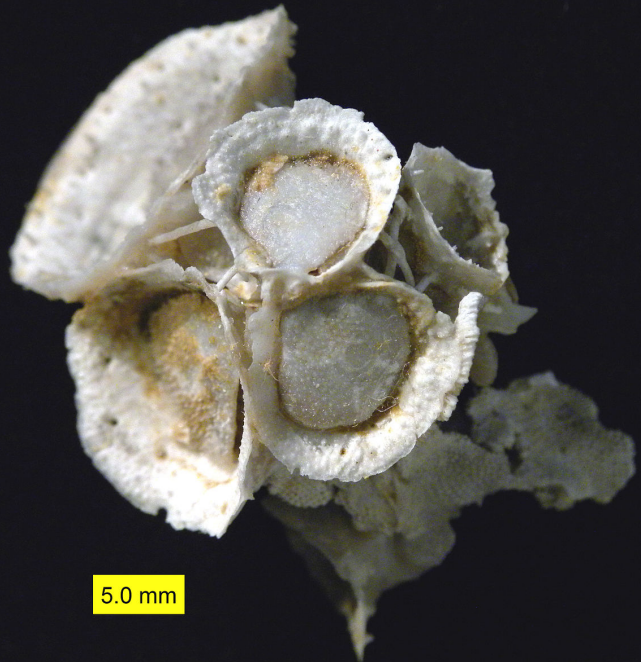
Retraction of a lingulid brachiopod into its burrow.



https://www.researchgate.net/publication/200558125_Morpho-anatomical_differences_of_the_Early_Cambrian_Chengjiang_and_Recent_lingulids_and_their_implications/figures?lo=1



2.0 mm



5.0 mm

Terebrirostra lyra (Sowerby 1816)

Elongated rostrum housing the pedicle, possibly an adaptation to being buried in sand or (more likely) in a sponge

Image

<https://www.geoforum.fr/topic/33984-brachiopodes-du-cap-de-la-h%C3%A8ve-et-environs/>



Pygope
The two edges of the shell grow around to meet at the front

Image
Treatise on Invertebrate palaeontology vol H

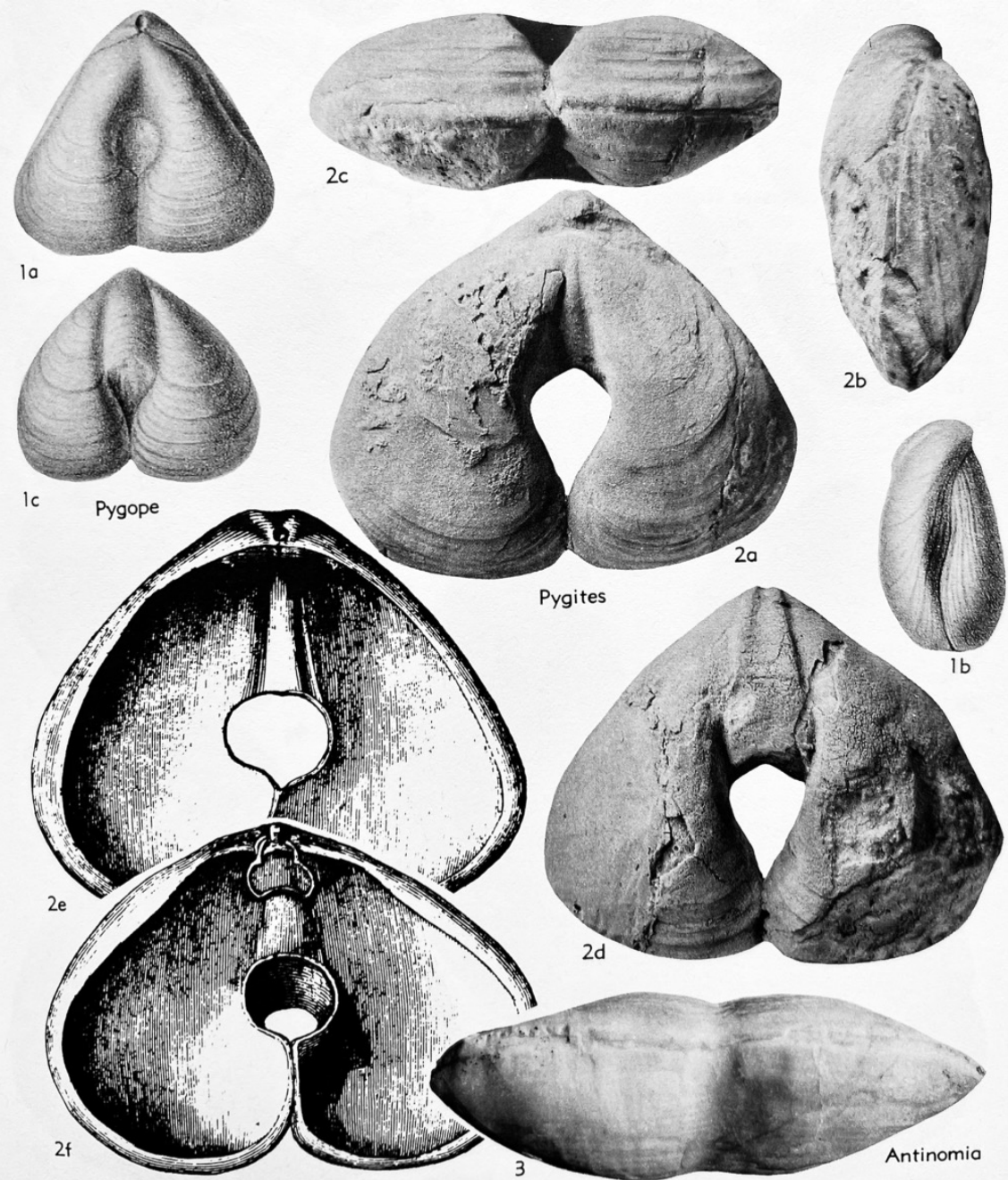


FIG. 678. Pygopidae (p. H802-H803).

The feeding mechanism or “Lophophore”

Feeding Lophophore

Phoronid 'worm'

