

***Peltogaster* : a very strange cirripedia**

J.M. Cavanilhac - France

I agree, the title itself is strange! Maybe we must already define what Cirripediae are: a class of exclusively marine species belonging to the subdivision of crustaceans. The best known are barnacles and *Pollicipes pollicipes*: gooseneck barnacle

Their life cycle is complex with motile larval forms that attach and transform into adults with a calcified structure.

Barnacles, for example, are very present in all harbours. The body of the adult is formed of limestone plates and attaches strongly to harbour structures, boat hulls and even whales. They are unloved by divers because they tear their wetsuits ...and their skin too.

Here are the stages of barnacle evolution: from left to right: nauplius stage, cypris stage and adult on the right: (the cypris stage does not feed).



The images below are taken from a video of an isolated specimen which shows the mobile cirri used to collect the plankton particles. It looks like a small hand going in and out of the limestone shell:

Right image of a juvenile before settlement.



A study about juvenile stages :

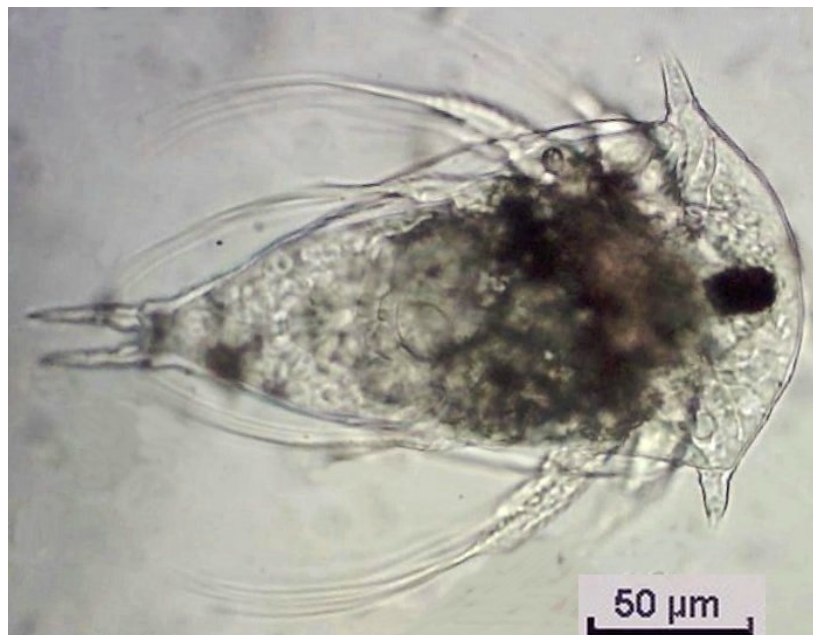
https://www.researchgate.net/publication/233448861_When_similar_beginnings_lead_to_different_ends_Constraints_and_diversity_in_cirripede_larval_development

The barnacle is **not** the subject of this article, but this preliminary about barnacles was useful to understand how strange *Peltogaster* is.

The first images I obtained had been sleeping for years in my "UMO files" (Unidentified Microscopic Objects!) and it was only recently that I was able to identify these specimens, in particular thanks to the very interesting work of *Otto Larink and Wilfried Westheide: Coastal Plankton: Photo guide for European seas*.

The classification gives: Cirripedia (Subclass) -> Rhizocephala (Infraclass: including about fifteen families -> *Peltogaster* (family).

Here is an image of the nauplius stage, which like other cirripedes goes through several phases, the images can relate to several species, identification being always difficult at this stage of development: We notice the eye on the right and the furca on the left end as well as the 2 characteristic frontal horns: it is a top view, the appendages are below the body.



