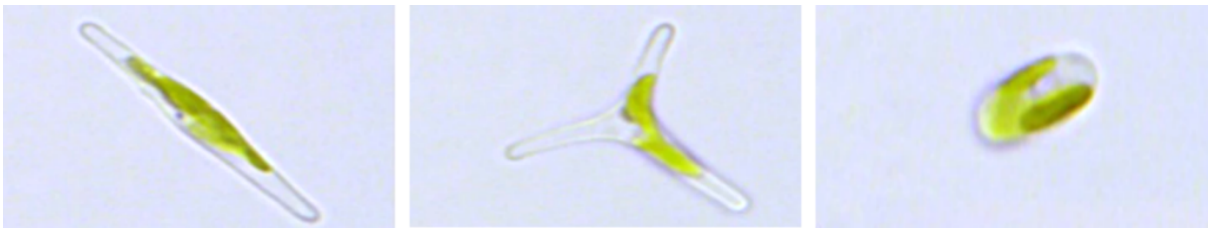
Phaeodactylum tricornutum - The strange morphology of a strange diatom

Phaeodactylum tricornutum is a diatom not quite like others. When we think of diatoms most people probably think of rigid cells with a very specific shape caused by their silica shells. *P. tricornutum* instead has a variable morphology and lacks the characteristic shell. It appears in three different distinct shapes: oval, fusiform or triradiate (figure 1) where fusiform is the most common. These three different morphologies come with different lifestyles. The oval form is mostly benthic while the fusiform and triradiate is planktonic. (Tesson et al. 2009)(Sabir et al, 2018)



https://microphyt.eu/wp-content/uploads/2023/01/p-tricornutum-1024x188.png
Fig 1. The three different shapes of P. tricornutum, from left to right: fusiform, triradiate and ovular.

Like other diatoms, *P. tricornutum*'s cell walls are made up of three different layers. These have similar contents except for the middle layer, which ordinarily would be silica but in *P. tricornutum* the degree of silicifications varies and sometimes they create entirely organic shells or accumulate only enough silica to form a structure for the raphe - a mucus producing slit(Diatoms of North America, 2021). (Tesson et al. 2009)

There are biochemical differences between the different forms of *P. tricornutum*. Polysaccharide concentration changed in response to environmental conditions which for example leads to aggregation and sinking in the benthic oval form. (Sabir et al, 2018)

The degree of silicification could simply be an effect of the availability of silica. It could also be an adaptation to either planktonic or benthic environments by changing the buoyancy of the diatom. There are however many factors that affect cell buoyancy and many of them, like solutes in the cell, can act faster than silica content, which mainly changes during cell division (Sabir et al, 2018). The reason that the oval form has more silica could simply be to create a raphe, which is needed for attachment and motility, and not necessary for the planktonic form.

According to a phylogenetic study the closest relative of the *P. trictorum* is the benthic diatom *Gomphonemopsis* (Sabir et al, 2018). This might mean that the common ancestor of both algae was benthic and that *P. tricornutum* evolved the ability to adapt its morphology. Changing between a platonic lifestyle and a benthic one is common for diatoms, however nowhere else is this done by initiating a morphological change (Sabir et al, 2018)

Referenser

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Tesson, B. et al. (2009) Insights into the polymorphism of the diatom Phaeodactylum tricornutum Bohlin. Botanica marina. [Online] 52 (2), 104–116.