Open to the water
on all sides

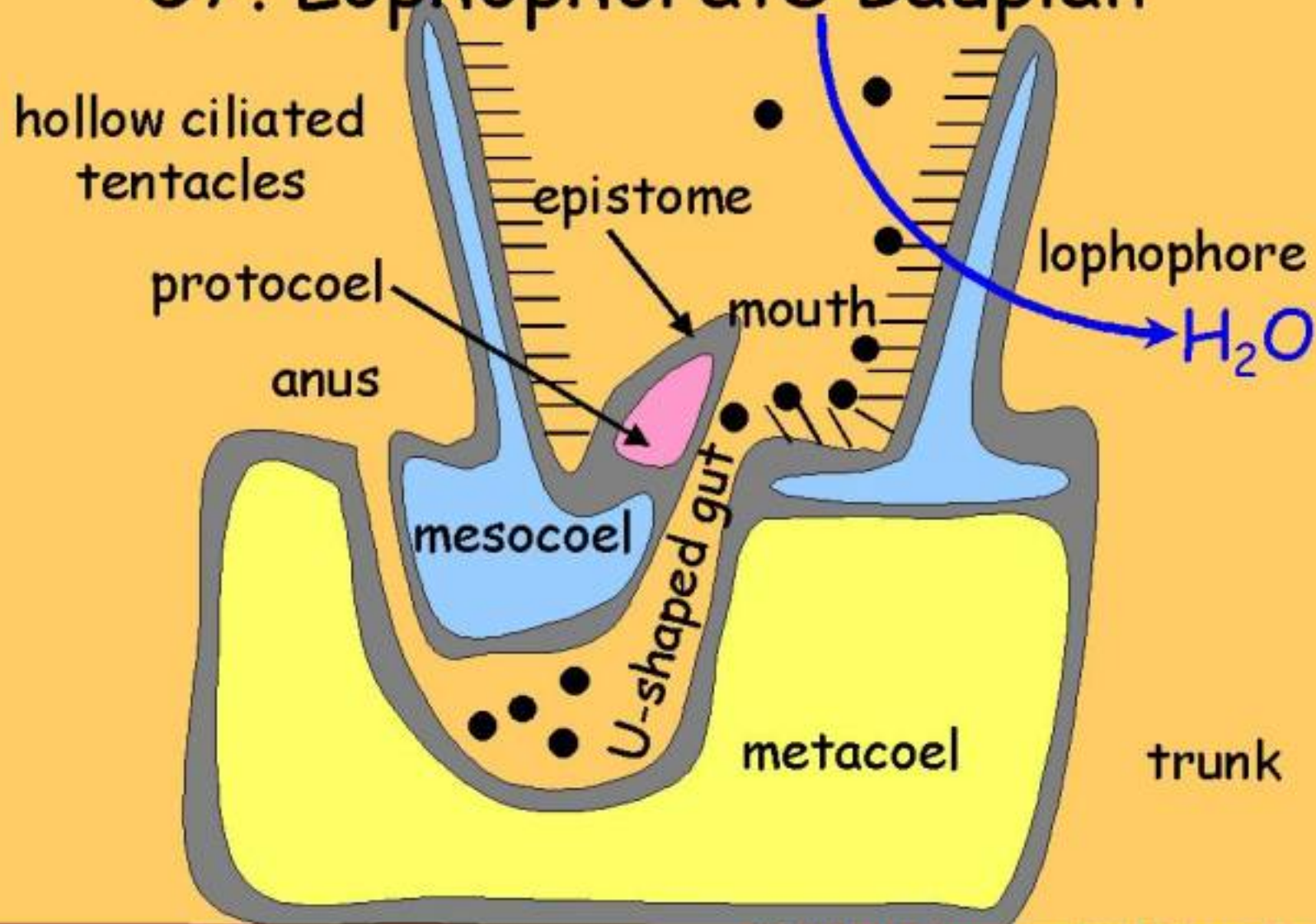


<http://www.starfish.ch/c-invertebrates/wuermer.html>

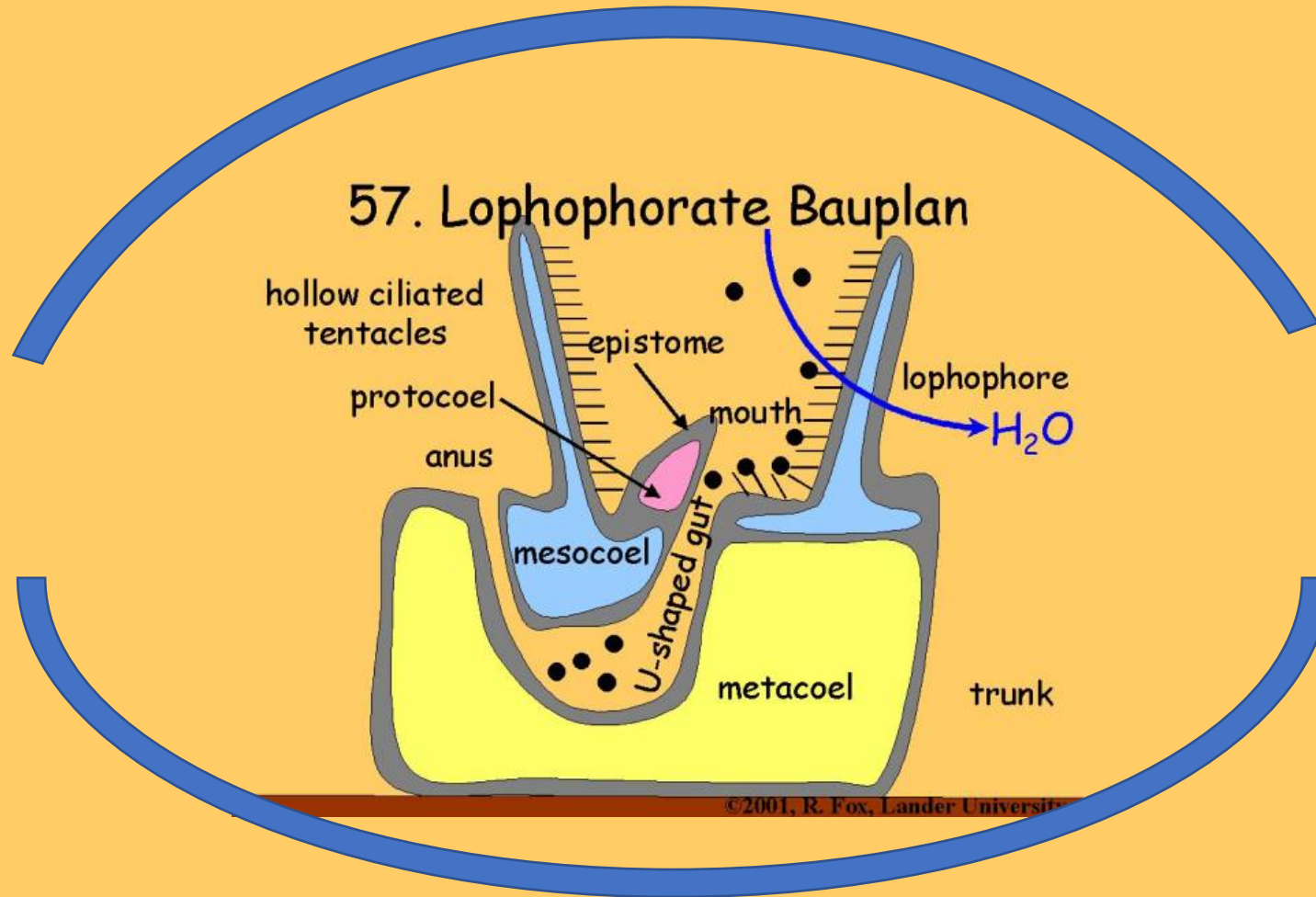


<https://theoceanexplained.wordpress.com/tag/lophophore/>

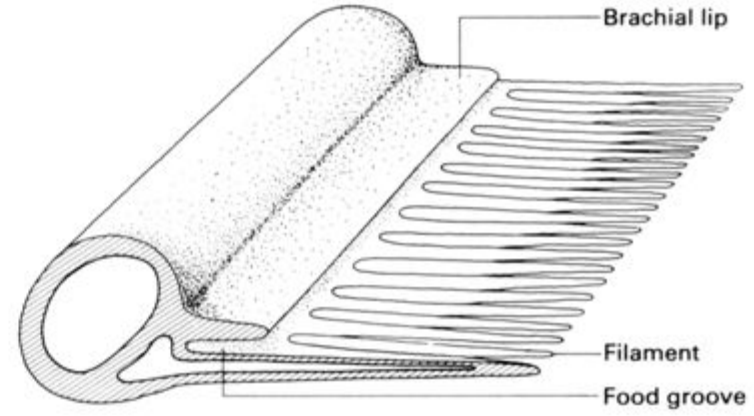
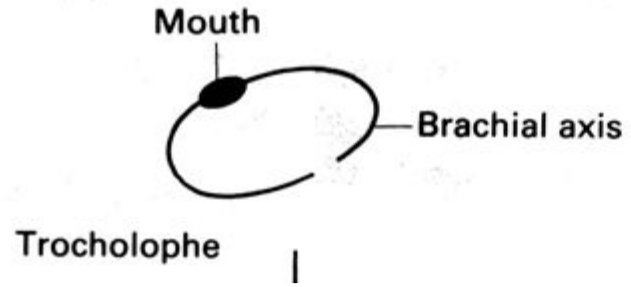
57. Lophophorate Bauplan