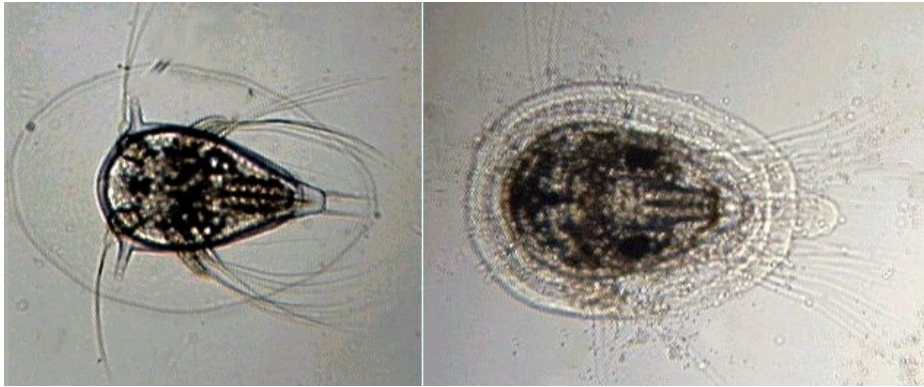
The WoRMS database lists at least 26 different species of the genus *Peltogaster*, ignoring old names (*Pestogasterella*, etc.), which have been grouped into species already known. It is possible that there are fewer species in reality: in depending on the places and times of observation, the name of the same species may have had synonyms.

<https://www.marinespecies.org/aphia.php?p=taxdetails&id=134777>

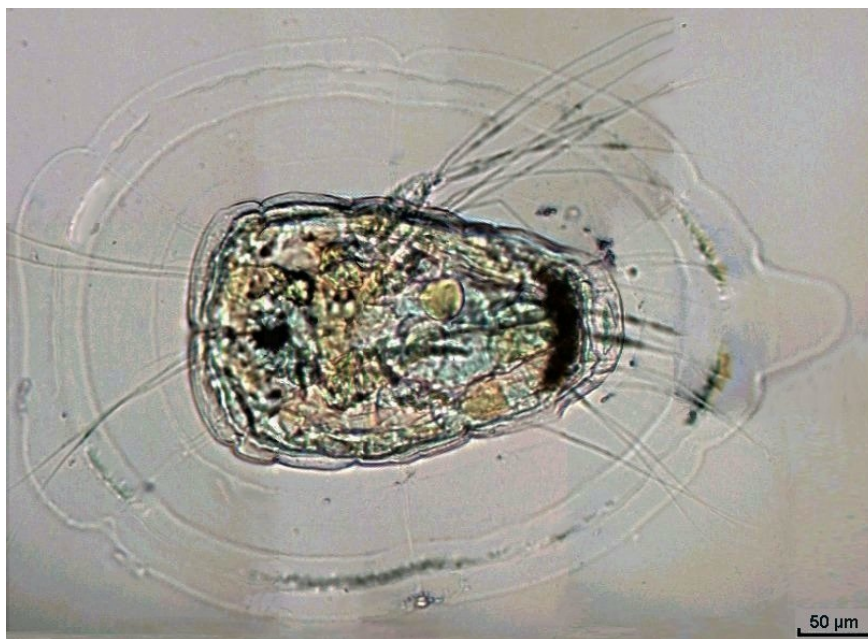
For the record and for those who have learned ancient Greek, *pelta* means "little shield" and *gaster*, "stomach". We will see why later in adult form ...

The next phase, which would correspond to the cypris in the barnacle, is particularly original since the body begins, in *Peltogaster* at least, to surround itself with a toric-shaped collar/float that we see here in top view: (not all species have a float: only *Peltogasterae* and *Lernaeodiscidae*).

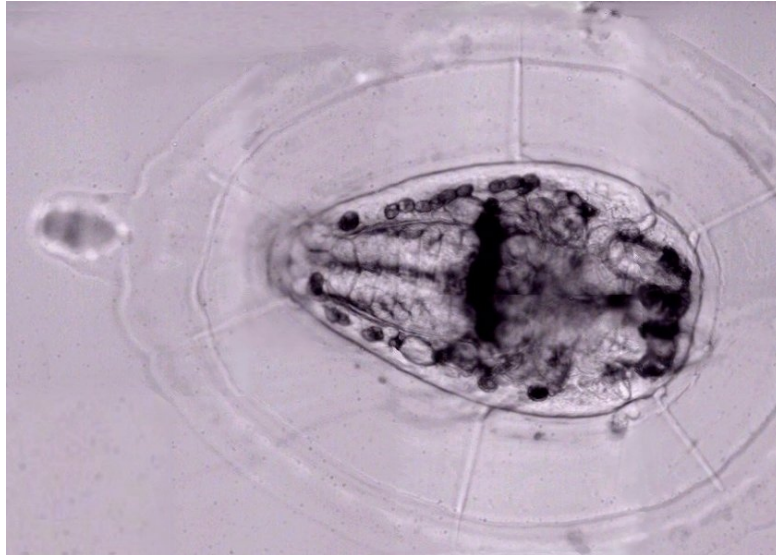
The image on the right is perhaps that of another species (?): we see that the float is smaller in size compared to the body size.