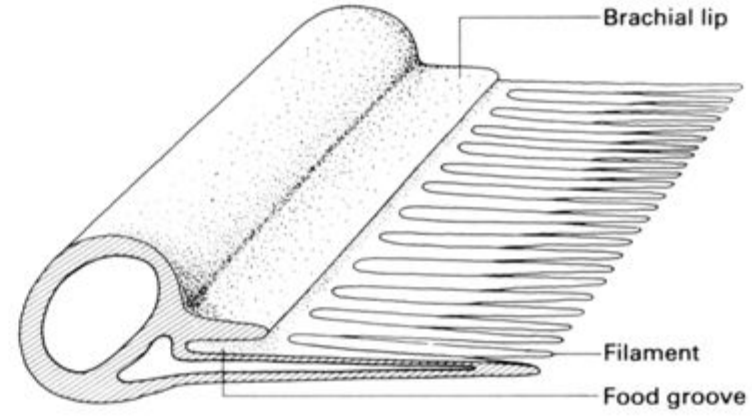
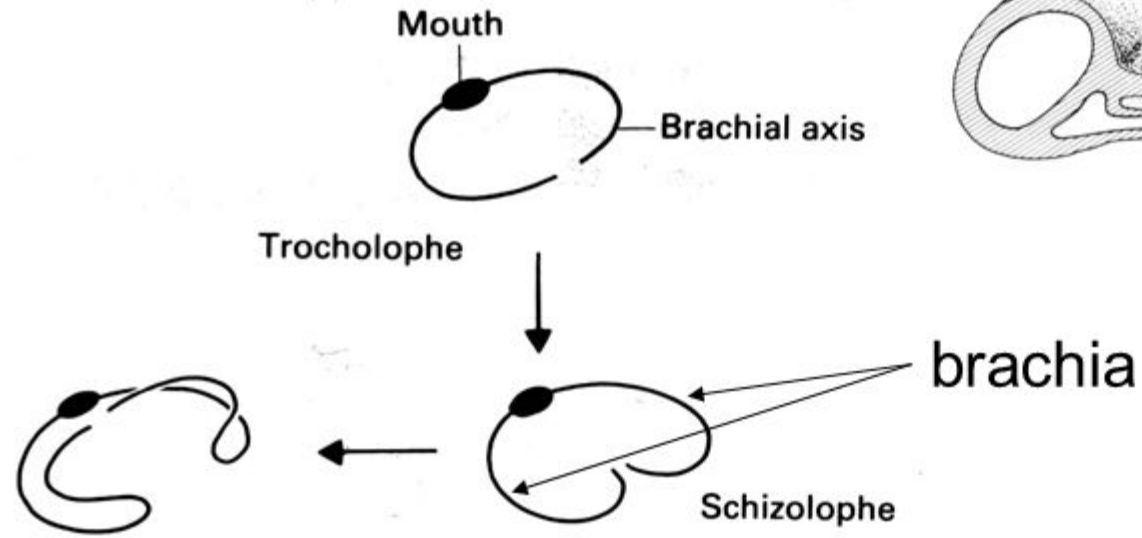
Lophophorate inside a shell = A brachiopod



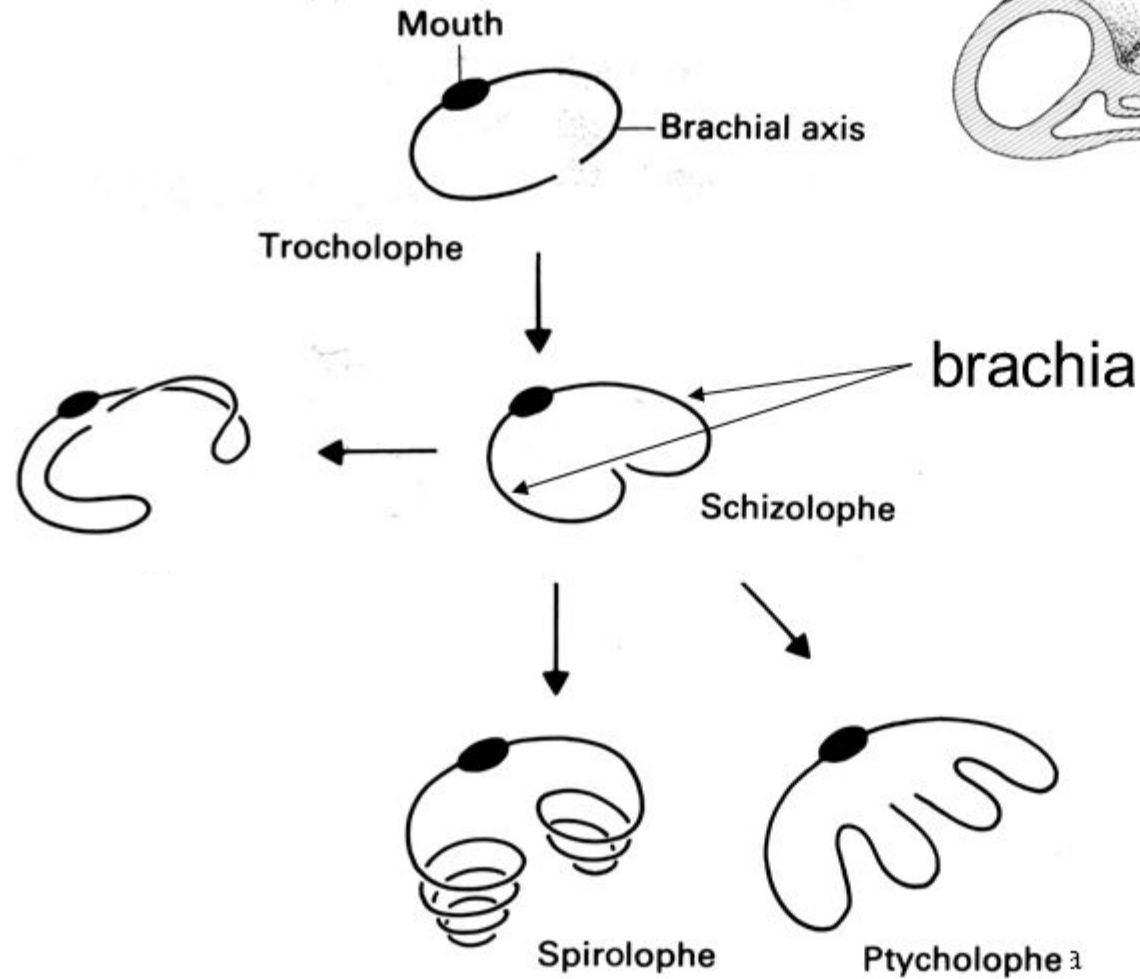
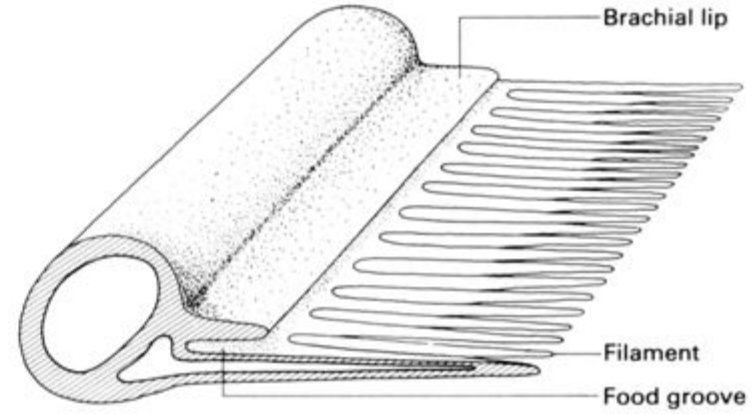
Lophophore types



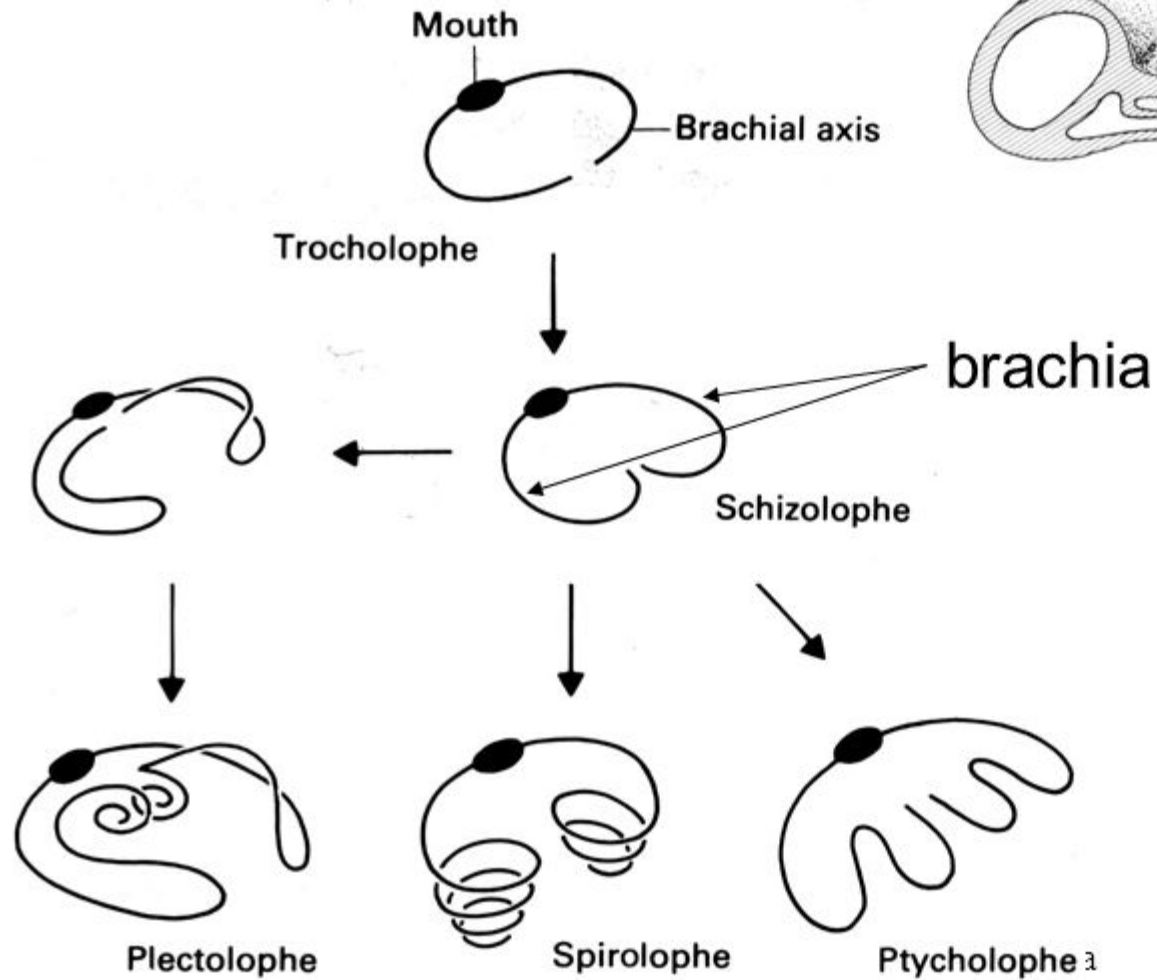
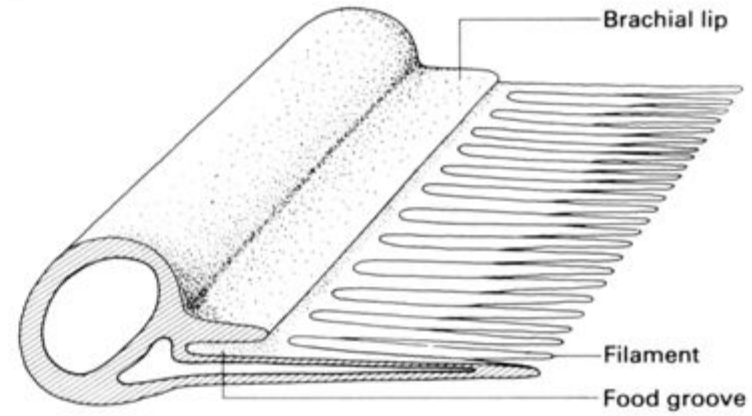
Lophophore types



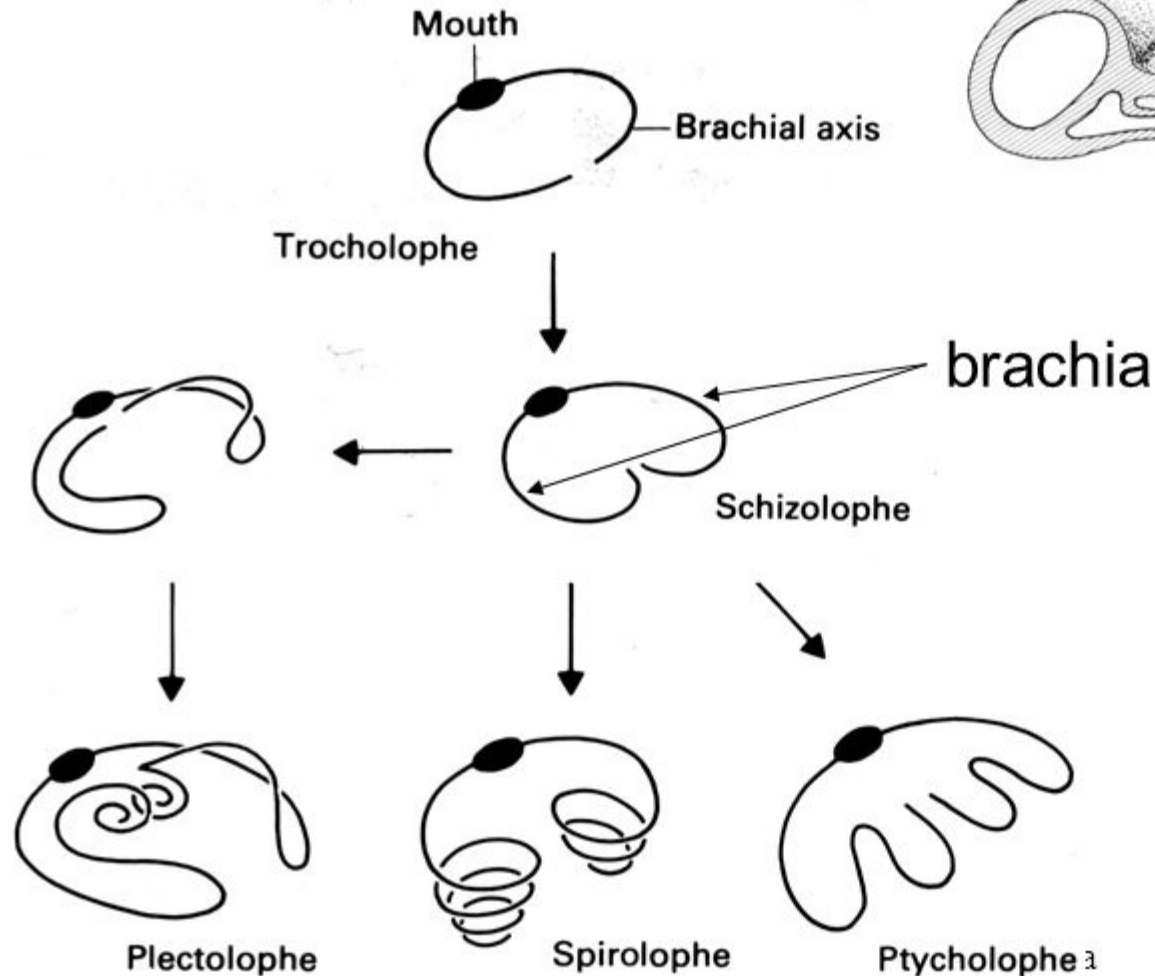
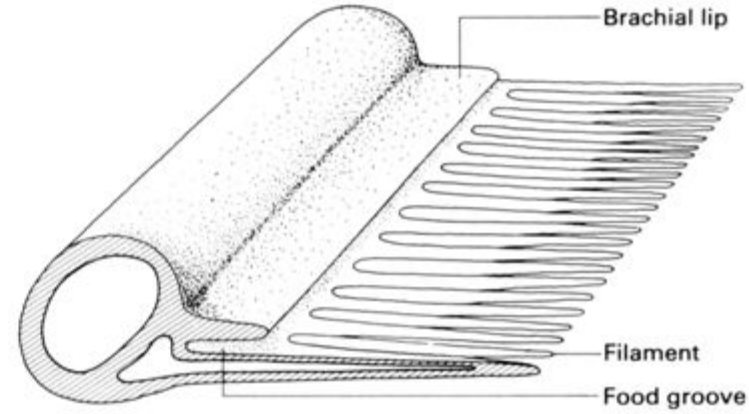
Lophophore types