Here is another stage of evolution (note: image taken by an analogue color camera of 380 by 260 pixels, was reconstructed – manually – from 8 partial images of a not very mobile individual). There is not much images of a living individual on the Net...



The image below shows a more advanced stage: the details of the body are taking shape: this image is even older (taken with a black and white camera of the time). The float seems reinforced by 6 spokes.



Here is a study that shows the float in side view on another species: *Peltogaster Carcini*, under the Scanning Electron Microscope:

https://www.researchgate.net/publication/225772075_The_unusual_floatation_collar_around_nauplii_of_certain_parasitic_barnacles_Crustacea_Cirripedia_Rhizocephala

And now, end of the suspense on the strangeness of this species:

Indeed *Peltogaster*, during its cypris phase, attaches itself to its host, often a decapod (Crab, Lobster, *Pagurus*, etc.). The cypris has sensory organs that allow it to find favorable ground for its final metamorphosis.

In its passage to the adult stage, it then loses its appendages and takes the appearance of a bag (in Latin: sacculum) fixed on the abdomen of the hosts: hence the common name which is: "sacculina".

It then sends inside their body a network of pseudo roots (called=interna) which surround the organs of the host. (Rhizo = root in Greek). And *Peltogaster* take control of it by diverting its vital functions and its nervous system to its sole interest.

The host lives only to feed the parasite. A common name in a colorful way is : "zombie crab"! We no longer distinguish in *Peltogaster* only this kind of bag (=externa) containing its reproductive organs which is outside.

It does not seem that this cohabitation leads to the death of the host. The parasite lives about 2 years.

It should be noted that this form is female, the males not being directly parasitic but transported by the female.

Example on a crab: (see on Micscape this article by Richard Howey: At the top of the first image we can see the "bag" on the abdomen of the crab:

<http://www.microscopy-uk.org.uk/mag/artjan19/rh-aliens.html>

We therefore have to draw a parallel with the evolution of the barnacle the following cycle: Nauplius/cypris/adult ... (partial image on the right extracted from the Micscape link above shows the parasite on the abdomen of a crab). On Wikipedia we see another species: *Peltogasterella sulcata* on the abdomen of a *Pagurus* (Hermit crab).



A classification exemple (page 26) which shows the complexity of these families of parasites:

https://www.researchgate.net/publication/250016211_Cypris_Larvae_in_Polysaccus_Mediterraneus_and_Mycetomorpha_Vancouverensis_Their_Importance_in_Analyzing_the_Phylogeny_and_Sexual_Evolution_of_Parasitic_Barnacles_Crustacea_Cirripedia_Rhizocephala

It is always surprising to see how the larvae of marine species manage to turn into adults of completely different and surprising morphology...which does not make identification easy !

Failing to be at the top level of aesthetics, adult *Peltogaster* and other Rhizocephalae occupy a place at the top of the list of the strange critters!

I agree with the opinion of Richard Howey, author of the Micscape article linked above, on these micro aliens ... which should make us modest compared to the life forms that we could find on exoplanets ... if that is so that we can one day meet them...

I liked the episodes of the TV series: Startrek (at least the original version from the sixties years) which proposed to explore the universe. I think that with our microscopes this quest can be done on earth !

Comments to the author J.M. Cavanihac are welcomed, email:
micromars1 AT orange DOT fr

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