Lophophore types



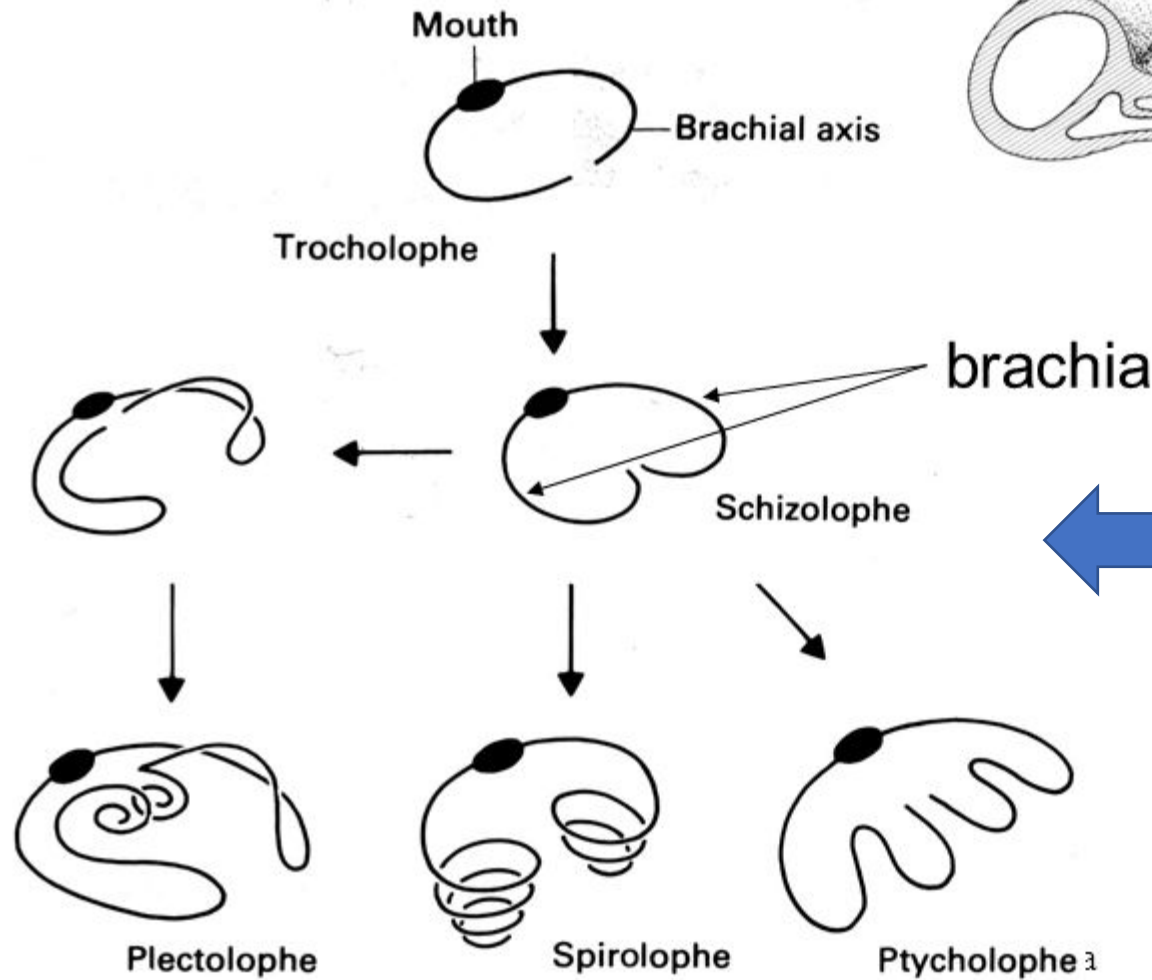
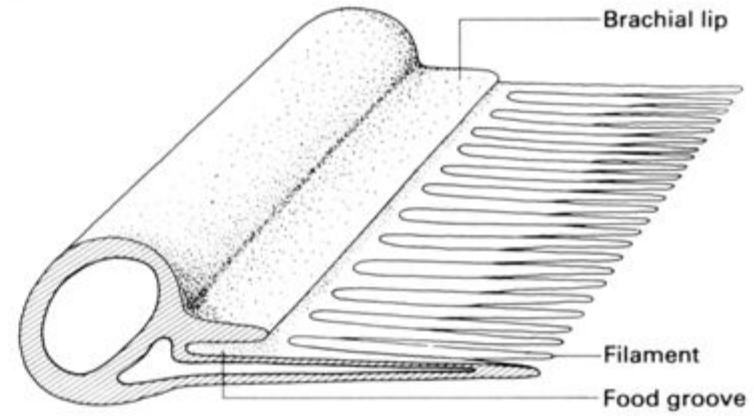
Lophophore types



Dear God!
This is complicated

Pipe Cleaner Time!

Lophophore types

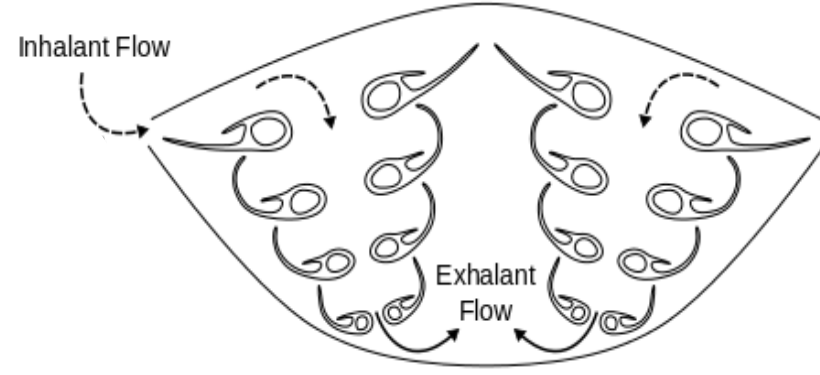


Make a model of these using the pipe cleaners



Parallel-axis spirolophes

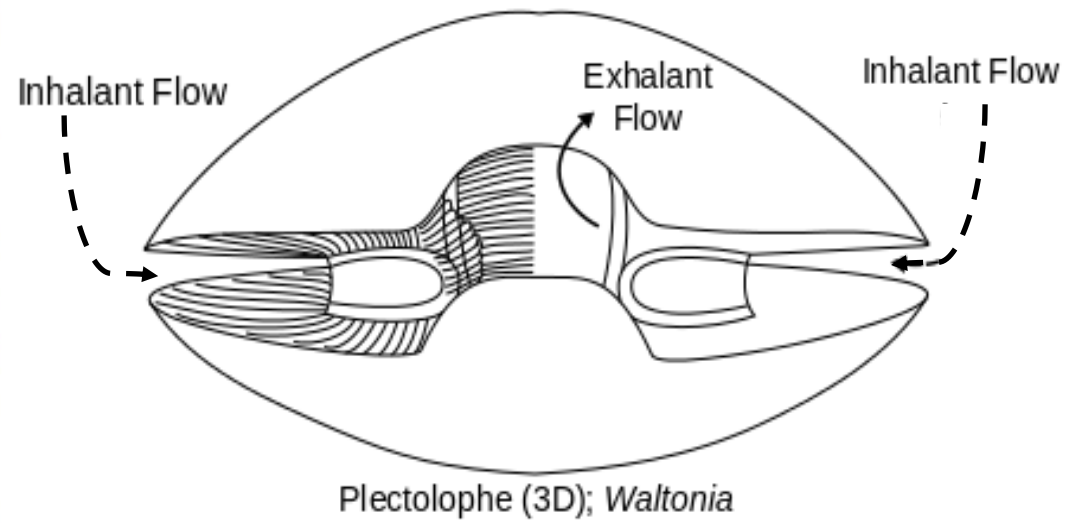
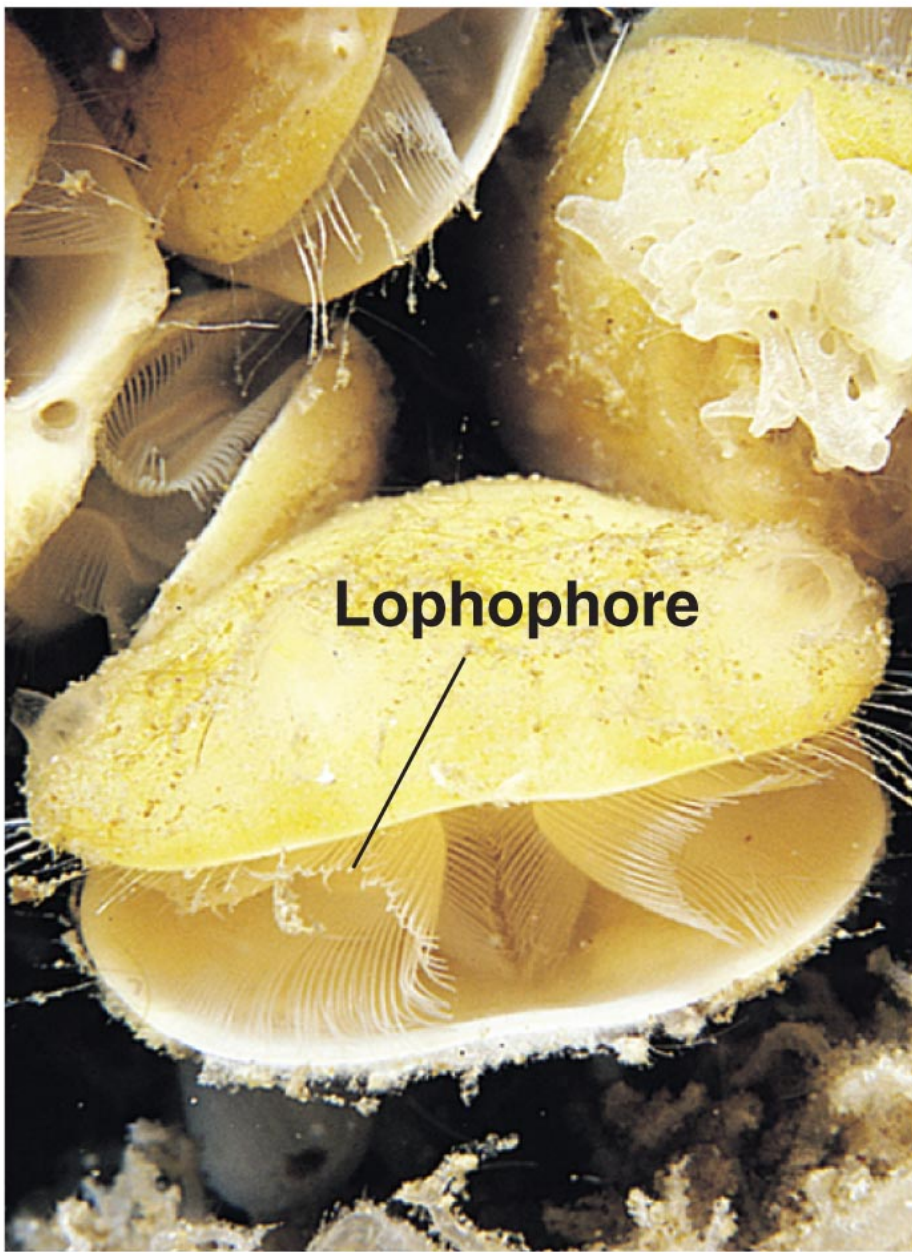
Typical of rhynchonellids



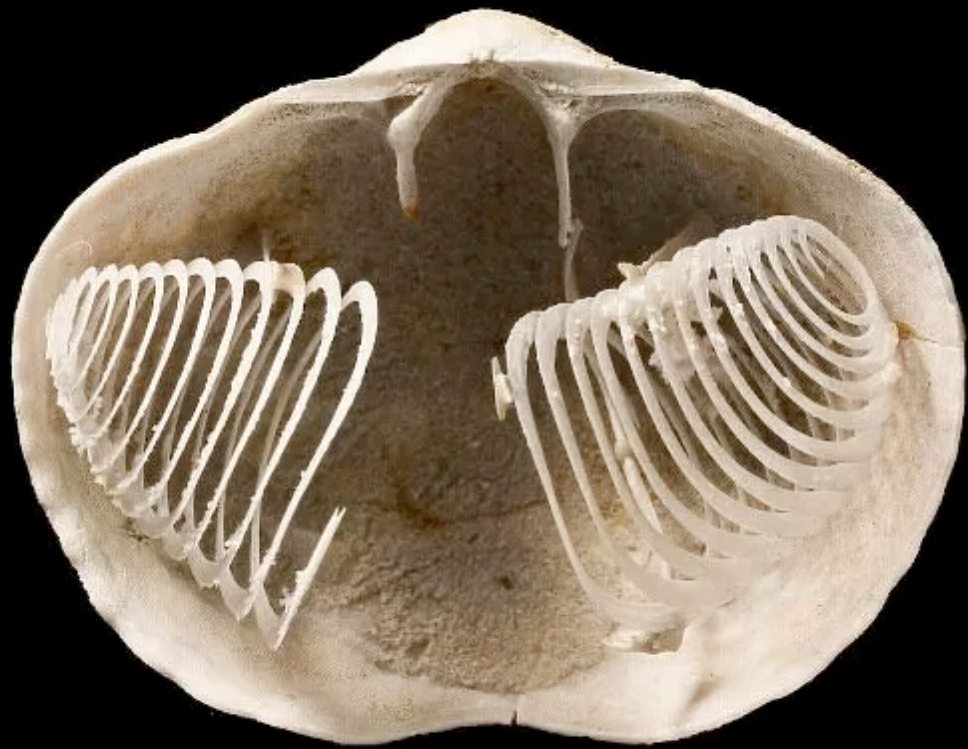
Filaments touching edge of top shell

Filaments touching edge of bottom shell

Filaments touching previous whirl

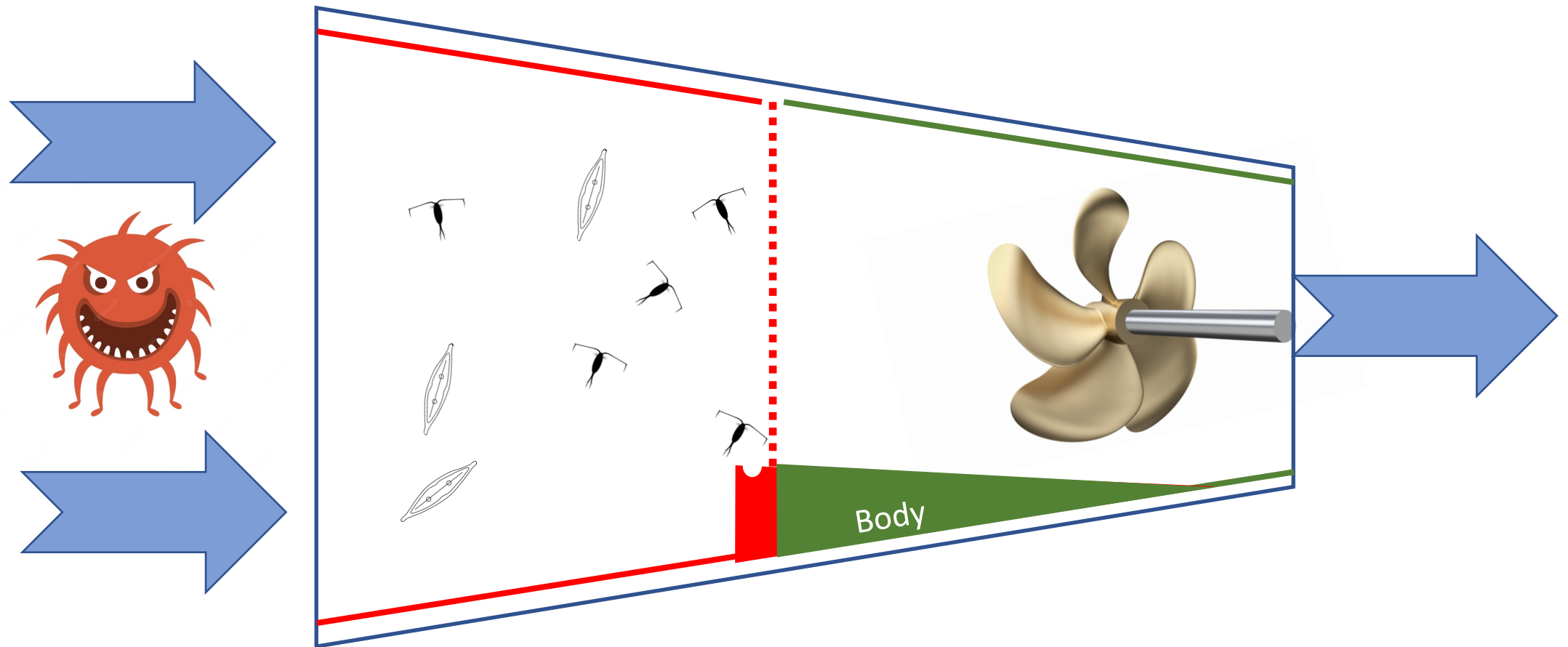


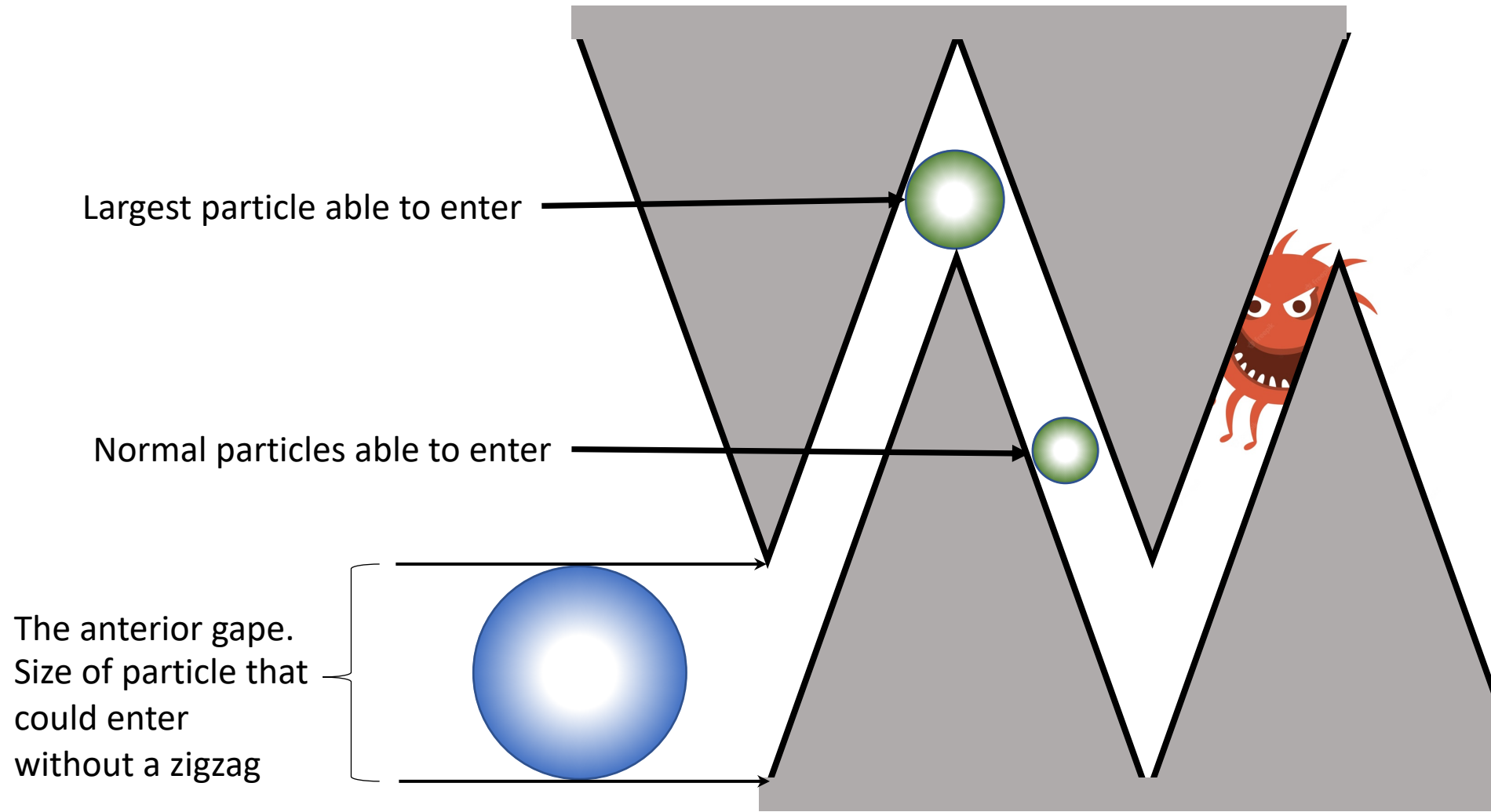
(b) Brachiopods



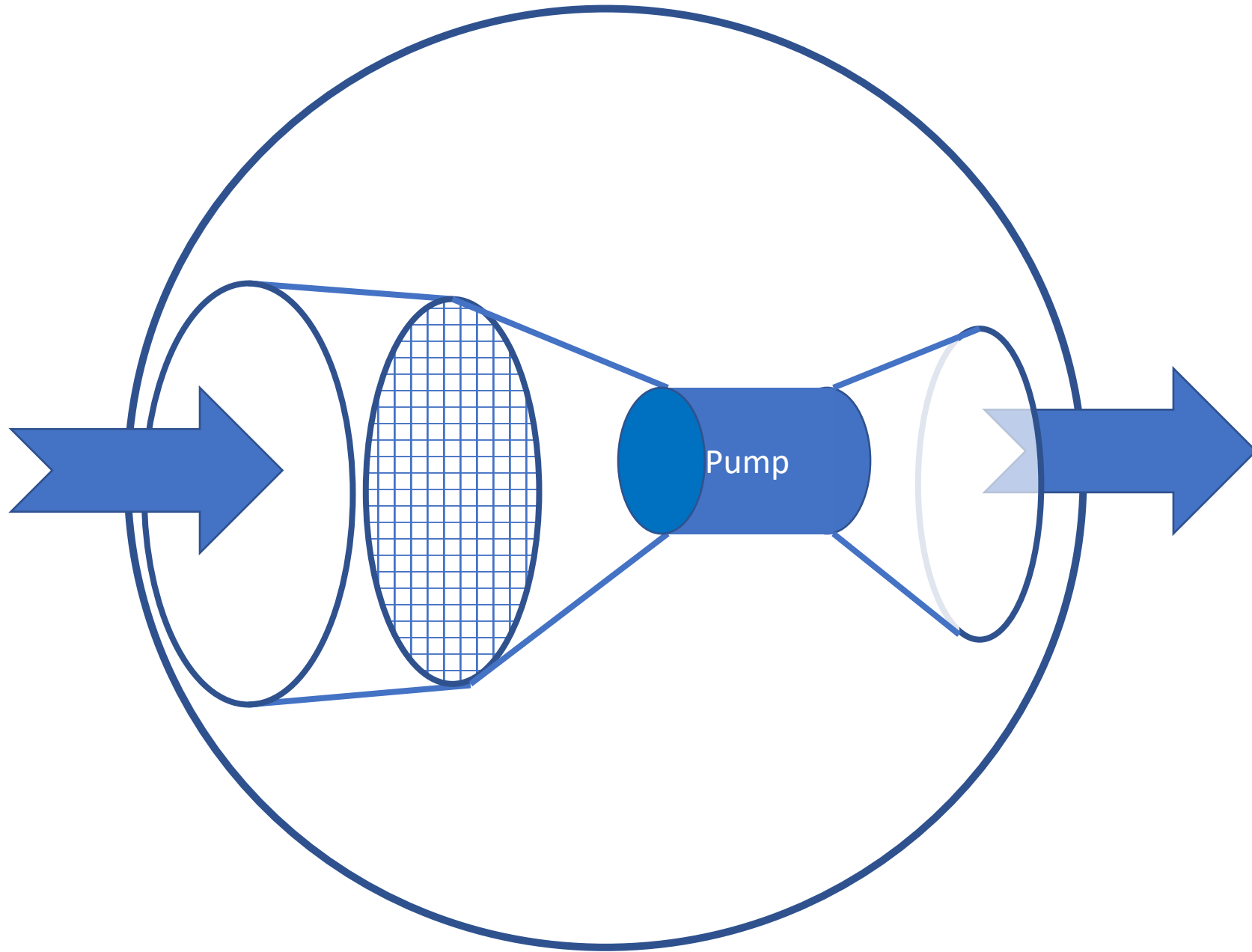
Zig zag Commissures

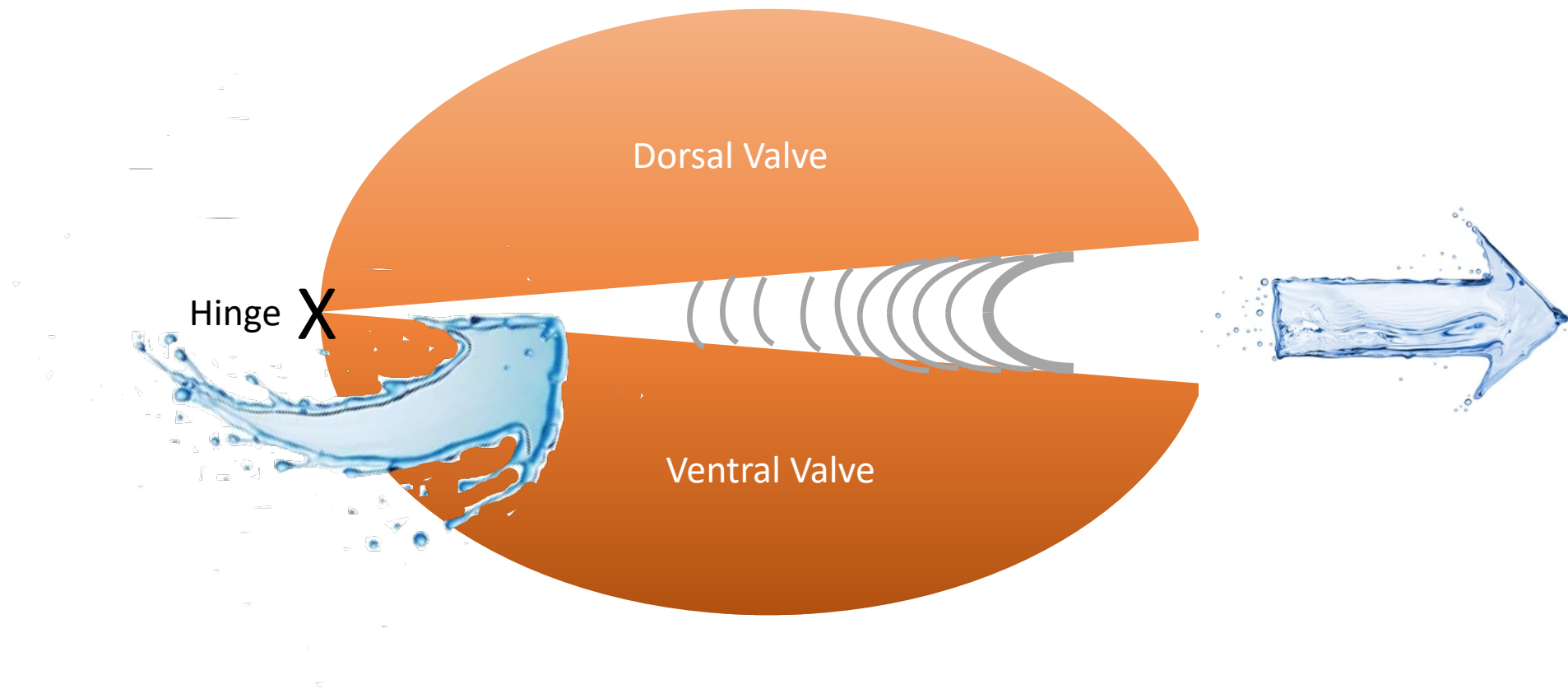
Exposure of vulnerable tissue to nasties outside





The
Brachiopod
as machine





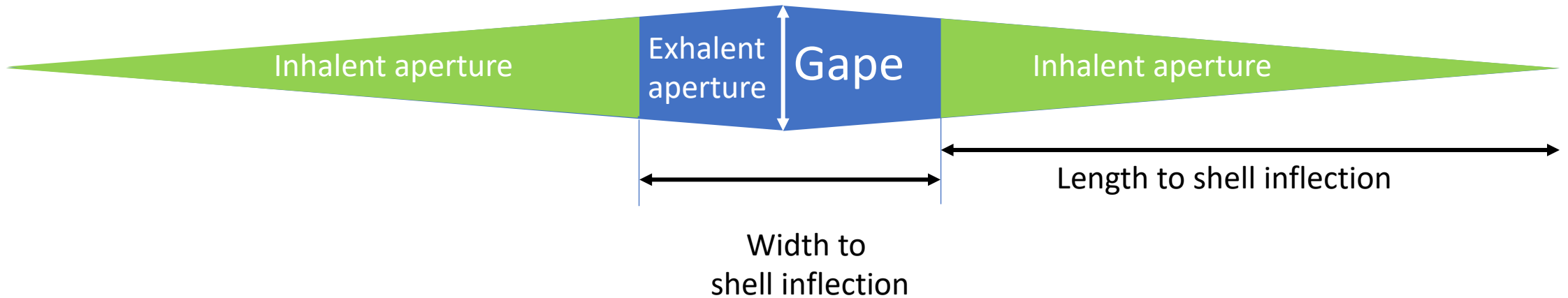
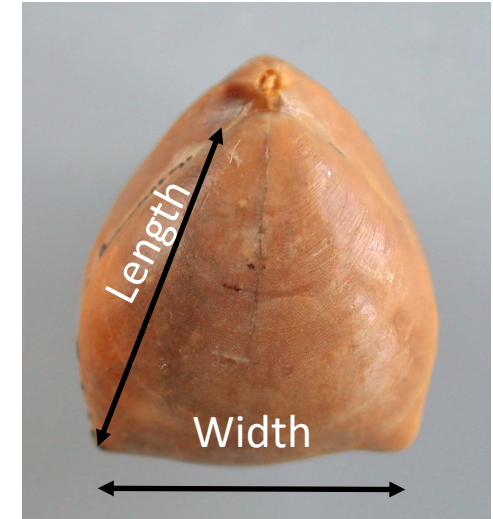
For small angles of gape

Area of exhalent current = Gape x Width

Areas of inhalent current = $2 \times \frac{1}{2} \text{Gape} \times \text{Length}$

Ratio of areas = length x width at point of shell inflection

Ratio of current speeds = width x length



After measuring 50 species, the ratio is 1 : 1.4

I conclude that this is the maximum head of pressure that the lophophore pump can generate